# Community Assessment for Public Health Emergency Response (CASPER) addressing the California drought—Tulare County, California, October, 2015.

California Department of Public Health (CDPH)

Tulare County Health and Human Services Agency (TCHHSA)

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## BACKGROUND

California is in its fifth year of the most severe drought in its recorded history. At the end of November 2015, California's reservoirs were at 52 percent of average across all hydrologic regions.[1] Low precipitation levels have adversely affected surface water with decreased stream flows and increases in groundwater depth. As of November 2015, approximately 2,455 "dry" wells have been identified statewide, affecting an estimated 12,275 residents.[2] Tulare County is one of the California counties impacted by the drought with the greatest number of reported dry wells (1,308 dry wells, affecting over 6,000 residents).[3] Some residents have been without a reliable source of water to their homes since 2014.

Governor Edmund G. Brown Jr. proclaimed a State of Emergency in California due to the drought in January 2014 as a result of record low precipitation persisting since 2012.[4] During that same month, the Secretary of the United States Department of Agriculture designated 27 California counties, including Tulare County, as natural disaster areas due to the drought.[5] As of November 2015, the state has received 63 Emergency Proclamations from city, county, tribal governments and special districts.[2] In April 2015, Governor Brown issued an Executive Order mandating a 25 percent water use reduction for cities and towns across California.[6] The Governor issued another Executive Order in November 2015, intensifying the State's drought response by calling for additional actions and extending emergency conservation regulations through October 2016.[7]

The weather outlook for the upcoming year is positive, with an El Niño weather pattern predicted to bring above average rainfall to most of California, particularly the southern portion of the state. However, climate experts agree that even if the October 1, 2015–September 30, 2016 "water year" is the wettest on record, rainfall amounts would need to exceed 198 percent to 300 percent of normal (depending on the region) to lift the current 5-year precipitation deficit out of the lowest 20 percent for all 5-year periods on record.[8] Thus, California will continue facing impacts of the drought into 2016, and for an unknown time period beyond.

Drought can have far-reaching impacts on the economy, the environment, and the whole community, leading to both direct and indirect public health consequences. The United States Centers for Disease Control and Prevention (CDC), in their report "When every drop counts: protecting public health during drought conditions—a guide for public health professionals," list a number of issues associated with droughts, including compromised quality and quantity of potable water, diminished living conditions, adverse mental and behavioral health outcomes, and increased disease incidence, including infectious diseases.[9] Water shortages can lead to closures of businesses and job losses, resulting in more poverty, a known social determinant of health.[9,10] A systematic review of drought-related studies has shown that the extent of health effects associated with this natural disaster depends not only on the drought severity and duration, but also on the underlying population vulnerability and resources available to mitigate the effects as they occur.[11]

Existing disease surveillance might support some predictions of drought-associated disease incidence. The CDC predicts an increased incidence of certain communicable diseases during drought resulting from environmental or ecological changes, lapses in hygiene maintenance, increased contamination of drinking water, and increased contamination of food due to greater use of recycled water.[9] However, systematic studies of drought-related public health impacts in California are limited, and none have clearly demonstrated increased infectious disease incidence attributable to the drought.

Given the slow and ongoing nature of a drought emergency, monitoring and anticipating the indirect public health implications is challenging because of the difficulties in assigning a starting point for accumulated effects over time. Multiple data sources and analytic methods might be necessary to gain a more complete understanding of the public health implications of the drought in California. Because relatively little is known about the population health effects of and coping mechanisms employed for this ongoing drought, a rapid needs assessment similar to those used in other natural disaster settings was employed to quantify these effects in the

near-term and to provide basic information that could be used for immediately actionable decisions by public health officials.

The California Department of Public Health (CDPH) reached out to County Health Officers wishing to partner with severely impacted counties in conducting a rapid needs assessment of drought-related health impacts using the Community Assessment for Public Health Emergency Response (CASPER) methodology (see Appendix 1).[12] CASPER is a tool developed by the CDC to assess public health needs in both disaster and non-disaster settings. It uses an epidemiologic technique (two-stage household-based sampling) designed to provide representative household-based information about a community's status and needs in a timely manner. In the context of a drought, CASPER could be used to gather actionable information about household water use, water needs, and conservation behaviors; hygiene (personal and food); impact on work, wages, and food affordability; mental, emotional, and behavioral health effects (from here on referred to as behavioral health); exacerbations of chronic diseases; drought-related community beliefs; and other topics of special interest to affected jurisdictions.

To address multiple knowledge gaps about the drought's impact on its residents, Tulare County Health and Human Services Agency (TCHHSA) partnered with the Emergency Preparedness (EP) Team of the Division of Environmental and Occupational Disease Control at CDPH to conduct two CASPERs in the northern and southern portions of Tulare County October 20–22, 2015. The EP Team also partnered with Mariposa County Health Department (MCHD) to conduct one county-wide CASPER November 12–14, 2015; Mariposa County data will be presented in a separate report. MCHD and TCHHSA both contributed to the design of the questionnaires used in these CASPERs. This report describes the methods, results, conclusions, and CDPH and TCHHSA's recommendations derived from the analysis of the data collected by these CASPERs.

