



Opinion **Dynamics**

Portland

503 287 9136 tel
503-281-7375 fax

3934 NE MLK Jr. Blvd.
Suite 300
Portland, OR 97212



2019 California Low-Income Needs Assessment

Final Report: Volume 2 of 3: Detailed Methods and Results

December 13, 2019



Contributors



Gomathi Sadhasivan
Steven Chang

Table of Contents

Volume 1: Summary of Key Findings

1. Executive Summary
2. Introduction
3. Informing CARE Program Post-Enrollment Processes
4. Informing CARE Program ME&O
5. Examining ESA Program Health, Comfort, and Safety (HCS) Impacts
6. Assessing Alternative Fuels Customer Hardships
7. Low Service Reliability Customer Hardships

Volume 2: Detailed Methods and Results

Appendix A. Introduction	1
Appendix B. Detailed Study Methods	2
B.1 2019 LINA Data Collection Methods.....	2
B.2 2019 LINA Analysis Methods and Metrics.....	18
Appendix C. RO.1a Detailed Findings: Informing CARE Program Post-Enrollment Processes.....	34
C.1 Current and Past CARE Participants Definition and Sample Characteristics	34
C.2 Current vs. Past CARE Participant Comparisons	37
C.3 Past CARE Participant Post-Enrollment Process Characteristics	80
C.4 Summary of Findings, Conclusions, and Recommendations	88
Appendix D. RO.1b Detailed Findings: Informing CARE Program ME&O	92
D.1 CARE-Eligible Nonparticipants and Current CARE Participants Definition and Sample Characteristics.....	92
D.2 CARE-Eligible Nonparticipant Vs. Current CARE Participant Characteristics Comparisons	94
D.3 Barriers to CARE Participation	101
D.4 Immigrants and Non-English Language CARE-Eligible Nonparticipants	107
D.5 Summary of Findings, Conclusions, and Recommendations	118
Appendix E. RO.2 Detailed Findings: Examining ESA Program Health, Comfort, and Safety (HCS) Impacts	120
E.1 ESA Participant, Nonparticipant, and Targeted Measure Definitions and Distributions	120
E.2 ESA Participant vs. Nonparticipant Characteristics Comparisons.....	124
E.3 ESA Participants' Perceptions of the HCS Impacts of Targeted ESA Measures	130
E.4 Factors of ESA Participants' Perceptions of HCS Impacts of Targeted ESA Measures.....	139

E.5	Participants' Recommendations for Improving the ESA Program's HCS Impacts	152
E.6	ESA Contractors' Perceptions of the HCS Impacts of Targeted ESA Measures.....	152
E.7	Summary of Findings, Conclusions, and Recommendations	161
Appendix F.	RO.3 Detailed Findings: Alternative Fuels Customer Hardships.....	164
F.1	Alt-Fuels and Non-Alt-Fuel Customer Definitions and Distributions.....	164
F.2	Alt-Fuels Customers' Characteristics and Hardship Comparisons	166
F.3	Experiences Using Alt-Fuels	176
F.4	Alt-Fuels Customers' Program Experiences and Impacts	178
F.5	Summary of Findings, Conclusions, and Recommendations	191
Appendix G.	RO.4 Detailed Findings: Low Service Reliability Customer Hardships.....	194
G.1	Low and High Service Reliability Customer Definitions.....	194
G.2	Low Service Reliability Customers' Characteristics and Hardships Comparisons	195
G.3	Low Service Reliability Customers' Experience of Electricity Outages	204
G.4	Low Service Reliability Customers' Program Impacts and Experiences	205
G.5	Summary of Findings, Conclusions, and Recommendations	218

Volume 3: Supporting Documentation

Appendix A.	Research Plan
Appendix B.	Customer Survey Instrument
Appendix C.	Customer Survey Communications
Appendix D.	ESA Supervisor Interview Guide
Appendix E.	CARE Capitation Agency Interview Guide

Table of Tables

Table 1. Current CARE Participant Sampling Plan.....	3
Table 2. Current CARE Participant Survey Disposition Results	4
Table 3. Past CARE Participant Sampling Plan.....	4
Table 4. Past CARE Participant Survey Disposition Results	5
Table 5. CARE-Eligible Nonparticipant Sampling Plan	6
Table 6. CARE-Eligible Nonparticipant Survey Disposition Results	7
Table 7. Prevalence of Targeted ESA Measures Among the ESA Participant Population and Within Each IOU	8
Table 8. ESA Participant Sampling Plan.....	9
Table 9. ESA Participant Survey Disposition Results	9
Table 10. ESA Nonparticipant Survey Disposition.....	10
Table 11. Potential Alternative Fuel Customers Sampling Plan	11
Table 12. Alternative Fuel Customer Survey Results	12
Table 13. Non-Alt-Fuel Customer Survey Disposition.....	13
Table 14. Low Service Reliability Customer Survey Disposition.....	13
Table 15. High Service Reliability Customer Survey Disposition	14
Table 16. Customer Survey Schedule	15
Table 17. ESA Program Contractor Interviews by IOU Territory and ESA Services Performed	16
Table 18. CARE Capitation Agency Staff Interviews	17
Table 19. SAIDI and SAIFI Descriptive Statistics for All and Surveyed Customers, by IOU	29
Table 20. 2018 CARE Program Statistics, by IOU	35
Table 21. Surveyed Current CARE Participants' Process Status, by IOU	36
Table 22. Surveyed Past CARE Participants' Process Status, by IOU.....	37
Table 23. Past CARE Participants' Eligibility Status	38
Table 24. Surveyed Current and Past CARE Participants' Eligibility Status, by IOU and Process Status.....	39
Table 25. Surveyed Current and Past CARE Participants' Geographic Characteristics, by Process Status	40
Table 26. Surveyed Current and Past CARE Participants' Geographic Characteristics, by Eligibility Status.....	41
Table 27. Surveyed Current and Past CARE Participants' Geographic Characteristics, by IOU	42
Table 28. Surveyed Current and Past CARE Participants' Energy Characteristics, by Process Status	43
Table 29. Surveyed Current and Past CARE Participants' Energy Characteristics, by Eligibility Status.....	45
Table 30. Surveyed Current and Past CARE Participants' Energy Characteristics, by IOU	47

Table 31. Surveyed Current and Past CARE Participants' Economic Characteristics, by Process Status.....	49
Table 32. Surveyed Current and Past CARE Participants' Economic Characteristics, by Eligibility Status	51
Table 33. Surveyed Current and Past CARE Participants' Economic Characteristics, by IOU	52
Table 34. Surveyed Current and Past CARE Participants' Health Characteristics, by Process Status	54
Table 35. Surveyed Current and Past CARE Participants' Health Characteristics, by Eligibility Status.....	55
Table 36. Surveyed Current and Past CARE Participants' Health Characteristics, by IOU	56
Table 37. Surveyed Current and Past CARE Participants' Demographic Characteristics, by Process Status..	57
Table 38. Surveyed Current and Past CARE Participants' Demographic Characteristics, by Eligibility Status	58
Table 39. Surveyed Current and Past CARE Participants' Demographic Characteristics, by IOU	59
Table 40. Surveyed Current and Past CARE Participants' Housing Characteristics, by Process Status.....	61
Table 41. Surveyed Current and Past CARE Participants' Housing Characteristics, by Eligibility Status	62
Table 42. Surveyed CARE and Past Current CARE Participants' Housing Characteristics, by IOU.....	63
Table 43. Factors of Current CARE Participants' Eligibility Status	64
Table 44. Factors of Past CARE Participants' Eligibility Status	66
Table 45. Factors of Surveyed CARE Participant High-Usage.....	67
Table 46. Factors of Success in and Removal from CARE by Process Status.....	69
Table 47. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by CARE Process Status.....	70
Table 48. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by CARE Eligibility Status	71
Table 49. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by IOU	72
Table 50. Factors of Surveyed Current and Past CARE Participants' Average Difficulty Rating for CARE Processes Involving Understanding, Gathering, and Submitting Information.....	73
Table 51. Difficulties with CARE Reported by Surveyed Current and Past CARE Participants, by CARE Process Status.....	75
Table 52. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by CARE Process Status.....	76
Table 53. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by CARE Eligibility Status	77
Table 54. Surveyed Current and Past CARE Participants' Assessment of CARE's Economic Impacts, by IOU	78
Table 55. Factors of CARE's Economic Impacts, by Participant Status	79
Table 56. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Process Status	81

Table 57. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Process Status	81
Table 58. Past CARE Participants' Average Number of Days on CARE by IOU	82
Table 59. SCE Past CARE Participants' Average Number of Days on CARE by Enrollment Channel	83
Table 60. SCE Past CARE Participants' Average Number of Days on CARE by Income Per Household Member Reported in CARE Applications.....	83
Table 61. PG&E Past CARE Participants' Average Number of Days on CARE by Number of Categorical Participation Programs.....	84
Table 62. PG&E Past CARE Participants' Average Number of Days on CARE by Categorical Participation Programs.....	85
Table 63. SCG Past CARE Participants' Average Number of Days on CARE by Categorical Participation and Type.....	86
Table 64. Past CARE Participants' Average Number of Days on CARE by Climate Zone, Language, and ESA Participation	86
Table 65. Percentage of Current CARE Participants who Participated in ESA	87
Table 66. CARE Program Participation.....	93
Table 67. Distribution of Surveyed CARE-Eligible Nonparticipants, by IOU, and Statistical Confidence/Precision at IOU-Level.....	93
Table 68. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Geographic Characteristics.....	94
Table 69. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Energy Characteristics, by IOU	95
Table 70. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Economic Characteristics, by IOU	97
Table 71. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Health Characteristics, by IOU	99
Table 72. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Demographic Characteristics, by IOU	100
Table 73. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Housing Characteristics, by IOU	101
Table 74. Surveyed CARE-Eligible Nonparticipants' Awareness of and Interest in CARE, by IOU	102
Table 75. Factors of CARE-Eligible Nonparticipants' Awareness of and Interest in CARE.....	102
Table 76. Reasons Surveyed CARE-Eligible Nonparticipants Uninterested in CARE Are Not Interested in CARE, by IOU and CARE Awareness	103
Table 77. Reasons Surveyed CARE-Eligible Nonparticipants Interested in CARE Have Not Applied for CARE, by IOU	105
Table 78. Services Surveyed CARE-Eligible Nonparticipants Want from Their IOU to Help Better Control Energy Usage and/or Help Afford Energy Bills, by IOU and Interest in CARE	106

Table 79. Surveyed CARE-Eligible Nonparticipants and Current Participants Reporting a Foreign-Born Household Member(s) and Speaking a Non-English Language at Home, by IOU	107
Table 80. Key Characteristics by Participation in CARE and Presence of a Foreign-Born Household Member(s).....	108
Table 81. Key Characteristics by Participation in CARE and Language Spoken in Home	110
Table 82. Surveyed CARE-Eligible Nonparticipants' Awareness of and Interest in CARE, by Immigrant Status, Language Status, and IOU	111
Table 83. Factors of CARE-Eligible Nonparticipants' Awareness of and Interest in CARE, by Immigrant Status and Language Status	112
Table 84. Reasons Surveyed CARE-Eligible Nonparticipants Interested in CARE Have Not Applied for CARE, by Immigrant Status and Language Status	113
Table 85. Services Surveyed CARE-Eligible Nonparticipants Want from Their IOU to Help Better Control Energy Usage and/or Help Afford Energy Bills, by Immigrant Status and Language Status	114
Table 86. Interviewed CARE Capitation Agencies' Key Characteristics	114
Table 87. Surveyed ESA Participants, by IOU and Install Date Year	121
Table 88. Surveyed ESA Participants' Targeted Measures, by IOU and Climate Region	122
Table 89. Surveyed ESA Participants' Number of Targeted Measures.....	122
Table 90. Surveyed ESA Participants' Targeted Measure Combinations	123
Table 91. Surveyed ESA Participants' and Nonparticipants' Geographic Characteristics.....	125
Table 92. Surveyed ESA Participants' and Nonparticipants' Energy Characteristics	126
Table 93. Surveyed ESA Participants' and Nonparticipants' Economic Characteristics	127
Table 94. Surveyed ESA Participants' and Nonparticipants' Health Characteristics.....	128
Table 95. Surveyed ESA Participants' and Nonparticipants' Demographic Characteristics	129
Table 96. Surveyed ESA Participants' and Nonparticipants' Housing Characteristics	130
Table 97. ESA Participants' Overall Average Satisfaction Ratings.....	131
Table 98. ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received	131
Table 99. ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received, by IOU	132
Table 100. Percentage of ESA Participants Reporting a Decline, No Change, or an Increase in the Frequency of Experiencing HCS Issues in Their Home Before and After Participation	134
Table 101. Comparisons of ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation, and with Nonparticipants' Frequency of Experiencing HCS Issues During Past Year	135
Table 102. Percentage of ESA Participants Reporting a Decline, No Change, or an Increase in the Frequency of Health Effects Caused by HCS Issues in Their Home Before and After Participation	135
Table 103. Comparisons of ESA Participants' Frequency of Health Effects Caused by HCS Issues in Their Home Before and After Participation, and with Nonparticipants' Frequency of Experiencing Health Effects from HCS Issues During Past Year.....	136

Table 104. ESA Participants' Average Rating of How Targeted ESA Measures Affected the Comfort of Their Home and Health of Their Household Members.....	137
Table 105. ESA Participants' and Nonparticipants Average Ratings of the HCS Components of their Homes	138
Table 106. Percentage of ESA Participants Reporting Their ESA Contractor Gave Advice About Saving Energy and Improving HCS in Their Home, by Measure Type.....	140
Table 107. Percentage of ESA Participants Reporting Their ESA Contractor Gave Advice About Saving Energy and Improving HCS in Their Home, by IOU	141
Table 108. Percentage of ESA Participants Reporting Their ESA Contractor Gave Advice About Saving Energy and Improving HCS in Their Home, by IOU	141
Table 109. Potential Factors of ESA Participants' Perceptions of the Changes in of the Frequency of HCS Issues Occurring in Their Homes Pre- vs. Post-Participation	143
Table 110. Potential Factors of ESA Participants' Perceptions of Changes in the Frequency of HCS Issues Causing Harm to Household Members Pre- vs. Post-Participation	146
Table 111. Potential Factors of ESA Participants' Perceptions How Targeted Measures Changed the Comfort of Their Homes and The Health of Household Members	149
Table 112. Surveyed ESA Participants' Recommendations for Improving the ESA Program's HCS Impacts	152
Table 113. ESA Program Contractor Interviews by IOU Territory and ESA Services Performed	152
Table 114. ESA Supervisors Input on the Relative HCS Benefits of the ESA Cooling Measures	155
Table 115. Measures' Non-Energy Benefits Reported by Customers to ESA Supervisors	158
Table 116. Program Rules Limiting ESA Services	160
Table 117. Distribution of Surveyed Alt-Fuels Customers by IOU, Customer Group, Fuel Type and End Use, and Number of Alt-Fuels	165
Table 118. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Geographic Characteristics.....	166
Table 119. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Energy Characteristics	167
Table 120. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Economic Characteristics	169
Table 121. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Health Characteristics.....	170
Table 122. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Demographic Characteristics	171
Table 123. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Housing Characteristics and Hardships.....	172
Table 124. Factors of Surveyed Alt-Fuel Customers' Economic and Health Hardships	175
Table 125. Surveyed Alt-Fuel Customers' Reported Reasons, Disadvantages, Assessment, & Costs of Using Alt-Fuels	177
Table 126. Surveyed Current and Past CARE Participant and CARE-Eligible Nonparticipant Hardship Metrics, by Alt-Fuel Status	178
Table 127. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by Alt-Fuel Status	179
Table 128. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by Alt-Fuel Status	180

Table 129. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Alt-Fuel Status.....	181
Table 130. Reasons Surveyed CARE-Eligible Nonparticipants Have Not Applied for CARE, by Alt-Fuel Status	182
Table 131. Surveyed ESA Participant and Nonparticipant Hardship Metrics, by Alt-Fuel Status	183
Table 132. Surveyed ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received, by Alt-Fuel Status.....	184
Table 133. Comparisons of Surveyed Alt-Fuel ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation, and with Alt-Fuel Nonparticipants' Frequency of Experiencing HCS Issues During Past Year	185
Table 134. Comparisons of Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation.....	186
Table 135. Comparisons of Surveyed Alt-Fuel ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation, and with Alt-Fuel Nonparticipants' Frequency of Experiencing of Health Effects from HCS Issues During Past Year	187
Table 136. Comparisons of Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation.....	188
Table 137. Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Average Rating of How Targeted ESA Measures Affected the Comfort of Their Home and Health of Their Household Members.....	189
Table 138. Surveyed Alt-Fuel ESA Participants' and Nonparticipants Average Ratings of the HCS Components of their Homes.....	189
Table 139. Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Average Ratings of the HCS Components of their Homes	190
Table 140. Hardship Metrics for Surveyed Alt-Fuel Participants and Nonparticipants in Other (non-CARE/non-ESA) Energy Assistance or Efficiency Programs.....	190
Table 141. Distribution of Surveyed Low Service Reliability Customers by IOU and Customer Group.....	195
Table 142. Surveyed Lower and Higher Service Reliability Customer Geographic Characteristics	196
Table 143. Surveyed Lower and Higher Service Reliability Customer Energy Characteristics.....	197
Table 144. Surveyed Lower and Higher Service Reliability Customer Economic Characteristics.....	198
Table 145. Surveyed Lower and Higher Service Reliability Customer Health Characteristics	199
Table 146. Surveyed Lower and Higher Service Reliability Customer Demographic Characteristics.....	199
Table 147. Surveyed Lower and Higher Service Reliability Customer Housing Characteristics and Hardships	200
Table 148. Potential Factors of Surveyed Lower Service Reliability Customers' Economic and Health Hardships	203
Table 149. Surveyed Low and High Service Reliability Customers' Experience of Electrical Outages During 2018.....	204
Table 150. Surveyed Current and Past CARE Participant and CARE-Eligible Nonparticipant Hardship Metrics, by Service Reliability Status	206

Table 151. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by Service Reliability Status	206
Table 152. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by Service Reliability Status	207
Table 153. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Service Reliability Status	208
Table 154. Reasons Surveyed CARE-Eligible Nonparticipants Have Not Applied for CARE, by Service Reliability Status	209
Table 155. Surveyed ESA Participant and Nonparticipant Hardship Metrics, by Service Reliability Status ..	211
Table 156. ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received, by Service Reliability Status	211
Table 157. Comparisons of Surveyed Lower Service Reliability ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation, and with Lower Service Reliability Nonparticipants' Frequency of Experiencing HCS Issues During Past Year	212
Table 158. Comparisons of Surveyed Lower and Higher Service Reliability ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation.....	214
Table 159. Comparisons of Surveyed Lower Service Reliability ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation, and with Lower Service Reliability Nonparticipants' Frequency of Experiencing of Health Effects from HCS Issues During Past Year	215
Table 160. Comparisons of Surveyed Lower and Higher Service Reliability ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation.....	216
Table 161. Surveyed Lower and Higher Service Reliability ESA Participants' Average Rating of How Targeted ESA Measures Affected the Comfort of Their Home and Health of Their Household Members.....	217
Table 162. Surveyed Lower Service Reliability ESA Participants' and Nonparticipants' Average Ratings of the HCS Components of their Homes	217
Table 163. Surveyed Lower and Higher Service Reliability ESA Participants' Average Ratings of the HCS Components of their Homes	218

Table of Figures

Figure 1. California Census Tracts by Percentage of Households at 100% of Federal Poverty Guidelines	6
Figure 2. California Census Tracts by Percentage of Households Using Alternative Fuels for Space Heating.....	11
Figure 3. Energy Burden Histogram	20
Figure 4. Modified Energy Burden Histogram.....	23
Figure 5. Economic Hardship Index Histogram	27
Figure 6. Health Hardship Index Histogram.....	28
Figure 7. California Building Climate Zones.....	30
Figure 8. ESA Participants' Mean Satisfaction with Heating, Cooling, and Enclosure Measures	132
Figure 9. Distribution of Surveyed ESA Participants' Perceptions of Changes in the Frequency of HCS Issues Occurring in Their Homes Pre- vs. Post-Participation	142
Figure 10. Distribution of Surveyed ESA Participants' Perceptions of Changes in the Frequency of HCS Issues Causing Harm to Household Members Pre- vs. Post-Participation	145
Figure 11. Distribution of Surveyed ESA Participants' Perceptions of How Targeted Measures Changed the Comfort of Their Homes and Health of Household Members	147
Figure 12. Percent of Company's Work Involving the ESA Program	153
Figure 13. ESA Supervisors Reporting Unconventional Strategies Customers Used to Keep Warm.....	156
Figure 14. Concerns Making Eligible Homes Infeasible to Assess.....	159

Glossary

Alternative-fuels (alt-fuels) customers: Low-income customers who do not have natural gas service and who use propane, kerosene/oil/diesel, and/or wood/pellets as their primary fuel(s) for space heating, water heating, and/or cooking.

Areas with high concentrations of CARE-eligible customers: Census tracts in California where 20% or more households earn 100% or less of federal poverty guidelines (FGP).

California Alternate Rates for Energy (CARE) program: A rate assistance program offered by the IOUs that provides income qualified customers who earn 200% or less of federal poverty guidelines (FPG) a discount of up to 35% on their monthly electricity bills and up to 20% on their monthly natural gas bills.

CARE capitation agencies: Community-based organizations that provide services to local residents, including assistance with CARE enrollment, recertification, income verification, and/or high-usage processes.

CARE categorical participation: Participants who enrolled in or recertified for CARE by selecting in their CARE application the public assistance programs they participate in or that they are on fixed income instead of providing an annual income amount.

CARE-eligible nonparticipants: Low-income customers earning 200% or less of federal poverty guidelines (FPG) and who have never participated in CARE as of July 2018.

CARE enrollment: Process through which low-income customers enroll in the CARE program by providing their household size and annual income or selecting public assistance programs they participate in or that they are on fixed income in the CARE application and submitting the application to their IOU.

CARE enrollment channel: Means through which customers can enroll in (and recertify for) CARE and include CARE capitation agencies, IOU website, IOU customer call center, direct mail, data sharing between IOUs, and others.

CARE high-usage verification: Process through which CARE high-users either reduce their usage to below 400% of their baseline allowance, through ESA participation and usage monitoring, or appeal their high-usage to their IOU; participants who do not reduce their usage or whose appeal is declined are removed from CARE for up to two years.

CARE high-users: CARE participants who monthly usage exceeds 400% (high-low user) or 600% (high-high user) of their baseline allowance and are selected for high-usage verification.

CARE income verification: Process through which CARE participants who are likely not income-eligible are identified via the IOU's monthly propensity modeling and are selected to verify their income (e.g., with tax forms, check stubs, etc.) or public assistance participation (e.g., with award letters, receipts, etc.) with their IOU; participants who do not provide the proper documentation or are no longer eligible are removed from CARE for up to two years.

CARE recertification: Process through which all CARE participants must recertify, or renew, their participation in CARE by completing and submitting the CARE application to their IOU; occurs every two years for most participants and those who do not provide their information or are no longer eligible are removed from CARE.

Current CARE participant: Low-income customers currently participating in CARE as of July 2018.

Energy Burden Metrics: Energy burden is the percentage of customers' annual income that is spent on their energy bills; modified energy burden includes the monetary value of public assistance programs in the income of customers participating in such programs; alternative energy burden includes the annual cost of alt-fuels in the annual energy costs of customers who use alt-fuels.

Energy Savings Assistance (ESA) program: An energy assistance program offered by the IOUs that provides income-qualified customers who earn 200% or less of federal poverty guidelines a free home energy assessment, energy saving equipment repair, replacements, or upgrades, and an energy education.

ESA supervisors/lead contractors: Contractors working for firms qualified by IOUs to provide ESA services and who manage or lead teams that do ESA enrollments and assessments and/or installation of ESA heating, cooling, or enclosure measures.

ESA participants: Low-income customers who participated in ESA between January 1, 2016 and June 30, 2018 (recent participants), received ESA energy education, and received at least one of the targeted ESA measures.

Family Electric Rate Assistance (FERA) program: A rate assistance program offered by the IOUs that provides income qualified customers who earn 250% or less of federal poverty guidelines (FPG) and who have three or more household members a discount of up to 12% on their monthly electricity bills.

High service reliability customers: Customers living in areas with high electricity service reliability, measured as less than one standard deviation above the SAIDI or SAIFI mean values for each IOU.

Investor-owned utilities (IOUs): The four utilities that are subject to the 2017-19 Low-Income Needs Assessment (LINA) and who provide energy services to most California residents; they include Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas & Electric (SDG&E).

Low service reliability customers: Customers living in areas with low electricity service reliability, measured as one standard deviation or more above the SAIDI or SAIFI mean values for each IOU.

Past CARE participants: Low-income customers who formerly participated in CARE any time between January 1, 2015 and June 30, 2018 but were removed from CARE as of July 2018.

System Average Interruption Duration Index (SAIDI): Measure of an IOU's annual average duration of electricity outages, where larger numbers mean longer outages.

System Average Interruption Frequency Index (SAIFI): Measure of an IOU's annual average frequency of electricity outages, where larger numbers mean more frequent outages.

Targeted ESA measures: The heating, cooling, and enclosure measures that are the focus of the 2017-19 LINA and identified as higher-cost and/or labor intensive: furnace repair or replacement; central air conditioning (AC) tune-up, repair, or replacement; room/window AC replacement; evaporative cooler replacement; attic insulation; weatherization; and, windows and doors.

Appendix A. Introduction

Volume 2 of the 2019 LINA report includes six appendices with detailed descriptions of the study methods and results that are summarized in Volume 1:

- Appendix B explains the study data collection and analysis methods that are summarized in Chapter 2 in Volume 1 of the report.
- Appendix C includes detailed results for RO.1a Informing CARE PE Processes that are summarized in Chapter 3 in Volume 1 of the report.
- Appendix D includes detailed results for RO.1b Informing CARE Marketing, Outreach, and Education (ME&O) that are summarized in Chapter 4 in Volume 1 of the report.
- Appendix E includes detailed results for RO.2 Examining ESA Program Health, Comfort, and Safety (HCS) Impacts that are summarized in Chapter 5 in Volume 1 of the report.
- Appendix F includes detailed results for RO.3 Assessing Alt-Fuels Customer Hardships that are summarized in Chapter 6 in Volume 1 of the report.
- Appendix G includes detailed results for RO.4 Assessing Low Service Reliability Customer Hardships that are summarized in Chapter 7 in Volume 1 of the report.

Volume 3 of the 2019 LINA report includes supporting documentation for the study, including the research plan, the customer survey instrument and messaging, and the ESA and CARE capitation agency interview guides.

Appendix B. Detailed Study Methods

B.1 2019 LINA Data Collection Methods

We collected data from several different sources for the 2019 LINA. These included interviews with CARE and ESA staff at each IOU; customer records from IOUs for sampling and analyses; surveys of customers; in-depth interviews with ESA contractors; in-depth interviews with staff at CARE capitation agencies that provide support to immigrant communities; and reviews of published literature about immigrants' perspectives toward public assistance programs like CARE. We provide details on each of these data sources and collection methods in the subsections below.

B.1.1 CARE and ESA Staff Interviews

In April 2018, we conducted two group interviews, the first with 13 key CARE staff and the second with 10 key ESA staff representing all the IOUs. Our overall goal was to learn more about each program and associated research objectives to inform the development of the project workplan. Each interview lasted about 2 hours and focused primarily on each program's processes and research needs. We used data from the interviews to provide more context around and details about how we would approach each research question and objective in the workplan.

B.1.2 Data from the IOUs

Between August 2018 and April 2019, we worked with each IOU to request and obtain customers lists of and associated data for each of the customer groups, ESA contractors, CARE capitation agencies, and SAIDI/SAIFI values. We used the data received from the IOUs for to develop survey and interview samples, field the customer survey and in-depth interviews, calculate customers' energy burden, and conduct select analyses with CARE enrollment data.

Some of the CARE and ESA data we requested from each IOU was not provided. For example, we did not receive 2018 or 2017 ESA participation data from SCG and did not receive 2018 or 2016 ESA participation data from SDG&E, but the data we did receive was sufficient to develop the sample frames for the customer survey (see Appendix E for more details). In addition, we did not receive several CARE program data fields from some or all the IOUs, including reasons past participants were removed from CARE from any IOU, the CARE removal date for past participants from SDG&E, enrollment channel and income data from all IOUs except SCE, and categorical participation data from all IOUs except PG&E. These omissions limited the analyses we could do with the IOUs' CARE data, as described in more detail in Appendix B.

B.1.3 Omnibus Customer Survey

In March and April 2018, we conducted a survey with a sample of 1,505 low-income customers, out of a total sample of 21,590, to collect data about their characteristics and experience with the CARE or ESA programs (see Volume 3 for survey instrument and communications). We used IOU customer data, Census data, and third-party data to create survey samples and worked with Washington State University's (WSU) Social and Economic Science Research Center (SESRC) to conduct the survey using web and phone survey modes.

Sampling Approach and Disposition Results

The sampling approach we used for the customer survey mostly varied by customer group but there were a few sampling characteristics that were consistent across all the groups. These included:

- All sampled customers were from the customer data we requested and received from the IOUs that included customer names, contact info, and other high priority data fields needed for sampling and survey implementation.
- All the customers in the requested customer data had to have an active account(s) at the time of the data request.
- We estimated response rates for each group and used them to determine the sample size we would need from each IOU to achieve the quota for each group and/or subgroup. Quotas were established to provide 90/10 confidence/precision at the IOU- or state-level.
- If the list of an IOU's customers, or subgroup of customers within the list, included less than half without an email address, we oversampled customers with an email address so that they comprised 50% of the overall or subgroup sample. This was done to remain within budget on the customer survey since sending emails is much less expensive than mailing letters. The tables in the subsections below indicate which groups included the email stratification.

Current CARE Participants

We requested from the IOUs their customers who were participating in CARE as of July 1, 2018. We stratified the sample of current CARE participants based on which CARE processes they had successfully experienced, in the following order: 1) enrolled but not yet recertified or verified, 2) recertified but not verified, 3) income verified, and 4) high-user verified. We estimated a 10% response rate and created a sample of 3,930 current CARE participants with the goal of obtaining responses from 393 (Table 1).

Table 1. Current CARE Participant Sampling Plan

	PG&E ^a	SCE ^a	SCG	SDG&E ^b	Total
Needed Survey Completes (Quotas)	101	101	90	101	393
Estimated Response Rate	10%	10%	10%	10%	10%
Strata Sample Size:					
Enrolled but not yet recertified or verified (25%)	252	252	225	252	981
Recertified but not verified (30%)	303	303	270	303	1,179
Income verified (30%)	303	303	270	303	1,179
High-user verified (15%)	152	152	135	152	591
Total Sample Size ^c	1,010	1,010	900	1,010	3,930

^a Strata include an oversample of potential alt-fuels customers (25%) and customers with an email address (50%).

^b Strata include an oversample of potential alt-fuels customers (25%).

^c Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision.

A total of 424 current CARE participants completed the survey (or, for the few partial completes, at least half of the survey), for an 11% response rate (Table 2). We met the quota goals and obtained enough completes from each IOU to achieve 90/10 confidence precision at the IOU-level. We also obtained enough completes from each stratum, except high users, for 90/10 confidence/precision at the state-level; the number of high-user completes (n=53) provide 85/10 confidence/precision at the state-level.

Table 2. Current CARE Participant Survey Disposition Results ^a

	PG&E	SCE	SCG	SDG&E	Total
Total Sample	1,010	1,010	900	1,010	3,930
Total Survey Completes	110	107	95	112	424
Web Completes	105	100	88	100	393
Phone Completes	0	1	2	3	6
Partial Completes ^b	5	6	5	9	25
Total Survey Incompletes/Nonrespondents	898	901	805	898	3,502
Partial Incompletes ^c	23	37	13	12	85
Refusals	0	1	0	1	2
Undeliverable letter(s)	25	34	4	18	81
Nonrespondents	852	831	788	867	3,338
Response Rate ^d	11%	11%	11%	11%	11%
Strata Completes and Partial Completes:					
Enrolled but not yet recertified or verified	28	22	24	22	96
Recertified but not yet verified	32	29	22	34	117
Income verified	34	44	42	38	158
High-user verified	16	12	7	18	53

^a Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision. Sample sizes of 67 or more completes have 90/10 confidence/precision.

^b Partial completes are counted as respondents who answered at least half of the survey questions.

^c Partial incompletes are counted as nonrespondents who answered less than half of the survey questions.

^d Response rate = total completes/total sample (American Association for Public Opinion Research [AAPOR] Response Rate 2).

Past CARE Participants

We asked the IOUs for their customers who had participated in CARE anytime between January 1, 2015 and June 30, 2018 but who were no longer participating as of July 1, 2018. We stratified the sample of past CARE participants based on the process at which they were removed from CARE, in the following order: 1) after a recertification request, 2) after an income verification request, and 3) after a high-user verification request. We estimated an 8% response rate and created a sample of 4,000 past CARE participants with the goal of obtaining survey responses from 320 (Table 3).

Table 3. Past CARE Participant Sampling Plan

	PG&E ^a	SCE ^b	SCG	SDG&E ^b	Total
Needed Survey Completes (Quotas)	90	90	70	70	320
Estimated Response Rate	8%	8%	8%	8%	8%
Strata Sample Size:					
Removed after recertification request (40%)	450	450	350	350	1,600
Removed after income verification request (40%)	450	450	350	350	1,600
Removed after high-user verification request (20%)	225	225	175	175	800
Total Sample Size ^c	1,125	1,125	875	875	4,000

^a Strata include an oversample of potential alt-fuels customers (25%) and customers with an email address (50%).

^b Strata include an oversample of potential alt-fuels customers (25%).

^c Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision.

A total of 345 past CARE participants completed the survey (or, for the few partial completes, at least half of the survey), for a 9% response rate (Table 4). We met the quota goals and obtained enough completes from each IOU to achieve 90/10 confidence precision at the IOU-level. We also obtained enough completes from each stratum for 90/10 confidence/precision at the state-level.

Table 4. Past CARE Participant Survey Disposition Results ^a

	PG&E ^b	SCE ^b	SCG	SDG&E ^c	Total
Total Sample	1,125	1,125	875	875	4,000
Total Survey Completes	95	102	74	74	345
Web Completes	87	87	58	70	302
Phone Completes	2	4	11	0	17
Partial Completes ^d	6	11	5	4	26
Total Survey Incompletes/Nonrespondents	1,030	1,023	801	799	3,653
Partial Incompletes ^e	17	10	24	26	77
Refusals	0	0	0	0	0
Undeliverable Letter(s)	227	27	13	72	339
Nonrespondents	786	986	764	701	3,237
Response Rate ^f	8%	9%	9%	9%	9%
Strata Completes and Partial Completes:					
Removed after recertification request	32	37	25	22	116
Removed after income verification request	44	44	39	35	162
Removed after high-user verification request	19	21	10	17	67

^a Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision. Sample sizes of 67 or more completes have 90/10 confidence/precision.

^b Strata include an oversample of potential alt-fuels customers (25%) and customers with an email address (50%).

^c Strata include an oversample of potential alt-fuels customers (25%).

^d Partial completes are counted as respondents who answered at least half of the survey questions.

^e Partial incompletes are counted as nonrespondents who answered less than half of the survey questions.

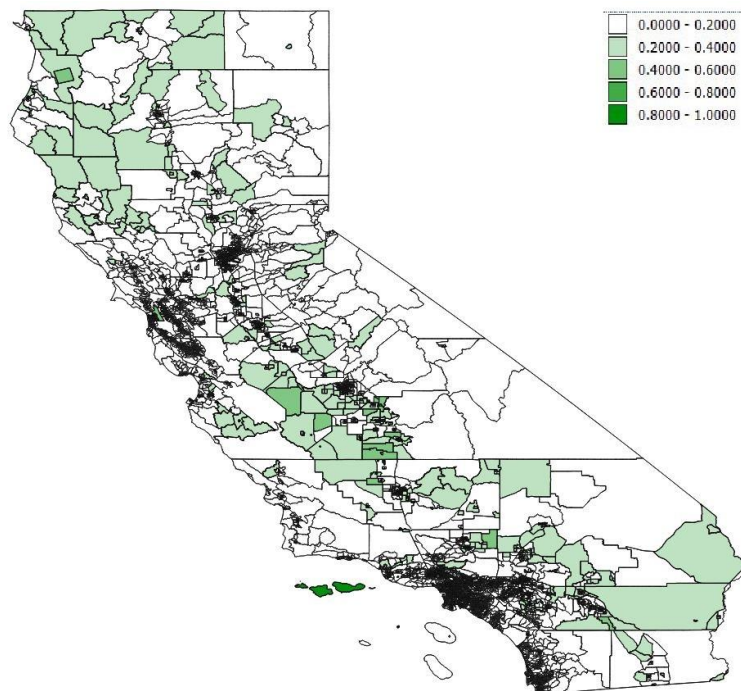
^f Response rate = total completes/total sample (AAPOR Response Rate 2).

CARE-Eligible Nonparticipants

We performed a two-stage sampling approach with PG&E and SCE nonparticipants to try to maximize the likelihood that the sampled customers would be CARE-eligible in terms of meeting the 2017 minimum household income and size requirements. For the first stage, we requested from the IOUs their customers whose premise was located in a Census tract with 20% or more households earn 100% or less of FPG where more eligible customers are concentrated (Figure 1), which we provided, and who had never participated in CARE.¹ We created a random sample of 15,000 of these nonparticipants from each IOU and determined their potential CARE eligibility using household-level estimates for their household income and size that we purchased from Acxiom.²

¹ We chose to use the 100% FPG poverty threshold (instead of the 200% FPG required by CARE) to increase the likely incidence of eligible nonparticipants in an effort to reduce survey costs and fielding times. We screened nonparticipants for eligibility based on the 2017 200% FPG CARE criteria.

² IOUs could use a similar approach for identifying nonparticipants who earn 200% or less FPG and qualified nonparticipants who live in Census tracts with lower poverty rates.

Figure 1. California Census Tracts by Percentage of Households at 100% of Federal Poverty Guidelines ^a

^a Source: 2016 American Community Survey 5-year estimates.

For the second stage, we sent the list of potential CARE-eligible nonparticipants back to each IOU for additional data we needed for the sampling and survey implementation and used this list to create the survey sample. We estimated a 6% response and incidence rate and created a sample of 3,000 PG&E and SCE CARE-eligible nonparticipants with the goal of obtaining survey responses from 180 (Table 5).

For SCG and SDG&E, we requested the customers whose premise was located in a Census tract with 20% or more households earn 100% or less of FPG, which we provided, and who had never participated in CARE, but we did not purchase Acxiom estimates for customers' household income and size. Instead, we created a larger survey sample from the unrefined nonparticipant list, assuming there would be more nonparticipants who screen out of the survey because they do not meet the minimum household income and size requirements than with the PG&E and SCE samples that we did refine with auxiliary data. We estimated a 3% response and incidence rate and created a sample of 7,000 SCG and SDG&E CARE-eligible nonparticipants with the goal of obtaining survey responses from 140 (Table 5).

Table 5. CARE-Eligible Nonparticipant Sampling Plan

	PG&E ^a	SCE ^a	SCG	SDG&E	Total
Needed Survey Completes (Quotas)	90	90	70	70	320
Estimated Response & Incidence Rate	6%	6%	2%	2%	3%
Total Sample Size ^b	1,500	1,500	3,500	3,500	10,000

^a Strata include an oversample of potential alt-fuels customers (25%) and customers with an email address (50%).

^b Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision.

We obtained responses from 816 customers, for an 8% response rate, 267 of which reported eligible annual incomes and household sizes and never participating in CARE, for a 3% incidence rate (Table 6). Due to the large number of “past participants” in the sample, we did not meet the quota goals but the sample sizes of respondents are large enough to achieve 90/10 confidence/precision at the state- and IOU-level, except for PG&E nonparticipants (n=58), which has 85/10 confidence/precision at the IOU-level.

Table 6. CARE-Eligible Nonparticipant Survey Disposition Results ^a

	PG&E ^b	SCE ^b	SCG	SDG&E ^c	Total
Total Sample	1,500	1,500	3,500	3,500	10,000
Total Survey Respondents	153	191	251	221	816
Screened-Out: Household Income/Size Ineligibility ^d	68	103	177	128	476
Screened-Out: Indicated previous CARE participation ^d	27	20	7	19	73
Total Survey Qualified Completes	58	68	67	74	267
Web Completes	59	79	67	83	288
Phone Completes	23	6	4	1	34
Partial Completes ^e	3	3	3	9	18
Total Survey Incompletes/Nonrespondents	1,347	1,309	3,193	3,239	9,184
Partial Incompletes ^f	21	26	67	56	170
Refusals	0	0	0	1	1
Undeliverable letter(s)	60	69	61	108	298
Nonrespondents	1,266	1,214	3,121	3,114	8,715
Response Rate ^g	10%	13%	7%	6%	8%
Incidence Rate ^h	4%	5%	2%	2%	3%

^a Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision. Sample sizes of 67 or more qualified completes have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

^b Strata include an oversample of potential alt-fuels customers (25%) and customers with an email address (50%).

^c Strata include an oversample of potential alt-fuels customers (25%).

^d Based on responses to survey questions.

^e Partial completes are counted as respondents who answered at least half of the survey questions.

^f Partial incompletes are counted as nonrespondents who answered less than half of the survey questions.

^g Response rate = total respondents/total sample (AAPOR Response Rate 2).

^h Incidence rate = total qualified completes/total sample.

ESA Participants

We asked the IOUs for their customers who participated in the ESA program between January 1, 2016 and June 30, 2018 and who received one or more of the targeted measures. We stratified the sample of ESA participants to try to achieve 90/10 confidence/precision for each of the targeted ESA measures. We used the following order to stratify participants based on each measure’s prevalence in the ESA participant population and what measure(s) each IOU offers (from least to most prevalent): room AC replacement, central AC replacement/repair, furnace replacement/repair, attic insulation, evaporative cooler replacement, and weatherization measures (Table 7).

We first excluded the few customers who did not receive an ESA energy education.³ Next, we sampled customers who had received only one of the targeted measures, then sampled from customers who received a combination of two or more targeted measures. We implemented this stepwise sampling approach to increase the number of survey respondents who would have received just one targeted measure so we could determine the measure's HCS impacts without confounding them with the impacts other targeted measures.

We did not include heat pumps as a separate sample stratum because there were so few participants who received a heat pump (less than 400). We also did not create a separate stratum for weatherization measures because, with the exception of SCE, nearly all ESA participants (91% or more) received a weatherization measure and we would obtain more than enough customers who received these measures to achieve the 68 needed for 90/10 confidence/precision without a separate stratum (Table 7).

Table 7. Prevalence of Targeted ESA Measures Among the ESA Participant Population and Within Each IOU

ESA Measures	Measure Total N	PG&E		SCE		SCG		SDG&E	
		% of Measure Total N	% of IOU Total N	% of Measure Total N	% of IOU Total N	% of Measure Total N	% of IOU Total N	% of Measure Total N	% of IOU Total N
Furnace replacement/repair	7,569	24%	2%	N/A	N/A	23%	19%	53%	39%
Central AC replacement/repair	5,749	N/A ^a	N/A ^a	100%	20%	N/A	N/A	N/A	N/A
Room AC replacement	5,234	68%	3%	28%	5%	N/A	N/A	4%	2%
Evaporative cooler replacement	30,805	23%	7%	77%	83%	N/A	N/A	N/A	N/A
Heat pump replacement/repair	363	N/A	N/A	100%	1%	N/A	N/A	N/A	N/A
Attic insulation	9,398	88%	8%	N/A	N/A	N/A	N/A	12%	11%
Weatherization measures	117,998	83%	91%	7%	3%	8%	99%	8%	95%
Total ESA Participants (1/2015 – 7/2018)	155,224	107,033		28,442		9,365		10,384	

^a Over 17,000 PG&E ESA participants received a central AC tune-up but none received a repair or replacement.

For the survey, we estimated a 10% response rate and created a sample of 3,660 ESA participants with the goal of obtaining survey responses from 365 (Table 8). For PG&E, we included all the targeted measures except central AC replacement/repair because PG&E offers only central AC tune-ups. For SCE, we included all targeted measures except furnace replacements/repairs and attic insulation because SCE does not offer these measures, they are provided through SCG instead. For SCG, we included only furnace replacements/repairs because SCG does not provide other targeted measures and attic insulation was provided to fewer than 1% of customers. For SDG&E, we included furnace replacement/repair, room AC replacement, and attic insulation since SDG&E does not offer central AC replacement/repair or evaporative cooler replacements. As noted above, this sampling plan will also achieve at least 68 participants who received weatherization measures from PG&E, SCG, and/or SDG&E since nearly all these IOUs' participants received at least one weatherization measure.

³ Nearly all customers (96%) in the ESA participants lists we received from the IOUs were flagged as having received an energy education and there were too few to include the sample to achieve at least 85/10 confidence/precision, so we excluded customers who did not receive it to avoid confounding the results. We do not know why the 4% of ESA participants were not offered or declined the ESA energy education but it does not seem to be based on ESA measures they received.

Table 8. ESA Participant Sampling Plan

	PG&E ^a	SCE ^a	SCG	SDG&E ^a	Total
Needed Survey Completes (Quotas)	150	130	40	45	365
Estimated Response Rate	10%	10%	10%	10%	10%
Strata Sample Size:					
Furnace replacement/repair	90	N/A	400	260	750
Central AC replacement/repair/tune-up	0	720	N/A	N/A	720
Room AC replacement	550	130	N/A	40	720
Evaporative cooler replacement	270	450	N/A	N/A	720
Attic insulation	600	N/A	N/A	150	750
Total Sample Size ^b	1,510	1,300	400	450	3,660

^a Strata include an oversample of potential alt-fuels customers (25%).

^b Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision.

A total of 396 ESA participants completed the survey (or, for the few partial completes, at least half of the survey), for an 11% response rate (Table 9). We successfully met the quota goals and obtained enough completes from each targeted measure stratum for 90/10 confidence/precision at the state-level and enough completes from PG&E and SCE participants to achieve 90/10 confidence precision at the IOU-level. However, due to the small number of sampled participants with only one targeted measure, most respondents received two or more targeted measures (see Chapter 5 for more details).

Table 9. ESA Participant Survey Disposition Results ^a

	PG&E ^b	SCE ^b	SCG	SDG&E ^c	Total
Total Sample	1,510	1,300	400	450	3,660
Total Survey Completes	160	141	47	48	396
Web Completes	139	128	44	44	355
Phone Completes	9	9	0	3	21
Partial Completes ^d	12	4	3	1	20
Total Survey Incompletes/Nonrespondents	1,350	1,159	353	402	3,264
Partial Incompletes ^e	45	35	13	8	101
Refusals	0	1	0	0	1
Undeliverable letter(s)	66	64	6	9	145
Nonrespondents	1,239	1,059	334	385	3,017
Response Rate ^f	11%	11%	12%	11%	11%
Targeted Measure Strata Completes ^g					
Furnace replacement/repair	10	N/A	47	38	95
Central AC replacement/repair/tune-up	29	99	N/A	N/A	128
Room AC replacement	59	11	N/A	4	74
Evaporative cooler replacement	48	85	N/A	N/A	133
Attic insulation	78	N/A	N/A	18	96
Weatherization	141	N/A	45	43	229

	PG&E ^b	SCE ^b	SCG	SDG&E ^c	Total
Number of Targeted Measures Per Respondent Strata Completes					
One targeted measure	12	87	2	5	106
Two targeted measures	98	54	45	32	229
Three targeted measures	43	0	0	10	53
Four targeted measures	7	0	0	1	8

^a Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision. Sample sizes of 67 or more completes have 90/10 confidence/precision; sample sizes of 52 to 66 completes have 85/10 confidence/precision; sample sizes less than 52 completes have too low confidence/precision for conclusive results.

^b Strata include an oversample of potential alt-fuels customers (25%) and customers with an email address (50%).

^c Strata include an oversample of potential alt-fuels customers (25%).

^d Partial completes are counted as respondents who answered at least half of the survey questions.

^e Partial incompletes are counted as nonrespondents who answered less than half of the survey questions.

^f Response rate = total completes/total sample (AAPOR Response Rate 2).

^g Respondents can be in multiple strata if they received multiple targeted measures so the sum of the strata completes can exceed the total survey completes; N/A means the measure is not offered by the IOU and not applicable.

ESA Nonparticipants

We defined ESA nonparticipants as income-qualified customers who had never participated in ESA before July 1, 2018 (just before we submitted the request to the IOUs for their customer data). We created the group of ESA nonparticipants by combining the surveyed customers in the surveyed CARE study groups – current and past CARE participants and CARE-eligible nonparticipants – who we identified from IOU program data as ESA nonparticipants. This convenience sampling approach resulted in 907 ESA nonparticipant survey respondents, with large enough sample sizes for 90/10 confidence/precision at the state- and IOU-level (Table 10).

Table 10. ESA Nonparticipant Survey Disposition ^a

	PG&E	SCE	SCG	SDG&E	Total
Total Sample ^b	3,635	3,635	5,275	5,385	17,930
Total Survey Completes by ESA Nonparticipants	230	263	237	177	907
Response Rate ^c	6%	7%	4%	3%	5%

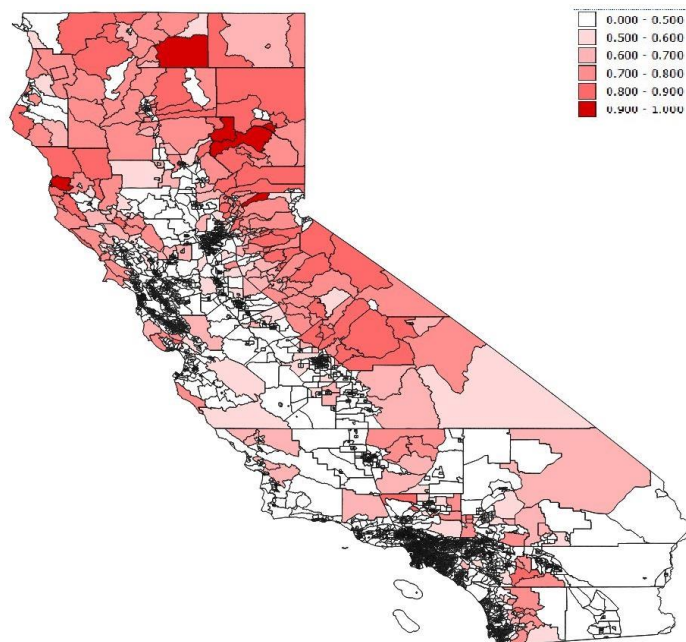
^a Sample sizes of 67 or more completes have 90/10 confidence/precision.

^b Total sample = sum of samples for current and past CARE participants and CARE-eligible nonparticipants.

^c Response rate = ESA nonparticipant completes / total sample.

Alt-Fuels Customers

We oversampled potential alt-fuels customers within each customer group so that they comprised 25% of each customer group sample. This was done to ensure we collect enough data from alternative fuel households for 90/10 confidence/precision. We developed the oversample using two data sources. First, we included customers who were flagged in the IOU customer data as using an alternative fuel – propane, kerosene/oil/diesel, wood/pellets - for primary space heating and/or water heating. If the number of these customers was not enough to achieve the 25% oversample, we randomly selected customers within each IOU who lived in a Census tract where 50% or more households uses an alternative fuel for space heating, as measured by 2016 American Community Survey 5-year estimates (Figure 2).

Figure 2. California Census Tracts by Percentage of Households Using Alternative Fuels for Space Heating ^a

^a Source: 2016 American Community Survey 5-year estimates.

Across the customer groups, we sampled a total of 3,105 potential alt-fuel customers and estimated a 2% response and incidence rate, with the goal of obtaining survey responses from 68 for 90/10 confidence/precision at the state-level (Table 11). We excluded SCG customers since they have natural gas service and are less likely to use and be dependent on alternative fuels than customers with only electricity service.

Table 11. Potential Alternative Fuel Customers Sampling Plan ^a

	PG&E	SCE	SDG&E ^b	Total
Needed Survey Completes (Quotas)	28	27	13	68
Estimated Response and Incidence Rate	2%	2%	2%	2%
Strata Sample Size of Potential Alt-Fuels Customers:				
Current CARE participants	253	253	253	759
Past CARE participants	281	281	218	780
CARE-eligible nonparticipants	375	375	0 ^b	750
ESA participants	378	325	113	816
Total Sample Size of Potential Alt-Fuels Customers ^c	1,287	1,234	584	3,105

^a SCG customers were excluded since they have natural gas service and are less likely to use and be dependent on alternative fuels.

^b None of SDG&E's potential CARE-eligible nonparticipants included a flag for space or water heating fuel or lived in a Census tract where 50% or more households uses alt-fuels for space heating.

^c Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision.

We successfully exceeded the survey quotas for alt-fuel customers (Table 12). We identified alt-fuels customers from their responses to questions about what fuels they use for space heating, water heating, and cooking, and excluded any customers who reported using an alt-fuel(s) but also had natural gas service as indicated by customer data from the IOUs. A total of 138 alt-fuels customers completed the survey (or, for the few partial completes, at least half of the survey) for an 4% response rate. We obtained enough total completes to achieve 90/10 confidence precision at the state-level. In addition, most of the alt-fuels customers reported using propane, some reported using wood/pellets, and only a few reported using kerosene/oil/diesel. The numbers of alt-fuels customers were mostly consistent across the reported end uses within each IOU.

Table 12. Alternative Fuel Customer Survey Results ^{a, b}

	PG&E	SCE	SDG&E	Total
Total Sample ^c	5,145	4,935	5,835	15,915
Total Sample Size of Potential Alt-Fuels Customers ^d	1,287	1,234	584	3,105
Total Survey Completes and Partial Completes ^e	61	49	28	138
Total Survey Incompletes/Nonrespondents ^e	1,226	1,185	556	2,967
Response Rate ^f	5%	4%	5%	4%
Incidence Rate ^g	1%	1%	1%	1%
Strata Completes and Partial Completes				
Current CARE participants	24	1	10	35
Past CARE participants	16	2	14	32
CARE-eligible nonparticipants	14	12	2	28
ESA participants	7	34	2	43
Completes by Alternative Fuel Type ^h				
Propane	53	44	26	123
Kerosene/Oil/Diesel	4	0	0	4
Wood/Pellets	17	11	6	34
Completes by Alternative Fuel End Use ^h				
Space Heating	48	36	15	99
Water Heating	44	35	19	98
Cooking	36	36	22	94

^a SCG customers were excluded since they have natural gas service and are less likely to use and be dependent on alternative fuels.

^b Sample sizes of 67 or more completes have 90/10 confidence/precision; sample sizes of 52 to 66 completes have 85/10 confidence/precision; sample sizes less than 52 completes have too low confidence/precision for conclusive results.

^c Total sample = sum of samples for current and past CARE participants, CARE-eligible nonparticipants, and ESA participants. Total sample sizes were determined by estimated response rates and the number of completes needed for 90/10 confidence/precision.

^d Potential alt-fuel customers were identified using IOU data about customers' space and/or water heating fuel type and from sampling in Census tracts where 50% or more households use alt-fuels for space heating, as measured by 2017 ACS 5-year estimates.

^e Specific disposition (e.g., web, phone, and partial completes; partial incompletes, refusals, undelivered, and nonrespondents) is not reported since alt-fuels customers were included in the samples of other customer groups reported above.

^f Response rate = total completes/total sample size of alt-fuels customers (AAPOR Response Rate 2).

^g Incidence rate = total completes/total sample.

^h Respondents can use multiple alt-fuels and use alt-fuels for multiple end-uses; thus, the sum of the completes by fuel type and by end use exceeds the total survey completes.

Non-Alt-Fuels Customers

We defined non-alt-fuels customers as the PG&E, SCE, and SDG&E low-income customers who reported in the customer survey not using alt-fuels as their primary fuel source for space heating, water heating, and/or cooking.⁴ This convenience sample approach resulted in 1,077 non-alt-fuels customers responding to the survey out of a sample of nearly 16,000, for a response rate of 7% (Table 13). The sample size is large enough for 90/10 confidence/precision at the state- and IOU-level.

Table 13. Non-Alt-Fuel Customer Survey Disposition ^{a, b}

	PG&E	SCE	SDG&E	Total
Total Sample ^c	5,145	4,935	5,835	15,915
Total Survey Completes	389	389	299	1,077
Response Rate ^d	8%	8%	5%	7%

^a SCG customers were excluded since they have natural gas service and are less likely to use and be dependent on alt-fuels.

^b Sample sizes of 67 or more completes have 90/10 confidence/precision.

^c Total sample = sum of samples for PG&E, SCE, and SDG&E current and past CARE participants, CARE-eligible nonparticipants, and ESA participants.

^d Response rate = total completes/total sample size of alt-fuels customers (AAPOR Response Rate 2).

Low Service Reliability Customers

We did not stratify the sample for low service reliability customers based on SAIDI or SAIFI values since we did not receive these data from the IOUs in time to develop a stratified sampling approach and doing so would have made the sampling approach overly complex. Instead, we used IOUs' SAIDI and SAIFI data to determine whether the customers we surveyed live in areas with high or low electrical service reliability. Out of the 1,147 customers we surveyed and who had known SAIDI/SAIFI values, 153 live in low service reliability areas, which we defined as an area with a SAIDI and/or SAIFI value one standard deviation or more above the mean value for all areas within an IOU's service territory (Table 14).⁵

Table 14. Low Service Reliability Customer Survey Disposition ^{a, b}

	PG&E	SCE	SDG&E	Total
Total Sample ^c	5,145	4,935	5,835	15,915
Total Survey Completes	450	438	327	1,215
Response Rate ^d	9%	9%	6%	8%
Total surveyed customers with known SAIDI/SAIFI values	403	426	318	1,147
Low-Service Reliability Customer Survey Completes	24	83	46	153
Incidence Rate ^e	5%	19%	14%	13%

^a SCG customers were excluded since SCG does not offer electricity service and thus does not have SAIDI/SAIFI data.

^b Sample sizes of 67 or more completes have 90/10 confidence/precision; sample sizes of 52 to 66 completes have 85/10 confidence/precision; sample sizes less than 52 completes have too low confidence/precision for conclusive results.

^c Total sample = sum of samples for PG&E, SCE, and SDG&E current and past CARE participants, CARE-eligible nonparticipants, and ESA participants.

^d Response rate = total completes/total sample (AAPOR Response Rate 2).

^e Incidence rate = low service reliability completes/total completes.

⁴ We excluded SCG from the non-alt-fuels group since no SCG customers are included in the alt-fuels group, due to their having natural gas service.

⁵ Higher SAIDI/SAIFI values means lower service reliability.

High Service Reliability Customers

We defined high service reliability customers as those who live in areas that have a SAIDI or SAIFI value of less than one standard deviation above the mean value for the entire IOU service territory. Of the 1,215 PG&E, SCE, and SDG&E customers who responded to the survey, 1,062 were identified as high service reliability customers, for an 87% incidence rate. The sample size is large enough for 90/10 confidence/precision at the state- and IOU-level.

Table 15. High Service Reliability Customer Survey Disposition^{a, b}

	PG&E	SCE	SDG&E	Total
Total Sample ^c	5,145	4,935	5,835	15,915
Total Survey Completes	450	438	327	1,215
Response Rate ^d	9%	9%	6%	8%
Total surveyed customers with known SAIDI/SAIFI values	403	426	318	1,147
High Service Reliability Customer Survey Completes	379	343	272	994
Incidence Rate ^e	95%	81%	86%	87%

^a SCG customers were excluded SCG does not offer electricity service and thus does not have SAIDI/SAIFI data.

^b Sample sizes of 67 or more completes have 90/10 confidence/precision; sample sizes of 52 to 66 completes have 85/10 confidence/precision; sample sizes less than 52 completes have too low confidence/precision for conclusive results.

^c Total sample = sum of samples for PG&E, SCE, and SDG&E current and past CARE participants, CARE-eligible nonparticipants, and ESA participants.

^d Response rate = total completes/total sample (AAPOR Response Rate 2).

^e Incidence rate = high service reliability completes/total completes.

Survey Nonresponse

The survey obtained responses from a broad cross-section of low-income customers in California across IOU territories and climate zones, and in terms of several customer characteristics like household composition, race/ethnicity, and housing type. However, the surveys' response rates are relatively low (due to the use of quotas needed to limit incentive costs), indicating the potential for some nonresponse bias. It is likely that the surveyed respondents are over-representative of low-income customers who do not have strong privacy concerns and those who have email and internet access (even though telephone was an option, few customers completed the survey via phone). Additionally, the sampled customers who responded to the survey may be, on average, more likely to need services from their IOU since the survey communications were framed to request respondents to respond to a survey about their energy needs.

Survey Implementation and Topics

Between March 1 and April 5, we partnered with WSU's SESRC to field a web and phone survey of samples of customers in each of the four main customer groups. All sampled customers were mailed an invitation letter to the mailing address they had on record, followed by up to three reminder letters or emails spaced about one week apart (Table 16; see Volume 3 - Appendix C for examples). Customers with an email address on record were sent reminder emails and those without an email address were mailed reminder letters.

Table 16. Customer Survey Schedule

Contact Mode	Invitation	Reminder 1	Reminder 2	Reminder 3	Outbound Calls
Letters	March 1, 2019	March 8, 2019	March 15, 2019	March 22, 2019	N/A
Emails	N/A	March 11, 2019	March 18, 2019	March 25, 2019	N/A
Phone	N/A	N/A	N/A	N/A	April 1 – 5, 2019

Customers could complete the survey on the web using a custom WSU website and unique access code, or they could call WSU's SESRC toll-free number to complete the survey on the phone. About a week after the final reminder emails/letters were sent, WSU's SESRC interviewers made outbound calls to fill the quotas for groups whose quotas had not yet been met. Customers could also complete the survey in English or Spanish on the web or phone. Letters and emails included a note in Spanish instructing Spanish-speakers to use the website or call the SESRC to complete the survey in their language. Customers who completed the survey could choose a \$25 e-gift card sent to them via email or a \$25 physical Visa gift card sent to them via postal mail.

We designed the survey to include several group-specific questions we developed directly from the research objectives (see Volume 3 – Appendix B for the questionnaire). For example, current CARE participants were asked about the difficulty of the CARE processes they had experienced (i.e., enrollment, recertification, verification, and high-usage processes), and the impacts CARE potentially had on their financial situation. Past CARE participants were asked the same questions as current CARE participants, and about the reasons why they were no longer participating in CARE. CARE-eligible nonparticipants were screened based on their household size and income, and those eligible for CARE were asked about their awareness of and interest in CARE, reasons why they are uninterested or have not applied for CARE, and services they would like their IOU to offer that could help them better control their household's energy usage and afford their monthly bills.⁶ ESA participants were asked about their satisfaction with the measures they received, the impact the measures had on the health, comfort, and safety of their household, and how the ESA program can better improve health, comfort, and safety of participants.

We also included questions in the survey to determine whether a customer used alternative fuels (i.e., propane, kerosene/oil/diesel, and/or wood/pellets) for space heating, water heating, and/or cooking. For those who reported using an alternative fuel(s) for one or more of these end-uses, we asked a few questions to address the associated research objectives about the why they use the alternative fuel(s) instead of electricity or natural gas, and the advantages, disadvantages, and annual costs of using the fuel(s).

We asked all customers about how often and how long they were without electricity at their home during the past two years to identify customers who potentially live in low service reliability areas. Customers who reported any electricity outages were asked about the extent to which and how the outages caused any difficulties for their household.

The remainder of the questions we included in the survey were asked to all customers and were used to create subgroups, to compare across groups and subgroups, and to calculate other variables used in analyses (e.g., energy burden, economic and health hardship, etc.). A few questions were about their home's heating, cooling, and cooking equipment (and fuels). Some questions were about their household's economic and health status (including the health, comfort, and safety of their home). Several questions were about their demographic and household characteristics, which included the number and age of household members; annual household income; housing tenure, type and number of rooms; household members' immigration status; languages spoken in the home; and the respondents' education, race/ethnicity, and marital status.

⁶ Those customers ineligible for CARE based on their household size and income were screened out of the survey.

Overall, the survey included a total of 75 questions and customers were asked a maximum of 50 of those questions. The average time to complete the survey was about 21 minutes.

B.1.4 ESA Contractor Interviews

In March and April 2018, an interviewer at Opinion Dynamics conducted IDIs by phone with a sample of ESA contractors.⁷ The goal of the interviews was to collect data on contractors' perceptions about and experience with the health, comfort, and safety impacts, or lack thereof, of the targeted ESA measures.

We received from the IOUs lists of managers and supervisors of the ESA field staff from 62 approved ESA program contractor firms. Some of the firms do ESA program work for multiple IOUs. Our goal was to interview at least two supervisors or lead installers who do ESA program work for each IOU and who had experience during the past two years doing enrollments and assessments (E&A), heating equipment installations, cooling equipment installation, and/or installations of enclosure measures. We interviewed a total of 12 ESA supervisors or lead installers, representing a mix of IOU service territories and ESA program services (Table 17).

Table 17. ESA Program Contractor Interviews by IOU Territory and ESA Services Performed

IOU	Total Interviews	Interviews by Services Performed ^a			
		E&A	Cooling ^b	Weatherization	Heating ^b
PG&E	2	1	1	2	1
SCE	5	2	4	1	0
SCG	3	2	0	2	1
SDG&E	2	2	2	1	2
Total	12	7	7	6	4

^a Most supervisor interviewees had experience performing multiple ESA program services.

^b SCE does not provide heating measures and SCG does not provide cooling measures.

We called and emailed ESA program contractor firms up to three times to reach a supervisor or lead installer who had experience performing the targeted services for the ESA program during the past two years. The phone interviews lasted between 45 and 60 minutes, and included up to 41 questions, and we provided interviewees with a \$50 gift card for their participation and time.

We asked the supervisors and lead installers mostly about the HCS impacts or lack thereof resulting from the services they performed with the targeted heating, cooling, and enclosure measures (see Volume 3 for the interview guide). For E&A supervisors, we asked whether and how they identified HCS issues in customers' homes, what issues they identified, and what they recommended to customers and their installation contractors for addressing the HCS issues. We asked supervisors and lead installers with experience installing the targeted measures about how they approached HCS issues in customers' homes, the HCS impacts or lack thereof of each measure, and the feedback they receive from participants about HCS issues and impacts. We asked all interviewees about what made homes infeasible to participate in the ESA program, how program rules and policies enable or prevent them from more effectively addressing HCS issues in customers' homes, and recommendations for improving the program in regard to increasing HCS in participants' homes.

⁷ We initially proposed and planned to conduct online focus groups with about 20 ESA contractors and in-depth interviews with about 16 ESA contractors but results from early focus-group recruitment efforts indicated that doing the focus groups would require much more budget and time and fewer commensurate benefits than the in-depth interviews and the study team approved the change in data collection approaches to conduct only in-depth interviews with a few ESA supervisors and lead installers in each IOU territory.

B.1.5 CARE Capitation Agency Staff Interviews and Literature Review of Studies of Immigrants' Use of Public Assistance Programs

In February 2018, an interviewer at Opinion Dynamics conducted IDIs by phone with staff at a sample of CARE capitation agencies that provide CARE referrals to the IOUs and support to immigrant communities. The goal of the interviews was to collect data on staff's experience with immigrants' use, or lack thereof, of the CARE program.

We received from the IOUs lists of their CARE capitation agencies, which totaled 202 unique agencies. We randomly sampled 12 agencies that were actively enrolling customers within each IOU territory in the past year (48 total) to attempt an interview with key staff who had experience with CARE referrals. Our goal was to complete an interview with at least one agency in each IOU territory.⁸ We completed interviews with staff at seven agencies, at which point we were instructed by the study team to stop the interviews (Table 18). Interviews lasted between 25 and 30 minutes, and included up to 30 questions, and we provided interviewees with a \$50 gift card for their participation and time. We asked CARE capitation agency staff about their clients' awareness of and participation in CARE, their clients' barriers to enrolling in CARE, and the agency's organizational and client characteristics (see Volume 3 for the interview guide).

