

Lawrence Berkeley National Laboratory

Recent Work

Title

Residential Cooking Behavior in the United States: Data Collected from a Web-Based Survey:

Permalink

<https://escholarship.org/uc/item/9gr92624>

Authors

Huang, Y.W
Andrew, E.E
Hu, T.C
[et al.](#)

Publication Date

2014-08-01



Residential Cooking Behavior in the United States: Data Collected from a Web-Based Survey

Y.W. Huang, E.E. Andrew, T.C. Hu, B.C. Singer, L. Ding, J.M. Logue¹

Environmental Energy Technologies Division

Funding was provided by the U.S. Dept. of Energy Building Technologies Program, Office of Energy Efficiency and Renewable Energy under DOE Contract No. DE-AC02-05CH11231; by the U.S. Dept. of Housing and Urban Development Office of Healthy Homes and Lead Hazard Control through Interagency Agreement I-PHI-01070, and by the California Energy Commission through Contract 500-08-061.

LBNL Report Number XXXX-X

¹ Corresponding author: jmlogue@lbl.gov

Disclaimer

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or The Regents of the University of California.

Abstract

Cooking has a significant impact on indoor air quality. When cooking occurs, how foods are cooked, and the types of food that are cooked have all been shown to impact the rate at which occupants are exposed to pollutants. Home occupancy characteristics impact how concentrations in the home translate into exposures for the occupants. With the intent of expanding our understanding of cooking behavior in the U.S., we developed and advertised an online survey to collect household cooking behavior for the 24 hrs prior to taking the survey. The survey questions were designed to address gaps in knowledge needed to predict the impact of cooking on indoor concentrations of PM_{2.5} and other pollutants. The survey included the following questions: 1) which meals households ate at home; 2) number of household members at home during cooking; 3) the type of oil used for cooking; 4) the type of foods cooked at each meal; 5) the type of cooking devices used; and 6) the methods selected for food preparation. We also collected information on household characteristics such as their location (zip code), ethnicity, and ages of family members. We analyzed the variability in home cooking characteristics for households in different climate zones and with four different types of family compositions: 1 senior living alone, 1 adult living alone, 2 or more adults/seniors, and families with children. We used simple statistical tests to determine if the probability of certain cooking behaviors differed between these subgroups.

Contents

Abstract	3
Introduction	4
Methods.....	4
Results and Discussion.....	5
Survey Response Characteristics.....	5
Survey Response Demographics	6
Frequency of meals cooked at home	10
Usage of different oils while cooking	14
Characteristics of meals eaten at home	20
Household occupants present at mealtimes.....	21
Respondent cooking device selection.....	32
Respondent cooking method selection	42
Conclusion.....	50
References	50
Appendix: Administered cooking survey questionnaire.....	51

Introduction

On average, Americans spend more than 65% of their time in residences (Klepeis et al. 2001). The air that occupants breathe in homes has a substantial impact on occupant health and comfort (Edwards et al. 2001; Weisel et al. 2005). The Lawrence Berkeley National Laboratory (LBNL) is in the process of developing a data-driven, physics-based model to assess the energy and indoor air quality (IAQ) impacts of ventilation and pollutant mitigation measures on the U.S. population for both new and retrofitted homes. The modeling framework is designed to provide technical support to develop energy efficient, health-based solutions to reduce the burden of indoor air pollutants. Specifically, the model is designed to assess the population and sub-population impact of changes in policy, behavior, and technologies used in homes on indoor concentrations and exposures. Including the health effects of cooking-related pollutants in the model requires knowledge of cooking behavior in U.S. homes, an area where there is limited data.

In order to determine nationwide cooking behavior in homes, we developed, posted, and advertised a web-based survey to assess occupant cooking behavior. A previous study at LBNL focused on a specific set of cooking behaviors in California homes (Klug et al. 2011). The purpose of this study is to expand the number of survey respondents and to assess cooking related statistics for parameters that were identified as important to assessing cooking impacts on PM_{2.5} concentrations, which has been identified as a major health concern in homes (Logue et al. 2012).

The survey was distributed widely, and results presented here are for all U.S. respondents. We did not provide incentives for completing the survey, and survey respondents do not cover all demographics and geographical regions in a representative manner. Despite this, these results provide useful data on national cooking behavior to advance the study of the impact of cooking on indoor concentrations and exposures.

Methods

This cooking survey was administered using the online survey tool Survey Monkey (www.surveymonkey.com), with which users can create and post their own questionnaires and gather responses. The survey was distributed through social media including air quality and home interest groups on LinkedIn and Facebook, through list serves including the LBNL employee listserv, and through online media including the blog BoingBoing.net. Responses were gathered from 7/15/2012 to 3/21/2013. The majority of responses coincided with the BoingBoing.net post, which may bias the results toward households with a Caucasian male over 35, based on BoingBoing.net readership demographics. The survey was approved and deemed exempt from annual review by the Human Subjects Committee of LBNL.

The survey was designed to ask respondents about their home demographics and their in-home cooking behavior in the past 24 hrs. Questions were asked about the past 24 hrs because this activity would be easier to remember and report accurately. Specifically, questions included: whether breakfast, lunch or dinner was cooked in the past 24 hrs; the number of occupants home during each meal over the past 24 hrs; the type of cooking devices used for each meal; the different kinds of oil used in the home; the kinds of food cooked for each meal over the past 24 hours; and the cooking methods conducted over

the past 24 hrs. Only those who reported cooking a specific meal (breakfast, lunch, dinner) in the past 24 hrs where asked further questions about meal preparation/characteristics. Demographic questions included: number and age of home occupants, home zip code, ethnicities of occupants, gender of primary cook, and type of home. Full details of the survey questionnaire can be found in the Appendix. When analyzing the survey responses, we are assuming that only one person responded per household or, in other words, each survey corresponds to the behavior of 1 distinct household.

In order to assess regional differences in cooking behavior, we separated the respondents into the International Energy Conservation Code (IECC) U.S. climate zone and states. There was insufficient data to compare between states, therefore only the comparison between climate zones is included in the report. We also compared the differences between homes with different types of family compositions: 1 senior living alone, 1 adult living alone, 2 or more adults/seniors without kids, and 1 or more kids and adults/seniors. These groupings correspond to the age groupings used by Klug, Lobscheid et al. (2011).

We use tables and graphs to get an intuitive sense of each parameter’s impact on the cooking behavior and used statistical analysis to determine if differences seen between subgroups were statistically significant. For each cooking parameter, we used the response results to determine the probability that homes of a certain type or in a certain location would have occupants present for certain meals, use certain cooking devices or if they would cook certain food types or not, etc. For each of these questions we report the probability, p , and the uncertainty, σ , in the reported probability. The probability, p , is determined as the percentage of occupants who responded that a specific condition occurred. We define the uncertainty in p as the 95th percentile confidence interval of p using the normal approximation method for binomial confidence intervals since we do not have knowledge of the underlying distribution of the data. The uncertainty, σ , in p for the values reported in this work is defined as a function of p and the number of respondents for each question, n , as shown in Equations 1 and 2 (Navidi 2006).

$$p \pm \sigma \tag{1}$$

$$p \pm 1.96 \sqrt{\frac{p(1-p)}{n}} \tag{2}$$

One drawback of the normal approximation is that the farther p is from 1/2, the larger the sample size needs to be for the normal approximation to be acceptable. We used the rule of thumb that the normal approximation was only applied when $n*p$ and $n*(1-p)$ were either greater than or equal to 10 (Navidi 2006). When this was not the case, uncertainty could not be determined and was not included in the presented results.

Results and Discussion

Survey Response Characteristics

Table 1 shows respondent characteristics based on the following factors: total number of respondents, respondents that completed the entire survey, U.S. residents that completed the entire survey, and those U.S. residents that completed the survey and reported valid zip codes. There were 2,821 total

respondents that attempted this survey, of which 2591 completed the entire survey. Of the respondents that completed the survey, 2171 indicated that their home is located in the US. All data for homes located in the US was used to analysis home demographic impacts on cooking. However, not all U.S. respondents gave valid zip codes. Only 2083 respondents provided data that could be analyzed by geographical region and only these survey responses were included in analyses of the impact of geographical location on cooking behavior. The majority of survey responses were made during the winter (78%) followed by the summer (21%). Very few (<1%) of survey responses were made during spring or fall.

				\$
%	&		2821	100%
'	(	(	2591	92%
)			
)	(	(	2171	77%
		(*		
)	)	*+	2083	74%

Table 1. Overall survey response data

Survey Response Demographics

For the respondents that indicated their homes were located in the US, we compared the demographics of the respondents' households to household characteristics collected as part of the U.S. Energy Information Administration's 2009 Residential Energy Consumption Survey (RECS)(US EIA 2009) to assess if our respondents' households are broadly representative of the occupants of the US housing stock. The RECS is a survey of US households that has been conducted every 1 to 5 years since 1979. The RECS is designed to gather data from a subset of US homes that is representative of the entire US population of occupied housing.

For the 2171 respondents that indicated that their home was in the US, the majority of home types indicated were single-family detached homes (57%), followed by apartment buildings with more than 5 units (22%), apartment/condo buildings with 2-4 units (11%), townhouses, i.e. attached or partially attached single family homes or row homes, (9.8%), mobile homes (0.6%), boats/house boats (0.2%), and other (0.5%). According to the RECS, the US housing stock consists of 63.2% detached houses, 24.8% multi-family homes, 5.9% attached single-family homes, and 6.1% mobile homes. Our results include slightly higher percentages of attached single-family and multi-family homes and lower percentages of mobile homes and detached single family homes.

The US survey respondents indicated that in 56% of homes the dominate cook was female and in 42% male. There was no RECS data to compare these numbers to, however the 2010 US Census indicates 49% of the US population is male and 51% is female.

The majority of respondents indicated that their household's ethnicity was Caucasian/white only (78%) followed by more than one ethnicity present (16%), Asian or Pacific Islander (2%), other (1%), and

American Indian/Alaskan Native (0.3%). The RECs determined that US households are 79% Caucasian/white, 14% Black or African American, 3% Asian, 1% American Indian or Alaska Native, 2% Other, and 1.32% more than one race. Our results have a much higher presence of household containing more than one race than the US household demographics and under-represents single ethnicity households other than White/Caucasian.

For our survey respondents, home occupancy ranged from 1 to 14 occupants. The majority of homes had 2 occupants (42%), followed by 3 occupants (20%), 1 occupant (18%), 4 occupants (16%), and 5 occupants (3.4%). Less than 2% had more than 5 occupants. The RECs indicated that 32% of US households contain 2 occupants, 28% contain 1 occupant, 16% 3 occupants, 14% 4 occupants, 7% have 5 occupants, and 4% have 6 or more occupants. Our results have higher number of households with 1 or 2 occupants and lower representation of higher occupancy households compared to the national data.

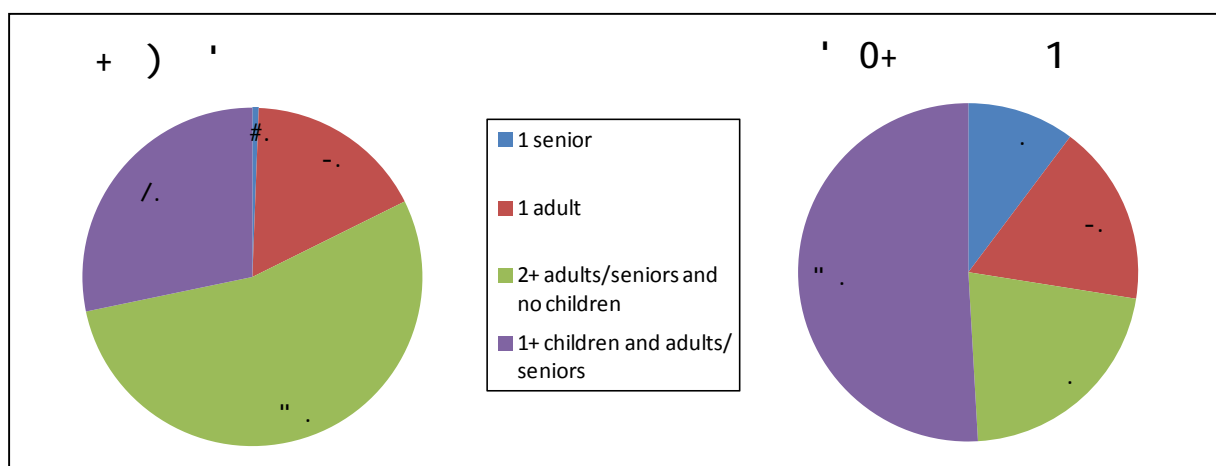


Figure 1. Number of respondents according to household demographics

Almost every survey respondent's house had a 18-64 year old present (99%), 20% had 1 or more seniors (>65 years of age), 31% indicated the presence of a young child (0-5) and 31% indicated the presence of an older child (6-17 years of age). According to the RECS, 89% of US homes contained a 18-64 year old, 22% contained 1 or more seniors, 36% have at least one young child, and 38% have one or more older child (6-17).

We divided occupancy into 4 broad characteristics for the respondent homes based on demographics used in previous cooking surveys (Klug et al. 2011). Figure 1 describes the occupancy characteristics of the respondents' homes. The "2 or more adults/seniors without children" category was the most common living situation selected and had almost twice the number of respondents than the "1 or more children and adults/seniors" category. Residencies housing only one senior have the fewest respondents. A senior was considered to be anyone age 65 and older, and a child was considered to be anyone less than 18 years of age for this survey. Figure 1 also shows the prevalence of each home type in the RECS. Compared to US demographics, our survey respondents over represent households with 2 or more adults/seniors without children and under represent households with children and with a single senior.

Climate zones	Representative City	Climate Description	Number (percentage) of respondents	Percentage of US homes (RECS)
CZ 1	Miami, Florida	hot, humid	12 (0.6%)	1.7%
CZ 2a	Houston, Texas	hot, humid	103 (4.9%)	11%
CZ 2b	Phoenix, Arizona	hot, dry	20 (1.0%)	1.8%
CZ 3a	Atlanta, Georgia	hot, humid	114 (5.5%)	14%
CZ 3b	Los Angeles, California	hot, dry	291 (14%)	9.4%
CZ 3c	San Francisco, California	marine	369 (18%)	2.3%
CZ 4a	Baltimore, Maryland	mild, humid	413 (20%)	21.4%
CZ 4b	Albuquerque, New Mexico	mild, dry	17 (0.8%)	0.8%
CZ 4c	Seattle, Washington	marine	103 (4.9%)	2.9%
CZ 5a	Chicago, Illinois	cold, humid	415 (20%)	23%
CZ 5b	Denver, Colorado	cold, dry	79 (3.8%)	3.7%
CZ 6a	Minneapolis, Minnesota	cold, humid	129 (4.9%)	6.9%
CZ 6b	Helena, Montana	cold, dry	10 (0.5%)	0.9%
CZ 7	Duluth, Minnesota	very cold	5 (0.2%)	0.9%
CZ 8	Fairbanks, Alaska	extreme cold	3 (0.1%)	0.1%
Total			!	

Table 2. Number of respondents by climate zone (CZ)

The International Energy Conservation Code (IECC) subdivides the country into 15 climate zones based on similar weather patterns (US DOE 2010), *Figure 2*. These designations are often used to identify appropriate characteristics for buildings based on expected weather conditions for the area. Weather and regional cultural variations may impact cooking behavior. Since we did not have enough data to inter-compare between states, we chose to inter-compare between climate zones. *Table 2* includes the number of respondents in each IECC climate zone (*Figure 2*). Major representative cities and climate descriptions are also included. For comparison, the percentage of US households in each climate zone determined from US census data (US Census Bureau 2012) and the IECC assigned climate zone (US DOE 2010) for each county is also included. Climate zone (CZ) 4a and 5a (represented by the cities Baltimore and Chicago, respectively) have over 400 respondents, whereas other climate zones have much fewer

survey responses (e.g. CZ 7 and CZ 8). Due to the small sample size of some of these climate zones, it is less likely that the survey results from those areas are representative of the entire climate zone compared to zones with more respondents. The majority of respondents are from humid or marine climate zones, and California (CZ 3b and CZ 3c) has a large representation. This is likely because California, the state where the survey originated, covers much of the area in CZ 3b and 3c. CZ 3b, CZ 3c, CZ 4a, CZ 5a and CZ 6a have greatest representation, and will be used most often for inter-climate zone comparisons. *Figure 3* compares the percentage of survey respondents per climate zone and the percentage of US homes located in each climate zone. Compared to US housing demographics, survey responses most significantly under represent responses from CZ 2a and CZ 3a and most over represent CZ 3b and 3c.

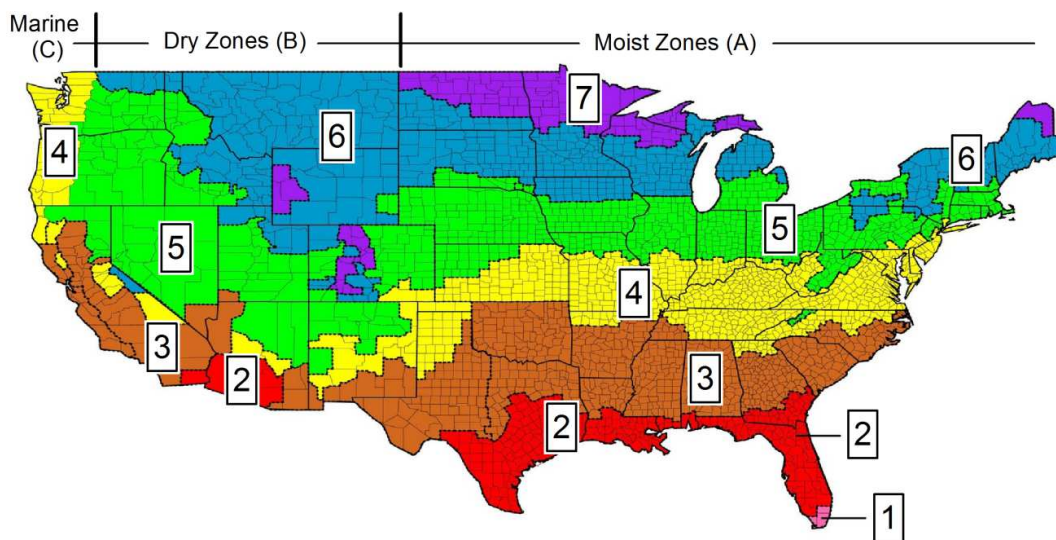


Figure 2. Map of IECC climate zones (CZs). Alaska (CZ 7 and CZ8) and Hawaii, Guam, Puerto Rico, and the Virgins Island (all CZ 1) are not shown.

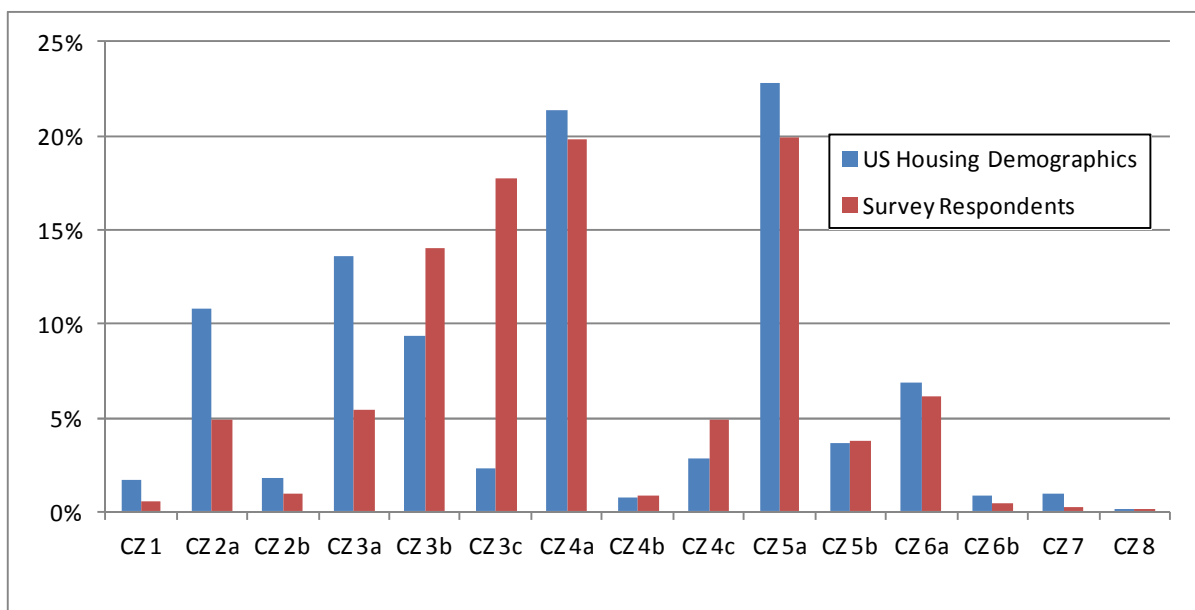


Figure 3. Percentage of survey respondents and US households in each climate zones

Frequency of meals cooked at home

This section presents the data on cooking frequency in homes by household occupancy type/location. *Figure 4* and *Table 3* show the percentage of respondents that reported having specific meals at home for each family composition. On average, the most commonly eaten meal at home was dinner, followed by breakfast and lunch, respectively. There was no statistically significant difference between the rates at which different family types without children reported eating meals at home. Families with at least one child ate breakfast and dinner at home slightly more frequently than homes with 1 adult or 2 or more adults/ seniors. Due to the low response rate of 1 senior households, we could not determine the uncertainty in the probability of eating meals at home for that demographic. All and all, there does not appear to be large variation in the frequency families eat different types of meals at home based on the age groups present in that home.