## METHODS

*CASPER sample selection and data collection*

CASPER uses a two-stage cluster sampling methodology modified from the World Health Organization's Expanded Program on Immunization Rapid Health Assessment to select a representative sample of 210 households (seven households from 30 clusters) to be interviewed in a predetermined geographic area of interest, i.e., sampling frame (detailed methodology described in the CASPER Toolkit Version 2.0).[13] The sampling frame can be an entire city or county, or any subset thereof, and captures the entire population from which a CASPER sample is drawn and to which the results would be generalized. The 30 clusters, typically census blocks, are selected from the sampling frame with probability proportional to the number of housing units in the cluster (i.e., the higher the number of housing units in a cluster, the higher the probability that this cluster would be selected for a CASPER). A cluster may be chosen more than once. Interview teams then select seven households in the field in accordance with the systematic random sampling instructions they receive at a just-in-time training. During data analysis, weights are applied to the sample to produce a result generalized to the entire sampling frame.

*Tulare sampling frame*

Tulare County has 442,179 residents according to the 2010 Census and an estimated 131,642 households.[14] Outside of the major population centers in the Cities of Visalia and Tulare, the county is largely rural and sparsely populated. TCHHSA was interested in focusing on areas without municipal water delivery and on areas reporting dry wells. The County chose two separate sampling frames, representing the small town and rural communities in the northern part of the county and the severely drought-affected community of East Porterville with its environs in the southern part of the county. To assess the impacts on these areas separately and compare them, two independent CASPERs were conducted simultaneously in two sampling frames: North Tulare and South Tulare (boundaries are shown in Figures 1–3).

The North Tulare sampling frame included the towns and environs of Cutler and Orosi (town residents are mostly on municipal water systems and the environs draw well water). There are 507 census blocks, 4,803 housing units, and 19,537 residents in the North Tulare sampling frame. The South Tulare sampling frame included the Census Designated Place (CDP) of East Porterville and its environs, specifically excluding the City of Porterville, which is served by large municipal water systems. There are 575 census blocks, 5,575 housing units, and 18,905 residents in South Tulare sampling frame.

CDPH used the 2010 TIGER/Line with Selected Demographic and Economic Data shapefile and the 2010 Census Redistricting Data Summary File for geography and for estimating population and housing units in the sampling frames and each cluster.[15,16]

*Cluster sample selection*

For each cluster, U.S. Census reports the total number of housing units and the number of occupied and vacant housing units. Clusters could be selected based on the total number of housing units or on the number of occupied ones. For both sampling frames in Tulare County, we modified the CASPER cluster sample selection process to account for low population density by aggregating adjacent census blocks and by sampling on occupied housing units. In North and South Tulare sampling frames, 304 out of 507 (60 percent) and 380 out of 575 (66 percent) census blocks, respectively, had fewer than seven total housing units; in some blocks, more than a third of housing units were vacant. To achieve a minimum of seven housing units per cluster, we combined geographically proximate census blocks with neighboring census blocks to form aggregated blocks with at least seven occupied housing units using the SAS version of the Geographic Aggregation Tool, developed by the New York State Health Department.[17] After aggregation, the North Tulare and South Tulare sampling frames had 218 and 216 new "blocks," respectively, from which to select the 30 clusters. We performed the final cluster selection (first stage of sampling) in ArcGIS 10.3, using a custom toolbox provided by the CDC.[18]

*Field sample selection*

In the second stage of sampling, field interview teams used systematic random sampling to select seven households from each of the selected clusters to conduct household interviews. The interviewers were provided with street level maps of each selected cluster and a randomly chosen starting point. They were instructed to go to every $n^{th}$ housing unit to systematically select the seven housing units to interview (n= total number of housing units in the cluster divided by seven; e.g. for a cluster with 28 housing units, teams would survey every fourth housing unit). Teams were instructed to make three attempts at each selected household before replacement (i.e., moving on to another unit). In several clusters where systematic random sampling opportunities were exhausted in the final hours of the survey, interview teams were permitted to abandon every $n^{th}$ housing unit selection and approach every housing unit that had not yet been sampled until they either obtained the seven interviews or ran out of housing units to approach.

*Questionnaire design*

The EP Team, in collaboration with TCHHSA and MCHD, developed a five-page questionnaire (Appendix 2), which included questions on the following: 1) household demographics; 2) knowledge, attitudes, and practices regarding the drought; 3) access to and use of water; 4) water conservation practices; 5) impacts of the drought on the household, including behavioral health issues, exacerbations of chronic diseases, and employment issues; and 6) household disaster communication preferences. Topics were selected based on county priority areas of interest. Questions were adapted from the California Health Interview Survey (CHIS), National Health and Nutrition Examination Survey (NHANES), Behavioral Risk Factor Surveillance System (BRFSS), and prior CASPERs in Alabama and California.[19,20] Potential questions were edited to lower literacy levels and re-worded from an individual to a household-based perspective.

To reflect the unique needs and interests of the county, TCHHSA was given the option of developing one additional page of questions to be used in CASPERs in its county. TCHHSA included two additional topics: households' need for special medical equipment and perceived

increase in ambient dust. The questionnaire and county supplements were translated into Spanish. We made disambiguation assumptions during data entry and analysis as needed, accounting for formatting differences between English and Spanish questionnaires.