Table 18. CARE Capitation Agency Staff Interviews

IOU	Number of Interviews
PG&E	1
SCE	1
SCG	2
SDG&E	3
Total	7

Following the IDIs with CARE capitation agency staff, we conducted a literature review of studies and reports on trends in immigrants' use of and barriers to using social service programs (see list below). We found a few recent sources that include analyses of and policy prescriptions for immigrants' social service program enrollments and barriers that seem to be relevant to programs like CARE. However, much of the research currently available on this topic is preliminary or anecdotal since social service program enrollment for 2017 and beyond, which show the beginning of a potential decline in participation among immigrants, only recently became available for research purposes.

- Chaudry, A (2014). Improving Access of Low-Income Immigrant Families to Health and Human Services. The Role of Community Based Organizations. Available online: <https://www.urban.org/research/publication/improving-access-low-income-immigrant-families-health-and-human-services> (Accessed June 19, 2019).
- The Henry J. Kaiser Family Foundation (2013). Fast Track to Coverage: Facilitating Enrollment of Eligible People Into Medicaid Expansion. Available online: <https://www.kff.org/report-section/fast-track-to-coverage-facilitating-enrollment-of-eligible-people-into-the-medicaid-expansion-issue-brief/> (Accessed June 19, 2019).

⁸ We initially proposed and planned to conduct in-depth interviews with about 20 CARE capitation agencies but after completing the interviews with seven agencies and not finding much variation in their perspectives, the study team decided to put the remaining resources for this task into a review of recent literature on trends in immigrants' use of public assistance programs like CARE.

- Fawcett, S. et al. Participatory Evaluation of a Community Mobilization Effort to Enroll Wyandotte County, Kansas, Residents Through the Affordable Care Act. *American Journal of Public Health*, September 3, 2015 vol 105, No. S3.
- Ambegaokar, S. et al. (2017). Opportunities to Streamline Enrollment Across Public Benefit Programs. Center on Budget and Policy Priorities. Available online: <https://www.cbpp.org/research/poverty-and-inequality/opportunities-to-streamline-enrollment-across-public-benefit> (Access June 19, 2019).
- Bernstein, H. et al. May 22, 2019. One in Seven Adults in Immigrant Families Reported Avoiding Public Benefit Programs in 2018. Available online: <https://www.urban.org/research/publication/one-seven-adults-immigrant-families-reported-avoiding-public-benefit-programs-2018> (Accessed June 24, 2019).
- Lowry, M. November 12, 2018. Following 10-Year Gains, SNAP Participation Among Immigrant Families Dropped in 2018. Available online: <https://www.apha.org/news-and-media/news-releases/apha-news-releases/2018/annual-meeting-snap-participation> (Accessed June 24, 2019).
- Nowrasteh, A. and Orr, R. May 10, 2018. Immigration and the Welfare State: Immigrant and Native Use Rates and Benefit Levels for Means-Tested Welfare and Entitlement Programs. Available online: <https://www.cato.org/publications/immigration-research-policy-brief/immigration-welfare-state-immigrant-native-use-rates> (Accessed June 25, 2019).
- Boyd-Barrett, C. April 19, 2019. As Public Charge Fears Escalate, Immigrants Urged Not to Drop Benefits. Available online: <https://www.calhealthreport.org/2019/04/19/as-public-charge-fears-escalate-immigrants-urged-not-to-drop-benefits/> (Accessed June 24, 2019).
- Gaglianone, V. & Amaro, Y. April 17, 2019. Will Undocumented Immigrants Avoid New State Health Benefits? Available online: <http://www.caprado.org/articles/2019/04/17/will-undocumented-immigrants-avoid-new-state-health-benefits/> (Accessed June 24, 2019).
- Honig, Esther. April 26, 2018. Fearing Deportation, Unauthorized Immigrants Shy Away from Signing Kids Up for Food Aid. Available online: <https://www.harvestpublicmedia.org/post/fearing-deportation-unauthorized-immigrants-shy-away-signing-kids-food-aid> (Accessed June 24, 2019)
- Wiltz, T. July 24, 2018. Why Crackdown Fears May Keep Legal Immigrants from Food Stamps. Available online: <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2018/07/24/why-crackdown-fears-may-keep-legal-immigrants-from-food-stamps> (Accessed June 25, 2019).

B.2 2019 LINA Analysis Methods and Metrics

We conducted several types of analyses to address the 2019 LINA research objectives and questions. In the subsections below, we describe how we calculated the energy burden and modified energy burden metrics and the economic and health hardship indices used comparisons of customer groups. We also outline the various other customer characteristics we collected from IOU and survey data for comparisons of the customer groups. For more details about the specific methods we used for analyzing survey and interview data, and how we defined alternative fuels customers and customers in low service reliability areas, refer to each of the results appendices below (Appendix C - Appendix F).

B.2.1 Energy Burden and Modified Energy Burden Methods

Energy Burden

One of the measures of hardship a customer may experience is energy burden. The standard, basic calculation of “customer energy burden” is the sum of each customer’s energy bills during a given year divided by their household income for that year, notated as:

$$\text{Customer Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bill Amounts}}{\text{Annual Household Income}}$$

The customers’ energy burden results are then summed and divided by the total number of customers to calculate the overall average energy burden metric.⁹

To calculate the 2017 energy burden of surveyed customers, we first requested and received from the IOUs the billing data available between December 2016 and January 2018 for each customer who completed the survey.¹⁰ We then summed the monthly gas and electric bill amounts and number of billing days to calculate the annual bill amount and total annual billing days for each customer. Annual bill values ranged from less than \$0.00 to over \$38,000, and annual billing days ranged from 0 to 393 days.

Next, we cleaned the billing data using methods very similar to those used by the 2016 LINA research team. We first prorated bill amounts for customers with less than 364 and more than 239 billing days (n=315), and for customers with more than 365 billing days (n=55), to estimate the total bill amount for 365 billing days. We then used imputation with variables from IOU customer data and from the customer survey to estimate:

- electric and/or gas bill amounts for customers who had fewer than 240 days of billing data (n=371) and for customers with more than \$6,000 in annual energy bills (n=10)
- electric bill amounts for SCG customers (n=290) and PG&E gas-only customers (n=80)
- gas bill amounts for SCE customers who also have natural gas service (n=337)

The variables from the sample that we used for imputation include:

- IOU (PG&E, SCE, SCG, and SDG&E)
- Customer group (current CARE participant, past CARE participant, CARE-eligible nonparticipant, and ESA participant)
- Climate zone that we recoded from 16 to five categories (hot, hot/moderate, moderate, cool/moderate/ and cool)

⁹ In contrast, another way of calculating energy burden, referred to as “overall energy burden”, is to calculate the average of all customers’ annual bill amounts and their annual household incomes, and divide the average bill amount by the average income amount. This method has been used to calculate energy burden for the general population in the 2007 LINA but is not applicable in the 2019 LINA since it does not include the general population and is focused instead only on low-income customers and subgroups.

¹⁰ We requested billing data for the month before and after 2017 since the monthly billing period for many customers begins/ends during the month instead of at the very beginning or very end of the month. Requesting billing data for only the 2017 months would have therefore limited the data to just 10 months for many customers.

The variables from the survey we used for imputation include:¹¹

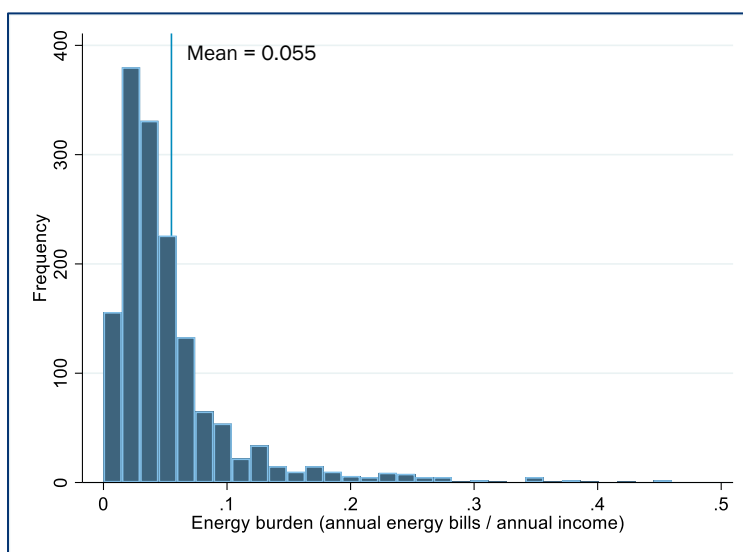
- Housing type that we recoded from five to two categories (single and multifamily)
- Number of rooms in home that we recoded from 10 to four categories (1 to 3, 4 to 5, 6 to 7, and 8 or more)
- Household size that we recoded from 12 to three categories (1 to 2, 3 to 5, and 6 or more).

To estimate annual household income for energy burden calculations, we took the midpoint of the household income range that customers selected in the survey (e.g., \$8,000 to less than \$16,000 = \$12,000 midpoint).¹² We imputed the annual household income midpoint for respondents who did not answer the income question in the survey (n=137), using one of two methods:

- We computed the average income of respondents who shared the same Census tract, IOU, housing type, and household size, if five or more respondents matched these criteria with the customer whose income was being imputed; if fewer than five customers shared these characteristics, then,
- We took the annual income of households sharing the same Census block as the customer whose income was being imputed, as reported in the 2016 American Community Survey 5-year estimates.

After cleaning and imputing the data, we had income and annual energy cost estimates for all surveyed customers and used the estimates to calculate energy burden. The overall sample mean of survey respondents is 5.5% with a median of 3.9%, a standard deviation of 5.6%, and minimum of 0.5% and a maximum of 46% (Figure 3). These sample statistics apply to the survey sample only and are not representative of any groups in the California population. See the individual results chapters for representative energy burden results.

Figure 3. Energy Burden Histogram



¹¹ We recoded variables to have fewer categories so that we could base the imputation of a customer's annual bill amount on the average annual bill amount of at least five similar customers. If the variables included more categories, we would not have had at least five similar customers for comparison.

¹² For the top-end income value of \$120,000 or more, we used \$128,500 since \$8,500 was the average difference in the ranges of the other 13 income categories.

Caveats for Comparing Energy Burdens for 2013, 2016, and 2019 LINAs

There are numerous differences in the methodologies and other study details between the 2013, 2016, and 2019 LINA studies, which mean a direct comparison of results is not always possible. For example, energy burden analysis was conducted using the same calculations in all three LINA studies, but differences in overall data collection methodologies mean the results do not permit apples-to-apples comparisons.¹³

Each of the many factors listed below may individually have an upward or downward effect on energy burden in 2019 relative to the 2016 study and relative to the 2013 study. The following are reasons that energy burden and other analyses described in this report cannot be compared between the 2013, 2016, and 2019 LINA studies:

- Differences in survey sampling approach:
 - The 2013 LINA study utilized a random sample of CARE customers within the entire IOU territory.
 - The 2016 LINA study utilized a stratified sample design based on FPG levels (e.g., less than 100% of FPG, 100% to less than 200% of FPG, etc.) and targeted 7-digit zip codes within each IOU territory that have a high percentage of the population that falls below 400% of FPG.
 - The 2019 LINA study utilized a stratified sample design and targeted specific groups of low-income customers: those currently participating in CARE (statewide), those who formerly participated in CARE but were no longer participating (statewide), those who are income-eligible but never participated in CARE (targeted Census tracts with 20% or more households earning 100% or less of FPG), and recent ESA participants who received a heating, cooling, and/or enclosure measure(s) (statewide).
- Difference in length and mode of the customer survey, which may result in respondent satisficing and affect survey responses:
 - The 2013 LINA phone survey and 2019 web/phone survey were considerably longer than the 2016 phone survey.
 - The 2013 and 2016 LINA customer surveys were conducted via phone, which can introduce social desirability effects, while the 2019 LINA was conducted via web and phone; about 98% responded via web, which has not been found to introduce social desirability.
- Difference in survey questions leading up to the question about income:
 - The 2013 and 2019 survey questions regarding income was preceded by a series of basic demographic questions
 - The 2016 survey question about income was preceded by questions regarding financial resources and sources of income
- Difference in the structure of the survey question about income:
 - The 2016 survey question regarding income was asked in two parts, first determining whether the respondent's household income was above or below the cutoff for 200% of FPL for their household size, followed by a second question that asked them to respond to income ranges that depended on their answer to the previous question.

¹³ The closest comparison that can be made between the previous three LINA studies are the 2013 overall CARE participant energy burden of 8.0% and the 2019 current CARE participant energy burden of 5.4%, but even here it is possible that the methodological differences between the studies could account for the large discrepancy in the estimates.

- The 2013 and 2019 survey question about income was asked in one part.
- Difference in wording of the survey question regarding income:
 - In 2013 the question was: “Including income from jobs, pensions, disability payments, social security, and other government programs and income, which of the following best describes the income of all members of your household in 2012? Please stop me when I come to the category for your household. Would you say it is...?”
 - In 2016 the question did not list specific sources of income and simply asked: “Next, I will read different income ranges that might apply to you. Please stop me when I come to the category that best describes your household’s 2015 income. Would you say it was...?”
 - In 2019 the question asked: “Approximately, what is your total household income from all sources before taxes in 2017? [IF PHONE: You can stop me when I get to the right category.]”
 - The response categories for income in the 2013 and 2016 survey questions were identical and the response categories in the 2019 survey questions were based on the 2017 CARE income-eligibility requirement ranges.
- Differences in the data available to calculate energy bill costs:
 - In 2013, the team was able to obtain SCE and SCG bills for customers served by both IOUs, allowing them to calculate customers’ total energy cost with actual gas and electric bill amounts.
 - In 2016 and 2019, the team was only able to obtain billing data from either SCE or SCG for customers that are served by both IOUs. The team then imputed the bill amount for the other IOU based on income, climate zone, and home type in order to arrive at a total energy cost that included gas and electric bill amounts.
- Changes in the CARE population over time:
 - The 2013 CARE population likely differs from the 2016 CARE population which likely differs from the 2019 CARE population as some households leave the rate (by not re-enrolling), some are removed from the rate (due to not responding to or failing to be eligible based on post-enrollment process requests), and others are added to the rate.

Modified Energy Burden

A potential shortcoming of the energy burden metric is that it doesn’t account for the value of public assistance benefits that qualified customers receive. Customers receiving public benefits likely have a lower energy burden than that reflected by the simple energy burden metric since public benefits enable customers to use more their disposable income toward affording basic needs than would be the case without public benefits.

The value of public benefits is included in the modified energy burden metric, notated as follows:

$$\text{Modified Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bill Amounts}}{\text{Annual Household Income} + \text{Value of Public Benefits Received}}$$

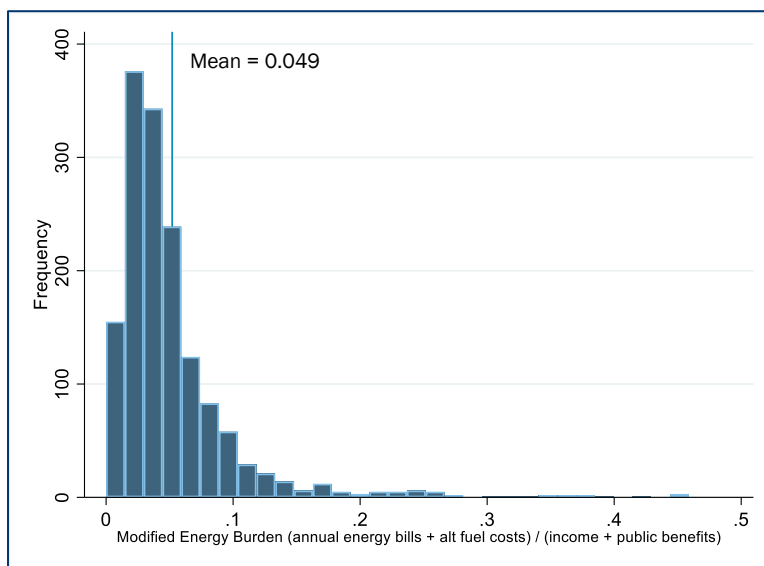
To measure the value of public assistance benefits customers received annually, we first asked customers in the survey who reported receiving any public assistance which specific types of benefits they received during the past year. Customers could choose from: ¹⁴

- Housing assistance such as Section 8 or other subsidized housing;
- Food assistance such as CalFresh, Supplemental Nutrition Assistance Program (SNAP), Women-Infant-Children Food Program (WIC), or other programs;
- Medical assistance from MediCal, MediCAID, or Children's Health Insurance (CHIP); and
- Financial assistance such as Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), CalWORKs, Aid to Families with Dependent Children (AFDC), or other welfare programs.

Next, we followed the steps described and used by the 2016 LINA research team, Evergreen Economics, to calculate the estimated dollar value of the public assistance benefits. The data sources and calculations vary by each type of public assistance, as described in more detail in the subsections below.

After we calculated the average dollar value of public assistance benefits, we added them to the annual income of customers who reported receiving the benefits and computed the modified energy burden metric. The overall sample mean of survey respondents is 4.9% with a median of 3.7%, a standard deviation of 4.7%, and minimum of 0.2% and a maximum of 46% (Figure 4). These sample statistics apply to the survey sample only and are not representative of any groups in the California population. See the individual results chapters for representative modified energy burden results.

Figure 4. Modified Energy Burden Histogram



¹⁴ We did not include cash-based benefits like Social Security, unemployment compensation, disability, or veterans' benefits since these are issued at regular time-intervals with predictable values, and thus are likely included in self-reported income estimates.

Housing Benefits Estimates

Housing benefits typically cover the cost of rent that is above one-third of a household's annual income. To estimate the dollar value of housing benefits like public housing, Section 8 vouchers, and subsidized private housing, we used the approach developed by the U.S. Census Bureau.¹⁵ The Census Bureau's formula takes into account annual household income and local average housing costs, as notated:

$$\text{Housing Benefits} = (\text{Fair Market Housing} - [0.3 * \text{Income}]) * (0.44 * [\text{Local Area Adjustment} + 0.56])$$

Fair market rent is based on the number of bedrooms in the housing unit and the county where the unit is located, and is tracked by the U.S. Department of Housing and Urban Development (HUD).¹⁶ We estimated annual household income by taking the midpoint of the income range customers selected in the survey. The local area adjustment is the ratio of the local average housing cost to the national average cost for each size unit, and it adjusts housing benefits accordingly in areas with very high or low housing costs. We estimated the number of bedrooms in surveyed customers' homes using one of two methods:

- We used customers' survey response to the number of rooms in their home, assuming one- and two-room homes have only one bedroom regardless of the number of household members, or
- We followed HUD's maximum occupancy rule of two people per bedroom for customers who reported more than two rooms in their home, and we used their survey responses to the number of rooms in their home and number of household members to estimate the number of bedrooms.

Food Benefits Estimates

We estimated the value of benefits for three food assistance programs: CalFresh (CA's version of SNAP), National School Lunch Program (NSLP), and WIC. CalFresh benefits go to income-qualified households of any type, school lunch benefits go to income-qualified households' children who are in primary school (grades K-12), and WIC benefits go to income-qualified households specifically with women, infants, and/or children under five to help meet their nutritional needs. We calculated average food benefit dollar estimates from for these three programs using the following formula:

$$\text{Food Benefits} = (\text{SNAP}_{\text{per person}} * \text{Household Size}) + ([\text{WIC}_{\text{per child}} + \text{NSLP}_{\text{per child}}] * \text{Children in Household})$$

We used California data from the 2017 U.S. Current Population Survey Annual Social and Economic Supplement (CPS ASEC) public use database for and data from the U.S. Department of Agriculture (USDA) to estimate the local average value of SNAP benefits per person and WIC benefits per child.^{17,18,19} We used data from the California Department of Education (CDE) to estimate the local average value of NSLP benefits per child.²⁰ We estimated customers' household size and number of children in the household from their responses to a survey question asking for the number of household members by age groups (under 18, 18 to 64, 65 to 84, and over 84).²¹

¹⁵ Johnson, P., Renwick, T., and Short, K. 2010. *Estimating the Value of Federal Housing Assistance for the Supplemental Poverty Measure*. <https://www.census.gov/content/dam/Census/library/working-papers/2010/demo/spm-housingassistancejuly2011.pdf>

¹⁶ HUD Fair Market Rent data: <https://www.huduser.gov/portal/datasets/fmr.html>

¹⁷ CPS ASEC 2017 data: <https://www.census.gov/data/datasets/2017/demo/income-poverty/2017-cps-asec-research-file.html>

¹⁸ USDA SNAP June 2017 estimates: <https://fns-prod.azureedge.net/sites/default/files/CostofFoodJun2017.pdf>

¹⁹ USDA WIC 2017 estimates: <https://www.fns.usda.gov/pd/wic-program>

²⁰ CDE school lunch value estimates: <https://www.cde.ca.gov/ls/nu/rs/rates1718.asp>

²¹ Food assistance benefit values are likely over-generous for customers with children in the household. Since we were unable to determine the age of each child, we assigned each child both a WIC and NSLP value, but WIC is for children under five and NSLP is for children in primary school and only households with eligible children receive benefits from both programs.

Medical Benefits Estimates

We estimated the dollar value of medical benefits from MediCAID/MediCal (not MediCARE) in terms of recipients' out of pocket medical expenses and not in terms of the total medical benefits received. Limiting the benefits to recipients' out of pocket expenses and comparing them to the out of pocket medical expenses of nonrecipients of MediCAID/MediCal provides a more accurate estimate of the additional dollar value of medical benefits recipients receive. We used the following formula for calculating the average value of these benefits:

$$\text{Medical Benefits} = (\text{Spending}_{\text{No MediCAID/Cal}} - \text{Spending}_{\text{MediCAID/Cal}}) * \text{Household Size}$$

We estimated the average out of pocket expenditures for recipients and nonrecipients of MediCAID/MediCal using data from the 2016 Medical Expenditure Panel Survey (MEPS) for the Western Census Region and low-income households.²² We used customers' responses to a survey question about the number of people in their household to estimate household size. We included children in the household size estimate since children in families that qualify for MediCAID/MediCal often receive CHIP. Data are not available for the estimated value of CHIP benefits, but MediCAID/MediCal benefits can serve as a proxy.

Financial Benefits Estimates

The most common financial assistance programs are CalWORKs – the California version of TANF – and AFDC, which support income-qualified families with a child dependent(s) under 19 years old. The value of these benefits is determined based multiple household characteristics in addition to income and number of children (e.g., number of children, number of dependents, disabled caretakers, etc.). We calculated the dollar value of financial benefits using the following formula:

$$\text{Financial Benefits} = (\text{TANF}_{\text{Max 3-Person Family}} * \text{Number of Children}) * (\text{TANF}_{\text{3-Person Family}} / \text{TANF}_{\text{Max 3-Person Family}})$$

We collected 2017 TANF dollar value estimates for California from data reported by the U.S. Department of Health and Human Services' (HHS) Office of Family Assistance and the California Department of Social Services (DSS).^{23,24} We also calculated an adjustment factor using the ratio of the average TANF benefit value to the maximum TANF benefit value for a family of three to calculate the average maximum benefit each household is eligible for rather than just the average benefit. For example, the maximum benefit is \$714, and the average benefit is \$565 for a family of three in California 2017. The resulting adjustment factor of 0.79 (\$565/\$714) was applied to all household sizes. We estimated the number of children in each household based on customers' responses to a survey question about number of household members by age group.

Alternative Energy Burden and Modified Energy Burden

We also created an alternative to the customer energy burden and modified energy burden metrics that includes the self-reported annual costs of alt-fuels for the surveyed alt-fuel customers. These alternative metrics add the average annual alt-fuel expenses to the numerator (annual IOU bill amounts). The overall sample mean of alt-fuels survey respondents is 8.7% with a median of 6.4%, a standard deviation of 8.3%,

²² MEPS 2016 data: https://meps.ahrq.gov/mepsweb/data_stats/download_data_files.jsp

²³ HHS 2017 TANF data: <https://www.acf.hhs.gov/ofa/resource/characteristics-and-financial-circumstances-of-tanf-recipients-fiscal-year-2017>

²⁴ CA DSS maximum TANF benefits (Region 1, non-exempt): <http://www.cdss.ca.gov/cdssweb/entres/forms/English/TEMP2250.pdf>

and minimum of 0.4% and a maximum of 57%; results are reported in Chapter 6 in Volume 1 and Appendix EF in this volume.

$$\text{Alternative Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bill Amounts} + \text{Alt-Fuel Expenses}}{\text{Annual Household Income}}$$

$$\text{Alternative Modified Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bill Amounts} + \text{Alt-Fuel Expenses}}{\text{Annual Household Income} + \text{Value of Public Benefits Received}}$$

B.2.2 Economic and Health Hardship Indices Methods

We also calculated two other measures of hardship – economic and health – using questions in the customer survey. Both hardship indices were used in a previous study for California’s IOUs, the California Statewide Opt-In Time-of-Use Pricing Pilot study. They were created using some survey questions we developed in conjunction with the IOUs and TOU Working Group in California and some questions that are asked in institutional surveys like the Center for Disease Control’s (CDC) Behavioral Risk Factor Surveillance System (BRFSS) survey, the Census Department’s American Community Survey (ACS), and the Consumer Financial Protection Bureau’s (CFPB) Financial Well-Being index.

Economic Hardship Index

The first index is a measure of general economic hardship. It is comprised of five survey questions, as follows:

- **CFPB Financial Well-Being:** We asked the two survey questions from the abbreviated financial well-being index developed by the CFPB. The first question asks how each item describes the respondent’s situation, using a 5-point scale from “Not at all” to “Completely”. The three items include:
 - Because of my financial situation, I feel like I will never have the things I want in life.
 - I am just getting by financially.
 - I am concerned that the money I have won’t last.

The second question asks how often each item applies to the respondent, using a 5-point scale from “Never” to “Always”. The two items include:

- I have money left over at the end of the month.
- My finances control my life.

We calculated the CFPB index using the five items and the respondent’s age, as instructed by the CFPB.²⁵ Scores range from 19 to 76, where lower scores correspond to lower well-being. Since the economic hardship index we created is on an opposite scale, where lower values mean less hardship, we inversed the scale of the CFPB index to be consistent.

- **Difficulty Paying Bills:** We asked respondents how many months during the past year their household had difficulty paying monthly energy bills, rent or mortgage, and bills for other basic needs such as a food, water, and others. Respondents could select none, 1 to 3 months, 4 to 6 months, 7 to 9 months, or 10 to 12 months for each bill type. We summed responses across the three bill types and scores ranged from 0, for never, to 16, for difficulty with all three bills for 10 to 12 months of the year.

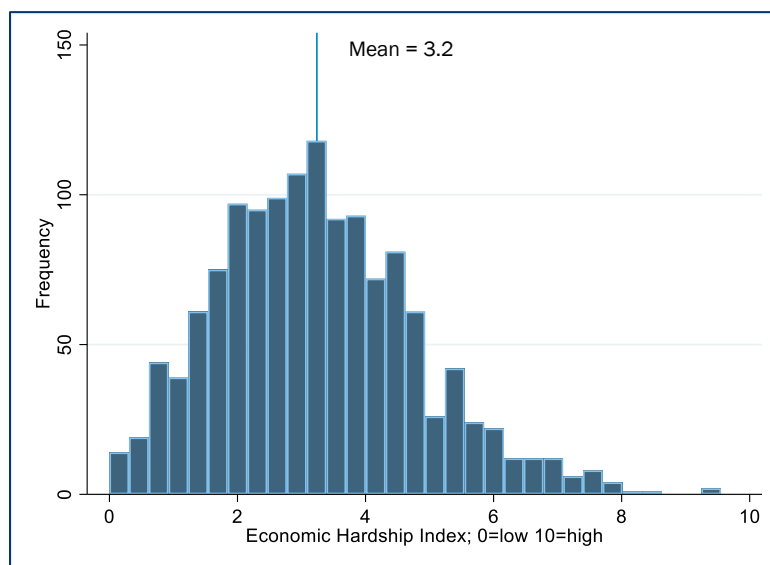
²⁵ CFPB Financial Well-Being Index development: <https://www.consumerfinance.gov/data-research/research-reports/financial-well-being-scale/>

- *Number of fixed-income and income-assistance sources:* We asked respondents from what sources they received their income or any financial assistance during the past year. Respondents could select from three income-based sources including wages and tips, self-employment income, and investment income. They could also select from nine fixed-income or income-assistance sources like pensions or retirement savings, social security payments, disability payments, veterans' payments, unemployment compensation, child support/alimony, public assistance programs, assistance from family/friends, and loans from banks/lenders. We summed the number fixed-income/income-assistance sources and scores ranged from 0 to 6.
- *Number of fixed-income and income-assistance bill payment sources:* We asked respondents what sources they used or actions they took to afford their basic needs during the past year. Respondents could select from income-based sources like wages, salary, tips, self-employment income, and investment income; fixed-income sources like social security and retirement savings, disability, and veterans' payments; forms of assistance like public benefits programs, IOU programs, unemployment compensation, and assistance from friends/family; and forms of debt like using a credit card they can't pay off, borrowing money from a bank/lender, and leaving bills unpaid past their due dates. Respondents could also select actions they took to afford basic needs like cutting back on their household spending and reducing their household energy use/bills. We summed the number of non-income-based sources and scores ranged from 0 to 9.

Because the range of possible values used in the survey questions varied considerably, we standardized the values of each question into z-scores, in which a score of zero reflects the sample mean and a score of one is one standard deviation away from the mean. This z-score standardization makes it possible to compare responses across different questions and items. We used confirmatory factor analysis (CFA) to create, confirm, and validate the economic hardship index. To assess the reliability of the index, we calculated Cronbach's alpha, which resulted in 0.53, indicating moderate reliability of the index.

We standardized the index on a 0 to 10 scale where 0 means low economic hardship and 10 means very high economic hardship. The overall sample mean is 3.2 with a median of 3.1 and a standard deviation of 1.6 (Figure 5). These sample statistics apply to the survey sample only and are not representative of any groups in the California population. See the individual results chapters for representative economic hardship results.

Figure 5. Economic Hardship Index Histogram



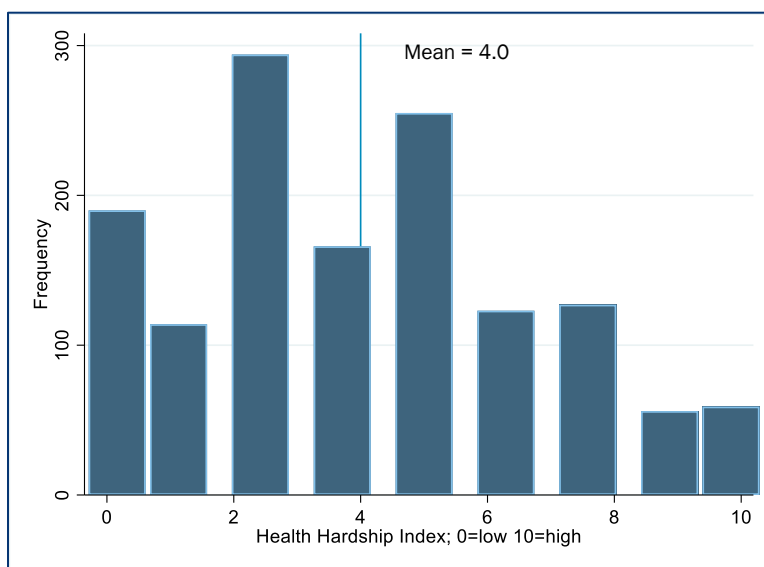
Health Hardship Index

The second index is a measure of general health hardship. It is comprised of two survey questions we developed from the CDC's BRFSS, as follows:

- *Frequency of poor health:* We asked respondents how often their health and the health of members of their household was not good during the past year, using a five-point scale from “Never” to “Most or all the time”.
- *Frequency poor health limited usual activities:* We asked respondents who indicated that they and/or members of their household experienced poor health more than never during the past year how often the poor health prevented them from doing their usual activities. We used the same five-point scale from “Never” to “Most of all the time”.

We used CFA to generate, confirm, and validate the health hardship index. To assess the reliability of the index, we calculated Cronbach's alpha, which resulted in 0.90, indicating high reliability of the index. We standardized the index on a 0 to 10 scale where 0 means low health hardship and 10 means very high health hardship. The overall sample mean is 4.0 with a median of 3.8 and a standard deviation of 2.7 (Figure 6). These sample statistics apply to the survey sample only and are not representative of any groups in the California population. See the individual results chapters for representative economic hardship results.

Figure 6. Health Hardship Index Histogram



B.2.3 Service Reliability Analyses

Since we were unable to develop separate survey strata based on the electric service reliability of the areas where sampled customers live, we instead conducted analyses with all surveyed customers and used their SAIDI and SAIFI values to define whether they live in an area with lower or higher reliability. Of the 1,215 PG&E, SCE, and SDG&E survey respondents, we were able to match SAIDI and SAIFI values to all but 68 (6%) (Table

19).²⁶ The PG&E SAIDI and SAIFI data were provided at the zip-code level, the SCE data were provided at the circuit level, and the SDG&E data were provided at the Census tract level.

The average, standard deviations, and ranges of SAIDI and SAIFI values for surveyed customers are similar to those of all customers provided by the IOUs (Table 19). The SAIDI values are slightly lower for PG&E surveyed vs. all customers and are slightly higher for SDG&E surveyed vs. all customers. To calculate the SAIDI and SAIFI threshold values that indicate lower service reliability, we added one standard deviation to the average value. For the analyses we conducted with surveyed customers and their electric service reliability, we used the SAIDI and SAIFI values as continuous measures or as dichotomous measures, in which values at or above the threshold value indicates lower service reliability.

Table 19. SAIDI and SAIFI Descriptive Statistics for All and Surveyed Customers, by IOU ^{a, b}

Characteristics	PG&E ^c	SCE	SDG&E
Level of SAIDI and SAIFI data	Zip code	Circuit	Census tract
Percent of surveyed customers matched to SAIDI and SAIFI values	90%	97%	97%
Average SAIDI (Standard Deviation)			
All customers	0.125 (0.386)	0.028 (0.051)	0.041 (0.047)
Surveyed customers	0.025 (0.15)	0.027 (0.034)	0.053 (0.063)
SAIDI Range			
All customers	0.0001 – 3.55	0.0000 – 1.01	0.0003 – 0.5
Surveyed customers	0.0001 – 2.31	0.0000 – 0.26	0.0004 – 0.5
SAIDI Low Service Reliability Threshold ^d	0.18	0.061	0.12
Average SAIFI (Standard Deviation)			
All customers	0.0004 (0.001)	0.0002 (0.0003)	0.0003 (0.0004)
Surveyed customers	0.0001 (0.001)	0.0002 (0.0003)	0.0004 (0.0004)
SAIFI Range			
All customers	0.000001 – 0.01	0.000000 – 0.005	0.000000 – 0.003
Surveyed customers	0.000001 – 0.009	0.000000 – 0.003	0.000001 – 0.003
SAIFI Low Service Reliability Threshold ^d	0.001	0.0005	0.0008

^a SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages; higher values mean lower reliability.

^b SCG is excluded because it only provides natural gas service and does not have electric service reliability measures.

^c We excluded nine surveyed customers whose SAIDI/SAIFI values were extreme outliers from zip codes with fewer than 100 customers.

^d We calculated the threshold values by adding one standard deviation to the average value for surveyed customers.

²⁶ SCG does not have SAIDI or SAIFI data because they do not provide electric service.

B.2.4 Customer Characteristics

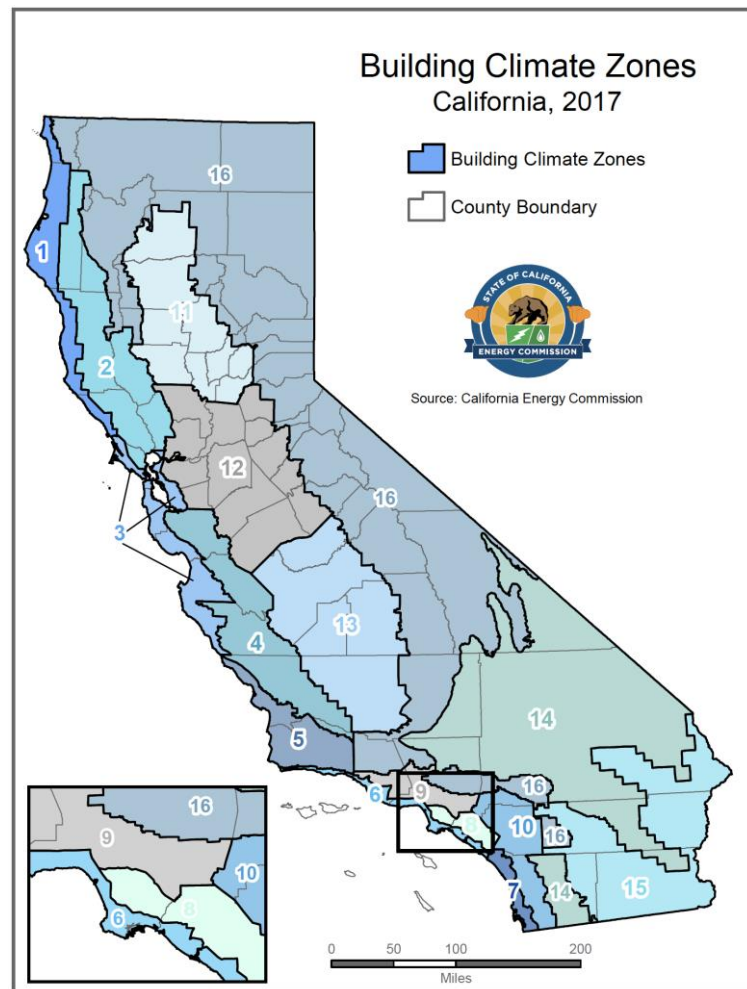
In addition to the metrics described above, we collected data about many other customer characteristics in the survey. These characteristics are used in analyses with all the customer groups and subgroups.

Climate Zones

We recoded the 16 climate zones in California into two different measures (see Figure 7 for a map of the 16 climate zones). The first climate zone measure is based on temperatures, or the ratio of the number of heating to the number of cooling days, in the climate zone. Most of the climate zones have more heating than cooling days, so we used the following coding scheme to combine zones into five categories. The zones with 85% or more heating days relative to cooling days – 1, 2, 3, and 5 – are the cool zones. The zones with between 65% and 84% heating days relative to cooling days – 4, 11, and 12 – are the cool/moderate zone. The zones with 60% to 64% heating days relative to cooling days – 6, 7, and 13 – are the moderate zone. The zones with 50% to 59% heating days relative to cooling days – 8, 9, and 10 – are the hot/moderate zone. And, zones with less than 50% heating days relative to cooling days – 14 and 15 – are the hot zone. This coding of the measure is consistent with the cool, moderate, and hot zones used for the California Time-Of-Use Opt-In and Default Pilot studies.

The second climate zone measure is based on five major geographic regions of California (Figure 7). The Central Valley region includes climate zones 11, 12, and 13. The Desert/Mountain region includes zones 14, 15, and 16. The North Coast region includes zones 1, 2, 3, 4, and 5. The South Coast region includes zones 6 and 7. And, the South Inland region includes zones 9 and 10. This coding of the measure is consistent with the climate zones used in the 2013 and 2016 LINAs.

Figure 7. California Building Climate Zones



Census Measures of Poverty and Alt-Fuel Usage

We used two community-based measures from 2017 American Community Survey 5-year Census tract estimates to define the survey samples and compare across the customer groups. The first measure is the percentage of households in poverty, or who earn 100% or less of Federal Poverty Guidelines. The second measure is the percentage of households who use an alt-fuel – propane, kerosene/oil/diesel, or wood/pellets – for space heating in their home.

Fuel Type and Annual Energy Costs

We used IOU and self-reported data to determine the fuel types customers have at their home and their average annual energy costs. The IOU data indicated whether customers had electricity and natural gas, and their monthly bills for 2017, and the self-reported data indicated whether and which type of alt-fuel(s) customers used and how much they paid annually. For fuel type, we calculated the average percentage of surveyed customers who have electricity and gas, electricity-only, and electricity and alt-fuels; we also calculated the average percentage of alt-fuels customers who use each alt-fuel type. For energy costs, we calculated the average electricity and gas costs and the average alt-fuel costs for surveyed customers.

Heating and Cooling Characteristics

We asked surveyed customers what type of heating and cooling equipment they have in their home, and how many rooms in their home are heated and cooled with the equipment they have. The heating equipment included central furnaces, wall/space heaters, fireplaces, radiant/hydronic systems, heat pumps, baseboard heating, and no heating equipment. The cooling equipment included central air conditioners (ACs), room/window ACs, evaporative coolers, portable ACs, heat pumps, ceiling fans, portable fans, and no cooling equipment. We calculated the average of percentage of survey customers who reported each equipment type.

We used customers' responses to questions about the total number of rooms in their home and the number of rooms that are heated and cooled to calculate two metrics. The first is the average percentage of rooms in customers' homes that are heated and the second is the average percentage of rooms in customers' homes that are cooled. Each metric indicates how much of customers' homes is space conditioned for heating and cooling.

Annual Income and Sources of Income

We asked surveyed customers their 2017 annual income range, using the ranges that define the 2017 CARE and ESA income eligibility requirements. We calculated the average annual income using the midpoint of each income range: less than \$8,000, \$8,000 to less than \$16,000, \$16,000 to less than \$33,000, \$33,000 to less than \$42,000, \$42,000 to less than \$50,000, \$50,000 to less than \$59,000, \$59,000 to less than \$68,000, \$68,000 to less than \$76,000, \$76,000 to less than \$85,000, \$85,000 to less than \$94,000, \$94,000 to less than \$103,000, \$103,000 to less than \$111,000, \$111,000 to less than \$120,000, and \$120,000 or more.

We also asked customers from what sources they received their income or financial assistance in 2017. We included earned income from wages, tips, salary, or investments; fixed income from retirement savings, pensions, social security, or disability or veterans benefits; public assistance income from housing, food, medical, financial, and/or childcare assistance programs; and, other types of income/assistance from unemployment compensation, child support or alimony, assistance from family/friends, and loans from banks or other financial lenders. We calculated the average percentage of each income source category.

Employment Status of Household Members

To determine the surveyed customers' employment status, we asked whether any members of their household were employed (full-time, part-time, and self-employed), unemployed and looking for work, retired, a student, a homemaker, and unable to work due to disability/medical condition. We calculated the average percentage for each employment status category.

Disabled Household Members

To measure the percentage of surveyed customers who have a disabled household member(s), we used their responses to questions about whether any members of their household receive disability benefits as a source of income and whether any household members are unable to work due to a disability/medical condition (regardless of whether they receive benefits). In addition, we also asked surveyed customers if any of their household members have a medical condition(s) that requires higher energy usage (e.g., they require special equipment that uses energy, higher than average heating and/or cooling, and/or higher air quality). We calculated the percentage of customers who reported any disabled household members and any household members with conditions that required more energy usage as two separate metrics.

Respondent Education, Race/Ethnicity, and Marital Status

We asked the respondents to the survey about their level of education, their race/ethnicity, and their marital status. We coded respondents' education level into four categories: high school or less, some college but no degree, technical or 2-year degree, and 4-year degree or higher. We coded respondents' race/ethnicity into five categories: White, Hispanic/Latinx/Spanish, Asian/Asian Indian, Black/African American, and Other (which included American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other). We coded respondents' marital status into two categories: married or in a domestic partnership and single (which included never married, separated/divorced, and widowed).

Household Size and Composition

We asked surveyed customers how many people of different age groups live in their household at least six months out of the year. We used responses to calculate total household size, or number of members, and to calculate the percentage of customers who have children under 18 and a senior(s) over 64 in the household.

Language Spoken in Home

We asked surveyed customers what languages they speak in their home. We coded responses into three categories: only English, English and non-English, and only non-English. The non-English languages included Spanish, Mandarin/Cantonese, Tagalog/Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, and Other.

Housing Tenure, Type, and Size

We asked surveyed respondents about their housing tenure (own or rent), the type of house they live in, and the number of rooms in their home. We coded housing tenure into three categories: own, rent, and free or unknown housing. We coded housing type into five categories: single-family, apartment/condo with five or more units, duplex/triplex/fourplex, townhome, and manufactured/mobile home. We calculated the average number of rooms in surveyed customers' homes and also coded the number of rooms in to four categories: 1 to 3 rooms, 4 to 5 rooms, 6 to 7 rooms, and 8 or more rooms.

B.2.5 Overview of Survey Data Analyses Methods

We used *Stata*, *SPSS*, and *Excel* to analyze the customer survey data. We calculated and applied post-stratification weights to the surveyed customer groups and subgroups that included a stratified sample. We used two-tailed t-tests for comparisons of means, two-tailed z-tests for comparisons of proportions, and chi-square tests for comparisons of distributions to conduct bivariate analyses for comparisons between groups or subgroups. We used linear regression with continuous dependent variables and logistic regression with binomial dependent variables to conduct multivariate analyses for identifying statistically significant factors that influence an outcome (e.g., removed/retained from CARE, ESA HCS impacts, etc.). In statistical analyses results tables, we highlighted significant differences at the $p \leq 0.05$ or $p \leq 0.10$ level, as indicated in table notes. Each of the results chapters below include more details about the specific method we used to conduct the analysis.

B.2.6 Overview of Interview Data Analyses Methods

We used *Nvivo*, *Word*, and *Excel* to analyze IDI data collected from ESA contractors, and CARE capitation agencies. We identified patterns in responses, coded response categories and themes, calculated frequencies and magnitudes, and identified representative quotes from the interview data.

Appendix C. RO.1a Detailed Findings: Informing CARE Program Post-Enrollment Processes

The first research objective is about informing CARE processes that occur after enrollment - recertification, income verification, and high-usage verification – with a focus on the experiences of customers currently participating in CARE (current participants) and customers recently removed from CARE (past participants). The specific research questions are:

- What are the key differences between eligible and ineligible CARE participants?
- To what extent do CARE post-enrollment (PE) processes remove ineligible participants and retain eligible participants?
- What are the key differences between current and past CARE participants by their eligibility status?
- What are the key differences between current and past CARE participants by their PE status?
- Can enrollment channel or data be used to determine how long participants stay in CARE or reasons for removal?
 - Can enrollment data be used to determine whether someone is likely to be a high-usage customer who will be retained?
- To what extent does CARE enrollment or recertification result in ESA participation?

We assessed the CARE post-enrollment process outcomes (e.g., recertification, income verification, and high-user verification) primarily using survey results from a sample of current and past participants, but also with data from the IOUs' CARE customer databases. First, we defined current and past participants for this study. Second, presented a summary of key findings. Third, we compared key characteristics of current and past participants to identify important differences and similarities between the groups and their CARE process and eligibility statuses. Fourth, we analyzed the key factors that significantly influence current and past participants' income-eligibility, likelihood of being a high-user, and likelihood of being retained on or removed from CARE. Fifth, we reported on current and past participants' perceptions of the difficulty of CARE processes and the impacts CARE had on their economic situations, as well as the factors that significantly influence these perceptions. Finally, we assessed past CARE participants' reasons for removal and length of time on CARE.

See Chapter 3 in Volume 1 for a summary of key findings. See the end of this chapter for an outline of all the results.

C.1 Current and Past CARE Participants Definition and Sample Characteristics

The 2018 CARE program statistics for current and past participants are shown in Table 20. About 28% of those who began 2018 on CARE were selected for a post-enrollment (PE) process. Nearly half of those selected for a PE process are removed (14% of all participants). The past participants in this study represent those removed at the PE processes and the current participants represent the 20% who were newly enrolled and the 50% retained at the PE processes (among those selected; 14% of all participants).

Table 20. 2018 CARE Program Statistics, by IOU ^{a, b}

	PG&E	SCE	SCG	SDG&E	Total
Total CARE Participants in January 2018	1,386,984 (100%)	1,224,623 (100%)	1,565,982 (100%)	298,295 (100%)	4,475,884 (100%)
Requested for PE Process	301,940 (22%)	427,254 (35%)	454,729 (29%)	61,401 (21%)	1,245,325 (28%)
Requested to Recertify	198,260 (14%)	316,701 (26%)	398,339 (25%)	35,542 (12%)	948,842 (21%)
Requested to Income Verify (PEV)	46,737 (3%)	45,996 (4%)	56,390 (4%)	14,816 (5%)	163,939 (4%)
Requested to High-Usage Verify	56,943 (4%)	64,557 (5%)	N/A	11,043 (4%)	132,543 (3%)
Current, Retained Participants	1,137,027 (82%)	894,934 (73%)	1,303,616 (83%)	225,840 (76%)	3,561,417 (80%)
Recertified	125,062 (9%)	181,943 (15%)	256,461 (16%)	22,459 (8%)	585,925 (13%)
Income Verified (PEV)	11,886 (1%)	12,270 (1%)	19,671 (1%)	6,646 (2%)	50,473 (1%)
High-Usage verified	1,966 (0.1%)	1,147 (0.1%)	N/A	1,309 (0.4%)	4,422 (0.1%)
No PE Process Required	998,113 (72%)	699,574 (57%)	1,027,484 (66%)	194,426 (65%)	2,919,597 (65%)
Past, Removed Participants	249,957 (18%)	328,377 (27%)	262,366 (17%)	70,994 (24%)	914,467 (20%)
Removed at PE Process	161,722 (12%)	221,016 (18%)	199,854 (13%)	25,063 (8%)	607,700 (14%)
Removed at Recertification	73,198 (5%)	123,925 (10%)	163,135 (10%)	7,159 (2%)	367,417 (8%)
Removed at Income Verification	34,851 (3%)	33,726 (3%)	36,719 (2%)	8,170 (3%)	113,466 (3%)
Removed at High-Usage Verification	53,673 (4%)	63,410 (5%)	N/A	9,734 (3%)	126,817 (3%)
Removed for Other Reason(s)	88,235 (6%)	107,316 (9%)	62,512 (4%)	45,931 (15%)	303,994 (7%)
Newly Enrolled in 2018	238,976 (17%)	310,605 (25%)	311,911 (20%)	71,263 (24%)	932,755 (21%)
Total CARE Participants in December 2018	1,376,003 (99%)	1,205,539 (98%)	1,615,527 (103%)	297,103 (100%)	4,494,172 (100%)
Other Metrics					
% Requested for PE Process Removed	54%	52%	44%	41%	49%
% Requested to Recertify Removed	37%	39%	41%	20%	39%
% Requested to Income Verify Removed	75%	73%	65%	55%	69%
% Requested to High-Usage Verification Removed	94%	98%	N/A	88%	96%

^a Source: IOUs' 2018 CARE Annual Reports (the latest available).^b Percentages in parentheses are out of the Total CARE Participants in January 2018.

C.1.1 Current CARE Participants

We surveyed a total of 424 CARE participants who were currently participating in CARE as of July 1, 2018. We developed four strata based on which CARE processes participants had successfully experienced:

- Enrollment in CARE but not yet required to recertify.
- Recertification, or renewal of their eligibility, but not required to verify.
- Income verification but not high-user verification.
- High-user verification for those who used 400% to less than 600% over their baseline allowance (high-low user) or 600% or more (high-high user) over their baseline allowance.

Based on the sample design, the surveyed current participants are fairly evenly distributed across the IOUs (Table 21). Within the IOUs, we sampled slightly higher percentages of surveyed current participants who successfully income verified, and lower percentages who successfully high-user verified. Based on the sample sizes, the confidence/precision is 90/10 at the IOU- and statewide-levels for all surveyed current participants and is 90/10 at the statewide-level for each of the process strata except the high-user verified, which is 85/10. Sample sizes of each process strata are too small at the IOU-level for high confidence/precision.

Table 21. Surveyed Current CARE Participants' Process Status, by IOU ^a

Strata	PG&E			SCE			SCG			SDG&E			Total		
	N	% of Total	% in IOU	N	% of Total	% in IOU	N	% of Total	% in IOU	N	% of Total	% in IOU	N	% of Total	% in Total
Current CARE Participants	110	26%	100%	107	25%	100%	95	22%	100%	112	26%	100%	424	100%	100%
Successfully...															
Enrolled	28	29%	25%	22	23%	21%	24	25%	25%	22	23%	20%	96	100%	23%
Recertified	32	27%	29%	29	25%	27%	22	19%	23%	34	29%	30%	117	100%	28%
Income Verified	34	22%	31%	44	28%	41%	42	27%	44%	38	24%	34%	158	100%	37%
High-User Verified	16	30%	15%	12	23%	11%	7	22%	7%	18	26%	16%	53	100%	13%

^a Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

C.1.2 Past CARE Participants

We surveyed a total of 345 past CARE participants who had participated in CARE anytime between January 1, 2015 and June 30, 2019 but were no longer participating as of July 1, 2018 because they were removed or dropped from the program. We developed three strata based on the PE process at which participants were removed from CARE:

- After a recertification request to renew their eligibility.
- After an income verification request to verify their income eligibility.
- After a high-user verification request to reduce their monthly usage to below 400% of baseline.

Based on our sample design, slightly higher percentages of surveyed past CARE participants are PG&E and SCE customers compared to SCG and SDG&E customers (Table 22). Within the IOUs, we sampled higher percentages of surveyed past participants who were removed after an income verification request, followed by removal after a recertification request, and then removal after a high-user verification request. The sample sizes indicate that confidence/precision is 90/10 at the IOU- and statewide-levels for all surveyed past participants and is 90/10 at the statewide-level for each of the process strata. Samples sizes of each process strata are too small at the IOU-level for high confidence/precision.

Table 22. Surveyed Past CARE Participants' Process Status, by IOU ^a

Strata	PG&E			SCE			SCG			SDG&E			Total		
	N	% of Total	% in IOU	N	% of Total	% in IOU	N	% of Total	% in IOU	N	% of Total	% in IOU	N	% of Total	% in Total
Past CARE Participants	95	27%	100%	102	30%	100%	74	21%	100%	74	22%	100%	345	100%	100%
Removed After...															
Recertification Request	32	28%	34%	37	32%	36%	25	22%	34%	22	19%	30%	116	100%	34%
Income Verification Request	44	27%	46%	44	27%	43%	39	24%	53%	35	22%	47%	162	100%	47%
High-User Verification Request	19	28%	20%	21	31%	21%	10	15%	13%	17	25%	23%	67	100%	19%

^a Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

C.2 Current vs. Past CARE Participant Comparisons

We compared the surveyed current and past CARE participants across a variety of measures related to their CARE eligibility, process and removal status, and experiences of CARE's economic impacts. Taken together, the comparisons will be useful for understanding the extent to which CARE PE processes are working to retain eligible customers and to remove ineligible customers, and the extent to which CARE has had positive economic impacts on current and past participants.

C.2.1 Key Characteristics

First, we compared surveyed current and past CARE participants on their CARE eligibility status and on key geographic, energy, economic, health, demographic, and housing characteristics. We report the comparisons by participants' process/removal status (e.g., recertification, income verification, etc.), income-eligibility status, and IOU. The data for these characteristics came from the customer data we received from the IOUs and from customers' responses to questions in the survey. The analyses below identify the extent to which past participants are different from and similar to current participants.

Eligibility Status

We estimated surveyed past CARE participants' eligibility using their responses to questions about their 2017 annual income and household size and reasons for removal from CARE.²⁷ First, we measured their income-eligibility for 2017 comparing their self-reported household size and annual income to the CARE eligibility criteria. Second, we coded their self-reported reasons for removal into two categories: removed due to ineligibility and removed due to a reason other than ineligibility.²⁸

Using the two self-reported measures of eligibility combined improves the accuracy of the estimates since each measure alone has limitations. For example, it's possible some past participants who reported income-ineligibility for 2017 (in the survey) may have been income-eligible at the time they were removed from CARE or those who reported income-eligibility in the survey may have reported a lower income to prove eligibility. In addition, it's also possible that some past participants were mistaken by or guessed the reason for their removal from CARE.

We defined ineligible past CARE participants as those who reported income-ineligibility *and* who reported being removed from CARE due to being ineligible (first row in Table 23). We defined eligible past CARE participants as those who reported income-eligibility *and* who reported being removed from CARE for a reason other than being ineligible (second row in Table 23). We excluded from analyses that involve eligibility those past CARE participants who reported inconsistent responses: those who reported income-ineligibility but reported being removed due to a reason other than ineligibility and those who reported income-eligibility but reported being removed due to ineligibility.

Table 23. Past CARE Participants' Eligibility Status ^{a, b}

Eligibility Status	PG&E	SCE	SCG	SDG&E	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Income-ineligible and removed due to ineligibility ^c	31 (35%)	33 (34%)	24 (34%)	16 (22%)	104 (32%)
Income-eligible and removed due to reason other than ineligibility ^d	37 (42%)	44 (45%)	28 (41%)	37 (51%)	146 (45%)
Income-eligible and removed due to ineligibility ^e	14 (16%)	9 (9%)	6 (9%)	14 (20%)	40 (12%)
Income-ineligible and removed due to reason other than ineligibility ^e	7 (8%)	11 (11%)	11 (16%)	8 (11%)	37 (11%)
Total	89 (100%)	97 (100%)	69 (100%)	72 (100%)	327 (100%)

^a Past CARE participants' eligibility status was determined by participants' survey responses about household size and annual income, for income-eligibility, and their reasons for removal from CARE (ineligibility or other reason).

^b Results weighted by IOU and process status.

^c Categorized as ineligible past CARE participant

^d Categorized as eligible past CARE participant.

^e Excluded from analyses involving CARE-eligibility due to inconsistent status.

²⁷ The IOU data we received included the specific reasons for past participants' removal from CARE for only a few PG&E customers and we had to instead rely on self-reported data.

²⁸ Past participants who we coded as 'removed due to ineligibility' selected not being eligible and/or not completing the high-usage process as reasons they were removed from CARE. Those who we coded as "removed for other reason" selected not knowing how to continue on CARE or why they were removed, recertifying or verifying was an inconvenience, not needing CARE any longer, moving residences, experiencing problems during the recertification or verification process, and/or privacy concerns.

We determined surveyed current CARE participants' income eligibility using their responses to survey questions about their household size and annual income. Those who reported household sizes and annual income levels at or below the CARE eligibility criteria were flagged as CARE-eligible while all others were flagged as CARE-ineligible.²⁹

Overall, 13% of surveyed current CARE participants are reportedly income-ineligible and 87% are reportedly income-eligible (Table 24). Among the current participants, the percentages of those ineligible are similar across the IOUs (12% to 15%), but are slightly higher for those who are enrolled (18%) than those who have recertified (11%), income verified (14%), or, especially, high-user verified (6%).

In contrast, 46% of surveyed past CARE participants are reportedly ineligible and 54% are reportedly eligible for CARE (Table 24). Among the past participants, the percentages of those ineligible are similar across the IOUs (46% to 48%), except for SDG&E (36%). In addition, higher percentages of past CARE customers who were removed at recertification are income-ineligible (56%) compared to those removed at income verification (30%) and at high-user verification (45%).

Table 24. Surveyed Current and Past CARE Participants' Eligibility Status, by IOU and Process Status ^{a, b}

IOU and Process Status	Current CARE Participants				Past CARE Participants			
	Income-Eligible		Income-Ineligible		Income-Eligible		Income-Ineligible	
	N	%	N	%	N	%	N	%
Total	351	87%	54	13%	136	54%	114	46%
IOU								
PG&E	94	87%	14	13%	37	54%	32	46%
SCE	89	88%	12	12%	40	52%	36	48%
SCG	76	84%	15	16%	27	52%	25	48%
SDG&E	95	87%	14	13%	35	64%	19	36%
Process Status								
Enrolled	75	81%	18	19%	N/A	N/A	N/A	N/A
Recertified/Removed after recertify request	101	89%	12	11%	53	44%	68	56%
Income verified/Removed after income verification request	129	90%	15	10%	55	70%	23	30%
High-user verified/Removed after high-user verification request	43	95%	2	5%	28	55%	23	45%

^a Current CARE participants' eligibility status was determined by participants' survey responses about household size and annual income. Past CARE participants' eligibility status was determined by participants' survey responses about household size and annual income and their reasons for removal from CARE.

^b N's weighted by IOU and process status.

Geographic Characteristics

Overall, surveyed current and past CARE participants are distributed fairly similarly across the climate zones and Census tracts based on poverty and alt-fuel usage (Table 25). Few current and past participants are in the cooler climate zones (6% to 11%) while similar percentages are distributed across the other zones based on temperature. Few current and past participants are also in the Desert/Mountain South Coast zones but are

²⁹ It is important to note that it is possible some of the surveyed current CARE participants who reported income-ineligibility at the time of the survey were income-eligible when they enrolled, recertified, or verified for CARE.

similarly distributed across the other zones based on geography. Current and past participants live in Census tracts that have similar poverty levels, but high-users live in tracts with slightly lower levels of poverty than recent enrollees or those recertified/removed at recertification. In addition, the current and past CARE participants live in Census tracts with a similar average percentage of households that use alt-fuels for heating.

Table 25. Surveyed Current and Past CARE Participants' Geographic Characteristics, by Process Status

Geographic Characteristics	Current CARE Participants					Past CARE Participants			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Climate Zone by Temperature ^a	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Cool	19%	24%	11%	19%	17%	16%	19%	16%	17%
Cool/Moderate	26%	26%	20%	25%	24%	22%	19%	21%	20%
Moderate	20%	10%	23%	17%	18%	17%	20%	25%	20%
Hot/Moderate	30%	32%	37%	32%	33%	36%	38%	33%	37%
Hot	5%	8%	9%	8%	8%	8%	4%	5%	6%
Climate Zone by Geography ^b	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Central Valley	32%	22%	20%	25%	25%	23%	23%	30%	24%
Desert/Mountain	5%	9%	9%	9%	9%	10%	5%	7%	7%
North Coast	23%	36%	17%	26%	25%	21%	23%	21%	22%
South Coast	9%	2%	16%	8%	10%	10%	11%	9%	10%
South Inland	30%	32%	37%	32%	33%	36%	38%	33%	37%
Poverty in Census Tract ^c	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Average % of Households in Poverty in Census tracts	21%	20%	15%	15%	18%	18%	17%	15%	17%
Alt-Fuel Usage in Census Tract ^d	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Average % of Households Using Alt-Fuels in Census tracts	8%	11%	6%	13%	9%	10%	10%	7%	10%

^a We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^b We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic regions; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^c Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

^d Households using alt-fuels (not electricity or natural gas) for heating; data from 2017 ACS 5-year estimates.

Surveyed current and past CARE participants' geographic characteristics are similar for those who are income-eligible vs. those who are ineligible for CARE (Table 26). Trends in the distributions of current and past CARE participants across climate zones and Census tracts are similar to those described above.

Table 26. Surveyed Current and Past CARE Participants' Geographic Characteristics, by Eligibility Status ^a

Geographic Characteristics	Current CARE Participants		Past CARE Participants	
	Eligible	Ineligible	Eligible	Ineligible
Climate Zone by Temperature ^b	N=351	N=54	N=146	N=104
Cool	8%	9%	8%	8%
Cool/Moderate	25%	28%	30%	16%
Moderate	23%	20%	27%	31%
Hot/Moderate	21%	22%	19%	23%
Hot	23%	20%	16%	22%
Climate Zone by Geography ^c	N=351	N=54	N=146	N=104
Central Valley	25%	22%	20%	29%
Desert/Mountain	8%	11%	8%	6%
North Coast	25%	26%	26%	17%
South Coast	9%	11%	13%	7%
South Inland	33%	30%	33%	41%
Poverty in Census Tract ^d	N=351	N=54	N=146	N=104
Average % of Households in Poverty in Census tracts	18%	18%	18%	17%
Alt-Fuel Usage in Census Tract ^e	N=351	N=54	N=146	N=104
Average % of Households Using Alt-Fuels in Census tracts	9%	7%	7%	10%

^a Eligibility status determined by participants' responses to survey questions about household size and income.

^b We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^c We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic regions; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^d Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

^e Households using alt-fuels (not electricity or natural gas) for heating; data from 2017 ACS 5-year estimates.

The geographic characteristics of current vs. past CARE participants are also similar across IOUs (Table 27). There are some differences between the IOUs for all current/past CARE participants, but these differences are partly due to the survey sample design and the geography of each IOUs' service territory. In addition, SDG&E has fewer Census tracts with higher levels of poverty compared to other IOUs, and SCE and SCG have fewer Census tracts with high percentages of alt-fuel users. These trends are reflected in the distributions of surveyed current/past participants within the IOUs' territories.

Table 27. Surveyed Current and Past CARE Participants' Geographic Characteristics, by IOU ^a

Geographic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Climate Zone by Temperature ^c	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Cool	24%	1%	0%	41%	17%	28%	0%	4%	41%	17%
Cool/Moderate	63%	N/A	N/A	29%	24%	58%	N/A	N/A	20%	20%
Moderate	13%	21%	15%	23%	18%	14%	18%	16%	36%	20%
Hot/Moderate	N/A	65%	74%	4%	33%	N/A	65%	78%	3%	37%
Hot	N/A	18%	12%	3%	8%	N/A	17%	1%	0%	6%
Climate Zone by Geography ^d	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Central Valley	60%	5%	4%	24%	24%	61%	4%	3%	27%	24%
Desert/Mountain	0%	20%	12%	3%	8%	0%	21%	4%	0%	7%
North Coast	40%	1%	0%	54%	25%	39%	0%	4%	50%	22%
South Coast	N/A	13%	11%	15%	10%	N/A	11%	11%	20%	10%
South Inland	N/A	62%	74%	4%	33%	N/A	65%	78%	3%	37%
Poverty in Census Tract ^e	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Average % of Households in Poverty in Census tracts	19%	20%	19%	14%	18%	17%	21%	14%	12%	17%
Alt-Fuel Usage in Census Tract ^f	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Average % of Households Using Alt-Fuels in Census tracts	16%	2%	2%	13%	9%	18%	5%	2%	13%	10%

^a The distribution of surveyed current and past CARE participants across IOUs and climate zones is mostly a result of the sample designs we used to survey each group.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^d We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic regions; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^e Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

^f Households using alt-fuels (not electricity or natural gas) for heating; data from 2017 ACS 5-year estimates.

Energy Characteristics

Surveyed current and past CARE participants have a few notable differences in their energy characteristics, on average, as follows (Table 28):

- Current participants who were high-user verified are less likely to have both electric and gas service and are more likely to use alt-fuels compared the past participants who were removed due to high-usage.

- Current participants who recertified have lower annual energy costs than past participants removed at recertification (but the current participants' costs include the CARE discount).
- Current participants who recertified are more likely to live in areas with higher electric service reliability (lower SAIDI/SAIFI) than past participants removed at recertification.
- Current participants are more likely to have participated in the ESA program compared to past participants. Within the current and past groups, high-users have higher ESA participation compared to the non-high-users, as should be expected since high-users are required to have an ESA assessment. In addition, fewer current CARE enrollees have participated in ESA compared to those who have recertified or verified. In addition, very few past participants are participating in FERA according to IOU records.
- Current and past participants have mostly similar heating and cooling characteristics, except for the central systems, in which current participants are less likely to have a central furnace or a central AC than past participants. Within the current and past CARE groups, high-users are more likely to have central heating and cooling systems and fireplaces compared to the non-high-users.