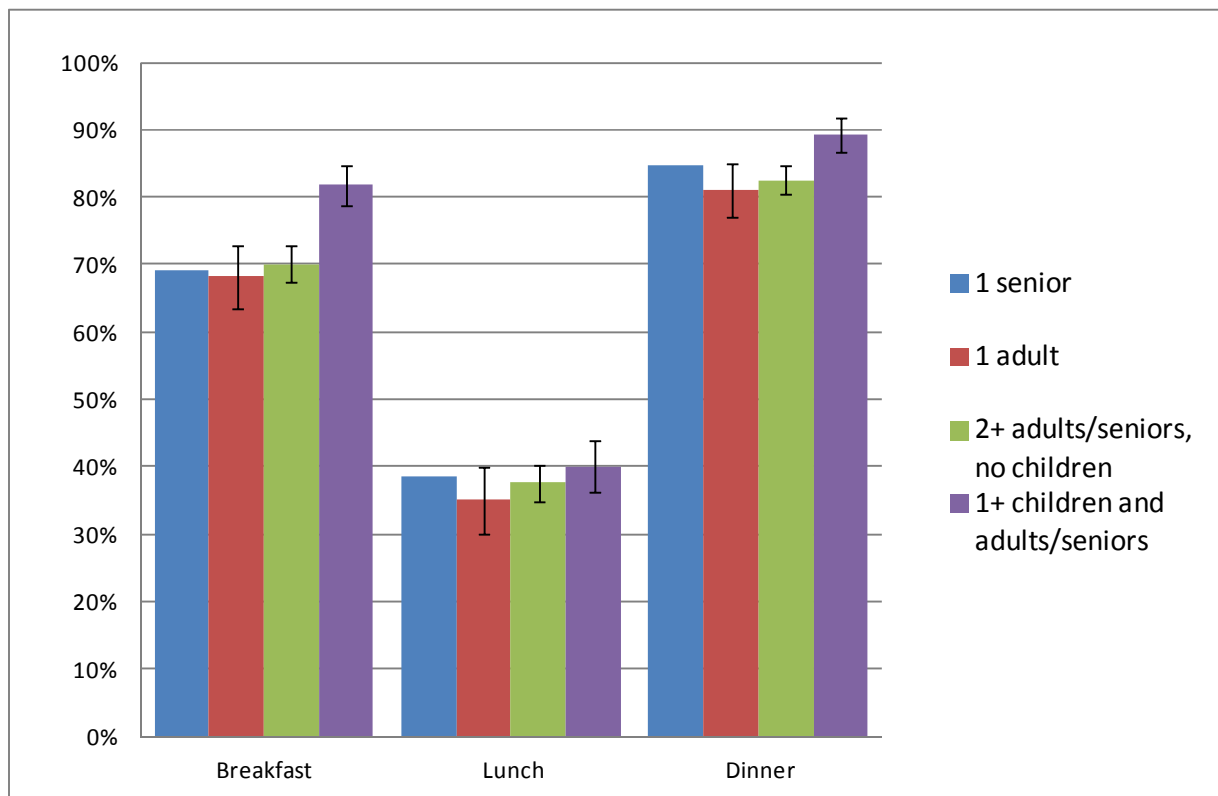


Figure 4. Percentage of households having breakfast, lunch, and dinner at home (bars) and the 95th percentile confidence intervals of the probability that different households occupancy types have breakfast, lunch, and dinner at home (whiskers).

Age groups	Breakfast	Lunch	Dinner	N
1 senior	69 ± NA	38 ± NA	85 ± NA	13
1 adult	68 ± 4.7	35 ± 4.9	81 ± 4.0	371
2 or more adults/seniors without children	70 ± 2.6	38 ± 2.8	83 ± 2.2	1175
1 or more children and adults/seniors	82 ± 3.1	40 ± 3.9	89 ± 2.5	614
Weighted average	73 ± 1.9	38 ± 2.0	84 ± 0.0	2173

Table 3. Probability, p , and uncertainty, σ , that different household demographics have breakfast, lunch, or dinner at home. Values are in percentages (%). NA indicates that the uncertainty could not be calculated. N indicates the number of respondents in each family type.

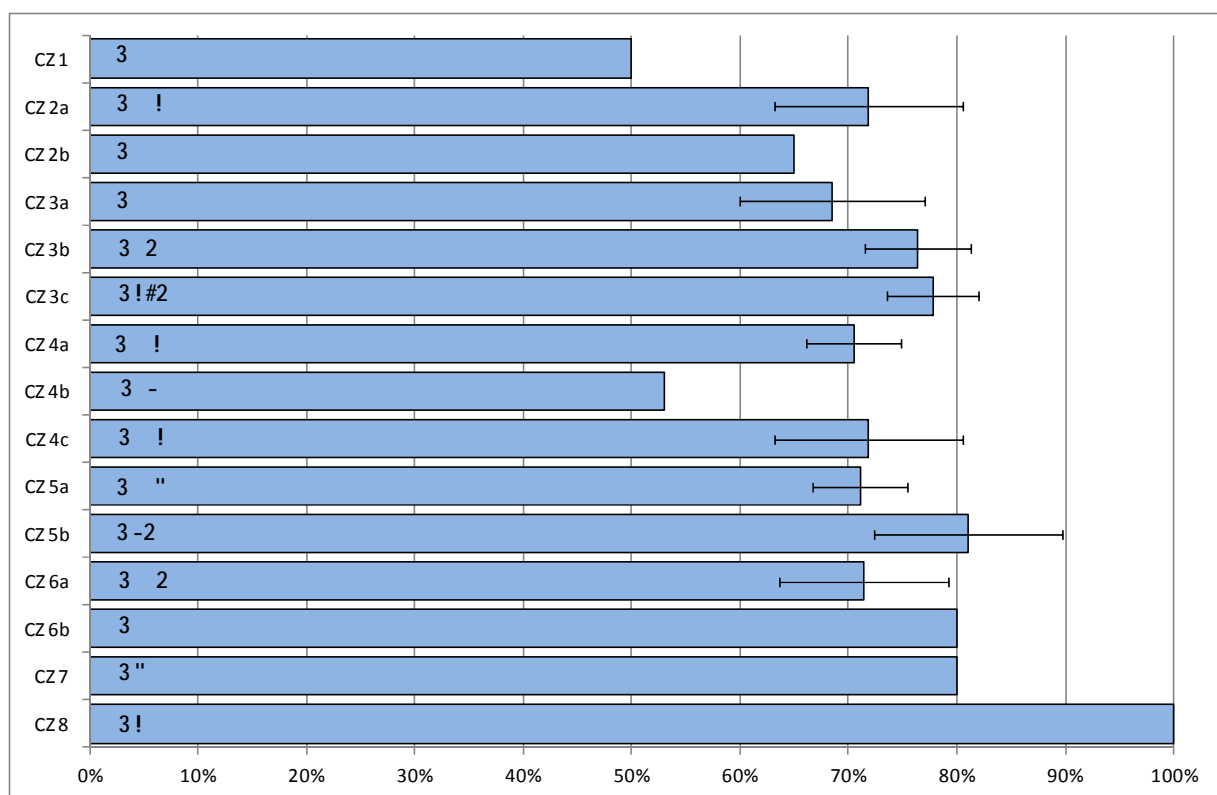


Figure 5. Percentage of households having breakfast home (bars) for all climate zones and the 95th percentile confidence interval of the probability that different climate zones eat breakfast at home (whiskers). The number of respondents (N) for each climate zone is included.

Figure 5 compares the percentage of respondents eating breakfast at home for all climate zones. Half or more of all households for each climate zones ate breakfast at home. All respondents from CZ 8 ate breakfast at home, but there is a small sample size (see Figure 3). CZ 1 has the smallest percentage of individuals eating breakfast at home, also with a small sample size. CZ 5a has the greatest representation of all climate zones, with 71% of respondents having eaten breakfast at home the day before. The weighted average of these percentages for having breakfast at home is 73%. Table 4 shows the uncertainty in the probabilities that households in each climate zone eat meals at home. Based on

the available uncertainties, we cannot say any climate zone eats breakfast more or less than any other.

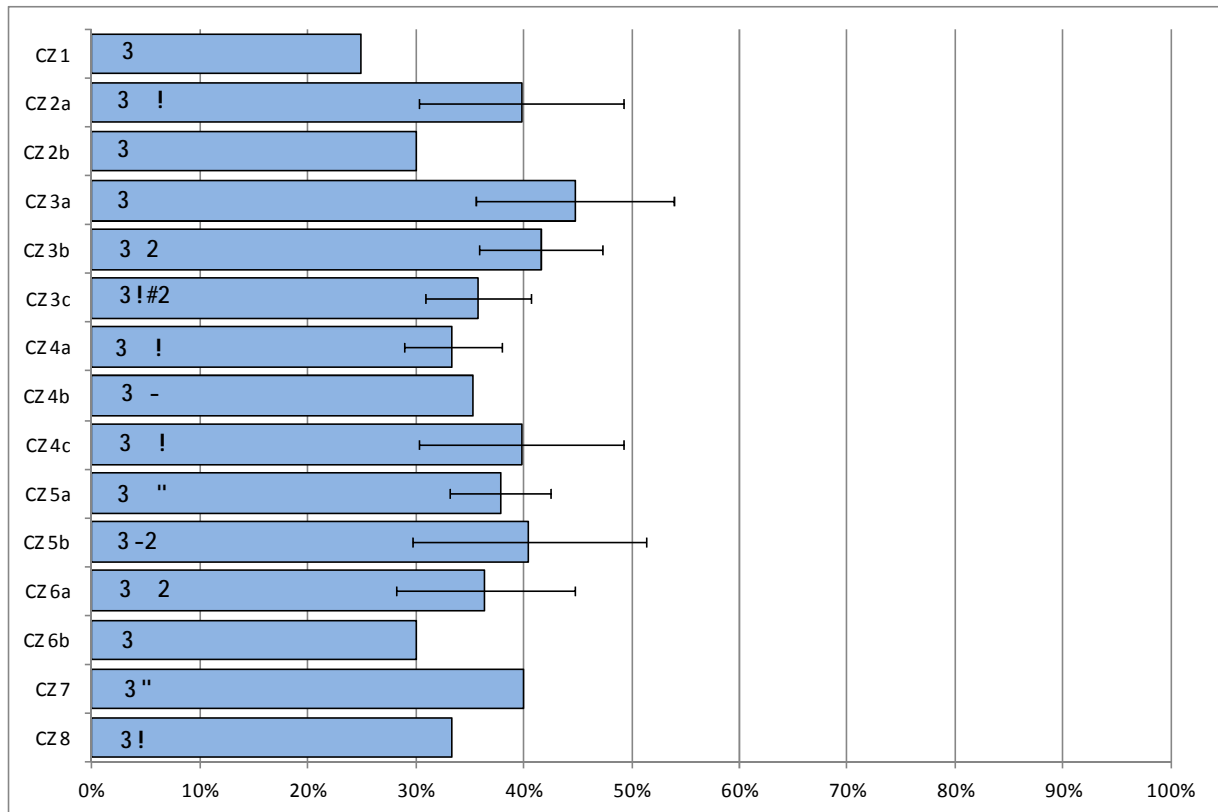


Figure 6. Percentage of households having lunch at home (bars) for all climate zones and the 95th percentile confidence interval of the probability that different climate zones eat lunch at home (whiskers). The number of respondents (N) for each climate zone is included.

Figure 6 compares the percentage of respondents eating lunch at home for all climate zones. Fewer than half of households for each climate zone ate lunch at home. CZ 6a has the greatest percentage of household reporting eating lunch at home, followed by CZ 5b. CZ 8 has the smallest percentage of people reported eating lunch at home, although the sample size is quite small relative to CZ 6a and CZ 5b (see figure 3). The weighted average of these percentages for having lunch at home is 37%. There is no statistically significant difference in the derived probabilities that households eat lunch at home between the climate zones as shown in Table 4.

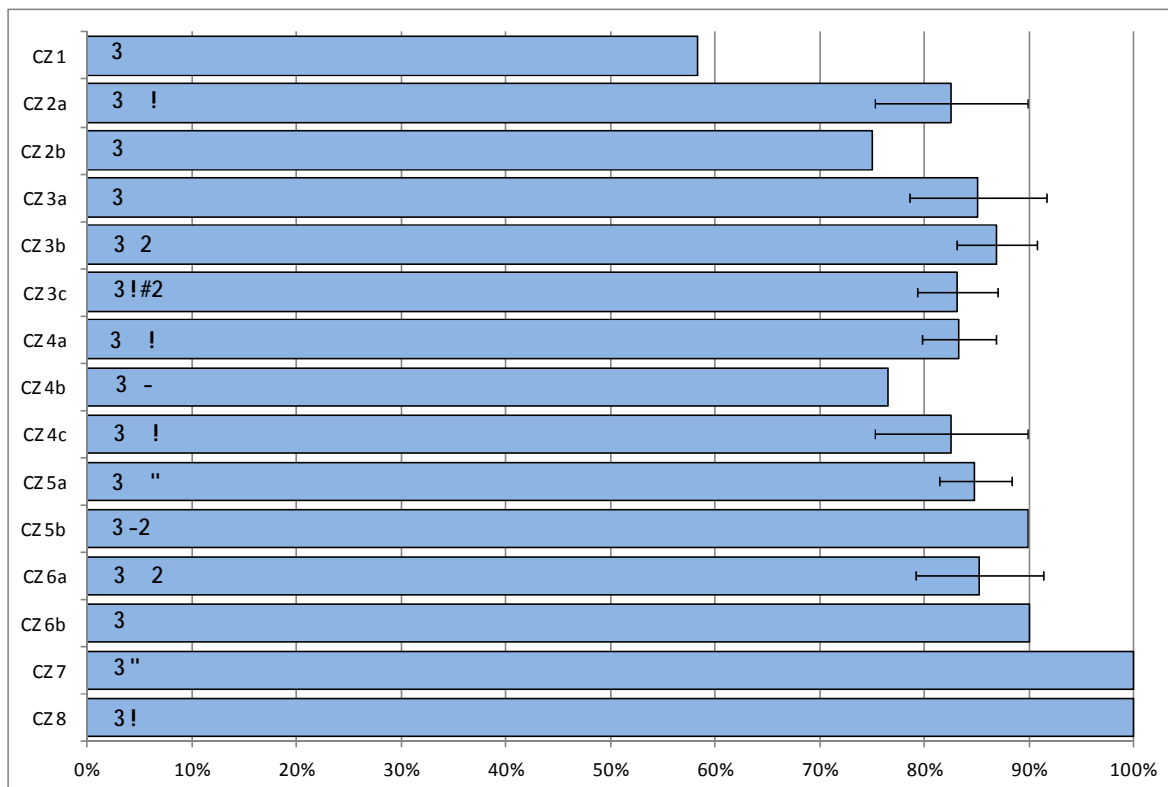


Figure 7. Percentage of households having dinner at home (bars) for all climate zones and the 95th percentile confidence interval of the probability that different climate zones eat dinner at home (whiskers). The number of respondents (N) for each climate zone is included.

Figure 7 compares the percentage of respondents eating dinner at home (bars) for all climate zones and the 95th percentile confidence interval of the probability that different climate zones eat dinner at home (whiskers). Greater than half of all respondents ate dinner at home, and all respondents from CZ 6b, CZ 7, and CZ 8 reported being home for dinner. For CZ 1, 58% of respondents ate dinner at home, the lowest value. There was no significant difference between calculated probabilities for the climate zones.

	Breakfast			Lunch			Dinner		
CZ1	50	±	NA	25	±	NA	58	±	NA
CZ2a	72	±	8.7	40	±	9.5	83	±	7.3
CZ2b	65	±	NA	30	±	NA	75	±	NA
CZ3a	68	±	8.5	45	±	9.1	85	±	6.5
CZ3b	76	±	4.9	42	±	5.7	87	±	3.9
CZ3c	78	±	4.2	36	±	4.9	83	±	3.8
CZ4a	70	±	4.4	33	±	4.5	83	±	3.6
CZ4b	53	±	NA	35	±	NA	76	±	NA
CZ4c	72	±	8.7	40	±	9.5	83	±	7.3
CZ5a	71	±	4.4	38	±	4.7	85	±	3.5
CZ5b	81	±	8.6	41	±	11	90	±	NA
CZ6a	71	±	7.8	36	±	8.3	85	±	6.1
CZ6b	80	±	NA	30	±	NA	90	±	NA
CZ7	80	±	NA	40	±	NA	100	±	NA
CZ8	100	±	NA	33	±	NA	100	±	NA

Table 4. Probability and uncertainties of households having meals at home in each climate zones. Values are in percentages (%). NA indicates that the uncertainty could not be calculated.

Usage of different oils while cooking

The following figures and tables were generated based on respondent usage of the following oils: canola oil, vegetable oil, peanut oil, soybean oil, olive oil, and “other” oils. Household type and climate zones are the variables considered with oil use. Respondents chose all applicable responses.

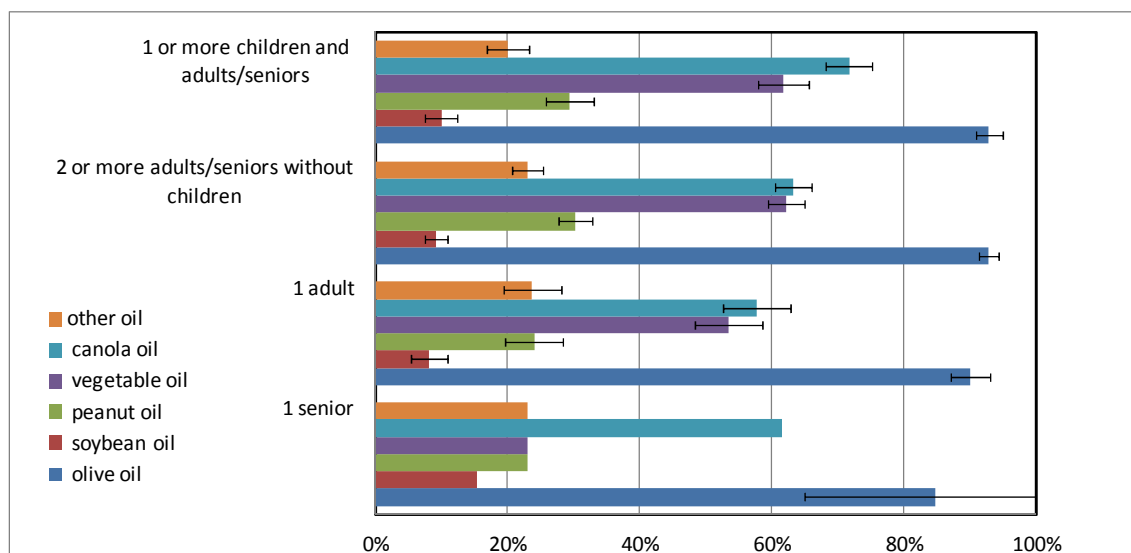


Figure 8. Percentage of household reporting cooking oil use according to household type (bars) and the 95th percentile confidence interval of the probability that different household types will use cooking oils (whiskers).

Figure 8 compares types of oil used per household type. Across all household types, olive oil is the most commonly used oil, followed by canola oil, then vegetable oil. Both “1 or more children and adults/seniors” and “2 or more adults/seniors without children” have over 90% of respondents claiming to have used olive oil within the past 24 hours. As shown in Table 5, there is no significant difference in the use of any particular type of oil for the different family types except for slight differences in percentages of households that use canola oil. There are large differences in the usage rates of different types of oil in all homes with the vast majority of homes using olive oil at some point and relatively few homes recorded using soybean oil. The top oils people indicated using in the "other" category were coconut oil (107 respondents), sesame oil (96 respondents), and grapeseed oil (61 respondents). Eighty-four of the respondents said they did not use oil but used butter.

Household type	Olive oil	Soybean oil	Peanut oil	Vegetable oil	Canola oil	Other oil	Num. of respondents
1 senior	85 ± 20	15 ± NA	23 ± NA	23 ± NA	61 ± NA	23 ± NA	13
1 adult	90 ± NA	8.0 ± 2.8	24 ± 4.3	53 ± 5.1	58 ± 5.0	24 ± 4.3	371
2 + adults/seniors without children	93 ± NA	9.2 ± 1.7	30 ± 2.6	62 ± 2.6	63 ± 2.8	23 ± 2.4	1175
1 + children and adults/seniors	92 ± NA	10 ± 2.4	29 ± 3.6	62 ± 3.6	72 ± 3.8	20 ± 3.2	614
Weighted average	92 ± 1.1	9.3 ± 1.2	29 ± 1.9	60 ± 1.9	65 ± 2.0	22 ± 1.7	2173

Table 5. Probability and uncertainties of households using various oils for each home occupancy type. Values are in percentages (%).

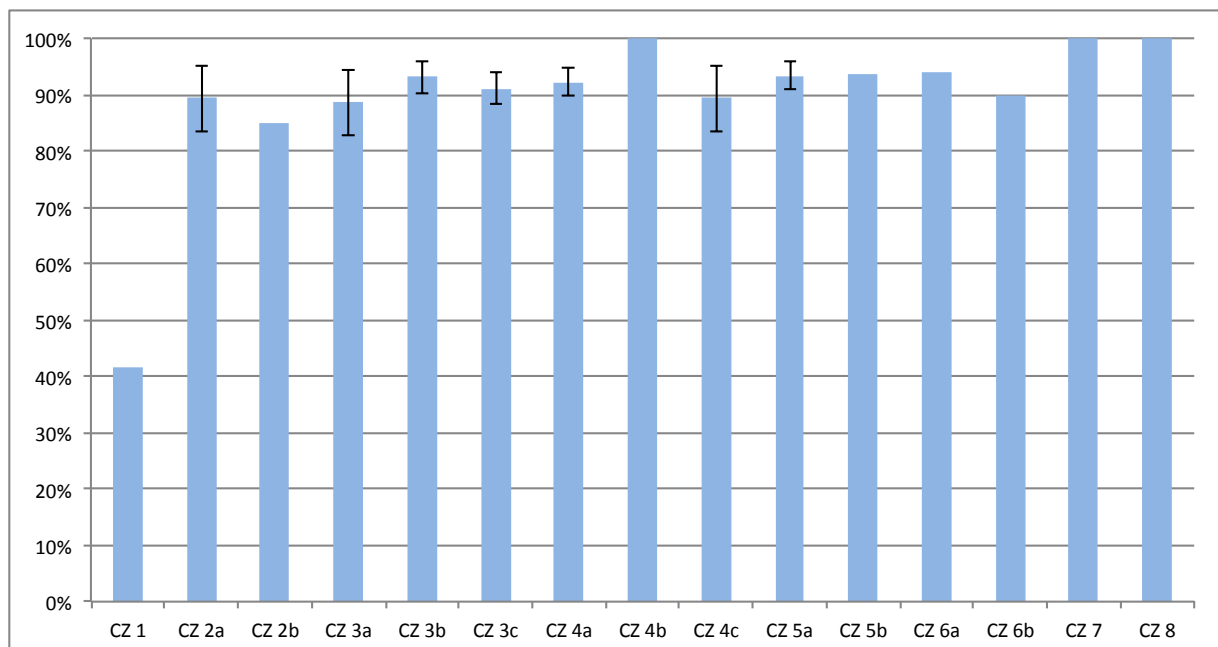


Figure 9. Percentage of households reporting using olive oil (bars) for all climate zones and the 95th percentile confidence interval of the probability that different households will use olive oil (whiskers).