*Training and field interviews*

On October 20, 2015, the EP Team provided field interview teams with a five-hour, just-in-time training session on the overall purpose of the CASPER, household selection process, questionnaire, interview techniques, safety, and logistics. In North Tulare, there were 13 two-person teams on October 20, and 15 teams October 21-22. In South Tulare there were 14 two-person teams October 20–22. The teams primarily consisted of Tulare County staff, CDPH staff, and volunteers recruited from community organizations. Some of the interviewers were monolingual Spanish speakers; they were paired with a bilingual partner. Teams conducted interviews between 2 pm and 6 pm PST on October 20, and 9 am and 6 pm PST on October 21 and 22. Each team was assigned clusters and attempted to complete seven interviews per cluster, with a goal of 210 interviews in both North Tulare and South Tulare. Three clusters in North Tulare were randomly selected twice; therefore, 14 interviews were attempted in each of those clusters. The teams gave all potential interviewees a packet with relevant information, including a consent form and an introductory letter by the Health Officer. The teams also provided a variety of health education materials and resources from the TCHHSA to households at the end of completed interviews. Eligible respondents were at least 18 years of age or older and resided in the selected housing unit. If the respondent preferred to conduct the interview in Spanish, we provided a Spanish-speaking interviewer and all written materials were provided in Spanish. Additionally, the interviewers were instructed to complete confidential referral forms whenever they encountered urgent physical or behavioral health needs. Interviewers were instructed to refer all media inquiries to TCHHSA.

*Data analysis*

For both the North Tulare and South Tulare CASPER interview data, we conducted a weighted cluster analysis. The weights are based on the total number of housing units in the sampling

frame, the number of clusters selected, and the number of housing units interviewed within each cluster. Some questions were open-ended and allowed respondents to provide narrative answers; responses to these questions were reviewed by CDPH staff and classified into themes which were not mutually-exclusive (i.e., a respondent's answer could be classified into multiple themes.)

Analysis was performed in SAS 9.4 (SAS Institute, Cary, North Carolina) to calculate unweighted and weighted frequencies (projected number of households in the sampling frame), unweighted and weighted percentages, and the 95 percent confidence intervals of the weighted percentages. Unless otherwise stated, throughout the text, the percentages in the text represent the weighted percentages. We calculated projected number of households and weighted percentages only on responses given by ≥10 households in each CASPER (North Tulare or South Tulare), as shown in the Tables.

## RESULTS

### North Tulare

Interview teams conducted 185 of a possible 210 interviews (88.1 percent completion rate; Table 1). Interviews were completed in 49.7 percent of approached housing units, and 76.4 percent of homes where the door was answered. Most (53.5 percent) interviews were conducted in Spanish.

#### *Household demographics and home characteristics of the surveyed households*

Household size and age categories of residents could not be determined for 13 households because of errors by interviewers (e.g., the number of household residents as categorized by age did not total the overall number of household residents). Among the other 172 households, household size ranged from 1–10, with a weighted mean of 4.15 and a median of four. Household age distribution was as follows: 63.0 percent had at least one member ≤ 17 years old

and 25.9 percent had at least one member ≥ 65 years old (Table 2). In most households (67.3 percent), Spanish was the main language spoken in the home. Approximately half of households (50.7 percent) reported that they owned their home.

***Attitudes about the drought***

The vast majority of households (74.7 percent) reported that television was their primary source of information regarding the drought (Table 3). The proportions of households reported the following statements about water usage as true: there is an increased demand for water (87.7 percent); some people are not cutting water usage enough (76.3 percent); there is poor water management by the government (69.3 percent); and there is overuse of water by cities (73.4 percent). Households were less likely to report that there is overuse of water by farming or agriculture (46.1 percent) and that too much water is used to protect wildlife (39.2 percent). The vast majority of households reported that droughts are caused by a lack of rain or snow (94.0 percent) and by climate change (86.8 percent). Almost half of households (49.8 percent) agreed that droughts are caused by a "higher power."

***Access to, use, and quality of tap water***

Respondents most frequently identified the following as their source(s) of household water before the drought (answers are not mutually exclusive and, therefore, sum to more than 100 percent): town, city, or county water system (69.8 percent); private well (28.6 percent); and bottled water (18.9 percent) (Table 4). Of those reporting a private well as a source of household water before the drought, 46.9 percent responded that their well water had previously been tested; these households most frequently reported that their well had been tested for potability or non-specific contaminants (34.0 percent) and for other unspecified or "standard" testing (31.7 percent).

Most households (90.9 percent) reported that they currently have running tap water (Table 4). Among households that currently have running tap water, the following were most frequently

reported as sources of help during a severe water shortage (answers are not mutually exclusive): other family members (64.5 percent); non-profit organizations, e.g., American Red Cross (60.6 percent); fire, police, or other emergency agencies (58.0 percent); county, state, or federal government (57.4 percent); a food bank (47.3 percent); a utility or water company (47.8 percent); faith community (44.9 percent); and neighbors (42.5 percent) (Table 5).

Some households (16 CASPER respondents and an estimated 372 households in the sampling frame, or 8.2 percent) reported that they do not have access to running water in their homes (Table 4).[a] Among these households, there was no single barrier to getting running tap water identified by the majority; the most commonly identified barrier was it is too expensive (31.4 percent) (Table 6). The most common reported source of household water among households that do not have running tap water in their home was bottled water (51.2 percent). Most (77.3 percent) of the households using bottled water reported purchasing the water themselves, and 44.1 percent of these households (three CASPER respondents and an estimated 65 households in the sampling frame) reported that purchasing bottled water has caused difficulty in affording other necessities. Most (60.5 percent) households reporting that they currently do not have running tap water also reported that they have not sought assistance to get water.