Table 28. Surveyed Current and Past CARE Participants' Energy Characteristics, by Process Status ^a

Energy Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Fuel Type	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Electric & natural gas	78%	73%	77%	68%*	75%	75%	75%	80%*	76%
Electric only	16%	16%	17%	19%	17%	16%	15%	13%	15%
Electric and alt-fuels ^c	6%	11%	6%	13%*	8%	9%	10%	6%*	9%
Fuel Costs ^d	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Average annual costs	\$1,162	\$1,053*	\$1,227	\$2,053	\$1,267*	\$1,267*	\$1,280	\$1,953	\$1,406*
Electric Service Reliability ^e	N=68	N=94	N=112	N=52	N=320	N=84	N=113	N=57	N=254
Average SAIDI	0.9	2.7*	0.05	0.02	1.0*	4.3*	0.03	0.02	1.4*
Average SAIFI	0.005	0.006*	0.0003	0.0002	0.003	0.01*	0.0001	0.0002	0.005*
ESA or FERA Participation	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Participated in ESA	19%	32%*	32%*	52%*	32%*	13%*	19%*	27%*	18%*
Participating in FERA	N/A	N/A	N/A	N/A	N/A	1%	2%	0%	1%

Energy Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Heating Characteristics ^f	N=93	N=114	N=154	N=53	N=414	N=111	N=157	N=66	N=334
Furnace	54%	55%*	71%	75%*	63%*	68%*	72%	82%*	72%*
Wall/space heater	53%	44%	39%	38%*	44%	41%	39%	45%*	41%
Fireplace	37%	29%	35%*	53%	36%	31%	40%*	55%	40%
Radiant/hydronic	6%	4%	5%	6%	5%	5%	3%	2%	3%
Heat pump	4%	3%*	3%	8%	4%	9%*	5%	2%	6%
Baseboard	3%	3%	1%	2%	2%	3%	0%	5%	2%
No heating equipment	0%	4%	1%	0%	2%	3%	4%	0%	3%
Average % of home heated ^g	67%	72%*	79%	76%	74%	79%*	75%	77%	77%
Cooling Characteristics ^f	N=94	N=114	N=157	N=53	N=418	N=116	N=160	N=66	N=342
Central AC	43%	43%*	59%	62%	51%*	60%	61%	61%	61%*
Ceiling fans	62%	61%	60%	81%*	64%	66%	64%	70%*	66%
Portable fans	74%	71%*	75%	75%	74%	78%*	74%	74%	76%
Room/window AC	21%	27%	18%	29%*	23%	27%	18%	21%*	22%
Portable AC	21%	17%	14%	17%	17%	18%	14%	21%	17%
Evaporative cooler	7%	18%*	9%	16%	12%	6%*	9%	15%	9%
Heat pump	6%	4%	7%	10%	6%	9%	6%	6%	7%
No cooling equipment	2%	4%	3%	0%	3%	1%	2%	4%	2%
Average % of home cooled ^g	66%	72%	71%	70%	70%	68%	67%	71%	68%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have a comparison group); two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data; we oversampled potential alt-fuels customers for the survey.

^d Includes 2017 electricity and natural gas costs from IOU billing data. Current CARE participants' costs include the CARE discount.

^e SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages; higher values mean lower reliability.

^f Survey respondents could select more than one heating and/or cooling equipment.

^g We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

Surveyed current and past CARE participants who are income-eligible and ineligible are different in a few notable ways regarding their energy characteristics (Table 29). On average, compared to eligible current/past participants, those who are ineligible are:

- More likely to have higher annual energy costs.
- More likely to live in areas with higher electric service reliability (lower SAIDI/SAIFI).
- Less likely to have participated in the ESA program.
- More likely to have central heating and cooling systems (furnace and AC) and fireplaces, and are less likely to have room/window ACs or evaporative coolers.
- More likely to live in homes with a greater percentage of the area serviced by the heating and cooling equipment.

Table 29. Surveyed Current and Past CARE Participants' Energy Characteristics, by Eligibility Status ^{a, b}

Energy Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Fuel Type	N=351	N=54	N=146	N=104
Electric & natural gas	75%	78%	74%^	82%^
Electric only	16%	17%	16%	12%
Electric and alt-fuels ^d	9%	6%	10%	7%
Fuel Costs ^e	N=351	N=54	N=146	N=104
Average annual costs	\$1,258*	\$1,274*	\$1,370*	\$1,433*
Electric Service Reliability ^f	N=267	N=39	N=111	N=74
Average SAIDI	1.2*^	0.2^	0.5*^	0.2^
Average SAIFI	0.003^	0.001^	0.003^	0.0001^
ESA or FERA Participation	N=351	N=54	N=146	N=104
Participated in ESA	33%*^	26%*^	23%*^	13%*^
Participating in FERA	N/A	N/A	2%	0%
Heating Characteristics ^g	N=342	N=54	N=141	N=102
Furnace	61%*^	80%^	68%*^	76%^
Wall/space heater	43%	47%*	38%	41%*
Fireplace	32%*^	51%*^	37%*^	42%*^
Radiant/hydronic	5%	6%	4%	3%
Heat pump	4%	4%	2%^	7%^
Baseboard	1%	2%	1%	1%
No heating equipment	2%	2%	5%	1%
Average % of home heated ^h	71%^	88%*^	75%^	80%*^

Energy Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Cooling Characteristics ^g	N=345	N=54	N=141	N=102
Central AC	48%* [^]	69%* [^]	56%* [^]	62%* [^]
Ceiling fans	63%*	63%*	58%* [^]	69%* [^]
Portable fans	73%	77%*	70% [^]	83%* [^]
Room/window AC	23% [^]	15%* [^]	21%	23%*
Portable AC	16%*	19%	22%* [^]	15% [^]
Evaporative cooler	13% [^]	6% [^]	10%	8%
Heat pump	7%	6%	6%	7%
No cooling equipment	3%	0%	2%	0%
Average % of home cooled ^h	68%* [^]	80% [^]	62%* [^]	76% [^]

^a Eligibility status determined by participants' responses to survey questions about household size and income.

^b * = statistically significant difference at $p \leq .05$ between current and past participants (eligible vs. eligible and ineligible vs. ineligible)

[^] = statistically significant difference at $p \leq .05$ between eligible and ineligible participants within current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data; we oversampled potential alt-fuels customers for the survey.

^e Includes 2017 electricity and natural gas costs from IOU billing data. Current CARE participants' costs include the CARE discount.

^f SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages; higher values mean lower reliability.

^g Survey respondents could select more than one heating and/or cooling equipment.

^h We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

Overall trends in current vs. past CARE participants' energy characteristics vary across the IOUs in ways discussed above. However, the energy characteristics are quite different between the IOUs, but mostly in inconsistent and nuanced ways (Table 30). Some key differences include:

- SCE and SDG&E current participants are more likely to have electric and gas service and less likely to have only electricity (SCE) or use alt-fuels (SDG&E) than past participants; the opposite is true for PG&E, whose current participants are less likely to have both electricity and gas and are more likely to have only electric service or use alt-fuels than past participants. In addition, SCE and SCG current/past participants are more likely to have electric and gas service than PG&E and especially SDG&E current/past participants.
- SCE, SCG, and SDG&E past participants have high annual energy costs than current participants, whose energy costs include the CARE discount.
- The difference in Table 29 above showing current participants living in areas with higher electric service reliability than past participants is only in PG&E's territory, which has more areas with lower reliability and greater variation in reliability than the other IOUs.
- ESA participation is higher among SDG&E current/past CARE participants, followed by PG&E, SCE, and SCG current/past participants, respectively. The ESA participation rate is similar for current and past

SCG CARE participants while it is significantly higher for PG&E, SCE, and SDG&E current vs. past participants.

- The differences showing fewer current CARE participants with central furnaces and fireplaces than past participants are primarily in PG&E, SCG, and SDG&E territories (vs. SCE); relatedly, differences showing fewer current CARE participants with central ACs than past participants are primary in SCG and especially SDG&E territories (vs. PG&E and SCE).

Table 30. Surveyed Current and Past CARE Participants' Energy Characteristics, by IOU ^a

Energy Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Fuel Type	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Electric & natural gas	62%*	85%*	100%	57%*	75%	75%*	79%*	100%	49%*	76%
Electric only	16%*	14%*	0%	34%	17%*	8%*	19%*	0%	32%	32%*
Electric and alt-fuels ^c	22%*	1%	0%	9%*	8%	17%*	2%	0%	19%*	9%
Fuel Costs ^d	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (254)
Average annual costs	\$1,368	\$1,264*	\$1,292*	\$1,151*	\$1,267*	\$1,364	\$1,538*	\$1,377*	\$1,309*	\$1,406*
Electric Service Reliability ^e	PG&E (103)	SCE (105)	SCG (0)	SDG&E (112)	Total (320)	PG&E (81)	SCE (100)	SCG (0)	SDG&E (73)	Total (254)
Average SAIDI	3.1*	0.03	N/A	0.05	1.01*	4.4*	0.03	N/A	0.04	1.43*
Average SAIFI	0.01	.0002	N/A	.0004	0.003	0.01	.0002	N/A	.0003	0.004
ESA or FERA Participation	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Participated in ESA	42%*	20%*	4%	57%*	32%*	12%*	12%*	3%	51%*	18%*
Participating in FERA	N/A	N/A	N/A	N/A	N/A	1%	4%	N/A	1%	2%
Heating Characteristics ^f	PG&E (108)	SCE (106)	SCG (94)	SDG&E (112)	Total (420)	PG&E (94)	SCE (99)	SCG (70)	SDG&E (71)	Total (334)
Furnace	69%*	69%	60%*	56%*	63%*	83%*	70%	66%*	69%*	73%*
Wall/space heater	48%	40%*	37%*	48%*	44%	50%	33%*	47%*	35%*	41%
Fireplace	33%*	39%*	31%*	40%*	36%	50%*	26%*	40%*	47%*	40%
Radiant/hydronic	3%	6%	10%*	3%	5%	5%	1%	1%*	4%	3%
Heat pump	7%*	4%	1%*	3%	4%	2%	7%	7%	7%	6%
Baseboard	4%	3%	0%	2%	2%	3%	2%	1%	0%	2%
No heating equipment	0%	2%	2%	3%	2%	0%	4%	5%	4%	3%
Average % of home heated ^g	77%	74%	73%	71%*	74%	79%	76%	70%	80%*	77%

Energy Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Cooling Characteristics ^f	PG&E (108)	SCE (106)	SCG (94)	SDG&E (112)	Total (420)	PG&E (94)	SCE (99)	SCG (70)	SDG&E (71)	Total (334)
Central AC	53%	66%	53%*	34%*	51%*	53%	65%	58%*	68%*	61%
Ceiling fans	58%*	68%*	64%	64%*	64%	67%*	61%*	62%	74%*	66%
Portable fans	67%*	73%	73%	81%	74%	80%*	72%	71%	78%	76%
Room/window AC	17%	19%	26%	28%*	23%	20%	20%	26%	20%*	22%
Portable AC	17%	14%	15%*	21%	17%	16%	10%	20%*	22%	17%
Evaporative cooler	22%*	13%	10%	3%	12%	10%*	12%	8%	6%	9%
Heat pump	10%	9%	3%	4%*	7%	6%	7%	7%	9%*	7%
No cooling equipment	5%	1%	1%	3%	3%	4%	2%	3%	0%	2%
Average % of home cooled ^g	69%	70%	73%*	70%	70%	70%	71%	58%*	71%	68%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N).

^b Sample sizes large enough for 90/10 confidence/precision.

^c Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data; we oversampled potential alt-fuels customers for the survey.

^d Includes 2017 electricity and natural gas costs from IOU billing data. Current CARE participants' costs include the CARE discount.

^e SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages; higher values mean lower reliability.

^f Survey respondents could select more than one heating and/or cooling equipment.

^g We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

Economic Characteristics

Surveyed current and past CARE participants are quite different economically, as follows (Table 31):

- Current participants have higher average energy burdens and modified energy burdens, even with the CARE discount, than past participants. Energy burdens and modified energy burdens within the groups are highest for those at high-user verification and, for past participants, at income verification, than those at recertification.
- Similarly, current participants reported higher general economic hardship than past participants, and high-users reported slightly higher economic hardship than others.
- Current participants reported much lower average annual household incomes than past participants; current participants are also less likely to have earned income and more likely to get their income from fixed-income and/or public assistance sources.
 - More current enrollees and past participants removed at recertification reported receiving earned income than fixed-income or public assistance compared to those at income verification or high-user verification.

- Current participants are less likely to have an employed household member(s) and are more likely to have a retired, homemaker, and/or disabled household member(s) than past participants.
- These differences are primarily between current and past participants at recertification and high-user verification; current and past income verification participants reported similar employment characteristics.

Table 31. Surveyed Current and Past CARE Participants' Economic Characteristics, by Process Status ^a

Economic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Hardship	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Average energy burden ^c	5.4%	5.0%*	5.1%*	7.2%*	5.4%*	3.3%*	4.5%*	5.9%*	4.4%*
Average modified energy burden ^c	4.3%	4.3%*	4.6%	6.4%*	4.7%*	3.2%*	4.3%	5.2%*	4.1%*
Average economic hardship index score ^d	3.9	4.0*	4.1*	4.4*	4.0*	2.7*	3.1*	3.4*	3.0*
Average months during past year had difficulty paying... ^e									
Energy bills	2.0	2.2	2.3	3.6	2.3	2.1	2.5	3.4	2.5
Rent/Mortgage	2.1	1.6	1.8	1.5*	1.8	1.7	2.0	2.8*	2.0
Other basic needs	1.9	1.9	2.0*	2.3	2.0	1.8	2.2	2.5*	2.1
Medical bills	1.3	1.2*	1.8*	2.1	1.6*	1.9*	2.5*	2.0	2.2
Income and Sources	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Average annual household income (\$1,000s) ^f	\$33.4	\$31.0*	\$34.4*	\$33.9*	\$33.2*	\$51.7*	\$40.9*	\$50.2*	\$46.3*
Earned income (from wages, salary, tips, investments)	68%	59%*	60%*	62%*	62%*	79%*	67%*	72%*	72%*
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)	33%	42%*	43%*	51%*	41%*	23%*	33%*	33%*	30%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)	20%	25%*	24%*	25%*	23%*	8%*	15%*	19%*	14%*
Other types of income/assistance ^g	17%	26%*	23%	23%	22%	20%*	26%	27%	24%

Economic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Employment Status of Household Members	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Employed	73%	62%*	63%	58%*	64%*	82%*	66%	76%*	73%*
Unemployed looking for work	15%	19%	20%	17%	18%	17%	16%	19%	17%
Retired	20%	27%*	32%	40%*	29%*	18%*	31%	21%*	25%*
Student(s)	42%	47%*	41%	45%	43%	35%*	44%	48%	42%
Homemaker	29%	31%*	23%*	34%*	28%	23%*	30%*	24%*	26%
Unable to work due to disability/medical condition	28%	28%*	24%	28%*	27%*	12%*	25%	18%*	19%*

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Respondents could choose never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^f Calculated by taking the average of the midpoints of the income ranges included in the survey.

^g Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

The economic characteristics of surveyed current and past CARE participants also vary in important ways by their income-eligibility status (Table 32). On average, compared to eligible current/past participants, the ineligible participants:

- Have lower average energy and modified energy burdens but similar levels of general economic hardship.
 - Among current participants, ineligible also reported fewer months of difficulty paying energy bills and other basic needs.
- Have higher annual household incomes, and are more likely to receive earned income, less likely to receive public assistance, and more likely to have an employed household member(s).
 - Among current participants, ineligible are less likely to have a retired household member(s).
 - Among past participants, ineligible are less likely to have unemployed, student, homemaker, and/or disabled household members.

Table 32. Surveyed Current and Past CARE Participants' Economic Characteristics, by Eligibility Status ^{a, b}

Economic Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Hardship	N=351	N=54	N=146	N=104
Average energy burden ^d	5.9%^	2.2%^	6.1%^	2.5%^
Average modified energy burden ^d	5.1%^	2.1%^	5.7%^	2.3%^
Average economic hardship index score ^e	4.1*	3.9*	3.1*^	2.6*^
Average months during past year had difficulty paying... ^f				
Energy bills	2.5*^	1.6^	3.1*^	1.7^
Rent/Mortgage	1.9*	1.3	2.5*	1.7
Other basic needs	2.1^	1.3^	2.5	1.6
Medical bills	1.6*	1.3*	2.6*	2.2*
Income and Sources	N=351	N=54	N=146	N=104
Average annual household income (\$1,000s) ^g	\$28.7^	\$63.0*^	\$28.7^	\$72.1*^
Earned income (from wages, salary, tips, investments)	60%^	80%^	63%^	85%^
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)	40%*	44%*	29%*	25%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)	27%*^	6%^	18%*^	8%^
Other types of income/assistance ^h	23%	22%	23%	23%
Employment Status of Household Members	N=351	N=54	N=266	N=134
Employed	65%^	80%*^	68%^	88%*^
Unemployed looking for work	18%	20%*	23%^	12%*^
Retired	31%*^	26%^	26%*	25%
Student(s)	45%	48%*	46%	41%*
Homemaker	29%	26%	27%	25%
Unable to work due to disability/medical condition	28%	26%*	27%^	11%*^

^a Eligibility status determined by participants' responses to survey questions about household size and income.

^b * = statistically significant difference at $p \leq .05$ between current and past participants (eligible vs. eligible and ineligible vs. ineligible)
 ^ = statistically significant difference at $p \leq .05$ between eligible and ineligible participants within current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Energy burden is annual energy bills divided by annual income; modified energy burden takes into account alt-fuels expenses (as part of energy bills) and public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^e Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^f Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^g Calculated by taking the average of the midpoints of the income ranges included in the survey.

^h Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

Overall, trends in the economic differences between current and past CARE participants are similar across the IOUs as those discussed above (Table 33). Moreover, between the IOUs, the current CARE participants are mostly similar and the past CARE participants are mostly similar economically.

Table 33. Surveyed Current and Past CARE Participants' Economic Characteristics, by IOU ^a

Economic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Hardship	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Average energy burden ^c	5.1%*	4.9%*	6.4%*	5.2%	5.4%*	4.2%*	4.3%*	4.0%*	5.0%	4.3%*
Average modified energy burden ^c	4.6%*	4.3%	5.6%*	4.4%	4.7%*	3.8%*	4.2%	4.0%*	4.5%	4.1%*
Average economic hardship index score ^d	4.2*	4.0*	3.8*	4.1*	4.0*	2.9	2.8	2.7	3.4	3.0
Average months during past year had difficulty paying... ^e										
Energy bills	2.6*	2.8	1.6*	2.2*	2.3	1.9*	2.6	2.3*	3.5*	2.5
Rent/Mortgage	2.5*	2.4	1.3*	0.9*	1.8	1.5*	2.0	1.8*	3.0*	2.0
Other basic needs	2.4*	2.2	1.7	1.6*	2.0	1.7*	1.9	2.1	2.9*	2.1
Medical bills	1.6	1.4*	1.8	1.4*	1.6*	2.0	2.0	2.1	2.8	2.2
Income and Sources	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Average annual household income (\$1,000s) ^f	\$33.5*	\$34.1*	\$32.9*	\$32.2	\$33.2*	\$46.1*	\$51.2*	\$51.0*	\$35.3	\$46.4*
Earned income (from wages, salary, tips, investments)	56%*	62%	63%*	65%*	62%*	83%*	65%	68%*	72%*	72%*
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)	50%*	38%*	35%*	42%*	42%*	35%*	30%*	22%*	31%*	30%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)	22%*	23%*	22%*	26%*	23%*	14%	16%	4%	20%	14%
Other types of income/assistance ^g	28%*	19%	17%*	25%	22%	22%	22%	26%	28%	24%

Economic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Employment Status of Household Members	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)
Employed	61%*	65%*	70%*	61%*	64%*	73%*	73%*	78%*	70%*	73%*
Unemployed looking for work	15%	25%*	19%	13%*	18%	13%	14%*	22%	23%*	17%
Retired	32%	25%	28%*	30%	29%	28%	25%	18%*	27%	25%
Student(s)	46%	46%*	44%	38%	43%	43%	39%*	45%	41%	42%
Homemaker	25%	25%*	28%	33%*	28%	24%	32%*	32%	15%*	26%
Unable to work due to disability/medical condition	35%*	22%	25%*	23%	27%*	19%	24%	11%	22%	19%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N).

^b Sample sizes large enough for 90/10 confidence/precision.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account alt-fuels expenses (as part of energy bills) and public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^f Calculated by taking the average of the midpoints of the income ranges included in the survey.

^g Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

Health Characteristics

Surveyed current and past CARE participants reported a few important health-related differences, as follows (Table 34):

- Current recertified participants reported higher health hardship than past participants removed at recertification
 - Current enrollees and past participants removed at recertification reported the lower health hardship compared those at income verification and especially high-user verification.
- Current participants who recertified and who high-user verified are more likely to have a disabled household member(s) than corresponding past participants.
- Similarly, current CARE high-users are more likely to have a household member(s) with a medical condition(s) requiring special equipment, more heating/cooling, and/or higher air quality than past participant high users and others.

Table 34. Surveyed Current and Past CARE Participants' Health Characteristics, by Process Status ^a

Health Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Hardship	N=93	N=114	N=151	N=52	N=407	N=108	N=145	N=64	N=315
Average health hardship index score ^c	3.5	4.1*	4.1	4.9	4.1	3.6*	4.4	4.6	4.2
Health Status	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Disabled household member(s) ^d	31%	33%*	27%	32%*	30%*	14%*	27%	19%*	21%*
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality	20%	23%	22%	36%*	23%	19%	25%	28%*	24%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N= number who answered survey question.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^c Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^d Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

Surveyed income-eligible and ineligible current and past CARE participants are more alike than different regarding their health characteristics (Table 35). A higher percentage of eligible past participants reported a disabled household member(s) and household member(s) with medical conditions requiring more energy usage or higher air quality than ineligible past participants.

Table 35. Surveyed Current and Past CARE Participants' Health Characteristics, by Eligibility Status ^{a, b}

Health Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Hardship	N=345	N=53	N=136	N=100
Average health hardship index score ^d	4.1*	3.8	4.6*	3.5
Health Status	N=351	N=54	N=146	N=104
Disabled household member(s) ^e	31%	30%*	29%^	12%*^
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality	25%	24%*	26%^	19%*^

^a Eligibility status determined by participants' responses to survey questions about household size and income.

^b * = statistically significant difference at $p \leq .05$ between current and past participants (eligible vs. eligible and ineligible vs. ineligible)

^ = statistically significant difference at $p \leq .05$ between eligible and ineligible participants within current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

Overall, trends in the health differences between current and past CARE participants are similar across the IOUs as those discussed above (Table 36). There are a few notable differences within the IOUs, as follows:

- Differences in current and past participants' reported health hardship occurs only among SDG&E customers.
- More PG&E current CARE participants have a disabled household member(s) compared to other IOUs' current and past participants.
- A higher percentage of past SCE participants reported a household member(s) with a medical condition requiring more energy and/or higher air quality than current SCE participants.

Table 36. Surveyed Current and Past CARE Participants' Health Characteristics, by IOU ^a

Health Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
	PG&E (109)	SCE (102)	SCG (93)	SDG&E (103)	Total (407)	PG&E (86)	SCE (95)	SCG (72)	SDG&E (72)	Total (325)
Hardship										
Average health hardship index score ^c	4.4	4.1	4.0	3.7*	4.1	4.3	4.3	3.7	4.2*	4.2
Health Status										
Disabled household member(s) ^d	39%*	28%	28%*	25%	30%*	21%*	25%	14%*	23%	21%*
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality	26%	19%*	24%	27%	24%	22%	25%*	22%	26%	24%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N).

^b Sample size large enough for 90/10 confidence/precision.

^c Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^d Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

Demographic Characteristics

The surveyed current and past CARE participants are demographically different on a few characteristics, as follows (Table 37):

- Current participants reported lower levels of education, on average, than past participants.
 - Within the current and past participant groups, those at income verification reported higher levels of education than high-users and those at recertification.
- Current participants are more likely to have children in the household and, among high-users and those at recertification, are more likely to have a senior(s) in the household.

- Current high-user participants are more likely to have a foreign-born household member(s), be Hispanic/Latinx/Spanish or black, and to speak a non-English language in the home than past high-user participants.
- Current participants who passed recertification or income verification are less likely to be white than corresponding past participants who were removed at recertification or income verification.

Table 37. Surveyed Current and Past CARE Participants' Demographic Characteristics, by Process Status ^a

Demographic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Education of Respondent	N=94	N=112	N=153	N=52	N=407	N=110	N=153	N=64	N=327
High school or less	28%	38%*	27%	38%*	31%*	25%*	23%	30%*	25%*
Some college, no degree	26%	21%	25%	33%*	25%	18%	27%	27%*	24%
Technical or 2-year degree	24%	19%*	14%	15%*	18%	25%*	14%	22%*	19%
4-year degree or higher	22%	21%*	33%*	15%*	25%*	31%*	37%*	22%*	32%*
Marital Status	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Married/domestic partnership	46%	50%*	42%	55%	47%	55%*	44%	57%	50%
Single (never married, separated, divorced, or widowed)	54%	50%*	58%	45%	53%	45%*	56%	43%	50%
Household Size and Composition	N=92	N=113	N=152	N=52	N=405	N=110	N=153	N=64	N=327
Average number of household members	3.4	3.5	3.2	4.3	3.5	3.1	3.2	4.0	3.5
Children under 18	54%	56%*	49%*	54%	53%*	41%*	42%*	59%	45%*
Seniors over 64	22%	30%*	34%	38%*	30%	23%*	33%	30%*	29%
Foreign-born	37%	32%	32%	24%*	32%	32%	36%	31%*	34%
Race/Ethnicity of Respondent ^c	N=94	N=112	N=154	N=52	N=407	N=111	N=158	N=64	N=333
White	38%	36%*	40%*	50%	40%*	41%*	45%*	53%	46%*
Hispanic/Latinx/Spanish	40%	40%	34%	27%*	36%	41%	35%	36%*	37%
Asian/Asian Indian	12%	7%	12%	4%	10%	11%	13%	9%	11%
Black/African American	5%	11%	7%	15%*	9%	8%	5%	6%*	6%
Other ^d	11%	7%	6%	10%	9%	6%	7%	10%	7%

Demographic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recertified	Income Verified	High-User Verified	Total	Removed After Recertification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Language in Home ^d	N=94	N=112	N=152	N=52	N=406	N=110	N=153	N=64	N=327
Speaks only English	59%	55%*	62%	79%*	61%	62%*	62%	69%*	63%
Speaks English and non-English	34%	36%	30%	21%*	31%	32%	32%	31%*	32%
Speaks only non-English	7%	10%	9%	0%	8%	6%	6%	0%	5%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^c Respondents could select more than one race/ethnicity; Other race/ethnicity includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^d Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Several demographic differences were also reported by current and past participants based on their income eligibility (Table 38). On average, compared to eligible current/past participants, the ineligible participants have higher levels of education, are more likely to be married, are less likely to have children or seniors in their household, and are more likely to speak English in their homes. In addition, among current participants, those who are ineligible are less likely to be Hispanic/Latinx/Spanish and are more likely to be Asian/Asian-Indian than those who are eligible. Similarly, among past participants, those who are ineligible are more likely to have smaller households and to be white and are less likely to have a foreign-born household member(s).

Table 38. Surveyed Current and Past CARE Participants' Demographic Characteristics, by Eligibility Status ^{a, b}

Demographic Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Education of Respondent	N=349	N=54	N=145	N=104
High school or less	34%^	17%^	37%^	13%^
Some college, no degree	26%	19%*	22%	26%*
Technical or 2-year degree	18%	17%*	15%^	25%*^
4-year degree or higher	21%^	48%*^	26%^	37%*^
Marital Status	N=351	N=54	N=146	N=104
Married/domestic partnership	48%*^	56%*^	43%*^	62%*^
Single (never married, separated, divorced, or widowed)	52%*^	44%*^	57%*^	38%*^
Household Size and Composition	N=351	N=54	N=146	N=104
Average number of household members	3.5	3.3	3.5	3.1
Children under 18	54%*^	44%^	47%*	44%
Seniors over 64	31%^	24%^	31%^	25%^
Foreign-born	32%*	33%	44%*^	28%^

Demographic Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Race/Ethnicity of Respondent ^d	N=349	N=54	N=146	N=104
White	40%	44%*	40%^	55%*^
Hispanic/Latinx/Spanish	39%^	22%*^	43%^	34%*^
Asian/Asian Indian	8%^	20%*^	10%	14%*
Black/African American	8%	13%*	8%	6%*
Other ^c	8%	8%	9%	4%
Language in Home ^e	N=348	N=54	N=144	N=104
Speaks only English	60%^	69%^	55%^	72%^
Speaks English and non-English	32%*	28%	38%*^	25%^
Speaks only non-English	8%	4%	7%	3%

^a Eligibility status determined by participants' responses to survey questions about household size and income.

^b * = statistically significant difference at $p \leq .05$ between current and past participants (eligible vs. eligible and ineligible vs. ineligible)

^c ^ = statistically significant difference at $p \leq .05$ between eligible and ineligible participants within current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^d Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^e Respondents could select more than one race/ethnicity; Other race/ethnicity includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^f Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Overall, trends in the demographic differences between current and past CARE participants are similar across the IOUs as those discussed above (Table 39). There are a few notable differences within the IOUs, as follows:

- SCE and SCG current/past participants are more likely to be non-white, have a foreign-born household member(s), and speak a non-English language than PG&E and SDG&E participants.
- Differences in current vs. past participants' education and race/ethnicity are found for all the IOUs.
- Differences in current and past participants' household composition are not found for SCG customers, and differences in current and past participants' language characteristics is only found for SDG&E customers.

Table 39. Surveyed Current and Past CARE Participants' Demographic Characteristics, by IOU ^a

Demographic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
	PG&E (109)	SCE (101)	SCG (92)	SDG&E (105)	Total (407)	PG&E (82)	SCE (78)	SCG (67)	SDG&E (104)	Total (331)
High school or less	29%*	29%	35%	33%*	31%*	18%*	32%	31%	18%*	25%*
Some college, no degree	26%	26%*	21%	29%	25%	28%	18%*	20%	31%	24%
Technical or 2-year degree	20%	21%	15%*	12%*	18%	20%	24%	10%*	21%*	19%
4-year degree or higher	25%*	29%	29%*	26%*	25%*	33%*	27%	39%*	31%*	32%*

Demographic Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Marital Status	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Married/domestic partnership	45%	52%	44%*	46%	47%	45%	54%	55%*	47%	50%
Single (never married, separated, divorced, or widowed)	55%	48%	56%*	54%	53%	55%	46%	45%*	53%	50%
Household Size and Composition	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (89)	SCE (97)	SCG (69)	SDG&E (72)	Total (327)
Average number of household members	3.4	3.8	3.3	3.3	3.5	3.4	3.3	3.4	3.2	3.3
Children under 18	52%*	60%*	50%	49%	53%*	46%*	39%*	48%	49%	45%
Seniors over 64	33%	27%	30%	31%*	30%	30%	30%	29%	25%*	29%
Foreign-born	23%*	31%*	43%	33%*	32%	30%*	39%*	40%	27%*	34%
Race/Ethnicity of Respondent ^c	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (92)	SCE (97)	SCG (72)	SDG&E (72)	Total (333)
White	54%	32%*	28%	43%*	40%*	55%	41%*	25%	56%*	45%*
Hispanic/Latinx/ Spanish	24%	38%*	47%*	39%	36%	25%	45%*	42%*	38%	37%
Asian/Asian Indian	7%*	12%*	14%*	7%	10%	13%*	6%*	22%*	6%	11%
Black/African American	8%	14%*	7%	6%	9%	8%	8%*	6%	3%	6%
Other ^c	12%*	9%	8%	5%	9%	5%*	6%	9%	6%	7%
Language in Home ^d	PG&E (110)	SCE (107)	SCG (95)	SDG&E (112)	Total (424)	PG&E (89)	SCE (96)	SCG (70)	SDG&E (72)	Total (327)
Speaks only English	72%	61%	50%	59%*	61%	71%	58%	54%	69%*	63%
Speaks English and non-English	24%	32%	37%	33%	31%	25%	36%	37%	29%	32%
Speaks only non-English	4%	7%	13%	8%*	8%	4%	6%	9%	2%*	5%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N).

^b Sample size large enough for 90/10 confidence/precision.

^c Respondents could select more than one race/ethnicity; Other race/ethnicity includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^d Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Housing Characteristics

Surveyed current and past CARE participants also reported a few differences in their housing situations, but the differences vary primarily by their process status, as follows (Table 40):

- Current participants who passed recertification or income verification are more likely to rent their homes than corresponding past participants.
- Current participants who recertified or high-user verified are less likely to live in single-family homes than corresponding past participants.
 - Current recertified participants also live in an apartment/condo or manufactured/mobile home and are less likely to live in a duplex/triplex/fourplex than corresponding past participants.

Table 40. Surveyed Current and Past CARE Participants' Housing Characteristics, by Process Status ^a

Housing Characteristics	Current CARE Participants ^b					Past CARE Participants ^b			
	Enrolled	Recert-ified	Income Verified	High-User Verified	Total	Removed After Recert-ification Request	Removed After Income Verification Request	Removed After High-User Verification Request	Total
Housing Tenure	N=96	N=117	N=158	N=53	N=424	N=116	N=162	N=67	N=345
Owens home	32%	43%	42%*	43%	40%*	46%	49%*	49%	48%*
Rents home	65%	52%*	52%*	47%	54%*	47%*	45%*	45%	46%*
Free housing or unknown	3%	5%	6%	9%	6%	7%	6%	6%	6%
Housing Type	N=94	N=111	N=153	N=52	N=406	N=111	N=154	N=64	N=329
Single-family home	47%	50%*	54%	65%*	52%*	55%*	53%	77%*	58%*
Apartment/condo with 5 or more units	37%	31%*	29%	17%	32%*	26%*	27%	17%	25%*
Duplex, triplex, fourplex	12%	5%*	10%	2%	8%	14%*	10%	5%	10%
Townhome	2%	4%	6%	4%	4%	3%	4%	2%	3%
Manufactured/mobile home	2%	10%*	2%	12%*	5%	3%	6%	0%	4%
Number of Rooms in Home	N=94	N=112	N=153	N=52	N=407	N=111	N=154	N=64	N=329
1 to 3 rooms	43%	30%	25%	19%	30%	32%	26%	20%	27%
4 to 5 rooms	27%	36%*	33%	23%	31%	25%*	33%	20%	28%
6 to 7 rooms	18%	21%	21%	29%	21%*	25%	25%	31%	26%*
8 or more rooms	13%	13%*	21%	29%	18%	18%*	17%	28%	19%
Average number of rooms	4.4	4.8	5.3	6.1	5.1	5.1	5.1	6.1	5.3

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

Surveyed current and past CARE participants' housing situations also differed by their eligibility status (Table 41). Compared to income-eligible current/past participants, the ineligible participants are more likely to own and less likely to rent their home and are more likely to live in single-family homes and in larger homes. Among current participants, those who are ineligible are more likely to live in a duplex/triplex/fourplex and are less likely to live in an apartment/condo, townhome, or manufactured/mobile home than those who are eligible.

Table 41. Surveyed Current and Past CARE Participants' Housing Characteristics, by Eligibility Status ^{a, b}

Housing Characteristics	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible	Ineligible	Eligible	Ineligible
Housing Tenure	N=351	N=54	N=146	N=104
Owens home	40%*^	52%^	48%*	53%
Rents home	58%*^	48%^	50%*	46%
Free housing or unknown	3%	0%	2%	1%
Housing Type	N=348	N=54	N=146	N=104
Single-family home	51%^	61%^	51%^	62%^
Apartment/condo with 5 or more units	31%*^	24%^	24%*	28%
Duplex, triplex, fourplex	7%*^	13%*^	16%*^	7%*^
Townhome	5%^	0%^	4%	1%
Manufactured/mobile home	6%^	0%^	5%	3%
Number of Rooms in Home	N=349	N=54	N=145	N=104
1 to 3 rooms	32%^	13%*^	34%^	23%*^
4 to 5 rooms	30%	33%*	33%^	18%*^
6 to 7 rooms	21%^	28%^	21%^	31%^
8 or more rooms	17%*^	26%^	11%*^	28%^
Average number of rooms	5.0^	5.9^	4.6^	5.9^

^a Eligibility status determined by participants' responses to survey questions about household size and income.

^b ^ = statistically significant difference at $p \leq .05$ between eligible and ineligible participants within current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

Overall, trends in the housing differences between current and past CARE participants are similar across the IOUs as those discussed above (Table 42). There are a few notable differences within the IOUs, as follows:

- Current SCG participants are more likely to own and less likely to rent their home than past participants, while trends are opposite within the other IOUs.
- Single-family homes are more common for PG&E customers and apartments/condos are more common for SCE customers compared to other IOUs.
- Differences in current and past participants house size is less pronounced for SDG&E customers than for other IOUs.

Table 42. Surveyed CARE and Past Current CARE Participants' Housing Characteristics, by IOU ^a

Housing Characteristics	Current CARE Participants ^b					Past CARE Participants ^b				
Housing Tenure	PG&E (109)	SCE (101)	SCG (92)	SDG&E (105)	Total (407)	PG&E (95)	SCE (102)	SCG (74)	SDG&E (74)	Total (345)
Owens home	41%*	37%*	48%*	36%*	40%*	59%*	46%*	39%*	46%*	48%*
Rents home	56%*	57%*	46%*	56%*	54%*	33%*	48%*	54%*	51%*	46%*
Free housing or unknown	3%*	6%	5%	8%*	5%	8%*	6%	7%	3%*	6%
Housing Type	PG&E (109)	SCE (101)	SCG (92)	SDG&E (105)	Total (407)	PG&E (90)	SCE (97)	SCG (70)	SDG&E (72)	Total (329)
Single-family home	60%*	51%	54%	46%*	53%*	73%*	51%	56%	51%*	58%*
Apartment/condo with 5 or more units	21%*	42%*	26%	31%*	30%*	11%*	34%*	30%	24%*	25%*
Duplex, triplex, fourplex	6%*	6%*	8%	13%	8%	11%*	11%*	9%	10%	10%
Townhome	5%*	1%	9%*	3%	4%	0%*	2%	4%*	7%	3%
Manufactured/mobile home	9%*	1%	2%	7%	5%	4%*	2%	1%	8%	4%
Number of Rooms in Home	PG&E (109)	SCE (101)	SCG (92)	SDG&E (105)	Total (407)	PG&E (90)	SCE (97)	SCG (70)	SDG&E (72)	Total (329)
1 to 3 rooms	26%*	28%	35%*	31%	30%	18%*	28%	29%*	35%	27%
4 to 5 rooms	28%	40%*	28%*	28%*	31%	24%	30%*	34%*	22%*	28%
6 to 7 rooms	28%*	18%*	18%	21%	21%*	33%*	26%*	20%	24%	26%*
8 or more rooms	18%*	15%	19%	20%	18%	24%*	17%	17%	19%	19%
Average number of rooms	5.3*	4.8	4.8	5.3	5.1	5.9*	5.2	4.9	5.1	5.3

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N).

^b Sample size large enough for 90/10 confidence/precision.

C.2.2 Factors of Current and Past CARE Participant Eligibility, High-Usage, and Removal

The surveyed current and past CARE participants are quite different in many respects and the regression analyses below identify which of these differences are significant factors that increase or decrease the odds that a current or past participant will be CARE-ineligible, will be a high-user, and will be removal from the CARE program at the different key processes.

Factors of Current and Past CARE Participant Eligibility

To identify the factors that significantly increase the odds that a current or past participant will be CARE-ineligible, we used bivariate logistic regression models to test the relationship between the dependent variable – a dichotomous measure of CARE income-eligibility, where 0 means “eligible” and 1 means “ineligible” – and the independent variables. The latter are all the key characteristics we reported on in Section C.2.1. We analyzed the factors of CARE eligibility for current and past CARE participants and for each CARE process status, except for current participant high-users, the samples sizes of which are too small for conclusive results.

As shown in Table 43, there are many factors that increase the odds that a current participant is income-ineligible for CARE. A few of these factors are common across all the processes status. For example, *current participants who live in homes with a higher percentage of the area serviced by their heating equipment, and who have lower energy burdens, lower modified energy burdens, and/or higher annual incomes are more likely to be ineligible for CARE.*

In addition to these factors, some significant factors vary by the current participants' process status, as follows:

- *All current participants* are more likely to be ineligible if they are recently enrolled, live in homes with a higher percentage of the area is serviced by cooling equipment, have employed household members, receive earned income and do not receive public assistance, have a higher education, own their home and live in larger homes.
- *Enrolled current participants* are more likely to be ineligible if they receive earned income, live in larger homes, have fewer household members, do not have children in the home, and speak only English in the home.
- *Recertified current participants* are more likely to be ineligible if they live in homes with a higher percentage of the area is serviced by cooling equipment, have a higher education, and/or own their home.
- *Income verified current participants* are more likely to be ineligible if they receive earned income and do not receive public assistance, have a higher education, own their home, live in a larger home, have a foreign-born household member(s), are married or in domestic partnership, and live in a single-family home.

Table 43. Factors of Current CARE Participants' Eligibility Status ^a

Statistically Significant Factors ^b	Current CARE Participants ^c			
	All (N=405)	Enrolled (N=92)	Recertified (N=113)	Income Verified (N=152)
Enrolled (vs. recertified or verified)	↑ Ineligibility	N/A	N/A	N/A
Higher percentage of home heated with heating equipment	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility
Higher percentage of home cooled with cooling equipment	↑ Ineligibility		↑ Ineligibility	
Lower energy burden	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility
Lower modified energy burden	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility
Higher annual household income	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility	↑ Ineligibility
Has employed household member(s)	↑ Ineligibility			
Receives earned income	↑ Ineligibility	↑ Ineligibility		↑ Ineligibility
Does not receive public assistance	↑ Ineligibility			↑ Ineligibility
Higher education	↑ Ineligibility		↑ Ineligibility	↑ Ineligibility
Owns home (vs. rents home)	↑ Ineligibility		↑ Ineligibility	↑ Ineligibility
Home has more rooms, larger in size	↑ Ineligibility	↑ Ineligibility		↑ Ineligibility
Has fewer household members		↑ Ineligibility		
Does not have child(ren) in household		↑ Ineligibility		

Statistically Significant Factors ^b	Current CARE Participants ^c			
	All (N=405)	Enrolled (N=92)	Recertified (N=113)	Income Verified (N=152)
Speaks only English in home		↑ Ineligibility		
Has foreign-born household member(s)				↑ Ineligibility
Married/domestic partnership (vs. single)				↑ Ineligibility
Lives in single-family home (vs. other housing types)				↑ Ineligibility

^a Upward arrows = odds of being ineligible for CARE increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

^c High-user verification is excluded from analyses due to small sample sizes.

Similar to the current participants, many of the same factors significantly increase the odds that a past participant is income-ineligible for CARE (Table 44). Across all the CARE process statuses, a few factors significantly increase the odds of being ineligible. For example, *past participants with lower energy burdens, lower modified energy burdens, and higher incomes are more likely to be ineligible regardless of their process status.*

Additionally, several significant factors vary by past participants' process status, as follows:

- *All past participants* are more likely to be ineligible if they were removed at recertification (vs. other process), live in warmer climate zones and not in the Central Valley region, live in homes with a higher percentage of the area serviced by cooling equipment, have not participated in ESA, have lower general economic hardship, have employed household members, receive earned income and not public assistance, have higher education, have lower health hardship and no disabled household members, live in larger homes, speak only English in the home and do not have foreign-born household members, are married or in a domestic partnership, and/or live in a duplex/triplex/fourplex.
- *Past participants removed at recertification* are more likely to be ineligible if they have employed household members, receive earned income, have a higher education, live in larger homes, have fewer household members, speak only English in the home and do not have foreign-born household members, and/or are white.
- *Past participants removed at income verification* are more likely to be ineligible if they have not participated in EA, live in homes with a higher percentage of the area serviced by heating and cooling equipment, have employed household members, receive earned income, have a higher education, have lower health hardship and no disabled household members, live in a larger home, do not have foreign-born household members, and/or live in an apartment/condo.
- *Past participants removed at high-user verification* are more likely to be income-ineligible if they have higher annual energy costs and/or are married or in a domestic partnership.

Table 44. Factors of Past CARE Participants' Eligibility Status ^a

Statistically Significant Factors ^b	Past CARE Participants			
	All (N=327)	Removed after Recertification Request (N=110)	Removed after Income Verification Request (N=153)	Removed after High-User Verification Request (N=64)
Removed after verification request (vs. other process status)	↑ Eligibility	N/A	N/A	N/A
Lives in cooler climate zones (vs. warmer zones)				↑ Eligibility
Lives in Central Valley region (vs. other regions)	↑ Eligibility			
Participated in ESA	↑ Eligibility		↑ Eligibility	
Lower percentage of home cooled with cooling equipment	↑ Eligibility	↑ Eligibility	↑ Eligibility	↑ Eligibility
Higher energy burden	↑ Eligibility	↑ Eligibility	↑ Eligibility	↑ Eligibility
Higher modified energy burden	↑ Eligibility	↑ Eligibility	↑ Eligibility	↑ Eligibility
Higher economic hardship	↑ Eligibility			
Lower annual household income	↑ Eligibility	↑ Eligibility	↑ Eligibility	↑ Eligibility
Does not have employed household member(s)	↑ Eligibility	↑ Eligibility	↑ Eligibility	
Does not receive earned income	↑ Eligibility		↑ Eligibility	
Receive public assistance	↑ Eligibility			
Lower education	↑ Eligibility	↑ Eligibility	↑ Eligibility	↑ Eligibility
Higher health hardship	↑ Eligibility		↑ Eligibility	
Has disabled household member(s)	↑ Eligibility		↑ Eligibility	↑ Eligibility
Has household member(s) with medical condition requiring special equipment, heating/cooling, and/or higher air quality			↑ Eligibility	
Home has fewer rooms, smaller in size	↑ Eligibility	↑ Eligibility	↑ Eligibility	↑ Eligibility
Has more household members	↑ Eligibility	↑ Eligibility		
Speaks non-English language in home	↑ Eligibility	↑ Eligibility		
Has foreign-born household member(s)	↑ Eligibility		↑ Eligibility	
Non-white respondent		↑ Eligibility		
Single (vs. married/domestic partnership)	↑ Eligibility	↑ Eligibility		↑ Eligibility
Does not live in single-family home (vs. other housing types)	↑ Eligibility	↑ Eligibility		
Lives in duplex/triplex/fourplex (vs. other housing types)	↑ Eligibility	↑ Eligibility	↑ Eligibility	

^a Upward arrows = odds of being eligible for CARE increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

Factors of Participant High-Usage

We also identified the factors that significantly increase the odds that a current or past CARE participant will be a high-user whose monthly usage is above 400% or 600% of their baseline allowance. We used logistic bivariate regression models to test the relationship between the dependent variable – a dichotomous measure of whether a participant is/was a high-user, where 0 means “non-high-user” and 1 means “high-user” – and the independent variables. The latter are all the key characteristics we reported on in Section C.2.1. We analyzed the factors of being a high-user for current and past CARE participants combined since results from separate analyses did not vary significantly.

There are many factors that increase the odds that a current or past participant will be a high-user (vs. a non-high-user) (Table 45). Participants are more likely to be a high-user if they are not an SCG customer; live in areas with higher electricity service reliability; have higher annual energy costs, energy and modified energy burdens and general economic and health hardship but also have higher annual incomes; have a household member(s) with medical condition(s) requiring more energy or higher air quality; have lower education; live in larger homes; have children in the household; speak only English in the home; are married or in a domestic partnership; and/or live in a single-family home and not in an apartment/condo.

Table 45. Factors of Surveyed CARE Participant High-Usage ^a

Statistically Significant Factors ^b	Current and Past CARE Participants
	N=769
PG&E, SCE, SDG&E customer (vs. SCG customer)	↑ High-Usage
Higher electric service reliability (lower SAIDI/SAIFI)	↑ High-Usage
Higher annual energy costs	↑ High-Usage
Higher energy burden	↑ High-Usage
Higher modified energy burden	↑ High-Usage
Higher economic hardship	↑ High-Usage
Higher annual household income	↑ High-Usage
Lower education	↑ High-Usage
Higher health hardship	↑ High-Usage
Has household member(s) with medical condition requiring special equipment, heating/cooling, and/or higher air quality	↑ High-Usage
Home has more rooms, larger in size	↑ High-Usage
Has more household members	↑ High-Usage
Has child(ren) in household	↑ High-Usage
Does not speak non-English language in home	↑ High-Usage
Married/domestic partnership (vs. single)	↑ High-Usage
Lives in single-family home (vs. other housing types)	↑ High-Usage
Does not live in duplex/triplex/fourplex (vs. other housing types)	↑ High-Usage
Does not live in apartment/condo with five or more units (vs. other housing types)	↑ High-Usage

^a Upward arrows = odds of being a high-user increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

We also analyzed the CARE enrollment data we received from the IOUs to determine whether any of the included fields are predictive of whether a participant will become a high-user who will be retained or removed. The fields included participants' enrollment channel, annual income reported in the CARE application, categorical participation, climate zone, ESA participation, and preferred language. We also did not find any consistent statistical relationships between nearly all the CARE enrollment data fields we received and the high-users who were retained and removed. It seems unlikely that the CARE enrollment data fields available to us – except climate zone and ESA participation – would be strong predictors of whether a participant becomes a high-user who does or does not successfully complete the high-user verification process. We did find that current and past participants who live in warmer climate zones are significantly more likely to become high-users than those who live in other climate zones and that previous ESA participants are significantly less likely to be high users than nonparticipants, but the climate zone, ESA participation, or any other CARE enrollment field do not predict whether the high-user will be retained or removed.³⁰

Factors of Participant Success in or Removal from CARE

Lastly, we identified the factors that significantly increase the odds that a participant will be removed at each of the key CARE processes (Table 46). We used logistic bivariate regression models to test the relationship between the dependent variable – a dichotomous measure of whether a participant is still a current participant or a removed past participant, where 0 means “current” and 1 means “past” – and the independent variables. The latter are all the key characteristics we reported on in Section C.2.1. We analyzed the factors of being removed from CARE for all current vs. past participants and within each of the key processes.

Several factors significantly increase the odds of CARE removal and vary by the PE process at which the participant was removed, as follows:

- Participants are more likely to be removed at recertification if they did not participate in ESA, have higher annual energy costs but lower energy and modified energy burdens and general economic hardship, have higher annual incomes, receive earned income and not fixed income or public assistance, have employed and not retired household members, have higher education, do not have disabled household members or children in the household, and/or do not live in manufactured/mobile homes.
- Participants are more likely to be removed at income verification if they did not participate in ESA, live in areas with higher electric service reliability, have lower general economic hardship and higher annual incomes, do not received fixed-income, and/or do not have disabled household members.
- Participants are more likely to be removed at high-user verification if they do not have gas service, have lower energy burdens and general economic hardship, have higher annual incomes, have employed and not retired or disabled household members, do not receive fixed-income, and/or live in a single-family home.

³⁰ High-users who participated in ESA after becoming a high-user were excluded since ESA participation is a requirement of high-usage participants to remain in CARE.

Table 46. Factors of Success in and Removal from CARE by Process Status ^a

Statistically Significant Factors ^b	Current vs. Past CARE Participants		
	Successfully Recertified vs. Removed after Recertification Request (N=233)	Successfully Income Verified vs. Removed after Income Verification Request (N=320)	Successfully High-User Verified vs. Removed after High-User Verification Request (N=120)
Participated in ESA	↓ Removal	↓ Removal	N/A
Lives in areas with lower electric service reliability		↓ Removal	
Has electric and natural gas service (vs. electric only or electric+alt-fuels)			↓ Removal
Lower annual energy costs	↓ Removal		
Higher energy burden	↓ Removal		
Higher modified energy burden	↓ Removal		
Higher economic hardship	↓ Removal	↓ Removal	↓ Removal
Lower annual household income	↓ Removal	↓ Removal	↓ Removal
Does not have employed household member(s)	↓ Removal		↓ Removal
Has retired household member(s)	↓ Removal		↓ Removal
Does not receive earned income	↓ Removal		
Receives fixed income	↓ Removal	↓ Removal	↓ Removal
Receives public assistance	↓ Removal		
Lower education	↓ Removal		
Has disabled household member(s)	↓ Removal	↓ Removal	↓ Removal
Has child(ren) in household	↓ Removal		
Lives in manufactured/mobile home (vs. other housing types)	↓ Removal		
Does not live in single-family home (vs. other housing types)			↓ Removal

^a Downward arrows = odds of being removed from CARE decreased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

C.2.3 Current and Past CARE Participants' Program Difficulties and Impacts

Next, we compared surveyed current and past CARE participants' reported difficulties with the CARE program and the economic impacts they experienced while participating in CARE. We analyzed the reported results by current and past participants' process status, eligibility status, and IOU.

Difficulty of CARE Processes

First, we asked surveyed current and past participants to rate the difficulty of several key CARE processes. Surveyed respondents could use an 11-point scale where 0 means "not at all difficult" and 10 means "extremely difficult."

Overall, both surveyed current and past participants reported low levels of difficulty, on average, for completing the CARE processes they experienced (Table 47). Current and past participants reported slightly greater difficulty with the high-user CARE processes, particularly reducing their usage, and with gathering required information than with the other CARE processes like understanding what is required and completing and submitting the application.

Current participants reported slightly but significantly lower difficulty, on average, with understanding what info was required and gathering the required info than past participants. In addition, current participants who recertified reported slightly less difficulty completing and submitting the application than corresponding past participants. Trends among high-users indicate that current participants who were high-user verified reported slightly less difficulty with the high-user processes than corresponding past participants, but sample sizes are too small for conclusive results.

Table 47. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by CARE Process Status ^{a, b}

CARE Process	Current CARE Participants ^c					Past CARE Participants ^c			
	Enrolled Mean (N)	Recertified Mean (N)	Income Verified Mean (N)	High-User Verified Mean (N)	Total Mean (N)	Removed After Recertification Request Mean (N)	Removed After Income Verification Request Mean (N)	Removed After High-User Verification Request Mean (N)	Total Mean (N)
Understanding what information was needed from you	1.2 (95)	0.9* (116)	1.2* (156)	1.4* (53)	1.2* (420)	2.2* (109)	2.7* (149)	2.5* (62)	2.5* (320)
Gathering the required information	1.3 (94)	1.2* (115)	1.6* (155)	1.9* (53)	1.5* (417)	2.6* (108)	3.4* (144)	3.8* (65)	3.2* (317)
Completing the application (after you understood and gathered the required information)	1.1 (93)	0.7* (115)	1.3 (154)	1.2 (52)	1.1* (414)	2.2* (109)	2.2 (141)	2.3 (64)	2.2* (314)
Submitting the application to [IOU]	1.1 (93)	0.7* (116)	1.4 (155)	1.4 (45)	1.1* (417)	2.1* (107)	2.3 (141)	2.1 (64)	2.2* (312)

CARE Process	Current CARE Participants ^c					Past CARE Participants ^c			
	Enrolled Mean (N)	Recertified Mean (N)	Income Verified Mean (N)	High-User Verified Mean (N)	Total Mean (N)	Removed After Recertification Request Mean (N)	Removed After Income Verification Request Mean (N)	Removed After High-User Verification Request Mean (N)	Total Mean (N)
Going through the assessment to identify free energy-saving appliances and equipment ^d	N/A	N/A	N/A	2.2 (45)	N/A	N/A	N/A	3.1 (60)	N/A
Understanding recommendations on how to reduce our energy usage ^d	N/A	N/A	N/A	2.0 (49)	N/A	N/A	N/A	2.3 (64)	N/A
Getting the free appliances and equipment installed ^d	N/A	N/A	N/A	2.8 (29)	N/A	N/A	N/A	3.5 (47)	N/A
Reducing your household's monthly energy usage ^d	N/A	N/A	N/A	3.5 (50)	N/A	N/A	N/A	4.4 (62)	N/A

^a Difficulty was measured on an 11=point scale where 0 means not at all difficult and 10 means extremely difficult.

^b * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Asked only to high-user current and past participants.

Past CARE eligible participants reported slightly but significantly greater difficulty, on average, with nearly all the CARE processes than ineligible current participants (Table 48). In contrast, current eligible and ineligible participants reported similar levels of difficulty, on average.

Table 48. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by CARE Eligibility Status ^{a, b}

CARE Process	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible Mean (N)	Ineligible Mean (N) ^e	Eligible Mean (N)	Ineligible Mean (N)
Understanding what information was needed from you	1.2 (347)	1.1 (54)	3.1 [^] (135)	1.5 [^] (102)
Gathering the required information	1.5 (344)	1.5 (54)	3.8 [^] (134)	2.0 [^] (101)
Completing the application (after you understood and gathered the required information)	1.1 (341)	1.1 (54)	2.8 [^] (132)	1.4 [^] (101)
Submitting the application to [IOU]	1.1 (344)	1.3 (54)	3.0 [^] (131)	1.1 [^] (100)

CARE Process	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible Mean (N)	Ineligible Mean (N) ^e	Eligible Mean (N)	Ineligible Mean (N)
Going through the assessment to identify free energy-saving appliances and equipment ^d	2.3 (38)	N/A	3.7 (25)	3.1 (20)
Understanding recommendations on how to reduce our energy usage ^d	2.0 (42)	N/A	2.3 (27)	2.3 (22)
Getting the free appliances and equipment installed ^d	2.6 (25)	N/A	4.4 (20)	3.3 (13)
Reducing your household's monthly energy usage ^d	3.7 (43)	N/A	4.6 [^] (26)	5.5 [^] (22)

^a Difficulty was measured on an 11=point scale where 0 means not at all difficult and 10 means extremely difficult.

^b [^] = statistically significant difference at $p \leq .05$ between eligible and ineligible participants within the current and past participants; two-tailed t-tests used to compare averages; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Asked only to high-user current and past participants.

^e There are only three current CARE ineligible high-user participants; results not reported.

Trends in surveyed current and past CARE participants' reported difficulty of CARE processes did not vary substantially between the IOUs, except in one regard. SDG&E current participants reported slightly less difficulty, on average, with understanding and gathering required info and completing and submitting the application compared to other IOUs' current participants (Table 49).

Table 49. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by IOU ^{a, b}

CARE Process	Current CARE Participants ^c					Past CARE Participants ^c				
	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)
Understanding what information was needed from you	1.4 (109)	1.2* (106)	1.3* (94)	0.8* (111)	1.2* (420)	2.3 (86)	2.4* (97)	2.8* (67)	2.5* (70)	2.5* (320)
Gathering the required information	1.5* (106)	1.5* (107)	1.7* (93)	1.1* (111)	1.5* (417)	3.1* (86)	3.0* (93)	3.2* (69)	3.6* (69)	3.2* (317)
Completing the application (after you understood and gathered the required information)	1.0* (105)	1.3 (107)	1.1* (92)	0.9* (110)	1.1* (414)	2.0* (87)	2.2 (91)	2.7* (67)	2.1* (69)	2.2* (314)
Submitting the application to [IOU]	1.1 (107)	1.4 (107)	1.2* (92)	0.9* (111)	1.1* (417)	2.0 (86)	2.2 (93)	2.2* (67)	2.3* (68)	2.2* (312)
Going through the assessment to identify free energy-saving appliances and equipment ^d	2.5 (15)	2.3 (11)	N/A ^e	1.7 (14)	2.2 (45)	2.9 (17)	2.0 (18)	4.5 (10)	3.5 (15)	3.1 (60)

CARE Process	Current CARE Participants ^c					Past CARE Participants ^c				
	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)
Understanding recommendations on how to reduce our energy usage ^d	2.8 (15)	1.8 (11)	N/A ^e	1.4 (16)	2.0 (49)	1.7 (19)	1.7 (19)	3.8 (10)	2.6 (16)	2.3 (64)
Getting the free appliances and equipment installed ^d	2.6 (10)	N/A ^e	N/A ^e	3.8 (11)	2.8 (29)	3.5 (13)	2.3 (15)	N/A ^e	5.0 (10)	3.5 (47)
Reducing your household's monthly energy usage ^d	3.4 (16)	3.8 (11)	N/A ^e	4.2 (16)	3.5 (50)	3.4 (17)	2.6 (19)	5.1 (10)	7.1 (16)	4.4 (62)

^a Difficulty was measured on an 11=point scale where 0 means not at all difficult and 10 means extremely difficult.

^b * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages; N = number who answered survey question.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Asked only to high-user current and past participants.

^e Results not reported since sample size is smaller than 10.

We used ordinary least square regression models to identify the factors that significantly impact surveyed current and past CARE participants' perceived difficulty of CARE processes (Table 50). We focus only on the processes that most current/past CARE participants experienced: understanding what info is required, gathering the required info, and completing and submitting the application. For the dependent variable, we computed the average difficulty rating across the four CARE processes of interest; for the independent variables, we used the characteristics discussed in Section C.1.2.

The significant factors impacting current/past participants' perceived difficulty of CARE processes are slightly different for current vs. past participants. Current participants' perceived difficulty is significantly greater for PG&E, SCE, and SCG customers (vs. SDG&E customers); those who enrolled, income verified, or high-user verified (vs. recertified); those with higher economic and health hardship; and/or those with a foreign-born household member(s).

Past participants' perceived difficulty of CARE processes is significantly greater for those who are CARE-eligible; those with higher energy and modified energy burdens and general economic and health hardship; those with a household member with a medical condition requiring more energy or higher air quality; and/or, those with a foreign-born household member(s).

Table 50. Factors of Surveyed Current and Past CARE Participants' Average Difficulty Rating for CARE Processes Involving Understanding, Gathering, and Submitting Information ^a

Statistically Significant Factors ^b	Current CARE Participants	Past CARE Participants
	N=392	N=303
Enrolled, income verified or high-user verified (vs. recertified)	↑ Difficulty	
CARE-Eligible		↑ Difficulty
Higher energy burden		↑ Difficulty
Higher modified energy burden		↑ Difficulty

Statistically Significant Factors ^b	Current CARE Participants	Past CARE Participants
	N=392	N=303
Higher economic hardship	↑ Difficulty	↑ Difficulty
Lower annual household income		↑ Difficulty
Does not have employed household member(s)		↑ Difficulty
Higher health hardship	↑ Difficulty	↑ Difficulty
Has household member(s) with medical condition requiring special equipment, heating/cooling, and/or higher air quality		↑ Difficulty
Has foreign-born household member(s)	↑ Difficulty	↑ Difficulty

^a Upward arrows = current/past CARE participants' level of difficulty they experienced with CARE processes increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

We also asked surveyed current and past CARE participants what difficulties they experienced with CARE in an open-end question format (Table 51). Most current/past participants reported that they did not experience any difficulties (that were important enough to note in the survey). However, some current participants and several past participants did report experiencing noteworthy difficulties, as follows:

- Several current income verified participants and past participants removed at income or high-user verification reported difficulty gathering and submitting the correct info.
- About one-third of current and past high-user participants reported difficulty with reducing their usage.
- A few past participants removed at recertification reported difficulty with not receiving the renewal notice from their IOU.
- A few current and past participants at income verification reported having to submit their info to their IOU multiple times.
- A few current and past non-high-user participants reported that the process was too time-consuming, that there was a language barrier, or they had trouble contacting their IOU about the CARE process.
- Very few current participants reported trouble getting proof of their medical condition or completing the application.
- Very few past participants reported issues with using the website to submit their info, understanding what is required of them to complete the CARE process, meeting the submission deadlines, or privacy concerns.

Table 51. Difficulties with CARE Reported by Surveyed Current and Past CARE Participants, by CARE Process Status ^a

CARE Difficulties ^b	Current CARE Participants ^c					Past CARE Participants ^c			
	Enroll % (N=86)	Recert-ified % (N=117)	Income Verified % (N=158)	High-User Verified % (N=53)	Total % (N=424)	Removed After Recert-ification Request % (N=116)	Removed After Income Verification Request % (N=162)	Removed After High-User Verification Request % (N=67)	Total % (N=345)
None	86%	85%*	72%*	62%*	78%*	72%*	58%*	49%*	60%*
Gathering and submitting correct income info	5%	7%	15%	4%*	9%	6%	18%	12%*	13%
Reducing usage	0%	0%	0%	32%	4%	0%	0%	32%	6%
Didn't receive notification from IOU	0%	0%*	0%	0%	0%*	9%*	4%	2%	5%*
Had to submit info multiple times	2%	1%	7%*	0%	3%	1%	3%*	2%	2%
Time consuming process	2%	2%	2%	0%	2%	3%	3%	2%	2%
Issues with website	1%	1%	2%	0%	1%	3%	4%	0%	3%
Language barrier	0%	1%	1%	0%	1%	2%	2%	0%	2%
Contacting IOU	2%	2%	0%	0%	1%	1%	1%	0%	1%
Understanding requirements/process	0%	0%	0%	0%	0%	2%	3%	0%	2%
Meeting submission deadlines	0%	0%	0%	0%	0%	2%	3%	2%	2%
Privacy concerns	0%	0%	0%	0%	0%	0%	3%	2%	2%
Getting proof of medical condition	1%	2%	1%	0%	1%	0%	0%	0%	0%
Completing application/paperwork	0%	1%	1%	2%	1%	0%	0%	0%	0%

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Difficulties were reported by surveyed participants in an open-ended question; participants could report more than one difficulty; results were coded into categories.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

Experiences of CARE Economic Impacts

Next, we asked surveyed current and past CARE participants the extent to which they agreed with statements about the positive impacts CARE could potentially have on their economic situation. Surveyed respondents could use an 11-point scale where 0 means “do not agree at all” and 10 means “completely agree”.

Overall, both current and past participants mostly agreed, on average, that participating in CARE resulted in positive impacts on their economic situations (Table 52). The highest levels of agreement are in regard to statements about whether enrolling/recertifying/verifying for CARE was worth the effort. Current and past participants also reported slightly higher agreement, on average, that CARE helped improve their overall financial situation, followed by CARE helping to reduce the amount they worry about affording energy bills, helping them afford other basic needs, and helping them pay energy bills on time. The lowest levels of agreement were reported for CARE helping them stay out of (deeper) debt.

Most current and past participants reported similar levels of agreement about CARE’s economic impacts, except for the current and past high-users. Past high-user participants reported the highest levels of agreement that CARE helped their household whereas current high-user participants reported the lowest levels of agreement among all the current and past participants.

Table 52. Surveyed Current and Past CARE Participants’ Average Assessments of CARE’s Economic Impacts, by CARE Process Status ^a

CARE Impact ^b	Current CARE Participants ^c					Past CARE Participants ^c			
	Enroll Mean (N)	Recertified Mean (N)	Income Verified Mean (N)	High-User Verified Mean (N)	Total Mean (N)	Removed After Recertification Request Mean (N)	Removed After Income Verification Request Mean (N)	Removed After High-User Verification Request Mean (N)	Total Mean (N)
Helped improve your household’s overall financial situation	8.3 (95)	8.2 (116)	8.7 (158)	7.7* (53)	8.3 (422)	8.3 (116)	8.4 (158)	8.7* (67)	8.4 (341)
Reduced the amount you worry about being able to pay your energy bills	7.9 (92)	8.2 (117)	8.3 (158)	7.0* (53)	8.0 (420)	8.4 (115)	8.3 (159)	8.4* (66)	8.3 (340)
Helped you afford other basic needs	8.1 (92)	8.2 (116)	8.2 (156)	7.1* (52)	8.1 (416)	8.1 (115)	8.0 (159)	8.3* (66)	8.1 (340)
Helped you pay your household’s energy bills on time	7.9 (94)	8.0 (117)	8.2 (157)	7.1 (53)	7.9 (420)	8.1 (114)	8.0 (158)	8.0 (67)	8.0 (339)
Helped your household stay out of debt or out of deeper debt	7.8 (94)	7.9 (117)	7.8 (158)	6.6* (53)	7.7 (422)	7.9 (115)	7.6 (157)	8.2* (66)	7.8 (338)
Has been worth the effort to enroll ^d	9.2 (93)	N/A	N/A	N/A	9.2 (93)	N/A	N/A	N/A	N/A
Has been/Seemed worth the effort to renew your enrollment to continue receiving the CARE discount ^e	N/A	9.1 (116)	9.2* (157)	N/A	9.2* (273)	8.4 (115)	8.3* (157)	N/A	8.3* (271)

CARE Impact ^b	Current CARE Participants ^c					Past CARE Participants ^c			
	Enroll Mean (N)	Recertified Mean (N)	Income Verified Mean (N)	High-User Verified Mean (N)	Total Mean (N)	Removed After Recertification Request Mean (N)	Removed After Income Verification Request Mean (N)	Removed After High-User Verification Request Mean (N)	Total Mean (N)
Has been/Seemed worth the effort to go through the process of reducing your energy use to continue receiving the CARE discount ^f	N/A	N/A	N/A	8.2 (52)	8.2 (52)	N/A	N/A	8.6 (66)	8.6 (66)

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed t-tests used to compare averages; N = number who answered survey question.