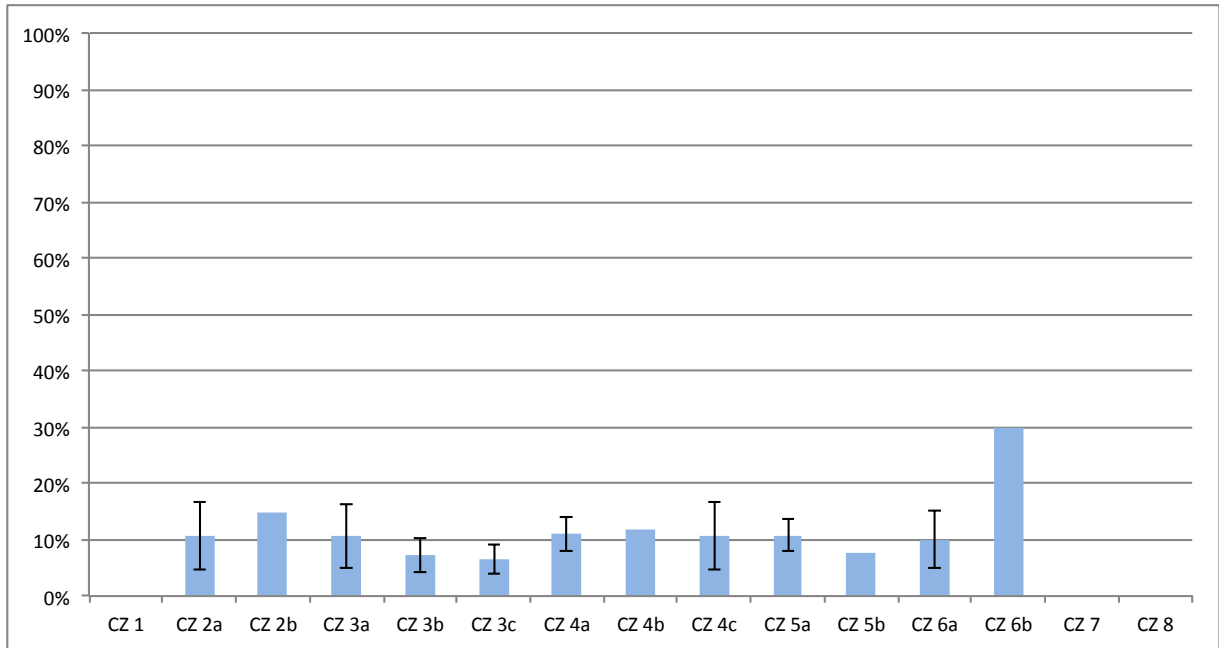


Figure 10. Percentage of household reporting using soybean oil (bars) for all climate zones and the 95th percentile confidence interval of the probability that different households will use soybean oil (whiskers).

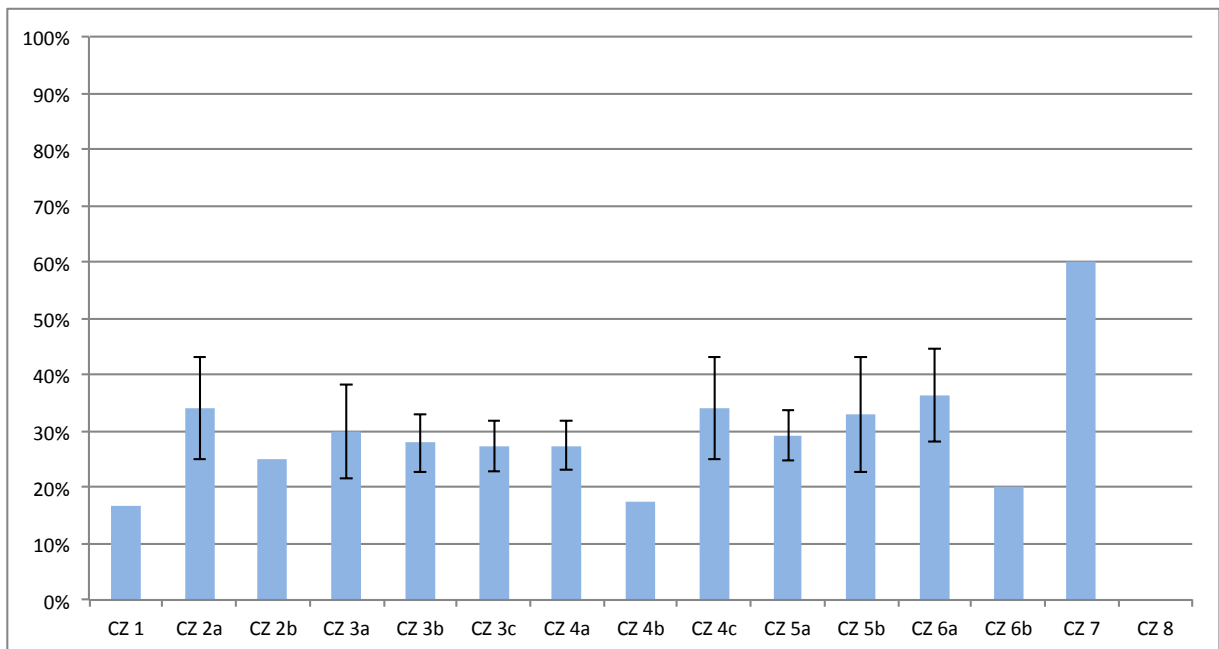


Figure 11. Percentage of households reporting using peanut oil (bars) for all climate zones and the 95th percentile confidence interval of the probability that different households will use peanut oil (whiskers).

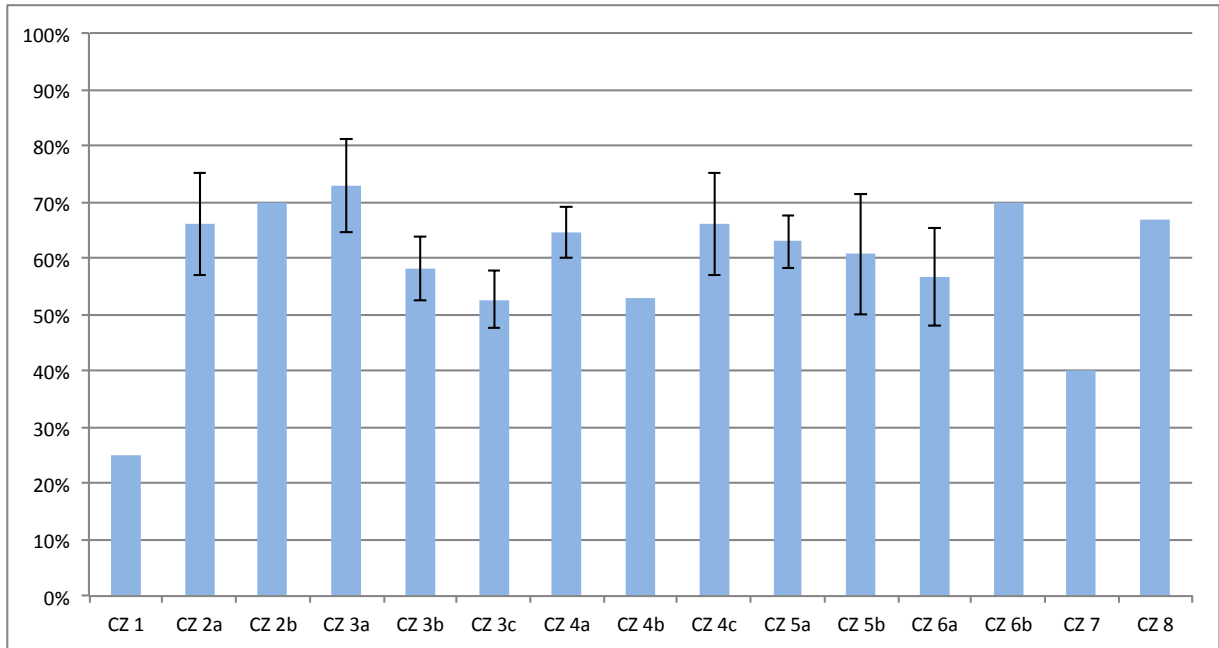


Figure 12. Percentage of households reporting using vegetable oil (bars) for all climate zones and the 95th percentile confidence interval of the probability that different households will use vegetable oil (whiskers).

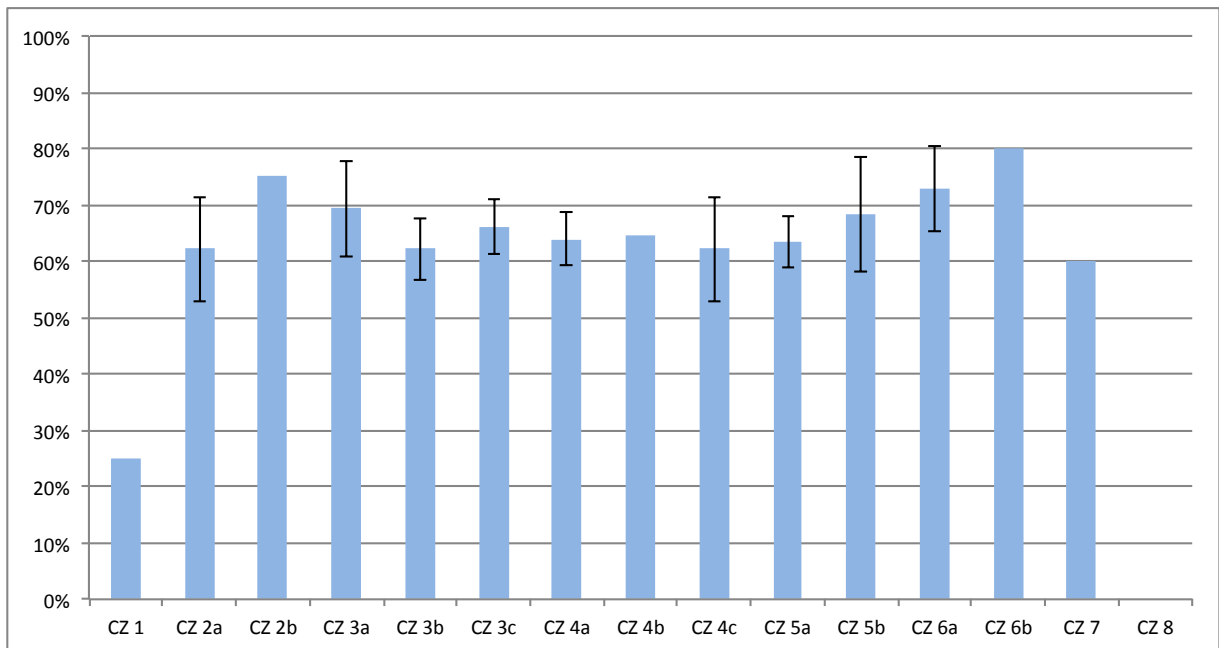


Figure 13. Percentage of households reporting using canola oil (bars) for all climate zones and the 95th percentile confidence interval of the probability that different households will use canola oil (whiskers).

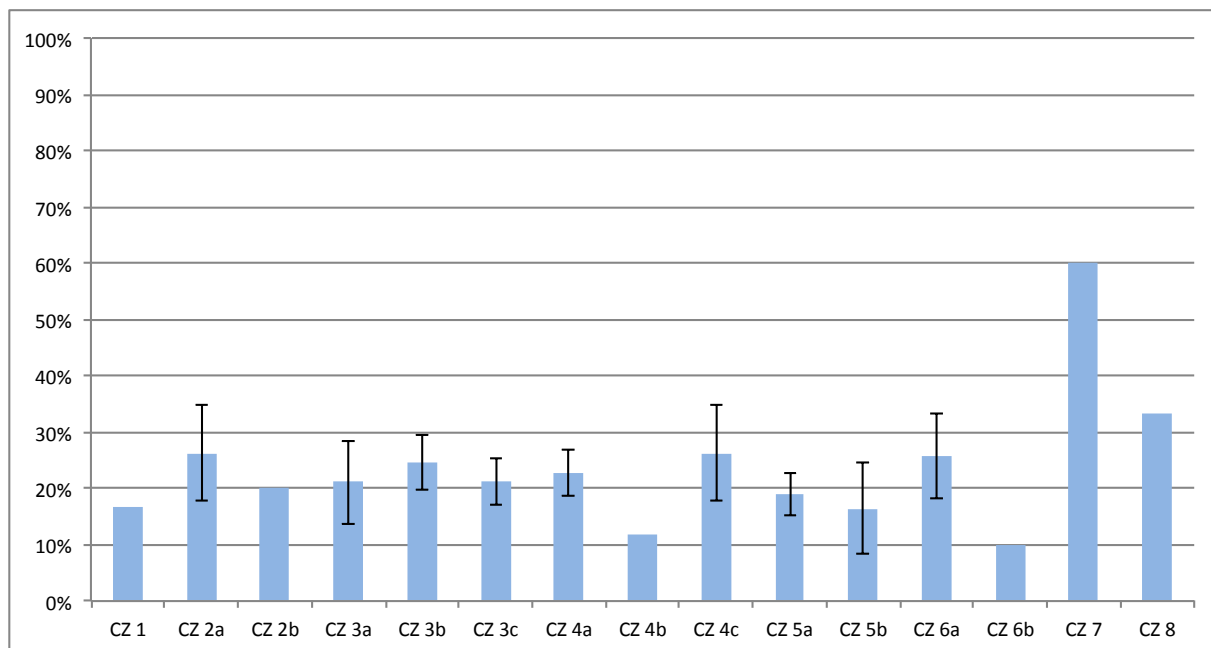


Figure 14. Percentage of households reporting using other oils (bars) for all climate zones and the 95th percentile confidence interval of the probability that different households will use other oils (whiskers).

Figures 9-14 compare the use of the following oils for all meals according to climate zone: olive, soybean, peanut, vegetable, canola, and other oils, respectively. Given the low number of respondents for many climate zones, we could not determine the uncertainty in the calculated probability of oil use in many CZs. For most of the oils, we could not say there was any statistically significant regional variation in oil use. The only exception is for vegetable oil which seems to have slightly less use in CZ 3c than in CZ 3a, 4a, or 5a.

Climate Zones	Olive oil	Soybean oil	Peanut oil	Vegetable oil	Canola oil	Other oil	Num. of respondents
CZ 1	42 ± NA	0.0 ± NA	17 ± NA	25 ± NA	25 ± NA	17 ± NA	12
CZ 2a	89 ± 6.0	11 ± 6.0	34 ± 9.1	66 ± 9.1	62 ± 9.4	26 ± 8.5	103
CZ 2b	85 ± NA	15 ± NA	25 ± NA	70 ± NA	75 ± NA	20 ± NA	20
CZ 3a	89 ± 5.6	11 ± 5.6	30 ± 8.4	73 ± 8.2	69 ± 8.2	21 ± 7.5	114
CZ 3b	93 ± 2.9	7.2 ± 3.0	28 ± 5.1	58 ± 5.7	62 ± 5.6	25 ± 5.0	291
CZ 3c	91 ± 2.9	6.5 ± 2.5	27 ± 4.5	53 ± 5.1	66 ± 4.8	21 ± 4.2	369
CZ 4a	92 ± 2.9	11 ± 3.0	27 ± 4.3	65 ± 4.6	64 ± 4.6	23 ± 4.0	413
CZ 4b	100 ± NA	12 ± NA	18 ± NA	53 ± NA	65 ± NA	12 ± NA	17
CZ 4c	89 ± 6.0	11 ± 6.0	34 ± 9.1	66 ± 9.1	62 ± 9.4	26 ± 8.5	103
CZ 5a	93 ± 2.4	11 ± 3.0	29 ± 4.4	63 ± 4.6	63 ± 4.6	19 ± 3.8	415
CZ 5b	94 ± NA	8.0 ± NA	33 ± 10	61 ± 11	68 ± 10	16 ± 8.2	79
CZ 6a	94 ± NA	10 ± 5.2	36 ± 8.6	57 ± 8.6	73 ± 7.7	26 ± 7.5	129
CZ 6b	90 ± NA	30 ± NA	20 ± NA	70 ± NA	80 ± NA	10 ± NA	10
CZ 7	100 ± NA	0.0 ± NA	60 ± NA	40 ± NA	60 ± NA	60 ± NA	5
CZ 8	100 ± NA	0.0 ± NA	0.0 ± NA	67 ± NA	0.0 ± NA	33 ± NA	3
Weighted average	92 ± 1.2	9.4 ± 1.3	29 ± 2.1	61 ± 2.1	65 ± 2.1	22 ± 1.8	

Table 6. Probability and uncertainties of households using different cooking oil according to climate zone. Values are in percentages (%).

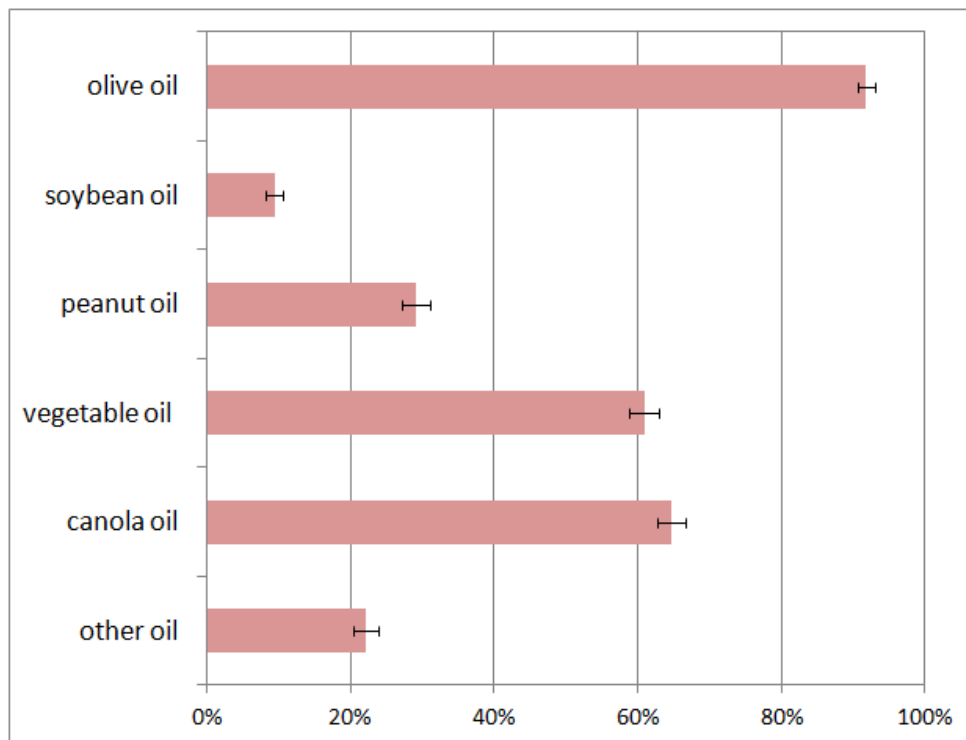


Figure 15. Percentage of US households reporting using cooking oils (bars) for all climate zones and the 95th percentile confidence interval of the probability that US households will use cooking oils (whiskers).

Figure 15 compares the different types of oil used in the United States reported by all respondents. Olive oil is the most commonly used oil on average, followed by canola and vegetable oil. Soybean oil is the least frequently used oil of the options presented to the survey takers. There are statistically significant differences in the types of oil used in US homes on average.

Characteristics of meals eaten at home

The following sections describe the characteristics of meals when they are eaten at home including the number of occupants present, the type of device used, and the method of preparation. The results for these sections represent just the respondents that indicated that a specific meal was consumed at home in the 24 hours prior to responding to the survey. Respondents that indicated that a specific meal was not had at home were not asked follow up questions about that meal.

Table 7 shows the number of respondents in each climate zone and for each occupancy type who reported eating breakfast, lunch, or dinner at home. Some respondents who indicated that a meal was eaten at home, did not answer all of the follow up questions.

0	&	(	1	4	(	&	(	1
05	6	3	7		9	5	11	
05	74	41	85		253	130	301	
05	13	6	15	6	7	824	442	970
05 !	78	51	97	6	(	502	246	548
05 !	222	121	253	7		1588	823	1830
05 !	287	132	307	%				
05	291	138	344					
05	9	6	13					
05	74	41	85					
05 "	295	157	352					
05 "	64	32	71					
05 #	92	47	110					
05 #	8	3	9					
05 -	4	2	5					
05 /	3	1	3					
%	1520	781	1756					

Table 7. Number of respondents who reported eating breakfast, lunch, and dinner at home.

Household occupants present at mealtimes

Seven respondents indicated that a meal was eaten at home, but then said that no one was present for that meal. We assumed that they had not included themselves in the number of people present for the meal and adjusted the number of people present to 1. There is a possibility that for other respondents, that they did not include themselves in the number of people present for a given meal.

Figures 16-18 and Tables 8-10 show the number of people present for each meal according to family type. For both the 1 senior and 1 adult household, for all meals, more than 80% of homes have 1 person present. For homes with more than 1 person and no children, most homes have 2 people present for breakfast and dinner and 1 or 2 people present for lunch. For homes with children, the majority of homes had 2-4 people present for breakfast and dinner and 1-3 people present for lunch.

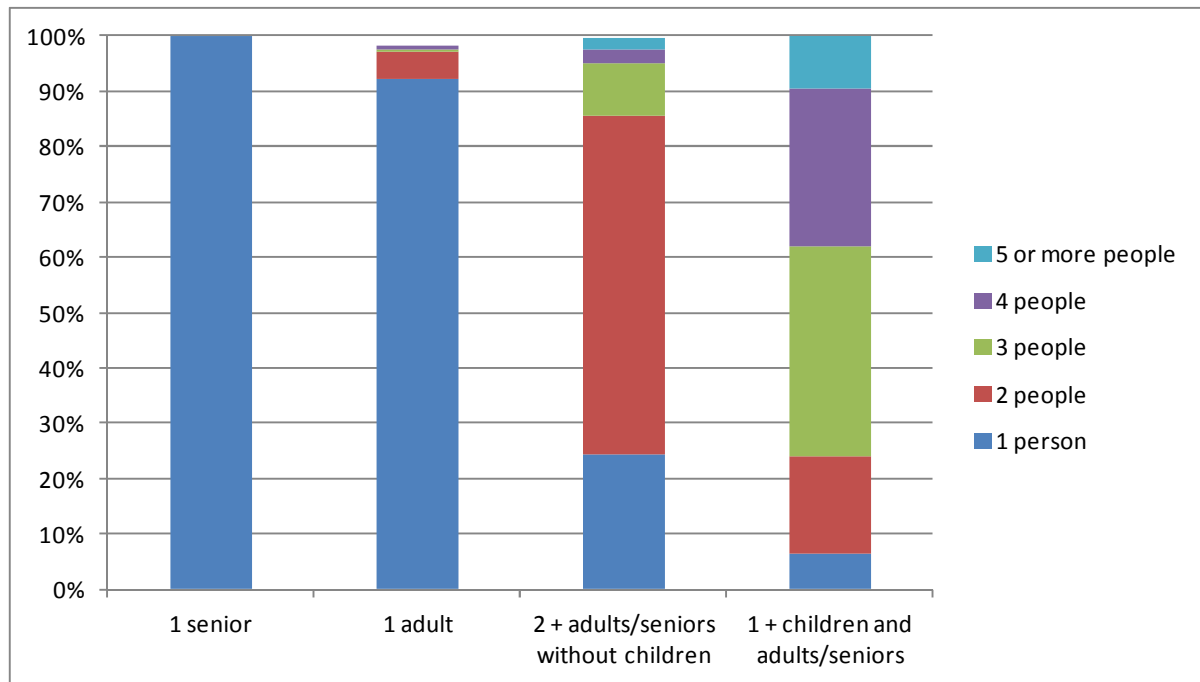


Figure 16. Reported percentage of people present in each household for breakfast according to family type.