Most households (68.2 percent) answered yes to whether they use tap water for drinking and cooking; 11.3 percent of these households further commented that they use tap water for cooking, but not for drinking[b] (Table 7). Some households (28.7 percent) reported that they were aware of problems with their tap water and that their tap water quality had changed since the drought began in terms of color (20.4 percent), clarity (26.2 percent), odor (13.5 percent),

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[a] TCHHSA reports that before the drought the number of households without running tap water was negligible and lack of running water would have been due to normal well life-cycle issues.

[b] Households were asked "Do you use tap water for drinking and cooking?" A portion of households (11.3 percent of 68.2 percent) specifically commented that they use tap water only for cooking.

and taste (25.3 percent) (categories are not mutually exclusive); 56.0 percent reported no changes. Some households (22.3 percent) reported that their well water production had fallen in the past year, and most (74.1 percent) reported that they did not have a well or that their well water production had not fallen in the past year (it is not possible in this report to determine which fraction of households that currently have a well have also reported a decrease in well water production).

***Water use reduction practices***

Nearly all households (94.4 percent) responded that they have reduced their water usage in response to the drought (Table 8). A majority of households reported saving water on property maintenance, including: repairing leaks (57.4 percent); quitting farming (50.8 percent); quitting gardening (60.7 percent); and reducing water used for lawn or landscaping (82.8 percent). A majority also reported reducing water usage in hygienic practices, including: reducing frequency of laundry (79.6 percent); flushing toilet less (53.0 percent); reducing shower time (85.1 percent); reducing shower frequency (59.9 percent); reducing handwashing frequency or duration (58.4 percent); and reducing food washing frequency or duration (62.2 percent). Over half (52.0 percent) of households reported spending less time outdoors because of the drought. Most households (71.8 percent) reported that they could further reduce their water usage if the drought continued.

***Potential health impacts of the drought***

Most households reported that the drought had negatively impacted them, as follows (categories are not mutually exclusive): affected their property (39.2 percent); finances (38.7 percent); health (10.1 percent); peace of mind (33.1 percent); or affected them in another way (4.9 percent) (Table 9). Only 22.9 percent reported that the drought has not negatively impacted their household.

Of the 22.8 percent of households that reported a member of the household is medically fragile or has a chronic medical condition, approximately one quarter (26.2 percent) reported that the condition has gotten worse since the drought began and that their household had sought additional medical attention for this condition (22.9 percent). Of the 6.8 percent of households that reported a member of the household has been told by a provider that they have depression or another emotional or mental health problem, most (59.1 percent) reported that the condition has gotten worse since the drought began, and 36.4 percent of households had sought additional medical attention for this condition.

Some households (15.4 percent) responded yes to at least one question indicating acute stress, most commonly reporting that during the last 30 days a household member had trouble sleeping (8.8 percent), trouble concentrating (5.1 percent), had a racing or pounding heartbeat (4.9 percent), or agitated behavior (4.4 percent) as a result of the drought. Of the households reporting an acute stressor, the most commonly reported source of help sought by the household was a primary care provider (42.6 percent).

When asked questions gauging economic stress, 36.0 percent of households reported reduced income and 35.2 percent reported fewer work hours because of the drought; 14.7 percent reported adults in the households cutting the size of or skipping meals because of lack of money to buy food. Some households (14.1 percent) reported considering moving because of the drought.

A minority of households (13.9 percent) reported seeking assistance related to the drought (Table 10). These households most commonly sought assistance with drinking water (76.1 percent), and most commonly sought assistance from county, state, or federal government agencies (36.0 percent). Some households (four CASPER respondents or an estimated 13.8 percent households in the sampling frame) sought food assistance and an estimated 12.7 percent (two CASPER respondents) sought assistance at a food bank. Most (65.0 percent)

reported getting the assistance they were seeking, with 56.1 percent reporting that it was easy or very easy to get assistance, and 43.9 percent reporting that it was difficult or very difficult to get assistance.

Households most commonly reported that their current greatest need was work, money, or financial assistance (25.2 percent) and water (16.2 percent); only one percent of households (two CASPER respondents) reported that food was their household's greatest need. Many households (40.9 percent) could not identify a need.

***Household disaster threats and emergency communications***

Households were asked to choose three from a list of nine of the greatest disaster or emergency threats to their household. The only disaster or threat identified by a majority of households was the drought (78.2 percent); the other most commonly identified disasters or threats were heatwaves (48.1 percent), wildfires (44.0 percent), and earthquakes (42.6 percent) (Table 11).

Most households (64.4 percent) identified television as their preferred method of receiving information during an emergency or disaster. Over a third of households (39.3 percent) identified difficulty understanding English as a potential barrier to communication during an emergency or a disaster.

***Questions developed by Tulare County***

A minority of households (16.1 percent) reported that someone in the household needed special medical equipment or supplies, and insulin was the most common need among these households (35.4 percent). Most of these households (63.6 percent) reported that the drought had not made it more difficult to obtain or maintain these supplies (Table 12).