^b Agreement with statements was measured on an 11=point scale where 0 means do not agree at all and 10 means completely agree.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Asked only to current CARE enrollees.

^e Asked only to recertification and income verification current and past participants.

^f Asked only to high-user current and past participants.

Surveyed current CARE participants' perceptions of CARE's economic impacts did not vary substantially by their eligibility status (Table 53). Trends indicate that past eligible participants agreed slightly more than past ineligible participants that CARE helped their economic situation and was worth the effort.

Table 53. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by CARE Eligibility Status ^a

CARE Impact ^b	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible Mean (N)	Ineligible Mean (N)	Eligible Mean (N)	Ineligible Mean (N)
Helped improve your household's overall financial situation	8.3 (349)	8.8 (54)	8.6 (144)	8.2 (104)
Helped you afford other basic needs	8.1 (343)	8.1 (54)	8.4 [^] (143)	7.7 [^] (133)
Reduced the amount you worry about being able to pay your energy bills	8.0 (347)	8.1 (54)	8.5 (143)	8.3 (104)
Helped you pay your household's energy bills on time	7.9 (348)	7.9 (54)	8.3 (144)	7.9 (104)
Helped your household stay out of debt or out of deeper debt	7.7 (349)	7.5 (54)	8.2 (143)	7.4 (103)
Has been worth the effort to enroll ^d	9.1 (72)	9.5 (17)	N/A	N/A
Has been/Seemed worth the effort to renew your enrollment to continue receiving the CARE discount ^e	9.2 (229)	9.0 (34)	8.7 (116)	8.2 (81)

CARE Impact ^b	Current CARE Participants ^c		Past CARE Participants ^c	
	Eligible Mean (N)	Ineligible Mean (N)	Eligible Mean (N)	Ineligible Mean (N)
Has been/Seemed worth the effort to go through the process of reducing your energy use to continue receiving the CARE discount ^f	8.3 (44)	N/A ^g	9.0 (26)	8.1 (22)

^a ^ = statistically significant difference at $p \leq .05$ between eligible and ineligible within the current and past participants; two-tailed t-tests used to compare averages; N = number who answered survey question.

^b Agreement with statements was measured on an 11=point scale where 0 means do not agree at all and 10 means completely agree.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Asked only to current CARE enrollees.

^e Asked only to recertification and income verification current and past participants.

^f Asked only to high-user current and past participants.

^g There are only three current CARE ineligible high-user participants; results not reported.

Surveyed past CARE participants' perceptions of CARE's impacts on their economic situation did not vary substantially between the IOUs (Table 54). Trends indicate that current SCG participants agreed slightly more than PG&E, SCE, and SDG&E participants that CARE helped their economic situation, but differences are not statistically significant.

Table 54. Surveyed Current and Past CARE Participants' Assessment of CARE's Economic Impacts, by IOU ^a

CARE Impact ^b	Current CARE Participants ^c					Past CARE Participants ^c				
	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)
Helped improve your household's overall financial situation	8.3 (109)	8.1 (107)	8.6 (95)	8.5 (111)	8.3 (422)	8.3 (94)	8.5 (101)	8.0 (73)	8.6 (73)	8.4 (341)
Helped you afford other basic needs	7.8 (107)	8.1 (106)	8.5 (93)	7.9 (110)	8.1 (416)	7.7 (93)	8.2 (101)	8.2 (72)	8.3 (74)	8.1 (340)
Reduced the amount you worry about being able to pay your energy bills	7.8 (109)	8.0 (107)	8.6 (93)	7.7 (111)	8.0 (420)	8.3 (94)	8.3 (102)	8.5 (73)	8.3 (71)	8.3 (340)
Helped you pay your household's energy bills on time	7.8 (109)	7.6 (107)	8.4 (94)	8.1 (111)	7.9 (420)	8.0 (92)	8.0 (102)	8.0 (73)	8.2 (72)	8.0 (339)
Helped your household stay out of debt or out of deeper debt	7.2 (109)	7.7 (107)	8.2 (94)	7.6 (112)	7.7 (422)	7.5 (92)	7.9 (101)	7.8 (73)	8.1 (72)	7.8 (338)
Has been worth the effort to enroll ^d	9.1 (26)	8.8 (22)	9.7 (23)	9.4 (22)	9.2 (93)	N/A	N/A	N/A	N/A	N/A
Has been/Seemed worth the effort to renew your enrollment to continue receiving the CARE discount ^e	9.2* (66)	9.0 (73)	9.2 (64)	9.3 (70)	9.2* (273)	8.0 (73)	8.4 (79)	8.3 (63)	8.7 (74)	8.3 (271)

CARE Impact ^b	Current CARE Participants ^c					Past CARE Participants ^c				
	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)	PG&E Mean (N)	SCE Mean (N)	SCG Mean (N)	SDG&E Mean (N)	Total Mean (N)
Has been/Seemed worth the effort to go through the process of reducing your energy use to continue receiving the CARE discount ^f	7.9 (16)	7.6 (11)	8.7 (7)	8.4 (18)	8.2 (52)	8.3 (18)	9.2 (21)	7.9 (10)	8.4 (17)	8.5 (66)

^a * = statistically significant difference at $p \leq .05$ between corresponding current and past participants (current enrolled does not have comparison group); two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Agreement with statements was measured on an 11=point scale where 0 means do not agree at all and 10 means completely agree.

^c Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^d Asked only to current CARE enrollees.

^e Asked only to recertification and income verification current and past participants.

^f Asked only to high-user current and past participants.

We used ordinary least square regression models to identify the factors that significantly influence surveyed current and past CARE participants' perceptions of CARE's positive economic impacts. We focus only on the five statements about how CARE helped their situation: helped their overall financial situation, helped them afford energy bills, helped them worry less about affording energy bills, helped them pay energy bills on time, and helped them afford other basic needs. For the dependent variable, we computed the average agreement rating across the five economic statements of interest; for the independent variables, we used the characteristics discussed in Section C.1.2.

The significant factors impacting current/past participants' perceptions of CARE's economic impacts are different for current vs. past participants (Table 55). Current participants perceived significantly greater impacts if they are SCG customers (vs. PG&E, SCE, and SDG&E customers); are enrolled, recertified, or income verified (vs. high-user verified); live in cooler climate zones; live in homes with a smaller area heated or cooled; have lower health hardship; and/or do not have household members with a medical condition(s) requiring higher usage or air quality. Past participants perceived significantly greater impacts from CARE if they have lower annual energy costs, are income-eligible for CARE, have higher general economic hardship and lower annual incomes, and/or live in a duplex/triplex/fourplex.

Table 55. Factors of CARE's Economic Impacts, by Participant Status ^a

Statistically Significant Factors ^b	Current CARE Participants (N=412)	Past CARE Participants (N=333)
SCG customer (vs. other IOUs)	↑ Impacts	
Does not live in Central Valley (vs. other regions)	↑ Impacts	
Enroll, recertification, and income verification participants (vs. high-user verification participant)	↑ Impacts	
Lives in cooler climate zones (vs. warmer zones)	↑ Impacts	
Lower percentage of home heated by heating equipment	↑ Impacts	
Lower percentage of home cooled by cooling equipment	↑ Impacts	

Statistically Significant Factors ^b	Current CARE Participants (N=412)	Past CARE Participants (N=333)
Lower health hardship	↑ Impacts	
No household members have medical condition requiring special equipment, heating/cooling, or higher air quality	↑ Impacts	
Lower annual energy costs		↑ Impacts
Eligible for CARE (vs. ineligible)		↑ Impacts
Higher economic hardship		↑ Impacts
Lower income		↑ Impacts
Lives in duplex/triplex/fourplex (vs. other housing types)		↑ Impacts

^a Upward arrows = current/past CARE participants' level of agreement that CARE had positive economic impacts increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

C.3 Past CARE Participant Post-Enrollment Process Characteristics

For the final analyses involving CARE processes, we analyzed surveyed past participants' reasons for removal by their process and eligibility status. We also analyzed past CARE participants' length of time on CARE by different characteristics available in the IOUs' CARE data. Last, we looked at ESA participation rates among current CARE participants.

C.3.1 Reasons for Removal from CARE

The IOU CARE program data we received did not include the specific reasons past CARE participants were removed from CARE (except for a few PG&E customers). Thus, we were unable to analyze whether CARE enrollment data could be used to predict the reasons for participants' removal. It seems unlikely that the fields we received in the IOUs' CARE enrollment data would be strong predictors of the reasons that participants are removed from CARE, but more research is needed to determine if this is the case. The fields we received from at least one IOU include: participants' enrollment channel, annual income reported in the CARE application, categorical participation, climate zone, ESA participation, and preferred language.

However, we did ask surveyed past CARE participants why they were removed from the program. Respondents could choose one or more reasons from a pre-defined list and/or provide their own. The most common reasons selected by respondents are that they were ineligible, it was an inconvenience, and they didn't know how to continue on CARE or why they were removed (Table 56). Less than 10% selected any of the other potential reasons they were removed from CARE.

Some of the surveyed past participants' reasons for being removed from CARE varied substantially by their process status (Table 56). Ineligibility was more commonly reported among past participants removed at recertification than those removed at income verification and especially those removed at high-user verification (Table 56). Inconvenience was the opposite; it was more commonly reported by those removed at high-user verification, followed those removed at income-verification, and then those removed at recertification. More past participants removed at income verification reported not knowing how to continue.

Table 56. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Process Status ^a

Reasons for Removal from CARE	Past CARE Participants ^b							
	Process Status						Total	
	Removed after Recertification Request		Removed after Income Verification Request		Removed after High-User Verification Request			
	N=116	%	N=162	%	N=67	%	N=345	%
<i>Ineligible</i> : No longer eligible	62	53%*	56	35%	23	34%	141	41%
<i>Inconvenience</i> : Forgot to renew, too busy, too much trouble	20	17%*	40	25%	18	27%	78	22%
<i>Unknowledgeable</i> : Didn't know how to continue CARE	10	9%	29	18%*	6	9%	45	13%
<i>Don't Know</i> : Not sure reasons for removal	15	13%	21	13%	5	7%	41	11%
<i>Mistaken</i> : Thought we were still on CARE ^c	5	4%	11	7%	1	1%	17	5%
<i>Process Issues</i> : Tried to continue CARE, had issues with process ^c	0	0%	9	6%	6	9%	15	4%
<i>Transient</i> : Moved residences ^c	2	2%	8	5%	4	6%	14	4%
<i>Privacy Concerns</i> : Didn't want to provide personal information	0	0%	8	5%	0	0%	8	2%
<i>No Need</i> : Didn't need CARE any longer	3	3%	1	1%	1	1%	5	1%
<i>Couldn't Reduce Usage</i> : Didn't know how/couldn't reduce energy usage ^d	N/A	N/A	N/A	N/A	9	13%	N/A	N/A
<i>Didn't Reduce Usage</i> : Didn't want to reduce energy usage ^d	N/A	N/A	N/A	N/A	1	1%	N/A	N/A
<i>Didn't Want ESA</i> : Didn't want ESA home assessment ^d	N/A	N/A	N/A	N/A	1	1%	N/A	N/A

^a ^ = statistically significant difference at p≤.05 between past participant process status totals; two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^c Reported by respondents, not included in list of pre-defined reasons.

^d Asked only to high-user past participants.

Surveyed eligible past. Participants most commonly reported being removed from CARE because it was an inconvenience or because they didn't know how to continue on CARE or why they were removed (Table 57). Less than 10% reported privacy concerns, process issues, moving frequently, or no longer needing CARE. Ineligible past participants reported being removed from CARE due to ineligibility.

Table 57. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Process Status ^a

Reasons for Removal from CARE ^b	Eligible (146)	Ineligible (104)	Total (250)
<i>Ineligible</i> : No longer eligible	0%	91%	41%
<i>Inconvenience</i> : Forgot to renew, too busy, too much trouble	42%	0%	24%
<i>Unknowledgeable</i> : Didn't know how to continue CARE	23%	0%	14%

Reasons for Removal from CARE ^b	Eligible (146)	Ineligible (104)	Total (250)
<i>Don't Know: Not sure reasons for removal</i>	21%	0%	12%
<i>Process Issues: Tried to continue CARE, had issues with process ^c</i>	9%	0%	4%
<i>Mistaken: Thought we were still on CARE ^c</i>	8%	0%	5%
<i>Transient: Moved residences ^c</i>	8%	0%	5%
<i>No Need: Didn't need CARE any longer</i>	3%	0%	2%
<i>Privacy Concerns: Didn't want to provide personal information</i>	4%	0%	2%
<i>Couldn't Reduce Usage: Didn't know how/couldn't reduce energy usage ^d</i>	0%	8%	2%
<i>Didn't Reduce Usage: Didn't want to reduce our energy usage ^d</i>	0%	1%	1%
<i>Didn't Want ESA: Didn't want ESA home assessment ^d</i>	0%	1%	1%

^a * = statistically significant difference at $p \leq .05$ between past participant process status totals; two-tailed z-tests used to compare proportions; N = number who answered survey question.

^b Respondents selected one or more pre-defined reasons from a list in the survey and/or provided their own reason(s).

^c Reported by respondents, not included in list of pre-defined reasons.

^d Asked only to high-user past participants.

C.3.2 Length of Time Participating in CARE

We used past participant data received from the PG&E, SCE, and SCG to analyze whether the length of time past participants spent on CARE varied by other characteristics included in IOU customer data. These are CARE enrollment channel (SCE only), income and household size reported on CARE applications (SCE only), categorical participation reported on CARE applications (PG&E and SCG), and climate zone, language, and ESA participation (PG&E, SCE, and SCG).³¹ We limited analyses to only the past CARE participants defined for this study: they participated in CARE anytime between January 1, 2015 and June 30, 2018 and were removed from CARE before July 1, 2018.

Overall, PG&E past CARE participants were on CARE for a shorter amount of time, on average, than SCE and SCG past CARE participants (Table 58). The difference is a magnitude of over a year.

Table 58. Past CARE Participants' Average Number of Days on CARE by IOU ^a

IOU	N	Average Days in CARE ^b
PG&E	862,669	864
SCE	282,610	1,305
SCG	277,948	1,242

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by the IOUs.

Enrollment Channel

SCE included in the past CARE participant data we requested the channel used by past participants to initially enroll in the program. We found that past participants' length of time of CARE varies substantially by the enrollment channel (Table 59). Those who enrolled through an "other source" remained on CARE the longest,

³¹ These data are available for SDG&E but we did not receive the CARE end/removal date for SDG&E past participants and thus could not calculate length of time on CARE.

followed by those who enrolled via a capitation agency, then by those who enrolled through a call center representative or direct mail, and then by those who were enrolled through external data sharing. Past participants who enrolled through a “special project,” the internet, and especially the call center interactive voice response system, remained on CARE the shortest amount of time. In sum, it appears that, on average, the self-service enrollment channels are used by customers who are on CARE for shorter amounts of time than those who enroll through a channel that includes assistance (e.g., capitation agency, representative) or via external data sharing.

Table 59. SCE Past CARE Participants’ Average Number of Days on CARE by Enrollment Channel ^a

Enrollment Channel ^b	SCE Past CARE Participants		
	N	%	Average Days in CARE ^c
Total	221,623	100%	1,368
Other Source	23,077	10%	2,433
Capitation Agency	4,845	2%	1,834
Call Center Representative	30,596	14%	1,667
Direct Mail	34,898	16%	1,681
External Data Sharing	34,298	15%	1,283
Special Project	40,340	18%	954
Internet/Website	35,762	16%	973
Call Center Interactive Voice Response (IVR)	17,774	8%	627

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Past CARE participant enrollment channels were provided only by SCE.

^c Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by SCE.

SCE also provided in the past CARE participant data we requested the annual income amounts and household sizes reported by past participants in their CARE application. We used these data to calculate annual income per household member by dividing the reported income amount by the reported number of household members (Table 60).

Past participants’ length of time on CARE varies somewhat by the income per household member, in which those with lower incomes/household member remain on CARE longer, on average, than those with larger incomes/household member. Past participants who reported \$4,000 to less than \$8,000 per household member were on CARE the longest amount of time and those who reported \$12,000 or more per household member were on CARE the shortest amount of time, on average.

Table 60. SCE Past CARE Participants’ Average Number of Days on CARE by Income Per Household Member Reported in CARE Applications ^a

Income Per Household Member ^b	SCE Past CARE Participants		
	N ^c	%	Average Days in CARE ^d
Total	152,152	100%	1,465
Less than \$4,000	20,957	14%	1,479
\$4,000 to less than \$8,000	42,928	28%	1,712
\$8,000 to less than \$12,000	49,336	32%	1,435
\$12,000 to less than \$16,000	24,847	16%	1,173
\$16,000 to less than \$20,000	4,402	3%	1,288

Income Per Household Member ^b	SCE Past CARE Participants		
	N ^c	%	Average Days in CARE ^d
\$20,000 or more	9,682	6%	1,314

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Past CARE participants' income and household size data reported in CARE applications were provided only by SCE; income per household member was calculated by dividing the reported annual income by the reported number of household members.

^c Income and household size application data was not available for all past SCE customers.

^d Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by SCE.

Categorical Participation

PG&E provided in the past CARE participant data we requested the low-income and fixed-income programs that past participants reported for categorical participation. When enrolling or recertifying for CARE, customers can either report the amount of their total annual household income, or they can select from a list of other low-income public assistance programs they are also participating in, or they can select that are on a fixed income and receive it from fixed-income sources. Participants who select low-income or fixed-income sources are enrolled in CARE through "categorical participation."

PG&E past participants length of time on CARE did not vary much by the number of low/fixed-income programs or sources they selected for categorical participation (Table 61). Past participants who reported any low/fixed-income programs or sources were on CARE less time than those who did not report them. However, the number of low/fixed-income programs and sources reported by past participants do not seem to be strongly correlated with their length of time on CARE.

Table 61. PG&E Past CARE Participants' Average Number of Days on CARE by Number of Categorical Participation Programs ^a

Number of Categorical Participation Programs ^b	PG&E Past CARE Participants		
	N	%	Average Days on CARE ^c
No categorical participation	757,749	87%	873
Categorical participation	98,460	13%	797
One program	35,930	36%	794
Two programs	29,518	30%	700
Three programs	17,813	18%	798
Four programs	9,455	10%	797
Five programs	3,918	4%	797
Six programs	1,375	1%	802
Seven programs	350	0.4%	797
Eight to Eleven programs	101	0.1%	834

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Categorical participation programs are low-income public assistance programs or fixed-income sources that customers who participate in them can select to enroll or recertify in CARE instead of providing the amount of their total annual household income. N = number of past participants and % = percentage who enrolled via categorical participation and, among these, the percentage who selected one or more public assistance programs in the CARE application.

^c Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by PG&E.

In addition, among PG&E's past categorical participants, the length of time on CARE also did not vary much by the specific low/fixed-income programs and sources they reported (Table 62). Past participants who reported being on a fixed income, on Medicaid (over 65), and on Supplemental Security Income (SSI) remained on CARE longer than those who did not report these programs. There were not any significant differences in the length of time for any of the other available programs that can be used for categorical participation.

Table 62. PG&E Past CARE Participants' Average Number of Days on CARE by Categorical Participation Programs ^a

CARE-Accepted Categorical Participation Programs ^b	PG&E Past CARE Categorical Participants			
	Participated in CARE-Accepted Low-Income Program		Did Not Participate in CARE-Accepted Low-Income Program	
	N (%)	Average Days in CARE ^c	N (%)	Average Days in CARE ^c
Total	98,460 (100%)	797	98,460 (100%)	797
Fixed Income	8,890 (9%)	862*	89,570 (91%)	835*
Medicaid Over 65	6,734 (7%)	845*	91,726 (93%)	794*
Supplemental Security Income (SSI)	14,339 (15%)	829*	84,121 (15%)	792*
Low-Income Home Energy Assistance Program (LIHEAP)	13,730 (14%)	806	84,730 (14%)	796
CalWORKS (TANF)	12,764 (13%)	794	85,696 (13%)	797
Medicaid Under 65	46,507 (47%)	794	51,953 (53%)	799
CalFRESH (SNAP)	42,642 (43%)	794	55,818 (57%)	800
National School Lunch Program (NSLP)	20,389 (21%)	791	78,071 (79%)	799
Healthy Families	35,008 (36%)	791	63,452 (64%)	800
Bureau of Indian Affairs	318 (0.3%)	789	98,142 (99.7%)	797
Head Start	1,311 (1%)	786	97,149 (99%)	797
Women, Infant, Children (WIC)	21,206 (22%)	786	77,254 (78%)	800

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Categorical participation programs are low-income public assistance programs or fixed-income sources that customers who participate in them can select to enroll in CARE instead of providing the amount of their total annual household income. N = number of past participants and % = percentage who enrolled via categorical participation and selected each of the public assistance programs on the CARE application.

^c Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by PG&E; * = statistically significant difference at $p \leq 0.01$ between those who participated in another low-income program and those who did not.

SCG and SCE provided an indicator of whether a past participant enrolled as a categorical participant or not (but did not provide additional details about categorical participation, like the type and number of public assistance programs participants selected in the application). Results for SCG indicate that past participants who enrolled via categorical participation remained on CARE longer than those who did not enroll via categorical participation (Table 63). In contrast, results from SCE show the opposite, that categorical past participants remained on CARE shorter than their non-categorical counterparts.

Table 63. SCG Past CARE Participants' Average Number of Days on CARE by Categorical Participation and Type ^a

Categorical Participation ^b	SCE Past CARE Participants			SCG Past CARE Participants		
	N	%	Average Days in CARE ^c	N	%	Average Days in CARE ^c
Total	221,623	100%	1,312	277,948	100%	1,242
Not a categorical participant	185,216	84%	1,415	170,890	86%	1,183
Categorical participant	36,407	16%	1,132	39,675	14%	1,596

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Categorical participation programs are low-income public assistance programs or fixed-income sources that customers who participate in them can select to enroll in CARE instead of providing the amount of their total annual household income. The data we received indicated whether customers enrolled via categorical participation or not. N = number of categorical and non-categorical past participants and % = percentage who are categorical and non-categorical past participants.

^c Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by SCG.

Climate Zone, ESA Participation, and Language

Three characteristics that are available in PG&E's, SCE's, and SCG's CARE data for at least some of their past CARE participants and that may influence length of time spent on CARE are climate zone, language preference, and ESA participation (Table 64). Evidence suggests that SCE and SCG past CARE customers who prefer non-English communications were on CARE longer than those who prefer English and SCG past CARE participants who participated in ESA were on CARE longer than those who did not participate in ESA.

Table 64. Past CARE Participants' Average Number of Days on CARE by Climate Zone, Language, and ESA Participation ^a

Characteristics	PG&E		SCE		SCG	
	N	Average Days in CARE ^b	N	Average Days in CARE ^b	N	Average Days in CARE ^b
Climate Zone ^{c, d}						
Cool	137,794	890	201	1,254	1,719	932
Cool/Moderate	140,633	874	28,877	1,367	823	823
Moderate	N/A	N/A	141,142	1,374	53,028	1,022
Hot/Moderate	208,190	864	65,596	1,238	17,643	892
Hot	231,915	862	46,762	1,156	11,388	962
Unknown	144,137	831	32	1,112	185,789	1,377
Language Preference						
English	803,031	869	200,396	1,256	75,431	884
Non-English	59,638	789	82,214	1,426	17,374	1,329
Unknown	N/A	N/A	N/A	N/A	185,143	1,379

Characteristics	PG&E		SCE		SCG	
	N	Average Days in CARE ^b	N	Average Days in CARE ^b	N	Average Days in CARE ^b
ESA Participation						
Participant	31,397	886	28,171	1,341	1,469	1,279
Nonparticipant	687,141	870	254,439	1,302	91,336	962
Unknown	144,131	831	N/A	N/A	185,143	1,379

^a Past CARE participants are defined as being on CARE anytime between January 1, 2015 and June 30, 2018 and were no longer on CARE as of July 1, 2018.

^b Number of days on CARE was measured by subtracting the CARE start date by the CARE end date provided by the IOUs.

^c We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 3, and 5; the cool/moderate zone includes zones 2, 4, and 6; the moderate zone includes zones 7, 8, 9, and 16; the hot/moderate zone includes zones 10 and 12; and, the hot zone includes zones 11, 13, 14, and 15.

^d PG&E does not have any past participants in the Moderate climate zones.

C.3.3 ESA Participation Rates Among Current CARE Participants

Overall, about 17% of the current CARE participants who recently enrolled or recertified participated in CARE after enrolling/recertifying (Table 65). According to program data, about 6% of current CARE customers participated in ESA after enrolling in CARE and an additional 11% participated in ESA after recertifying for CARE, indicating that longer tenure in CARE leads to higher participation rates in ESA. Results vary substantially by IOU and assume that each IOU's CARE program data includes up-to-date ESA participation dates/flags.³²

Table 65. Percentage of Current CARE Participants who Participated in ESA ^a

CARE Process	PG&E		SCE		SCG		SDG&E		Total	
	CARE Participants N	ESA %	CARE Participants N	ESA %	CARE Participants N	ESA %	CARE Participants N	ESA %	CARE Participants N	ESA %
Enrolled	273,533	3%	388,241	7%	415,201	1%	63,101	46%	1,140,076	6%
Recertified	486,616	2%	763,778	16%	899,101	3%	128,299	67%	2,277,794	11%

^a Estimates from IOU CARE and ESA program data as of July 1, 2018.

³² The IOU data we received may or may not contain complete records regarding which CARE participants also participated in ESA and we recommend that CARE staff look further into this on the IOU side.

C.4 Summary of Findings, Conclusions, and Recommendations

The following are the findings from our assessment:

- **Overall**, findings indicate that CARE post-enrollment processes are, on average, not retaining most of the participants who are eligible for CARE but are mostly removing participants who are income or high-usage ineligible. A large proportion of surveyed past participants, particularly those removed at income verification, are reportedly income-eligible for CARE and have greater economic hardships than those who are ineligible; many of the income-eligible past participants were also removed at least in part due to issues they experienced with CARE processes, such as difficulties gathering the required information, understanding what information is required to remain on CARE, not receiving a notification, etc.
- In addition, findings indicate that, on average, most surveyed current and past participants do not find CARE processes very difficult, particularly current CARE participants and those at recertification, and that CARE has had positive impacts on their economic situations.
- **Characteristics**: Surveyed current participants are different from past participants in several important ways indicating that they need CARE most.
 - On average, compared to past participants, the current participants are more likely to be income-eligible for CARE, have higher energy and modified energy burdens and general economic hardship, have lower annual incomes, receive fixed-income or public assistance sources (vs. earned income), have a retired and/or disabled household member(s), have lower education, have children and/or seniors in the household, be non-white, rent their home, and live in an apartment/condo multifamily building.
 - **Recertification**: Current participants who successfully recertified are quite different from past participants who were removed after a recertification request in ways that show current participants more likely need CARE, as indicated by the many statistically significant comparisons between the characteristics of the groups.
 - Participants are more likely to be removed at recertification if they have lower energy and modified energy burdens and general economic hardship, have higher annual incomes, receive earned income and not fixed income or public assistance, have employed and not retired household members, have higher education, do not have disabled household members or children in the household, and/or do not live in manufactured/mobile homes.
 - **Income Verification**: Current participants who successfully income verified are somewhat different from past participants who were removed after an income verification request in ways that show current participants more likely need CARE, but they also share many similarities as indicated by the fewer statistically significant differences between the characteristics of the groups.
 - Participants are more likely to be removed at income verification if they live in areas with higher electric service reliability, have lower general economic hardship and higher annual incomes, do not received fixed-income, and/or do not have disabled household members.

- **CARE High-Usage Verification:** Current participants who successfully high-user verified are quite different from past participants who were removed after a high-usage verification request in the ways that show current participants more likely need CARE, as indicated by the many statistically significant comparisons between the characteristics of groups.
 - Participants are more likely to be a high-user if they are not an SCG customer; live in areas with higher electricity service reliability; have higher energy burdens and general economic and health hardship, but also have higher annual incomes; have a household member(s) with medical condition(s) requiring higher usage or air quality; have lower education; live in larger homes; have children in the household; speak only English in the home; are married or in a domestic partnership; and/or, live in a single-family home and not in an apartment/condo.
 - High-user participants are more likely to be removed at high-user verification if they do not have gas service, have lower energy burdens and general economic hardship, have higher annual incomes, have employed and not retired or disabled household members, do not receive fixed-income, and/or live in a single-family home.
- **CARE Income-Eligibility:** A large percentage of surveyed past CARE participants (59%) are income-eligible, and this is more common among those removed after income or high-user verification than those removed after recertification. A small percentage of surveyed current CARE participants (23%) are income-ineligible, and this is more common among those who enrolled but have not yet recertified or verified than among those who recertified or income- or high-user-verified.
 - Current and past CARE participants' eligibility status is strongly correlated with many participant characteristics, most of which indicate that those who are income-eligible need CARE more than those who are ineligible because they have greater economic and health hardships.
- **CARE Process Difficulty:** Current and past participants rated the CARE processes they experienced as not very difficult, on average.
 - Current and past participants rated the high-user processes involving participating in ESA and reducing their usage as the most difficult.³³ Among the other CARE processes, current and past participants rated as most to least difficult: gathering the required household info, understanding what info is required, and completing and submitting the application.
 - Past CARE participants rated the processes more difficult, on average, than current participants.
 - Current and past participants at recertification reported the lowest levels of difficulty with CARE processes, compared to those at enrollment, income-verification, or high-user verification, likely because those at recertification had experienced the same processes before when they enrolled.
 - Past income-eligible participants rated the processes more difficult than past ineligible participants, while there are no differences between current eligible and ineligible participants. This is likely due to many past income-eligible participants being removed from CARE more for process-related reasons than for being ineligible (see more below).

³³ The high-usage requirements involve income verification and also getting an ESA home assessment and measures and agreeing to usage monitoring, or going through the appeal process, which do seem more difficult than the paperwork required for recertification and income verification.

- Difficulty with CARE processes is greater, on average, for current and past participants with higher economic and health hardships, and a foreign-born household member(s) (among other characteristics unique to each group).
- *CARE Economic Impacts:* Current and past participants reported moderately high to high agreement, on average, that CARE improved their economic situation. The levels of agreement are mostly similar between current and past participants.
 - Levels of agreement varied slightly across the different economic impacts, which are, from highest to lowest: enrolling/recertifying/verifying for CARE was worth the effort, CARE helped improve their overall financial situation, CARE helped to reduce the amount they worry about affording energy bills, CARE helped them afford other basic needs, CARE helped them pay energy bills on time, and CARE helped them stay out of (deeper) debt.
 - Current high-user verified participants reported the lowest levels of agreement, and past participants removed at high-user verification reported the highest levels of agreement that CARE improved their economic situation.³⁴ There were not any substantial differences between those at recertification or those at income verification.
 - Past income-eligible participants reported slightly higher agreement than past ineligible participants that CARE improved their economic situation while levels of agreement were similar for current eligible and ineligible participants. This is likely because many past eligible participants were benefitting from CARE and were removed for reasons other than being ineligible (see more below).
 - Agreement that CARE improved participants' economic situation was higher for those with higher economic (past participants) or health (current participants) hardships (among other characteristics unique to each group).
- *Reasons for Removal from CARE:* Past participants' reported reasons for being removed from CARE vary somewhat by their process and eligibility status but overall are, from most to least common: ineligibility, inconvenience, lack of knowledge, unsure, mistaken about being on CARE, process issues, transient household, no need for CARE, and privacy concerns.
 - Past participants removed at recertification were more likely to report ineligibility and less likely to report inconvenience or process issues as reasons for CARE removal compared to those removed at income or high-user verification.
 - Past participants removed at income verification were less likely to report being ineligible and not needing CARE, and more likely to mention a lack of knowledge or privacy concerns than those removed at recertification or high-user verification.
 - Past participants removed at high-user verification were less likely to report being unsure and more likely to report inconvenience than those removed at recertification or verification; several past high-user participants also reported issues with reducing their usage as a reason for removal.

³⁴ We think this is likely because past participants who were removed due to high usage likely saw in a large increase in their bills after losing the CARE discount, and could then see how much the CARE discount was actually helping them, while current high users have higher bills but likely don't know the impact of the CARE discount (unless they lost it).

- Most income-ineligible past CARE participants reported ineligibility as a reason for removal from CARE and a few reported inconvenience, lack of knowledge, unsure, and no need for CARE. In contrast, income-eligible past participants were significantly more likely to report inconvenience, lack of knowledge, unsure, process issues, and transient household, and significantly less likely to report ineligibility as reasons for removal.
- *Duration on CARE:* Past participants' length of time on CARE also varied somewhat across several data points available to IOUs in their customer databases.
 - Duration on CARE is shorter for: PG&E vs. SCE past participants, those who used self-service enrollment channels vs. other channels, those with a higher income per household member, those in cooler climate zones, and those who participated in ESA. Results are mixed for those who prefer English vs. those prefer non-English communications, and results do not vary by categorical participation.
- As these findings indicate, improvements to CARE post-enrollment processes should focus on retaining more of the income-eligible past CARE participants, which could potentially be done by targeting subgroups of past participants who most need CARE with, for example, more follow-up notifications and additional or more detailed information they might need to successfully complete the CARE processes, such as how to gather the information required to remain on CARE, why it is needed, and how to get help.

Appendix D. RO.1b Detailed Findings: Informing CARE Program ME&O

The second research objective is about informing CARE ME&O with a focus on CARE program awareness and interest by income-eligible customers who never participated (CARE-eligible nonparticipants), and particularly the subpopulations of immigrants and non-English speakers. The specific research questions are:

- What are the key differences between current CARE participants and CARE-eligible nonparticipants?
 - What about for immigrant and non-English speaker subgroups?
- What practices or processes, if any are needed, may facilitate or maximize CARE enrollments among CARE-eligible nonparticipants who are unaware and who aware but have not participated?
 - What about for immigrant and non-English speaker subgroups?

For the second research question about practices and processes that may facilitate CARE enrollments among nonparticipants (and subgroups), we focused on identifying the barriers nonparticipants face to enrolling in CARE. In the Conclusions and Recommendations, we recommend potentially effective ME&O practices or processes that may help nonparticipants overcome their reported barriers to enrollment.

We assessed the characteristics of a sample of CARE-eligible nonparticipants and their potential barriers to participation in CARE to inform CARE ME&O. First, we defined the nonparticipants who responded to the survey. Second, we presented a summary of key findings. Third, we compared CARE nonparticipant and participant characteristics to determine whether and how they are different. Fourth, we examined nonparticipants' reported barriers to participating in CARE. Finally, we reported findings from the customer survey, from interviews with CARE capitation agency staff, and from a literature review about the participation and barriers of non-English speaking and immigrant customers.

See Chapter 4 in Volume 1 for a summary of key findings. See the end of this chapter for an outline of all the results.

D.1 CARE-Eligible Nonparticipants and Current CARE Participants Definition and Sample Characteristics

D.1.1 CARE-Eligible Nonparticipants

The nonparticipants we surveyed reported never participating in CARE and annual incomes of 200% or less of FPG. We limited the eligible nonparticipants to those who live in areas of California where high concentrations of eligible customers live, defined as Census tracts where 20% or more households earn 100% or less of FPG. This was done to improve the incidence rate of likely eligible nonparticipants for the customer survey.³⁵

According to the IOUs' 2018 annual CARE Annual Reports, there are about 5.1 million CARE-eligible customers in California, 90% of whom are on CARE, leaving about 560,000 CARE-eligible nonparticipants (Table 66). We are unable to determine the exact percentage of the estimated 560,000 CARE-eligible nonparticipants in

³⁵ The incidence of CARE-eligible nonparticipants in lower poverty areas is too low to conduct a survey with 90/10 confidence/precision within the budget and timeline of the study. However, it is also important to note that the results from the surveyed CARE-eligible nonparticipants are potentially found among those living in other areas of the state but the actual percentages, means, and other statistics may be different.

California who live in areas with high concentrations of eligible customers from which we sampled nonparticipants for the customer survey. However, between 34% and 38% of the statewide survey samples of the current CARE participants, the past CARE participants, and the ESA participants (who received targeted measures) live in the same areas of the state where we sampled the CARE-eligible nonparticipants. Thus, using these estimates as a proxy, the CARE-eligible nonparticipants in areas with high concentrations of eligible customers would be comprise about 36% of all CARE-eligible nonparticipants in the state, which is about 202,000 customers and about 3.6% of all CARE-eligible customers in California.

Table 66. CARE Program Participation ^a

IOU	2018 CARE Participation Estimates (millions)			
	CARE-Eligible Population	Customers Served	Penetration Rate	Eligible Nonparticipants
PG&E	1.54	1.38	90%	0.16
SCE	1.42	1.21	85%	0.21
SCG	1.79	1.62	90%	0.17
SDG&E	0.32	0.30	92%	0.02
Total	5.07	4.51 ^b	90%	0.56

^a IOUs' 2017 & 2018 CARE and ESA Annual Reports (the latest available).

^b Double-counts customers who get their electricity and gas services from different IOUs (e.g., SCE and SCG).

A total of 267 CARE-eligible nonparticipants who live in a Census tract where 20% or more households are in poverty (e.g., earn 100% or less of FPG) responded to the survey and were screened as being income-eligible for CARE based on their reported household size and annual income and as having never participated in CARE previously (Table 65). We obtained responses from enough of the “never” CARE-eligible nonparticipants to achieve 90/10 confidence/precision at the IOU-level for SCE, SCG, and SDG&E and to achieve 85/10 confidence/precision at the IOU-level for PG&E.

Table 67. Distribution of Surveyed CARE-Eligible Nonparticipants, by IOU, and Statistical Confidence/Precision at IOU-Level

Status	PG&E		SCE		SCG		SDG&E		Total	
	N	%	N	%	N	%	N	%	N	%
CARE-eligible nonparticipants	85	25%	88	26%	74	22%	93	27%	340	100%
Confidence/Precision for Nonparticipants	85/10		90/10		90/10		90/10		90/10	

^a Reported in the survey as having never participated in CARE.

^b Reported in the survey as having participated in CARE in the past and are excluded from analyses.

It is important to note that, due to the different survey sampling designs we developed for nonparticipants to achieve a large-enough sample to address the group-specific research objectives, the surveyed nonparticipant respondents are not representative of the statewide population of nonparticipants. Instead, the surveyed nonparticipants are representative of the statewide population of customers who live in areas with high concentrations or CARE-eligible customers (Census tracts with at least 20% of households in earn 100% of less of FPG) and others like them. The CARE-eligible nonparticipants in other areas of the state likely have many of the same barriers to applying for CARE and would also likely respond similarly to any changes in ME&O made by the IOUs to improve awareness and enrollments as the nonparticipants reported in this study. However, the percentages reporting the different barriers to enrolling in CARE could be different among nonparticipants in areas with high and low concentrations of CARE-eligible customers.

D.1.2 Current CARE Participants

We surveyed a total of 424 CARE participants who were currently participating in CARE as of July 1, 2018. Of those, 155 (37%) live in the areas with high concentrations of eligible customers, or Census tracts where 20% or more households earn 100% or less FPG. We included only the current CARE participants in these areas in the statistical comparisons with the nonparticipants.

D.2 CARE-Eligible Nonparticipant Vs. Current CARE Participant Characteristics Comparisons

We compared surveyed CARE-eligible nonparticipants and the corresponding surveyed current CARE participants as a reference group for comparisons. We compared key geographic, energy, economic, health, demographic, and housing characteristics. The data for these characteristics came from the customer data we received from the IOUs and from customers' responses to questions in the survey. The analyses below identify the extent to which nonparticipants are different from and similar to current participants, which can be useful for targeting ME&O to certain segments of the population who are CARE-eligible and live in areas with high concentrations of CARE-eligible customers but have never participated.

D.2.1 Geographic and Energy Characteristics

The surveyed CARE nonparticipants and participants are fairly evenly distributed across the IOUs (Table 68), which is due to the sampling plan to achieve high confidence/precision at the IOU-level. Most of the surveyed nonparticipants are in the moderate and warmer climate zones, which have more higher poverty Census tracts than the cooler zones. In contrast, about equal percentages of current participants live in the cool and hot zones (41% in each), and 18% live in the moderate zones. Similarly, over half of nonparticipants live in the South Coast and Inland regions and less than half are in the Central Valley, Desert/Mountains, and North Coast regions whereas few current participants are in the South Coast and Desert/Mountain regions and the majority are in the other regions. In addition, nonparticipants live in Census tracts with more households in poverty (e.g., 100% or less FPG), which is also due to the nonparticipant sampling plan.

Table 68. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Geographic Characteristics ^a

Geography	CARE-Eligible Nonparticipants		Current CARE Participants	
IOU	N	%	N	%
PG&E	58	22%	40	26%
SCE	68	25%	52	34%
SCG	67	25%	37	24%
SDG&E	74	28%	26	17%
Climate Zone by Temperature ^b	N	%	N	%
Cool	22	8%	19	13%
Cool/Moderate	29	11%	33	21%
Moderate	95	36%	33	21%
Hot/Moderate	91	34%	52	34%
Hot	30	11%	18	12%

Geography	CARE-Eligible Nonparticipants		Current CARE Participants	
Climate Zone by Geography ^c	N	%	N	%
Central Valley	40	15%	46	30%
Desert/Mountains	45	17%	21	14%
North Coast	27	10%	25	16%
South Coast	64	24%	11	7%
South Inland	91	34%	52	34%
Poverty in Census Tract ^d	N	%	N	%
Average % of Households in Poverty in Census tracts	267	30%	155	30%
Alt-Fuel Usage in Census Tract ^e	N	%	N	%
Average % of Households Using Alt-Fuels in Census tracts	267	13%	155	5%

^a The distribution of surveyed CARE participants and nonparticipants across IOUs and climate regions is mostly a result of the sample designs we used to survey each group.

^b We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^c We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic region; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^d Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

^e Households using alt-fuels (not electricity or natural gas) for heating; data from 2017 ACS 5-year estimates.

Surveyed CARE nonparticipants and participants are somewhat different regarding their energy characteristics (Table 69). On average, compared to current participants, nonparticipants are:

- More likely to have only electricity and less likely to use alt-fuels in SDG&E territory, and less likely to have natural gas in SCE and SDG&E territories.
- More likely to have higher average annual fuel costs (vs. current CARE participants' discounted costs)
- Less likely to live in low service reliability areas in PG&E territory.
- Less likely to have participated in ESA.

Table 69. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Energy Characteristics, by IOU ^a

Energy Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
Fuel Type	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Electric and natural gas	64%	70%*	100%	28%*	65%*	65%	83%*	100%	73%*	81%*
Electric only	21%	18%	0%	72%*	29%*	20%	17%	0%	19%*	14%*
Electric and alt-fuels ^c	15%	12%*	0%	0%*	6%	15%*	0%*	0%	8%*	5%
Fuel Costs ^d	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Average annual costs	\$1,389*	\$1,321	\$1,450*	\$959	\$1,268*	\$1,197*	\$1,217	\$1,176*	\$883	\$1,146*

Energy Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
Electric Service Reliability ^e	PG&E (49)	SCE (65)	SCG (0)	SDG&E (68)	Total (182)	PG&E (33)	SCE (51)	SCG (0)	SDG&E (26)	Total (110)
Average SAIDI	.01*	.03	N/A	.07	.04	.14*	.02	N/A	.06	.07
Average SAIFI	.0001*	.0002	N/A	.0005	.0003	.0008*	.0002	N/A	.0003	.0002
ESA Participation	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Participated in ESA	3%*	2%*	0%	0%*	1%*	28%*	21%*	3%	73%*	27%*
Heating Characteristics ^f	PG&E (55)	SCE (66)	SCG (66)	SDG&E (72)	Total (259)	PG&E (38)	SCE (50)	SCG (37)	SDG&E (24)	Total (149)
Furnace	59%	52%*	65%*	49%*	56%	55%	64%*	49%*	33%*	53%
Wall/space heater	44%	43%	47%	47%	45%	47%	43%	46%	54%	47%
Fireplace	29%*	24%*	20%	14%*	21%	18%*	37%*	17%	23%*	25%
Radiant/hydronic	10%*	3%*	3%	9%*	6%	0%*	12%*	9%	0%*	6%
Heat pump	12%*	5%	2%	4%	5%	5%*	6%	0%	4%	4%
Baseboard	2%	5%	0%	3%	2%	3%	2%	0%	0%	1%
No heating equipment	5%*	4%	5%	7%	5%	0%*	4%	3%	8%	3%
Average % of home heated ^g	69%	72%	82%*	74%*	74%*	71%	76%	65%*	55%*	69%*
Cooling Characteristics ^f	PG&E (57)	SCE (68)	SCG (67)	SDG&E (73)	Total (265)	PG&E (38)	SCE (51)	SCG (37)	SDG&E (26)	Total (152)
Central AC	55%	49%*	48%*	40%*	48%	50%	63%*	35%*	12%*	44%
Ceiling fans	56%	63%	51%*	67%*	60%	54%	57%	61%*	46%*	55%
Portable fans	72%*	60%*	68%	68%*	67%	61%*	71%*	63%	85%*	69%
Room/window AC	18%	25%	24%	20%	22%	13%	26%	29%	27%	23%
Evaporative cooler	15%*	33%*	17%	1%	16%	28%*	16%*	17%	8%	18%
Portable AC	9%*	7%*	12%*	11%*	10%*	16%*	16%*	23%*	23%*	19%*
Heat pump	8%	3%*	5%	3%	5%	8%	15%*	3%	8%	9%
No cooling equipment	3%	0%	0%	4%	2%	5%	2%	0%	0%	2%
Average % of home cooled ^g	66%	70%	73%	71%	70%	69%	70%	73%	70%	70%

^a * = statistically significant difference at $p \leq .05$ between nonparticipants and participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N).

^b Sample sizes larger than 66 have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; samples sizes less than 52 have too low confidence/precision for conclusive results.

^c Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data; we oversampled potential alt-fuels customers for the survey.

^d Includes 2017 electricity and natural gas costs from IOU billing data. Current CARE participants' costs include the CARE discount.

^e SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages; higher values mean lower reliability.

^f Survey respondents could select more than one heating and/or cooling equipment.

^g We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

D.2.2 Economic and Health Characteristics

Surveyed CARE nonparticipants and participants are quite different economically (Table 70). On average, compared to current CARE participants, the nonparticipants have:

- Higher energy burdens and modified energy burdens, which could be partially due to participants' CARE discount, but also have lower economic hardship scores and fewer months during the past year they reported having difficulty paying energy bills and other basic needs, indicating they have less economic difficulty in general (not just regarding energy burden).
- Lower annual incomes, but more from other types of (non-public) assistance than from fixed-income and public assistance sources.
- More household members who are students and fewer household members who are unemployed, retired, a homemaker, and/or disabled.

Table 70. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Economic Characteristics, by IOU ^a

Economic Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Average energy burden ^c	6.6%*	6.7%*	6.2%	5.7%	6.3%*	4.8%*	4.5%*	6.8%	5.0%	5.2%*
Average modified energy burden ^c	6.5%*	6.2%*	5.7%*	5.2%*	5.9%*	4.0%*	3.6%*	4.9%	4.3%*	4.1%*
Average economic hardship index score ^d	2.8*	2.3*	2.7*	2.3*	2.5*	3.9*	4.2*	3.8*	3.7*	3.9*
Average months during past year had difficulty paying... ^e										
Energy bills	2.5	1.3*	2.0	0.9*	1.6*	2.2	3.6*	1.7	2.4*	2.5*
Rent/Mortgage	2.0	1.1*	1.6	0.7	1.3*	1.9	2.8*	0.8	0.8	1.8*
Other basic needs	2.2	1.0*	1.8	0.9*	1.4*	1.8	2.8*	1.4	2.1*	2.1*
Medical bills	2.1*	1.3	1.9	0.9	1.5	1.0*	1.9	1.3	1.4	1.5

Economic Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
Income and Sources	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (166)
Average annual household income (\$1,000s) ^f	\$29.7	\$26.3*	\$31.9	\$25.4*	\$28.2*	\$31.0	\$35.0*	\$31.6	\$29.6*	\$32.3*
Earned income (wages, salary, tips, investments)	62%*	63%	73%*	70%*	67%	53%*	69%	65%*	73%*	64%
Fixed income (retirement savings, pensions, social security, or disability or veterans' benefits)	24%*	25%*	24%	15%	22%*	50%*	33%*	27%	19%	33%*
Public assistance (housing, food, medical, financial, childcare)	7%*	12%*	11%*	8%*	9%*	23%*	29%*	29%*	23%*	26%*
Other types of income/assistance ^g	33%*	21%	22%*	49%*	32%*	25%*	21%	14%*	31%*	22%*
Employment Status of Household Members	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Employed	71%*	79%*	70%	70%	73%	58%*	73%*	84%*	65%	70%
Unemployed looking for work	22%	10%*	16%	20%	17%*	20%	27%*	19%	23%	23%*
Retired	12%*	18%*	22%	11%*	16%*	25%*	25%*	19%	27%*	24%*
Student(s)	48%*	43%	30%*	49%*	42%*	40%*	44%	49%*	62%*	47%*
Homemaker	17%*	22%	22%*	8%*	17%*	28%*	21%	35%*	38%*	29%*
Unable to work due to disability or medical condition	22%*	18%*	18%*	5%*	15%*	33%*	25%*	30%*	31%*	29%*

^a * = statistically significant difference at $p \leq .05$ between corresponding nonparticipants and participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N). Sample sizes larger than 66 have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; samples sizes less than 52 have too low confidence/precision for conclusive results.

^b The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account annual public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^f Calculated by taking the average of the midpoints of the income ranges included in the survey.

^g Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

Surveyed CARE participants and nonparticipants are similar from a health perspective but differ in regard to disabled household members (Table 71). Nonparticipants reported similar average health hardship index scores. However, Lower proportions of nonparticipants also reported having a disabled household member(s) and household member(s) with medical conditions requiring higher energy usage and/or air quality than participants.

Table 71. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Health Characteristics, by IOU ^a

Health Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
	PG&E (42)	SCE (64)	SCG (62)	SDG&E (68)	Total (236)	PG&E (40)	SCE (50)	SCG (36)	SDG&E (25)	Total (151)
Hardship										
Average health hardship index score ^c	3.6	3.7*	3.6	3.3	3.6	3.9	4.4*	3.6	3.5	3.9
Health Status										
Disabled household member(s) ^d	24%*	19%*	19%*	7%*	17%*	38%*	33%*	32%*	31%*	34%*
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality	14%*	18%	19%*	8%*	15%*	18%*	15%	24%*	19%*	19%*

^a * = statistically significant difference at $p \leq .05$ between corresponding nonparticipants and participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N). Sample sizes larger than 66 have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; samples sizes less than 52 have too low confidence/precision for conclusive results.

^b The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

^c Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^d Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

D.2.3 Demographic and Housing Characteristics

Surveyed CARE nonparticipants and participants reported a few key demographic differences (Table 72). On average, compared to current CARE participants, the nonparticipants are:

- More likely to have a four-year degree or higher.
- Less likely to be married or in a domestic partnership (except for PG&E).
- More likely to live in smaller households without children or seniors.
- More likely to be white and less likely to be Hispanic/Latinx/Spanish.
- Less likely to speak only English in their home in SCE, SCG, and SDG&E territories.

Table 72. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Demographic Characteristics, by IOU ^a

Demographic Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
Education of Respondent	PG&E (55)	SCE (67)	SCG (65)	SDG&E (70)	Total (257)	PG&E (40)	SCE (50)	SCG (36)	SDG&E (26)	Total (152)
High school or less	33%	19%*	31%*	26%*	27%*	33%	36%*	53%*	46%*	41%*
Some college, no degree	24%	37%*	22%	27%	28%*	27%	20%*	17%	23%	21%*
Technical or 2-year degree	15%	18%	11%	13%	14%*	18%	17%	17%	15%	20%*
4-year degree or higher	29%*	25%	37%*	34%*	32%*	22%*	23%	14%*	15%*	18%*
Marital Status	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Married/domestic partnership	40%	49%	36%*	39%*	41%*	35%	50%	56%*	58%*	49%*
Single (never married, separated, divorced, or widowed)	60%	51%	64%*	61%*	59%*	65%	50%	44%*	42%*	51%*
Household Size and Composition	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Average household size	3.4	3.1*	2.9*	2.8*	3.0*	3.1	3.7*	3.5*	3.7*	3.6*
Children under 18 in household	44%	40%*	32%*	20%*	34%*	48%	56%*	57%*	50%*	53%*
Seniors over 64 in household	15%*	15%*	23%*	7%*	15%*	25%*	22%*	14%*	27%*	22%*
Foreign-born household members	28%*	33%	25%*	43%	32%	17%*	35%	41%*	50%*	34%
Race/Ethnicity ^c	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (50)	SCG (36)	SDG&E (26)	Total (152)
White	52%*	45%*	43%*	47%*	47%*	45%*	30%*	8%*	38%*	30%*
Hispanic/Latinx/ Spanish	25%*	30%*	29%*	33%*	30%*	30%*	42%*	72%*	46%*	48%*
Asian or Asian Indian	11%*	12%	12%	23%*	15%	3%*	14%	14%	12%*	11%
Black or African American	5%	6%*	14%*	10%*	9%	8%	18%*	6%*	4%*	10%
Other ^d	4%*	10%	11%	7%	9%	15%*	4%	0%	12%	7%
Language in Home ^e	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (50)	SCG (36)	SDG&E (26)	Total (152)
Speaks only English	62%*	71%*	66%*	54%*	63%	75%*	64%*	50%*	42%*	60%
Speaks English and other language	33%*	26%*	31%*	44%*	34%	23%*	36%*	42%*	38%*	34%
Speaks only non-English language	5%	3%	3%	2%*	3%	2%	0%	8%	19%*	6%

^a * = statistically significant difference at $p \leq .05$ between corresponding nonparticipants and participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N). Sample sizes larger than 66 have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; samples sizes less than 52 have too low confidence/precision for conclusive results.

^b The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

^c Respondents could select more than one race/ethnicity.

^d Other includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^e Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Finally, surveyed nonparticipants and participants reported similar housing situations regarding housing tenure, type, and size (Table 73). There are a few differences by IOU but, on average, the groups are statistically similar.

Table 73. Surveyed CARE-Eligible Nonparticipants' and Current CARE Participants' Housing Characteristics, by IOU ^{a, b}

Housing Characteristics	CARE-Eligible Nonparticipants ^b					Current CARE Participants ^b				
Housing Tenure	PG&E (58)	SCE (68)	SCG (67)	SDG&E (74)	Total (267)	PG&E (40)	SCE (52)	SCG (37)	SDG&E (26)	Total (155)
Owens home	33%*	40%*	33%	10%*	28%	25%*	31%*	38%	27%*	30%
Rents home	60%*	51%*	64%	81%*	65%	73%*	65%*	59%	73%*	67%
Free housing or unknown	7%	9%	3%	9%	7%	2%	4%	3%	0%	3%
Housing Type	PG&E (55)	SCE (66)	SCG (65)	SDG&E (70)	Total (256)	PG&E (39)	SCE (50)	SCG (36)	SDG&E (26)	Total (151)
Single-family home	49%*	50%*	49%*	17%	41%*	36%*	38%*	42%*	23%	36%*
Apartment or condo with 5 or more units	29%*	36%*	29%*	73%*	43%	44%*	52%*	36%*	46%*	45%
Duplex, triplex, fourplex	15%	9%	11%	9%	11%	10%	8%	11%	15%	11%
Townhome	5%	0%	9%	1%	4%	3%	2%	8%	0%	3%
Manufactured or mobile home	2%	5%	2%	0%*	2%	8%	0%	3%	15%*	5%
Number of Rooms in Home	PG&E (55)	SCE (66)	SCG (65)	SDG&E (70)	Total (256)	PG&E (40)	SCE (50)	SCG (36)	SDG&E (26)	Total (152)
1 to 3 rooms	33%*	42%*	25%*	50%*	38%	50%*	36%*	44%*	38%*	42%
4 to 5 rooms	35%*	20%*	31%*	34%	30%	15%*	40%*	22%*	31%	28%
6 to 7 rooms	20%	26%*	29%*	13%*	22%	25%	14%*	19%*	23%*	20%
8 or more rooms	13%	12%	15%	3%	11%	10%	10%	14%	8%	11%
Average number of rooms	4.7	4.6	5.3	3.6*	4.5	4.4	4.4	4.3	4.7*	4.4

^a * = statistically significant difference between nonparticipants and participants at $p \leq .05$; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; number who answered survey question in parentheses (N). Sample sizes larger than 66 have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

^b The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

D.3 Barriers to CARE Participation

We asked CARE-eligible nonparticipants about their awareness of and interest in CARE, as well as why they may be uninterested and, if they're aware, why they haven't applied for CARE. The following results highlight some key barriers preventing more nonparticipants from trying to enroll in CARE and can help inform ME&O messaging and targeting.

D.3.1 Eligible Nonparticipants' Awareness of and Interest in CARE

A majority of surveyed CARE-eligible nonparticipants in all the IOUs (31% to 44%) reported that they were aware of CARE before responding to the survey (Table 74). However, three-fourths or more of all the

nonparticipants reported being interested in applying for CARE participation, regardless of their awareness. Looking at the interaction of reported CARE awareness and interest, more than half of the nonparticipants are unaware but interested, about 30% are aware and interested, and about 17% are split nearly evenly between being unaware and uninterested (9%) and being aware and uninterested (8%).

Table 74. Surveyed CARE-Eligible Nonparticipants' Awareness of and Interest in CARE, by IOU

Awareness/Interest	PG&E ^a		SCE ^b		SCG ^b		SDG&E ^b		Total ^b	
Awareness	N (58) ^a	%	N (68) ^b	%	N (67) ^b	%	N (74) ^b	%	N (267) ^b	%
Aware of CARE	22	38%	30	44%	27	40%	23	31%	102	38%
Unaware of CARE	36	62%	38	56%	40	60%	51	69%	165	62%
Interest	N (58) ^a	%	N (68) ^b	%	N (67) ^b	%	N (74) ^b	%	N (267) ^b	%
Interested in CARE	50	86%	52	76%	54	81%	66	89%	222	83%
Uninterested in CARE	8	14%	16	24%	13	19%	8	11%	45	17%
Interaction of Awareness and Interest	N (58) ^a	%	N (68) ^b	%	N (67) ^b	%	N (74) ^b	%	N (267) ^b	%
Unaware and Interested	32	55%	30	44%	34	51%	46	62%	142	53%
Aware and Interested	18	31%	22	32%	20	30%	20	27%	80	30%
Unaware and Uninterested	4	7%	8	12%	6	9%	5	7%	23	9%
Aware and Uninterested	4	7%	8	12%	7	10%	3	4%	22	8%

^a Sample size large enough for 85/10 confidence/precision.

^b Sample size large enough for 90/10 confidence/precision.

We examined the relationships between nonparticipants' awareness of and interest in CARE and a multitude of characteristics that are potential factors significantly influencing awareness and interest. We used bivariate logistic regression models to test the relationship between the dependent variables - dichotomous measures of awareness and interest, where 0 equals "not aware" or "not interested" and one equals "aware" or "interested," - and the independent variables. The latter are all the key characteristics we reported on in Section D.2.

There are not many significant predictors of nonparticipants' reported awareness of or interest in CARE (Table 75). Nonparticipants who live in warmer climate zones are more likely to be aware than those in cooler zones, and nonparticipants with higher annual energy costs, with a foreign-born household member(s), and/or who live in an apartment/condo with five or more units are less likely to be aware than those with lower energy costs, without a foreign-born member, or who live in a different type of housing (e.g., single-family, du/tri/four-plex, manufactured/mobile home). Nonparticipants' interest in CARE is driven more by energy and economic factors: those who don't natural gas, and who have higher energy burdens and economic hardship are more likely to be interested than those who have natural gas and/or have lower energy burdens and economic hardship.

Table 75. Factors of CARE-Eligible Nonparticipants' Awareness of and Interest in CARE ^a

Statistically Significant Factors ^b	Awareness of CARE	Interest in CARE
	N = 267	
Lives in Warmer Climate Zones	↑ Awareness	
Does not Live in South Coast Region (vs. other regions)	↑ Awareness	

Statistically Significant Factors ^b	Awareness of CARE	Interest in CARE
	N = 267	
Lives in Desert/Mountain Region (vs. other regions)	↑ Awareness	
Has Higher Annual Energy Costs	↑ Awareness	
Does not have Foreign-born Household Member(s)	↑ Awareness	
Does not live in apartment/condo with 5 or more units (vs. other housing types)	↑ Awareness	
Uses Electricity-only or Electricity + Alt-Fuels (vs. Electricity + Gas)		↑ Interest
Higher Energy Burden		↑ Interest
Higher Modified Energy Burden		↑ Interest
Higher Economic Hardship		↑ Interest

^a Downward arrows = odds of being aware of CARE decreased in relation to the factor; upward arrows = odds of being aware of CARE increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

D.3.2 Reasons for Lack of Interest in CARE

It is important to note that since most surveyed CARE-eligible nonparticipants reported being interested in CARE, the sample sizes are too small, and the confidence/precision is too low, for results to be conclusive for those who reported being uninterested in CARE. The proportions from analyses of nonparticipants' reasons for a lack of interest in CARE in Table 76 thus apply only to the survey respondents and others like them in the state, but the reported reasons are also likely found among the nonparticipant population in California.

The most common reason for a lack of interest in CARE reported by nonparticipants is that they don't think their household will be eligible (40%), particularly for those who are unaware of CARE (Table 76). About one-fourth reported that they don't need the CARE discount. Nearly 20% reported their household moves frequently, which is more common among those who are aware of CARE. A few nonparticipants reported privacy concerns with sharing their household info with their IOU, that they didn't know a reason for their lack of interest, or that applying would be too much of an inconvenience, the latter of which was more of a barrier for those who are unaware of CARE. Very few nonparticipants mentioned that they didn't know what was involved or how to apply for CARE and none thought that CARE would be ineffective as reasons for their lack of interest.

Table 76. Reasons Surveyed CARE-Eligible Nonparticipants Uninterested in CARE Are Not Interested in CARE, by IOU and CARE Awareness ^{a, b}

Reasons Not Interested in CARE ^c	PG&E			SCE			SCG			SDG&E			Total		
	Aware		Total (8)	Aware		Total (16)	Aware		Total (13)	Aware		Total (8)	Aware		Total (45)
	Y (4)	N (4)		Y (8)	N (8)		Y (7)	N (6)		Y (3)	N (5)		Y (22)	N (23)	
Ineligible: Don't think household will be eligible	50%	25%	38%	13%	50%	31%	71%	50%	62%	0%	40%	25%	36%	44%	40%
No Need: Don't need CARE, energy bills are affordable	0%	25%	13%	50%	13%	31%	14%	33%	23%	33%	40%	38%	27%	26%	27%

Reasons Not Interested in CARE ^c	PG&E			SCE			SCG			SDG&E			Total		
	Aware		Total (8)	Aware		Total (16)	Aware		Total (13)	Aware		Total (8)	Aware		Total (45)
	Y (4)	N (4)		Y (8)	N (8)		Y (7)	N (6)		Y (3)	N (5)		Y (22)	N (23)	
<i>Transient:</i> Household moves frequently/will be moving soon	25%	0%	13%	0%	13%	6%	29%	0%	15%	67%	40%	50%	23%	13%	18%
<i>Privacy:</i> Don't want to share household's info with IOU	0%	0%	0%	25%	13%	19%	14%	17%	15%	0%	40%	25%	14%	17%	16%
<i>Don't know</i>	25%	50%	38%	38%	13%	25%	0%	0%	0%	0%	0%	0%	18%	13%	16%
<i>Inconvenience:</i> Too busy/don't have time	0%	0%	0%	0%	25%	13%	0%	33%	15%	33%	20%	25%	5%	22%	13%
<i>Unknowledgeable:</i> Don't know what is involved or how to apply	0%	0%	0%	0%	13%	6%	0%	17%	8%	33%	0%	13%	5%	9%	7%
<i>Ineffective:</i> CARE won't help household's financial situation	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

^a Respondents could select more than one reason.

^b Results are inconclusive due to small sample sizes and low confidence/precision, findings apply only to sampled subgroups and others like them but may potentially be found among the California population of the subgroups.

^c Listed from most to least commonly reported.

D.3.3 Reasons for Not Applying for CARE

Most surveyed nonparticipants who are interested in applying for CARE were not aware of the program before taking the survey (64% on average), and the lack of awareness if the most common reason why nonparticipants have not applied (Table 77). Among those who are aware of and interested in CARE, the most common reasons reported for not applying are: it's an inconvenience, don't know how to apply, don't think they would be eligible, mistakenly thought they were already participating, tried to apply in past and were deemed ineligible, don't need CARE due to affordable energy bills, household moves often, thought other people needed it more, and privacy concerns. In addition, CARE-eligible nonparticipants with lower annual incomes were significantly more likely to report not knowing how to apply for CARE than those with higher annual incomes.

It is important to note that due to small sample sizes and low confidence/precision at the IOU-level, the IOU-specific results are inconclusive and reflect the surveyed sample of nonparticipants who are aware of CARE and others like them; the reported reasons very likely exist among the nonparticipant population but possibly not in the proportions reported here.

Table 77. Reasons Surveyed CARE-Eligible Nonparticipants Interested in CARE Have Not Applied for CARE, by IOU ^a

Reasons for Not Applying for CARE ^b	PG&E		SCE		SCG		SDG&E		Total	
Awareness	N (50) ^c	%	N (52) ^d	%	N (54) ^d	%	N (66) ^d	%	N (222) ^e	%
<i>Unaware</i> : Not aware of CARE	32	64%	30	58%	34	63%	46	70%	142	62%
<i>Other Reason</i> (Aware of CARE)	18	36%	22	42%	20	37%	20	30%	80	36%
Reasons for Those Aware of CARE	N (18) ^c	%	N (22) ^e	%	N (20) ^e	%	N (20) ^e	%	N (80) ^e	%
<i>Inconvenience</i> : Too busy/forgot about it	4	22%	6	28%	2	10%	12	60%	24	30%
<i>Unknowledgeable</i> : Don't know how to enroll/what is involved	5	28%	4	19%	6	30%	5	25%	20	25%
<i>Ineligible</i> : Don't think household would be eligible	6	33%	3	14%	5	25%	4	20%	18	23%
<i>Mistaken</i> : Thought my household was participating	1	6%	2	9%	5	25%	3	15%	11	14%
<i>Ineligible</i> : Tried to apply in the past but was ineligible	4	22%	3	14%	3	15%	2	10%	12	15%
<i>No Need</i> : Don't need CARE, energy bills are already affordable	1	6%	2	9%	2	10%	4	20%	9	11%
<i>Transient</i> : Household moves frequently/ will be moving soon	2	11%	1	5%	2	10%	3	15%	8	10%
<i>Altruism</i> : Other people need the discount more	1	6%	0	0%	2	10%	4	20%	7	9%
<i>Don't know</i> : Not sure of reason	2	11%	4	18%	1	5%	0	0%	7	9%
<i>Privacy</i> : Don't want to share household info with IOU	2	11%	0	0%	1	5%	0	0%	3	4%
<i>Ineffective</i> : CARE won't help household's financial situation	0	0%	0	0%	1	5%	0	0%	1	1%

^a Respondents aware of CARE could select more than one reason for not applying.

^b Listed from most to least commonly reported.

^c Results are inconclusive due to small sample sizes and low confidence/precision, findings apply only to sampled subgroups but may potentially be found among the California population of the subgroups.

^d Sample size large enough for 85/10 confidence/precision.

^e Sample size large enough for 90/10 confidence/precision.