Household type	1 person	2 people	3 people	4 people	5 or more people
1 senior	100 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
1 adult	92 ± 3.3	5.1 ± 2.7	0.4 ± NA	0.4 ± NA	0.0 ± NA
2 + adults/seniors without children	24 ± 2.9	61 ± 3.3	9.6 ± 2.0	2.5 ± 1.1	2.1 ± 1.0
1 + children and adults/seniors	6.4 ± 2.2	18 ± 3.3	38 ± 4.3	29 ± 4.0	10 ± 2.6
Weighted average	30 ± 2.3	38 ± 2.4	17 ± 1.8	10 ± 1.5	4.2 ± 1.0

Table 8. Probability and uncertainties of people present in each household for breakfast according to family type. Values are in percentages (%).

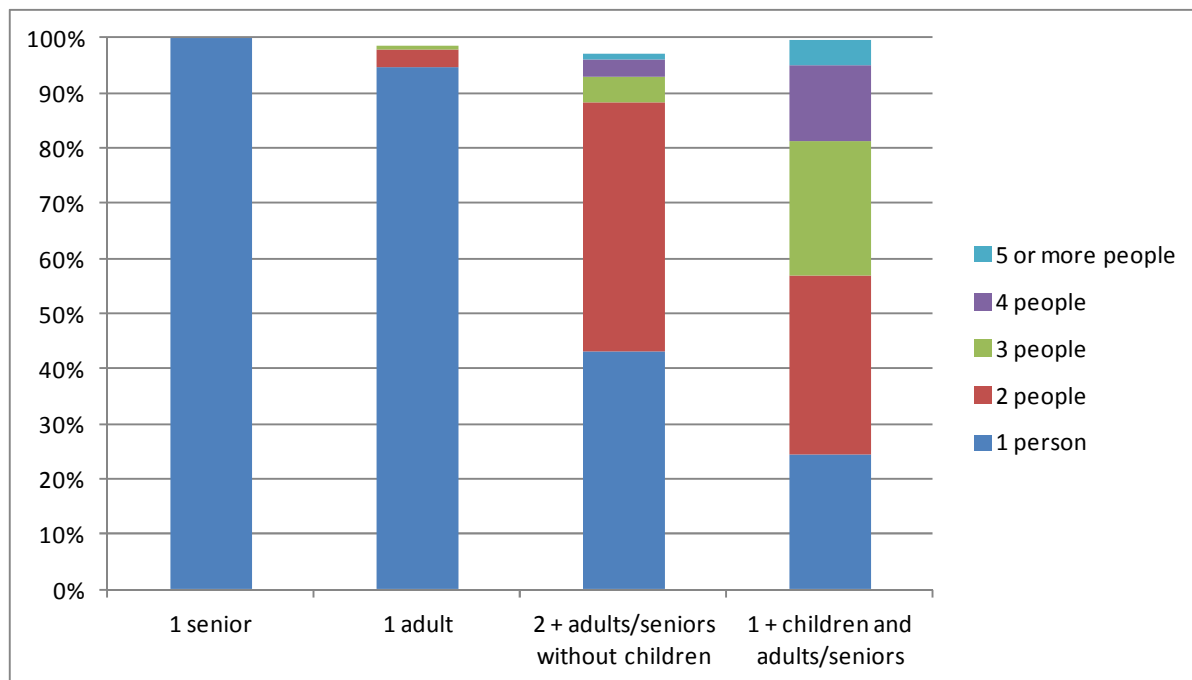


Figure 17. Reported percentage of people present in each household for lunch according to family type.

Household type	1 person	2 people	3 people	4 people	5 or more people
1 senior	100 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
1 adult	95 ± NA	3.1 ± NA	0.8 ± NA	0.0 ± NA	0.0 ± NA
2 + adults/seniors without children	43 ± 4.6	45 ± 4.6	4.8 ± 2.0	2.9 ± 1.6	1.4 ± NA
1 + children and adults/seniors	25 ± 5.4	32 ± 5.9	25 ± 5.4	14 ± 4.3	4.6 ± 2.6
Weighted average	46 ± 3.4	34 ± 3.3	9.9 ± 2.0	5.6 ± 1.6	2.1 ± 1.0

Table 9. Probability and uncertainties of people present in each household for lunch according to family type. Values are in percentages (%).

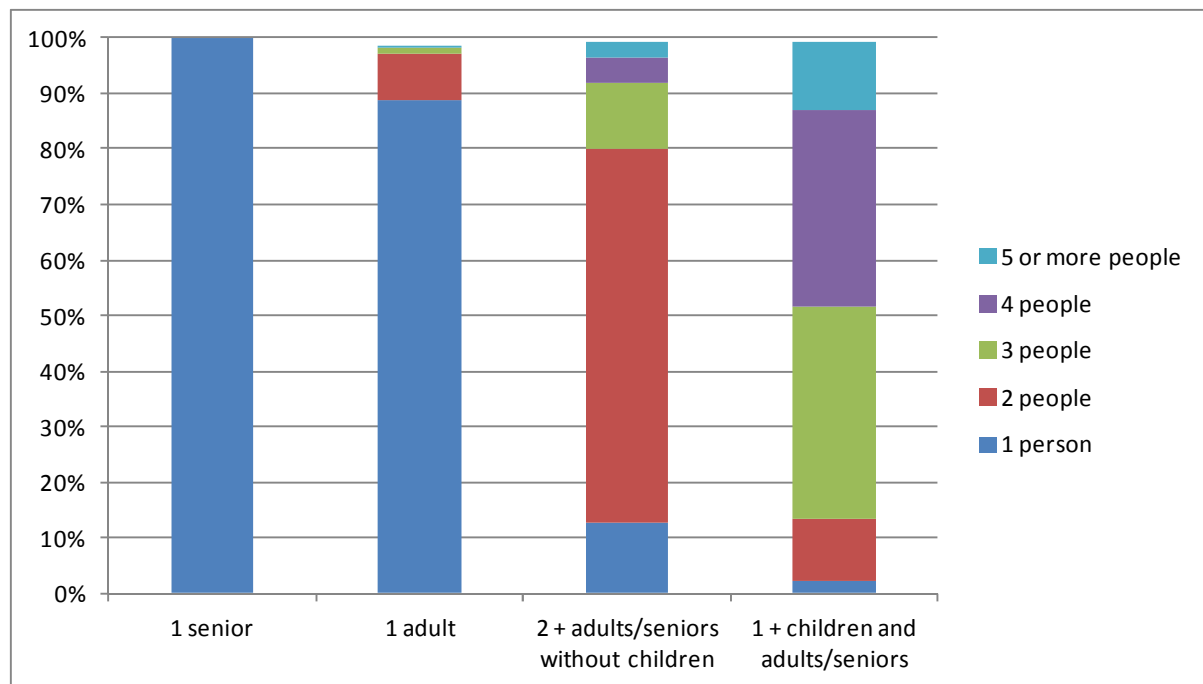


Figure 18. Reported percentage of people present in each household for dinner according to family type.

Household type	1 person	2 people	3 people	4 people	5 or more people
1 senior	100 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
1 adult	89 ± 3.6	8.3 ± 3.1	1.0 ± NA	0.0 ± NA	0.3 ± NA
2 + adults/seniors without children	13 ± 2.1	67 ± 2.9	12 ± 2.0	4.4 ± 1.3	2.9 ± 1.1
1 + children and adults/seniors	2.4 ± 1.3	11 ± 2.6	38 ± 4.1	35 ± 4.0	12 ± 2.8
Weighted average	23 ± 1.9	40 ± 2.2	18 ± 1.8	13 ± 1.5	5.3 ± 1.0

Table 10. Probability and uncertainties of people present in each household for dinner according to family type. Values are in percentages (%).

Figure 19 show the percentage of individuals present for breakfast for each climate zone and Table 11 shows the probability and uncertainties of the number of people present in each household for breakfast according to climate zone. According to the weighted average, the presence of two people in the home during breakfast is the most common, followed by one person. Five or more people in the home during breakfast is least common. There is no statistically significant difference in the probabilities that a given number of people will be present for a meal between climate zones. There is a significant difference in the likelihood that a certain number of people will be present for all the respondents as indicated by the weighted averages in Table 11.

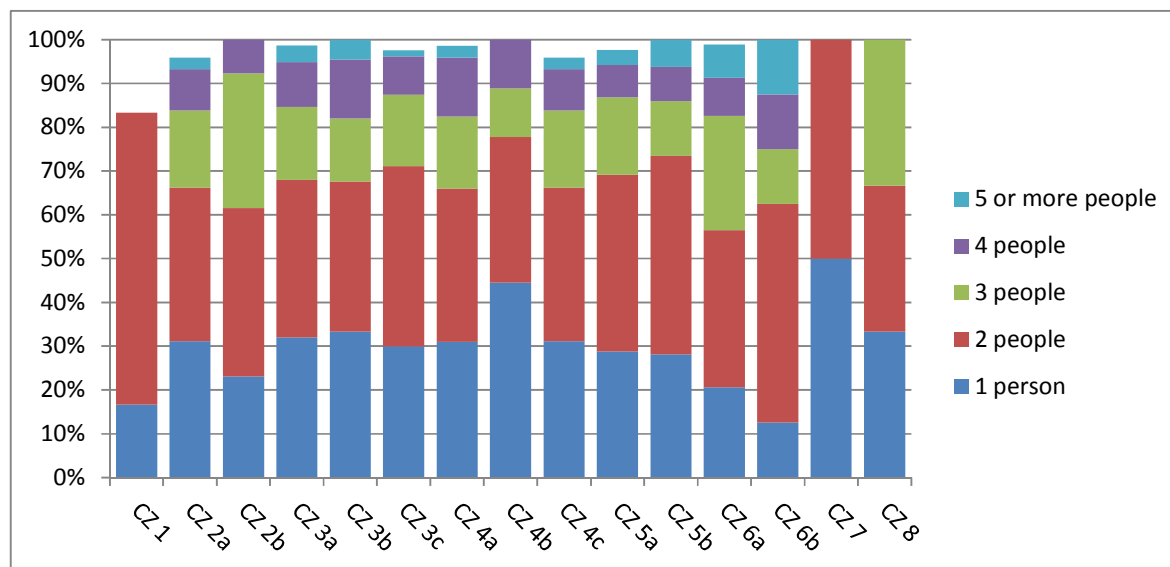


Figure 19. Reported percentage of people present in each household for breakfast according to climate zone.

Climate zones	1 person	2 people	3 people	4 people	5 or more people
CZ 1	17 ± NA	67 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 2a	31 ± 11	35 ± 11	18 ± 8.7	9.5 ± NA	2.7 ± NA
CZ 2b	23 ± NA	38 ± NA	31 ± NA	7.7 ± NA	0.0 ± NA
CZ 3a	32 ± 10	36 ± 11	17 ± 8.3	10 ± NA	3.9 ± NA
CZ 3b	33 ± 6.2	34 ± 6.2	14 ± 4.6	14 ± 4.5	4.5 ± 2.7
CZ 3c	30 ± 5.3	41 ± 5.7	16 ± 4.3	8.7 ± 3.3	1.4 ± NA
CZ 4a	31 ± 5.3	35 ± 5.5	16 ± 4.3	13 ± 3.9	2.8 ± NA
CZ 4b	44 ± NA	33 ± NA	11 ± NA	11 ± NA	0.0 ± NA
CZ 4c	31 ± 11	35 ± 11	18 ± 8.7	9.5 ± NA	2.7 ± NA
CZ 5a	29 ± 5.2	40 ± 5.6	18 ± 4.3	7.5 ± 3.0	3.4 ± 2.1
CZ 5b	28 ± 11	45 ± 12	13 ± NA	7.8 ± NA	6.3 ± NA
CZ 6a	21 ± 8.3	36 ± 10	26 ± 9.0	8.7 ± NA	7.6 ± NA
CZ 6b	13 ± NA	50 ± NA	13 ± NA	13 ± NA	13 ± NA
CZ 7	50 ± NA	50 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 8	33 ± NA	33 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA
Weighted average	30 ± 2.3	38 ± 2.4	17 ± 1.9	10 ± 1.5	3.3 ± 0.9

Table 11. Probability and uncertainties of people present in each household for breakfast according to climate zone. Values are in percentages (%).

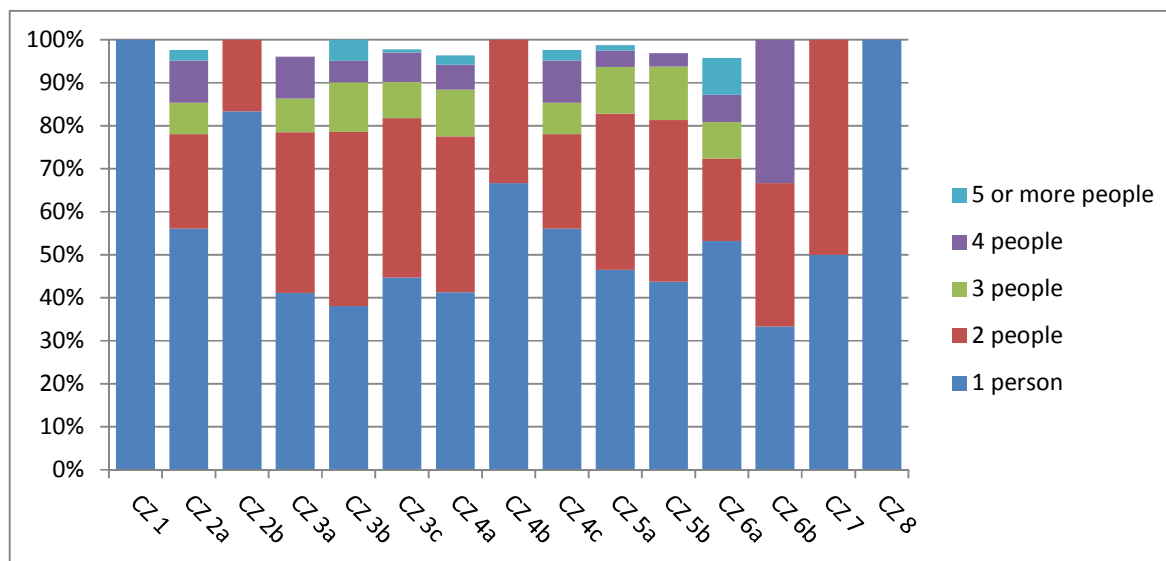


Figure 20. Percentage of people present in each household for lunch according to climate zone.

Climate zones	1 person	2 people	3 people	4 people	5 or more people
CZ 1	100 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 2a	56 ± 15	22 ± NA	7.3 ± NA	10 ± NA	2.4 ± NA
CZ 2b	83 ± NA	17 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 3a	41 ± 14	37 ± 13	7.8 ± NA	10 ± NA	0.0 ± NA
CZ 3b	38 ± 8.6	40 ± 8.7	12 ± 5.7	5.0 ± NA	5.0 ± NA
CZ 3c	45 ± 8.5	37 ± 8.2	8.3 ± 4.7	6.8 ± NA	0.8 ± NA
CZ 4a	41 ± 8.2	36 ± 8.0	11 ± 5.2	5.8 ± NA	2.2 ± NA
CZ 4b	67 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 4c	56 ± 15	22 ± NA	7.3 ± NA	10 ± NA	2.4 ± NA
CZ 5a	46 ± 7.8	36 ± 7.5	11 ± 4.9	3.8 ± NA	1.3 ± NA
CZ 5b	44 ± 17	38 ± 17	13 ± NA	3.1 ± NA	0.0 ± NA
CZ 6a	53 ± 14	19 ± NA	8.5 ± NA	6.4 ± NA	8.5 ± NA
CZ 6b	33 ± NA	33 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA
CZ 7	50 ± NA	50 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 8	100 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
Weighted average	46 ± 3.5	34 ± 3.3	10 ± 2.1	6.0 ± 1.7	2.3 ± 1.1

Table 12. Probability and uncertainties of people present in each household for lunch according to climate zone. Values are in percentages (%).

Figure 20 and Table 12 show the number (displayed as percentages) of individuals present for lunch for each climate zone and the probability and uncertainty that a certain number of people will be present for lunch. Across all homes, the presence of one person in the home during lunch if lunch is prepared at home is most common, followed by two people. All respondents in CZ 1 and CZ 8 reported one person as present for lunch. Similar to the data for breakfast, there is no statistically significant difference in the likelihood that a specific number of people will be present between climate zones.

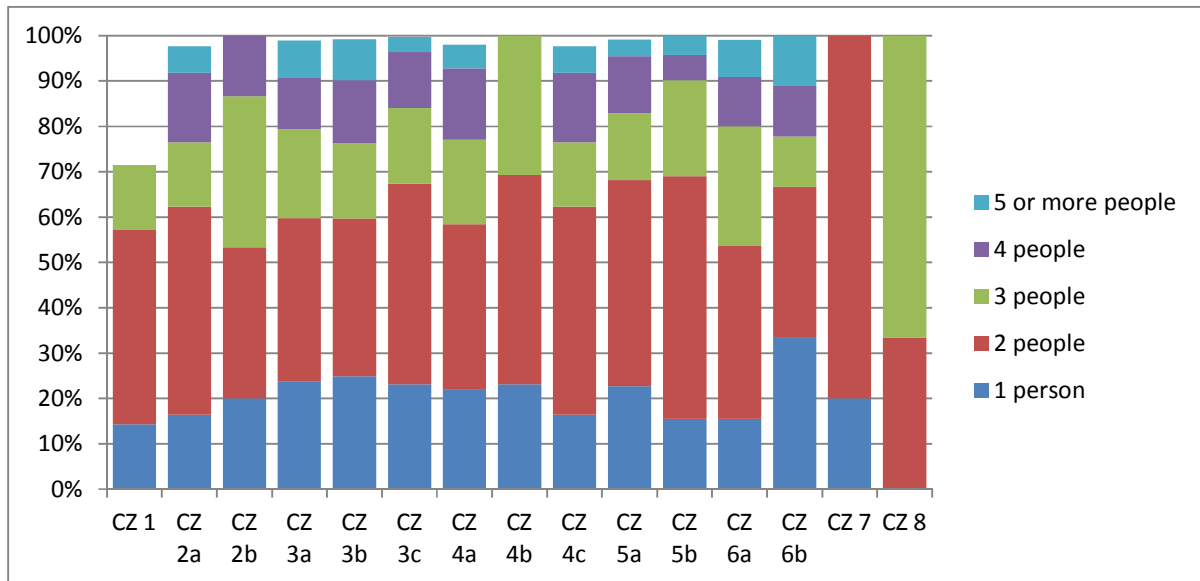


Figure 21. Percentage of people present in each household for dinner according to climate zone.

Climate zones	1 person	2 people	3 people	4 people	5 or more people
CZ 1	14 ± NA	43 ± NA	14 ± NA	0.0 ± NA	0.0 ± NA
CZ 2a	16 ± 7.9	46 ± 11	14 ± 7.4	15 ± 7.7	6.0 ± NA
CZ 2b	20 ± NA	33 ± NA	33 ± NA	13 ± NA	0.0 ± NA
CZ 3a	24 ± 8.5	36 ± 9.6	20 ± 7.9	11 ± 6.3	8.0 ± NA
CZ 3b	25 ± 5.3	35 ± 5.9	17 ± 4.6	14 ± 4.3	9.0 ± 3.5
CZ 3c	23 ± 4.7	44 ± 5.6	17 ± 4.2	12 ± 3.7	3.0 ± 2.0
CZ 4a	22 ± 4.4	36 ± 5.1	19 ± 4.1	16 ± 3.8	5.0 ± 2.4
CZ 4b	23 ± NA	46 ± NA	31 ± NA	0.0 ± NA	0.0 ± NA
CZ 4c	16 ± 7.9	46 ± 11	14 ± 7.4	15 ± 7.7	6.0 ± NA
CZ 5a	23 ± 4.4	45 ± 5.2	15 ± 3.7	13 ± 3.5	4.0 ± 2.0
CZ 5b	15 ± 8.4	54 ± 12	21 ± 9.5	5.6 ± NA	4.0 ± NA
CZ 6a	15 ± 6.8	38 ± 9.1	26 ± 8.2	11 ± 5.8	8.0 ± NA
CZ 6b	33 ± NA	33 ± NA	11 ± NA	11 ± NA	11 ± NA
CZ 7	20 ± NA	80 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 8	0.0 ± NA	33 ± NA	67 ± NA	0.0 ± NA	0.0 ± NA
Weighted average	22 ± 1.9	41 ± 2.3	18 ± 1.8	13 ± 1.6	5.4 ± 1.1

Table 13. Probability and uncertainties of people present in each household for dinner according to climate zone. Values are in percentages (%).

Figure 21 and Table 13 shows the number (displayed as percentages) of individuals present for dinner for each climate zone and the probability and uncertainty that a certain number of people will be present for dinner. The majority of respondents have two people present in the home for dinner, followed by one person.

Figure 22 shows the total percentage of respondents that report the number of people home for each meal and the probability that a certain number of people will be home for each meal. The probabilities all have uncertainty of 3% or less. Figure 19 shows that 2 people, followed 1 person are the typical

number of people home during cooking breakfast. The most probable situation is one person at home for lunch, followed by two people. The most common situation is two people for dinner, followed by one person, then three. The presence of three people during this mealtime occurs more often than breakfast or lunch. The shape of the distribution is very similar for breakfast and lunch. For any meal, 5% of homes or less reported having 5 or more people present. This is likely due to household sizes being smaller than 5 people.

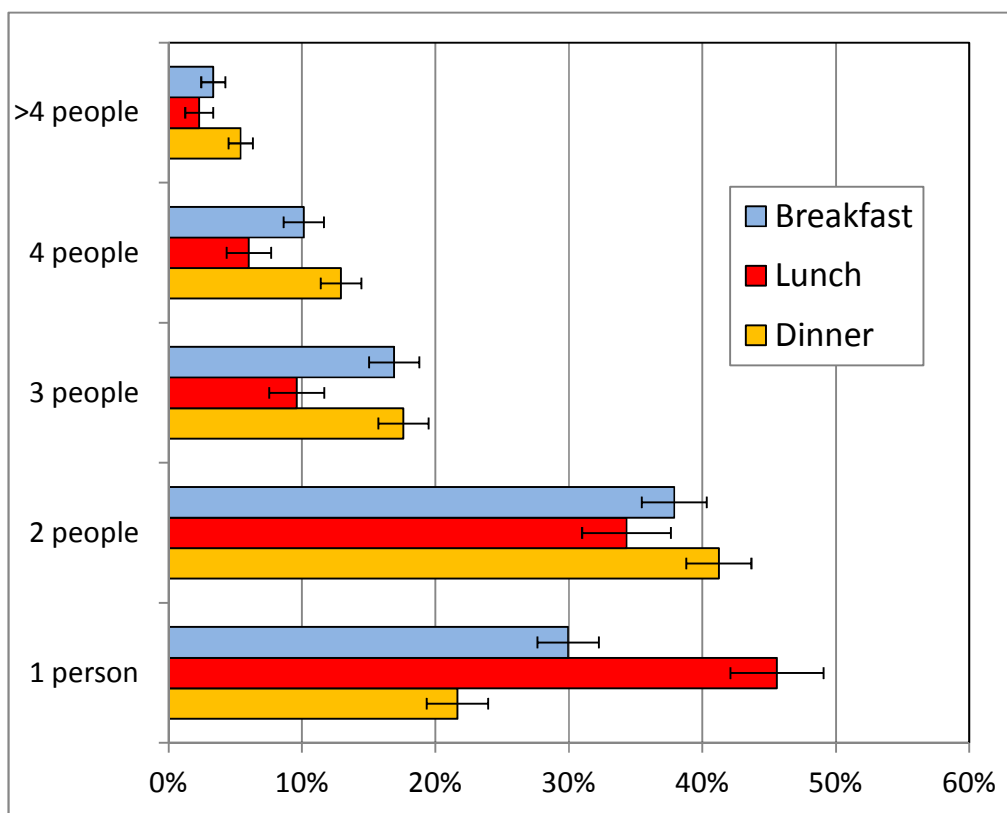


Figure 22. Percentage of individuals reported present for breakfast, lunch, and dinner (bars) and 95th percentile confidence interval of the probability of a certain number of people being home for each meal (whiskers).