Most households (58.8 percent) reported that outdoor dust levels have increased since the drought began, and of those, 67.7 percent reported that they had health concerns about the increased dust. Among households with concerns, the most common were respiratory, i.e., allergies (30.7 percent), asthma (26.7 percent), and other unspecified respiratory issues (23.6 percent).

**South Tulare**

Interview teams conducted 207 of a possible 210 interviews (98.6 percent completion rate; Table 1). Interviews were completed in 63.1 percent of approached housing units, and 80.5 percent of homes where the door was answered. Approximately one-third (32.9 percent) of interviews were conducted in Spanish.

***Household demographics and home characteristics of the surveyed households***

Household size and ages of residents could not be determined for 11 households because of errors by interviewers (e.g. the number of household residents as categorized by age did not total the overall number of household residents). Among the other 196 households, household sizes ranged from 1–14, with a weighted mean of 3.7 and a median of three. Household age distribution was as follows: 50.4 percent had at least one member ≤ 17 years old, and 27.6 percent had at least one member ≥ 65 years old (Table 2). In most households (58.5 percent), English was the main language spoken in the home. Approximately half of households (51.6 percent) reported that they owned their home.

***Attitudes about the drought***

A little over a half of households surveyed (52.2 percent) reported that television was their primary source of information regarding the drought; a minority identified newspaper (11.8 percent) and internet (10.0 percent) (Table 3). The proportions of households reported the following statements about water usage as true: there is an increased demand for water (84.1

percent); some people are not cutting water usage enough (77.4 percent); there is poor water management by the government (64.0 percent); and there is overuse of water by cities (71.2 percent). Households were less likely to report that there is overuse of water by farming or agriculture (46.7 percent) and that too much water is used to protect wildlife (36.7 percent). The vast majority of households reported that droughts are caused by a lack of rain or snow (95.2 percent) and by climate change (76.4 percent). Almost half of households agreed that droughts are caused by a "higher power" (49.1 percent).

***Access to, use, and quality of tap water***

Respondents most frequently identified the following as their source(s) of household water before the drought (answers are not mutually exclusive): private well (62.9 percent), and town, city, or county water system (30.1 percent) (Table 4). Of those reporting a private well as a source of household water before the drought, 54.9 percent responded that their well water had previously been tested; these households most frequently reported that their well had been tested for unspecified or "standard" testing (30.3 percent), potability or non-specific contaminants (20.7 percent), and for specific chemicals (19.0 percent).

Most households (87.4 percent) reported that they currently have running tap water (Table 4). Among households that currently have running tap water, the following were most frequently reported as sources of help during a severe water shortage (answers are not mutually exclusive): other family members (58.0 percent); fire, police, or other emergency agencies (42.8 percent); non-profit organizations, e.g., American Red Cross (41.2 percent); county, state, or federal government (39.7 percent); neighbors (35.1 percent); and faith community (33.3 percent) (Table 5).

Some households (11.7 percent) responded that they do not have access to running water in their homes (Table 4). Among these households, there was no single barrier to getting running water identified by the majority; the most commonly identified barriers were that it is too

expensive to get running tap water in their home (38.1 percent), and that it was the landlord's responsibility but the landlord had not done it (24.5 percent) (Table 6). The most common reported source of household water among households that do not have running tap water in their home was bottled water (75.5 percent). Among households using bottled water, 39.6 percent reported purchasing the water themselves, 37.8 percent reported obtaining bottled water from the government, and 33.3 percent reported obtaining bottled water from a private or non-profit donation (categories are not mutually exclusive). Among households reporting purchasing bottled water, 40.9 percent stated that purchasing bottled water has caused difficulty in affording other necessities. Among households reporting that they currently do not have running tap water, households most commonly sought assistance to get water from the following sources: other family members (29.3 percent); their faith community (24.5 percent); and non-profit organizations, e.g., American Red Cross, (20.4 percent).

Most households (62.5 percent) answered yes to whether they use tap water for drinking and cooking; 11.1 percent of these households further commented that they use tap water for cooking, but not for drinking (Table 7). Some households (32.2 percent) reported that they were aware of problems with their tap water, and that their tap water quality had changed since the drought began in terms of color (24.4 percent), clarity (17.3 percent), odor (9.8 percent), and taste (11.4 percent) (categories are not mutually exclusive); 61.7 percent reported no changes. Over half of households (53.0 percent) reported that their well water production had fallen in the past year; 42.6 percent reported that they did not have a well or that their well water production had not fallen in the past year.

***Water use reduction practices***

Nearly all households (95.7 percent) responded that they have reduced their water usage in response to the drought (Table 8). A majority of households reported saving water on property maintenance, including: repairing leaks (59.6 percent); installing faucet aerators (53.9 percent); replacing appliances such as washing machine or toilet (51.1 percent); quitting farming (67.9

percent); quitting gardening (77.5 percent); and reducing water used for lawn or landscaping (91.9 percent). A majority also reported reducing water usage in hygienic practices, including: reducing frequency of laundry (79.3 percent); flushing toilet less (65.8 percent); reducing shower time (87.5 percent); reducing shower frequency (69.1 percent); reducing handwashing frequency or duration (67.9 percent); and reducing food washing frequency or duration (63.8 percent). Over half (55.2 percent) of households reported spending less time outdoors because of the drought. Most households (72.6 percent) reported that they could further reduce their water usage if the drought continued.