D.3.4 Services Wanted from IOU to Help Manage Energy Usage and Costs

Another potential barrier for applying to CARE is that many surveyed nonparticipants don't think they want or need it from their IOU to help manage their energy usage or costs (Table 78). About 17% of all surveyed nonparticipants and 19% of nonparticipants who are interested in CARE reported wanting lower rates, CARE, or other rate discounts (e.g., for seniors, students, etc.). In fact, nearly half of surveyed nonparticipants reported that they did not want anything from their IOU, especially among those not interested in CARE. A few nonparticipants reported wanting energy efficient products or rebates, and very few reported wanting more energy saving tips or information, more info about their usage and rate, a demand response-type program or discount, usage alerts or monitoring, time-varying rate options, or solar panels.

It is important to note that the survey question was open-ended and required respondents to report wanted services from their own thoughts and not from a pre-defined list. Item nonresponse rates tend to be higher for such questions and it is likely that more respondents would have selected a wanted service from a pre-defined list. Also, sample sizes below 52 are too small, with low confidence/precision, for results to be conclusive.

Table 78. Services Surveyed CARE-Eligible Nonparticipants Want from Their IOU to Help Better Control Energy Usage and/or Help Afford Energy Bills, by IOU and Interest in CARE ^a

Services Wanted from IOU ^b	PG&E			SCE			SCG			SDG&E			Total		
	Interested in CARE		Total ^d	Interested in CARE		Total ^e	Interested in CARE		Total ^e	Interested in CARE		Total ^e	Interested in CARE		Total ^e
	Y ^c (50)	N ^c (8)		Y ^d (52)	N ^c (16)		Y ^d (54)	N ^c (13)		Y ^d (66)	N ^c (8)		Y ^c (222)	N ^c (45)	
Nothing	42%	75%	47%	54%	75%	59%	35%	46%	37%	44%	88%	49%	44%	69%	48%
Lower rates, CARE, or other bill discounts	24%	25%	24%	18%	0%	13%	19%	0%	15%	17%	13%	16%	19%	6%	17%
Energy efficient products or rebates	8%	0%	7%	10%	6%	9%	15%	15%	15%	9%	0%	8%	10%	7%	10%
Don't know	8%	0%	7%	10%	6%	9%	15%	15%	15%	9%	0%	8%	10%	7%	10%
Energy saving tips or info	4%	0%	3%	6%	0%	4%	2%	8%	3%	6%	0%	5%	5%	2%	4%
More info on bill or online about usage/rates	6%	0%	5%	0%	6%	2%	4%	8%	5%	5%	0%	4%	4%	4%	4%
Demand response/ discounts for lower usage	0%	0%	0%	2%	0%	2%	4%	0%	3%	8%	0%	7%	4%	0%	3%
Usage alerts or monitoring	0%	0%	0%	0%	0%	0%	7%	8%	7%	0%	0%	0%	2%	2%	2%
TOU or time-varying rates	4%	0%	3%	0%	6%	2%	0%	0%	0%	2%	0%	1%	1%	2%	1%
Solar panels	2%	0%	2%	0%	0%	0%	0%	0%	0%	2%	0%	1%	1%	0%	1%
Options for bill extensions or different types of payment plans	2%	0%	2%	2%	0%	2%	0%	0%	0%	0%	0%	0%	1%	0%	1%

^a Respondents reported the services in an open-ended survey question, and we coded responses into the categories.

^b Listed from most to least commonly reported.

^c Results are inconclusive due to small sample sizes and low confidence/precision, findings apply only to sampled subgroups but may potentially be found among the California population of the subgroups.

^d Sample size large enough for 85/10 confidence/precision.

^e Sample size large enough for 90/10 confidence/precision.

D.4 Immigrants and Non-English Language CARE-Eligible Nonparticipants

Two subgroups of CARE-eligible nonparticipants in California that are of particular interest for the 2017-19 LINA are foreign-born immigrants and non-English speakers, which comprise about 1% of the total CARE-eligible population in California.³⁶ We used three approaches to better understand these subgroups and their potential barriers to applying for CARE. First, we included questions in the customer survey to identify respondents who have a foreign-born household member(s) and/or who speak a language other than English in their homes so that we could analyze barriers specific to the subgroups. Second, we conducted in-depth interviews with staff at CARE capitation agencies that serve immigrant and non-English speaking populations in California. Third, we performed a literature review of studies focused on recent trends in and barriers to immigrants' use of public assistance programs like CARE.

D.4.1 Feedback from Surveyed CARE-Eligible Nonparticipants

The proportions of surveyed CARE-eligible nonparticipants reporting a foreign-born household member(s) and speaking a non-English language in the home are not very different from the proportions of all the surveyed current CARE participants and of those who recently enrolled in CARE (Table 79).³⁷ This indicates that CARE nonparticipants are similar to current participants regarding their immigration status and language status, and that immigrants and non-English speakers are not underrepresented in CARE.

In addition, SDG&E has the highest percentages of nonparticipant respondents with an immigrant household member(s) and non-English speakers. After SDG&E, higher percentages of nonparticipant respondents with a foreign-born household member(s) are in SCE, PG&E, and SCG territories, respectively, and higher percentages of respondents who speak a non-English language in the household are in PG&E, SCG, and SCE territories, respectively.

Table 79. Surveyed CARE-Eligible Nonparticipants and Current Participants Reporting a Foreign-Born Household Member(s) and Speaking a Non-English Language at Home, by IOU

Immigrant and Language Status ^{a, b}	PG&E		SCE		SCG		SDG&E		Total	
	N	%	N	%	N	%	N	%	N	%
Foreign-Born Household Member(s)										
CARE-Eligible Nonparticipants	58	28%	68	33%	67	25%	74	43%	267	32%
Participants: All	40	17%	52	35%	37	41%	26	50%	155	34%
Participants: Recent Enrollees	13	8%	11	36%	15	33%	3	67%	42	29%

³⁶ CARE-eligible nonparticipants in areas with high concentrations of eligible customers comprise about 3.6% of the total CARE-eligible population (see Section D.1) and, based on survey results, nonparticipant immigrants and non-English speakers in these areas comprise about one-third of all the eligible nonparticipants. Multiplying 3.6% by one-third is about 1%.

³⁷ For analyses of immigrants and non-English speaking customers, we did not limit surveyed current CARE participants to only those who live areas with high concentrations of eligible customers because doing so would have reduced sample sizes too much for high confidence/precision needed to make statistical comparisons.

Immigrant and Language Status ^{a, b}	PG&E		SCE		SCG		SDG&E		Total	
	N	%	N	%	N	%	N	%	N	%
Non-English Language in Home										
CARE-Eligible Nonparticipants	58	36%	68	28%	67	33%	74	43%	267	35%
Participants: All	40	23%	50	36%	36	42%	26	38%	152	34%
Participants: Recent Enrollees	15	20%	12	42%	17	47%	3	67%	47	38%

^a Determined from responses to survey questions about whether the household has a member(s) born outside the U.S. and about what language(s) are spoken in the home; recent CARE enrollees had not yet been required to recertify as of June 30, 2018, indicating they enrolled on or before June 30, 2016 (based on the CARE requirement that recertification occurs two years after enrollment for most participants).

^b Sample sizes larger than 66 have 90/10 confidence/precision, sample sizes between 52 and 66 have 85/10 confidence/precision, and sample sizes smaller than 52 are inconclusive due to low confidence/precision.

Moreover, the surveyed nonparticipants with a foreign-born household member(s) and/or who speak a non-English language in the home are different from participants with these characteristics and from participants and nonparticipants without these characteristics in ways that indicate that they need CARE the least (Table 80 and Table 81). Nonparticipants with a foreign-born household member(s) or who speak a non-English language have slightly higher energy burdens but lower general economic hardship, lower or similar annual incomes, earned income more than fixed-income or public assistance income, more employed and fewer retired household members, lower health hardship and fewer disabled household members, and smaller households without children or seniors compared to one or more of the other comparison groups. However, they are also more likely to be renters, live in smaller homes, live in apartment/condo multifamily buildings, and not live in single-family homes compared one or more of the comparisons groups.

Table 80. Key Characteristics by Participation in CARE and Presence of a Foreign-Born Household Member(s) ^{a, b}

Key Characteristics	CARE-Eligible Nonparticipant with Foreign-Born in Household		CARE-Eligible Nonparticipant without Foreign-Born in Household		Current CARE Participant with Foreign-Born in Household		Current CARE Participant without Foreign-Born in Household	
	N	Stat	N	Stat	N	Stat	N	Stat
% Using Alt-Fuels ^c	80	3%	167	7%	47	2%	90	6%
Average Energy Burden ^d	80	6.5%*	167	6.2%	47	5.0%*	90	5.5%*
Average Modified Energy Burden ^d	80	6.3%*	167	5.8%	47	4.2%*	90	4.3%*
Average Economic Hardship Index Score ^e	68	2.4*	156	2.6	44	3.8*	84	4.0*
Average Annual Household Income (\$1,000s) ^f	80	\$31.2	167	\$27.4*	47	\$34.8*	90	\$30.1
Earned income (from wages, salary, tips, investments)	80	78%	167	66%*	47	77%	90	66%*
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)	80	8%	167	29%*	47	19%*	90	37%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)	80	6%	167	10%	47	30%*	90	26%*
Employed household member(s)	80	83%	167	73%*	47	81%	90	69%*
Retired household member(s)	80	6%	167	20%*	47	28%*	90	23%*

Key Characteristics	CARE-Eligible Nonparticipant with Foreign-Born in Household		CARE-Eligible Nonparticipant without Foreign-Born in Household		Current CARE Participant with Foreign-Born in Household		Current CARE Participant without Foreign-Born in Household	
	N	Stat	N	Stat	N	Stat	N	Stat
Average Health Hardship Index Score ^g	73	3.5	152	3.7	47	3.9*	87	4.1*
% with Disabled Household Member ^h	80	8%	167	21%*	47	28%*	90	34%*
% with Household Member with Medical Condition Requiring Higher Usage or Air Quality	80	8%	167	17%*	47	19%*	90	19%*
Has high school diploma or less	80	29%	167	25%	47	38%*	90	37%*
Average Household Size	80	3.3	167	2.9	47	4.1*	90	3.2
% with Children in Household	79	42%	165	30%*	47	70%*	90	46%*
% with Senior in Household	79	10%	165	17%*	47	21%*	90	22%*
% Speaks Non-English Language in Home ⁱ	80	71%	167	20%*	47	77%*	90	21%*
% Owns home	80	31%	167	29%	47	36%*	90	30%
% Lives in Single-Family Home	80	35%	167	43%*	47	32%	89	40%*
% Lives in Apartment/Condo with 5+ Units	80	54%	167	38%*	47	45%*	89	42%*
Average Number of Rooms in Home	80	3.8	167	4.9*	47	4.6*	90	4.5*

^a Includes only select energy, economic, health, demographic, and housing characteristics.

^b * = statistically significant difference at $p \leq .05$ between CARE eligible nonparticipants with a foreign-born household member and the other groups; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question; sample sizes larger than 66 have 90/10 confidence/precision, sample sizes between 52 and 66 have 85/10 confidence/precision, and sample sizes smaller than 52 are inconclusive due to low confidence/precision.

^c Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data.

^d Energy burden is annual energy bills divided by annual income; modified energy burden takes into account annual public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^e Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^f Calculated by taking the average of the midpoints of the income ranges included in the survey.

^g Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^h Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

ⁱ Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Table 81. Key Characteristics by Participation in CARE and Language Spoken in Home ^{a, b}

Key Characteristics	CARE-Eligible Nonparticipant and Speaks Non-English in Household		CARE-Eligible Nonparticipant and Speaks English-only in Household		Current CARE Participant and Speaks Non-English in Household		Current CARE Participant and Speaks English-only in Household	
	N	Stat	N	Stat	N	Stat	N	Stat
% Using Alt-Fuels ^c	94	1%	173	9%	61	3%	94	6%
Average Energy Burden ^d	94	5.8%	173	6.6%*	61	4.1%*	94	5.9%*
Average Modified Energy Burden ^d	94	5.5%	173	6.1%*	61	3.3%*	94	4.7%*
Average Economic Hardship Index Score ^e	85	2.4	150	2.6	56	3.8*	86	4.0*
Average Annual Household Income (\$1,000s) ^f	94	\$30.3	173	\$27.1*	61	\$31.9	94	\$32.5*
Earned income (from wages, salary, tips, investments)	94	75%	173	64%*	61	67%*	94	63%*
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)	94	5%	173	31%*	61	25%*	94	39%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)	94	7%	173	10%	61	28%*	94	26%*
Employed household member(s)	94	88%	173	64%*	61	82%*	94	62%*
Retired household member(s)	94	5%	173	21%*	61	20%*	94	27%*
Average Health Hardship Index Score ^g	85	3.1	151	3.8*	61	3.5*	90	4.2*
% with Disabled Household Member ^h	94	6%	173	23%*	61	26%*	94	38%*
% with Household Member with Medical Condition Requiring Higher Usage or Air Quality	94	9%	173	17%*	61	9%	94	18%*
Has high school diploma or less	94	35%	163	22%*	61	52%*	91	33%
Average Household Size	94	3.4	173	2.8*	61	4.0*	92	3.2
% with Children in Household	94	39%	159	30%*	61	67%*	92	43%*
% with Senior in Household	94	9%	159	19%*	61	18%*	92	24%*
% with Foreign-Born Household Member	91	63%	156	15%*	55	65%	82	13%*
% Owns Home	94	22%	173	21%	61	30%*	94	31%*
% Lives in Single-Family Home	94	28%	162	48%*	61	31%	90	40%*
% Lives in Apartment/Condo with 5+ Units	94	56%	162	35%*	61	48%*	90	43%*
Average Number of Rooms in Home	94	3.5	160	5.2*	61	4.2*	91	4.6*

^a Includes only select energy, economic, health, demographic, and housing characteristics.

^b * = statistically significant difference at $p \leq .05$ between CARE eligible nonparticipants with a foreign-born household member and the other groups; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who

answered survey question; sample sizes larger than 66 have 90/10 confidence/precision, sample sizes between 52 and 66 have 85/10 confidence/precision, and sample sizes smaller than 52 are inconclusive due to low confidence/precision.

^c Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data.

^d Energy burden is annual energy bills divided by annual income; modified energy burden takes into account annual public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^e Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^f Calculated by taking the average of the midpoints of the income ranges included in the survey.

^g Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^h Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

ⁱ Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

CARE Awareness and Interest

On average, lower percentages of surveyed nonparticipants with a foreign-born household member(s) or who speak a non-English language in the home reported awareness of CARE compared to those without these characteristics (Table 82). In contrast, nearly equal proportions of the subgroups and their counterparts reported being interested in CARE.

Table 82. Surveyed CARE-Eligible Nonparticipants' Awareness of and Interest in CARE, by Immigrant Status, Language Status, and IOU ^a

Awareness of and Interest in CARE	PG&E		SCE		SCG		SDG&E		Total	
Aware of CARE	N	%	N	%	N	%	N	%	N	%
Has Foreign-Born Household Member(s)	15	33%	20	40%	16	25%	29	24%	80	30%
No Foreign-Born Household Member(s)	39	36%	41	44%	48	46%	39	39%	167	41%
Speaks Non-English Language in Home	21	38%	19	32%	22	27%	32	37%	94	34%
Speaks Only English in Home	37	38%	49	49%	45	47%	42	26%	173	41%
Interested in CARE	N	%	N	%	N	%	N	%	N	%
Has Foreign-Born Household Member(s)	15	80%*	20	75%	16	75%	29	93%	80	83%
No Foreign-Born Household Member(s)	39	92%*	41	76%	48	81%	39	85%	167	83%
Speaks Non-English Language in Home	21	86%	19	84%*	22	77%	32	91%	94	85%
Speaks Only English in Home	37	87%	49	74%*	45	82%	42	88%	173	82%

^a Total sample sizes are large enough for 90/10 confidence/precision; IOU samples sizes are too small for conclusive results, which are included for reference only.

We conducted the bivariate logistic regression analyses described in Section D.3.1 above to determine what characteristics might influence foreign-born and non-English speaking nonparticipants' awareness of CARE.³⁸ We limited the regression models to only those surveyed nonparticipants who reported a foreign-born household member(s), those who reported speaking a non-English language in the home, and, for comparison, those who did not report an immigrant household member(s) and who speak only English in the home.

Results indicate that different factors are associated with awareness for nonparticipants with immigrants compared to those without, and for nonparticipants who speak a non-English language and those who do not (Table 83). Nonparticipants with a foreign-born household member(s) and who live in cooler climate zones, who are not on a fixed-income, and/or who don't have disabled household member(s) are less likely to report awareness of CARE. Moreover, nonparticipants who speak a non-English language in the home and who live in smaller households, have higher energy burdens, and/or have a foreign-born household member(s) are less likely to report awareness of CARE. In contrast, nonparticipants who don't have an immigrant household member(s) and who speak only English in the home are less likely to be aware of CARE if they have lower energy costs, energy burdens, and economic hardship, and/or are white.

Table 83. Factors of CARE-Eligible Nonparticipants' Awareness of and Interest in CARE, by Immigrant Status and Language Status ^a

Statistically Significant Factors ^b	Has Foreign-Born Household Member(s)	Speaks Non-English Language in Home	No Foreign-Born Member(s), Speaks Only English in Home
	N=80 ^c	N=94 ^c	N=133 ^c
Lives in Warmer Climate Zones	↑ Awareness		
Lives in Desert/Mountain Region	↑ Awareness		
On Fixed Income	↑ Awareness		
Has Disabled Household Member(s)	↑ Awareness		
Non-White Respondent			↑ Awareness
Higher Annual Energy Bills			↑ Awareness
Higher Energy Burden		↓ Awareness	↑ Awareness
Higher Modified Energy Burden			↑ Awareness
Higher Economic Hardship			↑ Awareness
Larger Household Income		↑ Awareness	
Does not have Foreign-Born Household Member(s)		↑ Awareness	

^a Downward arrows = odds of being aware of CARE decreased in relation to the factor; upward arrows = odds of being aware of CARE increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from logistic bivariate regression.

^c Sample size large enough for 90/10 confidence/precision.

Barriers to Applying for CARE

Lack of awareness of CARE is the most common barrier for why surveyed nonparticipants with immigrant household member(s) and/or who speak a non-English language in the home have not applied for CARE (Table

³⁸ We did not analyze "interest in CARE" since results did not significantly vary between nonparticipants with and without a foreign-born household member(s) or between those who do and who do not speak a non-English language at home.

84). Two-thirds or more reported that they are not aware of CARE (and thus could not apply), which is slightly higher than for surveyed nonparticipants who do not have an immigrant household member(s) and who speak only English in their home.

Among the surveyed nonparticipants who are aware of CARE, the most to least common reasons reported for not applying are mostly similar for across the subgroups: applying is inconvenient, they don't think they are eligible or tried in the past and was deemed ineligible, no need for CARE, household moves frequently, they think others need it more, they mistakenly thought they were enrolled in CARE, they don't know, or they have privacy concerns. It is notable that more immigrant and non-English speaking nonparticipants reported inconvenience concerns, and fewer reported ineligibility concerns as barriers, compared to their non-immigrant, English speaking counterparts.

We did not include results by IOU since samples sizes are so small and few differences were found between IOUs. Also, it is important to note that due to small sample sizes and low confidence/precision among those aware of CARE, the results are inconclusive; the reported reasons very likely exist among the nonparticipant subgroup populations but possibly not in the proportions reported here.

Table 84. Reasons Surveyed CARE-Eligible Nonparticipants Interested in CARE Have Not Applied for CARE, by Immigrant Status and Language Status ^a

Reasons for Not Applying for CARE ^b	Has Foreign-Born Household Member(s)		Speaks Non-English Language in Home		No Foreign-Born Member(s), Speaks Only English in Home	
	N (80) ^c	%	N (94) ^c	%	N (133) ^c	%
Awareness						
<i>Unaware</i> : Not aware of CARE	56	70%	62	66%	79	59%
<i>Other Reason</i> (Aware of CARE)	24	30%	32	34%	54	41%
Reasons for Those Aware of CARE	N (18) ^d	%	N (26) ^d	%	N (44) ^d	%
<i>Inconvenience</i> : Too busy/forgot about it	7	39%	10	38%	12	28%
<i>Unknowledgeable</i> : Don't know how to enroll/what is involved	4	23%	7	27%	12	28%
<i>Ineligible</i> : Don't think household would be eligible	3	17%	4	15%	12	28%
<i>Ineligible</i> : Tried to apply in the past but was ineligible	2	11%	6	23%	5	11%
<i>No Need</i> : Don't need CARE, energy bills are already affordable	3	17%	3	12%	5	11%
<i>Transient</i> : Household moves frequently/ will be moving soon	1	6%	3	12%	5	11%
<i>Altruism</i> : Other people need the discount more	2	11%	2	8%	5	11%
<i>Mistaken</i> : Thought my household was participating	1	6%	2	8%	7	16%
<i>Don't know</i>	1	6%	1	4%	6	14%
<i>Privacy</i> : Don't want to share household info with IOU	1	6%	0	0%	1	2%
<i>Ineffective</i> : CARE won't help household's financial situation	0	0%	0	0%	1	2%

^a Respondents aware of CARE could select more than one reason for not applying.

^b Listed from most to least commonly reported, on average.

^c Sample size large enough for 90/10 confidence/precision.

^d Results are inconclusive due to small sample sizes and low confidence/precision, findings apply only to sampled subgroups but may potentially be found among the California population of the subgroups.

Surveyed nonparticipants with an immigrant household member(s) and/or who speak a non-English language in their home reported similar trends in the services they want from their IOU (Table 85). More than half reported that they did not need anything, which is slightly higher than the nonparticipants without an immigrant household member(s) and who speak only English. However, a few did report wanting lower rates, CARE, or other discounts, and energy efficient products or rebates. Very few reported wanting any of the other services we asked about in the survey.

Table 85. Services Surveyed CARE-Eligible Nonparticipants Want from Their IOU to Help Better Control Energy Usage and/or Help Afford Energy Bills, by Immigrant Status and Language Status ^a

Services Wanted from IOU ^b	Has Foreign-Born Household Member(s)		Speaks Non-English Language in Home		No Foreign-Born Member(s), Speaks Only English in Home	
	N (80) ^c	%	N (94) ^c	%	N (133) ^c	%
Nothing	42	53%	49	52%	58	44%
Lower rates, CARE, or other bill discounts	14	17%	15	16%	22	17%
Energy efficient products or rebates	9	11%	10	11%	13	10%
Don't know	4	5%	7	8%	16	12%
Energy saving tips or info	3	4%	4	4%	6	5%
More info on bill or online about usage/rates	4	5%	3	3%	4	3%
TOU or time-varying rates	2	3%	1	1%	2	2%
Usage alerts or monitoring	1	1%	2	2%	3	2%
Demand response/ discounts for lower usage	0	0%	1	1%	7	5%
Solar	1	1%	1	1%	1	1%
Options for bill extensions or different types of payment plans	0	0%	1	1%	1	1%

^a Respondents reported the services in an open-ended survey question, and we coded responses into the categories.

^b Listed from most to least commonly reported.

^c Sample size large enough for 90/10 confidence/precision.

D.4.2 Feedback from CARE Capitation Agencies

We interviewed staff at seven CARE capitation agencies (“agencies”) to ask about their experience with enrolling immigrants in the CARE program. The interviewed agencies provided varied core services to their clients, with health-related services being the most common. Their typical clients also live different kinds of housing, most commonly single-family homes and apartments. Four of the agencies’ clientele include large portions of non-English speakers (Table 86).

Table 86. Interviewed CARE Capitation Agencies’ Key Characteristics

Interviewed CARE Capitation Agency	Core Services Provided to Clients ^a	Percent of Clients Who Speak Non-English Language	Most Common Housing Types of Clients
#1	Refugee resettlement	70%	Apartments
#2	Health provider	50%	Don't know
#3	Immigration assistance	75%	Single family homes
#4	Family services	70%	Don't know
#5	Health provider	35%	Single family homes

Interviewed CARE Capitation Agency	Core Services Provided to Clients ^a	Percent of Clients Who Speak Non-English Language	Most Common Housing Types of Clients
#6	Housing	Don't know ^b	Apartments
#7	Health provider	25%	Mix of home types

^a Agencies provided multiple services but tended to focus their resources on a core service most needed in the communities they serve.

^b Agency has non-English speaking clientele, but interviewed staff did not know percent of the agency's clients who spoke a non-English language.

Client CARE Referral and Awareness

The interviewed agencies' staff suggested that most clients, such as long-term low-income residents of the area, are already enrolled in CARE and the bulk of new enrollees in CARE are from new residents. For example, two agencies, one that offers refugee resettlement and one that provides housing to the homeless, enroll all these new clients in CARE along with providing a host of other services like enrollment in other public assistance programs and assistance finding appropriate housing. Most of their clients (85% to 90%) are already CARE enrollees. Another agency also reported that a large majority of its clients (75% to 80%) was already enrolled in CARE and four agencies did not know the percentage of their clients enrolled in CARE but estimated that it was well over the majority.

The agencies' staff all reported that most of their clients who are not enrolled in CARE are not income-eligible and a few may be unaware. Staff reported that very few clients of their clients who are eligible for and familiar with CARE are not enrolled. One of the instances where a client may be aware of CARE and not enrolled is where several families may be living in one house or apartment and the utility bill is in the name of another resident of the unit. Agency staff may be reluctant to mention the CARE program to any household members whose name is not on the bill. Another possible reason a client may be eligible for and aware of CARE but is not enrolled is when agency staff does not complete the CARE application for the client and instead instructs the client on how to do it themselves (more on this below). When asked for possible reasons a client may not be interested in enrolling in CARE, one respondent represented the others when they stated, "I never heard of any case of someone refusing CARE."

Enrollment Barriers and Suggested Improvements

All the interviewed staff agreed that the biggest barriers they face for enrolling immigrants in CARE (and in other programs) is getting immigrants into their local agency. The agencies do a lot of outreach in their local communities to expand their clientele, but some immigrants don't know about their services or are not interested.

The agencies are typically offering CARE referral and enrollment assistance along with many other more top-of-mind social services such as food assistance and housing. Each agency is working with clients that have distinct social service needs that cross many areas from health care, nutrition assistance for children, housing, and legal assistance. Discounts on utility bills are welcome to clients looking for a way to preserve their income but it is not top-of-mind for them like finding housing or feeding their children. For example, one agency has a client intake form that asks the client for information about many social service needs, of which concern with utility bills is only one item.

Some agencies enroll new clients in CARE by completing the paperwork for them and others inform the client of CARE and count on the client to apply to CARE. Two respondents reported providing the application to clients but not helping in completing the form and three noted they complete the application for the client. Two respondents indicated in some cases the client will complete the CARE application and in other cases the

agency staff will complete the application. Instances where the client completes the CARE application instead of the agency staff are mostly due to the client preferring to do it or the client not having enough time to spend at the agency for staff to do it. Staff noted that they are unaware of whether some of the clients who apply for CARE on their own actually completed the application process.

All the interviewed agencies reported clients are not very concerned with enrolling in CARE, that the time commitment to enroll is minimal, and there were no major challenges to enrollment. Staff noted that applications take about five to fifteen minutes to complete, suggesting that the time commitment to complete the application is not a barrier to enrollment. Furthermore, none of the interviewed staff reported hearing concerns from clients about enrolling in CARE.

None of the agencies' staff reported hearing from their clients about a lack of trust in their clients' energy utility or in the CARE program. Of the seven interviewed agencies, only one noted any hesitancy among their clients to enroll in any social service program. That one agency noted in some cases clients are hesitant to enroll in government sponsored program – perhaps because of concerns about immigration or bureaucracy - but they are not hesitant to enroll in a utility program.

Three of the agencies suggested improvements to CARE. Two indicated ways to improve outreach and enrollment, with one suggesting that utilities should advertise CARE more, including television ads, and advertise that CBOs can provide assistance to customers interested in CARE. The other suggested offering financial assistance and ME&O collateral to agencies like theirs to support outreach efforts at events like community fairs and workshops that are often attended by new immigrants and residents of the community. A third respondent suggested making the CARE discounts larger than the roughly 30% currently offered, particularly for those with very low incomes and/or special needs.

D.4.3 Findings from Literature Review

Currently, some of the best practices identified by researchers for enrolling immigrants into programs like CARE have been implemented by the IOUs, particularly in their partnering with CARE capitation agencies and Community Based Organizations (CBOs). For example, there is evidence that foreign-born immigrants can be reluctant to apply for benefits or services from formal government offices unless they have established relationships. CBOs like the CARE capitation agencies can be the liaison between programs, including CARE, and foreign-born immigrants that qualify for the program.³⁹

In addition, evidence from multiple organizations suggest that the IOU outreach efforts to enroll immigrants through CARE capitation agencies that can concurrently enroll them in other social service programs are in line with successful enrollment practices.

- The Henry J Kaiser Family Foundation found that fast-track enrollment procedures – allowing enrollment in the Affordable Care Acts (ACA) Medicaid Expansion via past enrollment in the Supplemental Nutrition Assistance Program (SNAP) - was key to enrolling participants.⁴⁰

³⁹ Chaudry, A (2014). *Improving Access of Low-Income Immigrant Families to Health and Human Services. The Role of Community Based Organizations*. Available online: <https://www.urban.org/research/publication/improving-access-low-income-immigrant-families-health-and-human-services> (Accessed June, 19, 2019).

⁴⁰ The Henry J. Kaiser Family Foundation (2013). *Fast Track to Coverage: Facilitating Enrollment of Eligible People Into Medicaid Expansion*. Available online: <https://www.kff.org/report-section/fast-track-to-coverage-facilitating-enrollment-of-eligible-people-into-the-medicare-expansion-issue-brief/> (Accessed June, 19, 2019).

- Researchers from the University of Kansas and a Community Health Center in Kansas determined that working with CBOs was a key method to enroll residents in the health insurance under the Affordable Care Act.⁴¹
- The Center for Budget and Policy Priorities determined that developing cross-enrollment opportunities among a group of programs eases burdens on participants and organizations administering social service programs.⁴² For example, using the same income qualification for CalFresh and CARE can make the process of enrolling in both programs easier for the recipient and the agencies.
- The Urban Institute recognized that coordinating complementary services across social service agencies and offering multiple languages allows immigrant populations to be served comprehensively.⁴³

Similarly, partnering with or leveraging faith-based organizations and housing developments is another way to encourage participation in programs like CARE. Chaudry et. al identified many settings including churches, libraries, and housing complexes where it could be appropriate to promote an assistance program. Some of these types of places may be more trustworthy among potential participants that have concerns about their or a family member's immigration status. Promotion of these programs could include making program literature available in these places and door-to-door solicitation.⁴⁴

However, there have been a few preliminary research reports from think tanks showing a decline in government social service program enrollments among the immigrant population.^{45,46,47} In addition, more anecdotal evidence from news reports indicates that some immigrants are not enrolling or renewing their enrollment out of fear or distrust that their enrollment in government programs will be used against them (e.g., to limit their ability to become legal residents or citizens, to pursue them for deportation or other potential sanctions, etc.) but could also be the result of economic improvements or other reasons.^{48,49,50,51}

⁴¹ Fawcett, S. et al. *Participatory Evaluation of a Community Mobilization Effort to Enroll Wyandotte County, Kansas, Residents Through the Affordable Care Act*. American Journal of Public Health, September 3, 2015 vol 105, No. S3.

⁴² Ambegaokar, S. et al. (2017). *Opportunities to Streamline Enrollment Across Public Benefit Programs*. Center on Budget and Policy Priorities. Available online: <https://www.cbpp.org/research/poverty-and-inequality/opportunities-to-streamline-enrollment-across-public-benefit> (Access June 19, 2019).

⁴³ Chaudry, et al. *ibid*.

⁴⁴ Chaudry, et al. *ibid*.

⁴⁵ Bernstein, H. et al. May 22, 2019. *One in Seven Adults in Immigrant Families Reported Avoiding Public Benefit Programs in 2018*. Available online: <https://www.urban.org/research/publication/one-seven-adults-immigrant-families-reported-avoiding-public-benefit-programs-2018> (Accessed June 24, 2019).

⁴⁶ Lowry, M. November 12, 2018. *Following 10-Year Gains, SNAP Participation Among Immigrant Families Dropped in 2018*. Available online: <https://www.apha.org/news-and-media/news-releases/apha-news-releases/2018/annual-meeting-snap-participation> (Accessed June 24, 2019).

⁴⁷ Nowrasteh, A. and Orr, R. May 10, 2018. *Immigration and the Welfare State: Immigrant and Native Use Rates and Benefit Levels for Means-Tested Welfare and Entitlement Programs*. Available online: <https://www.cato.org/publications/immigration-research-policy-brief/immigration-welfare-state-immigrant-native-use-rates> (Accessed June 25, 2019).

⁴⁸ Boyd-Barrett, C. April 19, 2019. *As Public Charge Fears Escalate, Immigrants Urged Not to Drop Benefits*. Available online: <https://www.calhealthreport.org/2019/04/19/as-public-charge-fears-escalate-immigrants-urged-not-to-drop-benefits/> (Accessed June 24, 2019).

⁴⁹ Gaglianone, V. & Amaro, Y. April 17, 2019. *Will Undocumented Immigrants Avoid New State Health Benefits?* Available online: <http://www.caprдио.org/articles/2019/04/17/will-undocumented-immigrants-avoid-new-state-health-benefits/> (Accessed June 24, 2019).

⁵⁰ Honig, Esther. April 26, 2018. *Fearing Deportation, Unauthorized Immigrants Shy Away from Signing Kids Up for Food Aid*. Available online: <https://www.harvestpublicmedia.org/post/fearing-deportation-unauthorized-immigrants-shy-away-signing-kids-food-aid> (Accessed June 24, 2019).

⁵¹ Wiltz, T. July 24, 2018. *Why Crackdown Fears May Keep Legal Immigrants from Food Stamps*. Available online: <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2018/07/24/why-crackdown-fears-may-keep-legal-immigrants-from-food-stamps> (Accessed June 25, 2019).

In sum, we think it is too soon for definitive evidence showing whether the declining trends in immigrants' use of assistance programs and social services are consistent, widespread, and result from an increase in fear/distrust rather than an increase in economic well-being or other reasons. It is also unclear from available literature about whether potential downward trends in immigrants use of public benefits applies to non-government programs, like CARE provided by the IOUs. As staff at the interviewed CARE capitation agencies put it, the immigrant clients they work with are not yet concerned with sharing their info with their utility, even if they are reluctant to share it with a government agency. It is difficult to make any other conclusions until more data and studies become available.

D.5 Summary of Findings, Conclusions, and Recommendations

The following are the findings from our assessment:

- Overall, the findings suggest that most surveyed eligible nonparticipants are not aware of CARE but are interested upon learning about it. Eligible nonparticipants also do not appear to be in greater need of CARE than surveyed current participants, and many who were aware of CARE reported that they have not applied for CARE because they thought it might be too much of an inconvenience or didn't know how to apply or whether they are eligible.
- In addition, immigrant and non-English speaking customers do not appear to be underrepresented in CARE and, among surveyed nonparticipants, have lower levels of awareness but also less need for CARE than non-immigrants and English-only speakers. Privacy concerns do not appear to be a major barrier for immigrants and non-English speaking nonparticipants to enroll in CARE but recent trends in participation in other public assistance programs do show declines among immigrant households that is likely influenced by their privacy concerns.
- Surveyed CARE-eligible nonparticipants are different from the current CARE participants in a few important ways that indicate that, while they are income-eligible, nonparticipants likely do not need CARE as much as the current participants.
 - On average, compared to participants, the nonparticipants have higher energy burdens but lower overall economic hardship and health hardship, lower incomes but a higher likelihood of receiving earned income than fixed-income and public assistance sources, more employed household members and fewer who are retired and/or disabled, higher educations, smaller households, and a higher likelihood of being single, white, and/or Asian.
- Although many nonparticipants might not need CARE as much as current participants, most reported interest in CARE and a few key barriers to enrolling. The most common barriers nonparticipants reported are a lack of awareness of the program, a perceived inconvenience of applying for CARE, a lack of understanding of how to apply or whether their household is eligible for CARE. A few nonparticipants did report a lack of need for or interest in CARE, and very few reported privacy concerns or thought CARE would be ineffective.
- Nonparticipants' awareness of and interest in CARE are significantly correlated with several key characteristics:
 - Awareness of CARE is lower for nonparticipants living in cooler climate zones (vs. in warmer zones), who have a foreign-born household member(s) (vs. none), and/or who live in an apartment/condo with five or units (vs. other housing types).
 - Interest in CARE is lower for nonparticipants who have both electricity and natural gas service (vs. electricity only and/or alt-fuels), have lower energy burdens, and/or have lower general economic hardship.

- Surveyed immigrant and non-English speaking customers are not currently underrepresented in CARE, and eligible nonparticipants with immigrant and/or non-English speaking household members need CARE less than others, based on many key characteristics including economic and health hardship.
- According to survey results, awareness of CARE is lower among immigrant and non-English speaking nonparticipants but interest in CARE is about the same compared to their non-immigrant and English-speaking counterparts. More nonparticipants with immigrants and non-English speakers also reported that applying for CARE is an inconvenience and fewer reported ineligibility concerns than their non-immigrant and English-speaking counterparts. Very few reported privacy concerns as a reason for not applying for CARE.
 - Nonparticipants with immigrant household members are less likely to be aware of CARE if they live in cooler climate zones, are not on a fixed income, and/or do not have a disabled household member(s). Nonparticipants who speak a non-English language in their home are less likely to be aware of CARE if they have higher energy burdens, lower household incomes, and/or a foreign-born household member(s).
- According to CARE capitation agency staff, the immigrant and non-English speaking clientele they provide services to face very few barriers to participating in CARE and are currently not concerned about sharing information with their utility to get the CARE discount.
- According to results from the literature review, IOUs are implementing some of the best practices for encouraging participation in CARE, such as leveraging community organizations that assist immigrants to enroll in multiple programs.
 - However, some research has found declining trends in immigrants' use of public assistance programs but it's too soon to know the causes. Anecdotal evidence suggests that it could be due to immigrants' increased fear or distrust that their information will be used against them, but it could also be due to improving economic conditions, or it could be a temporary trend. More research is needed after more enrollment data
- As these findings indicate, CARE ME&O may improve awareness if it were done more widely and frequently across the IOUs' service territories and may reduce barriers by better addressing concerns about how to apply, the ease of applying, and the eligibility criteria.
- In addition, making CARE ME&O more available in multiple languages and in more places with immigrant and/or non-English speaking households may improve awareness of and enrollments in CARE among these subgroups.

Appendix E. RO.2 Detailed Findings: Examining ESA Program Health, Comfort, and Safety (HCS) Impacts

The third research objective is about the impacts of ESA program heating, cooling, and enclosure measures on participants' health, comfort, and safety (HCS), with a focus on the experience of recent participants who received one or more of the measures and of ESA contractors who install the measures. The specific research questions are:

- What are ESA participants' perceptions of the non-energy HCS impacts of heating, cooling, and enclosure ESA measures?
 - How do ESA participants' HCS perceptions vary across key characteristics?
- What are ESA contractors' perceptions of the non-energy HCS impacts of heating, cooling, and enclosure ESA measures?
- What are the conditions under which the heating, cooling and enclosure ESA measures provide more or less HCS impacts?
 - To what extent are non-energy HCS impacts influenced by the home assessment, education, or installation?

We assessed the potential HCS impacts of the ESA program targeted heating, cooling, and enclosure measures. First, we defined the ESA participants and nonparticipants who responded to the survey, including reporting the distributions of the targeted measures installed in surveyed participants' homes. Second, we presented a summary of key findings. Third, we compared ESA participants' and nonparticipants' key characteristics. Fourth, we performed four different approaches to analyzing ESA participants' perceptions of the HCS impacts of the targeted ESA measures they received, including comparisons to nonparticipants' HCS perceptions. Fifth, we explored the potential factors of the HCS impacts perceived and reported by ESA participants. Finally, we reported on interviewed ESA contractors' perceptions of the HCS impacts of the targeted ESA measures.

See Chapter 5 in Volume 1 for a summary of key findings. See the end of this chapter for an outline of all the results.

E.1 ESA Participant, Nonparticipant, and Targeted Measure Definitions and Distributions

We defined who qualifies as an ESA participant and nonparticipant for purposes of this assessment. We also described the targeted measures participants received, including when participants received them and their distribution among ESA participant survey respondents.

It is important to note that due to the different survey sampling designs we developed for nonparticipants and participants to address the group-specific research objectives, the surveyed respondents are not representative of the statewide population of participants and nonparticipants. Instead, the surveyed ESA participants are representative of the statewide population of participants who received the targeted measures since we used a stratified sampling design based on the targeted measures they received. We also do not see any indications that the convenience sample of nonparticipants who were included in the nearly equal samples of current and past CARE participants and CARE-eligible nonparticipants would be very different

from the statewide population of ESA-eligible nonparticipants, but we are unable to determine this conclusively.

E.1.1 Surveyed ESA Participants and the Targeted Measures They Received

We obtained survey responses from 396 ESA participants who had at least one targeted measure installed in their home and received an energy education as part of their ESA participation between January 1, 2016 to June 30, 2018. Targeted measures were installed for most surveyed PG&E and SCE participants in 2018, for nearly all surveyed SDG&E participants in 2017, and for nearly all surveyed SCG participants in 2016 (Table 87).

Table 87. Surveyed ESA Participants, by IOU and Install Date Year

IOU	ESA Install Year						Total
	2016		2017		2018		
	N	%	N	%	N	%	
PG&E	29	18%	4	3%	127	79%	160
SCE	7	5%	18	13%	116	82%	141
SCG ^a	46	98%	1	2%	0	0%	47
SDG&E ^a	2	4%	46	96%	0	0%	48
Total	84	21%	69	18%	243	61%	396

^a Although we requested from SCG and SDG&E customers who participated in ESA between January 1, 2016 and June 30, 2018, we received mostly customers who participated in 2016 from SCG and who participated in 2017 from SDG&E, and did not receive any customers who participated in 2018 from either IOU.

The targeted measures were selected for the 2017-19 LINA by the IOUs and CPUC based on their potential impact on participants' HCS, as well as their relatively higher costs and/or time- and labor-intensive installation requirements. The targeted measures include (Table 88):

- Furnace repairs and replacements (heating measures) provided by PG&E, SCG, and SDG&E and installed mostly in moderate and hot/moderate climate zones.
- Central AC tune-ups, repairs, and replacements (cooling measures) provided by PG&E (tune-ups only) and SCE and installed mostly in hot climate zones.
- Room/window AC replacements (cooling measure) provided by PG&E, SCE, and SDG&E and installed mostly in cool/moderate, moderate, and hot/moderate hot climate zones.
- Evaporative cooler replacements (cooling measure) provided by PG&E and SCE and installed mostly in cool/moderate, moderate, and hot climate zones.
- Attic insulation (enclosure measure) provided by PG&E and SDG&E and installed mostly in cool/moderate, moderate, and hot/moderate climate zones.
- Weatherization/air sealing including caulking, glazing, weather-stripping, wall repairs, and door and window replacements and repairs (enclosure measures) provided by PG&E, SCG, and SDG&E and installed mostly in cool/moderate, moderate, and hot/moderate climate zones.

Table 88. Surveyed ESA Participants' Targeted Measures, by IOU and Climate Region ^a

	Furnace Replacement/Repair	Central AC Replacement/Repair/Tune-Up	Room AC Replacement	Evaporative Cooler Replacement	Attic Insulation	Weatherization
Total	95	128	74	133	96	229
IOU	%	%	%	%	%	%
PG&E	11%	23%	80%	36%	81%	62%
SCE	0%	77%	15%	64%	0%	0%
SCG	49%	0%	0%	0	0%	20%
SDG&E	40%	0%	5%	0	19%	19%
Climate Zone by Temperature ^b	%	%	%	%	%	%
Cool	4%	1%	8%	5%	10%	8%
Cool/Moderate	5%	13%	51%	22%	51%	40%
Moderate	21%	12%	20%	14%	26%	23%
Hot/Moderate	62%	0%	12%	8%	13%	27%
Hot	7%	74%	8%	51%	0%	3%

^a Respondents could have received more than one targeted measure.

^b We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

Many ESA participants received more than one of the targeted measures (Table 89). We included in the sample all customers who received just one of the targeted measures but there were not enough to achieve the number of survey respondents required for at least 90/10 confidence/precision, so we also included in the survey sample the customers who received two or more measures. Most surveyed participants (85%) received one or two measures and a few (15%) received three or four.

Table 89. Surveyed ESA Participants' Number of Targeted Measures

Number of Targeted ESA Measures	Total		PG&E		SCE		SCG		SDG&E	
	N	%	N	%	N	%	N	%	N	%
One	106	27%	12	8%	87	62%	2	4%	5	10%
Two	229	58%	98	61%	54	38%	45	96%	32	67%
Three	53	13%	43	27%	0	0%	0	0%	10	21%
Four	8	2%	7	4%	0	0%	0	0%	1	2%
Total	396	100%	160	100%	141	100%	47	100%	48	100%

For participants who received multiple targeted measures, the most common combinations occurred for heating and enclosure measures and for cooling and enclosure measures (Table 90). Very few participants received both heating and cooling measures and those who did also received an enclosure measure(s).

Table 90. Surveyed ESA Participants' Targeted Measure Combinations

Targeted ESA Measures	N	% of Sample
Heating only	5	1%
Cooling only	153	39%
Central AC only	49	12%
Room/window AC only	13	3%
Evaporative cooler only	33	8%
Central AC & evaporative cooler	50	13%
Room/window AC & evaporative cooler	8	2%
Enclosure only	63	16%
Attic insulation only	6	2%
Weatherization & attic insulation	57	14%
Heating & Enclosure	85	21%
Heating & weatherization	73	18%
Heating, weatherization, & attic insulation	12	3%
Cooling & Enclosure	85	21%
Central AC & attic insulation	2	0.5%
Central AC, weatherization, & attic insulation	10	3%
Room/window AC & weatherization	27	7%
Room/window AC & attic insulation	1	0.3%
Room/window AC, weatherization, & attic insulation	1	0.3%
Evaporative cooler & weatherization	11	3%
Evaporative cooler, weatherization, & attic insulation	1	0.3%
Central AC, evaporative cooler, & weatherization	10	3%
Central AC, evaporative cooler, weatherization, & attic insulation	2	0.5%
Central AC, room/window AC, & weatherization	3	0.8%
Room/window AC, evaporative cooler, & weatherization	13	3%
Room/window AC, evaporative cooler, weatherization, & attic insulation	2	0.5%
Central AC, room/window AC, evaporative cooler, & weatherization	2	0.5%
Heating, Cooling, & Enclosure	5	1%
Heating, room/window AC, & weatherization	2	0.5%
Heating, room/window AC, weatherization, & attic insulation	2	0.5%
Heating, evaporative cooler, & weatherization	1	0.3%
Total	396	100%

Based on the number of and respondent sample sizes for the various targeted measure combinations found among surveyed ESA participants, we are unable to focus only on participants who received one targeted measure. Although this single-measure approach would be ideal for isolating the impact of each measure on customers' HCS, we don't have the statistical power and, based on IOUs' participant data, it's not typical for

customers to receive just one targeted measure. Instead, we focus our analyses on the following targeted measures with the understanding that their impacts are confounded, at least to some extent, with those of other targeted measures as well as with those of other non-targeted ESA measures participants may have received:

- *Furnace replacement/repair*, with an understanding that most were also installed with an enclosure measure(s).
- *Central AC replacement/repair/tune-up*, with an understanding that many were also installed with an evaporative cooler replacement and/or enclosure measure(s).
- *Room AC replacement*, with an understanding that many were also installed with an evaporative cooler replacement and/or enclosure measure(s).
- *Evaporative cooler replacement*, with an understanding that many were also installed with a central AC measure, a room AC replacement, and/or enclosure measure(s).
- *Enclosure (weatherization & air sealing)*, with an understanding that many were also installed with a heating or cooling measure.

E.1.2 Surveyed ESA Nonparticipants

Overall, 907 of the 1,109 survey respondents (82%) in the CARE study groups were also ESA nonparticipants (as determined by indicators in the IOU customer data). They were asked many of the same survey questions as ESA participants to enable comparisons between the two groups and sample sizes are large enough for 90/10 confidence/precision at the statewide and IOU levels.

The ESA nonparticipants were in the samples of the CARE groups we surveyed (e.g. current and past CARE participants and CARE-eligible nonparticipants). We used a convenience sample approach to obtain survey responses from the ESA nonparticipants since most of the CARE groups we sampled for the survey were flagged in the customer data we received from the IOUs as having never participated in ESA.

Developing a separate stratum of ESA nonparticipants for the survey was too costly and was beyond the scope of this assessment. However, we did apply design weights to the surveyed nonparticipants based on ESA participants' IOU, climate zone, and housing type to ensure more valid and reliable comparisons between the groups.

E.2 ESA Participant vs. Nonparticipant Characteristics Comparisons

We compared ESA participants and nonparticipants on key geographic, energy, economic, health, demographic, and housing characteristics. The data for these characteristics came from the customer data we received from the IOUs and from customers' responses to questions in the survey.

E.2.1 Geographic and Energy Characteristics

The majority of surveyed ESA participants live in PG&E or SCE service territory and surveyed nonparticipants are nearly evenly distributed across the four IOUs. This, however, is due to the sample design we developed for the study.

Very few of the ESA participants reside in cool climate zones while very few of the sampled nonparticipants live in the hot zones (these results are also artifacts of the sample designs we developed for the different customer groups) (Table 91). Moreover, most surveyed ESA participants also live in the inland climate zones

while nonparticipants are fairly evenly distributed across the geographic climate zones, except a higher proportion live in the South Inland region than in the other regions. In addition, ESA participants and nonparticipants live in Census tracts with about the same average percentage of households in poverty (e.g. 100% or less of FPG) and of households using alt-fuels for heating.

Table 91. Surveyed ESA Participants' and Nonparticipants' Geographic Characteristics ^a

Geography	ESA Participants (N=396)	Nonparticipants (N=907)
IOU	%	%
PG&E	40%	25%
SCE	36%	29%
SCG	12%	26%
SDG&E	12%	20%
Climate Zone by Temperature ^b	%	%
Cool	5%	12%
Cool/Moderate	25%	17%
Moderate	17%	25%
Hot/Moderate	20%	37%
Hot	32%	8%
Climate Zone by Geography ^c	%	%
Central Valley	34%	19%
Desert/Mountains	33%	11%
North Coast	8%	17%
South Coast	4%	16%
South Inland	20%	38%
Poverty in Census Tract ^d	%	%
Average % of Households in Poverty in Census tracts	22%	19%
Alt-Fuel Usage in Census Tract ^e	%	%
Average % of Households Using Alt-Fuels in Census tracts	9%	12%

^a The distribution of surveyed ESA participants and nonparticipants across IOUs and climate regions is partially a result of the sample designs we used to survey each group.

^b We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^c We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic regions; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^d Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

^e Households using alt-fuels (not electricity or natural gas) for heating; data from 2017 ACS 5-year estimates.

Most of the surveyed ESA participants and nonparticipants have electricity and natural gas service (Table 92). A slightly higher percentage of ESA participants have both services or use electricity and alt-fuels compared to nonparticipants, who are more likely to have only electric service. Surveyed ESA participants also live in areas with slightly lower electricity service reliability, as measured by SAIDI and SAIFI, compared to nonparticipants. More surveyed ESA participants also are participating or have participated in CARE than nonparticipants, but this is also likely due to the sample design of the surveyed ESA nonparticipant group that includes nearly equal proportions of current CARE participants, past CARE participants, and CARE-eligible nonparticipants.

Surveyed ESA participants are more likely to have a furnace and/or fireplace as heating equipment in their homes compared to nonparticipants, while the latter group is more likely to have a wall/cadet/space heater(s) in their homes (Table 92). Surveyed ESA participants are also more likely to have a central AC, a ceiling fan(s), and/or an evaporative cooler(s) as cooling equipment in their homes than nonparticipants, while the latter are more likely to have a portable fan(s) and/or AC unit(s) in their homes. On average, surveyed ESA participants reported more rooms in their homes have heating and cooling service compared to nonparticipants.

Table 92. Surveyed ESA Participants' and Nonparticipants' Energy Characteristics ^a

Energy Characteristics	ESA Participants		Nonparticipants	
Fuel Type	N	Statistic	N	Statistic
Electric and natural gas	396	82%*	907	76%*
Electric only		7%*		18%*
Electric and alt-fuels ^b		11%*		6%*
Fuel Costs ^c	N	Statistic	N	Statistic
Average annual costs	396	\$1,297	907	\$1,286
Electric Service Reliability ^d	N	Statistic	N	Statistic
Average SAIDI	331	1.47*	623	1.11*
Average SAIFI		0.007*		0.003*
CARE Participation ^e	N	Statistic	N	Statistic
Current or past CARE participant	396	89%*	907	63%*
CARE nonparticipant		11%*		37%*
Heating Characteristics ^f	N	Statistic	N	Statistic
Furnace	364	80%*	839	63%*
Fireplace		44%*		31%*
Wall/space heater		31%*		43%*
Radiant/hydronic		3%		5%
Heat pump		3%		5%
Baseboard		2%		2%
No heating equipment		5%		4%
Average % of home heated ^g		82%*		74%*
Cooling Characteristics ^f	N	Statistic	N	Statistic
Central AC	368	70%*	849	53%*
Ceiling fans		70%*		63%*
Portable fans		64%*		71%*
Room/window AC		22%		24%
Evaporative cooler		34%*		11%*
Portable AC		10%*		15%*
Heat pump		4%		6%
No cooling equipment		3%		2%
Average % of home cooled ^g		77%*		69%*

^a * = statistically significant difference at $p \leq .05$ between participants and nonparticipants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^b Alt-fuels are propane, kerosene/oil/diesel, and/or wood/pellets used for space heating, water heating, and/or cooking, and was determined by a combination of survey responses and IOU customer data.

^c SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages.

^d Includes 2017 electricity and natural gas costs from IOU billing data.

^e IOU ESA customer data did not distinguish between whether participant was currently on CARE or previously on CARE, only whether they had ever been on CARE or not. In addition, we CARE-eligible nonparticipants are an oversampled subgroup of the ESA nonparticipants.

^f Survey respondents could select more than one heating and/or cooling equipment.

^g We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

E.2.2 Economic and Health Characteristics

Surveyed ESA participants have slightly higher levels of energy burden and modified energy burden and lower annual incomes than nonparticipants, but have about the same average level of moderately low general economic hardship and number of months they reported having difficulty paying bills or for basic needs (Table 93).⁵² The sources of income do differ between the groups: higher percentages of participants reported being on a fixed income or public assistance and lower percentages reported receiving earned income or other types of income or assistance than nonparticipants. This is also reflected in the groups' employment status, in which higher percentages of participants reported having retired, stay-at-home, and/or disabled household members who don't work and lower percentages reported having household members who are employed compared to nonparticipants.

Table 93. Surveyed ESA Participants' and Nonparticipants' Economic Characteristics ^a

Economic Characteristics	ESA Participants		Nonparticipants	
Hardship	N	Statistic	N	Statistic
Average energy burden ^b	396	5.9%*	907	5.2%*
Average modified energy burden ^b		5.0%		4.7%
Average economic hardship index ^c	341	3.2	817	3.1
Average months during past year had difficulty paying... ^d				
Energy bills	380	2.2	871	2.1
Rent/Mortgage		1.5		1.7
Other basic needs		2.1		1.8
Medical bills		1.8		1.7
Income and Sources	N	Statistic	N	Statistic
Average annual household income ^e	396	\$34,234*	907	\$36,523*
Earned income (from wages, salary, tips, investments)		52%*		68%*
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)		50%*		30%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)		23%*		14%*
Other types of income/assistance ^f		18%*		25%*

⁵² Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

Economic Characteristics	ESA Participants		Nonparticipants	
Employment Status	N	Statistic	N	Statistic
Employed household member(s)	396	55%*	907	71%*
Unemployed household member(s) looking for work		16%		19%
Retired household member(s)		37%*		22%*
Student household member(s)		31%*		43%*
Homemaker household member(s)		28%*		24%*
Household member(s) unable to work due to disability or medical condition		32%*		21%*

^a * = statistically significant at $p \leq .05$; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions.

^b Energy burden is annual energy bills divided by annual income; modified energy burden takes into account annual public assistance benefits (as part of income).

^c Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^d Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^e Calculated by taking the average of the midpoints of the income ranges included in the survey.

^f Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

Surveyed ESA participants reported slightly higher average health hardship than nonparticipants, as measured by the health hardship index (Table 94).⁵³ This is also reflected in comparisons of participants' and nonparticipants' reported health status of their household members: higher percentages of participants reported a household member(s) with a disability and/or medical condition that requires special equipment, more heating and/or cooling, or higher air quality.

Table 94. Surveyed ESA Participants' and Nonparticipants' Health Characteristics ^a

Health Characteristics	ESA Participants		Nonparticipants	
Hardship	N	Statistic	N	Statistic
Average health hardship index ^b	364	4.3*	832	3.9*
Health Status	N	Statistic	N	Statistic
Disabled household member(s) ^c	396	33%*	907	23%*
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality		29%*		20%*

^a * = statistically significant difference at $p \leq .05$ between participants and nonparticipants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^b Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^c Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

E.2.3 Demographic and Housing Characteristics

Surveyed ESA participants and nonparticipants reported similar levels of education and a similar marital status (Table 95). They also reported having about the same average number of household members.

⁵³ Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

Their household compositions are slightly different, however (Table 95). Higher percentages of ESA participants reported having a senior household member(s), which is in line with the economic characteristics above showing higher percentages of ESA participants reported a fixed-income and retired household member(s) than nonparticipants. In addition, a slightly lower percentage of surveyed participants reported a foreign-born household member(s) than nonparticipants (Table 95). This is in line with the race/ethnicity results showing higher percentages of surveyed ESA participants reported being white and lower percentages reported being Hispanic/Latinx/Spanish or Asian/Asian Indian compared to nonparticipants. It also aligns with the languages spoken in the home, in which slightly higher percentages of participants reported speaking only English and lower percentages reported speaking a non-English language in the home compared to nonparticipants.

Table 95. Surveyed ESA Participants' and Nonparticipants' Demographic Characteristics ^a

Demographic Characteristics	ESA Participants		Nonparticipants	
Education of Respondent	N	Statistic	N	Statistic
High school or less	386	32%	259	29%
Some college, no degree		24%	214	25%
Technical or 2-year degree		21%	143	17%
4-year degree or higher		23%*	253	29%*
Marital Status of Respondent	N	Statistic	N	Statistic
Married or in domestic partnership	396	46%	421	46%
Single (never married, separated, divorced, or widowed)		54%	486	54%
Household Size and Composition	N	Statistic	N	Statistic
Average number of household members	378	3.1	879	3.3
Children under 18 in household		41%	383	44%
Seniors over 64 in household		41%*	210	24%*
Foreign-born household members		28%	272	32%
Race/Ethnicity of Respondent ^b	N	Statistic	N	Statistic
White	385	53%*	373	43%*
Hispanic/Latinx/Spanish		30%*	302	35%*
Asian or Asian Indian		8%*	118	14%*
Black or African American		8%	69	8%
Other ^c		10%	12	8%
Language in Home ^d	N	Statistic	N	Statistic
Speaks only English	383	68%*	534	62%*
Speaks English and other language		25%*	286	33%*
Speaks only non-English language		7%	46	5%

^a * = statistically significant difference at $p \leq .05$ between participants and nonparticipants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^b Respondents could select more than one race/ethnicity.

^c Other includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^d Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Surveyed ESA participants are more likely than nonparticipants to own their home and live in a single-family or manufactured/mobile home than nonparticipants, while the latter are more likely to rent and live in an

apartment (Table 96). Similarly, ESA participants reported living in slightly larger homes than nonparticipants, as measured by the reported number of rooms in the home (excluding unoccupied rooms like closets, pantries, and hallways).

Table 96. Surveyed ESA Participants' and Nonparticipants' Housing Characteristics ^a

Housing Characteristics	ESA Participants		Nonparticipants	
Housing Tenure	N	Statistic	N	Statistic
Owns home	396	64%*	332	37%*
Rents home		30%*	515	57%*
Free housing or unknown tenure		6%	60	6%
Housing Type	N	Statistic	N	Statistic
Single-family home	382	66%*	438	51%*
Apartment or condo with 5 or more units		11%*	290	33%*
Duplex, triplex, fourplex		6%	84	10%
Townhome		4%	32	4%
Manufactured or mobile home		12%*	20	2%*
Number of Rooms in Home	N	Statistic	N	Statistic
1 to 3 rooms	381	21%*	282	32%*
4 to 5 rooms		27%	261	30%
6 to 7 rooms		28%	196	23%
8 or more rooms		24%*	130	15%*
Average number of rooms		5.7*	867	4.9*

^a * = statistically significant difference at $p \leq .05$ between participants and nonparticipants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

E.3 ESA Participants' Perceptions of the HCS Impacts of Targeted ESA Measures

We included several questions in the survey to measure ESA participants' perceptions of the impacts the targeted ESA measures they received had on the HCS of their homes. The questions can be divided into four different approaches that, taken together, provide a more comprehensive assessment of ESA participants' perceptions of the targeted measures' potential HCS impacts than one approach alone.

E.3.1 Participants' Satisfaction with Their Overall Program Experience and the Targeted Measures They Received

For the first approach, we measured ESA participants' overall satisfaction with the ESA program and satisfaction with the targeted ESA measures they received. This indirect approach to assessing HCS is an indicator of the extent to which the program experience was satisfactory and the targeted measures were acceptable to participants. Higher satisfaction indicates potentially better HCS impacts and lower satisfaction indicates potentially lower HCS impacts.

Overall, ESA participants reported being highly satisfied with their experience with the program, reporting an average satisfaction rating of 8.6 on a scale of 0, meaning "not at all satisfied," to 10, meaning "completely

satisfied” (Table 97). SCE and SDG&E participants reported slightly higher average satisfaction with the ESA program than SCG and PG&E participants.

Table 97. ESA Participants’ Overall Average Satisfaction Ratings

IOU	N ^a	Mean Satisfaction ^b
PG&E	158	8.0
SCE	141	9.1
SCG	46	8.5
SDG&E	48	9.2
Total	393	8.6

^a N = total number who answered the survey question.

^b Satisfaction measured on 11-point scale from 0 (not at all satisfied) to 10 (completely satisfied).

Participants’ reported satisfaction was more mixed with the specific types of targeted ESA measures they received (Table 98; Figure 8). Participants who received a central AC replacement or repair, enclosure measures, an evaporative cooler replacement, or a furnace replacement reported moderately high to high satisfaction with the measure(s) (7.0 or higher). Participants who received a furnace replacement/repair, furnace repair, room/window AC replacement, or a central AC tune-up reported moderate satisfaction with the measure(s) (5.0 or 6.9). However, it is important to note that results with fewer than 52 respondents are inconclusive due to the small sample size and low confidence/precision.

Table 98. ESA Participants’ Average Satisfaction Ratings with Targeted ESA Measures They Received

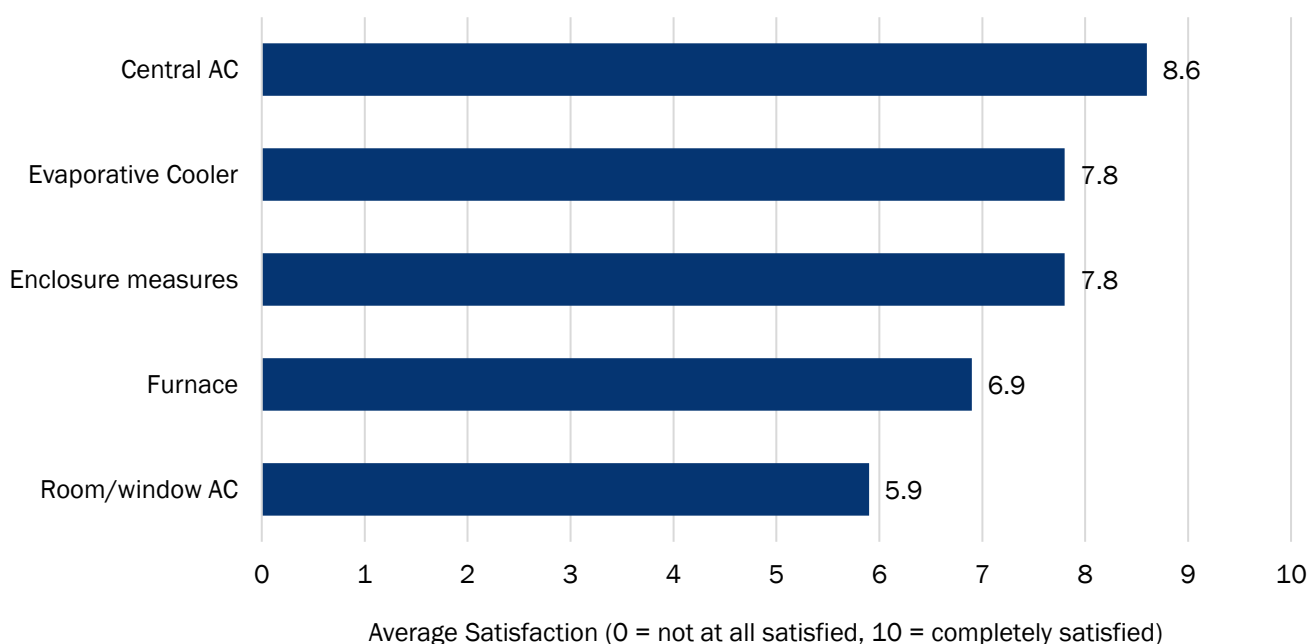
Targeted ESA Measures ^a	N ^b	Mean Satisfaction ^c
All heating measures	85	6.9
Furnace replacement	28	7.8
Furnace replacement or repair ^d	12	6.5
Existing furnace repair	45	6.4
All cooling measures	217	7.8
All central AC measures	121	8.6
Existing central AC repair	75	9.4
Central AC replacement	23	9.2
Existing central AC tune-up	23	5.5
Evaporative cooler	116	7.8
Room/window AC	54	5.9
All enclosure measures	227	7.8
Weatherization + attic insulation	85	8.0
Weatherization only	133	7.9
Attic insulation only	9	7.1

^a Asked only about targeted heating, cooling, and enclosure measures; heat pumps were also included but none of the survey respondents received a heat pump repair or replacement.

^b N = total number who answered the survey question; results with fewer than 52 respondents are inconclusive due to small sample size and low confidence/precision.

^c Satisfaction measured on 11-point scale from 0 (not at all satisfied) to 10 (completely satisfied).

^d We were unable to determine from the SCG customer data if some participants’ heating systems were replaced or repaired.

Figure 8. ESA Participants' Mean Satisfaction with Heating, Cooling, and Enclosure Measures

Participants' reported satisfaction with targeted measures was similar across IOUs except with regards to the cooling measures (Table 99). PG&E participants reported moderate to moderately low satisfaction while SCE customers reported high satisfaction with cooling measures they received. SCG and SDG&E participants reported similar satisfaction with the heating measures they received, and PG&E, SCG, and SDG&E participants reported similar levels of satisfaction with the enclosure measures they received. However, it is important to note that results with fewer than 52 respondents are inconclusive due to the small sample size and low confidence/precision.