We also looked at the impact of the number of home occupants on how many people are present for specific meals. Figures 23-25 and Tables 14-16 show the reported number of people present for breakfast, lunch and dinner for homes with more than one occupant. The figures only show data for occupancies that had 30 or more responses. For homes with 2-5 occupants, the most likely number of people of present for breakfast and dinner is the number of home occupants followed by 1 less than the number of occupants. For lunch, independent of home size, the most common number of people home is 2 although there is large variability in the number of people home.

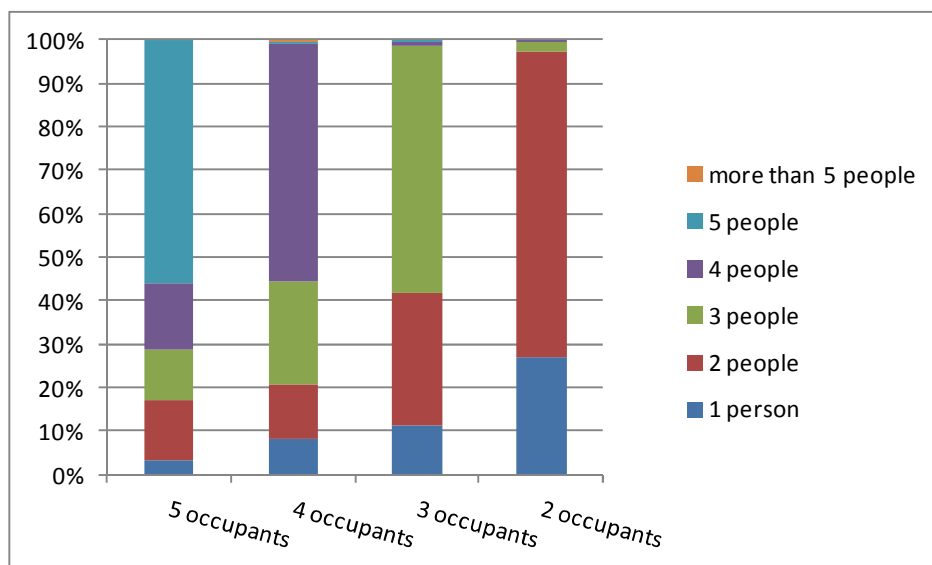


Figure 23. Percentage of homes reporting a certain number of people present for breakfast based on home occupancy. Data is included for home sizes that had more than 30 respondents indicated that they prepared breakfast at home. Data for single occupancy homes are not included.

	\$	8	!	"	#	-	/	2	'		
	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	100 ±	0.0 ±	1
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	0.0 ±	0.0 ±	50 ±	0.0 ±	50 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	2
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
/	0.0 ±	33 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	33 ±	33 ±	0.0 ±	0.0 ±	3
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
-	20 ±	20 ±	0.0 ±	0.0 ±	0.0 ±	20 ±	20 ±	0.0 ±	0.0 ±	20 ±	5
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
#	0.0 ±	5.9 ±	18 ±	12 ±	29 ±	35 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	17
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
"	3.2 ±	12 ±	11 ±	15 ±	53 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	4.8 ±	62
	NA	NA	NA	NA	12	NA	NA	NA	NA	NA	
	7.9 ±	12 ±	23 ±	54 ±	0.4 ±	0.4 ±	0.0 ±	0.0 ±	0.0 ±	1.9 ±	266
	3.2	4.0	5.1	6.0	NA	NA	NA	NA	NA	NA	
!	11 ±	30 ±	56 ±	1.2 ±	0.3 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	1.2 ±	321
	3.5	5.0	5.4	NA	NA	NA	NA	NA	NA	NA	
	27 ±	70 ±	2.0 ±	0.5 ±	0.0 ±	0.2 ±	0.0 ±	0.0 ±	0.0 ±	0.8 ±	636
	3.4	3.6	1.1	NA	NA	NA	NA	NA	NA	NA	

Table 14. Probabilities and uncertainties of number of people present for breakfast as a function of home occupancy. All values are in percentages (%). NR is percentage that did not respond. N is the number of respondents.

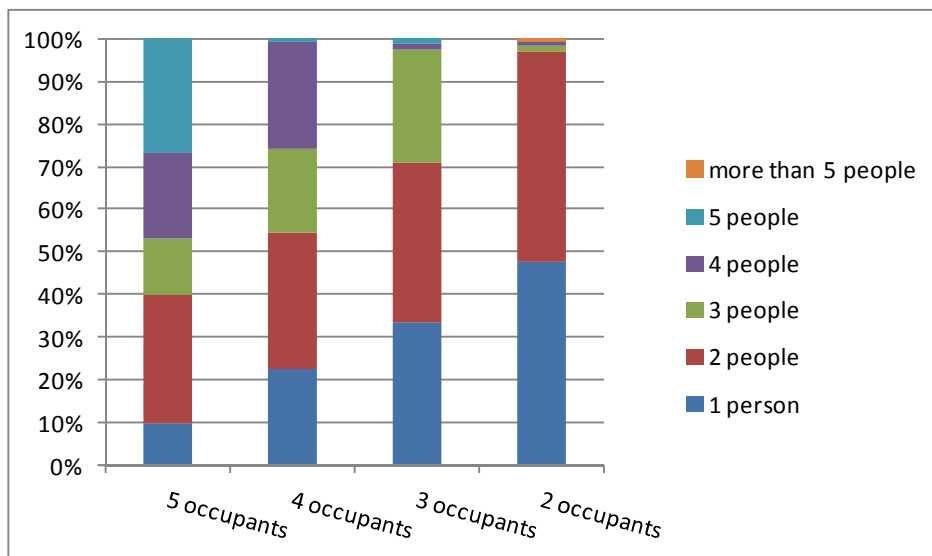


Figure 24. Percentage of homes reporting a certain number of people present for lunch based on home occupancy. Data is included for home sizes that had more than 30 respondents indicated that they prepared breakfast at home. Data for single occupancy homes are not included.

	\$	8	!	"	#	-	/	9 /	'		
	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	100 ±	0.0 ±	0.0 ±	0.0 ±	1
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	100 ±	0.0 ±	0.0 ±	0.0 ±	1
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
/	0.0 ±	0.0 ±	100 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	1
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
-	0.0 ±	0.0 ±	50 ±	0.0 ±	0.0 ±	50 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	2
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
#	11 ±	33 ±	22 ±	22 ±	0.0 ±	11 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	9
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
"	10 ±	30 ±	13 ±	20 ±	27 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	30
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	22 ±	31 ±	19 ±	24 ±	0.8 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	3.0 ±	132
	5.0	5.6	4.7	5.2	NA	NA	NA	NA	NA	NA	
!	33 ±	37 ±	26 ±	1.3 ±	1.3 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.6 ±	159
	5.2	5.3	4.8	NA	NA	NA	NA	NA	NA	NA	
	47 ±	48 ±	1.5 ±	0.9 ±	0.0 ±	0.3 ±	0.0 ±	0.0 ±	0.3 ±	2.9 ±	342
	3.9	3.9	NA	NA	NA	NA	NA	NA	NA	NA	

Table 15. Probabilities and uncertainties of number of people present for lunch as a function of home occupancy. All values are in percentages (%). NR is percentage that did not respond. N is the number of respondents.

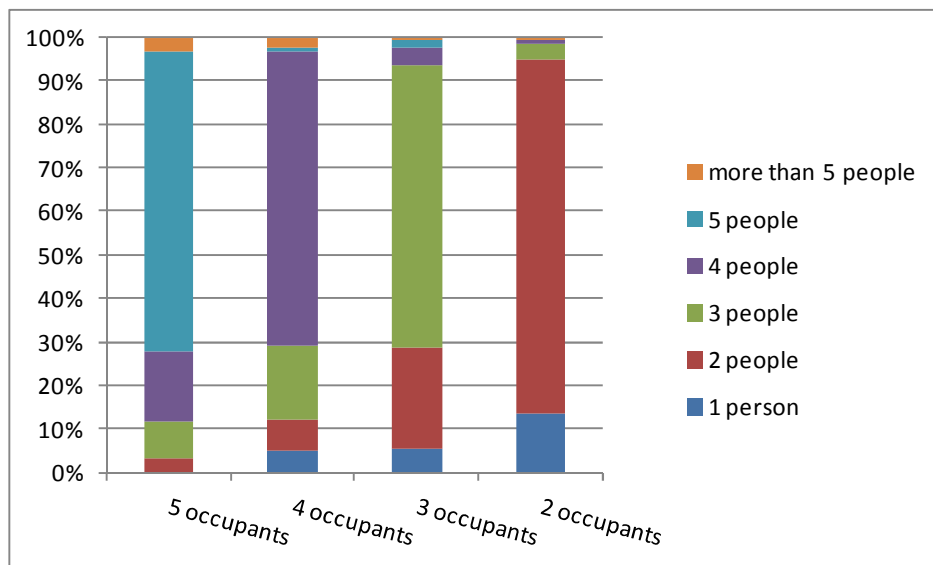


Figure 25. Percentage of homes reporting a certain number of people present for dinner based on home occupancy. Data is included for home sizes that had more than 30 respondents indicated that they prepared breakfast at home. Data for single occupancy homes are not included.

	\$	&	8	!	"	#	-	/	9 /	'	
	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	100 ±	0.0 ±	1
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	0.0 ±	0.0 ±	0.0 ±	33 ±	0.0 ±	0.0 ±	0.0 ±	0.0 ±	67 ±	0.0 ±	3
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
/	0.0 ±	0.0 ±	0.0 ±	0.0 ±	33 ±	33 ±	0.0 ±	33 ±	0.0 ±	0.0 ±	3
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
-	0.0 ±	0.0 ±	0.0 ±	0.0 ±	40 ±	20 ±	40 ±	0.0 ±	0.0 ±	0.0 ±	5
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
#	5.3 ±	5.3 ±	5.3 ±	16 ±	11 ±	47 ±	0.0 ±	5.3 ±	0.0 ±	5.3 ±	19
	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
"	0.0 ±	3.2 ±	8.1 ±	16 ±	68 ±	0.0 ±	0.0 ±	3.2 ±	0.0 ±	1.6 ±	62
	NA	NA	NA	NA	12	NA	NA	NA	NA	NA	
	4.8 ±	7.2 ±	17 ±	67 ±	1.0 ±	0.7 ±	0.7 ±	1.0 ±	0.7 ±	0.3 ±	292
	2.5	3.0	4.3	5.4	NA	NA	NA	NA	NA	NA	
!	5.2 ±	23 ±	64 ±	4.1 ±	1.6 ±	0.5 ±	0.5 ±	0.0 ±	0.3 ±	0.8 ±	367
	2.3	4.3	4.9	2.0	NA	NA	NA	NA	NA	NA	
	13 ±	80 ±	3.9 ±	0.8 ±	0.0 ±	0.4 ±	0.3 ±	0.0 ±	0.3 ±	0.8 ±	745
	2.4	2.9	2.9	NA	NA	NA	NA	NA	NA	NA	

Table 16. Probabilities and uncertainties of number of people present for dinner as a function of home occupancy. All values are in percentages (%). NR is percentage that did not respond. N is the number of respondents.

Respondent cooking device selection

The following figures and tables were generated based on respondent usage of the following cooking device at all meals: toaster, microwave, electric cooking devices (indicates either an electric wok, electric grill, or electric crock-pot), propane grill indoors, outdoor devices (grill or other cooking device), no devices, and other. Due to a survey error, cooking on the stove and cooking in the oven was referred to differently for each meal. For breakfast we asked respondents if they used the oven and/or the stove. For lunch we asked respondents if they used the cook top burners and/or the stove. For dinner we asked if respondents used cook top burners and/ or the oven. *Figures 26-32 and Tables 17-23* present the data as it was reported by the survey respondents.

The respondents were also asked to report the type of cooking they did for each meal. Results of this analysis are presented in the next section. The terms "oven" and "stove" can both be used to refer to a cooking range containing both an oven and cooktop/stovetop burners. In order to determine whether the meal was prepared in the oven or on the cooktop burners, we used the described cooking method to subdivide respondent results that reported using the stove or oven into cooktop burner use and oven use. If the respondents said they baked or broiled or specified that they used the oven in comments under the "other" category, we assumed that cooking was done in the oven. If the respondents said they pan fried/sautéed, stir fired, grilled or boiled or indicated they used the cooktop in the comments under the "other" category, we assumed that cooking was done on the cooktop burners. The results of this analysis are presented in *Table 24*.

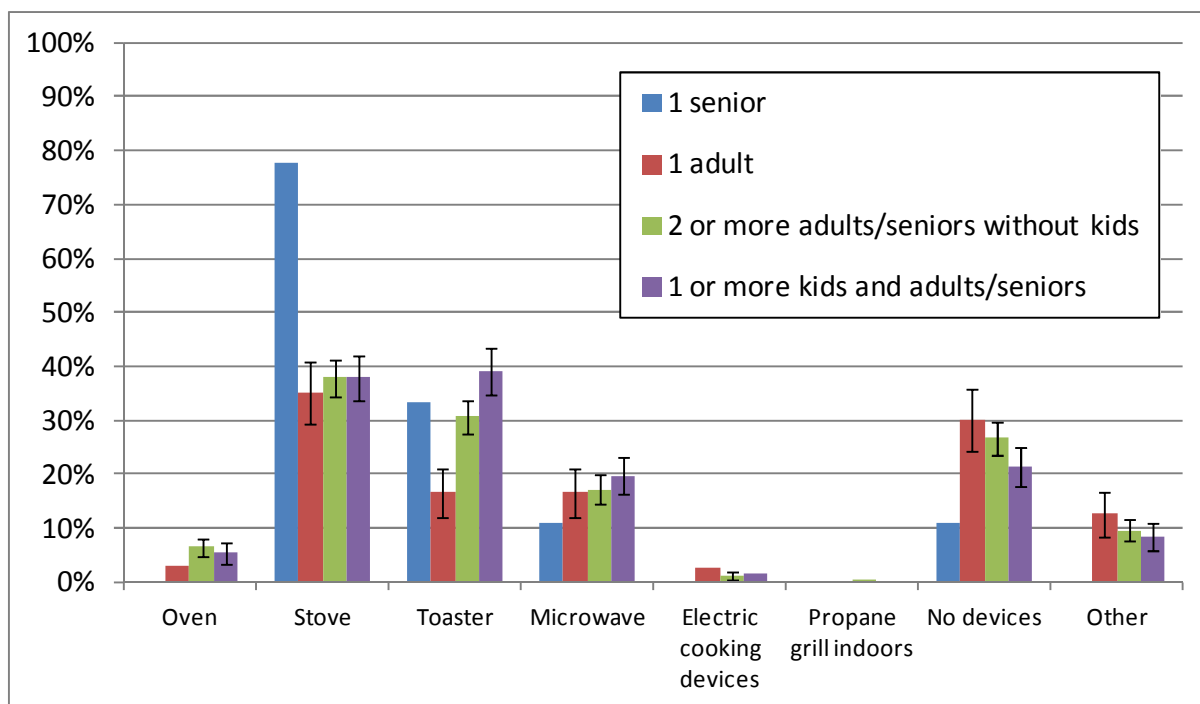


Figure 26. Percentage of households reporting device use for breakfast (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers). Devices not included in graphs were not reported used by any respondent. Results only reflect households that had breakfast at home.

Figure 26 shows the usage of different cooking devices for households during breakfast. For one senior households, stoves are the most commonly reported used device for breakfast, followed by toaster, and the microwave. Stoves are the most commonly used device in one adult homes for breakfast, followed by “no devices,” and toaster, respectively. Households with 2 or more adults/seniors and no kids reported that the stove is the most commonly used device for breakfast, followed by “no devices”, then toaster, respectively. Households consisting of “1 or more children and adults/seniors” reported the stove and toaster as the most commonly selected devices for breakfast, followed by the microwave and “no devices,” respectively. There is no statistically significant difference in the use of any cooking device between home types except for the toaster which is less likely to be used in single adult households than in households with more than one occupant.

Home type	Oven	Stove	Toaster	Microwave	Electric cooking devices
1 senior	0.0 ± NA	78 ± NA	33 ± NA	11 ± NA	0.0 ± NA
1 adult	3.2 ± NA	35 ± 5.9	17 ± 4.6	17 ± 4.6	2.8 ± NA
2 + adults/seniors without kids	6.6 ± 1.7	38 ± 3.3	31 ± 3.1	17 ± 2.6	1.2 ± 0.7
1 + kids and adults/seniors	5.4 ± 2.0	38 ± 4.2	39 ± 4.3	20 ± 3.5	1.6 ± NA
Weighted average	5.6 ± 1.0	38 ± 2.4	31 ± 2.3	18 ± 1.9	1.6 ± 0.6
Home type	Propane grill indoors	Outdoor device	No devices	Other	Num. of respondents
1 senior	0.0 ± NA	0.0 ± NA	11 ± NA	0.0 ± NA	9
1 adult	0.0 ± NA	0.0 ± NA	30 ± 5.6	13 ± 4.1	253
2 + adults/seniors without kids	0.1 ± NA	0.0 ± NA	27 ± 3.0	9.6 ± 2.0	824
1 + kids and adults/seniors	0.0 ± NA	0.0 ± NA	22 ± 3.6	8.4 ± 2.4	502
Weighted average	0.0 ± NA	0.0 ± NA	26 ± 2.1	9.7 ± 1.5	

Table 17. Probabilities and uncertainties of households corresponding to cooking device selection for breakfast. Values are in percentages (%).

Table 17 shows the probabilities and uncertainties that cooking devices will be used in each household type for breakfast. According to the weighted averages, the stove is the device that is used the most often for cooking breakfast, followed by the toaster, and microwave, respectively. Outdoor devices were not used by any respondents, and propane grill use indoors was very infrequent.

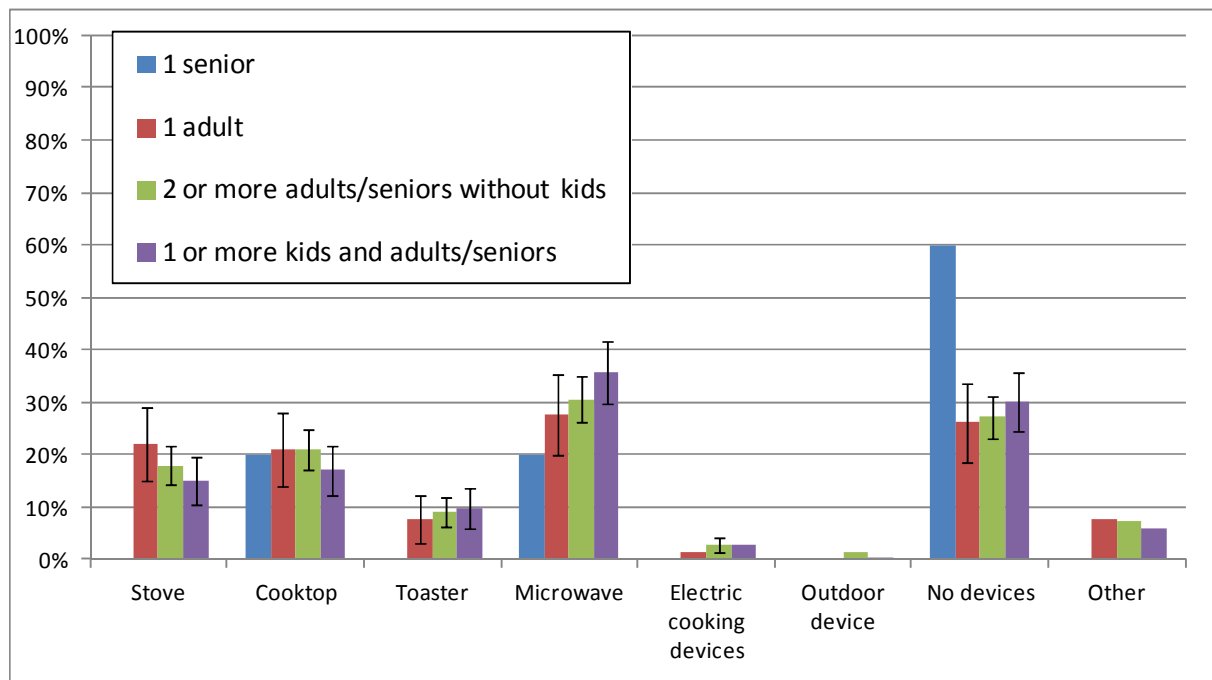


Figure 27. Percentage of households reporting device use for lunch (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers). Devices not included in graphs were not reported used by any respondent. Results only reflect households that had lunch at home.

Figure 27 shows the usage of different cooking devices during lunch. Table 18 shows the cooking device selection per household type for lunch. According to the weighted averages, the microwave is the device that is used the most often for cooking lunch, followed by “no devices” and stove. The propane grill for indoor use was not used by any respondents, and the outdoor grill/cooking device was not used frequently. There was no significant difference in device usage between home types.

Home type	Stove	Cooktop	Toaster	Microwave	Electric cooking devices
1 senior	0.0 ± NA	20 ± NA	0.0 ± NA	20 ± NA	0.0 ± NA
1 adult	22 ± 7.1	21 ± 7.0	7.7 ± 4.6	28 ± 7.7	1.5 ± NA
2 + adults/seniors without kids	18 ± 3.6	21 ± 3.8	9.1 ± 2.7	30 ± 4.3	2.7 ± 1.5
1 + kids and adults/seniors	15 ± 4.5	17 ± 4.7	9.8 ± 3.7	36 ± 6.0	2.9 ± NA
Weighted average	17 ± 2.6	20 ± 2.7	9.0 ± 2.0	31 ± 3.2	2.5 ± 1.1

Home type	Propane grill indoors	Outdoor device	No devices	Other	Num. of respondents
1 senior	0.0 ± NA	0.0 ± NA	60 ± NA	0.0 ± NA	5
1 adult	0.0 ± NA	0.0 ± NA	26 ± 7.6	7.7 ± 4.6	130
2 + adults/seniors without kids	0.0 ± NA	1.4 ± NA	27 ± 4.1	7.2 ± 2.4	442
1 + kids and adults/seniors	0.0 ± NA	0.4 ± NA	30 ± 5.7	6.1 ± 3.0	246
Weighted average	0.0 ± NA	0.9 ± NA	28 ± 3.1	7.0 ± 1.7	

Table 18. Probabilities and uncertainties of households corresponding to cooking device selection for lunch. Values are in percentages (%).