***Potential health impacts of the drought***

Most households reported that the drought had negatively impacted them, as follows (categories are not mutually exclusive): affected their property (48.4 percent); finances (40.2 percent); health (20.3 percent); peace of mind (49.4 percent); or affected them in another way (3.3 percent) (Table 9). Only 19.4 percent reported that the drought has not negatively impacted their household.

Of the 28.7 percent of households that reported a member of the household is medically fragile or has a chronic medical condition, nearly half (45.7 percent) reported that the condition has gotten worse since the drought began, and 20.2 percent reported that their household had sought additional medical attention for this condition. Of the 18.1 percent of households that reported a member of the household has been told by a provider that they have depression or another emotional or mental health problem, over a third (38.2 percent) reported that the condition has gotten worse since the drought began, and 21.9 percent of households had sought additional medical attention for this condition.

About one quarter (26.2 percent) of households responded yes to at least one question indicating acute stress, most commonly reporting that during the last 30 days, a household member had trouble sleeping (15.2 percent), agitated behavior (14.4 percent), had trouble

concentrating (9.6 percent), a racing or pounding heartbeat (7.8 percent), or loss of appetite (7.2 percent) as a result of the drought. Of the households reporting an acute stressor, most (68.5 percent) reported not seeking help.

When asked questions gauging economic stress, 29.6 percent of households reported reduced income and 19.8 percent reported fewer work hours because of the drought; 10.1 percent reported adults in the households cutting the size of or skipping meals because of lack of money to buy food. Just over one third (34.1 percent) of households reported that they are considering moving because of the drought.

Approximately one quarter of households (25.6 percent) reported seeking assistance related to the drought (Table 10). These households most commonly sought assistance with drinking water (82.7 percent), and most commonly sought assistance from county, state, or federal government agencies (26.2 percent) and non-profit organizations, e.g., American Red Cross (23.4 percent). Some households (three CASPER respondents or an estimated 5.6 percent of households in the sampling frame) sought food assistance, and 9.4 percent sought assistance at a food bank (four CASPER respondents). Most (79.3 percent) reported getting the assistance they were seeking, with 60.1 percent reporting that it was easy or very easy to get assistance, and 35.9 percent reporting that it was difficult or very difficult to get assistance.

Households most commonly reported that their current greatest need was water (35.1 percent) and work or money (14.1 percent); 4.3 percent of households reported that food was their household's greatest need (9 CASPER respondents). Many households (29.4 percent) could not identify a need.

***Household disaster threats and emergency communications***

Households were asked to choose three from a list of nine of the greatest disaster or emergency threats to their household. The only disaster or threat identified by a majority of

households was the drought (88.3 percent); the other most commonly identified disasters or threats were heatwaves (46.2 percent), wildfires (36.2 percent), and earthquakes (34.7 percent) (Table 11).

Households most commonly identified television (53.5 percent) and cell phone (18.0 percent) as their preferred method of receiving information during an emergency or disaster. A fifth of households (20.5 percent) identified difficulty understanding English as a potential barrier to communication during an emergency or a disaster.

***Questions developed by Tulare County***

A minority of households (12.7 percent) reported that someone in the household needed special medical equipment or supplies; oxygen (30.0 percent) and dialysis (23.8 percent) were the most common needs among these households. Most of these households (61.9 percent) reported that the drought had not made it more difficult to obtain or maintain these supplies (Table 12).

Most households (66.3 percent) reported that outdoor dust levels have increased since the drought began, and of those, 61.3 percent reported that they had health concerns about the increase in dust. Among households with concerns, the most common were respiratory, i.e., allergies (29.9 percent), asthma (23.4 percent), and other unspecified respiratory issues (21.9 percent).

## DISCUSSION AND CONCLUSIONS

The California drought has evolved over several years and its health effects have not been well-characterized. While CASPERs were originally conceived to assess communities following an acute disaster, this methodology provides a statistically valid approach to evaluate community status in any situation, including a slow motion disaster like drought. This report presents data

from the CASPER surveys conducted in two areas of Tulare County October 20–22, 2015. CDPH completed 185 surveys in the North Tulare CASPER area surrounding the communities of Cutler and Orosi, and 207 interviews in the South Tulare CASPER area surrounding East Porterville.

These CASPERs were conducted during the fourth year of the California drought, and are therefore timely and relevant. The demographic data collected in this CASPER is similar to that reported by U.S. Census QuickFacts[14] as follows: 1) QuickFacts reports that Cutler and Orosi, the population centers of the North Tulare CASPER, have owner-occupied housing unit rates of 37.2 percent and 50.9 percent, respectively; 50.7 percent of households sampled in the North Tulare CASPER reported owning their homes; 2) QuickFacts reports that East Porterville, the population center of the South Tulare CASPER, has an owner-occupied housing unit rate of 51.4 percent; 51.6 percent of households sampled in the South Tulare CASPER reported owning their homes; 3) QuickFacts reports the average household size in both Cutler and Orosi as 4.24; the average household size reported in the North CASPER was 4.15; and 4) QuickFacts reports the average household size in East Porterville as 3.96; the average household size reported in the South CASPER was 3.73. These comparisons increase our confidence that the interviewed households are representative of the sampled areas.