Table 99. ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received, by IOU

Targeted ESA Measures ^a	PG&E		SCE		SCG		SDG&E	
	N ^b	Mean Satisfaction ^c	N ^b	Mean Satisfaction ^c	N ^b	Mean Satisfaction ^c	N ^b	Mean Satisfaction ^c
All heating measures	8	6.0	0	N/A	42	6.9	35	7.1
Furnace replacement	8	6.0	0	N/A	8	8.3	12	8.6
Furnace replacement/repair ^d	0	N/A	0	N/A	12	6.5	0	N/A
Existing furnace repair	0	N/A	0	N/A	22	6.6	23	6.3
All cooling measures	73	5.2	141	9.0	0	N/A	0	N/A
All central AC measures	23	5.5	98	9.4	0	N/A	0	N/A
Existing central AC repair	0	N/A	75	9.4	0	N/A	0	N/A
Central AC replacement	0	N/A	23	9.2	0	N/A	0	N/A
Existing central AC tune-up	23	5.5	0	N/A	0	N/A	0	N/A
Room/window AC	40	4.6	11	9.3	0	N/A	3	10.0
Evaporative cooler	32	5.1	84	8.9	0	N/A	0	N/A

Targeted ESA Measures ^a	PG&E		SCE		SCG		SDG&E	
	N ^b	Mean Satisfaction ^c	N ^b	Mean Satisfaction ^c	N ^b	Mean Satisfaction ^c	N ^b	Mean Satisfaction ^c
All enclosure measures	141	7.8	0	N/A	44	7.9	42	8.0
Weatherization + attic insulation	69	7.8	0	N/A	0	N/A	16	9.1
Weatherization only	64	7.9	0	N/A	44	7.9	25	7.2
Attic insulation only	8	6.8	0	N/A	0	N/A	1	10

^a Asked only about heating, cooling, and enclosure measures; heat pumps were also included but none of the survey respondents received a heat pump repair or replacement.

^b N = total number who answered the survey question; results with fewer than 52 respondents are inconclusive due to small sample size and low confidence/precision.

^c Satisfaction measured on 11-point scale from 0 (not at all satisfied) to 10 (completely satisfied).

^d We were unable to determine from SCG customer data if some participants' heating systems were replaced or repaired.

E.3.2 Participants' Perceptions of Changes in HCS Issues in Their Homes Pre- and Post- ESA Participation, and in Comparison to Nonparticipants' HCS Perceptions

For the second approach, we asked two questions to both ESA participants and nonparticipants about how often they experienced five HCS issues in their home that could be impacted by ESA targeted measures, and how often the issue(s) caused harm to members of their household. On both survey questions, respondents could choose a frequency on a five-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time." The five different HCS issues included in the survey are:

- Uncomfortably cold temperatures, for participants who received heating and/or enclosure measure(s).
- Uncomfortably hot temperatures, for participants who received cooling and/or enclosure measure(s).
- Drafts from outside, for participants who received enclosure measure(s).
- Mold, mildew, fungus, or moisture, for participants who received heating, cooling, and/or enclosure measure(s).
- Pests like insects or rodents, for participants who received enclosure measure(s).

We asked participants the questions about during the year before they participated in ESA and about the time since they participated in ESA so that we could compare the pre-participation and post-participation HCS perceptions within the ESA participant group. Comparing within ESA participants provides an indicator of whether participants perceived that their home's HCS changed after ESA participation. If ESA participation and the targeted measures positively impacted HCS, the HCS issues participants reported occurring pre-participation should have declined in frequency post-participation.

We asked nonparticipants the questions about during the past year so that we could compare their perceptions to ESA participants' post-participation perceptions. We weighted nonparticipant results based on the percentage of ESA participants in each IOU, climate zone, and housing type to ensure nonparticipants and participants are similar on these characteristics for purposes of comparisons.

Comparing between ESA participants and nonparticipants provides an indicator of whether participants' perceptions of the frequency of HCS issues in their home is greater, the same, or less than the frequency perceived by nonparticipants. If ESA participation and the targeted measures positively impacted HCS, the

frequency of HCS issues participants reported occurring post-participation should be lower than the frequency of HCS issues nonparticipants reported occurring during the past year.

Overall, results from the first question about how frequent HCS issues occurred inside the home show that about half to two-thirds of the ESA participants perceived that the HCS issues they experienced before participation declined in frequency after participating in ESA (Table 100). Declines were greatest for uncomfortably hot temperatures and drafts, followed by uncomfortably cold temperatures and mold/mildew/fungus/moisture, and were the least for pests. Very few participants reported that the HCS issues increased in frequency.⁵⁴

Table 100. Percentage of ESA Participants Reporting a Decline, No Change, or an Increase in the Frequency of Experiencing HCS Issues in Their Home Before and After Participation^a

Applicable Targeted ESA Measures	HCS Issue	N ^b	% Reporting a Decline in Frequency after Participation	% Reporting No Change in Frequency after Participation	% Reporting an Increase in Frequency after Participation
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year occurred	202	58%	33%	9%
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	321	66%	28%	6%
Enclosure Measures	Drafts coming from outside occurred	175	66%	27%	7%
	Pests such as rodents or insects occurred	161	48%	45%	7%
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	139	55%	36%	9%

^a Frequency of issues is measured on 5-point scale where 1 means “never,” 2 means “a few times,” 3 means “sometimes,” 4 means “many times,” and 5 means “most or all the time.”

^b N = total number who received the targeted measure and answered the survey questions about how often the HCS issues occurred before and after ESA participation.

In addition, the average amount of the reported decline in the frequency of HCS issues after ESA participation is statistically significant (Table 101). ESA participants also reported a statistically significant lower average frequency of the HCS issues occurring in their homes after participation than nonparticipants reported occurring in their homes during the past year. The HCS impacts are greater for indoor temperature HCS issues (e.g., uncomfortably cold and/or hot and drafty) than for infestation HCS issues (e.g., mold/mildew/fungus/moisture and pests).

⁵⁴ Participants who reported an increase in cold temperatures after participation received a furnace repair not a replacement; most of participants who reported an increase in hot temperatures after participation received a room/window AC, evaporative cooler, or central AC tune-up (not a central AC repair or replacement).

Table 101. Comparisons of ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation, and with Nonparticipants' Frequency of Experiencing HCS Issues During Past Year ^a

Applicable Targeted ESA Measures	HCS Issues	ESA Participants			Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation Frequency
		Mean Frequency (N) ^b	Mean Frequency (N) ^b	Statistical Significance ^c	Mean Frequency (N) ^b	Statistical Significance ^c
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year occurred	3.3 (226)	2.3 (226)	-1.0*	2.8 (858)	-0.5*
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	3.3 (360)	2.2 (360)	-1.1*	3.2 (863)	-1.0*
Enclosure Measures	Drafts coming from outside occurred	3.1 (208)	2.0 (208)	-1.1*	2.5 (825)	-0.5*
	Pests such as rodents or insects occurred	2.5 (218)	2.0 (218)	-0.5*	2.3 (852)	-0.3
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	2.0 (332)	1.5 (332)	-0.5*	2.0 (830)	-0.5*

^a Frequency of issues is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^b N = total number who answered the survey question.

^c Two-tailed t-test comparison of means for statistical significance; * = $p \leq .05$.

ESA participants and nonparticipants who reported an HCS issue occurred in their home a few times or more were then asked how often the issue caused harm to any household members. Between 37% and 46% reported a decline in the how often HCS issues caused harm after participation, about half reported no change, and a few reported an increase (Table 102). ⁵⁵

Table 102. Percentage of ESA Participants Reporting a Decline, No Change, or an Increase in the Frequency of Health Effects Caused by HCS Issues in Their Home Before and After Participation ^a

Applicable Targeted ESA Measures	HCS Issue	N ^b	% Reporting a Decline in Frequency after Participation	% Reporting No Change in Frequency after Participation	% Reporting an Increase in Frequency after Participation
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year occurred	116	56%	30%	14%

⁵⁵ Participants who reported an increase in health effects from cold temperatures after participation received a furnace repair not a replacement; most of participants who reported an increase in health effects from hot temperatures after participation received a room/window AC, evaporative cooler, or central AC tune-up (not a central AC repair or replacement).

Applicable Targeted ESA Measures	HCS Issue	N ^b	% Reporting a Decline in Frequency after Participation	% Reporting No Change in Frequency after Participation	% Reporting an Increase in Frequency after Participation
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	161	57%	29%	14%
Enclosure Measures	Drafts coming from outside occurred	70	53%	37%	10%
	Pests such as rodents or insects occurred	96	58%	35%	7%
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	75	54%	39%	7%

^a Frequency of issues is measured on 5-point scale where 1 means “never,” 2 means “a few times,” 3 means “sometimes,” 4 means “many times,” and 5 means “most or all the time.”

^b N = total number who answered the survey question.

On average, the ESA participants perceived a slight but statistically significant decline in the frequency of the issues causing harm to households after participating in ESA compared to before their participation (Table 103). However, ESA participants’ reported frequency of issues causing harm after participation was statistically similar to the frequency reported by nonparticipants during the past year. This indicates that the issues ESA participants experienced before participation caused harm more frequently than for nonparticipants, and the ESA measures potentially contributed to a reduction in the frequencies to be similar to those reported by nonparticipants.

Table 103. Comparisons of ESA Participants’ Frequency of Health Effects Caused by HCS Issues in Their Home Before and After Participation, and with Nonparticipants’ Frequency of Experiencing of Health Effects from HCS Issues During Past Year ^a

Applicable Targeted ESA Measures	HCS Issues	ESA Participants			Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants’ After Participation Frequency
		Mean Frequency (N) ^b	Mean Frequency (N) ^b	Statistical Significance ^c	Mean Frequency (N) ^b	Statistical Significance ^c
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year caused harm	2.7 (149)	2.0 (149)	-0.7*	2.0 (715)	0.0
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year caused harm	2.8 (214)	2.1 (214)	-0.7*	2.0 (744)	0.1

Applicable Targeted ESA Measures	HCS Issues	ESA Participants			Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation Frequency
		Mean Frequency (N) ^b	Mean Frequency (N) ^b	Statistical Significance ^c	Mean Frequency (N) ^b	Statistical Significance ^c
Enclosure Measures	Drafts coming from outside caused harm	2.7 (99)	2.1 (99)	-0.6*	2.0 (498)	0.1
	Pests such as rodents or insects caused harm	2.5 (123)	1.9 (123)	-0.7*	1.9 (553)	0.0
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture caused harm	2.8 (90)	2.1 (90)	-0.7*	2.2 (330)	-0.1

^a Frequency of issues is measured on 5-point scale where 1 means “never,” 2 means “a few times,” 3 means “sometimes,” 4 means “many times,” and 5 means “most or all the time.” Asked to respondents who indicated that the issue occurred in their home at least “a few times”

^b N = total number who were eligible to answer and answered the survey question.

^c Two-tailed t-test comparison of means for statistical significance; * = $p \leq .05$.

E.3.3 Participants’ Perceptions of How Targeted Measures Affected the HCS of Their Homes

The third approach to measuring ESA participants’ perceptions of the HCS impacts of targeted ESA measures involved asking them directly in the survey about how much each measure they received affected the comfort of their home and the health of their household members. Respondents could choose on an 11-point scale where 0 means “made a lot worse,” 5 means “did not cause any change,” and 10 means “made a lot better.” We recoded the variables to use a -5, 0, and +5 scale for purposes of analyses. If the targeted measures had positive HCS impacts, participants’ ratings should be positive and not zero or negative.

Overall, results indicate that ESA participants perceived all the targeted measures had, on average, positive HCS impacts (Table 104). In terms of both comfort of the home and health of household members, central AC measures, an evaporative cooler, and enclosure measures had the greatest perceived impacts, followed by heating measures and a room/window AC. Respondents also perceived that the targeted ESA measures had slightly larger average impacts on the comfort of their home than on the health of household members.

Table 104. ESA Participants’ Average Rating of How Targeted ESA Measures Affected the Comfort of Their Home and Health of Their Household Members ^a

Targeted ESA Measures	Change in Comfort of Home				Change in Health of Household Members			
	N ^b	Mean Change	% Improved	% No Change	N ^b	Mean Change	% Improved	% No Change
Furnace replacement or repair	89	+1.9	58%	36%	88	+1.1	36%	57%
Central AC replacement, repair, or tune-up	123	+3.2	81%	12%	124	+2.4	61%	35%

Targeted ESA Measures	Change in Comfort of Home				Change in Health of Household Members			
	N ^b	Mean Change	% Improved	% No Change	N ^b	Mean Change	% Improved	% No Change
Room/window AC replacement	58	+1.8	61%	31%	57	+1.3	48%	44%
Evaporative Cooler	122	+3.0	79%	14%	123	+2.2	62%	33%
Weatherization and/or attic insulation	233	+2.3	70%	24%	234	+1.8	53%	43%

^a Respondents used an 11-point scale where -5 means “made a lot worse,” 0 means “did not cause any change,” and +5 means “made a lot better.”

^b N = total number who answered survey question.

E.3.4 Participants’ vs. Nonparticipants’ Perceptions of the Overall HCS of Their Homes

The fourth approach to measuring ESA participants’ perceptions of the HCS impacts of targeted ESA measures involves comparing participants’ and nonparticipants’ responses to a question about how good or poor is the HCS components of their home. We asked respondents to rate the overall comfort of their home, the overall safety of their home, and how healthy their home is as a place to live. They used an 11-point scale where 0 means “extremely poor,” 5 means “not good but not poor,” and 10 means “extremely good.” We recoded the variable to use -5, 0, and +5 scale for purposes of analyses. If targeted ESA measures had positive HCS impacts, we expect participants’ ratings to be positive and larger than nonparticipants’ ratings.

Overall, results from this approach indicate that ESA participants perceived the HCS components of their homes to be significantly better, on average, than nonparticipants’ perceptions of the HCS components of their homes (Table 105). Both participants and nonparticipants rated the HCS components positively, on average, and both groups rated the safety of their home and their home as a healthy place to live as slightly better than the comfort of their home. The difference between participants’ and nonparticipants’ ratings for all three HCS components is also similar.

Table 105. ESA Participants’ and Nonparticipants Average Ratings of the HCS Components of their Homes ^a

HCS Components	ESA Participants		ESA Nonparticipants		Difference
	N ^b	Mean Rating	N ^b	Mean Rating	Statistical Significance ^c
Overall comfort of home	394	+2.7	871	+1.7	1.0*
Overall safety of home	390	+3.0	868	+1.9	1.1*
Home as a healthy place to live	393	+3.1	868	+2.0	1.1*

^a Respondents used an 11-point scale where -5 means “extremely poor,” 0 means “not good but not poor,” and +5 means “extremely good.”

^b N = total number who answered the survey question.

^c Two-tailed t-test comparison of means for statistical significance; * = $p \leq .05$.

E.4 Factors of ESA Participants' Perceptions of HCS Impacts of Targeted ESA Measures

We examined the relationships between ESA participants' perceptions of the HCS impacts of the targeted measures they received and a multitude of characteristics that are potential factors influencing participants' perceptions. These analyses will help better understand what could be contributing to the variation in participants' perceptions of the HCS impacts of the targeted measures.

We limit our focus to the results from two of the approaches we used above to measure ESA participants' perceptions of HCS impacts. The first approach is the change in the reported frequencies of HCS issues occurring in participants' homes and causing harm to household members before and after their ESA participation (see Table 101 and Table 103 above). We created two variables to measure the reported changes: one for the change in the frequency of the occurrence of the HCS issue in participants' homes pre- and post-participation, and another for the reported change in the frequency the HCS issue caused harm to household members pre- and post-participation. To do this, we subtracted the reported pre-participation frequency from the reported post-participation frequency, as follows:

Change in frequency of HCS issue occurring = Post-participation – pre-participation frequency

Change in the frequency of HCS issue causing harm = Post-participation – pre-participation frequency

For example, if a surveyed participant reported that, before participating in ESA drafts occurred “many times” (coded as a 4) and after participating drafts occurred only a few times (coded 2), then we subtract the pre-participation score of 4 from the post-participation score of 2 and score the respondent a -2 in change. This “change” score indicates there was a decline in frequency of drafts post-participation and thus an improvement in HCS. Negative scores mean a decline in frequency of the issue and improvement in HCS, positive scores mean an increase in frequency and a decline in HCS, and zero scores mean there was no change and no impact on HCS. The same applies to the results from the frequency that HCS issues caused harm to household members pre- and post-participation.

The second approach we focus on is ESA participants' direct assessment of the extent the targeted measures they received contributed to a change in the comfort of their homes and the health of household members post-participation (see Table 104 above). Respondents rated these attributes on a 0 to 10 scale where 0 means “made a lot worse,” 5 means “did not cause any change,” and 10 means “made a lot better.” We recoded the variables on a -5 to +5 scale where negative numbers mean a decline in HCS, zero means no change, and positive numbers mean an improvement in HCS.

We use bivariate ordinary least square (OLS) regression models to examine the relationships between the measures of ESA participants' perceptions of HCS impacts and the potential factors. In the regression models, the dependent variables are the scaled measures of ESA participants' perceptions. The independent variables we included in the regression models are the specific targeted ESA measures participants received, and the geographic, energy, economic, health, demographic, and housing characteristics we describe in Section E.2. In addition, we also include results from a survey question about whether ESA participants recalled receiving advice from their ESA contractor about improving the HCS of their home, as described in more detail below.

E.4.1 ESA Participants' Recollection of Their ESA Contractors' Advice about Improving HCS and Saving Energy

Most ESA participants (64% or more) reported that their ESA contractor explained or gave advice on how to improve HCS and save energy in their home (Table 106).⁵⁶ However, some results vary by the specific topic of advice and measure type. Over 75% of participants reported that their contractor gave them advice on how to save energy and how to improve their home's comfort while fewer participants, between 64% and 74%, reported that their contractor gave advice on how to improve their home's safety or make their home a healthier place to live. Moreover, lower percentages of participants who received a room AC replacement, heating measure, or enclosure measure reported receiving advice about improving their home's comfort and making their home a healthier place to live compared to the participants who received a central AC measure or evaporative cooler. Similarly, lower percentages of participants who received a room AC replacement reported receiving advice about improving their home's safety compared to participants who received the other measures.

Table 106. Percentage of ESA Participants Reporting Their ESA Contractor Gave Advice About Saving Energy and Improving HCS in Their Home, by Measure Type

Topic of Advice	Total	Furnace Replacement/Repair	Central AC Replacement/Repair	Room AC Replacement	Evaporative Cooler Replacement	Weatherization & Attic Insulation
N	367	85	123	67	126	215
Saving energy	89%	88%	90%	85%	89%	90%
Improving home's comfort	82%	78%	82%	77%	84%	79%
Making home healthier place to live	68%	64%	76%	62%	72%	65%
Improving home's safety	67%	69%	68%	58%	68%	67%

In addition, the types of advice participants reported receiving from their ESA contractor also varied some by IOU (Table 107). Substantially more SCE participants reported getting advice from their ESA contractor about improving their home's comfort and making their home a healthier place to live compared to the other IOU participants, but it is important to note that SCE customers received only cooling measures. More SCG participants reported receiving advice from their ESA contractor about improving their home's safety compared to the other IOU participants, which likely is due to all the surveyed SCG participants receiving natural gas furnace measures that have safety implications.

⁵⁶ All surveyed ESA participants were flagged in the IOU customer lists as having received an energy education as part of their ESA participation. However, the survey respondent may not have been the person in the household who received the advice, they may have forgotten receiving the advice, or the contractor may not have actually provided advice or provided limited advice.

Table 107. Percentage of ESA Participants Reporting Their ESA Contractor Gave Advice About Saving Energy and Improving HCS in Their Home, by IOU

Topic of Advice	Total	PG&E	SCE	SCG	SDG&E
N	367	143	137	41	46
Saving energy	89%	87%	91%	88%	91%
Improving home's comfort	82%	77%	88%	77%	80%
Making home healthier place to live	68%	65%	74%	67%	64%
Improving home's safety	67%	64%	67%	73%	68%

We combined the survey results for the HCS-related items to use as a potential factor variable in the regression analyses examining the relationship between ESA participants' HCS perceptions and potential factors. We summed surveyed ESA participants' responses to whether they received ESA contractor advice about improving comfort, improving safety, and making the home a healthier place to live. For the combined variable, a 0 means they did not receive advice about any of the three HCS improvements, 1 means they received advice about one HCS improvement, 2 means they received advice about two HCS improvements, and 3 means they received advice about all three HCS improvements.

Most participants reported receiving advice from their ESA contractor about all three HCS topics but a few did not recall receiving any advice or recalled receiving advice about only one or two of the topics (Table 108). In addition, fewer SCE participants, all who received cooling measures, reported not receiving any HCS advice compared to PG&E, SCG, and SDG&E participants, who received mostly heating and enclosure measures.

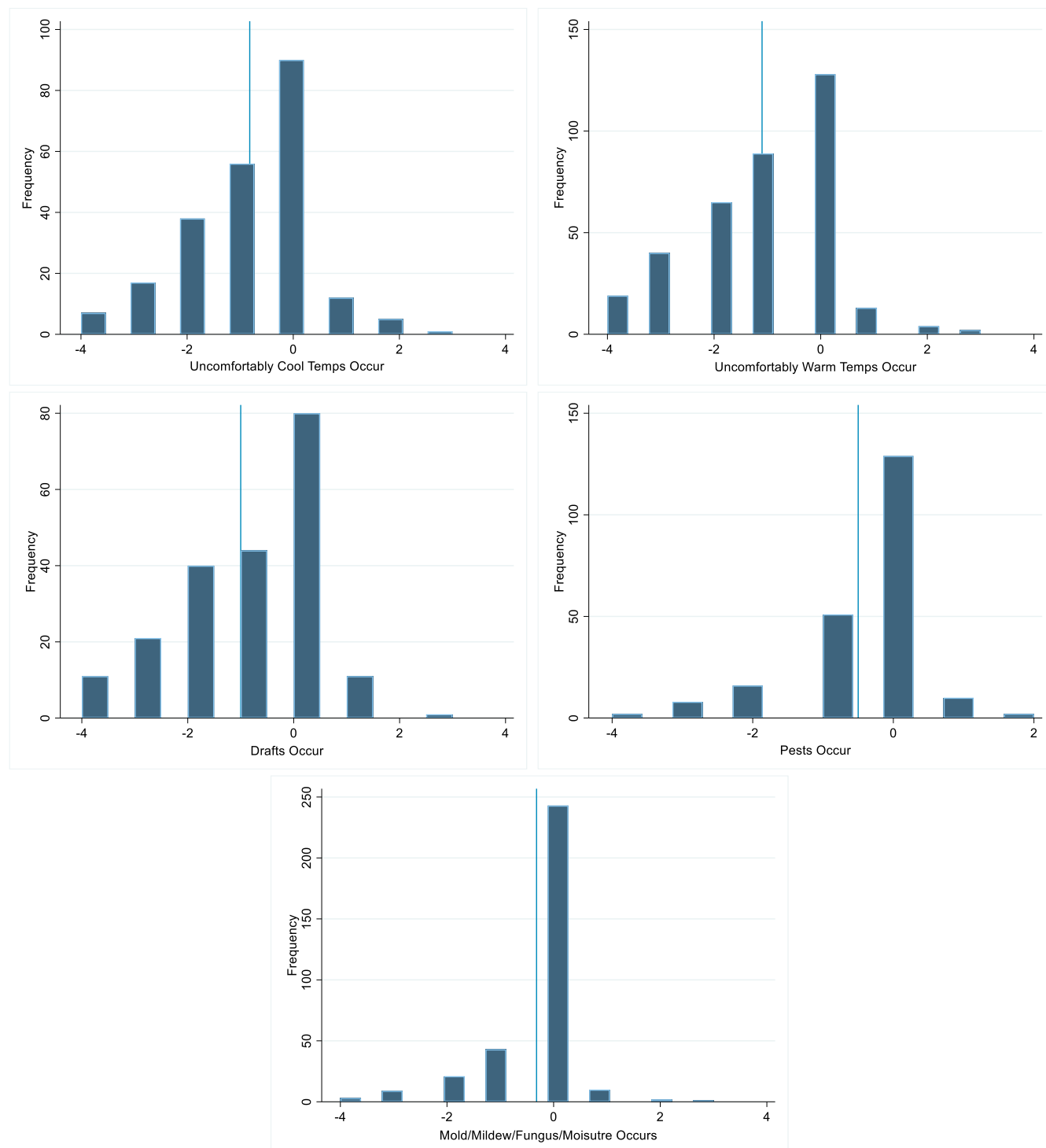
Table 108. Percentage of ESA Participants Reporting Their ESA Contractor Gave Advice About Saving Energy and Improving HCS in Their Home, by IOU

Contractor Advice on Number of HCS Topics	Total	PG&E	SCE	SCG	SDG&E
N	300	115	115	33	37
Did not recall any HCS advice	18%	23%	12%	21%	19%
Recalled advice on one HCS topic	11%	9%	12%	12%	11%
Recalled advice on two HCS topics	8%	5%	11%	3%	8%
Recalled advice on all three HCS topics	64%	63%	65%	64%	62%

E.4.2 Factors of the Changes in Participants' Reported Pre- vs. Post-Participation Frequencies of HCS Issues Occurring in Their Homes

We established that ESA participants perceived declines in the frequencies of HCS issues occurring in their homes after their participation in the program, with the perceived declines a bit greater for the temperature-related issues than for the infestation issues (D.3.2). These trends are also seen in the histograms in Figure 9 showing the distributions of the changes in the reported frequencies of the HCS issues occurring in participants' homes pre- vs. post-participation. The histograms also show that the changes in the reported frequencies vary considerably across the negative end of the scales, and that very few ESA participants perceived a post-participation increase in the frequency of the HCS issues occurring in their homes. The potential factors significantly related to the change in ESA participants' reported frequencies help to explain the variations in their perceptions of the HCS impacts.

Figure 9. Distribution of Surveyed ESA Participants' Perceptions of Changes in the Frequency of HCS Issues Occurring in Their Homes Pre- vs. Post-Participation ^a



^a Negative numbers = decrease in frequency; zero = no change; positive numbers = increase in frequency; blue line = average.

The statistically significant factors related to the change in ESA participants' reported frequencies of an HCS issue occurring in the home varied by the issue, as follows (Table 109):

- The frequency of uncomfortably cold temperatures occurring in the home declined significantly more for participants who live in the South Coast region, in cooler climate zones, received HCS advice from their ESA contractor, have lower energy burden and higher annual incomes, have employed household members, and/or live in a manufactured/mobile home and not in a duplex/triplex/fourplex.
- The frequency of uncomfortably hot temperatures occurring in the home declined significantly more for participants who received cooling and enclosure measures (vs. one alone), live in warmer climate zones, received a central AC, received HCS advice from their ESA contractor, have lower energy burdens, use alt-fuels, and/or do not live in an apartment.
- The frequency of drafts occurring in the home declined significantly more for participants who live in the South Coast region, received HCS advice from their ESA contractor, use alt-fuels, have a foreign-born household member(s), and/or live in a manufactured/mobile home and not in a duplex, triplex, or fourplex.
- The frequency of pests occurring in the home declined significantly more for participants who received HCS advice from their ESA contractor, live in larger households, and/or speak a non-English language in the home.
- The frequency of mold/mildew/fungus/moisture occurring in the home declined significantly more for participants who received a combination of attic insulation and weatherization measures, live in cooler climate regions, have lower energy burdens and higher annual incomes, have employed household members and not retired household members, have earned income and not fixed income, live in larger households, have a children(ren) but not seniors in the household, are non-white, and speak a non-English language in the household.

Table 109. Potential Factors of ESA Participants' Perceptions of the Changes in of the Frequency of HCS Issues Occurring in Their Homes Pre- vs. Post-Participation ^a

Statistically Significant Factors ^b	Heating and Enclosure Measures	Cooling and Enclosure Measures	Enclosure Measures		Heating, Cooling, and Enclosure Measures
	Frequency of Uncomfortably Cold Temps Occurring	Frequency of Uncomfortably Hot Temps Occurring	Frequency of Drafts Occurring	Frequency of Pests Occurring	Frequency of Mold/Mildew/Fungus/Moisture Occurring
Received Central AC		↓			
Received Enclosure Measure with Heating or Cooling Measure (vs. Enclosure Measure Only)		↓			
Received Weatherization & Attic Insulation (vs. Either Alone)					↓
Lives in Cooler Climate Zones	↓				
Lives in Warmer Climate Zones		↓			
Lives in South Coast Region (vs. other regions)	↓		↓		
Received Contractor HCS Advice	↓	↓	↓	↓	
Use Alt-Fuels		↓	↓		

Statistically Significant Factors ^b	Heating and Enclosure Measures	Cooling and Enclosure Measures	Enclosure Measures		Heating, Cooling, and Enclosure Measures
	Frequency of Uncomfortably Cold Temps Occurring	Frequency of Uncomfortably Hot Temps Occurring	Frequency of Drafts Occurring	Frequency of Pests Occurring	Frequency of Mold/Mildew/Fungus/Moisture Occurring
Lower Energy Burden	↓	↓			↓
Higher Income	↓				↓
Employed Household Member(s)	↓				↓
Received Earned Income					↓
No Retired Household Member(s)					↓
Not on Fixed Income					↓
Larger Household Size				↓	↓
Child(ren) in Household					↓
No Senior(s) in Household					↓
Non-White Respondent					↓
Non-English Language in Home				↓	↓
Foreign-born in Household			↓		
Lives in Manufactured/Mobile Home	↓		↓		
Does not Live in Duplex, Triplex, Fourplex	↓		↓		
Does not Live in Apartment (5+ units)		↓			

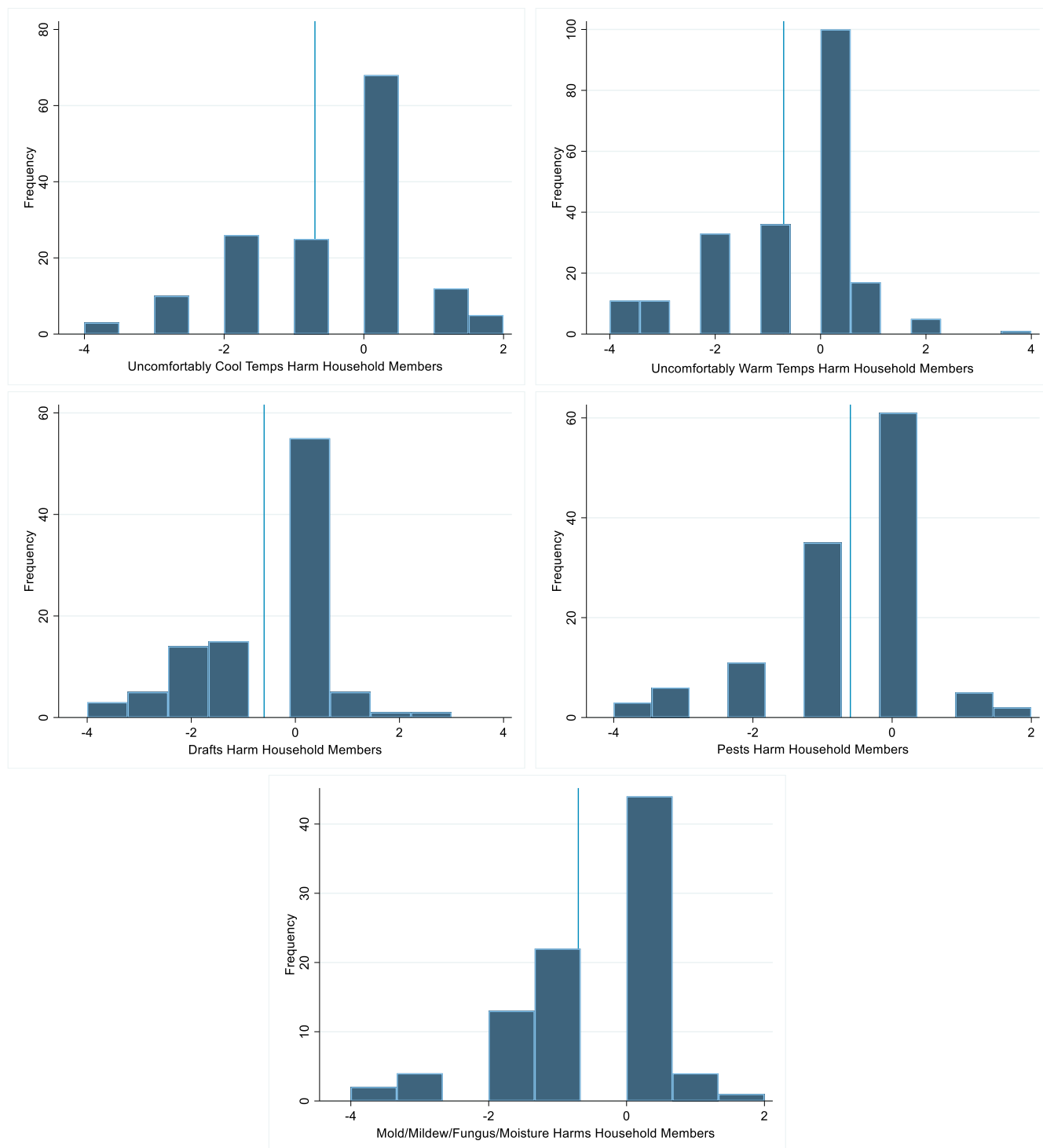
^a Downward arrows = change in reported frequency of HCS issue occurring declined significantly more in relation to the factor; upward arrows = change in reported frequency of HCS issue occurring declined significantly less or increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from ordinary least squares bivariate regression.

E.4.3 Factors of the Changes in Participants' Reported Pre- vs. Post-Participation Frequencies of HCS Issues Causing Harm to Their Household Members

We also established that ESA participants perceived a slight decline in the frequencies of HCS issues causing harm to household members after they participated in the program. These trends are reflected in the distributions of the changes in the reported frequencies (Figure 10). Most participants did not perceive a change or perceived a decline in the frequencies of HCS issues causing harm, while very few perceived an increase. The changes in the reported frequencies vary somewhat across the negative end of the scales and the potential factors significantly related to the changes in these frequencies help to explain the variations in ESA participants' perceptions of the HCS impacts.

Figure 10. Distribution of Surveyed ESA Participants' Perceptions of Changes in the Frequency of HCS Issues Causing Harm to Household Members Pre- vs. Post-Participation ^a



^a Negative numbers = decrease in frequency, zero = no change, positive numbers = increase in frequency, blue line = average.

The statistically significant factors related to the change in ESA participants' reported frequencies of an HCS issue causing harm to household members also varied by the issue, as follows (Table 110):

- The frequency of uncomfortably cold temperatures causing harm to household members declined significantly more for participants who live in warmer climate zones, received HCS advice from their ESA contractor, live in areas with lower electric service reliability, participated(ing) in CARE, are on a fixed income, own their home, and/or are non-white.
- The frequency of uncomfortably hot temperatures causing harm to household members declined significantly more for participants who received HCS advice from their ESA contractor, live in areas with lower electric service reliability, and/or participate(d) in CARE.
- The frequency of drafts causing harm to household members declined significantly more for participants who rent their home.
- The frequency of pests causing harm to household members declined significantly more for participants who do not use alt-fuels, have lower economic hardship, are not on a fixed income, and/or live in larger households.
- The frequency of mold/mildew/fungus/moisture occurring in the home declined significantly more for participants who live in homes with a higher percentage of the rooms with heating and/or cooling service and/or who are on a fixed income.

Table 110. Potential Factors of ESA Participants' Perceptions of Changes in the Frequency of HCS Issues Causing Harm to Household Members Pre- vs. Post-Participation ^a

Statistically Significant Factors ^b	Heating and Enclosure Measures	Cooling and Enclosure Measures	Enclosure Measures		Heating, Cooling, and Enclosure Measures
	Frequency of Uncomfortably Cold Temps Causing Harm	Frequency of Uncomfortably Hot Temps Causing Harm	Frequency of Drafts Causing Harm	Frequency of Pests Causing Harm	Frequency of Mold/Mildew/Fungus/Moisture Causing Harm
Live in Warmer Climate Zones	↓				
Received Contractor HCS Advice	↓	↓			
Does not Use Alt-Fuels				↓	
Live in Area with Higher SAIDI/SAIFI (Lower Reliability)	↓	↓			
Participate(d) in CARE	↓	↓			
Lower Economic Hardship				↓	
On Fixed Income	↓			↑	
Larger Household Size				↓	
Non-White Respondent	↓				
Larger % of Home Cooled					↓
Larger % of Home Heated					↓
Owns Home (vs. Rents)	↓		↓		

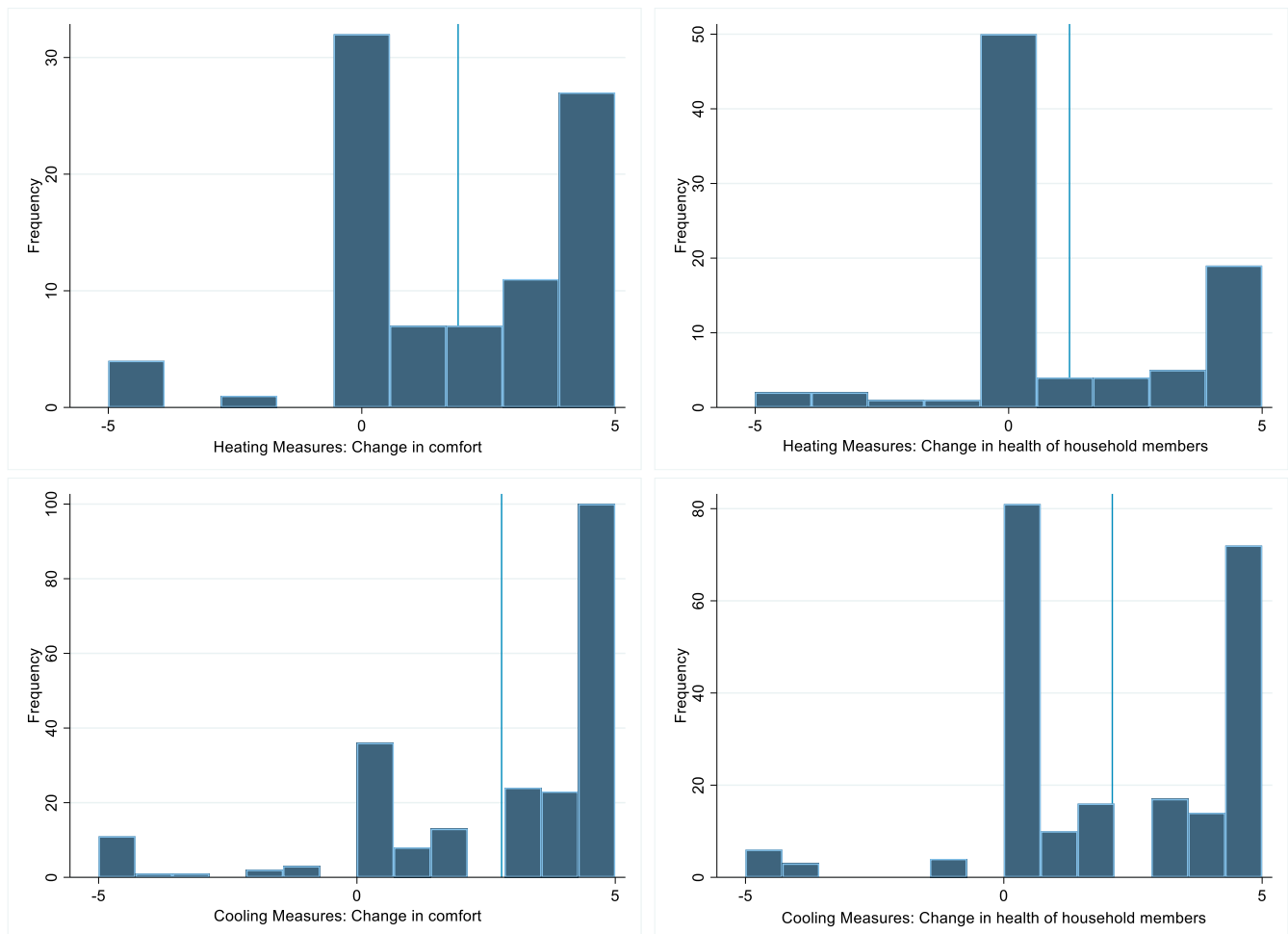
^a Downward arrows = change in reported frequency of HCS issue occurring declined significantly more in relation to the factor; upward arrows = change in reported frequency of HCS issue occurring declined significantly less or increased in relation to the factor.

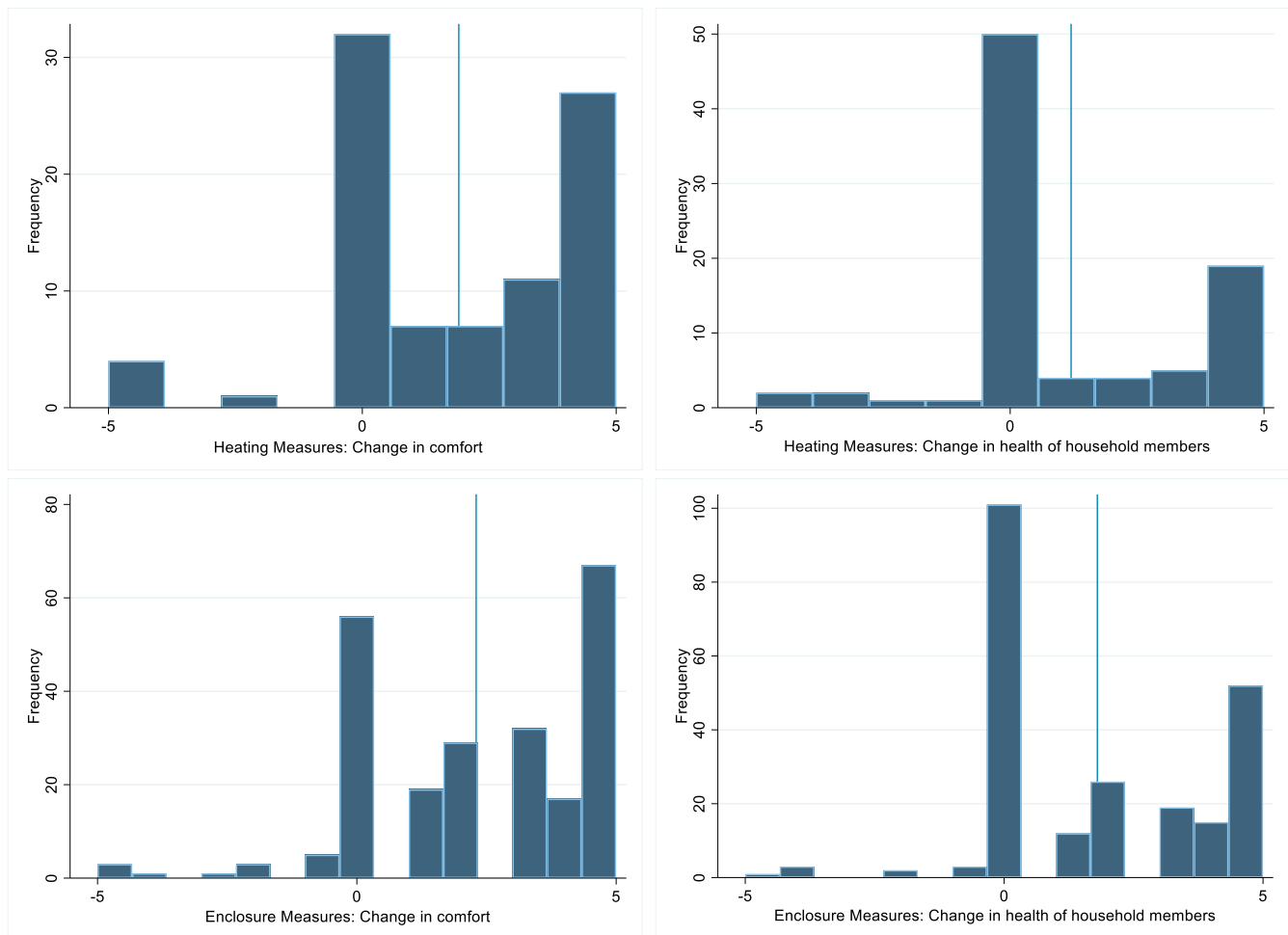
^b Statistically significant results at $p \leq .10$ from ordinary least squares bivariate regression.

E.4.4 Factors of Participants' Perceptions of How Targeted Measures Affected the Comfort of their Home and Health of Household Members

The distributions of ESA participants' direct assessments of how the targeted measure affected the comfort of their homes and health of their household members show an overall positive trend, with considerable variation on the positive end of the scales and very few reporting a decline (Figure 11). The potential factors significantly related to ESA participants' assessments help to explain the variations.

Figure 11. Distribution of Surveyed ESA Participants' Perceptions of How Targeted Measures Changed the Comfort of Their Homes and Health of Household Members ^a





^a Positive numbers = improvement, zero = no change, negative numbers = decline, blue line = average.

The statistically significant factors related to the ESA participants' assessments of changes in comfort and household members' health due to the targeted measures varied by the issue, as follows (Table 111):

- Participants who received a heating measure(s) perceived greater improvements to comfort if they live in the Desert/Mountain region, received HCS advice from their ESA contractor, have a retired household member(s), and/or do not live in an apartment.
- Participants who received a heating measure(s) perceived greater improvements to household members' health if they have a retired household member(s) and/or a foreign-born household member(s).
- Participants who received a cooling measure(s) perceived greater improvements to comfort if they received a central AC (vs. a room/window AC), live in warmer climate zones and/or Desert/Mountain region, received HCS advice from their ESA contractor, use alt-fuels, have a lower annual income, have a retired household member(s), and/or live in a manufactured/mobile home housing type.
- Participants who received a cooling measure(s) perceived greater improvements to household members' health if they received a central AC (vs. a room/window AC), live in warmer climate zones and/or Desert/Mountain region, received HCS advice from their ESA contractor, have lower annual incomes, and/or are non-white.

- Participants who received an enclosure measure(s) perceived greater improvements to comfort if they received a combination of attic insulation and weatherization measures, live in the Central Valley or South Coast regions, received HCS advice from their ESA contractor, have lower energy burden and economic and health hardship, have a retired household member(s), have a senior household member(s), do not have disabled household member(s), and/or are non-white.
- Participants who received an enclosure measure(s) perceived greater improvements to household members' health if they live in the Central Valley or South Coast regions, received HCS advice from their ESA contractor, have lower energy burden and economic hardship, are non-white, speak a non-English language at home, and/or have a foreign-born household member(s).

Table 111. Potential Factors of ESA Participants' Perceptions How Targeted Measures Changed the Comfort of Their Homes and The Health of Household Members

Statistically Significant Factors	Heating Measures		Cooling Measures		Enclosure Measures	
	Change in Comfort of Home	Change in Health of Household Members	Change in Comfort of Home	Change in Health of Household Members	Change in Comfort of Home	Change in Health of Household Members
Received Central AC (vs. Room/Window AC and Evaporative Cooler)			↑	↑		
Did not received Room/Window AC (vs. Central AC and Evaporative Cooler)			↑	↑		
Received Weatherization & Attic Insulation (vs. Either Alone)					↑	
Lives in Warmer Climate Zones			↑	↑		
Lives in Desert/Mountain Region	↑		↑	↑		
Lives in Central Valley or South Coast Regions					↑	↑
Received Contractor HCS Advice	↑		↑	↑	↑	↑
Uses Alt-Fuels			↑		↑	
Lower Energy Burden					↑	↑
Lower Economic Hardship					↑	↑
Lower Income			↑	↑		
Retired Household Member(s)	↑	↑	↑	↑	↑	
Lower Health Hardship					↑	
No Disabled Household Member(s)					↑	
No Household Member(s) with Medical Condition(s) Requiring Higher Energy Usage/Air Quality					↑	
Senior(s) in Household					↑	
Non-White Respondent				↑	↑	↑
Non-English Language in Home						↑

Statistically Significant Factors	Heating Measures		Cooling Measures		Enclosure Measures	
	Change in Comfort of Home	Change in Health of Household Members	Change in Comfort of Home	Change in Health of Household Members	Change in Comfort of Home	Change in Health of Household Members
Foreign-born Household Member(s)		↑				↑
Lives in Manufactured/Mobile Home			↑			
Does not Live in Apartment (5+ units)	↑					

^a Downward arrows = change in reported frequency of HCS issue occurring declined significantly more in relation to the factor; upward arrows = change in reported frequency of HCS issue occurring declined significantly less or increased in relation to the factor.

^b Statistically significant results at $p \leq .10$ from ordinary least squares bivariate regression.

E.4.5 Trends in Factors of ESA Participants' Perceptions of HCS Impacts

Although we found that the factors significantly associated with ESA participants' perceptions of HCS impacts varies by HCS issues and components, there are some trends across the factors, as follows:⁵⁷

ESA Program Factors

- ESA participants who recalled receiving advice from their contractor reported more improvements to nearly all aspects of HCS than participants who did not recall receiving contractor advice.
- ESA participants who received central ACs reported greater declines in the frequency of hot temps occurring in their homes and more improvements to cooling-related comfort and health effects, particularly compared to participants who did not receive a central AC or received room/window ACs.
- Participants who received a combination of attic insulation and weatherization measures reported more improvements to their home's enclosure-related comfort and a greater decline in the frequency of mold/mildew/fungus/moisture occurring in their homes compared to participants who received only one type of enclosure measure (e.g. attic insulation or weatherization).

Geographic and Energy Factors

- Participants who live in warmer climate zones reported greater declines in the frequency of hot temps and greater improvements to cooling-related comfort and health effects; conversely, participants in cooler climate zones reported greater declines in the frequency of cold temps and mold/mildew/fungus/moisture occurring but fewer declines in the frequency of cold temps causing harm to household members.
- Participants who live in the South Coast region reported greater declines in the frequency of warm temps and drafts occurring; those living in the Desert/Mountain region reported greater improvements in comfort from heating and cooling measures, and in health from cooling measures; and, those living

⁵⁷ Note that the frequency of cool temps and the heating-related comfort and health effects were asked only to participants with a heating measure or combination of heating and enclosure measures; the frequency of warm temps and cooling-related comfort and health effects were asked only to participants with a cooling measure(s) or combination of cooling and enclosure measures; the frequency of drafts and pests and enclosure-related comfort and health effects were asked only to participants with an enclosure measure(s), a combination of enclosure and cooling measures, or a combination of enclosure and heating measures; and, the frequency of mold/mildew/fungus/moisture was asked to ESA participants with any of the targeted measures.

in the Central Valley and South Coast regions reported greater improvements in comfort and health from enclosure measures.

- Participants who use alt-fuels for space or water heating or cooking reported greater declines in the frequency of hot temps and drafts occurring and greater improvements to cooling-related comfort but reported fewer declines in the frequency of pests causing harm.
- ESA participants who live in areas with lower electric service reliability and who participate(d) in CARE reported greater declines in the frequency of hot and cold temps causing harm.

Economic and Health Factors

- ESA participants with higher incomes, employed household members, and/or earned income reported greater declines in the frequency of uncomfortably cold temps and mold/mildew/fungus/moisture in their homes and more improvements in enclosure-related comfort, but also reported less improvements in cooling-related comfort and health effects.
- Economically vulnerable participants with higher energy burdens and/or economic hardship, or on a fixed income, reported lower declines in the frequency of cold and warm temps and mold/mildew/fungus/moisture occurring and causing harm and in pests causing harm, and reported less improvement in enclosure-related comfort and health effects.
- ESA participants who have retired or senior household members also reported mixed impacts; on the one hand, they reported lower declines in the frequency of mold/mildew/fungus/moisture occurring in their homes but, on the other hand, they reported greater improvements to heating- and cooling-related comfort and health effects and enclosure-related comfort effects.
- The only HCS impact correlated with participants with health vulnerabilities (e.g., high health hardship, disabled household members, and/or household members with medical condition requiring higher energy usage or air quality) is enclosure-related comfort, in which those with a health vulnerability reported less improvement to the enclosure-related comfort of their homes than those without a health vulnerability.

Demographic and Housing Factors

- Participants living in a manufactured or mobile home reported a greater decline in the frequency of cold temps and drafts occurring and more improvements to cooling-related comfort effects. In contrast, participants who live in a duplex/triplex/fourplex reported lower declines in the frequency of cold temps and drafts occurring, and participants living in apartments with five or more units reported lower declines in the frequency of hot temps and fewer improvements to heating-related comfort effects.
- Participants who rent their home reported more declines in the frequency of cold temps and drafts causing harm.
- Participants living in homes with a larger percentage of rooms with heating and/or cooling reported greater declines in the frequency of mold/mildew/fungus/moisture causing harm.
- Participants with larger household sizes reported greater declines in the frequency of pests and mold/mildew/fungus/moisture occurring and of pests causing harm.
- Participants who are non-white, speak a non-English language in their home, and/or have foreign-born household members reported greater declines in the frequency of drafts, pests, and mold/mildew/fungus/moisture occurring and greater improvements in heat- and cooling-related health effects and enclosure-related comfort and health effects.

E.5 Participants' Recommendations for Improving the ESA Program's HCS Impacts

Nearly half of surveyed ESA participants recommended that the program install in homes more of the equipment or items that impact HCS as a way to further improve HCS outcomes (Table 112). Measures participants recommended that are not provided through the program include air and water filtration/purification systems, air filters for heating and/or cooling equipment, smart thermostats, humidity or moisture monitors, carbon monoxide monitors, ventilation fans in bathrooms, efficient ceiling or portable fans, efficient portable heaters and air conditioners, solar panels, sliding doors, and stove upgrades.

About three-fourths of participants recommended improvements to communication about HCS issues, either getting more feedback from customers about HCS issues (25%), better explaining to participants how to improve HCS (26%), or better explaining the HCS benefits of the measures participants receive in their homes (25%). Over one-fourth of the participants (27%) recommended keeping the program the same.

Table 112. Surveyed ESA Participants' Recommendations for Improving the ESA Program's HCS Impacts

Recommendation ^a	Percentage (n=391)
Include in homes more equipment/items that improve HCS	46%
Keep program the same, it works well as is	27%
Better explain what participants can do to improve HCS in their homes	26%
Get more feedback from customers about HCS issues in their homes	25%
Better explain the HCS benefits of ESA measures participants receive(d)	25%

^a Respondents could select more than one recommendation from a list in the survey.

E.6 ESA Contractors' Perceptions of the HCS Impacts of Targeted ESA Measures

E.6.1 Interviewed ESA Contractors Definition and Characteristics

We interviewed a total of 12 ESA contractor supervisors or leaders (supervisors), including at least two in each IOU territory (Table 113). All the interviewed supervisors had experience during the past two years doing enrollments and assessments (E&A), heating equipment installations, cooling equipment installation, and/or installations of enclosure measures.

Table 113. ESA Program Contractor Interviews by IOU Territory and ESA Services Performed

IOU	Total Interviews	Interviews by Services Performed ^a			
		E&A	Cooling ^b	Weatherization	Heating ^b
PG&E	2	1	1	2	1
SCE	5	2	4	1	0
SCG	3	2	0	2	1
SDG&E	2	2	2	1	2
Total	12	7	7	6	4

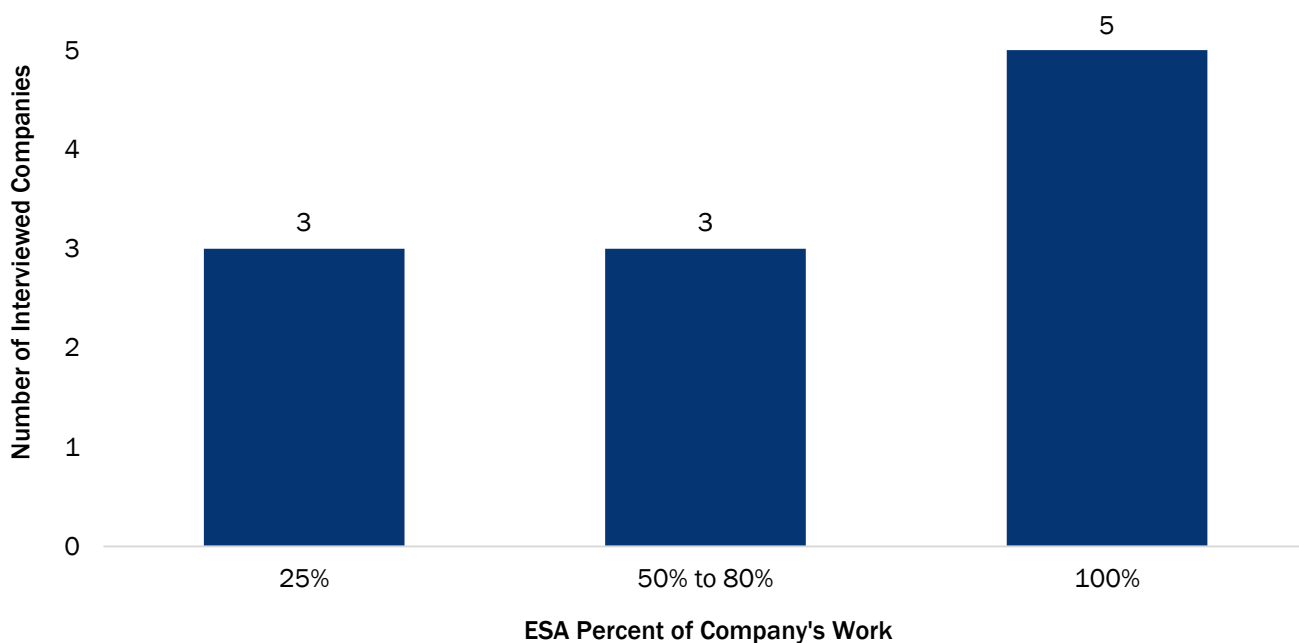
^a Most supervisor interviewees had experience performing multiple ESA program services.

^b SCE does not provide heating measures and SCG does not provide cooling measures.

The interviewed ESA supervisors had substantial experience working in the ESA program. Their time with the program ranged from 2.5 years to 24 years, with an average of 12 years. The 12 supervisors estimated that, in total, they had been to over 158,000 homes in their time working for the ESA program.

The supervisors' companies also had a depth of experience with the ESA program. The companies had been involved with the ESA program between 7 and 20 years, with an average of 14 years. About half of the companies exclusively perform work for the ESA program and the other half do some work outside of the ESA program (Figure 12). The non-ESA work included HVAC work, solar installations, landscaping, water conservation, developing and managing multifamily properties, and providing services for other programs like the Low Income Home Energy Assistance Program (LIHEAP), the California Mobile Home Program, a multifamily energy rebate program, and a commercial business lighting program.

Figure 12. Percent of Company's Work Involving the ESA Program (n=11)



E.6.2 Cooling Measures

We asked ESA supervisors with experience doing E&A and cooling work for the program about their perceptions of the HCS impacts of the program's cooling measures and the conditions under which the cooling measures provide more or fewer HCS benefits. The interviewed supervisors reported a few common themes.

Supervisors mentioned that there is high demand for cooling measures among IOU customers. Many reported that customers frequently comment on uncomfortable hot temperatures in their home and, less frequently, mention how their existing cooling system does not work or how they cannot afford to improve their thermal comfort. The supervisors said that customers will inform them of the places in their home where it is too hot (for example, upstairs) or where hot outside air is leaking into their home.

Supervisors perceived that it is common for homes to be uncomfortably hot during the peak of summer, but it was rare for a home to be dangerously hot to the occupants. Interviewees estimated that homes were dangerously hot between 0% and 10% of the time and noticed these dangerously hot conditions more often

in modular homes and homes with no attic insulation. In addition, many of the supervisors said they can tell the homes are very hot because the occupant is “sweating bullets,” or because it feels hotter inside the home than outside the home. Supervisors reported that the reason it is so hot in the house is more often because the customers are not using their existing cooling equipment to avoid a potentially high bill rather than because of broken cooling equipment.

Supervisors noticed that customers who are uncomfortably hot in their homes use a variety of inconvenient, ineffective, and costly strategies to try to keep cool. Most commonly, the customers will use plug-in fans or ceiling fans to try to cool off and limit their activity to the room with the fans. Other, less commonly mentioned strategies were opening windows, buying a backyard portable swimming pool or energy-intensive room AC, and/or leaving the home to go to the mall or a public swimming pool.

Supervisors suggested that homes with elderly customers and children tend to have greater need for cooling measures from an HCS perspective. Elderly customers who cannot drive do not leave their home during the day and cannot access refuge from the heat elsewhere. Further, they tend to reside in one place in the home for most of the day, like in a chair watching TV, and there can be a hot outside air leaking into the area where they sit. Additionally, children with autism reportedly have a great need for comfortable environments, because when it gets too hot for them, they tend to express more disruptive behavior.

According to the ESA supervisors, in most situations and for most people, evaporative coolers provide sufficient HCS benefits due to their low operating costs and effective cooling power (Table 114). Even in homes with central ACs, the occupants often do not run their AC for fear of a high energy bill and instead use an evaporative cooler. Central ACs may provide cooler temperatures throughout a home but many ESA participants want to avoid the cost of running it. Also, if the customer is enrolled in an AC cycling program, the customer can use the evaporative cooler during the peak events to save money and still cool at least part of their home. As an interviewee in SCE territory put it:

“Everyone benefits from an evaporative cooler. It’s the best way to get cool air at an efficient cost all year. Everyone’s a big fan of the energy savings compared to the central AC.”

However, interviewees mentioned a few instances for when an evaporative cooler is not ideal (Table 114). The first is in cases where an occupant has asthma. The moisture in the air produced by the evaporative cooler makes the air thicker and reportedly more difficult to breathe for people with asthma. The second is in mobile homes because evaporative coolers do not work as efficiently when installed near the metal roofs in the sunlight. The third is in humid environments where it regularly is over 100 degrees in the summer because the evaporative coolers do not work as well in these conditions.

The cases supervisors mentioned where a CAC would be better included larger and multi-level homes where several people are in different areas of the home, or in regions where it is humid and frequently over 100 degrees (Table 114). One interviewee mentioned that CACs are also better for customers with higher incomes because they are more likely to feel like they can afford to use it.

ESA supervisors perceived that room ACs to provide the most HCS benefits in smaller homes, homes where a single occupant largely spends their time in one room, or in mobile and manufactured homes (Table 114). However, as one interviewed supervisor mentioned, cases where the room has only one window that serves as the egress window in case of an emergency cannot have a room AC installed in the window. This reportedly has caused some customers to sleep in another where another cooling device makes the temperature more comfortable or to use an inefficient cooling device.

Table 114. ESA Supervisors Input on the Relative HCS Benefits of the ESA Cooling Measures

Measure	Delivers More HCS Benefits	Delivers Fewer HCS Benefits
Evaporative Cooler	<ul style="list-style-type: none"> Most homes, though smaller, one-story homes are ideal 	<ul style="list-style-type: none"> Homes with household members with asthma Manufactured/mobile homes Larger and multi-level homes Humid and hot environments
Room Air Conditioner	<ul style="list-style-type: none"> Manufactured or mobile homes Apartments Smaller homes with one resident 	<ul style="list-style-type: none"> Larger and multi-level homes
Central Air Conditioner	<ul style="list-style-type: none"> Larger and multi-level homes Humid and hot environments Multiple residents using many parts of home 	<ul style="list-style-type: none"> Smaller homes Manufactured or mobile homes Apartments Homes with one resident

Interviewed ESA supervisors also agreed that, in general, customers were receiving the right cooling measure(s) for their situation. Two of the supervisors described the ESA program as a “like for like” program. They said that, even if the customer may benefit more from a CAC than a room AC, by replacing the room AC with a newer, more efficient model, the energy savings still produce a financial benefit. So, while thermal comfort may not appreciably change, the improved affordability of cooling is still helping the customer.

The supervisors mentioned a couple challenges to getting the customer the measure they need for HCS reasons. One issue is when a landlord will not sign the form to allow their renter to receive the cooling measure. A supervisor from SCE territory estimated that one out of five customers with medical conditions were not receiving any cooling measure and attributed it solely to landlords mostly in multifamily buildings not authorizing the program to serve their tenants. The other is when the customer had no existing cooling measures in place and therefore could not qualify for a new replacement measure through the program.

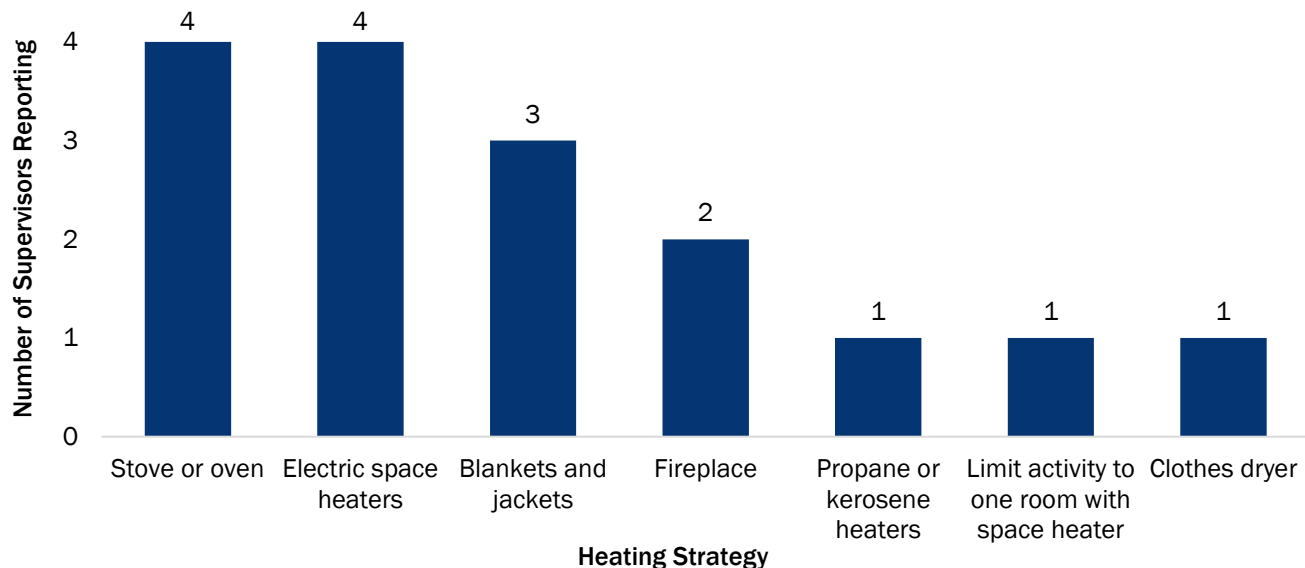
E.6.3 Heating Measures

We also asked about ESA supervisors’ perceptions of the HCS impacts resulting from the program’s heating measures and the conditions under which the heating measures provide more or fewer HCS benefits.

According to the interviewed supervisors, it is common for a home to be uncomfortably cold prior to ESA program work, but dangerously cold conditions are not very common. Interviewed ESA supervisors from SDG&E, PG&E, and SCG territories said that customers either always or often complain that they are uncomfortably cold in their homes during the winters, but that dangerously cold conditions were limited to 10% of the time or once every three to four months. The supervisors considered it dangerously cold when indoor air temperatures were below 55 degrees or if the occupant cannot comfortably live in temperatures in the 60s. Supervisors said that homes with sick and/or elderly residents are the ones most in danger of living in uncomfortably cold conditions.

Some ESA supervisors have observed customers who were uncomfortably cold in their homes and reported that many of them use dangerous or costly strategies, such as their stove, oven, or clothes dryer, to stay warm (Figure 13). Such practices are reportedly dangerous due to potential fire/burn hazards and carbon monoxide poisoning (for gas appliances). All the interviewees also mentioned that many customers use electric space heaters in ways that can overload the outlets and potentially cause shortages and fires. Similarly, fires in the fireplace also have the potential for burns and poor indoor air quality. Supervisors noted that these unconventional strategies often are not effective at keeping the home adequately warm.

Figure 13. ESA Supervisors Reporting Unconventional Strategies Customers Used to Keep Warm (n=4)



Supervisors reported that broken or very old, inefficient furnaces are most commonly the cause of uncomfortably cold homes and are the main reason customers use the ineffective and potentially dangerous unconventional heating methods. Other issues contributing to ineffective heating in homes with furnaces included supply vents being covered, vents clogged with hair, dust, and debris, or the ductwork under or in homes falling apart or needing cleaning. These issues most commonly are found in homes 30 years or older and in cases of customers with limited incomes who have lived in the house a long time and who have not performed regular maintenance or repairs on the system. Heating systems in these homes are typically very energy inefficient and/or may also be in disrepair or not wired properly.

ESA supervisors perceived the program's heating measures provide the most HCS benefits to participants with babies, young children, elderly, or infirm household members because a comfortable temperature in the home during the winter is particularly important for their comfort and health. They also commented that ESA heating measures are also very important for healthy adults if their alternative heating strategies carry carbon monoxide or fire risks. Overall, the interviewed ESA supervisors thought the program is effectively reaching the customers most in need of new heating measures because many of the customers they have served with heating measures are those who could most benefit.