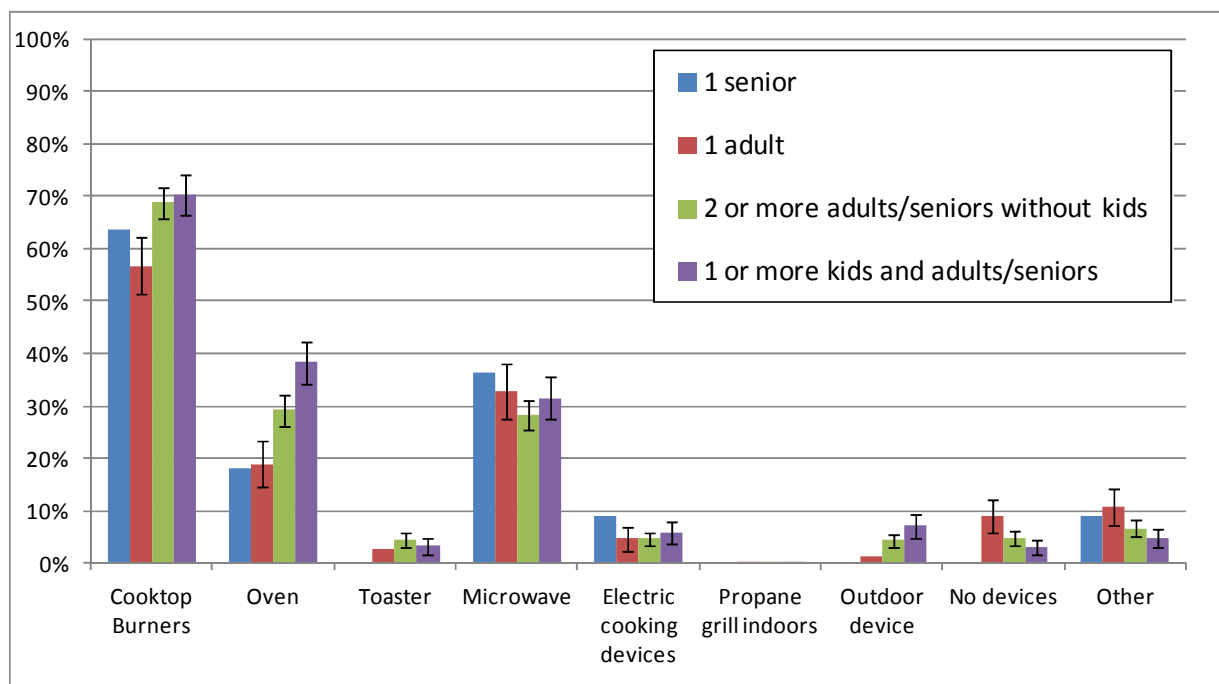


Figure 28. Percentage of households reporting device use for dinner (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers). Devices not included in graphs were not reported used by any respondent. Results only reflect households that had dinner at home.

Figure 28 shows the usage of different cooking devices for households during dinner. No respondents in 1 senior households indicated using: toaster, outdoor device, “no devices,” or propane grill for indoor use. The most commonly used device for 1 senior homes was the stove, followed by the microwave, and oven, respectively. Households consisting of one adult reported using the stove most frequently, followed by the microwave and oven, respectively. Households with “2 or more adults/seniors without children” reported using stoves most frequently, followed by equal selection of the oven and microwave. Households of “1 or more children and adults/seniors” reported using stoves the most frequently, followed by ovens and microwaves. The majority of survey responses were from the winter, which could result in reduced outdoor cooking or reduced indoor cooking using devices that would be ventilated via windows or doors. Households that have 1 adult are less likely to use the oven than other home types and homes with kids are slightly less likely to use “no device” compared to homes with just one adult.

Age groups	Cooktop Burners	Oven	Toaster	Microwave	Electric cooking devices
1 senior	64 ± NA	18 ± NA	0.0 ± NA	36 ± NA	9.1 ± NA
1 adult	57 ± 5.6	19 ± 4.4	2.7 ± NA	33 ± 5.3	4.7 ± 2.4
2 or more adults/seniors without kids	69 ± 2.9	29 ± 2.9	4.4 ± 1.3	28 ± 2.8	4.6 ± 1.3
1 or more kids and adults/seniors	70 ± 3.8	38 ± 4.1	3.3 ± 1.5	32 ± 3.9	5.8 ± 2.2
weighted average	67 ± 2.2	30 ± 2.1	3.8 ± 0.9	30 ± 2.1	4.6 ± 1.0
Age groups	Propane grill indoors	Outdoor device	No devices	Other	Num. of respondents
1 senior	0.0 ± NA	0.0 ± NA	0.0 ± NA	9.1 ± NA	11
1 adult	0.3 ± NA	1.3 ± NA	9.0 ± 3.2	11 ± 3.5	301
2 or more adults/seniors without kids	0.4 ± NA	4.3 ± 1.3	4.9 ± 1.4	6.6 ± 1.4	970
1 or more kids and adults/seniors	0.4 ± NA	7.1 ± 2.2	3.1 ± 1.5	4.7 ± 1.5	548
Weighted average	0.4 ± NA	4.6 ± 1.0	5.0 ± 1.0	6.8 ± 1.0	

Table 19. Probabilities and uncertainties of households corresponding to cooking device selection for dinner. Values are in percentages (%).

Table 19 shows the cooking device selection per household type for dinner. According to the weighted averages, the stove is the most frequently used device of all households, followed by equal oven and microwave use. The propane grill was the least used device.

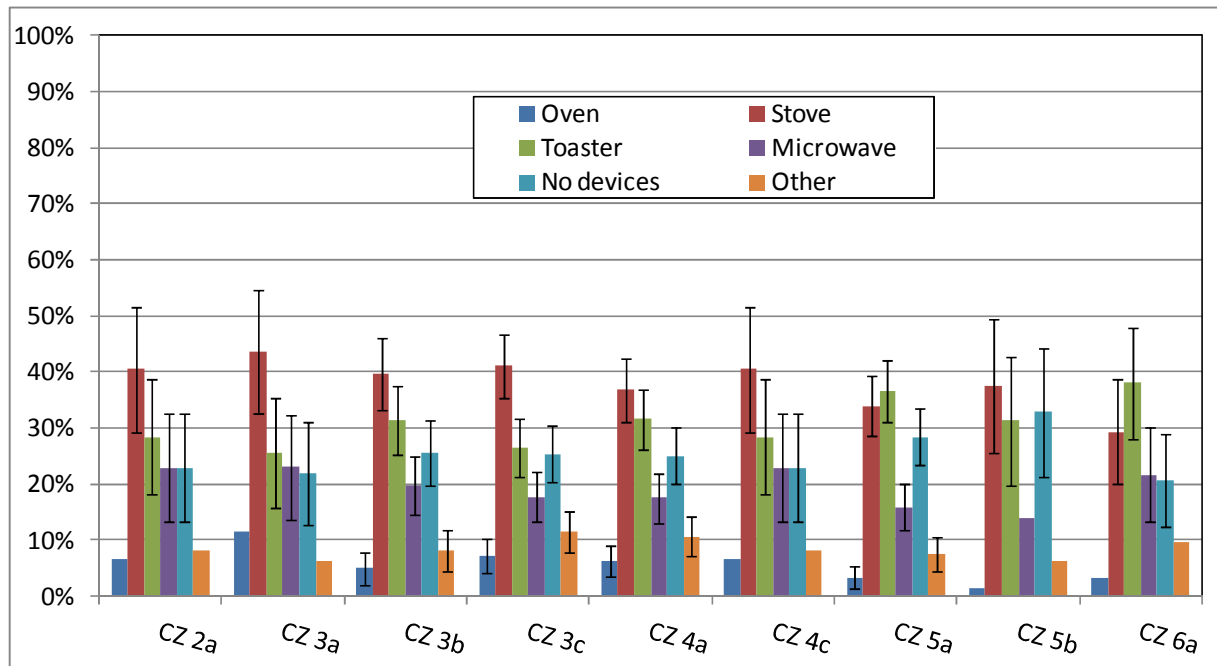


Figure 29. Percentage of households reporting use of cooking devices for breakfast in climate zones with more than 20 respondents (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers). Devices not included in graphs had low reported usage.

Figure 29 and table 20 show the percentage of cooking device use in the climate zones for breakfast preparation. Respondents did not use an outdoor grill or propane grill indoors. The stove was used most frequently, followed by toaster use, and microwave, respectively. There is a very slight statistically significant difference in toaster use between CZs 3a and 5a, but there is no significant difference in device usage between any other climate zones.

	Oven	Stove	Toaster	Micro-wave	Electric cooking devices	Propane grill indoors	Outdoor grill/ cooking device	No devices	Other
CZ 1	0.0 ± NA	50 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	17 ± NA	17 ± NA
CZ 2a	6.8 ± NA	41 ± 11	28 ± 10	23 ± 9.6	0.0 ± NA	0.0 ± NA	0.0 ± NA	23 ± 9.6	8.1 ± NA
CZ 2b	7.7 ± NA	31 ± NA	7.7 ± NA	15 ± NA	7.7 ± NA	0.0 ± NA	0.0 ± NA	31 ± NA	0.0 ± NA
CZ 3a	12 ± NA	44 ± 11	26 ± 9.7	23 ± 9.4	2.6 ± NA	0.0 ± NA	0.0 ± NA	22 ± 9.2	6.4 ± NA
CZ 3b	5.0 ± 2.9	40 ± 6.4	32 ± 6.1	20 ± 5.2	0.9 ± NA	0.0 ± NA	0.0 ± NA	26 ± 5.7	8.1 ± 3.6
CZ 3c	7.3 ± 3.0	41 ± 5.7	26 ± 5.1	18 ± 4.4	1.7 ± NA	0.0 ± NA	0.0 ± NA	25 ± 5.0	11 ± 3.7
CZ 4a	6.2 ± 2.8	37 ± 5.5	32 ± 5.3	18 ± 4.4	1.7 ± NA	0.0 ± NA	0.0 ± NA	25 ± 5.0	11 ± 3.5
CZ 4b	11 ± NA	44 ± NA	33 ± NA	11 ± NA	11 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	44 ± NA
CZ 4c	6.8 ± NA	41 ± 11	28 ± 10	23 ± 9.6	0.0 ± NA	0.0 ± NA	0.0 ± NA	23 ± 9.6	8.1 ± NA
CZ 5a	3.4 ± 2.1	34 ± 5.4	37 ± 5.5	16 ± 4.2	1.7 ± NA	0.0 ± NA	0.0 ± NA	28 ± 5.1	7.5 ± 3.0
CZ 5b	1.6 ± NA	38 ± 12	31 ± 11	14 ± NA	7.6 ± NA	0.0 ± NA	0.0 ± NA	33 ± 12	6.3 ± NA
CZ 6a	3.3 ± NA	29 ± 9.3	38 ± 9.9	22 ± 8.4	0.0 ± NA	0.0 ± NA	0.0 ± NA	21 ± 8.3	10 ± NA
CZ 6b	0.0 ± NA	63 ± NA	25 ± NA	13 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 7	0.0 ± NA	75 ± NA	25 ± NA	25 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	25 ± NA
CZ 8	0.0 ± NA	33 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA

Table 20. Probabilities and uncertainties of cooking device use breakfast. Values are in percentages (%).

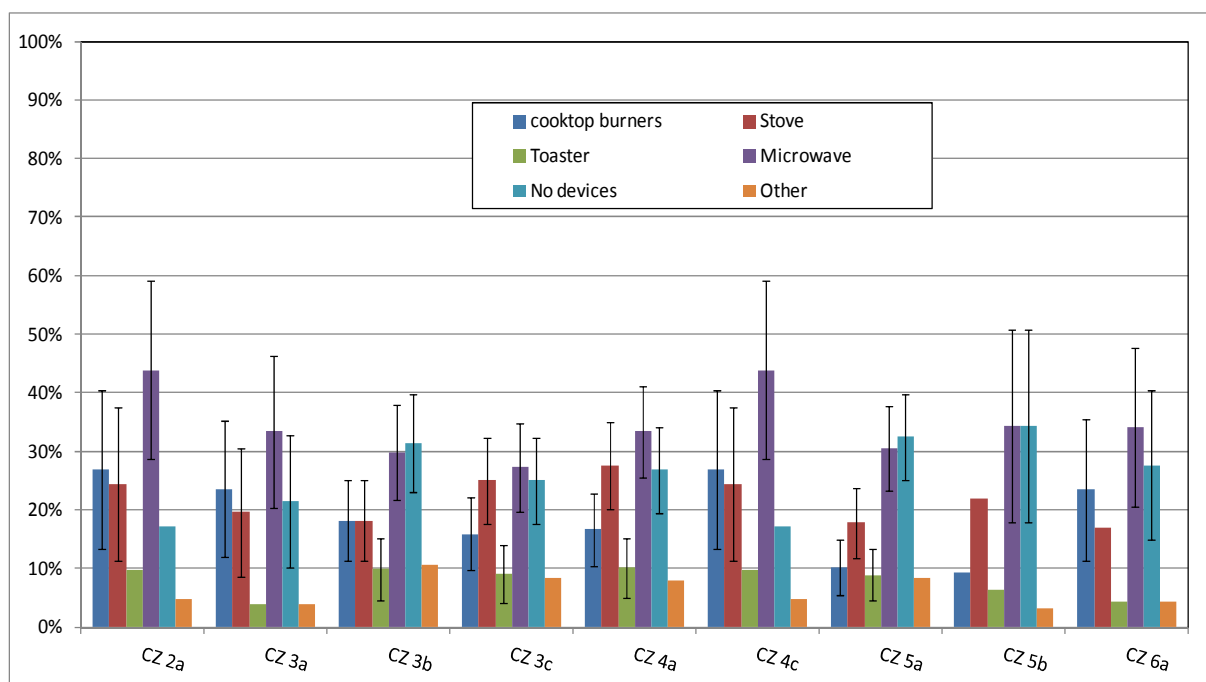


Figure 30. Percentage of households reporting use of cooking devices for lunch in climate zones with more than 20 respondents (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers). Devices not included in graphs had low reported usage.

Climate zones	Cook top burners	Stove	Toaster	Microwave	Electric cooking devices	Propane grill indoors	Outdoor grill/cooking device	No devices	Other
CZ 1	0.0 ± NA	100 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 2a	27 ± 14	24 ± 13	9.8 ± NA	44 ± 15	7.3 ± NA	0.0 ± NA	0.0 ± NA	17 ± NA	4.9 ± NA
CZ 2b	17 ± NA	17 ± NA	0.0 ± NA	50 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA
CZ 3a	24 ± 12	20 ± 11	3.9 ± NA	33 ± 13	3.9 ± NA	0.0 ± NA	0.0 ± NA	22 ± 11	3.9 ± NA
CZ 3b	18 ± 6.9	18 ± 6.9	9.9 ± 5	30 ± 8.1	0.8 ± NA	0.0 ± NA	0.8 ± NA	31 ± 8.3	11 ± NA
CZ 3c	16 ± 6.2	25 ± 7.4	9.1 ± 5	27 ± 7.6	3.8 ± NA	0.0 ± NA	1.5 ± NA	25 ± 7.4	8.3 ± NA
CZ 4a	17 ± 6.2	28 ± 7.5	10 ± 5	33 ± 7.9	1.5 ± NA	0.0 ± NA	2.2 ± NA	27 ± 7.4	8.0 ± NA
CZ 4b	50 ± NA	17 ± NA	0.0 ± NA	17 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	33 ± NA	17 ± NA
CZ 4c	27 ± 14	24 ± 13	9.8 ± NA	44 ± 15	7.3 ± NA	0.0 ± NA	0.0 ± NA	17 ± NA	4.9 ± NA
CZ 5a	10 ± 4.7	18 ± 6.0	8.9 ± 4	31 ± 7.2	4.5 ± NA	0.0 ± NA	0.6 ± NA	32 ± 7.3	8.3 ± NA
CZ 5b	9.4 ± NA	22 ± NA	6.3 ± NA	34 ± 16	0.0 ± NA	0.0 ± NA	0.0 ± NA	34 ± 16	3.1 ± NA
CZ 6a	23 ± 12	17 ± NA	4.3 ± NA	34 ± 14	0.0 ± NA	0.0 ± NA	0.0 ± NA	28 ± 13	4.3 ± NA
CZ 6b	0.0 ± NA	67 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 7	50 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	50 ± NA	0.0 ± NA
CZ 8	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	100 ± NA	0.0 ± NA

Table 21. Probabilities and uncertainties of cooking device use during lunch. Values are in percentages (%).

Figure 30 and table 21 show the percentage of cooking device use for lunch in the climate zones. Respondents did not use a propane grill indoors. The microwave was the most used device, followed by the stove and cook top burner, respectively. CZ 4a reported the greatest microwave use. Outdoor devices were barely used. There is no statistically significant difference in device use between climate zones.

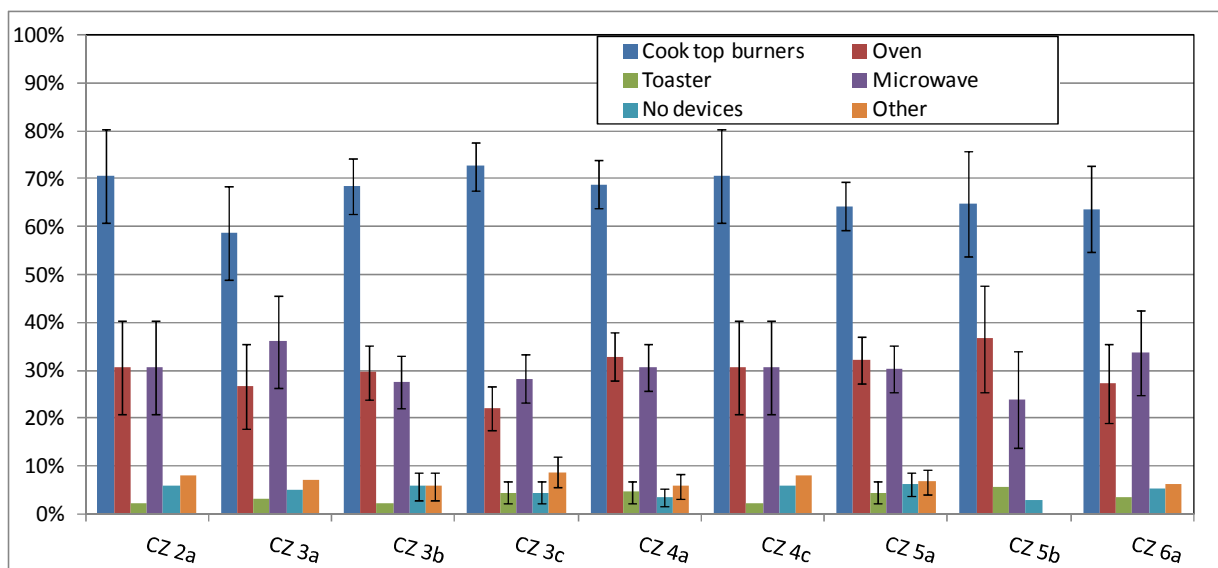


Figure 31. Percentage of households reporting use of cooking devices for dinner in climate zones with more than 20 respondents (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers). Devices not included in graphs had low reported usage.

Climate zones	Cook top burners	Oven	Toaster	Microwave	Electric cooking devices	Propane grill indoors	Outdoor grill/cooking device	No devices	Other
CZ 1	43 ± NA	29 ± NA	14 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 2a	71 ± 9.7	31 ± 9.8	2.4 ± NA	31 ± 9.8	4.7 ± NA	0.0 ± NA	3.5 ± NA	5.9 ± NA	8.2 ± NA
CZ 2b	53 ± NA	47 ± NA	0.0 ± NA	40 ± NA	0.0 ± NA	0.0 ± NA	6.7 ± NA	0.0 ± NA	0.0 ± NA
CZ 3a	59 ± 9.8	27 ± 8.8	3.1 ± NA	36 ± 9.6	3.1 ± NA	0.0 ± NA	5.2 ± NA	5.2 ± NA	7.2 ± NA
CZ 3b	68 ± 5.7	30 ± 5.6	2.4 ± NA	28 ± 5.5	6.3 ± 3.0	1.6 ± NA	8.7 ± 3.5	5.9 ± 2.9	5.9 ± 2.9
CZ 3c	73 ± 5.0	22 ± 4.6	4.6 ± 2.3	28 ± 5.0	5.2 ± 2.5	0.0 ± NA	5.9 ± 2.6	4.6 ± 2.3	8.8 ± 3.2
CZ 4a	69 ± 4.9	33 ± 5.0	4.7 ± 2.2	31 ± 4.9	5.8 ± 2.5	0.0 ± NA	4.7 ± 2.2	3.5 ± 1.9	5.8 ± 2.5
CZ 4b	62 ± NA	31 ± NA	0.0 ± NA	31 ± NA	15 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	7.7 ± NA
CZ 4c	71 ± 9.7	31 ± 9.8	2.4 ± NA	31 ± 9.8	4.7 ± NA	0.0 ± NA	3.5 ± NA	5.9 ± NA	8.2 ± NA
CZ 5a	64 ± 5.0	32 ± 4.9	4.6 ± 2.2	30 ± 4.8	4.3 ± 2.1	0.3 ± NA	3.7 ± 2.0	6.3 ± 2.5	6.8 ± 2.6
CZ 5b	65 ± 11	37 ± 11	5.6 ± NA	24 ± 9.9	11 ± NA	0.0 ± NA	4.2 ± NA	2.8 ± NA	0.0 ± NA
CZ 6a	64 ± 9.0	27 ± 8.3	3.6 ± NA	34 ± 8.8	5.5 ± NA	0.0 ± NA	1.8 ± NA	5.5 ± NA	6.4 ± NA
CZ 6b	44 ± NA	33 ± NA	22 ± NA	22 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
CZ 7	40 ± NA	40 ± NA	0.0 ± NA	20 ± NA	0.0 ± NA	20 ± NA	0.0 ± NA	0.0 ± NA	20 ± NA
CZ 8	100 ± NA	67 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA	0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA

Table 22. Probabilities and uncertainties of cooking device use during dinner. Values are in percentages (%).

Figure 31 and table 22 show use of different cooking devices during dinner. Respondents did not use propane grills indoors. The most commonly used device was the cooktop burners, followed by microwave and oven. CZ 3c reported the greatest stove use for dinner, and CZ 4c reported the most microwave use. There is a very slight statistically significant difference in oven use between CZs 3c and CZs 4a and 5a, but there is no significant difference in device usage between any other climate zones.