When comparing responses of households of North vs. South Tulare, it is important to consider that there are demographic, household, and economic differences between East Porterville CDP (a small area within South Tulare CASPER), Porterville County Census Division (CCD), Orosi-Cutler CCD (some of which comprises North Tulare CASPER), and CDPs of Cutler and Orosi individually, as reported in the U.S. Census' American Community Survey[c] 2010–2014.[21] For

[c] The American Community Survey (ACS) is a nation-wide statistical sample survey, where a series of monthly samples produce annual estimates for census tracts and block groups. All ACS estimates have associated margins of error, which are not reported here.

example, there are only modest differences in the percentage of households living below poverty between Porterville CCD (31.2 percent), East Porterville CDP (36.9 percent), and Orosi-Cutler CCD (39.5 percent), but there is a substantial difference between Cutler CDP (63.6 percent) and Orosi CDP (28.7 percent). Among renters, 33.1 percent in Cutler CDP and 15.5 percent in Orosi CDP do not have an available vehicle, compared to 16.9 percent in Orosi-Cutler CCD, 9.1 percent in Porterville CCD, and 6.8 percent in East Porterville CDP. Half of residents in Cutler CDP (50.2 percent) and 44.1 percent of residents in Orosi CDP have <ninth grade education, compared to 43.4 percent in Orosi-Cutler CCD, 23.4 percent in Porterville CCD, and 38.0 percent in East Porterville CDP.

Respondents in both the North and South Tulare CASPERs overwhelmingly reported perceptions of poor water management by the government and overuse of water by cities, and that droughts are caused at least in part by climate change. The vast majority reported that they had engaged in at least some water-conserving behaviors. Furthermore, most households reported that they also believed they could further reduce their water usage. Taken together, these data suggest that households could still be motivated by outreach and messaging to further and/or more appropriately reduce their water usage. However, the reported widespread practice of reducing the frequency or duration of hand and food washing in response to the drought is worrisome, as hand washing and food washing are well-established means of reducing the risk of a wide variety of communicable diseases (e.g., enteric diseases and influenza) and removing pesticide residues. Households were less likely to report that they had created a method for capturing and/or reusing water, suggesting that they could be motivated by outreach and messaging about economic ways of doing so. Households were also less likely to report that they had replaced appliances such as washing machines and toilets. Since replacing appliances can be expensive, this result is consistent with U.S. Census QuickFacts data that 36.9 percent of population in East Porterville, 63.6 percent in Cutler, and 28.7 percent in Orosi are at poverty level[14].

It is not possible to fully characterize the health effects associated with the drought within these sampling frames using household-based interviews. Nevertheless, the data presented in Table 9 provides insight into the various ways that the ongoing drought has impacted the surveyed populations and the estimated number of households in the sampling frames, and may be useful in informing outreach and mitigation plans. A substantial proportion of households reported that the drought has negatively affected their property and finances, with many households experiencing decreased income and fewer work hours and the associated stress of strained finances. These findings are consonant with recent projections of approximately 21,000 total job losses in 2015 due to the drought, most of which are in the Tulare Basin.[22] Approximately one third of households in North Tulare and one half of households in South Tulare reported that the drought has negatively affected their peace of mind. 15.4 percent and 26.2 percent of households in North and South Tulare, respectively, reported at least one household member who had symptoms of acute stress within the past 30 days they felt was related to the drought. Of households with member(s) experiencing acute stress, most in the South CASPER sampling frame reported the affected household member(s) did not seek any help in dealing with this stress. Furthermore, of those households reporting that a member has been diagnosed with depression or another emotional or mental health problem, 59.1 percent and 38.2 percent of households in North and South Tulare, respectively, report that the condition had gotten worse since the drought began, and that most have not sought additional medical attention.

This CASPER also provides some evidence that the drought has negatively impacted the preexisting health conditions of residents of Tulare County. Approximately one quarter of households in both North and South Tulare report that a member of the household is medically fragile or has a chronic medical condition; of those, 26.2 percent and 45.7 percent, respectively, report that the condition has gotten worse since the drought began and most households have not sought additional medical care. Further, 10.1 percent and 20.3 percent of households in North and South Tulare, respectively, report that the drought has negatively affected their household's health. Admittedly, it may be difficult to directly associate a worsening of a chronic

disease or mental health condition with the drought given that the condition may have naturally deteriorated over time, or that the worsening chronic condition could also be associated with aspects of the environment that might or might not be related to the drought (e.g. economic or other stressors that households may experience in their daily lives). Nevertheless, these findings suggest that households in North and South Tulare perceive a connection between worsening health and the drought. A substantial proportion of households in the North and South Tulare (14.1 percent and 34.1 percent, respectively) report that they have considered moving because of the drought.

Among households that reported lacking reliable running water, the most common identified barrier to getting running tap water was cost. Most households without running water use bottled water, but data show striking differences in how households obtained water in North Tulare (primarily by purchasing the water themselves) and South Tulare (a combination of government-provided, private or non-profit donation, and purchased water). Moreover, most households without running tap water in North Tulare have not sought assistance, while those in South Tulare have sought assistance from a variety of sources. Given the larger proportion of private well usage as a water source before the drought in South Tulare households (62.9 percent vs 28.6 percent in North Tulare) and that East Porterville is one of the most impacted areas in California with regards to drying wells, we speculate that the observed assistance-seeking behavior differences may be attributable to greater outreach and messaging efforts in South Tulare.