E.6.4 Enclosure Measures

We asked about ESA supervisors' perceptions of the HCS benefits resulting from the program's enclosure measures, such as air sealing, duct sealing, attic insulation, and window and door replacements/repairs, and the conditions under which the measures provide more or fewer HCS benefits.

All the interviewed ESA supervisors agreed that enclosure measures were needed in most homes they serviced and in nearly all of the homes that also receive a heating and/or cooling upgrade(s).⁵⁸ Very few of the homes supervisors serviced were well weatherized and/or insulated before participating in ESA. Many of the homes with working heating and/or cooling only need enclosure measures to improve the thermal comfort and reduce

⁵⁸ Supervisors in SCE territory mentioned that SCG contractors perform the majority of weatherization services in their areas, but still commented on the necessity of weatherization in relation to heating and cooling.

drafts. Supervisors also noticed that older homes need weatherization services the most because they tend to be leakier and have less attic insulation. A couple of the supervisors added that many mobile homes, even some newer ones, also have a need for weatherization services to improve HCS due to their lower quality construction and materials.

Many supervisors observed that participants are generally happy to receive all the program measures they are eligible for, but some participants prioritize the heating and cooling upgrades, and/or appliances upgrades, over the enclosure measures and services. Unless the enclosure measure is a new window or door, many participants reportedly require additional information from the supervisor about the benefits of enclosure measures before they see as much value in the measures as they do in the equipment upgrades. Some supervisors thought that this was due to participants being able to use equipment upgrades and “feel” the benefits, which is not typically the case with enclosure measures. A couple of interviewed ESA supervisors also said the main reason some participants reject weatherization services is because they “don’t want to be bothered with all the other work” that is often required to weatherize and/or install insulation.

However, the supervisors thought that customers who do receive enclosure measures are getting the measures appropriate for their homes. They believe that the assessors do a good job of determining whether someone needs an enclosure measure or not and reported that customers with medical conditions were getting the enclosure services they needed to properly seal and insulate the home to improve thermal comfort and air quality.

E.6.5 ESA Participant Feedback to Supervisors about HCS Issues and Impacts

We asked ESA supervisors about what feedback they received from participants about the HCS issues they experienced and the impacts the program had on these issues. In general, most participant feedback is typically about the ESA contractors’ quality of work or their general appreciation for or complaints about the program. Customers reportedly do not often mention specific HCS improvements to the ESA supervisors but, given the volume of projects the interviewed supervisors had done, they were able to report on a few trends (Table 115).

The interviewed ESA supervisors most commonly heard from participants who received a cooling measure that their thermal comfort substantially improved. Some supervisors also reported receiving feedback from participants who received a central AC or evaporative cooler about improved ventilation in their homes, about being able to use more of their homes during the summer days, and about the health benefits of their upgraded cooling system, particularly participants with a household member with a heat sensitive medical condition.

Similarly, supervisors reported hearing about both comfort and health benefits from participants who received a heating measure(s). Supervisors noted that participants mostly commented on experiencing fewer times when it was uncomfortably cold in their home. A couple supervisors mentioned hearing about improvements to the ventilation of their home, about participants being able to use more of their home during winter, and about participants’ enhanced sense of safety that the natural gas they use for heating is working properly or that they don’t have to risk a natural gas safety issue since they don’t have to use their gas stove, oven, or dryer for heating.

Supervisors also reported receiving some participant feedback about the HCS benefits of enclosure measures. A few participants who received a door or window replacement or repair mentioned improved thermal comfort, fewer drafts, an enhanced sense of security, and greater protection from pest infestations. Some participants who received weatherization, insulation, and/or duct sealing noted an improvement in the performance of

their heating and/or cooling system, as well as improved thermal comfort and air quality, and fewer drafts entering the home.

Table 115. Measures' Non-Energy Benefits Reported by Customers to ESA Supervisors (n=11) ^a

ESA Measure	Health	Comfort	Safety	Notes
Central AC	✓	✓		Improved thermal comfort and ventilation; no longer limit activity to one room; fewer problems for participants with heat sensitive medical conditions
Evaporative cooler	✓	✓		Improved thermal comfort; fewer headaches and dizziness
Room/Window AC		✓		Improved thermal comfort
Furnace	✓	✓	✓	Improved thermal comfort and ventilation; no longer limit activity to one room; improved safety that gas is working properly or from not having to use gas appliances for heating; fewer problems for participants with cold sensitive medical conditions
Doors/windows		✓	✓	Improved thermal comfort and fewer drafts; enhanced feelings of security; greater protection from infestations
Weatherization/insulation/duct sealing	✓	✓		Heating/cooling systems work more effectively; improved thermal comfort and air quality, and fewer drafts.

^a One interviewed ESA supervisor said they had not received any feedback on improvements to health, comfort, or safety following ESA program work.

E.6.6 Barriers to Improving HCS and Suggestions for Improvement

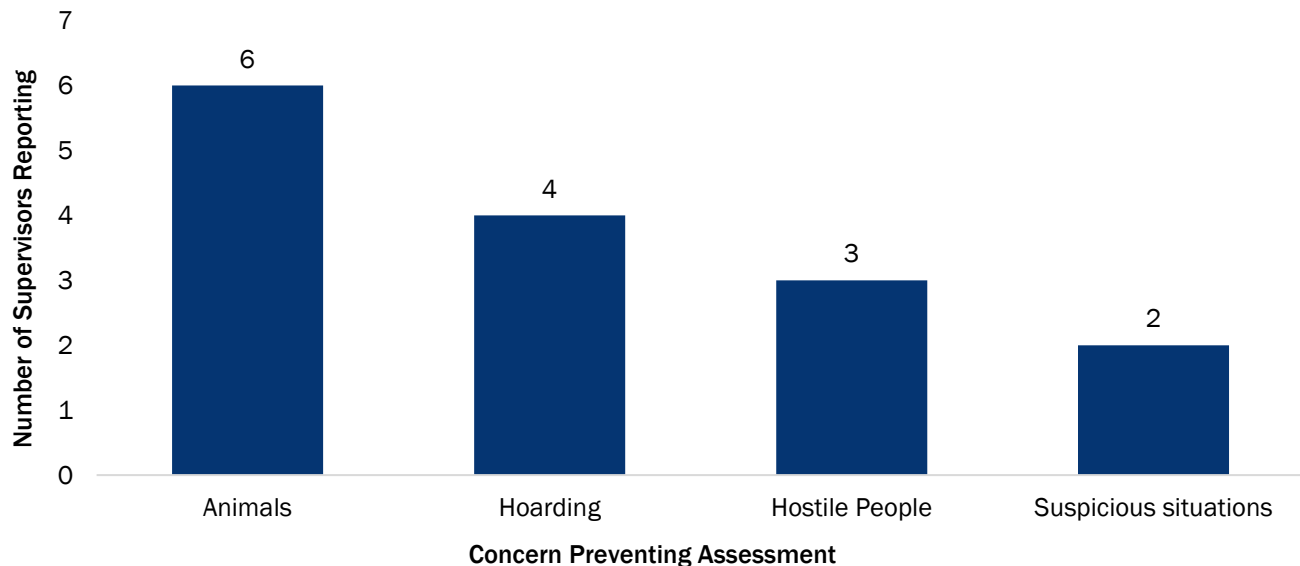
We asked ESA supervisors about what barriers they encounter to enrolling customers in the ESA program and making HCS improvements in customers' homes. The feedback we received falls into three categories: infeasible homes, program policies, information gaps and customer characteristics, and eligible measures.

Infeasible Homes

Customers who are income-eligible for ESA participation but whose homes are not safe to work in are unable to be enrolled in the ESA program. These customers live in what are referred as "infeasible homes." Interviewed E&A supervisors estimated that they encounter an infeasible home in less than 5% of their ESA projects. Figure 14 displays the most common, though infrequent, situations reported by the seven interviewees who conduct the E&A services (and are the first contractors to see the potential participants' homes). The reported situations that make a home infeasible include, from most to least common:

- Aggressive pets the occupant refuses to put away, too many animals in the home, animal feces or refuse inside the home, and/or pest infestations.
- Hoarding and too much clutter in the home preventing ESA contractors from accessing rooms or areas of the home to check existing equipment or conduct required tests.
- Hostile people who are aggressive or hostile toward the ESA contractor and/or refuse to let the contractor in the home.
- Suspicious or criminal situations like drug usage and/or dealing, theft or burglary, domestic violence, and the like occurring in or near the home.

Figure 14. Concerns Making Eligible Homes Infeasible to Assess (n=7)



Supervisors did not have any recommendations for overcoming this barrier. They reported that customers are informed of what they need to do in order for the contractors to be able to work in their homes and were unsure what more they could do.

Program Policies

ESA supervisors identified a few program policies that can prevent installation of ESA measures that may improve HCS in participants' homes. The interviewed supervisors generally understood the need for the policies and found them to be reasonable but noted that the policies can make some participants ineligible for some of the targeted measures.

The interviewed supervisors identified two situations in which they felt they could make the fewest HCS heating-related improvements due to program or measure eligibility requirements. The first is when participants use alternative heating fuels, such as propane or wood; these participants are not eligible for heating measures and possibly some enclosure measures. The second is when participants do not have existing heating in their homes. Since ESA equipment upgrades must replace or repair existing equipment, those without equipment are not qualified. Both situations are reportedly not very common, occurring in an estimated 10% or fewer homes.

Similarly, ESA supervisors reported that customers without cooling equipment are not eligible to receive cooling equipment upgrades through the program. This is reportedly more common than customers without heating equipment; an SCE supervisor reported that about three of every 10 homes he assesses do not have eligible cooling equipment to replace or repair.

Another common policy reported by ESA supervisors that could limit or prevent HCS improvements are the measure eligibility rules based on the different climate zones and/or housing types. For example, customers living in cool climate zones are typically not eligible for cooling measures. The interviewed supervisors reported having to explain this to many of their customers who could benefit from a cooling measure but who don't live in an eligible climate zone. In addition, customers living in manufactured homes in hot climate regions are not eligible to receive furnace upgrades.

Interviewed ESA supervisors mentioned a few more program policies that limit participant eligibility in regard to receiving measures that could improve their HCS (Table 116). These include rules about retreatments, housing tenure and type, type of fuels, safety issues, and climate.

Table 116. Program Rules Limiting ESA Services (n=12)

Issue	Frequency	IOU
“Ten-year rule” prevents servicing of participants’ homes that may have a need for retreatment until 10 years after they last participated in ESA.	Occurs in cases when the ESA staff may not have performed all ESA services, or a tenant misuses the house and degrades home conditions.	SDG&E
Customers in non-owner-occupied homes are unable to secure homeowner’s waiver form, preventing enrollment	Up to 30% of non-owner-occupied homes.	SCG
Cooling measures are not eligible in most cool climate zones.	Up to 30% of homes in cool zones.	SCE
Existing, functioning evaporative coolers near a mobile home’s roof cannot be replaced because they are functioning, even though they are not working as efficiently as they could be if they were placed in a window.	“The majority” of mobile homes with an evaporative cooler.	SCE
Evaporative coolers cannot be installed in apartments when there are five or more units.	All apartment buildings.	SCE
Non-owner-occupied homes cannot qualify for a furnace replacement.	25 to 30 times a year, or about 1% in SCG territory; about 25% of renters in PG&E territory	PG&E, SCG
In hot climate zones, mobile homes are ineligible for furnace replacements.	Not stated	SDG&E
Homes not heated by the utility’s gas are not eligible for all the program’s weatherization measures.	15% of homes in general, but up to 40% in Humboldt county; not stated for SDG&E territory	PG&E, SDG&E
Knob and tube wiring prevents additional attic insulation.	More common in Berkeley and areas where many homes are 100 years or older.	PG&E

Interviewed supervisors also did not have many recommendations for changing program policies. A couple thought that relaxing climate zone measure requirements would be helpful, but they also understood that these requirements likely improve cost-effectiveness of the program, which they didn’t want to be negatively impacted.

Information Gaps and Customer Characteristics

Supervisors reported that they and their contractors try to provide all participants with information about how to improve energy savings and, if relevant, how to improve HCS in their homes with the new measures participants received. However, the supervisors also noted some information gaps. Sometimes the supervisors don’t often get to speak with all the household members and thus rely on the person they spoke with to relay the information to others. Some participants are reportedly not very engaged by the information the contractors provide, don’t have the time to listen, or experience a language barrier. A few supervisors also mentioned that some participants have habits that are hard to break and noted a few times when instructing a participant on how to save energy that the participant replied that they like their old way better.

Supervisors did not have many recommendations for improving these information gaps. They reported that they do their best to communicate the information to as many household members as possible as clearly as

possible and try to work around any language barriers. A couple of supervisors suggested creating “handouts” for each measure that explains what the measure does and how participants can get the most benefit out of it.

Supervisors also mentioned that participants with lower incomes and/or who live older or deteriorated homes are often unable to afford their energy bills if they try to improve HCS, even with the upgraded equipment. A supervisor mentioned that a participant in a home that received lots of upgrades but was still in bad shape was very thankful but still couldn’t afford to run the new equipment. Supervisors did not have many recommendations for overcoming barriers associated with participants’ economic or housing characteristics. They reported that they do their best to address participants’ concerns about how they can use their new equipment under their income or housing limitations.

Overall, supervisors said they do everything they can within the guidelines to provide measures the customer is eligible to receive to enhance their HCS. In some cases, they will call the IOU and see if they can get approval to repair something important for HCS while they are at the home. If there is something they cannot address, they inform the customer of a safer way to stay warm or cool their space or note a practice in the program documentation, such as heating a home with propane. Five of the interviewed ESA supervisors mentioned they refer customers to other state or utility programs that may be able to help when the ESA program cannot, such as the LIHEAP and CARE.

Eligible ESA Measures

Unlike surveyed participants, the interviewed ESA supervisors did not report a strong need to expand the program’s eligible measures. One-fourth of the interviewees (3 of 12) did not suggest any additional measures that could improve the ESA participants’ HCS. The most feasible suggestions made the other interviewed supervisors were new smart thermostats, specialized HVAC filters, air filtration systems, efficient stoves, and encouraging more mini-split heat pump systems.

E.7 Summary of Findings, Conclusions, and Recommendations

The following are the findings from our assessment:

- Overall, surveyed ESA participants who received the targeted heating, cooling, and/or enclosure measures perceived a significant improvement in the HCS of their homes, on average. ESA participants are also very different from nonparticipants in many ways that indicate that those served by ESA needed it most.
 - In addition, interviewed ESA supervisors’ perceptions were largely aligned with the surveyed participants perceptions that the targeted measures most often result in significant HCS improvements. However, supervisors identified a few barriers to making HCS improvements that include unsafe homes, program equipment requirements, communication gaps, and very poor participant economic, health, or housing characteristics.
- Surveyed ESA participants who received targeted measures are very different from nonparticipants in several important ways that indicate that most of the customers who need ESA most are being served by ESA. On average, compared to nonparticipants, the ESA participants are more likely to:
 - Have gas service or use alt-fuels (vs. electric only), live in areas with lower electric service reliability, participate(d) in CARE, have central furnaces and ACs, fireplaces, and evaporative coolers (and less likely to have wall/space heaters and portable fans/ACs), and live in homes with a greater area serviced by the heating and cooling equipment.

- Have slightly higher energy and modified energy burdens and lower annual incomes, are more likely to get their income from fixed-income and public assistance sources (vs. earned income), and are more likely to have retirees, homemakers, and household member(s) unable to work due to disability or medical condition (vs. employed or student members).
- Have higher average health hardship, have disabled household member(s), and household member(s) with a medical condition requiring higher energy usage and/or air quality.
- Have a senior household member(s), be white (vs. Hispanic/Latinx/Spanish or Asian), speak only English in the home, own their home (vs. rent), live in a single-family or manufactured/mobile home (vs. apartments/condos), and live in a larger sized home.
- Surveyed ESA participants perceived, on average, that the targeted measures they received significantly improved the HCS of their home. They reported:
 - Moderately high to high satisfaction with the measures they received and their overall experience with the program.
 - A significant reduction in the frequency of HCS-related issues – uncomfortably cold or warm temps, drafts, mold/mildew/fungus/moisture, and pests – occurring in their home compared to before they participated in ESA and compared to the nonparticipants.
 - A significant improvement in their home’s comfort and in the health of their household members that was due at least in part to the targeted measures they received.
 - A higher average level of comfort and safety, and that their home was a healthier place to live, compared to nonparticipants.
- ESA participant characteristics significantly correlated with perceived increases in HCS improvements varied substantially by the HCS issue and outcome, and somewhat by the targeted measures participants received, as discussed in detail in Section E.3. Results indicate that:
 - Overall, HCS improvements were greater for ESA participants who recalled receiving HCS advice from their ESA contractor (vs. those who did not recall), regardless of which measures they received or HCS issues they reported.
 - Heating-related comfort improvements were greater for participants who have lower energy burdens and higher incomes, live in cooler climate zones, live in manufactured/mobile homes and not in a duplex/triplex/fourplex or an apartment/condo multifamily building, and/or who have a retired household member(s). Health improvements were greater for participants who live in warmer climate zones, live in areas with higher service reliability, participate(d) in CARE, receive a fixed-income, and/or have a retired or foreign-born household member(s).
 - Cooling-related comfort improvements were greater for participants who received a central AC (vs. room/window AC), live in warmer climate zones, use alt-fuels, have lower energy burdens and annual incomes, have a retired household member(s), and/or live in a manufactured/mobile home and not in an apartment/condo multifamily building. Health improvements were greater for participants who received a central AC (vs. room/window AC), live warmer climate zones, live in areas with higher service reliability, participate(d) in CARE, have lower annual incomes, have a retired household member(s), and/or are non-white.
 - Enclosure-related comfort improvements were greater for participants who received weatherization and attic insulation measures (vs. one alone), use alt-fuels, have lower energy burdens and economic and health hardship, do not have a disabled household member(s) or household member(s) with a medical condition(s) requiring higher usage or air quality, have a

retired household member(s), and are non-white. Health improvements were greater for participants who have lower energy burdens and economic hardship, who are non-white, speak a non-English language in the home, and have a foreign-born household member.

- *Draft-specific* comfort or health improvements were greater for participants who use alt-fuels, have a foreign-born household member(s), live in a manufactured/mobile home and not in a duplex/triplex/fourplex, and/or who rent their home.
- *Pest-specific* comfort or health improvements were greater for participants who use alt-fuels, have higher economic hardship, received a fixed-income, have larger household sizes, and/or speak a non-English language in the home.
- *Mold/mildew/fungus/moisture-specific* comfort or health improvements were greater for participants who received weatherization and attic insulation measures (vs. one alone), live in cooler climate zones, live in homes with a greater area serviced by the heating and cooling equipment, have lower energy burdens and higher incomes, received earned income and not fixed income, have employed and not retired household members, have children and not seniors in the household, have a larger household size, have a foreign-born household member(s), and are non-white.
- The feedback from interviewed ESA supervisors about the HCS impacts of the targeted measures was mostly aligned with what surveyed participants reported: overall, the measures result in HCS improvements if they are installed and used appropriately.
 - ESA supervisors' reported barriers to making greater HCS improvements, both through increasing participation among nonparticipants and through making more improvements in participants' homes, include infeasible homes where contractors cannot safely work, program policies that limit most equipment upgrades to repairs or replacements (not new installs), information gaps between contractors and participants about how to maximize energy savings and HCS improvements, and very poor economic, health, and/or housing situations.
- As these findings indicate, the targeted measures have been leading to HCS improvements, on average, but more HCS improvements could be potentially made to the homes of participants with characteristics that significantly correlate with less improvement or a decline a HCS, like those who don't recall getting advice from their ESA contractor, those with greater economic and health hardship, renters, those living in apartments, and those living in certain climate zones. In addition, continuing to install the targeted heating, cooling, and enclosure measures in future participants' homes should also lead to HCS improvements.

Appendix F. RO.3 Detailed Findings: Alternative Fuels Customer Hardships

The fourth research objective is about on the hardships of PG&E, SCE, and SDG&E low-income customers who rely on alt-fuels – propane, kerosene/oil/diesel, wood/pellets – for space heating, water heating, and/or cooking and who do not have natural gas service (alt-fuels customers). The specific research questions are:

- What are the energy burdens, unique hardships, and key characteristics of alt-fuel customers?
 - Are they different compared to non-alt-fuels customers?
- How do alt-fuel customers' energy burdens and hardships vary by key characteristics and drivers?
- To what extent do CARE and ESA programs mitigate alt-fuel customers' energy burden and hardships?

We assessed the hardships and experiences of surveyed customers who reportedly use an alternative fuel(s) – propane, kerosene/oil/diesel, and/or wood/pellets – for space heating, water heating, and/or cooking (alt-fuels customers). First, we defined the alt-fuels customers who responded to the survey and reported their distribution across the IOUs and main customers groups. Second, we presented a summary of key findings. Third, we characterized the surveyed alt-fuel customers in comparison to those who do not use alt-fuels (non-alt-fuels customers), including assessing their economic and health hardships. Fourth, we reported alt-fuels customers' experiences with using alt-fuels. Finally, we assessed alt-fuels customers' experiences with CARE, ESA, and other energy assistance or efficiency programs.

See Chapter 6 in Volume 1 for a summary of key findings. See the end of this chapter for an outline of all the results.

F.1 Alt-Fuels and Non-Alt-Fuel Customer Definitions and Distributions

F.1.1 Alt-Fuels Customers

We surveyed a total of 138 PG&E, SCE, and SDG&E alt-fuels customers.⁵⁹ We included an oversample of potential alt-fuels customers in the survey samples for each of the four primary customer groups (e.g., current and past CARE participants, CARE nonparticipants, and ESA participants) in order to obtain enough completes from alt-fuels customers for at least 90/10 confidence/precision at the state-level.

To identify potential alt-fuels customers for the survey sample, we used data from the IOUs' customer database that included a space heating and water heating fuel indicator for some customers, and we used 2016 American Community Survey data to sample customers who live in Census tracts where 50% or more households use an alt-fuel for space heating. We coded respondents as alt-fuel customers if they indicated in the survey that they used an alt-fuel for one of the main end-uses and that they did not have natural gas service. Non-alt-fuel respondents are the PG&E, SCE, and SDG&E customers who reported not using alt-fuels for space heating, water heating, and cooking.

Due to the sampling design for alt-fuels customers, the surveyed respondents are not representative of the statewide population of low-income alt-fuels customers but instead comprise a snapshot of a sample of these customers in California. Although the following results are not representative, the sample size is large enough

⁵⁹ SCG customers are excluded since they have natural gas service.

for 90/10 confidence/precision and the results do reflect the experiences of the surveyed sample of low-income alt-fuels customers and others like them that are potentially found among the statewide population.

Based on the survey disposition, more of the alt-fuels respondents are PG&E customers, followed by SCE customers, and then SDG&E customers (Table 117). We did not include an alt-fuel customer stratum within each of the main customer groups and instead relied on natural selection, which resulted in slightly more ESA participants, about the same number of current and past CARE participants, and slightly fewer CARE-eligible nonparticipants in the sample. These also vary substantially within each IOU: more of the PG&E and SDG&E customers are current or past CARE participants and more of the SCE customers are ESA participants.

In addition, most of the surveyed alt-fuels customers reported using propane, followed by wood/pellets, and then kerosene/oil/diesel (Table 117). Nearly equal numbers of surveyed propane users reported using propane for space heating, water heating, and cooking. In contrast, most of the surveyed wood users reported using wood/pellets for space heating and only about half reported using wood/pellets for water heating or cooking. All four of the surveyed kerosene/oil/diesel users reported using the fuel(s) for space heating, two reported using the fuel(s) for water heating, and one reported using the fuel(s) for cooking. Most surveyed customers also reported using one alt-fuel while a few reported using two alt-fuels (e.g., propane and wood). These trends are similar within each IOU.

Table 117. Distribution of Surveyed Alt-Fuels Customers by IOU, Customer Group, Fuel Type and End Use, and Number of Alt-Fuels ^a

Surveyed Alt-Fuels Customers	PG&E	SCE	SDG&E	Total
Total surveyed customers	450	438	327	1,215
Total surveyed alt-fuels customers	61	49	28	138
% Alt-fuels customers	14%	11%	9%	9%
Customer Group ^b	N	N	N	N
Current CARE Participant	24	1	10	35
Past CARE Participant	16	2	14	32
CARE-Eligible Nonparticipant	14	12	2	28
ESA Participant	7	34	2	43
Fuel Type and End Use	N	N	N	N
Propane	53	44	26	123
Space Heating	46	35	15	96
Water Heating	44	35	19	98
Cooking	35	36	22	93
Wood/Pellets	17	11	6	34
Space Heating	16	11	6	33
Water Heating	8	6	4	18
Cooking	9	6	4	19
Kerosene/Oil/Diesel	4	0	0	4
Space Heating	4	0	0	3
Water Heating	2	0	0	1
Cooking	1	0	0	0

Surveyed Alt-Fuels Customers	PG&E	SCE	SDG&E	Total
Number of Alt-Fuels	N	N	N	N
One	52	43	25	120
Two ^c	9	6	3	18

^a SCG customers are excluded since they all have natural gas service.

^b We did not stratify surveyed alt-fuels customers by customer group.

^c Most of the surveyed alt-fuel customers who reported using two alt-fuels selected propane and wood/pellets; one surveyed customer selected wood/pellets and kerosene/oil/diesel.

F.1.2 Non-Alt Fuels Customers

We used a convenience sample approach to collect data from 1,077 low-income non-alt-fuels customers. They are the respondents among the surveyed CARE and ESA study groups who reported not depending on alt-fuels for space heating, water heating, or cooking. Some of the non-alt-fuels customers reported using alt-fuels occasionally (e.g. wood for a cooking stove or grill, kerosene for backup heat, etc.) but not as the primary fuel for the end-uses under consideration.

F.2 Alt-Fuels Customers' Characteristics and Hardship Comparisons

We compared alt-fuels and non-alt-fuels customers on key geographic, energy, economic, health, demographic, and housing characteristics as well as on their level of economic, health, and housing hardships. We also compare alt-fuel customers who use propane with those who use wood/pellets.⁶⁰ The data for these characteristics came from the customer data we received from the IOUs and from customers' responses to questions in the survey.

F.2.1 Geographic and Energy Characteristics

Overall, more of the surveyed alt-fuels live in cooler climate zones than in warmer zones whereas non-alt-fuels users are fairly evenly distributed across the climate zones (Table 118). In addition, few alt-fuels customers live in the South Coast and Inland regions and most are in the Central Valley, Desert/Mountain, and North Coast regions. Surveyed alt-fuels and non-alt-fuels users also live in Census tracts with similar average levels of poverty. There are no differences between alt-fuels customers who use propane or wood/pellet.

Table 118. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Geographic Characteristics ^{a, b}

Geographic Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Climate Zone by Temperature ^d	N	Stat	N	Stat	N	Stat	N	Stat
Cool	123	14%		18%	138	15%	1,077	14%
Cool/Moderate		38%		35%		36%*		24%*
Moderate		16%		24%		19%*		25%*
Hot/Moderate		4%		6%		5%*		22%*
Hot		27%^		18%^		25%*		14%*

⁶⁰ We did not include a separate comparison for alt-fuels customers who use kerosene/oil/diesel since there are so few (n=4) but we did include these customers in the total estimates of alt-fuels customers.

Geographic Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Climate Zone by Geography ^e	N	Stat	N	Stat	N	Stat	N	Stat
Central Valley	123	33%	34	38%	138	33%	1,077	30%
Desert/Mountain		34%		32%		34%*		15%*
North Coast		25%		24%		25%*		19%*
South Coast		3%		0%		3%*		15%*
South Inland		4%		6%		5%*		22%*
Poverty in Census Tract ^f	N	Stat	N	Stat	N	Stat	N	Stat
Average % of Households in Poverty in Census tracts	123	17%	34	19%	138	17%	1,077	21%

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions.

^c ^ = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions.

^d We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^e We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic regions; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^f Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

The surveyed alt-fuels customers are more likely to live in areas with higher electricity reliability than the surveyed non-alt-fuels customers (Table 119). They are also more likely to have a fireplace and wall/space heater, and ceiling fans and evaporative coolers, and are less likely to have central furnaces or ACs, than non-alt-fuels customers. Similarly, propane users are more likely to have a central furnace and AC, and wall/space heaters, and are less likely to have a fireplace, heat pump, and evaporative cooler than wood/pellets users. Propane users also reported higher alt-fuels costs than wood users.

Table 119. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Energy Characteristics ^{a, b, c}

Energy Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Fuel Costs ^d	N	Stat	N	Stat	N	Stat	N	Stat
Electricity/natural gas	123	\$1,170	34	\$1,129	138	\$1,145	1,077	\$1,289
Alt-fuels		\$785^		\$320^		\$709*		\$0*
Electric Service Reliability ^e	N	Stat	N	Stat	N	Stat	N	Stat
Average SAIDI	118	0.06	31	0.07	132	0.06*	1,015	1.2*
Average SAIFI	118	0.0003	31	0.0003	132	0.0003*	1,015	0.004*

Energy Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Heating Characteristics ^f	N	Stat	N	Stat	N	Stat	N	Stat
Furnace	110	61%^	32	30%^	131	49%*	1,003	69%*
Fireplace		48%^		80%^		60%*		35%*
Wall/space heater		55%^		42%^		55%*		38%*
Radiant/hydronic		3%		3%		5%		4%
Heat pump		5%		6%		5%		4%
Baseboard		3%		6%		4%		2%
No heating equipment		2%		0%		2%		3%
Average % of home heated ^g	118	69%	33	67%	132	69%*	994	78%*
Cooling Characteristics ^f	N	Stat	N	Stat	N	Stat	N	Stat
Central AC	122	54%^	34	38%^	132	51%*	1,050	59%*
Ceiling fans		78%		76%		77%*		65%*
Portable fans		66%		65%		66%		70%
Room/window AC		21%		15%		20%		22%
Evaporative cooler		47%^		62%^		49%*		15%*
Portable AC		7%		9%		8%*		14%*
Heat pump		4%^		18%^		7%		6%
No cooling equipment		1%		0%		1%		3%
Average % of home cooled ^g	118	72%	32	73%	132	72%	1,002	72%

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^c ^ = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^d Includes 2017 electricity and natural gas costs from IOU billing data and reported alt-fuels costs used by the customers. Only non-alt-fuels customers have any natural gas costs since alt-fuels customers do not have natural gas service.

^e SAIDI is the System Average Interruption Duration Index, which measures the duration of electric outages; SAIFI is the System Average Interruption Frequency Index, which measures the frequency of electric outages.

^f Survey respondents could select more than one heating and/or cooling equipment.

^g We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

F.2.2 Economic and Health Characteristics and Hardships

Economic hardships are somewhat greater for surveyed alt-fuels customers than non-alt-fuels customers (Table 120). Although energy burden and modified energy burden are similar between the groups, alt-fuels customers' alternative energy and modified energy burden, which accounts for alt-fuels costs, is significantly higher than it is for non-alt-fuels customers. Alt-fuels customers also reported slightly higher general economic hardship and a greater frequency of difficulty paying energy bills and other basic needs than non-alt-fuels customers. Alt-fuels customers reported slightly lower average annual incomes, are more likely to received

fixed-income or public assistance sources, and are more likely to have retirees, homemakers, and household members unable to work due to a disability or medical condition compared to non-alt-fuels customers.

There are similar trends between surveyed propane and wood/pellets users within the alt-fuels group (Table 120). Compared to wood/pellets users, the propane users have higher energy and modified energy burdens, greater general economic hardship, and more often have difficulty paying energy and medical bills and other basic needs. Propane users are more likely to received earned income and have employed household members but are also more likely to receive public or other financial assistance than wood/pellets users.

Table 120. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Economic Characteristics ^{a, b, c}

Economic Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Hardship	N	Stat	N	Stat	N	Stat	N	Stat
Average energy burden ^d	123	5.2%^	34	4.2%^	138	5.1%	1,077	5.5%
Average modified energy burden ^d		4.9%^		4.0%^		4.8%		4.8%
Average alternative energy burden ^e		9.1%^		8.2%^		8.7%*		5.5%*
Average alternative modified energy burden ^e		8.5%^		6.9%^		7.5%*		4.8%*
Average economic hardship index ^f	111	3.6^	32	3.2^	126	3.5*	958	3.2*
Average months during past year had difficulty paying... ^g								
Energy bills	110	3.1^	33	2.4^	134	3.0*	982	2.2*
Rent/Mortgage		2.1^		1.5^		2.0		1.7
Other basic needs		2.7^		2.0^		2.6*		1.9*
Medical bills		2.3^		1.6^		2.2		1.7
Income and Sources	N	Stat	N	Stat	N	Stat	N	Stat
Average annual household income (\$1,000s) ^h	123	\$31.2	34	\$30.8	138	\$31.0*	1,077	\$35.0*
Earned income (from wages, salary, tips, investments)		60%^		38%^		59%		62%
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)		36%^		50%^		47%*		38%*
Public assistance (for housing, food, medical, financial, and/or childcare needs)		24%^		18%^		23%*		18%*
Other types of income/assistance ⁱ		25%^		15%^		22%		24%

Economic Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Employment Status	N	Stat	N	Stat	N	Stat	N	Stat
Employed household member(s)	123	60%^	34	47%^	138	58%*	1,077	65%*
Unemployed household member(s) looking for work		13%		12%		13%		18%
Retired household member(s)		36%^		56%^		39%*		27%*
Student household member(s)		30%		32%		31%*		40%*
Homemaker household member(s)		30%^		40%^		33%*		25%*
Household member(s) unable to work due to disability or medical condition		30%^		38%^		32%*		24%*

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^c ^ = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^d Energy burden is annual energy bills divided by annual income; modified energy burden takes into account annual public assistance benefits (as part of income).

^e Alternative energy burden is annual energy bills, including alt-fuels expenses, divided by annual income; alternative modified energy burden takes into account annual alt-fuels expenses (as part of energy bills) and public assistance benefits (as part of income).

^f Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^g Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^h Calculated by taking the average of the midpoints of the income ranges included in the survey.

ⁱ Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

Surveyed alt-fuels customers also reported higher health hardship than non-alt-fuels customers (Table 121). Their general health hardship is greater, and they are more likely to have a disabled household member(s) and/or a household member(s) with a medical condition(s) that requires higher usage or air quality, compared to non-alt-fuels customers. In addition, wood/pellets users are more likely to have a disabled household member(s) but are otherwise similar to propane users regarding the health metrics.

Table 121. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Health Characteristics ^{a, b, c}

Health Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Hardship	N	Stat	N	Stat	N	Stat	N	Stat
Average health hardship index ^d	119	4.7	30	4.5	131	4.6*	985	4.0*
Health Status	N	Stat	N	Stat	N	Stat	N	Stat
Disabled household member(s) ^e	123	33%^	34	41%^	138	35%*	1,077	26%*
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality		34%		38%		35%*		22%*

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^c ^ = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^d Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

F.2.3 Demographic and Housing Characteristics and Housing Hardships

Surveyed alt-fuels customers are quite different demographically from non-alt-fuels customers (Table 122). They have slightly lower levels of education, are more likely to be married or in a domestic partnership, are more likely to have a senior(s) in the household, and are less likely to be non-white, have a foreign-born household member(s), or speak a non-English language in the home compared to non-alt-fuels users.

Propane users are also somewhat different demographically compared to wood/pellets users (Table 122). However, propane users are less likely to be married or in a domestic partnership, more likely to have children and less likely to have seniors in the household, and are more likely to be Hispanic/Latinx/ Spanish and less likely to be white than wood/pellets users.

Table 122. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Demographic Characteristics ^{a, b, c}

Demographic Characteristics	Alt-Fuels Customer						Non-Alt-Fuels Customer	
	Propane		Wood/Pellets		Total		N	Stat
Education of Respondent	N	Stat	N	Stat	N	Stat	N	Stat
High school or less	120	30%	34	29%	135	30%	1,034	30%
Some college, no degree		30%		33%		31%*		25%*
Technical or 2-year degree		24%^		12%^		22%		19%
4-year degree or higher		16%^		25%^		17%*		27%*
Marital Status of Respondent	N	Stat	N	Stat	N	Stat	N	Stat
Married/domestic partnership	123	55%^	34	61%^	138	56%*	1,077	45%*
Single (never married, separated, divorced, or widowed)		45%^		39%^		44%*		55%*
Household Size and Composition	N	Stat	N	Stat	N	Stat	N	Stat
Average household size	119	3.3	34	3.2	134	3.3	1,038	3.3
Children under 18 in household		47%^		35%^		43%		44%
Seniors over 64 in household		33%^		43%^		36%*		30%*
Foreign-born household members	105	12%	33	10%	119	12%*	1,021	32%*

Demographic Characteristics	Alt-Fuels Customer						Non-Alt-Fuels Customer	
	Propane		Wood/Pellets		Total			
Race/Ethnicity of Respondent ^d	N	Stat	N	Stat	N	Stat	N	Stat
White	121	73%^	34	85%^	136	75%*	1,039	46%*
Hispanic/Latinx/ Spanish		19%^		10%^		18%*		33%*
Asian or Asian Indian		4%		0%		3%*		11%*
Black or African American		2%		0%		1%*		9%*
Other ^e		6%^		12%^		8%		9%
Language in Home ^f	N	Stat	N	Stat	N	Stat	N	Stat
Speaks only English	121	85%	34	88%	136	85%*	1,030	63%*
Speaks English and other language		13%		12%		13%*		31%*
Speaks only non-English language		2%		0%		2%		6%

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^c ^ = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^d Respondents could select more than one race/ethnicity.

^e Other includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^f Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Surveyed alt-fuels customers have different housing situations, but similar housing hardships compared to non-alt-fuels customers (Table 123). They are more likely to own their home, live in a single-family or manufactured/mobile home, and live in a larger sized home than non-alt-fuels customers. However, in regards to housing hardships, non-alt-fuels customers rated their home more comfortable overall than alt-fuels customers, but otherwise both groups reported similar HCS issues.

Trends are somewhat similar for propane vs. wood/pellets users (Table 123). Propane users are less likely to own their home or live in a single-family home and are more likely to live in a smaller sized home, than wood/pellets users. Both groups reported similar housing hardships with HCS issues.

Table 123. Surveyed Alt-Fuel and Non-Alt-Fuel Customer Housing Characteristics and Hardships ^{a, b, c}

Housing Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Housing Tenure	N	Stat	N	Stat	N	Stat	N	Stat
Owns home	123	60%^	34	82%^	138	62%*	1,077	44%*
Rents home		35%^		12%^		33%*		50%*
Free housing or unknown		5%		6%		5%		6%

Housing Characteristics	Alt-Fuels Customers						Non-Alt-Fuels Customers	
	Propane		Wood/Pellets		Total			
Housing Type	N	Stat	N	Stat	N	Stat	N	Stat
Single-family home	121	62%^	33	73%^	135	64%*	1,032	53%*
Apartment/condo with 5+ units		3%		3%		3%*		30%*
Duplex, triplex, fourplex		4%		0%		3%*		9%*
Townhome		2%		0%		2%		4%
Manufactured or mobile home		29%		24%		28%*		5%*
Number of Rooms in Home	N	Stat	N	Stat	N	Stat	N	Stat
1 to 3 rooms	121	20%^	33	9%^	135	18%*	1,032	29%*
4 to 5 rooms		30%		31%		30%		30%
6 to 7 rooms		28%^		33%^		30%*		24%*
8 or more rooms		22%		24%		22%*		17%*
Average number of rooms		5.6		5.9		5.7*		5.1*
Housing Hardship	N	Stat	N	Stat	N	Stat	N	Stat
Overall comfort of home ^d	120	1.8	34	1.9	135	1.8*	1,043	2.3*
Overall safety of home ^d		2.7		2.6		2.7		2.7
Home as a healthy place to live ^d		2.7		2.6		2.7		2.8
Uncomfortably cold temps inside home...								
Occur ^e	120	2.9	34	2.6	135	2.8	1,035	2.6
Cause harm ^f	103	1.9	32	1.6	117	1.9	854	2.0
Uncomfortably hot temps inside home...								
Occur ^e	120	2.8	34	2.6	135	2.7	1,036	2.8
Cause harm ^f	99	2.0	29	1.7	111	2.0	894	2.0
Drafts inside home...								
Occur ^e	119	2.4	33	2.4	133	2.4	997	2.3
Cause Harm ^f	77	2.0	22	1.9	87	2.0	617	2.0
Pests inside home...								
Occur ^e	119	2.3	34	2.5	134	2.3	1,019	2.2
Cause harm ^f	80	1.9	27	1.7	93	1.9	655	1.9
Mold/mildew/fungus/moisture inside home...								
Occurs ^e	115	1.7	34	1.7	130	1.7	989	1.8
Causes harm ^f	43	2.0	13	1.8	49	2.0	399	2.1

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^c ^ = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^d Respondents used an 11-point scale where -5 means "extremely poor," 0 means "not good but not poor," and +5 means "extremely good."

^e Frequency of occurrence is measured on 5-point scale where 1 means “never,” 2 means “a few times,” 3 means “sometimes,” 4 means “many times,” and 5 means “most or all the time.” Asked to respondents who indicated that the issue occurred in their home at least “a few times”

^f Frequency of causing harm is measured on 5-point scale where 1 means “never,” 2 means “a few times,” 3 means “sometimes,” 4 means “many times,” and 5 means “most or all the time.” Asked only to respondents who indicated that the issue occurred in their home at least “a few times”

F.2.4 Factors of Alt-Fuels Customers’ Economic and Health Hardships

We used bivariate ordinary least squares regression models to identify the factors of propane and wood/pellet alt-fuel customers’ economic and health hardships (Table 124). In the regression models, the dependent variables are energy burden, modified energy burden, the general economic hardship index, and the general health hardship index. The independent variables are the geographic, energy, economic, health, demographic, and housing characteristics we report on in Sections F.2.1 to F.2.3 above. We also conducted the regression models with non-alt-fuels customers and indicate in Table 124 below with the underlined arrows which factors are unique to the alt-fuels customers’ hardships.

- Energy burden is higher for surveyed alt-fuel customers who have higher annual electricity costs, lower annual incomes, do not receive earned income or have employed household members, and/or do not live in single-family but do live in manufactured/mobile homes.
 - For propane users, energy burden is also higher for customers who live in homes with a greater area heated with heating equipment, have higher health hardship, have a disabled household member(s), are not married or in a domestic partnership, and/or have lower education levels.
 - For wood/pellet users, energy burden is also higher for customers who receive public assistance, have a retired household member(s), and/or have fewer household members.
 - The factors of energy burden unique to alt-fuels customers (vs. non-alt-fuels customers) are IOU (propane users), retired household members (wood/pellets users), and/or manufactured/mobile home type (all alt-fuels).
- Modified energy burden is higher for surveyed alt-fuels customers who have lower annual incomes and/or who live in a manufactured/mobile home.
 - For propane users, modified energy burden is also higher for customers who do not receive earned income or have employed household members, have higher health hardship, have a disabled household member(s), have lower education levels, and/or are not married or in a domestic partnership.
 - For wood/pellet users, modified energy burden is also higher for customers who speak only English in the home.
 - The factors of modified energy burden unique to alt-fuels customers (vs. non-alt-fuels customers) are IOU (propane users) and language (wood/pellets users).
- General economic hardship is higher for surveyed alt-fuel customers who receive public and other financial assistance, have higher health hardship, and/or have a disabled household
 - For propane users, economic hardship is also higher for customers who have lower annual incomes.
 - For wood/pellet users, economic hardship is also higher for customers who have lower education levels, speak only English in the home, and/or rent their home.

- The factors of economic hardship unique to alt-fuels customers (vs. non-alt-fuels customers) are IOU (all alt-fuels), alt-fuel costs (wood/pellet users), education (wood/pellet users), and housing tenure (wood/pellet users).
- General health hardship is higher for surveyed alt-fuel customers who have lower annual incomes, have higher economic hardship, have a senior and/or disabled household member(s).
- For propane users, economic hardship is also higher for customers who receive fixed-income, do not have employed household members, have higher annual electricity costs and energy burdens, do not have a foreign-born household member(s), have fewer household members, and/or rent their home.
- For wood/pellet users, economic hardship is also higher for customers who have higher annual alt-fuels costs and/or a child(ren) in the household.
- The factors of economic hardship unique to alt-fuels customers (vs. non-alt-fuels customers) are education (propane users), electricity costs (propane users), foreign-born household members (propane users), and household size (propane users).

Table 124. Factors of Surveyed Alt-Fuel Customers' Economic and Health Hardships ^a

Statistically Significant Factors ^b	Energy Burden ^c		Alternative Energy Burden ^c		Economic Hardship ^d		Health Hardship ^e	
	Propane	Wood/Pellets	Propane	Wood/Pellets	Propane	Wood/Pellets	Propane	Wood/Pellets
Lives in Warmer Climate Zones					↓			
Lives in North Coast Region (vs. Desert/Mountain)	↓		↓		↓			
Lives in Desert Mountain Region (vs. Central Valley)	↓		↓		↓	↓		
Smaller area of home heated with heating equipment	↓							
Higher annual household income	↓	↓	↓	↓	↓		↓	↓
Receives earned income (vs. fixed income or public assistance)	↓	↓	↓	↓				
Does not receive fixed income							↓	
Does not receive public assistance		↓		↓	↓	↓		
Does not receive other financial assistance					↓	↓		
Employed household member(s)	↓	↓	↓				↓	
No retired household member(s)		↓						
Lower annual electricity costs	↓	↓	↓				↓	
Lower annual alt-fuel costs			↓	↓	↓	↓		
Lower energy burden	N/A	N/A	N/A	N/A			↓	
Lower economic hardship					N/A	N/A	↓	↓
Lower health hardship	↓		↓		↓	↓	N/A	N/A

Statistically Significant Factors ^b	Energy Burden ^c		Alternative Energy Burden ^c		Economic Hardship ^d		Health Hardship ^e	
	Propane	Wood/Pellets	Propane	Wood/Pellets	Propane	Wood/Pellets	Propane	Wood/Pellets
No Disabled household member(s)	↓		↓		↓	↓	↓	↓
No Household member(s) with medical condition(s) requiring higher usage or air quality	↓		↓		↓	↓	↓	↓
Higher education	↓		↓			↓	↓	
Child(ren) household member(s)								↓
No Senior household member(s)							↓	↓
Foreign-born household member(s)							↓	
Speaks non-English language in home				↓		↓		
Married/Domestic partnership	↓		↓					
More household members		↓					↓	
Lives in Single-family home (vs. other housing types)	↓	↓						
Does not Live in Manufactured/Mobile home (vs. other housing types)	↓	↓	↓	↓				
Owens home (vs. rent)					↓	↓	↓	

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service.

^b Statistically significant results at $p \leq .10$ from ordinary least squares bivariate regression. Downward arrows = hardship significantly decreases in relation to the factor; upward arrows = hardship significantly increases in relation to the factor; Underline = factor is unique to alt-fuel customers and is not a significant factor for non-alt-fuels customers.

^c Energy burden is annual energy bills divided by annual income; alternative energy burden takes into account annual alt-fuels expenses (as part of energy bills).

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

F.3 Experiences Using Alt-Fuels

We asked alt-fuels customers several questions about their use of alt-fuels. These included why they use their alt-fuel(s) instead of electricity or natural gas, the disadvantages of using their alt-fuel(s), their assessment of whether the alt-fuel(s) has more, less, or the same disadvantages as advantages, and the annual cost of using the alt-fuel(s).

Surveyed alt-fuels customers' reported experiences with using alt-fuels that vary substantially by the fuel type (Table 125). ⁶¹ Propane users are more likely to report using propane because they can't get natural gas service whereas wood/pellet users are more likely to report using wood/pellets because it is affordable, convenient, safe, and good for the environment. Propane users are also more likely to report the cost of using propane is a disadvantage while few wood/pellet users reported any disadvantages, the most common of which is that wood/pellets is inconvenient; this can also be seen in alt-fuels customers' reported annual costs

⁶¹ We did not conduct statistical comparisons with kerosene/oil/diesel users due to the very small sample size.

that show propane users paying over twice as much as wood/pellet users. Similarly, propane users are more likely to report that using propane is more of a disadvantage or that the advantages and disadvantages are about equal, whereas wood/pellet users are much more likely to report that using wood/pellets is more of an advantage.

Table 125. Surveyed Alt-Fuel Customers' Reported Reasons, Disadvantages, Assessment, & Costs of Using Alt-Fuels ^{a, b}

Alt-Fuel Usage Reasons, Disadvantages, Assessment, and Costs	Alt-Fuel Customers					
	Propane		Wood/Pellets		Kerosene/Oil/Diesel	
Reasons for Using Alt-Fuel Instead of Electricity or Natural Gas ^c	N	%	N	%	N	%
Can't get natural gas service	97	67%*	32	19%*	4	25%
Alt-fuel is affordable		18%*		66%*		50%
Alt-fuel is convenient		14%*		31%*		25%
Alt-fuel is safe		13%*		34%*		0%
Prefer to be off the grid		8%*		16%*		25%
Alt-fuel is good for the environment		7%*		23%*		0%
Can't get electricity service		6%		6%		25%
Other reason ^d		4%		3%		0%
Disadvantages of Using Alt-Fuel ^c	N	%	N	%	N	%
Alt-fuel is expensive	97	68%*	32	13%*	4	25%
Alt-fuel is not convenient		19%		22%		25%
Alt-fuel is bad for the environment		11%		13%		25%
Alt-fuel is not safe		11%		9%		25%
None		12%*		28%*		25%
Other disadvantage ^e		4%*		13%*		0%
Don't know		12%*		0%*		0%
Assessment of Alt-Fuel Usage	N	%	N	%	N	%
Using alt-fuel is more of an advantage	96	22%*	32	61%*	4	50%
Using alt-fuel is more of a disadvantage		40%*		16%*		50%
Advantages and disadvantages of using alt-fuel are equal		38%*		22%*		0%
Alt-Fuel Costs	N	Mean	N	Mean	N	Mean
Average annual cost of alt-fuel	123	\$785*	34	\$320*	4	\$720

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between propane alt-fuels customers and wood/pellets alt-fuels customers (kerosene/oil/diesel customers are not included in statistical comparisons due to very small sample size); two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

^c Respondents could select all that apply.

^d Other reasons respondents provided are "the alt-fuel is less expensive (than electricity/gas)" and "the alt-fuel is a better fuel (than electricity/gas)".

^e Other disadvantages respondents provided are "the alt-fuel can be messy," "the alt-fuel requires more work/time," and "the alt-fuel is the only choice (of fuels) in the area".

F.4 Alt-Fuels Customers' Program Experiences and Impacts

We compared surveyed alt-fuels customers' and non-alt-fuels customers' levels of economic and health hardships by their CARE and ESA participation status. We also assessed the extent to which the CARE and ESA program experiences and impacts were different for alt-fuels vs. non-alt-fuels customers. We combined propane and wood/pellet alt-fuel users into one group for comparisons since sample sizes within the customer groups based on CARE and ESA participation are very small.

F.4.1 CARE Program

Economic and Health Hardships

Overall, trends in the levels of economic and health hardships across CARE participation statuses are similar to those reported in Appendix C and Appendix D (Table 126). Surveyed past and current CARE participants have lower energy and modified energy burdens, in part due to the CARE discount, but reported greater general economic and health hardship compared to nonparticipants, indicating they need CARE the most. In addition, alt-fuels past CARE participants reported higher annual alt-fuels costs, followed by current CARE participants, then CARE-eligible nonparticipants.

There are also some notable differences between surveyed alt-fuels and non-alt-fuels customers within each customer group (Table 126). Alt-fuels customers have significantly higher modified energy burdens than non-alt-fuels customers across all three CARE groups, likely due to the CARE discount only applying to their electricity costs and not their alt-fuel costs. Within the past CARE participant group, alt-fuels customers reported higher general economic and health hardship compared to non-alt-fuels customers.

Table 126. Surveyed Current and Past CARE Participant and CARE-Eligible Nonparticipant Hardship Metrics, by Alt-Fuel Status ^{a, b}

Hardship Metrics	Current CARE Participant		Past CARE Participant		CARE-Eligible Nonparticipant	
	Alt-Fuels (N)	Non-Alt-Fuels (N)	Alt-Fuels (N)	Non-Alt-Fuels (N)	Alt-Fuels (N)	Non-Alt-Fuels (N)
Average Annual Electricity and Natural Gas Costs	\$1,296 (35)	\$1,256 (294)	\$1,388 (32)	\$1,418 (239)	\$1,577 (17)	\$1,673 (183)
Average Annual Alt-Fuel Costs	\$748 (35)	N/A	\$856 (32)	N/A	\$601 (17)	N/A
Average Energy Burden ^c	4.8% (35)	5.2% (294)	4.4% (32)	4.5% (239)	6.0% (17)	6.4% (183)
Average Modified Energy Burden ^c	4.6% (35)	4.4% (294)	4.3% (32)	4.1% (239)	5.6% (17)	6.0% (183)
Average Alternative Energy Burden ^c	8.2%^ (35)	5.2%^ (294)	7.5%^ (32)	4.5% (239)	8.2%^ (17)	6.4% (183)
Average Alternative Modified Energy Burden ^c	7.6%^ (35)	4.4%^ (294)	7.0%^ (32)	4.1%^ (239)	7.7%^ (17)	6.0%^ (183)
Average Economic Hardship Score ^d	4.0 (30)	4.1 (272)	3.8^ (30)	2.9^ (217)	2.6 (16)	2.4 (161)

Hardship Metrics	Current CARE Participant		Past CARE Participant		CARE-Eligible Nonparticipant	
	Alt-Fuels (N)	Non-Alt-Fuels (N)	Alt-Fuels (N)	Non-Alt-Fuels (N)	Alt-Fuels (N)	Non-Alt-Fuels (N)
Average Health Hardship Score ^e	4.3 (33)	4.0 (281)	5.2 [^] (31)	4.2 [^] (222)	3.7 (16)	3.5 (158)

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b [^] = statistically significant difference at $p \leq .10$ between alt-fuels customers and non-alt-fuels customers within each customer group; two-tailed t-tests used to compare averages.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income); alternative energy and modified energy burden includes annual alt-fuel expenses in the numerator with annual energy bills. Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

Current and Past CARE Participants' Program Impacts

Overall, surveyed alt-fuels and non-alt-fuels current and past CARE participants reported that the CARE program had moderately high to high positive impacts on their economic situations (Table 127). The reported impacts are similar for both alt-fuels and non-alt-fuels customers; there were no significant differences between them.

Table 127. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by Alt-Fuel Status ^{a, b, c}

CARE Impact	Current CARE Participants ^c		Past CARE Participants ^c	
	Alt-Fuels Mean (N)	Non-Alt-Fuels Mean (N)	Alt-Fuels Mean (N)	Non-Alt-Fuels Mean (N)
Helped improve your household's overall financial situation	8.5 (35)	8.2 (292)	8.5 (32)	8.5 (236)
Reduced the amount you worry about being able to pay your energy bills	8.3 (35)	7.8 (292)	8.4 (31)	8.3 (236)
Helped you pay your household's energy bills on time	8.2 (35)	7.8 (292)	8.2 (32)	8.0 (234)
Helped you afford other basic needs	7.9 (35)	7.9 (288)	8.2 (32)	8.0 (236)
Helped your household stay out of debt or out of deeper debt	7.7 (35)	7.5 (293)	7.8 (31)	7.8 (234)
Has been worth the effort to enroll ^d	8.7 (6)	9.1 (64)	N/A	N/A
Has been/Seemed worth the effort to renew your enrollment to continue receiving the CARE discount ^e	9.5 (22)	9.1 (187)	8.0 (27)	8.4 (181)
Has been/Seemed worth the effort to go through the process of reducing your energy use to continue receiving the CARE discount ^f	7.9 (7)	8.1 (38)	10.0 (4)	8.6 (52)

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b ^ = statistically significant difference at $p \leq .10$ between alt-fuel and non-alt-fuel customers within the current and past participants; two-tailed t-tests used to compare averages; N = number who answered survey question.

^c Agreement with statements was measured on an 11=point scale where 0 means do not agree at all and 10 means completely agree.

^d Asked only to current CARE enrollees.

^e Asked only to recertification and income verification current and past participants.

^f Asked only to high-user current and past participants.

Current and Past CARE Participants' Program Difficulties

The surveyed alt-fuels and non-alt-fuels current and past CARE participants also reported similar levels of low or moderate difficulty with CARE processes they experienced (Table 128). There were no significant differences between the alt-fuels and non-alt-fuels customers, except that non-alt-fuels customers reported greater difficulty, on average, with the high usage processes than alt-fuels customers.

Table 128. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by Alt-Fuel Status ^{a, b, c}

CARE Process	Current CARE Participants		Past CARE Participants	
	Alt-Fuels Mean (N)	Non-Alt-Fuels Mean (N)	Alt-Fuels Mean (N)	Non-Alt-Fuels Mean (N)
Understanding what information was needed from you	1.7 (35)	1.1 (291)	2.7 (27)	2.4 (226)
Gathering the required information	2.1 (34)	1.3 (290)	3.9 (28)	3.1 (220)
Completing the application (after you understood and gathered the required information)	1.3 (33)	1.0 (289)	2.5 (27)	2.1 (220)
Submitting the application to [IOU]	1.5 (35)	1.1 (290)	2.8 (27)	2.1 (220)
Going through the assessment to identify free energy-saving appliances and equipment ^d	1.3^ (6)	2.3^ (34)	1.0^ (3)	2.9^ (47)
Understanding recommendations on how to reduce our energy usage ^d	1.5^ (6)	2.1^ (36)	1.0^ (3)	2.0^ (51)
Getting the free appliances and equipment installed ^d	4.3^ (6)	2.2^ (20)	0.0^ (1)	3.5^ (37)
Reducing your household's monthly energy usage ^d	2.7^ (6)	4.0^ (37)	5.0^ (2)	4.2^ (50)

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b ^ = statistically significant difference at $p \leq .10$ between alt-fuel and non-alt-fuel customers within the current and past participants; two-tailed t-tests used to compare averages; N = number who answered survey question.

^c Difficulty was measured on an 11=point scale where 0 means not at all difficult and 10 means extremely difficult.

^d Asked only to high-user current and past participants.

Past CARE Participants' Reasons for Removal From CARE

The reasons surveyed past CARE participants reported for being removed from CARE do vary somewhat between alt-fuels and non-alt-fuels customers (Table 129). Significantly lower proportions of alt-fuels customers reported being ineligible or that continuing on CARE was an inconvenience, and higher

proportions reported not knowing how to continue on CARE and difficulty with reducing their usage, compared to non-alt-fuels customers.

Table 129. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Alt-Fuel Status ^{a, b}

Reasons for Removal from CARE ^c	Past CARE Participants	
	Alt-Fuels (N)	Non-Alt-Fuels (N)
<i>Ineligible</i> : No longer eligible	34%* (32)	42%* (239)
<i>Inconvenience</i> : Forgot to renew, too busy, too much trouble	15%* (32)	24%* (239)
<i>Unknowledgeable</i> : Didn't know how to continue CARE	22%* (32)	12%* (239)
<i>Don't Know</i> : Not sure reasons for removal	13% (32)	12% (313)
<i>Mistaken</i> : Thought we were still on CARE ^d	3% (32)	5% (313)
<i>Process Issues</i> : Tried to continue CARE, had issues with process ^d	3% (32)	4% (313)
<i>Transient</i> : Moved residences ^d	0% (32)	1% (313)
<i>No Need</i> : Didn't need CARE any longer	3% (32)	3% (239)
<i>Privacy Concerns</i> : Didn't want to provide personal information	3% (32)	2% (239)
<i>Couldn't Reduce Usage</i> : Didn't know how/couldn't reduce energy usage ^e	25%* (4)	15%* (53)
<i>Didn't Reduce Usage</i> : Didn't want to reduce our energy usage ^e	20%* (5)	2%* (53)
<i>Didn't Want ESA</i> : Didn't want ESA home assessment ^e	0% (4)	0% (63)

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuels and non-alt-fuels past participants; two-tailed z-tests used to compare proportions; N = number who answered survey question.

^c Respondents selected one or more pre-defined reasons from a list in the survey and/or provided their own reason(s).

^d Reported by respondents, not included in list of pre-defined reasons.

^e Asked only to high-user past participants.

CARE-Eligible Nonparticipants' Reported Barriers to Applying for CARE

Among the surveyed CARE-eligible nonparticipants, significantly higher proportions of alt-fuels customers reported being aware of CARE compared to non-alt-fuels customers. Among the aware nonparticipants, significantly lower proportions of alt-fuels customers reported inconvenience, frequent moving, or altruism as a barrier to applying for CARE, and significantly higher proportions reported not knowing the reason(s) for why they haven't applied for CARE, compared to non-alt-fuels customers (Table 130).

Table 130. Reasons Surveyed CARE-Eligible Nonparticipants Have Not Applied for CARE, by Alt-Fuel Status ^{a, b}

Reasons for Not Applying for CARE	CARE-Eligible Nonparticipants			
	Alt-Fuels		Non-Alt-Fuels	
	N=17	%	N=183	%
Awareness and Interest				
<i>Unaware</i> : Not aware of CARE	8	47%*	117	64%*
<i>Uninterested</i> : Not interested in applying for CARE	1	6%	14	8%
<i>Other Reason</i> (Aware of and/or interested in CARE)	8	47%*	52	28%*
Reasons for Those Aware of and Interested in CARE ^c	N=8	%	N=52	%
<i>Inconvenience</i> : Too busy/forgot about it	0	0%*	22	42%*
<i>Unknowledgeable</i> : Don't know how to enroll/what is involved	2	25%	12	23%
<i>Ineligible</i> : Don't think household would be eligible	2	25%	11	21%
<i>Mistaken</i> : Thought my household was participating	0	0%*	6	12%*
<i>Ineligible</i> : Tried to apply in the past but was ineligible	1	13%	8	15%
<i>No Need</i> : Don't need CARE, energy bills are already affordable	1	13%	6	12%
<i>Transient</i> : Household moves frequently/ will be moving soon	0	0%*	6	12%*
<i>Altruism</i> : Other people need the discount more	0	0%*	5	10%*
<i>Don't know</i> : Not sure of reason	3	38%*	3	6%*
<i>Privacy</i> : Don't want to share household info with IOU	0	0%	2	4%
<i>Ineffective</i> : CARE won't help household's financial situation	0	0%	0	0%

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuels and non-alt-fuels past participants; two-tailed z-tests used to compare proportions; N = number who answered survey question.

^c Respondents aware of and interested in CARE could select more than one reason for not applying for CARE.

F.4.2 ESA Program

We made comparisons between surveyed alt-fuels and non-alt-fuels ESA participants and, when possible, between surveyed alt-fuels ESA participants and nonparticipants to assess the effects of the program's targeted measures on HCS. We did not report results for targeted ESA heating measures since none of the surveyed alt-fuels participants received them.

Economic and Health Hardships

Overall, trends in the levels economic and health hardships between surveyed ESA participants and nonparticipants are similar to those reported in Chapter 6 (Table 131). ESA participants have at least slightly higher energy and modified energy burdens than nonparticipants, indicating that many of the participants are those who most needed the program. In addition, alt-fuels ESA participants reported higher annual alt-fuels costs than nonparticipants.

Within each group there are some notable differences between surveyed alt-fuels and non-alt-fuels customers (Table 131). Alt-fuels ESA participants have substantially higher annual energy costs and alternative energy burdens compared to non-alt-fuels participants, likely in part because alt-fuel participants are unable to receive ESA equipment upgrades on their alt-fuel equipment. The alt-fuels ESA participants also reported significantly higher health hardship than non-alt-fuels participants.

Table 131. Surveyed ESA Participant and Nonparticipant Hardship Metrics, by Alt-Fuel Status ^{a, b}

Hardship Metrics	ESA Participant		ESA Nonparticipant	
	Alt-Fuels (N)	Non-Alt-Fuels (N)	Alt-Fuels (N)	Non-Alt-Fuels (N)
Average Annual Electricity and Natural Gas Costs	\$1,036 [^] (43)	\$1,220 [^] (306)	\$1,354 (56)	\$1,351 (614)
Average Annual Alt-Fuel Costs	\$882 (43)	N/A	\$623 (56)	N/A
Average Energy Burden ^c	5.2% (43)	5.9% (306)	4.9% (56)	5.1% (614)
Average Modified Energy Burden ^c	4.8% (43)	5.0% (306)	4.7% (56)	4.6% (614)
Average Alternative Energy Burden ^c	10.2% [^] (43)	5.9% [^] (306)	7.0% [^] (56)	5.1% [^] (614)
Average Alternative Modified Energy Burden ^c	9.2% [^] (43)	5.0% [^] (306)	6.8% [^] (56)	4.6% [^] (614)
Average Economic Hardship Score ^d	3.3 (40)	3.2 (259)	3.2 (51)	3.1 (557)
Average Health Hardship Score ^e	4.7 [^] (41)	4.2 [^] (278)	4.1 (52)	3.9 (561)

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b [^] = statistically significant difference at $p \leq .10$ between alt-fuels customers and non-alt-fuels customers within each ESA group; two-tailed t-tests used to compare averages.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income); alternative energy and modified energy burden includes annual alt-fuel expenses in the numerator with annual energy bills.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

Satisfaction with ESA Program and Targeted Measures

Surveyed alt-fuels ESA participants reported higher satisfaction with cooling measures they received, particularly central AC tune-ups, evaporative coolers, and room/window ACs, compared to non-alt-fuels ESA participants. The alt-fuels participants who received weatherization and attic insulation also reported higher satisfaction with the measures than non-alt-fuels participants, but those who received weatherization only reported lower satisfaction compared to non-alt-fuels participants (Table 132).

Table 132. Surveyed ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received, by Alt-Fuel Status ^{a, b, c}

Targeted ESA Measures ^d	Alt-Fuels ESA Participants		Non-Alt-Fuels ESA Participants	
	N	Mean Satisfaction	N	Mean Satisfaction
Overall ESA experience	42	8.4	305	8.6
All cooling measures	38	8.6*	179	7.6*
All central AC measures	16	9.1	105	8.6
Existing central AC repair	13	9.6	62	9.4
Existing central AC tune-up	3	7.0*	20	5.3*
Evaporative cooler	28	8.5*	88	7.6*
Room/window AC	5	7.0*	49	5.8*
All enclosure measures	8	7.4	175	7.8
Weatherization + attic insulation	5	9.4*	80	8.0*
Weatherization only	3	4.0*	86	7.8*

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages; N = total number who answered the survey question.

^c Satisfaction measured on 11-point scale from 0 (not at all satisfied) to 10 (completely satisfied).

^d Asked only about targeted heating, cooling, and enclosure measures and none of the surveyed alt-fuel customers received heating measures, a central AC replacement, or attic insulation without weatherization measures.

ESA Program Impacts: Frequency of HCS Issues

The surveyed alt-fuels ESA participants reported a significant reduction in the frequency of two HCS issues – uncomfortably hot temperatures and drafts coming from outside – after they participated in ESA and received the targeted measures (Table 133). In addition, the reported frequency of these two issues and pests occurring in alt-fuels participants' homes after their ESA participation is significantly less than in alt-fuels nonparticipants' homes during the past year.

Table 133. Comparisons of Surveyed Alt-Fuel ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation, and with Alt-Fuel Nonparticipants' Frequency of Experiencing HCS Issues During Past Year
a, b, c

Targeted Measures	HCS Issues ^d	ESA Alt-Fuel Participants			Alt-Fuel Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Statistical Significance
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	3.8 (42)	2.0 (42)	-1.8*	3.1 (54)	-1.1*
Enclosure Measures	Drafts coming from outside occurred	4.2 (7)	2.0 (7)	-2.2*	2.5 (54)	-0.5*
	Pests such as rodents or insects occurred	2.0 (8)	1.6 (8)	-0.4	2.2 (55)	-0.6*
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	1.5 (39)	1.4 (39)	-0.1	1.6 (54)	-0.2

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuels ESA participants' difference and alt-fuels nonparticipants' difference; two-tailed t-tests used to compare average differences; N = total number who answered the survey question.