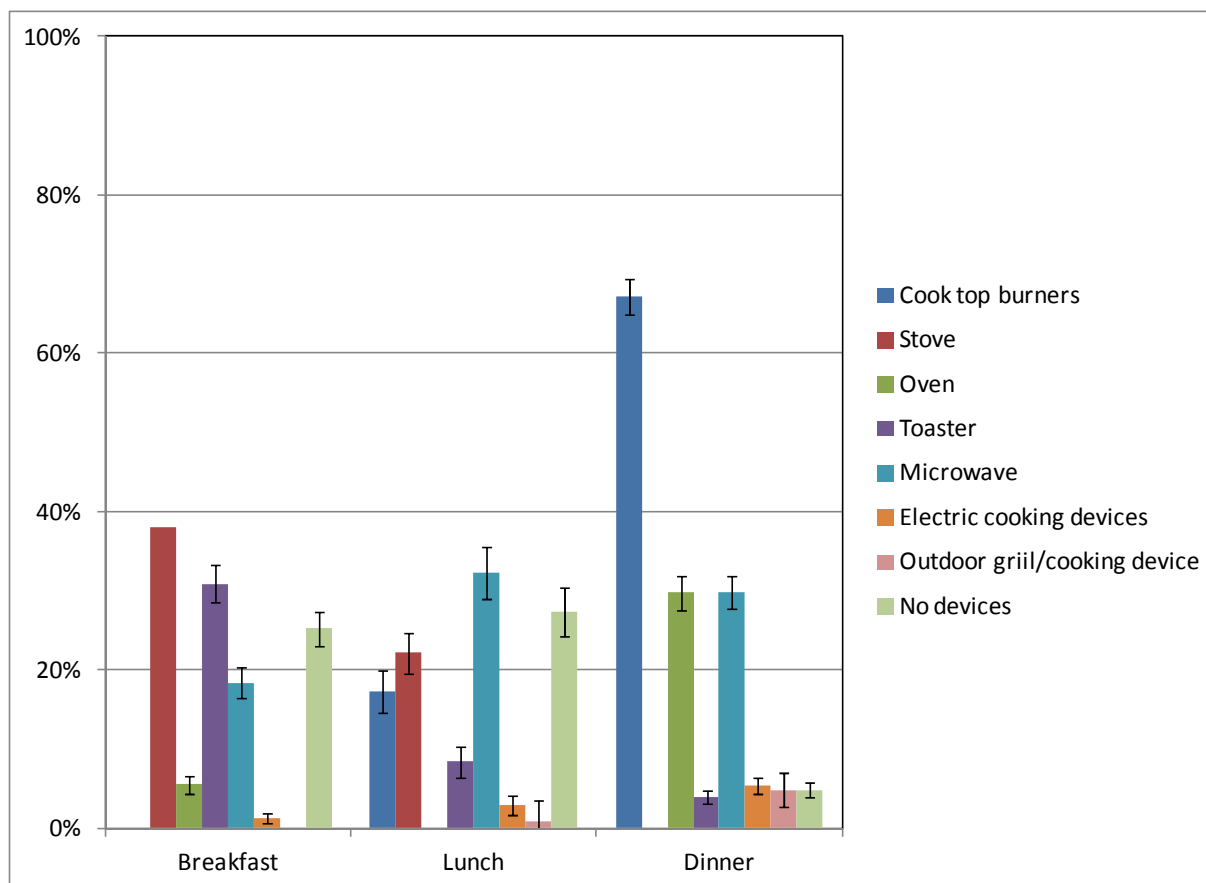


Figure 32. Average percentage of cooking device use by all households for breakfast, lunch, and dinner (bars) and 95th percentile confidence interval of the probability of households using particular devices (whiskers).

	Cook Top Burners	Stove	Oven	Toaster	Microwave	Electric cooking devices	No devices	Outdoor device
Breakfast	NA	38 ± 2.4	5.6 ± 1.2	31 ± 2.3	18 ± 2.0	1.4 ± NA	26 ± 2.2	0.0 ± NA
Lunch	17 ± 2.7	22 ± 2.9	NA	8.5 ± 2.0	32 ± 3.3	2.9 ± NA	28 ± 3.1	0.9 ± NA
Dinner	67 ± 2.2	NA	30 ± 2.1	4.0 ± 0.9	30 ± 2.1	5.4 ± NA	4.9 ± 1.0	4.9 ± 1.0

Table 23. Probabilities and uncertainties of cooking device use averages by all households for breakfast, lunch, and dinner. Values are in percentages (%).

Figure 32 and Table 23 show the weighted average percentages of devices used for each meal. The stove/cook top is the most used device for breakfast and dinner, and microwaves are most commonly used for lunch. Dinnertime has the greatest percentage of device use overall, followed by breakfast and lunch, respectively. Toaster use decreased with each meal from breakfast to dinner, and oven use increased dramatically from breakfast to dinner.

Table 24 shows the estimated cooktop and oven use for each meal for each family type and the weighted average based on the reported type of cooking. Many respondents selected the oven or stove

and indicated that they performed cooking that occurred in both the oven and on the cooktop burners. For this reason the total respondents using the oven or the cooktop burner is higher than the total respondents that reported using the stove or oven for breakfast, the cooktop burners or stove for lunch, and the cooktop burners or oven for dinner. The data in *Table 24* is likely a more accurate representation of the frequency with which the oven and cooktop burners are used than the raw survey responses presented in *Table 23*.

:	&		(		1	
	)	0	)	0	)	0
1 senior	0.0 ± NA	78 ± NA	0.0 ± NA	20 ± NA	18 ± NA	64 ± NA
1 adult	2.8 ± NA	35 ± 5.9	6.2 ± NA	35 ± 8.2	17 ± 4.2	57 ± 5.6
2 or more adults/seniors without kids	5.8 ± 1.6	38 ± 3.3	5.2 ± 2.1	35 ± 4.4	28 ± 2.8	68 ± 2.9
1 or more kids and adults/seniors	5.4 ± 2.0	39 ± 4.3	6.9 ± 3.2	27 ± 5.6	39 ± 4.1	69 ± 3.9
weighted average	5.2 ± 1.1	38 ± 2.4	5.8 ± 1.6	32 ± 3.2	30 ± 2.1	66 ± 2.2

Table 24. Probabilities and uncertainties of cooktop burner(s) and oven use averages by all households for breakfast, lunch, and dinner. Values are in percentages (%).

Respondent cooking method selection

This section describes the different cooking methods used by the respondents. Variations in cooking methods used are explored as a function of household type, climate zone, and meal type.

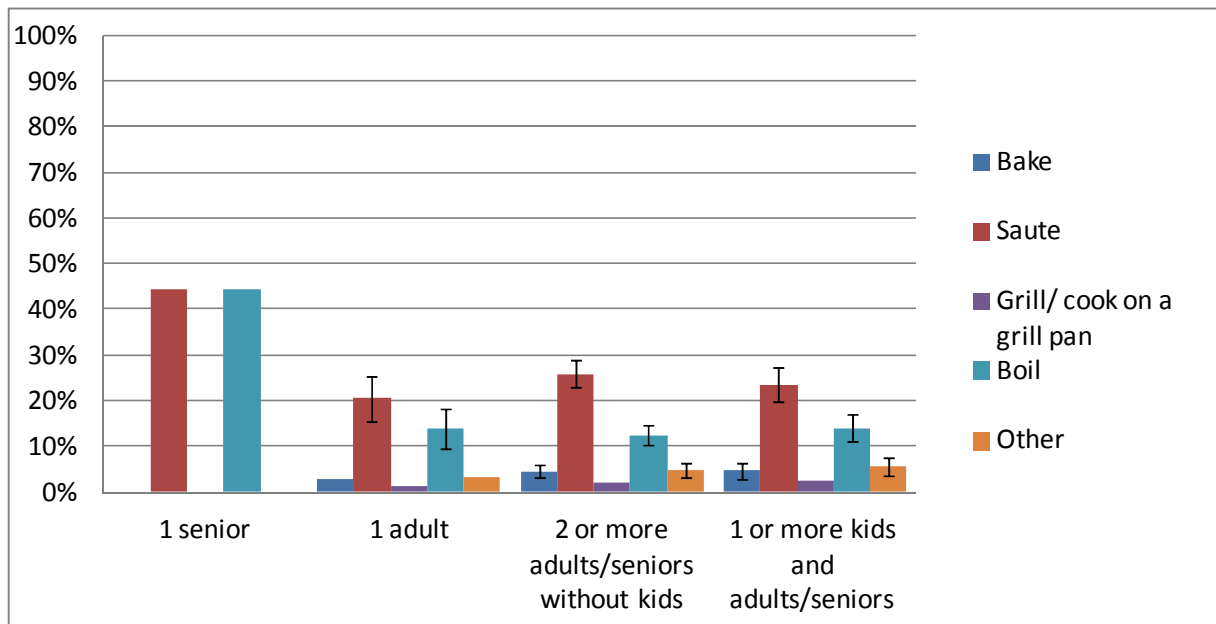


Figure 33. Percentage of households using different food preparation methods for breakfast (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Home type	Bake	Sauté	Deep fry	Grill	Boil	Other	Num. of respondents
1 senior	0.0 ± NA	44 ± NA	0.0 ± NA	0.0 ± NA	44 ± NA	0.0 ± NA	9
1 adult	2.8 ± NA	21 ± 5.0	0.0 ± NA	1.2 ± NA	11 ± 4.3	3.2 ± NA	253
2 or more adults/ seniors without kids	4.5 ± 1.4	26 ± 3.0	0.0 ± NA	1.9 ± 0.9	12 ± 2.2	4.7 ± 1.4	824
1 or more kids and adults/seniors	4.6 ± 4.8	23 ± 3.7	0.0 ± NA	2.6 ± 1.4	14 ± 3.0	5.4 ± 2.0	502
Weighted average	4.2 ± 1.0	24 ± 2.1	0.0 ± NA	2.0 ± 0.7	13 ± 1.7	4.6 ± 1.0	

Table 25. Probabilities and uncertainties of households using different food preparation methods for breakfast. Values are in percentages (%).

Figure 33 and Table 25 show the cooking method selections of households for breakfast. Not every respondent indicated a cooking method, and some respondents indicated more than one. There was no significant difference in usage of specific devices between home types, but there were significant differences in usage between devices for both specific home types and on average. Sautéing was the most common activity, followed by boiling and “other,” respectively.

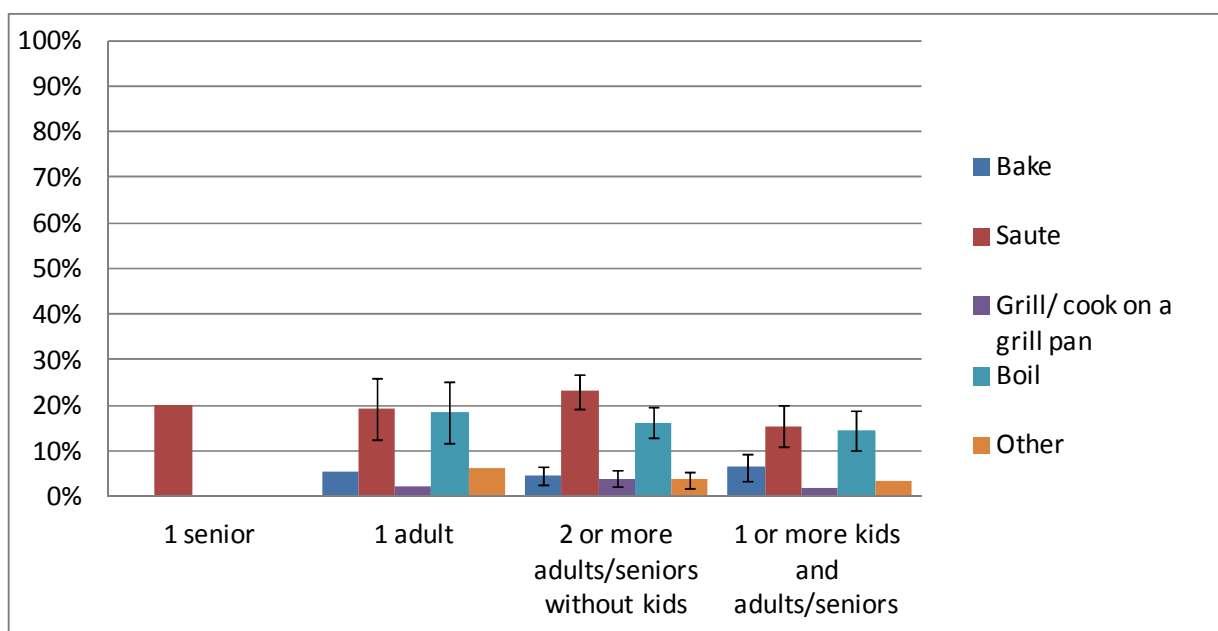


Figure 34. Percentage of households using different food preparation methods for lunch (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Home type	Bake	Sauté	Deep Fry	Grill	Boil	Other	Num. of respondents
1 senior	0 ± NA	20 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	5
1 adult	5.4 ± NA	19 ± 6.8	0.8 ± NA	2.3 ± NA	18 ± 6.7	6.2 ± NA	130
2 or more adults/ seniors without kids	4.5 ± 1.9	23 ± 3.9	0.9 ± NA	4.1 ± 1.8	16 ± 3.4	3.9 ± 1.8	442
1 or more kids and adults/seniors	6.5 ± 3.1	15 ± 4.5	0.0 ± NA	2.0 ± NA	15 ± 4.4	3.7 ± NA	246
Weighted average	5.2 ± 1.5	20 ± 2.7	0.6 ± NA	3.2 ± 1.2	16 ± 2.5	4.2 ± 1.4	

Table 26. Probabilities and uncertainties of households using different food preparation methods for lunch. Values are in percentages (%).

Figure 34 and table 26 show the cooking method selections of households for lunch. Again, there was no significant difference in usage of specific devices between home types, but there were significant differences in usage between devices for both specific home types and on average. Sautéing has the greatest likelihood. Boiling is the second most common activity for lunch.

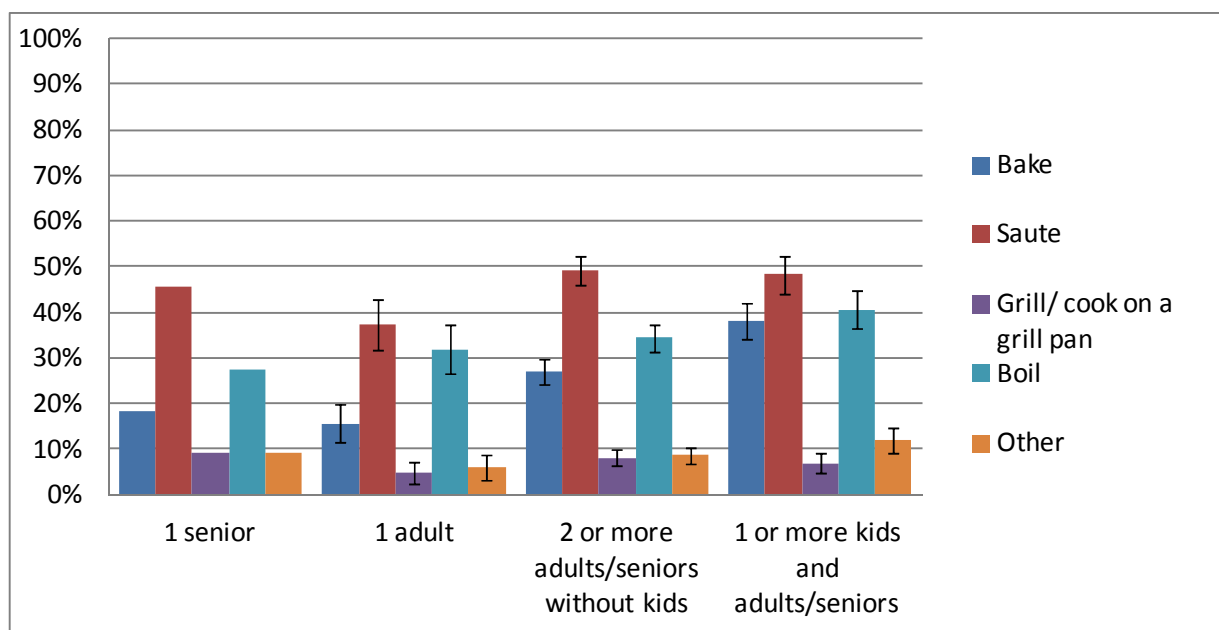


Figure 35. Percentage of households using different food preparation methods for dinner (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Age groups	Bake	Sauté	Deep Fry	Grill	Boil	Other	Num. of respondents
1 senior	18 ± NA	45 ± NA	0.0% ± NA	9.1 ± NA	27 ± NA	9.1 ± NA	13
1 adult	16 ± 4.1	37 ± 5.5	2.0% ± NA	4.7 ± 2.4	32 ± 5.3	6.0 ± 2.7	301
2 or more adults/seniors without kids	27 ± 2.8	49 ± 3.1	0.4% ± NA	8.1 ± 1.7	34 ± 3.0	8.8 ± 1.8	970
1 or more kids and adults/seniors	38 ± 4.1	48 ± 4.2	0.2% ± NA	6.9 ± 2.1	40 ± 4.1	12 ± 2.7	548
Weighted average	28 ± 2.1	47 ± 2.3	0.6 ± NA	7.2 ± 1.2	36 ± 2.2	9.2 ± 1.3	

Table 27. Probabilities and uncertainties of households using different food preparation methods for dinner. Values are in percentages (%).

Figure 35 and table 27 show the cooking method selections of households for dinner. Dinner had the greatest use of each method on average than breakfast or lunch. Sautéing and boiling were the dominate cooking methods. For dinner there are significant differences in device usage between home types. Homes with kids are more likely to bake than homes with more than one adult with no kids and homes with more than one adult/senior and no kids are more likely to bake than homes with 1 adult. Homes with more than one occupant are more likely to sauté than homes with 1 adult.

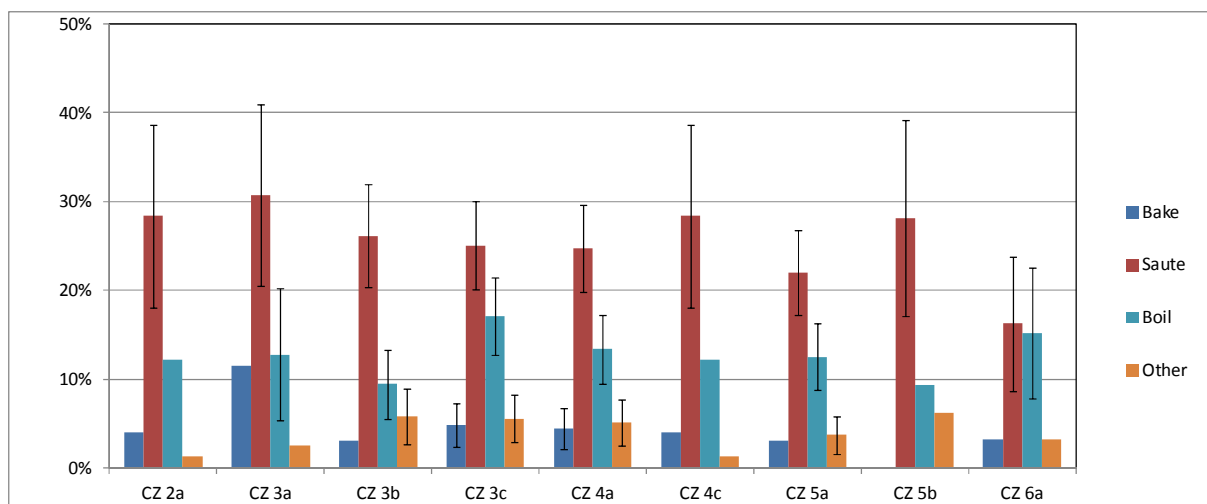


Figure 36. Percentage of households using different food preparation methods for breakfast for climate zones with more than 20 respondents (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Climate zones	Bake	Sauté	Deep Fry	Grill/ cook on grill plate	Boil	Other
CZ 1	0.0 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA	17 ± NA	0 ± NA
CZ 2a	4.1 ± NA	28 ± 10	0.0 ± NA	0.0 ± NA	12 ± NA	1.4 ± NA
CZ 2b	7.7 ± NA	15 ± NA	0.0 ± NA	0.0 ± NA	15 ± NA	0.0 ± NA
CZ 3a	12 ± NA	31 ± 10	1.3 ± NA	5.1 ± NA	13 ± 7.4	2.6 ± NA
CZ 3b	3.2 ± NA	26 ± 5.8	0.5 ± NA	4.1 ± NA	9.5 ± 3.8	5.9 ± 3.1
CZ 3c	4.9 ± 2.5	25 ± 5.0	0.0 ± NA	2.4 ± NA	17 ± 4.4	5.6 ± 2.7
CZ 4a	4.5 ± 2.4	25 ± 5.0	0.0 ± NA	1.7 ± NA	13 ± 3.9	5.2 ± 2.5
CZ 4b	0.5 ± NA	11 ± NA	0.0 ± NA	0.0 ± NA	33 ± NA	22 ± NA
CZ 4c	4.5 ± NA	28 ± 10	0.0 ± NA	0.0 ± NA	12 ± NA	1.4 ± NA
CZ 5a	3.1 ± NA	22 ± 4.7	0.0 ± NA	1.0 ± NA	12 ± 3.8	3.7 ± 2.2
CZ 5b	0.0 ± NA	28 ± 11	0.0 ± NA	1.6 ± NA	9.4 ± NA	6.3 ± NA
CZ 6a	3.1 ± NA	16 ± 7.5	0.0 ± NA	1.1 ± NA	15 ± 7.3	3.3 ± NA
CZ 6b	0.0 ± NA	25 ± NA	0.0 ± NA	0.0 ± NA	37 ± NA	0.0 ± NA
CZ 7	0.0 ± NA	50 ± NA	0.0 ± NA	0.0 ± NA	25 ± NA	0.0 ± NA
CZ 8	0.0 ± NA	0 ± NA	0.0 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA
Weighted average	4.1 ± 1.0	25 ± 2.2	0.1 ± NA	2.0 ± 0.7	13 ± 1.7	4.5 ± 1.0

Table 28. Probabilities and uncertainties of households using different cooking methods for breakfast by climate zone. Values are in percentages (%).

Figure 36 and table 28 show the reported percentage of homes using different cooking methods for breakfast according to climate zone. There is no statistical difference in the likelihood of using a specific cooking method between climate zones, however that are significant difference in the likelihood of using a cooking method both in a given climate zone and on average. Sauté and boil occur most often for breakfast preparation.