^c Frequency of HCS issues is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuels ESA participants did not receive heating measures so heating-related HCS issues are not reported.

Similarly, the reported reduction in the frequency of hot temperatures and drafts occurring in surveyed alt-fuels participants homes was significantly greater than in non-alt-fuels participants' homes (Table 134). That is, the targeted ESA measures' impacts on reducing the frequency of hot temps and drafts occurring in participants' homes was reportedly greater for alt-fuels participants than for non-alt-fuels participants.

Table 134. Comparisons of Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Alt-Fuel Participants			ESA Non-Alt-Fuel Participants		
		Before Participation	After Participation	Difference	Before Participation	After Participation	Difference
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Mean Frequency (N)	Statistical Significance
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	3.8 (42)	2.0 (42)	-1.8*	3.2 (284)	2.2 (287)	-1.0*
Enclosure Measures	Drafts coming from outside occurred	4.2 (7)	2.0 (7)	-2.2*	3.1 (168)	2.0 (172)	-1.1*
	Pests such as rodents or insects occurred	2.0 (8)	1.6 (8)	-0.4	2.4 (172)	2.0 (177)	-0.4
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	1.5 (39)	1.4 (39)	-0.1	2.0 (272)	1.6 (277)	-0.4

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuel ESA participants' difference and non-alt-fuel ESA participants' difference; two-tailed t-tests used to compare average differences; N = total number who answered the survey question.

^c Frequency of HCS issues is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuel ESA participants did not receive heating measures so heating-related HCS issues are not reported.

ESA Program Impacts: Frequency of Health Effects from HCS Issues

Surveyed alt-fuels ESA participants also reported a significant reduction in the frequency that hot temperatures and drafts caused harm to household members after they participated in ESA (Table 135). However, alt-fuels participants' reported frequencies are similar to those reported by nonparticipants for the past year.

Table 135. Comparisons of Surveyed Alt-Fuel ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation, and with Alt-Fuel Nonparticipants' Frequency of Experiencing of Health Effects from HCS Issues During Past Year ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Alt-Fuel Participants			Alt-Fuel Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Statistical Significance
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year caused harm	2.7 (22)	2.2 (22)	-0.5*	1.9 (49)	0.3
Enclosure Measures	Drafts coming from outside caused harm	3.3 (3)	2.3 (3)	-1.0*	1.9 (34)	0.4
	Pests such as rodents or insects caused harm	1.7 (4)	1.7 (4)	0.0	1.7 (36)	0.0
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture caused harm	1.9 (7)	1.9 (7)	0.0	2.2 (18)	-0.3

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuels ESA participants' difference and alt-fuels nonparticipants' difference; two-tailed t-tests used to compare average differences; N = total number who answered the survey question.

^c Frequency of HCS issue causing harm is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuels ESA participants did not receive heating measures so heating-related HCS issues are not reported.

The reported reduction in the frequencies that drafts caused harm to household members after participating in ESA was greater for surveyed alt-fuels ESA participants than for non-alt-fuels participants (Table 136). That is, the enclosure measures had a greater impact for alt-fuels participants regarding drafts in their homes causing harm. However, the reported reduction in the frequencies of health effects from pests and mold/mildew/fungus/moisture was significantly less for alt-fuels participants compared to non-alt-fuels participants, indicating that the targeted measures' impacts on reducing harm caused by these two HCS issues are greater for non-alt-fuels participants.

Table 136. Comparisons of Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Alt-Fuel Participants			ESA Non-Alt-Fuel Participants		
		Before Participation	After Participation	Difference	Before Participation	After Participation	Difference
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Mean Frequency (N)	Statistical Significance
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year caused harm	2.7 (22)	2.2 (22)	-0.5	2.8 (164)	2.1 (164)	-0.7
Enclosure Measures	Drafts coming from outside caused harm	3.3 (3)	2.3 (3)	-1.0*	2.7 (75)	2.2 (75)	-0.5*
	Pests such as rodents or insects caused harm	1.7 (4)	1.7 (4)	0.0*	2.5 (92)	1.9 (92)	-0.5*
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture caused harm	1.9 (7)	1.9 (7)	0.0*	2.9 (74)	2.2 (74)	-0.7*

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuel participants' difference and non-alt-fuel participants' difference; two-tailed t-tests used to compare average differences; N = total number who answered the survey question.

^c Frequency of HCS issue causing harm is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuel ESA participants did not receive heating measures so heating-related HCS issues are not reported.

ESA Program Impacts: Comfort and Health Changes

The surveyed alt-fuels ESA participants who received a room/window AC and/or evaporative cooler replacements reported greater improvements in the comfort of their home and health of their household members compared to non-alt-fuels participants (Table 137). There were no significant differences for central AC and weatherization/attic insulation measures.

Table 137. Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Average Rating of How Targeted ESA Measures Affected the Comfort of Their Home and Health of Their Household Members ^{a, b, c}

Targeted ESA Measures	Alt-Fuels				Non-Alt-Fuels			
	Change in Comfort of Home		Change in Health of Household Members		Change in Comfort of Home		Change in Health of Household Members	
	N	Mean Change	N	Mean Change	N	Mean Change	N	Mean Change
Central AC replacement, repair, or tune-up	16	+3.5	16	+2.0	107	+3.2	108	+2.4
Room/window AC replacement	5	+3.3 ^a	5	+3.4 ^a	53	+1.6 ^a	52	+1.1 ^a
Evaporative Cooler	29	+3.5 ^a	29	+2.7 ^a	93	+2.8 ^a	94	+2.1 ^a
Weatherization and/or attic insulation	8	+2.1	8	+1.4	181	+2.4	182	+1.8

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b ^a = statistically significant difference at $p \leq .10$ between alt-fuel participants' mean change and non-alt-fuel participants' mean change for each change (in comfort and in health); two-tailed t-tests used to compare averages; N = total number who answered the survey question.

^c Respondents used an 11-point scale where -5 means "made a lot worse," 0 means "did not cause any change," and +5 means "made a lot better."

ESA Program Impacts: Overall HCS

Surveyed alt-fuel ESA participants rated the comfort of their home and their home as a healthy place to live as significantly higher than alt-fuels nonparticipants (Table 138). However, there were no differences between alt-fuel and non-alt-fuel participants in their perceptions their homes' overall HCS (Table 139).

Table 138. Surveyed Alt-Fuel ESA Participants' and Nonparticipants Average Ratings of the HCS Components of their Homes ^{a, b, c}

HCS Components	Alt-Fuel Participants		Alt-Fuel Nonparticipants		Difference
	N	Mean Rating	N	Mean Rating	Statistical Significance
Overall comfort of home	43	+2.6	133	+1.8	0.8*
Overall safety of home	43	+3.0	133	+2.7	0.3
Home as a healthy place to live	43	+3.3	133	+2.7	0.6*

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuel participants' mean rating and alt-fuel nonparticipants' mean rating; two-tailed t-tests used to compare averages; N = total number who answered the survey question.

^c Respondents used an 11-point scale where -5 means "extremely poor," 0 means "not good but not poor," and +5 means "extremely good."

Table 139. Surveyed Alt-Fuel and Non-Alt-Fuel ESA Participants' Average Ratings of the HCS Components of their Homes ^{a, b, c}

HCS Components	Alt-Fuel Participants		Non-Alt-Fuel Participants		Difference
	N	Mean Rating	N	Mean Rating	Statistical Significance
Overall comfort of home	43	+2.6	305	+2.7	-0.1
Overall safety of home	43	+3.0	302	+3.0	0.0
Home as a healthy place to live	43	+3.3	304	+3.1	0.2

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between alt-fuel participants' mean rating and non-alt-fuel participants' mean rating; two-tailed t-tests used to compare averages; N = total number who answered the survey question.

^c Respondents used an 11-point scale where -5 means "extremely poor," 0 means "not good but not poor," and +5 means "extremely good."

F.4.3 Other Programs

We asked surveyed alt-fuels customers if they had participated in a program in the past year, other than CARE or ESA, that provided energy assistance or efficiency upgrades. Overall, of the 137 alt-fuels customers who answered the question, 18 (13%) reported they had participated in such a program and nearly all of them reported that the program was provided by their IOU (one reported not knowing; results not shown in a table). Those who reported participating in such a program also appeared to have needed it more than those who didn't participate: the program participants have higher annual alt-fuels costs and modified energy burden, and reported greater economic and health hardship than the nonparticipants (Table 140).

Table 140. Hardship Metrics for Surveyed Alt-Fuel Participants and Nonparticipants in Other (non-CARE/non-ESA) Energy Assistance or Efficiency Programs ^{a, b}

Hardship Metrics	Other Program Participant (N)	Nonparticipant (N)
Average Annual Electricity Costs	\$1,158 (18)	\$1,272 (119)
Average Annual Alt-Fuel Costs	\$893* (18)	\$741* (119)
Average Energy Burden ^c	5.1% (18)	4.8% (119)
Average Modified Energy Burden ^c	4.6% (18)	4.5% (119)
Average Alternative Energy Burden ^c	9.3% (18)	8.2% (119)
Average Alternative Modified Energy Burden ^c	8.6%* (18)	7.5%* (119)
Average Economic Hardship Score ^d	4.3* (17)	3.2* (110)
Average Health Hardship Score ^e	5.7* (15)	4.4* (112)

^a Alt-fuels customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^b * = statistically significant difference at $p \leq .10$ between participants and nonparticipants; two-tailed t-tests used to compare averages.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income); alternative energy and modified energy burden includes annual alt-fuel expenses in the numerator with annual energy bills.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

F.5 Summary of Findings, Conclusions, and Recommendations

The following are the findings from our assessment:

- Overall, surveyed alt-fuels customers have greater economic and health hardships than non-alt-fuels customers, as measured by energy and modified energy burden, and general economic and health hardship indices. They are also different in many of their energy, economic, demographic, and housing characteristics in ways that strongly correlate with greater hardships. Among alt-fuels customers, propane users reported greater hardships, and more disadvantages and higher costs to using their alt-fuel, than wood/pellet users.
- CARE program experiences and impacts are mostly similar for alt-fuels and non-alt-fuels current and past participants; they reported high positive economic impacts and low levels of difficulty with CARE processes. ESA program impacts are somewhat greater for alt-fuels participants than non-alt-fuels participants.
- Surveyed alt-fuels customers are somewhat different than non-alt-fuels customers regarding many of their hardships and characteristics. Compared to non-alt-fuels customers, the alt-fuels customers:
 - Have greater hardships in terms of their modified energy burden, general economic and health well-being, and difficulty paying energy bills and other basic needs.
 - Have lower annual incomes and are more likely to receive fixed-income or public assistance, have fewer employed and more disabled household members or household members with a medical condition(s) requiring higher usage or air quality.
 - Are more likely to have a fireplace, wall/space heater, evaporative cooler, and ceiling fans, and are less likely to have a central furnace or central AC system.
 - Have lower levels of education and are more likely to be married, have senior household members, be white, not have foreign-born household members, and speak only English in the home.
 - Are more likely to own their home, live in a single-family or manufactured home (vs. apartment/condo multifamily building or duplex/triplex/fourplex), live in a larger sized home, and have lower levels of comfort.
- Within the surveyed alt-fuels customers, propane users are different from wood/pellet users in several important ways. Compared to wood/pellet users, the propane users:
 - Have higher annual alt-fuels costs, energy and modified energy burdens, general economic hardship, and greater difficulty paying energy bills and other basic needs.
 - Are more likely to receive public and other types of financial assistance but are also more likely to receive an earned income, have more employed household members, and fewer retired or disabled household members.
 - Are more likely to have a central furnace, central AC, or wall/space heater, and are less likely to have a fireplace, evaporative cooler, or heat pump.

- Are less likely to be married, have senior household members, or be white and are more likely to have children household members and be Hispanic/Latinx/Spanish.
- Are less likely to own their home, live in a single-family home, or live in a larger sized home.
- Many characteristics are significantly correlated with alt-fuels customers' greater economic and health hardship, such as annual income, income sources, CARE participation status, marital status, and presence of disabled household members. The characteristics that are uniquely correlated to one or more of the alt-fuels customers' hardships (and are not correlated with non-alt-fuels customers' hardships) vary by the hardship metric and alt-fuel type, and include IOU, annual energy costs, employment status, housing type and tenure, education, language, and household composition and size.
- Surveyed propane and wood/pellet alt-fuels customers reported very different experiences with using their alt-fuels.
 - Propane users are more likely to report using propane because they can't get natural gas service whereas wood/pellet users are more likely to report using wood/pellets because it is affordable, convenient, safe, and good for the environment.
 - Propane users are also more likely to report the cost of using propane is a disadvantage while few wood/pellet users reported any disadvantages of using wood/pellets, the most common of which is that wood/pellets is inconvenient.
 - Propane users are more likely to report that using propane is more of a disadvantage or that the advantages and disadvantages are about equal, whereas wood/pellet users are much more likely to report that using wood/pellets is more of an advantage.
 - Propane users spend more than twice the amount annually on propane than wood/pellet users spend on wood/pellets.
- Many of alt-fuel customers who most need CARE appear to be participating. The current CARE participants have lower energy burdens than past participant and nonparticipants but have higher general economic and health hardships. However, some alt-fuels past CARE customers are income-eligible and reported greater hardships than nonparticipants and similar to that of current participants.
- Surveyed alt-fuels customers' CARE program experiences and impacts are mostly similar to those reported by non-alt-fuels customers. Both reported similar levels of positive economic impacts from CARE and similar levels of difficulty with CARE processes. However, there are a few important CARE program differences, including:
 - Modified energy burden is greater for alt-fuels customers than non-alt-fuels customers across current CARE participants, past CARE participants, and CARE-eligible nonparticipants, and alt-fuels past CARE participants also reported greater economic and health hardship and higher income-eligibility than non-alt-fuels past participants.
 - Alt-fuels past CARE participants reported a higher likelihood of being removed from CARE due to not knowing how to continue on CARE or due to high-usage issues, and reported a lower likelihood of being removed due to ineligibility or that continuing on CARE was an inconvenience, compared to non-alt-fuels past participants.
 - Alt-fuels CARE-eligible nonparticipants reported greater awareness of CARE and fewer barriers to applying for CARE than non-alt-fuels nonparticipants.
- Alt-fuels ESA participants appear to have needed ESA the most, they have higher economic and/or health hardships than alt-fuels nonparticipants and non-alt-fuels participants/nonparticipants.

- The ESA program HCS impacts were somewhat greater for alt-fuels than non-alt-fuels participants. Alt-fuels participants reported that, after participating in ESA, they experienced:
 - Greater satisfaction with cooling measures, particularly the evaporative coolers and room/window ACs than non-alt-fuels participants.
 - A lower frequency of hot temperatures and drafts occurring in their home compared to alt-fuels nonparticipants and a greater reduction in hot temps and drafts compared to non-alt-fuels participants.
 - A lower frequency of hot temperatures and drafts causing harm to household members compared to alt-fuels nonparticipants and a greater reduction in drafts, pests, and mold/mildew/fungus/moisture causing harm compared to non-alt-fuels participants.
 - Greater comfort and health impacts from evaporative coolers and room/window ACs compared to non-alt-fuels participants.
 - Greater overall comfort in their home and their home as a healthier place to live than alt-fuels nonparticipants (and the same level of comfort and healthiness compared to non-alt-fuels participants).
- About 13% of surveyed alt-fuel customers reported participating in an energy assistance or efficiency program, excluding CARE and ESA, during the prior two years. Nearly all of these customers reported that the program(s) was offered by their IOU, and it appears they needed the program(s) most:
 - Alt-fuels customers who reported participation in an energy assistance or efficiency program aside from CARE and ESA have higher annual alt-fuel costs, modified energy burden, and general economic and health hardship compared to alt-fuels nonparticipants.

Appendix G. RO.4 Detailed Findings: Low Service Reliability Customer Hardships

The fifth research objective is about the hardships of PG&E, SCE, and SDG&E low-income customers who live in low electrical service reliability areas, as defined by IOUs' System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) data that measure the duration and frequency of outages, respectively. The specific research questions are:

- What are the energy burdens, unique hardships, and key characteristics of low service reliability customers?
 - Are they different compared to high service reliability customers?
- How do low service reliability customers' energy burdens and hardships vary by key characteristics and drivers?
- To what extent do CARE and ESA programs mitigate low service reliability customers' energy burden and hardships?

We assessed the hardships and experiences of surveyed customers who live in areas with lower electricity service reliability (low service reliability customers). First, we defined the low service reliability customers who responded to the survey and reported their distribution across the IOUs and main customers groups. Second, we presented a summary of key findings. Third, we characterized the surveyed low service reliability customers in comparison to those who live in areas with higher service reliability (high service reliability customers), including assessing their economic and health hardships. Fourth, we reported low service reliability customers' experiences with electricity outages during the past year. Finally, we assessed low service reliability customers' experiences with CARE, ESA, and other energy assistance or efficiency programs.

See Chapter 7 in Volume 1 for a summary of key findings. See the end of this chapter for an outline of all the results.

G.1 Low and High Service Reliability Customer Definitions

We surveyed a total of 153 PG&E, SCE, and SDG&E low-income low service reliability customers, who we defined as customers living in areas with a SAIDI and/or SAIFI value one standard deviation or more above the mean value for all areas within an IOU's service territory.⁶² High service reliability customers live in areas with a SAIDI/SAIFI value of less than one standard deviation or more above the mean value for all areas within an IOU's service territory.

We did not stratify the survey samples by service reliability and used a convenience sample approach among the surveyed CARE and ESA study group respondents. The majority of surveyed low service reliability customers are in SCE territory, followed by SDG&E territory, and then PG&E territory (Table 141). Slightly more low service reliability survey respondents are current CARE participants than past participants, nonparticipants, or ESA participants, which all have similar sample sizes.

⁶² SCG customers are excluded since they have natural gas service and SCG does not have SAIDI/SAIFI data.

Table 141. Distribution of Surveyed Low Service Reliability Customers by IOU and Customer Group ^a

Surveyed Low Service Reliability Customers	PG&E	SCE	SDG&E	Total
Total surveyed customers with known SAIDI/SAIFI values	403	426	318	1,147
Total surveyed low service reliability customers	24	83	46	153
% Low service reliability customers	6%	19%	14%	13%
Customer Group ^b				
Current CARE participants	7	23	14	44
Past CARE participants	7	20	5	32
CARE-eligible nonparticipants	2	14	15	31
ESA participants	4	24	8	36

^a SCG customers are excluded since they all have natural gas service and SCG does not have SAIDI/SAIFI data.

^b We did not stratify surveyed low-service reliability customers by customer group.

Due to the convenience sampling design for surveying and identifying low and high service reliability customers, the surveyed respondents are not representative of the statewide population of low-income customers in these areas. Instead, they comprise a snapshot of a sample of these customers in California. Although the following results are not representative, the sample size is large enough for 90/10 confidence/precision and the results do reflect the experiences of the surveyed sample of low-income low service reliability customers that are potentially found among the statewide population. However, more research is needed for representative, conclusive results.

G.2 Low Service Reliability Customers' Characteristics and Hardships Comparisons

We compared low and high service reliability customers on key geographic, energy, economic, health, demographic, and housing characteristics as well as on their level of economic, health, and housing hardships. The data for these characteristics came from the customer data we received from the IOUs and from customers' responses to questions in the survey.

G.2.1 Geographic and Energy Characteristics

Overall, more of the surveyed low and high service reliability customers live in moderate and warmer climate zones than in cooler zones (Table 142). More of the low service reliability customers live in hot/moderate climate zones and fewer live in cooler climate zones than high service reliability customers. In addition, more low service reliability customers are in the Desert/Mountain, South Coast, and South Inland regions, and fewer are in the Central Valley and North Coast, compared to high-service reliability customers. Low and high service reliability customers live in Census tracts with similar levels of poverty and alt-fuel usage.

Table 142. Surveyed Lower and Higher Service Reliability Customer Geographic Characteristics ^{a, b}

Geographic Characteristics	Low Service Reliability Customers		High Service Reliability Customers	
Climate Zone by Temperature ^c	N	Stat	N	Stat
Cool	153	8%*	994	16%*
Cool/Moderate		13%*		25%*
Moderate		28%		24%
Hot/Moderate		30%*		20%*
Hot		21%*		15%*
Climate Zone by Geography ^d	N	Stat	N	Stat
Central Valley	153	16%*	994	30%*
Desert/Mountain		25%*		16%*
North Coast		8%*		22%*
South Coast		22%*		11%
South Inland		30%*		20%*
Poverty in Census Tract ^e	N	Stat	N	Stat
Average % of Households in Poverty in Census tracts	153	21%	994	20%
Alt-Fuel Usage in Census Tract ^f	N	Stat	N	Stat
Average % of Households Using Alt-Fuels in Census tracts	153	14%	994	13%

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on heating and cooling degree days; the cool zone includes zones 1, 2, 3, and 5; the cool/moderate zone includes zones 4, 11, and 12; the moderate zone includes zones 6, 7, and 13; the hot/moderate zone includes zones 8, 9, and 10; and, the hot zone includes zones 14 and 15.

^d We recoded the 16 climate zones used by the IOUs and CPUC into five zones based on geographic regions; the Central Valley zone includes zones 11, 12, and 13; the Desert/Mountain zone includes zones 14, 15, and 16; the North Coast zone includes zones 1, 2, 3, 4, and 5; the South Coast zone includes zones 6 and 7; and, the South Inland zone includes zones 9 and 10.

^e Households in poverty earn 100% or less of FPG; data from 2017 ACS 5-year estimates.

^f Households using alt-fuels (not electricity or natural gas) for heating; data is from 2017 ACS 5-year estimates and was used for stratifying the survey sample to include more alt-fuels customers.

Surveyed low and high service reliability customers have similar energy characteristics (Table 143). Most have electricity and natural gas service, and similar percentages have only electricity or electricity and alt-fuels. A majority also reportedly have central furnaces and ACs but lower service reliability customers are more likely to have a fireplace and ceiling fans compared to high service reliability customers.

Table 143. Surveyed Lower and Higher Service Reliability Customer Energy Characteristics ^{a, b, c}

Energy Characteristics	Low Service Reliability Customers		High Service Reliability Customers	
Fuel Type	N	Stat	N	Stat
Electricity and natural gas	153	69%	994	69%
Electricity only		21%		20%
Electricity and alt-fuels		10%		11%
Fuel Costs ^d	N	Stat	N	Stat
Average annual costs	153	\$1,256	994	\$1,290
Heating Characteristics ^e	N	Stat	N	Stat
Furnace	147	65%	965	68%
Fireplace		41%*		36%*
Wall/space heater		38%		41%
Radiant/hydronic		8%		3%
Heat pump		4%		5%
Baseboard		2%		3%
No heating equipment		3%		3%
Average % of home heated ^f	144	74%	919	77%
Cooling Characteristics ^e	N	Stat	N	Stat
Central AC	151	56%	976	57%
Ceiling fans		72%*		65%*
Portable fans		73%		69%
Room/window AC		22%		22%
Evaporative cooler		21%		19%
Portable AC		14%		13%
Heat pump		5%		6%
No cooling equipment		3%		3%
Average % of home cooled ^f	143	69%	928	72%

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question; Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^d Includes 2017 electricity and natural gas costs from IOU billing data.

^e Survey respondents could select more than one heating and/or cooling equipment.

^f We measured the average percentage of homes heated and cooled by asking surveyed respondents the number of rooms in their homes that are heated and cooled, and dividing the result by the total number of rooms respondents reported are in their homes (excluding unoccupied rooms like closets, pantries, and hallways).

G.2.2 Economic and Health Characteristics and Hardships

Surveyed low and high service reliability customers also have similar economic characteristics and hardships, except in regard to their energy burden (Table 144). Low service reliability customers have higher energy

burdens than high service reliability customers, and reported more frequent difficulty paying their energy bills, than high service reliability customers. Low service reliability customers also reported lower average annual incomes and more household members unable to work due to a disability or medical conditions than high service reliability customers, but otherwise the groups are economically very similar.

Overall, it appears that customers with higher energy burdens and other associated characteristics are more likely to live in areas with lower service reliability rather than low service reliability contributing much to customers having higher energy burdens since there are few other differences between customers in low vs high reliability areas.

Table 144. Surveyed Lower and Higher Service Reliability Customer Economic Characteristics ^{a, b}

Economic Characteristics	Low Service Reliability Customers		High Service Reliability Customers	
Hardship	N	Stat	N	Stat
Average energy burden ^c	153	6.6%*	994	5.3%*
Average modified energy burden ^c		5.7%*		4.7%*
Average economic hardship index ^d	141	3.2	882	3.3
Average months during past year had difficulty paying... ^e				
Energy bills	144	2.5*	899	1.7*
Rent/Mortgage		1.4		1.8
Other basic needs		1.6		2.0
Medical bills		1.5		1.8
Income and Sources	N	Stat	N	Stat
Average annual household income (\$1,000s) ^f	153	\$31.3*	994	\$35.1*
Earned income (from wages, salary, tips, investments)		62%		62%
Fixed income (from retirement savings, pensions, social security, or disability or veterans' benefits)		41%		38%
Public assistance (for housing, food, medical, financial, and/or childcare needs)		21%		19%
Other types of income/assistance ^g		25%		24%
Employment Status	N	Stat	N	Stat
Employed household member(s)	153	67%	994	64%
Unemployed household member(s) looking for work		16%		17%
Retired household member(s)		25%		29%
Student household member(s)		36%		40%
Homemaker household member(s)		27%		25%
Household member(s) unable to work due to disability or medical condition		29%*		24%*

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question; Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account annual public assistance benefits (as part of income).

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

^f Calculated by taking the average of the midpoints of the income ranges included in the survey.

^g Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

Surveyed low and high service reliability customers are also very similar in regard to their health characteristics and hardships (Table 145). Low service reliability customers are more likely to have a disabled household member(s) than high service reliability customers, but otherwise the groups are alike.

Table 145. Surveyed Lower and Higher Service Reliability Customer Health Characteristics ^{a, b}

Health Characteristics	Low Service Reliability Customers		High Service Reliability Customers	
	N	Stat	N	Stat
Hardship				
Average health hardship index ^c	139	4.0	915	4.1
Health Status	N	Stat	N	Stat
Disabled household member(s) ^d	153	33%*	994	26%*
Household member(s) with medical condition requiring special equipment, more heating/cooling, and/or high air quality		25%		23%

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question; Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^d Determined based on responses to survey questions about employment status (have disabled household member) and sources of income (received disability payments).

G.2.3 Demographic and Housing Characteristics and Housing Hardships

Surveyed low and high service reliability customers are very similar demographically (Table 146). They reported similar education levels, marital status, household size and composition, language characteristics, and race/ethnicity, except low service reliability customers are slightly less likely to be white.

Table 146. Surveyed Lower and Higher Service Reliability Customer Demographic Characteristics ^{a, b}

Demographic Characteristics	Lower Service Reliability Customers		Higher Service Reliability Customers	
	N	Stat	N	Stat
Education of Respondent				
High school or less	148	29%	955	25%
Some college, no degree		20%		19%
Technical or 2-year degree		20%		26%
4-year degree or higher		31%		30%

Demographic Characteristics	Lower Service Reliability Customers		Higher Service Reliability Customers	
Marital Status of Respondent	N	Stat	N	Stat
Married/domestic partnership	153	48%	994	47%
Single (never married, separated, divorced, or widowed)		42%		53%
Household Size and Composition	N	Stat	N	Stat
Average household size	148	3.1	957	3.3
Children under 18 in household		45%		44%
Seniors over 64 in household		29%		30%
Foreign-born household members	138	30%	918	30%
Race/Ethnicity of Respondent ^c	N	Stat	N	Stat
White	149	43%*	960	50%*
Hispanic/Latinx/ Spanish		36%		32%
Asian or Asian Indian		8%		10%
Black or African American		9%		7%
Other ^d		6%		8%
Language in Home ^e	N	Stat	N	Stat
Speaks only English	121	66%	1,308	65%
Speaks English and other language		31%		29%
Speaks only non-English language		3%		6%

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question; Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents could select more than one race/ethnicity.

^d Other includes American Indian/Alaska Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and Other.

^e Non-English languages in the survey include Spanish, Mandarin or Cantonese, Tagalog or Filipino, Korean, Vietnamese, Russian, Arabic, Farsi, Hindi, or Other.

Surveyed low and high service reliability customers reported somewhat different housing situations but very similar housing hardships (Table 147). Low service reliability customers are more likely to own their home and live in homes with 1 to 3 rooms than high service reliability customers. However, both groups reported similar housing types and HCS issues.

Table 147. Surveyed Lower and Higher Service Reliability Customer Housing Characteristics and Hardships ^{a, b}

Housing Characteristics	Low Service Reliability Customers		High Service Reliability Customers	
Housing Tenure	N	Stat	N	Stat
Owns home	123	54%*	994	45%*
Rents home		41%*		49%*
Free housing or unknown		5%		6%

Housing Characteristics	Low Service Reliability Customers		High Service Reliability Customers	
Housing Type	N	Stat	N	Stat
Single-family home	148	53%	954	54%
Apartment/condo with 5+ units		28%		27%
Duplex, triplex, fourplex		9%		8%
Townhome		3%		3%
Manufactured or mobile home		5%		8%
Number of Rooms in Home	N	Stat	N	Stat
1 to 3 rooms	148	32%*	955	27%*
4 to 5 rooms		29%		30%
6 to 7 rooms		18%*		25%*
8 or more rooms		20%		17%
Average number of rooms		5.0		5.2
Housing Hardship	N	Stat	N	Stat
Overall comfort of home ^c	149	2.2	963	2.2
Overall safety of home ^c		2.7		2.7
Home as a healthy place to live ^c		2.9		2.8
Uncomfortably cold temps inside home...				
Occur ^d	148	2.7	956	2.7
Cause harm ^e	121	2.0	801	2.0
Uncomfortably hot temps inside home...				
Occur ^d	149	2.9	956	2.8
Cause harm ^e	124	2.1	828	2.0
Drafts inside home...				
Occur ^d	144	2.1	922	2.3
Cause Harm ^e	86	1.7	581	2.0
Pests inside home...				
Occur ^d	148	2.1	940	2.2
Cause harm ^e	88	1.9	616	1.9
Mold/mildew/fungus/moisture inside home...				
Occurs ^d	143	1.7	915	1.8
Causes harm ^e	53	2.0	365	2.2

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents used an 11-point scale where -5 means "extremely poor," 0 means "not good but not poor," and +5 means "extremely good."

^d Frequency of occurrence is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time." Asked to respondents who indicated that the issue occurred in their home at least "a few times"

^e Frequency of causing harm is measured on 5-point scale where 1 means “never,” 2 means “a few times,” 3 means “sometimes,” 4 means “many times,” and 5 means “most or all the time.” Asked only to respondents who indicated that the issue occurred in their home at least “a few times”

G.2.4 Factors of Low Service Reliability Customer Economic and Health Hardships

We used bivariate ordinary least squares regression models to identify the factors of low service reliability customers’ economic and health hardships (Table 148). In the regression models, the dependent variables are energy burden, modified energy burden, the general economic hardship index, and the general health hardship index. The independent variables are the geographic, energy, economic, health, demographic, and housing characteristics we report on in Sections G.2.1 to G.2.3 above. We also conducted the regression models with high service reliability customers (not shown in table), and indicate in Table 148 below with the underlined arrows which factors are unique to the low service reliability customers’ hardships.

- Energy burden is higher for surveyed low service reliability customers who are PG&E customers (vs. SCE or SDG&E), live in the lowest service reliability areas, live in homes with a greater area heated with heating equipment, have lower annual incomes, do not receive earned income, receive public or other financial assistance, do not have employed household members, have higher annual energy costs, have greater economic or health hardship, have senior or disabled household members, are non-white, and/or live in a manufactured/mobile home.
 - The factors of energy burden unique to low service reliability customers (vs. high service reliability customers) are senior household members, race/ethnicity, and manufactured/mobile home type.
- Modified energy burden is higher for surveyed low service reliability customers who are PG&E customers (vs. SCE or SDG&E), are not current CARE participants, use electricity-only or alt-fuels, live in homes with a greater area heated/cooled with heating/cooling equipment, have lower annual incomes, do not receive earned income, receive other financial assistance, do not have employed household members, have retired or senior household members, have higher annual energy costs, have greater health hardship, have a disabled household member(s), and/or live in a manufactured/mobile home.
 - The factors of modified energy burden unique to low service reliability customers (vs. high service reliability customers) are CARE participation, retired household members, and senior household members.
- General economic hardship is higher for surveyed low service reliability customers who live in cooler climate zones, are current CARE participants, receive fixed-income, public assistance, and/or other financial assistance, have higher energy burden and/or health hardship, have a disabled household member(s), do not have a foreign-born household member(s), speak only English in the home, and/or are married or in a domestic partnership.
 - The factor of economic hardship unique to low service reliability customers (vs. high service reliability customers) is climate zone.
- General health hardship is higher for surveyed low service reliability customers who are CARE and/or ESA participants, use electricity-only, live in homes with a greater area heated with heating equipment, receive fixed-income, does not have employed household members, have higher energy burdens and/or economic hardship, have disabled household members, do not have children household

members, speak only English in the home, have fewer household members, live in larger sized homes, and/or own their home.

- The factor of health hardship unique to low service reliability customers (vs. high service reliability customers) is household size.

Table 148. Potential Factors of Surveyed Lower Service Reliability Customers' Economic and Health Hardships ^a

Statistically Significant Factors ^b	Energy Burden ^c	Economic Hardship ^d	Health Hardship ^e
SCE or SDG&E customer (vs. PG&E customer)	↓		
Higher service reliability (SAIFI)	↓		
Not a current CARE participant		↓	
CARE-eligible nonparticipant		↓	↓
ESA Nonparticipant			↓
Electricity and Gas (vs. Electricity-only)			↓
Does not use alt-fuels			
Smaller area of home heated with heating equipment	↓		↓
Smaller area of home cooled with cooling equipment			
Higher annual household income	↓		
Receives earned income	↓		
Does not receive fixed income		↓	↓
Does not receive public assistance	↓	↓	
Does not receive other financial assistance	↓	↓	
Employed household member(s)	↓		↓
No retired household member(s)			
Lower annual energy costs	↓		
Lower energy burden	N/A	↓	↓
Lower economic hardship	↓	N/A	↓
Lower health hardship	↓	↓	N/A
No disabled household member(s)	↓	↓	↓
No household member(s) with medical condition(s) requiring higher usage or air quality		↓	↓
Child(ren) household member(s)			↓
No senior household member(s)	↓		
White respondent (vs. nonwhite)	↓		
Foreign-born household member(s)		↓	
Speaks non-English language in home		↓	↓
More household members			↓
Married/Domestic partnership		↓	

Statistically Significant Factors ^b	Energy Burden ^c	Economic Hardship ^d	Health Hardship ^e
Lives in smaller home			↓
Does not live in manufactured/mobile home (vs. other housing types)	↓		
Rents home (vs. own)			↓

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b Statistically significant results at $p \leq .10$ from ordinary least squares bivariate regression. Downward arrows = hardship significantly decreases in relation to the factor; upward arrows = hardship significantly increases in relation to the factor; Underline = factor is unique to low service reliability customers and is not a significant factor for high service reliability customers.

^c Energy burden is annual energy bills divided by annual income.

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

G.3 Low Service Reliability Customers' Experience of Electricity Outages

We asked surveyed customers how many outages they recall experiencing in 2018 that were not due to an issue caused by something inside their home (e.g., an electrical short, house fire, flooded house). We also asked them how long the outages lasted, on average, how long the longest outages lasted, and the extent to which the outages caused their household difficulty.

Low and high service reliability customers reported slightly more electrical outages they experienced in 2018 (Table 149). However, high service reliability customers reported experiencing longer outages both in terms of the average duration of all outages they experienced and the duration of the longest outage they experienced.⁶³ Nevertheless, low service reliability customers reported experiencing greater difficulty because of the outages compared to high service reliability customers, indicating that low reliability may slightly contribute to increasing the burdens or difficulties low service reliability customers experience already.

Table 149. Surveyed Low and High Service Reliability Customers' Experience of Electrical Outages During 2018 ^{a, b}

Electricity Outages in 2018	Low Service Reliability Customers		High Service Reliability Customers	
Number of outages ^c	N	Statistic	N	Statistic
Average number of outages in the past year reported by all customers	151	1.9	991	1.8
Average number of outages in the past year reported by only customers who experienced one or more outages	100	2.9*	694	2.2*
% of customers who reported experiencing one or more outages	151	66%	991	70%
Duration of outages ^d	N	Statistic	N	Statistic
Average minutes of all outages	85	188*	597	259*
Average minutes of longest outage	66	577*	477	722*

⁶³ This is not likely related to service reliability as measured by IOUs' SAIDI and SAIFI measures and could be due to several circumstances such as recall bias, when the outages occurred, whether the respondent was present for the entire outage, etc.

Electricity Outages in 2018	Low Service Reliability Customers		High Service Reliability Customers	
Assessment of difficulty ^e	N	Statistic	N	Statistic
Average level of difficulty caused by outages	100	5.2*	691	4.5*

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers; two-tailed t-tests used to compare averages; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents could select None (coded as 0), 1 to 2 times (coded as 1.5), 3 to 4 times (coded as 3.5), 5 to 6 times (coded as 5.5), 7 to 8 times (coded as 7.5), 9 to 10 times (coded as 9.5), and more than 10 times (coded as 11.5).

^d Respondents were asked how long outages lasted on average and how long the longest outage lasted; they could select less than 15 minutes (coded as 7.5), 15 minutes to less than one hour (coded as 37), one hour to less than six hours (coded as 210), six hours to less than 12 hours (coded as 540), 12 hours to less than a day (coded as 1080), One to two days (coded as 2160), and more than two days (coded as 4320).

^e Respondents used an 11-point scale from 0 (no difficulty) to 10 (great difficulty).

G.4 Low Service Reliability Customers' Program Impacts and Experiences

We compared surveyed low and high service reliability customers' levels of economic and health hardships by their CARE and ESA participation status. We also assessed the extent to which the CARE and ESA program experiences and impacts were different for low vs. high service reliability customers.

Sample sizes of low service reliability participants and nonparticipants are too small for conclusive results, but the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the subgroup.

G.4.1 CARE Program

Economic and Health Hardships

Overall, trends in the levels of economic and health hardships across CARE participation statuses are similar to those reported in Appendix C and Appendix D (Table 150). Surveyed past and current CARE participants have lower energy and modified energy burdens, in part due to the CARE discount, but reported greater general economic and health hardship compared to nonparticipants, indicating they needed CARE more than nonparticipants.

Within each group, there are some notable differences between surveyed low and high service reliability customers (Table 150). Low service reliability current and past participants have higher energy burdens than their high service reliability counterparts. The low service reliability past participants also have significantly higher modified energy burdens than their high service reliability counterparts, while the opposite occurs for CARE-eligible nonparticipants. Low service reliability current participants reported lower economic hardship than their high service reliability counterparts, and low service reliability nonparticipants reported lower health hardship than their high service reliability counterparts.

Table 150. Surveyed Current and Past CARE Participant and CARE-Eligible Nonparticipant Hardship Metrics, by Service Reliability Status ^{a, b}

Hardship Metrics	Current CARE Participant		Past CARE Participant		CARE-Eligible Nonparticipant	
	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)
Average Annual Electricity and Natural Gas Costs	\$1,278 (44)	\$1,259 (276)	\$1,441 (32)	\$1,401 (222)	\$1,573 (31)	\$1,506 (151)
Average Energy Burden ^c	6.2%^ (44)	4.9%^ (276)	5.6%^ (32)	4.3%^ (222)	6.3% (31)	6.5% (151)
Average Modified Energy Burden ^c	4.9% (44)	4.8% (276)	5.7%^ (32)	4.3%^ (222)	5.8%^ (31)	6.5%^ (151)
Average Economic Hardship Score ^d	3.7^ (42)	4.2^ (252)	3.1 (28)	3.0 (204)	2.4 (28)	2.5 (132)
Average Health Hardship Score ^e	3.8 (43)	4.1 (263)	4.2 (29)	4.3 (207)	2.8^ (28)	3.8^ (129)

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b ^ = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers within each customer group; two-tailed t-tests used to compare averages; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income).

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

Current and Past CARE Participants' Program Impacts

Overall, surveyed low and high service reliability current and past CARE participants reported that the CARE program had moderately high to high positive impacts on their economic situations (Table 151). Low service reliability current participants reported that CARE had a greater impact on helping them afford basic needs than high service reliability current participants.

Table 151. Surveyed Current and Past CARE Participants' Average Assessments of CARE's Economic Impacts, by Service Reliability Status ^{a, b, c}

CARE Impact	Current CARE Participants ^c		Past CARE Participants ^c	
	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)
Helped improve your household's overall financial situation	8.8 (44)	8.2 (275)	8.1 (32)	8.6 (220)
Reduced the amount you worry about being able to pay your energy bills	8.1 (43)	7.8 (275)	7.8 (31)	8.4 (220)
Helped you pay your household's energy bills on time	8.3 (44)	7.8 (275)	7.4 (31)	8.2 (219)
Helped you afford other basic needs	8.7^ (43)	7.8^ (272)	7.5 (32)	8.2 (219)

CARE Impact	Current CARE Participants ^c		Past CARE Participants ^c	
	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)
Helped your household stay out of debt or out of deeper debt	8.0 (44)	7.4 (276)	7.1 (32)	7.9 (217)
Has been worth the effort to enroll ^d	9.6 (10)	9.0 (57)	N/A	N/A
Has been/Seemed worth the effort to renew your enrollment to continue receiving the CARE discount ^e	9.2 (30)	9.1 (174)	8.0 (30)	8.5 (163)
Has been/Seemed worth the effort to go through the process of reducing your energy use to continue receiving the CARE discount ^f	9.8 (4)	7.9 (41)	9.5 (2)	8.6 (54)

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b ^ = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers within each customer group; two-tailed t-tests used to compare averages; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Agreement with statements was measured on an 11=point scale where 0 means do not agree at all and 10 means completely agree.

^d Asked only to current CARE enrollees.

^e Asked only to recertification and income verification current and past participants.

^f Asked only to high-user current and past participants.

Current and Past CARE Participants' Program Difficulties

The surveyed low and high service reliability current and past CARE participants also reported low or moderate difficulty with CARE processes they experienced, and there were some differences between the groups (Table 152). Among the current participants, low service reliability customers reported less difficulty understanding and gathering the required information and submitting the application to their IOU compared to high service reliability customers. In contrast, among the past participants, the low service reliability customers reported greater difficulty with understanding and gathering the required information and completing and submitting the application to their IOU than high service reliability customers. Low reliability customers also reported less difficulty with the high-usage processes than high service reliability customers.

Table 152. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by Service Reliability Status ^{a, b, c}

CARE Process	Current CARE Participants		Past CARE Participants	
	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)
Understanding what information was needed from you	0.6^ (43)	1.2^ (274)	3.0^ (29)	2.3^ (207)
Gathering the required information	0.8^ (44)	1.5^ (272)	4.1^ (27)	3.0^ (205)
Completing the application (after you understood and gathered the required information)	0.8 (44)	1.1 (270)	2.7^ (26)	1.9^ (204)

CARE Process	Current CARE Participants		Past CARE Participants	
	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)
Submitting the application to [IOU]	0.6^ (44)	1.2^ (273)	3.0^ (27)	2.0^ (203)
Going through the assessment to identify free energy-saving appliances and equipment ^d	0.5^ (4)	2.3^ (36)	0.0 (1)	2.8 (49)
Understanding recommendations on how to reduce our energy usage ^d	0.5^ (4)	2.2^ (38)	0.0^ (1)	2.0^ (53)
Getting the free appliances and equipment installed ^d	0.5^ (2)	2.8^ (24)	-- (0)	3.4 (38)
Reducing your household's monthly energy usage ^d	4.8^ (4)	3.7^ (39)	0.0^ (1)	4.4^ (51)

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b ^ = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers within each customer group; two-tailed t-tests used to compare averages; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Difficulty was measured on an 11=point scale where 0 means not at all difficult and 10 means extremely difficult.

^d Asked only to high-user current and past participants.

Past CARE Participants' Reasons for Removal From CARE

The reasons surveyed past CARE participants reported for being removed from CARE do vary somewhat between low and high service reliability customers (Table 153). Significantly lower proportions of low service reliability customers reported being ineligible, and significantly higher proportions reported that continuing on CARE is an inconvenience, they didn't know how to continue on CARE, they didn't know why they were removed, or they mistakenly thought they were still on CARE, compared to high service reliability customers. Lower proportions of low service reliability customers also reported issues with reducing usage as a reason for removal from CARE compared to high service reliability customers.

Table 153. Reasons Surveyed Past CARE Participants Reported for Why They Were Removed from CARE, by Service Reliability Status ^{a, b}

Reasons for Removal from CARE ^c	Past CARE Participants	
	Low Reliability (N)	High Reliability (N)
<i>Ineligible</i> : No longer eligible	28%* (32)	42%* (222)
<i>Inconvenience</i> : Forgot to renew, too busy, too much trouble	32%* (32)	23%* (222)
<i>Unknowledgeable</i> : Didn't know how to continue CARE	19%* (32)	12%* (222)
<i>Don't Know</i> : Not sure reasons for removal	22%* (32)	10%* (222)

Reasons for Removal from CARE ^c	Past CARE Participants	
	Low Reliability (N)	High Reliability (N)
<i>Mistaken</i> : Thought we were still on CARE ^d	13%* (32)	4%* (222)
<i>Process Issues</i> : Tried to continue CARE, had issues with process ^d	3% (32)	6% (222)
<i>Transient</i> : Moved residences ^d	3% (32)	1% (222)
<i>No Need</i> : Didn't need CARE any longer	0% (32)	4% (222)
<i>Privacy Concerns</i> : Didn't want to provide personal information	0% (32)	2% (222)
<i>Couldn't Reduce Usage</i> : Didn't know how/couldn't reduce energy usage ^e	0% (2)	16%* (55)
<i>Didn't Reduce Usage</i> : Didn't want to reduce our energy usage ^e	0% (2)	4% (56)
<i>Didn't Want ESA</i> : Didn't want ESA home assessment ^e	0% (2)	0% (55)

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability past participants; two-tailed t-tests used to compare averages; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents selected one or more pre-defined reasons from a list in the survey and/or provided their own reason(s).

^d Reported by respondents, not included in list of pre-defined reasons.

^e Asked only to high-user past participants.

CARE-Eligible Nonparticipants' Reported Barriers to Applying for CARE

Among the surveyed CARE-eligible nonparticipants, significantly higher proportions of low service reliability customers reported being aware of CARE compared to non-alt-fuels customers. Among the aware nonparticipants, significantly lower proportions of low service reliability customers reported inconvenience, frequent moving, or altruism as a barrier to applying for CARE, and significantly higher proportions reported not knowing how to apply for CARE, thinking they are ineligible, and not knowing the reason(s) for why they haven't applied for CARE, compared to high service reliability customers (Table 154).

Table 154. Reasons Surveyed CARE-Eligible Nonparticipants Have Not Applied for CARE, by Service Reliability Status ^{a, b}

Reasons for Not Applying for CARE	CARE-Eligible Nonparticipants			
	Low Reliability		High Reliability	
Awareness and Interest	N=31	%	N=151	%
<i>Unaware</i> : Not aware of CARE	17	55%*	94	62%*
<i>Uninterested</i> : Not interested in applying for CARE	3	10%	11	7%
<i>Other Reason</i> (Aware of and/or interested in CARE)	11	35%	46	31%

Reasons for Not Applying for CARE	CARE-Eligible Nonparticipants			
	Low Reliability		High Reliability	
Reasons for Those Aware of and Interested in CARE ^c	N=11	%	N=46	%
<i>Inconvenience</i> : Too busy/forgot about it	3	27%*	18	39%*
<i>Unknowledgeable</i> : Don't know how to enroll/what is involved	4	36%*	10	22%*
<i>Ineligible</i> : Don't think household would be eligible	3	27%*	9	20%*
<i>Ineligible</i> : Tried to apply in the past but was ineligible	1	9%	7	15%
<i>Transient</i> : Household moves frequently/ will be moving soon	0	0%*	6	13%*
<i>Mistaken</i> : Thought my household was participating	0	0%*	6	13%*
<i>No Need</i> : Don't need CARE, energy bills are already affordable	1	9%	5	11%
<i>Don't know</i> : Not sure of reason	1	9%	5	11%
<i>Altruism</i> : Other people need the discount more	0	0%*	5	11%*
<i>Privacy</i> : Don't want to share household info with IOU	0	0%	0	0%
<i>Ineffective</i> : CARE won't help household's financial situation	0	0%	0	0%

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability CARE-eligible nonparticipants; two-tailed t-tests used to compare averages; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents aware of and interested in CARE could select more than one reason for not applying for CARE.

G.4.2 ESA Program

We made comparisons between surveyed low and high service reliability ESA participants and, when possible, between surveyed low service reliability ESA participants and nonparticipants to assess the effects of the program's targeted measures on HCS.

Economic and Health Hardships

Overall, trends in the levels economic and health hardships for surveyed high service reliability but not surveyed low service reliability ESA participants and nonparticipants are similar to those reported in Appendix E (Table 155). The high service reliability ESA participants have at least slightly higher energy and modified energy burdens than nonparticipants, but the low service reliability ESA participants' energy burdens are actually very similar to nonparticipants' burdens, indicating that many low service reliability customers could likely benefit from ESA participation. In addition, low service reliability participants' annual energy costs are the lowest.

There are also some notable differences between surveyed low and high service reliability customers within each group (Table 155). Low service reliability participants and nonparticipants have substantially higher energy burdens compared to their high service reliability counterparts. In addition, within the nonparticipant group, low service reliability nonparticipants have greater modified energy burden but lower general health hardship than their high service reliability counterparts. Within the participant group, low service reliability customers have lower annual energy costs than high service reliability customers.

Table 155. Surveyed ESA Participant and Nonparticipant Hardship Metrics, by Service Reliability Status ^{a, b}

Hardship Metrics	ESA Participant		ESA Nonparticipant	
	Low Reliability (N)	High Reliability (N)	Low Reliability (N)	High Reliability (N)
Average Annual Electricity and Natural Gas Costs	\$1,100^ (36)	\$1,306^ (295)	\$1,341 (93)	\$1,346 (540)
Average Energy Burden ^c	6.6% [^] (36)	5.8% [^] (295)	6.5% [^] (93)	4.8% [^] (530)
Average Modified Energy Burden ^c	5.8% (36)	5.6% (295)	6.0% [^] (93)	4.6% [^] (530)
Average Economic Hardship Score ^d	3.1 (35)	3.2 (248)	3.1 (84)	3.2 (481)
Average Health Hardship Score ^e	4.6 (32)	4.3 (272)	3.5 [^] (85)	4.0 [^] (484)

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability customers within each ESA group; two-tailed t-tests used to compare averages; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income).

^d Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

^e Health hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

Satisfaction with ESA Program and Targeted Measures

Surveyed low service reliability ESA participants reported higher satisfaction with their furnace replacement, and the cooling measures they received, particularly central AC systems and tune-ups, evaporative coolers, and room/window ACs, compared to high service reliability ESA participants. The low service reliability participants reported lower satisfaction with weatherization measures than high service reliability participants (Table 156).

Table 156. ESA Participants' Average Satisfaction Ratings with Targeted ESA Measures They Received, by Service Reliability Status ^{a, b, c}

Targeted ESA Measures ^d	Low Reliability ESA Participants		High Reliability ESA Participants	
	N	Mean Satisfaction	N	Mean Satisfaction
Overall ESA experience	36	8.9	293	8.6
All heating measures	5	7.0	35	7.0
Furnace replacement	1	10.0*	17	7.7*
Existing furnace repair	4	6.3	18	6.3

Targeted ESA Measures ^d	Low Reliability ESA Participants		High Reliability ESA Participants	
	N	Mean Satisfaction	N	Mean Satisfaction
All cooling measures	27	8.7*	180	7.7*
All central AC measures	17	8.9	100	8.5
Central AC replacement	4	7.0*	18	9.7*
Existing central AC repair	12	9.8	61	9.4
Existing central AC tune-up	1	7.0*	21	5.2*
Evaporative cooler	17	8.8*	94	7.8*
Room/window AC	7	9.3*	44	5.3*
All enclosure measures	11	7.1	158	7.8
Weatherization + attic insulation	3	7.2	76	7.9
Weatherization only	8	7.0*	74	7.8*

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability ESA participants; two-tailed t-tests used to compare averages; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Satisfaction measured on 11-point scale from 0 (not at all satisfied) to 10 (completely satisfied).

^d Asked only about targeted heating, cooling, and enclosure measures and none of the surveyed lower service reliability customers received attic insulation without weatherization measures.

ESA Program Impacts: Frequency of HCS Issues

The surveyed low service reliability ESA participants reported a significant reduction in the frequency of three HCS issues – uncomfortably cold and hot temperatures and drafts coming from outside – after they participated in ESA and received the targeted measures (Table 157). In addition, the reported frequency of hot and cold temperatures occurring in low service reliability participants' homes after their ESA participation is significantly less than in low service reliability nonparticipants' homes during the past year.

Table 157. Comparisons of Surveyed Lower Service Reliability ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation, and with Lower Service Reliability Nonparticipants' Frequency of Experiencing HCS Issues During Past Year ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Low Reliability Participants			Low Reliability Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Statistical Significance
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year occurred	3.6 (11)	2.3 (11)	-1.3*	2.7 (89)	-0.4

Targeted Measures	HCS Issues ^d	ESA Low Reliability Participants			Low Reliability Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Statistical Significance
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	3.3 (36)	2.1 (36)	-1.2*	3.1 (90)	-1.0*
Enclosure Measures	Drafts coming from outside occurred	3.2 (11)	1.8 (11)	-1.4*	2.2 (86)	-0.4
	Pests such as rodents or insects occurred	2.6 (11)	2.2 (11)	-0.4	2.1 (89)	0.1
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	1.7 (35)	1.5 (35)	-0.2	1.7 (85)	-0.2

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower service reliability ESA participants' differences and nonparticipants' difference; two-tailed t-tests used to compare average differences; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Frequency of HCS issues is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuels ESA participants did not receive heating measures so heating-related HCS issues are not reported.

Similarly, the reported reduction in the frequency of cold temperatures occurring in surveyed low service reliability participants homes was significantly greater than in high service reliability participants' homes (Table 158). That is, the targeted ESA heating measures' impacts on reducing the frequency of cold temps occurring in participants' homes was reportedly greater for low service reliability participants than for high service reliability participants.

Table 158. Comparisons of Surveyed Lower and Higher Service Reliability ESA Participants' Frequency of Experiencing HCS Issues in Their Home Before and After Participation ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Low Reliability Participants			ESA High Reliability Participants		
		Before Participation	After Participation	Difference	Before Participation	After Participation	Difference
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Mean Frequency (N)	Statistical Significance
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year occurred	3.6 (11)	2.3 (11)	-1.3*	3.2 (159)	2.4 (163)	-0.8*
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year occurred	3.3 (36)	2.1 (36)	-1.2	3.3 (273)	2.2 (275)	-1.1
Enclosure Measures	Drafts coming from outside occurred	3.2 (11)	1.8 (11)	-1.4	3.1 (150)	2.0 (155)	-1.1
	Pests such as rodents or insects occurred	2.6 (11)	2.2 (11)	-0.4	2.4 (156)	1.9 (161)	-0.5
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture occurred	1.7 (35)	1.5 (35)	-0.2	1.9 (256)	1.6 (264)	-0.3

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower service reliability ESA participants' differences and higher service reliability ESA participants' difference; two-tailed t-tests used to compare average differences; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Frequency of HCS issues is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuel ESA participants did not receive heating measures so heating-related HCS issues are not reported.

ESA Program Impacts: Frequency of Health Effects from HCS Issues

Surveyed low service reliability ESA participants did not report a significant reduction in the frequency that HCS issues they experienced caused harm to household members after they participated in ESA (Table 159). In addition, the low service reliability participants' reported frequency of HCS issues causing harm to household members since they participated in ESA was similar to the frequencies reported by low service reliability nonparticipants during the past year.

Table 159. Comparisons of Surveyed Lower Service Reliability ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation, and with Lower Service Reliability Nonparticipants' Frequency of Experiencing of Health Effects from HCS Issues During Past Year ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Low Reliability Participants			Low Reliability Nonparticipants	
		Before Participation	After Participation	Difference	During Past Year	Difference from Participants' After Participation
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Statistical Significance
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year caused harm	2.4 (8)	2.3 (8)	-0.1	1.9 (71)	0.4
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year caused harm	2.3 (19)	2.2 (19)	-0.1	2.1 (75)	0.1
Enclosure Measures	Drafts coming from outside caused harm	2.4 (5)	2.2 (5)	-0.2	1.7 (55)	0.5
	Pests such as rodents or insects caused harm	2.1 (11)	1.8 (9)	-0.3	1.9 (52)	-0.1
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture caused harm	2.9 (8)	2.6 (8)	-0.3	1.9 (30)	0.5

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower service reliability ESA participants' differences and nonparticipants' difference; two-tailed t-tests used to compare average differences; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Frequency of HCS issue causing harm is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuels ESA participants did not receive heating measures so heating-related HCS issues are not reported.

The reported reduction in the frequencies that hot and cold temperatures caused harm to household members after participating in ESA was greater for surveyed high service reliability ESA participants than for low service reliability participants (Table 160). That is, the targeted ESA measures had less of an impact for low service reliability participants regarding hot and cold temps in their homes causing harm. Trends were similar for the other three HCS issues, but the results were not statistically significant.

Table 160. Comparisons of Surveyed Lower and Higher Service Reliability ESA Participants' Frequency of Health Effects from HCS Issues in Their Home Before and After Participation ^{a, b, c}

Targeted Measures	HCS Issues ^d	ESA Low Reliability Participants			ESA High Reliability Participants		
		Before Participation	After Participation	Difference	Before Participation	After Participation	Difference
		Mean Frequency (N)	Mean Frequency (N)	Statistical Significance	Mean Frequency (N)	Mean Frequency (N)	Statistical Significance
Heating and Enclosure Measures	Uncomfortably cold temperatures on the cold days or nights of the year caused harm	2.6 (8)	2.4 (8)	-0.2*	2.8 (106)	2.0 (106)	-0.8*
Cooling and Enclosure Measures	Uncomfortably hot temperatures on the hot days or nights of the year caused harm	2.3 (19)	2.3 (19)	0.0*	2.8 (159)	2.1 (159)	-0.7*
Enclosure Measures	Drafts coming from outside caused harm	2.6 (5)	2.4 (5)	-0.2	2.7 (69)	2.1 (69)	-0.6
	Pests such as rodents or insects caused harm	2.1 (11)	1.8 (9)	-0.3	2.5 (80)	1.9 (80)	-0.6
Heating, Cooling, and Enclosure Measures	Mold, mildew, fungus, or moisture caused harm	2.9 (8)	2.6 (8)	-0.3	2.8 (69)	2.1 (69)	-0.7

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower service reliability ESA participants' differences and higher service reliability ESA participants' difference; two-tailed t-tests used to compare average differences; N = number who answered survey question; sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Frequency of HCS issue causing harm is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

^d Surveyed alt-fuel ESA participants did not receive heating measures so heating-related HCS issues are not reported.

ESA Program Impacts: Comfort and Health Changes

The surveyed low service reliability ESA participants who received a furnace replacement/repair and/or room/window AC reported greater improvements in the comfort of their home and health of their household members compared to high service reliability participants (Table 161). In contrast, the low service reliability ESA participants who received a central AC replacement, repair, or tune-up reported less improvements in the comfort of their home and health of their household members compared to high service reliability participants.

Table 161. Surveyed Lower and Higher Service Reliability ESA Participants' Average Rating of How Targeted ESA Measures Affected the Comfort of Their Home and Health of Their Household Members ^{a, b, c}

Targeted ESA Measures	Low Reliability				High Reliability			
	Change in Comfort of Home		Change in Health of Household Members		Change in Comfort of Home		Change in Health of Household Members	
	N	Mean Change	N	Mean Change	N	Mean Change	N	Mean Change
Furnace replacement or repair	5	+2.2 [^]	5	+2.0 [^]	37	+1.7 [^]	36	+1.2 [^]
Central AC replacement, repair, or tune-up	17	+1.8 [^]	17	+1.0 [^]	102	+3.4 [^]	103	+2.6 [^]
Room/window AC replacement	7	+3.9 [^]	7	+3.0 [^]	48	+1.6 [^]	47	+1.1 [^]
Evaporative Cooler	17	+2.9	17	+2.5	100	+3.1	101	+2.3
Weatherization and/or attic insulation	11	+2.4	11	+1.9	164	+2.3	165	+1.8

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b [^] = statistically significant difference at $p \leq .10$ between lower service reliability ESA participants' mean change and higher service reliability ESA participants' mean change for each change (in comfort and in health); two-tailed t-tests used to compare averages; N = total number who answered the survey question; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents used an 11-point scale where -5 means "made a lot worse," 0 means "did not cause any change," and +5 means "made a lot better."

ESA Program Impacts: Overall HCS

Surveyed low service reliability ESA participants rated the comfort of their home and their home as a healthy place to live as significantly higher than low service reliability nonparticipants (Table 162). However, there were no differences between low and high service reliability participants in their perceptions their homes' overall HCS and trends in results indicate that overall HCS is slightly higher for high service reliability participants (Table 163).

Table 162. Surveyed Lower Service Reliability ESA Participants' and Nonparticipants' Average Ratings of the HCS Components of their Homes ^{a, b, c}

HCS Components	ESA Low Reliability Participants		Low Reliability Nonparticipants		Difference
	N	Mean Rating	N	Mean Rating	Statistical Significance
Overall comfort of home	36	+2.8	148	+2.2	0.6*
Overall safety of home	36	+3.2	146	+2.7	0.5
Home as a healthy place to live	36	+3.4	147	+2.8	0.6*

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower service reliability ESA participants' and nonparticipants' mean ratings; two-tailed t-tests used to compare averages; N = total number who answered the survey question; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents used an 11-point scale where -5 means "extremely poor," 0 means "not good but not poor," and +5 means "extremely good."

Table 163. Surveyed Lower and Higher Service Reliability ESA Participants' Average Ratings of the HCS Components of their Homes ^{a, b, c}

HCS Components	ESA Low Reliability Participants		ESA High Reliability Participants		Difference
	N	Mean Rating	N	Mean Rating	Statistical Significance
Overall comfort of home	36	+2.8	294	+2.6	0.2
Overall safety of home	36	+3.2	291	+3.0	0.2
Home as a healthy place to live	36	+3.4	293	+3.1	0.3

^a Lower service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

^b * = statistically significant difference at $p \leq .10$ between lower and higher service reliability ESA participants' mean ratings; two-tailed t-tests used to compare averages; N = total number who answered the survey question; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

^c Respondents used an 11-point scale where -5 means "extremely poor," 0 means "not good but not poor," and +5 means "extremely good."

G.5 Summary of Findings, Conclusions, and Recommendations

The following are the findings from our assessment:

- Overall, low service reliability customers have greater energy and modified energy burdens, but similar general economic and health hardships compared to high service reliability customers. They are also different in a few of the energy, economic, demographic, and housing characteristics in ways that strongly correlate with greater energy burden.
- The low and high service reliability current and past CARE participants reported similar levels of high positive economic impacts from participating in CARE but had different experiences with the program. ESA program impacts are mostly similar for low and high service reliability participants but a few of the temperature-related impacts are mixed.
- Surveyed low service reliability customers are more similar to than different from high service reliability customers. However, there are some important differences between the groups. Compared to high service reliability customers, the low service reliability customers:
 - Have higher energy and modified energy burdens, more difficulty paying energy bills, lower annual incomes, and more disabled household members.
 - Are less likely to be white, rent their home, or live in a larger sized home.
- Many characteristics are significantly correlated with low service reliability customers' greater energy and modified energy burdens, such as annual income, income sources, energy characteristics and costs, and presence of disabled household members. The characteristics that are uniquely correlated to one or more of the low service reliability customers' hardships (and are not correlated with high service reliability customers' hardships) vary by the hardship metric, and include climate zone, CARE participation status, employment status, housing type, education, race/ethnicity, and household composition and size.
- Surveyed low service reliability customers reported experiencing slightly more electricity outages in 2018 but reported that the outages were much shorter in duration than high service reliability customers. The outages reportedly caused more difficulty for low than high service reliability customers.

- Many of low service reliability customers who most need CARE appear to be participating. The current CARE participants have lower energy burdens than past participant and nonparticipants but have higher general economic and health hardships than the nonparticipants. However, some low service reliability past CARE participants are income-eligible and reported greater hardships than nonparticipants and similar to that of current participants, indicating they likely still need CARE.
- The reported economic impacts of CARE were very similar for the low and high service reliability current and past participants – they all reported high, positive impacts from participating in CARE – but CARE program experiences differed somewhat between the low and high service reliability customers.
 - Energy burden is higher for low service reliability current and past participants and modified energy burden is higher for low service reliability past participants than for their high service reliability counterparts. More of the low service reliability past participants are also income-eligible for CARE than high service reliability past participants. However, in contrast, low service reliability current participants reported lower general economic hardship and low service reliability nonparticipants have lower modified energy burden and health hardship than their high service reliability counterparts.
 - Low service reliability current CARE participants reported less difficulty with CARE processes than the high service reliability participants while the opposite occurred for the past participants, in which low service reliability past participants reported greater difficulty with CARE processes than high service reliability past participants.
 - Low service reliability past CARE participants were less likely to report being removed from CARE due to ineligibility or high usage issues and were more likely to report that continuing on CARE was an inconvenience or they didn't know how to continue CARE compared to high service reliability past participants.
 - Low service reliability CARE-eligible nonparticipants reported lower awareness of CARE than high service reliability nonparticipants. In addition, among those who are aware of CARE, the low service reliability nonparticipants were more likely to mention a lack of knowledge of how to apply or that they think they're ineligible as barriers to applying, and were less likely to mention that applying is an inconvenience, compared to high service reliability nonparticipants.
- Low service reliability ESA participants have slightly greater economic and/or health hardships than the high service reliability participants and nonparticipants, but are similar to the low service reliability nonparticipants, indicating many nonparticipants could benefit from participating in the program.
- The ESA program HCS impacts were mostly similar for the low and high service reliability participants but the temperature-related HCS impacts were somewhat mixed. Low service reliability participants reported that, after participating in ESA, they experienced:
 - Greater satisfaction with the evaporative coolers and room/window ACs but lower satisfaction with central ACs than high service reliability participants.
 - A lower frequency of hot temperatures occurring in their home compared to low service reliability nonparticipants and a greater reduction in cold temps compared to high service reliability participants.
 - A smaller reduction in the frequencies of hot and cold temps causing harm to household members compared to high service reliability participants.
 - Greater comfort and health impacts from furnace replacements and room/window ACs, and lower comfort and health impacts from central ACs, compared to high service reliability participants.

- Greater overall comfort in their home and their home as a healthier place to live than low service reliability nonparticipants (and the same level of comfort and healthiness compared to high service reliability participants).

For more information, please contact:

Benjamin Messer, Ph.D.
Managing Consultant

503-943-2372 tel
503-281-7375 Fax
bmesser@opiniondynamics.com

3934 NE MLK Jr. Blvd., Suite 300
Portland, OR 97212



Opinion **Dynamics**

Boston | Headquarters

617 492 1400 tel
617 492 7944 fax
800 966 1254 toll free

1000 Winter Street
Waltham, MA 02451

San Francisco Bay

510 444 5050 tel
510 444 5222 fax

1 Kaiser Plaza
Suite 445
Oakland, CA 94612

San Diego

858 270 5010 tel
858 270 5211 fax

7590 Fay Avenue
Suite 406
La Jolla, CA 92037

Portland

503 287 9136 tel
503-281-7375 fax

3934 NE MLK Jr. Blvd.
Suite 300
Portland, OR 97212