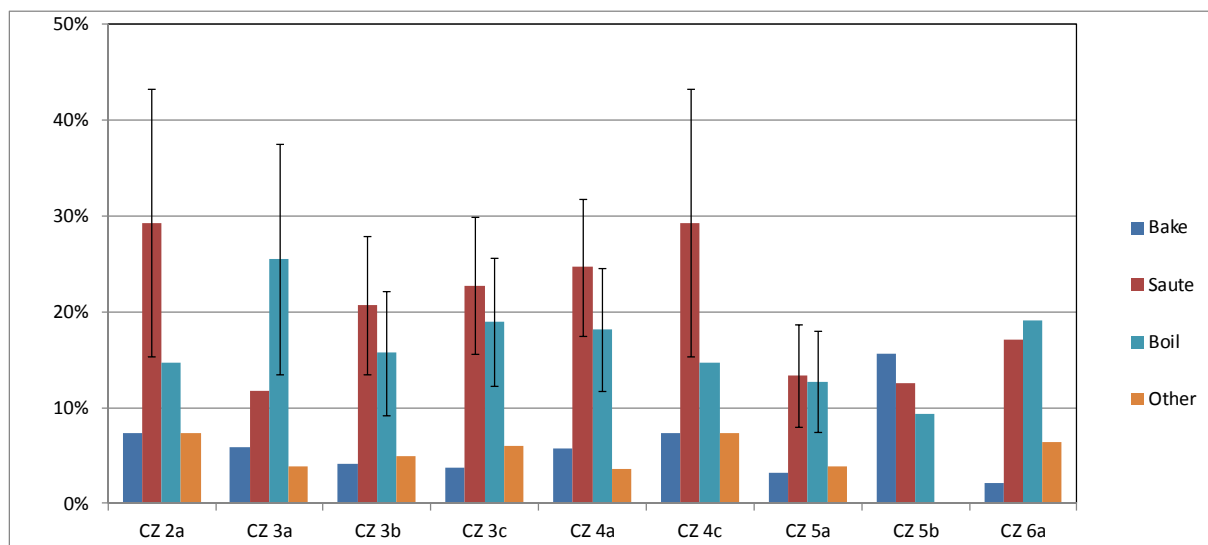


Figure 37. Percentage of households using different food preparation methods for lunch for climate zones with more than 20 respondents (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Climate zones	Bake	Sauté	Deep fry	Grill/ cook on a grill pan	Boil	Other
CZ 1	0.0 ± NA	67 ± NA	0.0 ± NA	0.0 ± NA	67 ± NA	0.0 ± NA
CZ 2a	7.3 ± NA	29 ± 14	0.0 ± NA	7.3 ± NA	15 ± NA	7.3 ± NA
CZ 2b	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	17 ± NA	0.0 ± NA
CZ 3a	5.9 ± NA	12 ± NA	0.0 ± NA	2.0 ± NA	25 ± 12	3.9 ± NA
CZ 3b	4.1 ± NA	21 ± 7.2	1.7 ± NA	3.3 ± NA	16 ± 6.5	5.0 ± NA
CZ 3c	3.8 ± NA	23 ± 7.1	0.8 ± NA	1.5 ± NA	19 ± 6.7	6.1 ± NA
CZ 4a	5.8 ± NA	25 ± 7.2	1.4 ± NA	5.1 ± NA	18 ± 6.4	3.6 ± NA
CZ 4b	0.0 ± NA	50 ± NA	0.0 ± NA	17 ± NA	17 ± NA	0.0 ± NA
CZ 4c	7.3 ± NA	29 ± 14	0.0 ± NA	7.3 ± NA	15 ± NA	7.3 ± NA
CZ 5a	3.2 ± NA	13 ± 5.3	0.0 ± NA	1.9 ± NA	13 ± 5.2	3.8 ± NA
CZ 5b	16 ± NA	13 ± NA	0.0 ± NA	0.0 ± NA	9.4 ± NA	0.0 ± NA
CZ 6a	2.1 ± NA	17 ± NA	0.0 ± NA	2.1 ± NA	19 ± NA	6.4 ± NA
CZ 6b	0.0 ± NA	33 ± NA	0.0 ± NA	33 ± NA	0.0 ± NA	0.0 ± NA
CZ 7	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	50 ± NA	0.0 ± NA
CZ 8	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA	0.0 ± NA
Weighted average	4.9 ± 1.5	20 ± 2.8	0.6 ± NA	3.3 ± 1.3	17 ± 2.6	4.6 ± 1.5

Table 29. Probabilities and uncertainties of households using different cooking methods for lunch by select climate zones. Values are in percentages (%).

Figure 37 and Table 29 show the reported percentage of cooking methods for lunch. Again, there is no statistical difference in the likelihood of using a specific cooking method between climate zones, however that are significant difference in the likelihood of using a cooking method both in a given climate zone and on average. The most used method overall is sautéing, followed by boiling, and deep frying occurs least for lunch.

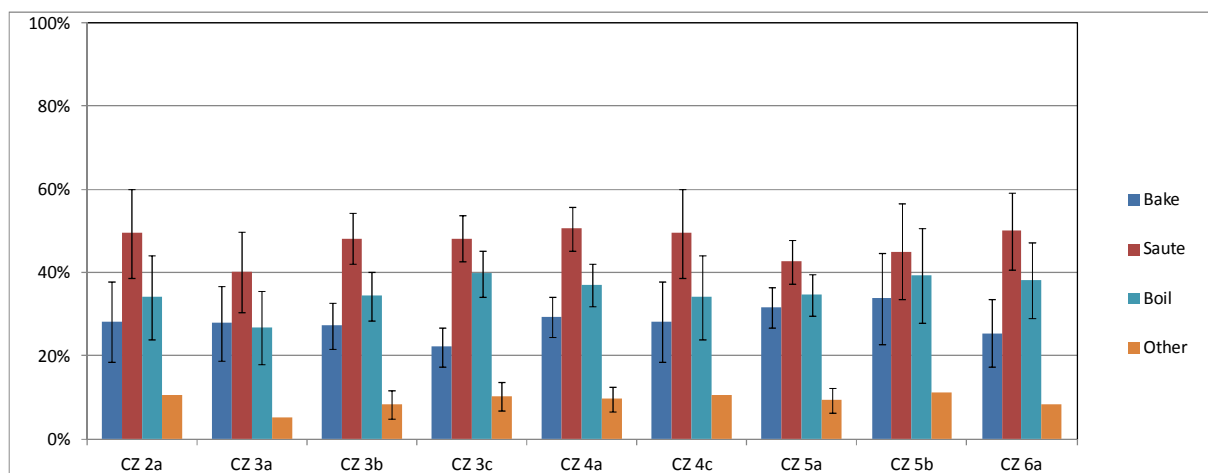


Figure 38. Percentage of households using different food preparation methods for dinner for climate zones with more than 20 respondents (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Climate zones	Bake	Sauté	Deep fry	Grill/ cook on a grill pan	Boil	Other
CZ 1	29 ± NA	14 ± NA	0.0 ± NA	0.0 ± NA	29 ± NA	0.0 ± NA
CZ 2a	28 ± 9.6	49 ± 11	0.0 ± NA	8.2 ± NA	34 ± 10	11 ± NA
CZ 2b	47 ± NA	40 ± NA	0.0 ± NA	6.7 ± NA	13 ± NA	13 ± NA
CZ 3a	28 ± 8.9	40 ± 9.8	0.0 ± NA	9.3 ± NA	27 ± 8.8	5.2 ± NA
CZ 3b	27 ± 5.5	48 ± 6.2	1.6 ± NA	7.9 ± 3.3	34 ± 5.9	8.3 ± 3.4
CZ 3c	22 ± 4.6	48 ± 5.6	0.3 ± NA	7.2 ± 2.9	40 ± 5.5	10 ± 2.9
CZ 4a	29 ± 4.8	51 ± 5.3	0.9 ± NA	5.8 ± 2.5	37 ± 5.1	10 ± 3.1
CZ 4b	31 ± NA	31 ± NA	0.0 ± NA	0.0 ± NA	23 ± NA	8.3 ± NA
CZ 4c	28 ± 9.6	49 ± 11	0.0 ± NA	8.2 ± NA	34 ± 10	11 ± NA
CZ 5a	32 ± 4.9	43 ± 5.2	0.6 ± NA	7.4 ± 2.7	35 ± 5.0	9.6 ± 3.0
CZ 5b	34 ± 11	45 ± 12	0.0 ± NA	4.2 ± NA	39 ± 11	11 ± NA
CZ 6a	25 ± 8.1	50 ± 9.3	0.0 ± NA	5.2 ± NA	38 ± 9.1	7.7 ± NA
CZ 6b	11 ± NA	22 ± NA	0.0 ± NA	11 ± NA	33 ± NA	11 ± NA
CZ 7	40 ± NA	0 ± NA	0.0 ± NA	20 ± NA	40 ± NA	0.0 ± NA
CZ 8	67 ± NA	67 ± NA	0.0 ± NA	33 ± NA	33 ± NA	0.0 ± NA
Weighted Average	28 ± 2.1	47 ± 2.3	0.6 ± NA	7.1 ± 1.2	36 ± 2.2	9 ± 1.4

Table 30. Probabilities and uncertainties of households using different cooking methods for dinner by select climate zones. Values are in percentages (%).

Figure 38 and table 30 show the percentage of each cooking method reported for dinner according to select climate zones and the uncertainty in the probability that each climate zone uses a specific type of cooking at each meal. There are slight significant differences in the likelihood that occupants of CZ 3c and 5a will bake, but for the remainder of cooking methods, there is no significant difference in

likelihood between climate zones. There are significant differences between cooking methods for each climate zone and for the weighted averages. Sautéing is the most commonly chosen method for dinner preparation followed by boiling.

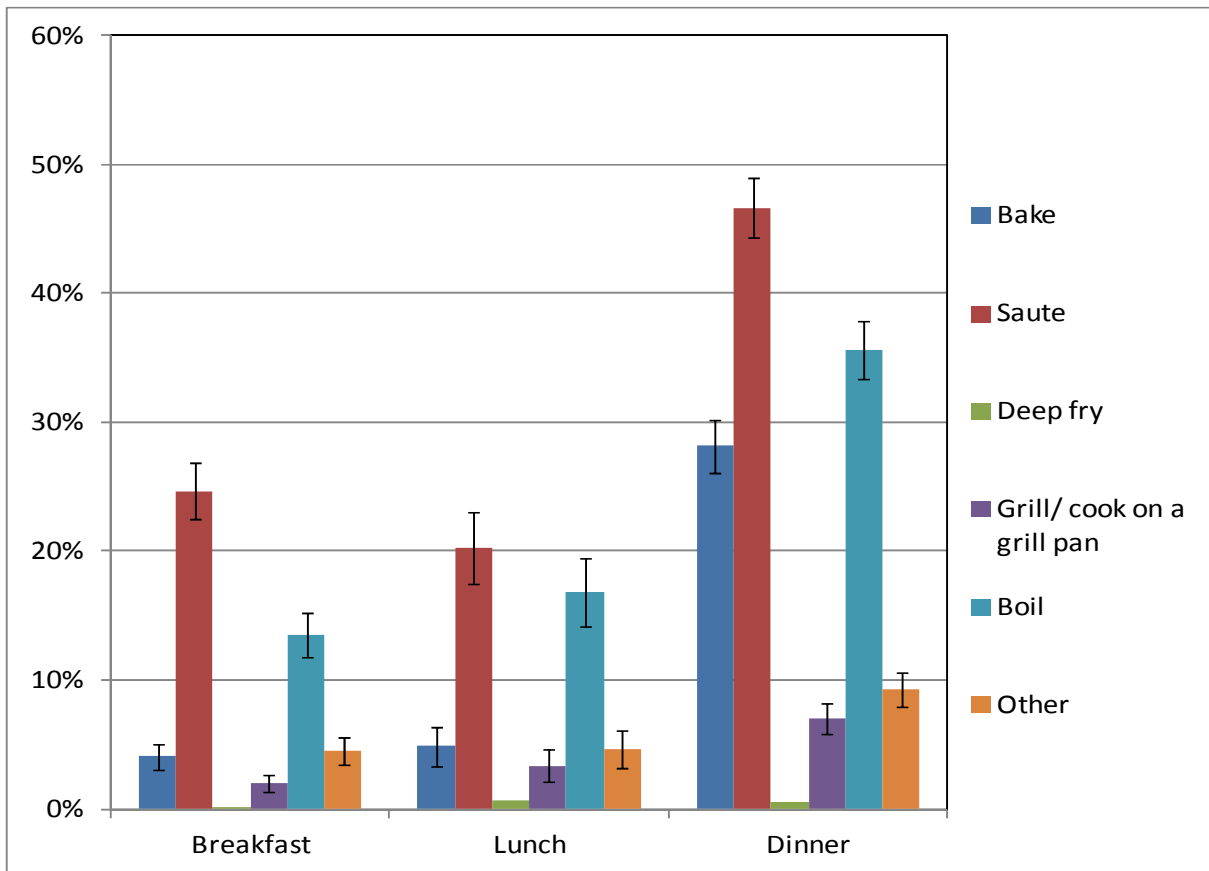


Figure 39. Percentage of households using different food preparation methods (bars) and 95th percentile confidence interval of the probability of households using different food preparation methods (whiskers).

Meal	Bake	Sauté	Deep fry	Grill	Boil	Other
Breakfast	4.1 ± 1.0	25 ± 2.2	0.1 ± NA	2.0 ± 0.7	13 ± 1.7	4.5 ± 1.0
Lunch	4.9 ± 1.5	20 ± 2.8	0.6 ± NA	3.3 ± 1.3	17 ± 2.6	4.6 ± 1.5
Dinner	28 ± 2.1	47 ± 2.3	0.6 ± NA	7.1 ± 1.2	36 ± 2.2	9.3 ± 1.4

Table 31 Average percentage of households and selected cooking methods for breakfast, lunch, and dinner. Values are in percentages (%).

Figure 39 and table 31 compare the weighted averages of each cooking method choice for each meal. Respondents sauté most often at dinnertime then breakfast and lunch. Boiling occurs most often for dinner preparation. Baking, boiling, and grilling frequency increase from breakfast to the dinner meal. In sum, sautéing for all meals is the most used method, followed by boil, bake, “other,” grill and deep fry, respectively.

Conclusion

We conducted an online survey to determine cooking behaviors for occupants of the U.S. housing stock. Over 2800 households responded to the survey on questions of meal preparation rates, type of cooking behavior, and types of devices used. Respondents were predominately two or more adults or seniors households without children. Climate zones 5a, 4a, and 3c (cold, humid; mild, humid; and marine, respectively) had the greatest number of respondents of all the climate zones. We determined the central estimate and 95th percentile confidence interval of the probability that homes with different occupancy profiles and in different locations would cook certain meals and how they would prepare them. The results indicated that, given the data that was available, we cannot differentiate between cooking activity patterns in different climate zones, however different family types did have slightly different behaviors for some of the parameters explored. When the entire dataset is considered, the probability that meals will be cooked and how they will be prepared can be estimated with relatively low uncertainty.

This paper provides the reader with an overview of cooking behavior in the United States based on data collected from the survey in addition to information that can be used to model indoor pollution generated through cooking. The cooking device usage data from this report will allow for more accurate modeling of the impacts of cooking on indoor air quality.

References

- Edwards, R. D., J. Jurvelin, K. Saarela and M. Jantunen (2001). "VOC concentrations measured in personal samples and residential indoor, outdoor and workplace microenvironments in EXPOLIS-Helsinki, Finland." *Atmospheric Environment* (27): 4531-4543.
- Klepeis, N. E., W. C. Nelson, W. R. Ott, J. P. Robinson, A. M. Tsang, P. Switzer, J. V. Behar, S. C. Hern and W. H. Engelmann (2001). "The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants." *Journal of Exposure Analysis and Environmental Epidemiology* (3): 231-252.
- Klug, V. L., A. B. Lobscheid and B. C. Singer (2011). *Cooking Appliance Use in California Homes – Data Collected from a Web-Based Survey, LBNL-5028E*. Berkeley, CA, Lawrence Berkeley National Laboratory LBNL-5028E.
- Logue, J. M., P. N. Price, M. H. Sherman and B. C. Singer (2012). "A Method to Estimate the Chronic Health Impact of Air Pollutants in US Residences." *Environmental Health Perspectives* (2): 216-222.
- Navidi, W. (2006). 4.10 The Central Limit Theorem. *Statistics for Engineers and Scientists*. S. Jeans and D. D. Matteson. New York, NY, McGraw-Hill 270-280.
- US Census Bureau. (2012). "County Housing Unit Estimates for States: 2010 to 2011." Retrieved 6/27/2012 from <http://www.census.gov/popest/data/housing/totals/2011/HU-EST2011-3.html>.
- US DOE (2010). VOLUME 7.1 Building America Best Practices Series: High-Performance Home Technologies, Guide to Determining Climate Regions by County. Washington DC, US Department of Energy
- US EIA (2009). Residential Buildings Energy Consumption Survey (RECs), U.S. Energy Information Administration.
- Weisel, C. P., J. Zhang, B. J. Turpin, M. Morandi, S. Colome, T. Stock and D. M. Spektor (2005). Relationships of Indoor, Outdoor, and Personal Air (RIOPA) Part I. Collection Methods, Health Effects Institute, Mickely Leland National Urban Air Toxics Research Center and Descriptive Analysis HEI Research Report 130 <http://pubs.healtheffects.org/getfile.php?u=25>

Appendix: Administered cooking survey questionnaire

Cooking Survey

Part 1: Consent to Participate in Household Cooking Activity Survey

The purpose of this survey is to collect data on household cooking activity. This research is being conducted by Lawrence Berkeley National Laboratory and is funded by the Department of energy. Participation involves completing an online survey that will take 5-10 minutes. You can discontinue taking this survey at anytime by leaving the site.

The survey tool was designed to be anonymous and confidential. The results of this study will be used for scientific research purposes only.

If you have any questions about the research study, please contact Jennifer Logue at 510-486-5945, or jmlogue@lbl.gov.

***1. ELECTRONIC CONSENT: Please select your choice below.**

Clicking on the "agree" button below indicates that:

- you have read the above information
- you voluntarily agree to participate
- you are at least 18 years of age.

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button or leave the webpage.

Agree

Disagree

Cooking Survey

Part 2: Home Characteristics

*2. Home Location: Is your home located in the US?

- Yes
 No

3. In what ZIP code is your home located? (enter 5-digit ZIP code; for example, 00544 or 94305)

4. How many people currently live in your household?

5. How many residents are ____ of age?

	0-5 years	6-17 years	18-65 years	over 65 years
Number of people	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

6. What is the gender of the primary cook?

- Female
 Male

7. Which of the following ethnicities are represented by members of your household?

- American Indian, Alaska native
 Asian or Pacific Islander
 Black, African American
 Hispanic/Latino
 White/Caucasian
 Other (please specify)

Cooking Survey

8. What type of building do you live in?

- Single Family detached
- Townhome/duplex
- 2-4 unit condo or apartment
- Apartment/condo with more than 5 unites
- Mobile home
- Other (please specify)

Cooking Survey

Part 3: Yesterday Breakfast

***9. Did you have your breakfast at home yesterday?**

Yes

No

Cooking Survey

Part 3: Yesterday's Breakfast

10. What foods did you prepare for breakfast?

- | | | |
|---|--------------------------------|--|
| <input type="checkbox"/> Boiled eggs | <input type="checkbox"/> Toast | <input type="checkbox"/> Muffins, pancakes |
| <input type="checkbox"/> Fried eggs and bacon | <input type="checkbox"/> Bagel | |
| <input type="checkbox"/> Other (please specify) | | |
| <input type="text"/> | | |

11. Which of the following devices did you use to cook breakfast yesterday?

- | | | |
|---|--|--|
| <input type="checkbox"/> Oven | <input type="checkbox"/> Electric wok | <input type="checkbox"/> Outdoor grill or cooking device |
| <input type="checkbox"/> Stove | <input type="checkbox"/> Electric grill | <input type="checkbox"/> No cooking device |
| <input type="checkbox"/> Toaster | <input type="checkbox"/> Electric crock-pot | |
| <input type="checkbox"/> Microwave | <input type="checkbox"/> Propane grill indoors | |
| <input type="checkbox"/> Other (please specify) | | |
| <input type="text"/> | | |

Cooking Survey

Part 3: Yesterday's Breakfast

12. Did you:

- Bake
- Pan fry/sauté
- Deep fry
- Stir fry
- Grill/ cook on a grill pan
- Boil
- Other (please specify)

Cooking Survey

Part 3: Yesterday's Breakfast

***13. How many people ate breakfast at home?**

Cooking Survey

Part 4: Yesterday's Lunch

***14. Did you have your lunch at home yesterday?**

Yes

No

Cooking Survey

Part 4: Yesterday's Lunch

15. What foods did you prepare for lunch?

- | | | |
|---|--|-------------------------------------|
| <input type="checkbox"/> Red meat | <input type="checkbox"/> Chicken or turkey | <input type="checkbox"/> Pasta |
| <input type="checkbox"/> Fish, shellfish or other sea foods | <input type="checkbox"/> Potatoes | <input type="checkbox"/> Vegetables |
| <input type="checkbox"/> Other (please specify) | | |

16. Which of the following devices did you use to cook lunch yesterday?

- | | | |
|---|--|--|
| <input type="checkbox"/> Cook top burners | <input type="checkbox"/> Electric wok | <input type="checkbox"/> Outdoor grill or cooking device |
| <input type="checkbox"/> Stove | <input type="checkbox"/> Electric grill | <input type="checkbox"/> No cooking device |
| <input type="checkbox"/> Toaster | <input type="checkbox"/> Electric crock-pot | |
| <input type="checkbox"/> Microwave | <input type="checkbox"/> Propane grill indoors | |
| <input type="checkbox"/> Other (please specify) | | |

Cooking Survey

Part 4: Yesterday's Lunch

17. Did you:

- Bake
- Pan fry/sauté
- Deep fry
- Stir fry
- Grill/ cook on a grill pan
- Boil
- Other (please specify)

Cooking Survey

Part 4: Yesterday's Lunch

***18. How many people ate lunch at home?**

Cooking Survey

Part 5: Yesterday's Dinner

***19. Did you have your dinner at home yesterday?**

Yes

No

Cooking Survey

Part 5: Yesterday's Dinner

20. What foods did you prepare for dinner?

- | | | |
|---|--|-------------------------------------|
| <input type="checkbox"/> Red meat | <input type="checkbox"/> Chicken or turkey | <input type="checkbox"/> Pasta |
| <input type="checkbox"/> Fish, shellfish or other sea foods | <input type="checkbox"/> Potatoes | <input type="checkbox"/> Vegetables |
| <input type="checkbox"/> Other (please specify) | | |

21. Which of the following devices did you use to cook dinner yesterday?

- | | | |
|---|--|--|
| <input type="checkbox"/> Cook top burners | <input type="checkbox"/> Electric wok | <input type="checkbox"/> Outdoor grill or cooking device |
| <input type="checkbox"/> Oven | <input type="checkbox"/> Electric grill | <input type="checkbox"/> No cooking device |
| <input type="checkbox"/> Toaster | <input type="checkbox"/> Electric crock-pot | |
| <input type="checkbox"/> Microwave | <input type="checkbox"/> Propane grill indoors | |
| <input type="checkbox"/> Other (please specify) | | |

Cooking Survey

Part 5: Yesterday's Dinner

22. Did you:

- Bake
- Pan fry/sauté
- Deep fry
- Stir fry
- Grill/ cook on a grill pan
- Boil
- Other (please specify)

Cooking Survey

Part 5: Yesterday's Dinner

***23. How many people ate dinner at home?**

Cooking Survey

Part 6: General Cooking Questions

24. What kind of oil do you prefer to cook with?

	Never	Occasionally	Frequently
Olive oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soybean oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peanut oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetable oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Canola oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)