We found that most households rely on television both for information about the drought and for receiving information during an emergency or disaster. This is an important finding for two reasons: 1) delivery of general outreach messages and 2) overall emergency planning as, depending on the emergency, television might not be a reliable communication medium (e.g. during any event causing a widespread and/or prolonged power outage). Spanish was the primary language spoken at home among most households in North Tulare and a large proportion of households in South Tulare. Substantial proportions of both North and South

Tulare households reported that difficulty understanding English by household members may be a barrier to effective communication during an emergency.

Among households that currently have running water, in the event of a severe water shortage, the majority of households in North Tulare and a large proportion in South Tulare would seek assistance from the government, from emergency agencies, and from non-profit organizations such as the American Red Cross. Most surveyed households believe that there is poor water management by the government. Despite this, a substantial percentage of households reported they would seek government assistance in the case of a severe water shortage, indicating that they, regardless of beliefs and perceptions of the government, would still rely on it for assistance.

Comparing North and South Tulare CASPERs, we found a number of notable differences. In North Tulare, 67.3 percent of households reported Spanish as their primary language, while in South Tulare, it was little over a third (35.5 percent). Two thirds (74.7 percent) of North Tulare households report TV as primary drought information source, but little over half (52.2 percent) of South Tulare households do so; in South Tulare, 10 percent of households prefer the Internet, versus only 3.4 percent of households in North Tulare. Most households in North Tulare reported being on municipal water systems (69.8 percent), whereas in South Tulare 62.9 percent of households reported being on private wells. Very few households in South Tulare reported using bottled water (5.3 percent), yet 18.9 percent in North Tulare did so. More South Tulare households reported capturing and reusing water than in North Tulare, 41.5 percent and 29.0 percent, respectively; more households also replaced appliances, 51.1 percent in the South and 38.0 percent in the North.

More South Tulare households report that the drought affected their property, finances, health, and peace of mind, with health having the most dramatic difference: 20.3 percent of South Tulare versus 10.1 percent of North Tulare households. Of those with chronic conditions, 45.7

percent of South Tulare households report condition worsening since the drought compared to 26.2 percent of North Tulare households. Little over a quarter (26.2 percent) of South Tulare households report a mental health effect in the past 30 days, whereas only 15.4 percent report so in North Tulare. Interestingly, more North Tulare households reported economic impacts across all offered categories; most notably, 35.2 percent of households reported fewer work hours compared to 19.8 percent of households in South Tulare. Yet, more than double of households in South Tulare considered moving than in North Tulare (34.1 percent and 14.1 percent, respectively). Finally, over a third of South Tulare households (35.1 percent) report water as their greatest need compared to 16.2 percent in North Tulare.

Based on a preliminary analysis of the data collected during these CASPERs, CDPH recommends the following to TCHHSA:

1. Continue outreach efforts in Tulare County to inform residents of available drought assistance and encourage reporting of dry wells, especially in North Tulare where a greater proportion of residents have not sought assistance. Consider focusing on television as a medium and ensure that messages are delivered in English and Spanish. These CASPERs identified that approximately 10 percent of sampled households do not presently have reliable tap water despite current assistance programs, and that approximately 40 percent of households report that the drought has negatively impacted their finances.

2. Promote water reduction, capture, and reuse techniques by households. Consider promoting replacement of inefficient appliances, to the extent affordable by households.

3. Ensure that households use adequate water for critical hygienic practices, especially adequate hand washing. Establish outreach and messaging to promote the importance of hand washing and food washing even in the context of the drought.

4. Consider expanding behavioral health services to serve those under acute stress from the drought. Consider providing mental health training and resources to local community health workers in order to increase information and assistance availability in the communities. Consider partnering with food assistance organizations, to provide public health and behavioral health services at food pickup locations.

5. Ensure that households are aware of County relocation assistance programs since a substantial proportion of sampled households have considered moving because of the drought.

6. Consider implementing a notification system in areas of poor air quality. County residents can also access AQI online, which could be helpful for sensitive populations who work or spend time outdoors. The majority of the sampled households perceived that levels of outdoor dust have increased since the drought and reported various health-related concerns.
   http://www.airnow.gov/index.cfm?action=flag_program.index.

7. Consider how households' preference for receiving emergency information may affect the County's planned communications during acute disasters and events that may cause widespread and/or prolonged power outages, since most households report relying on television for receiving information during an emergency or disaster.

8. Consider diverse, language-appropriate outreach and messaging approaches in each of the areas in order to reach the desired populations given the differences in findings and known demographic differences between Cutler, Orosi, and East Porterville,

**LIMITATIONS**

Based on our sampling methodology, we caution against generalizing percentages of households giving a particular answer to a question outside of the geographically defined sampling frames. These two CASPERs in Tulare County were purposefully conducted in areas with the greatest concentration of reported dry wells and primarily off municipal water systems; therefore we particularly caution against generalizing the results reported here to populations of Tulare County served by large municipal water systems, as these populations likely do not face the same water stressors. However, the recommendations provided here will likely prove applicable to residents of Tulare County outside of the North and South CASPER sampling frames. We also caution that the data generated by these CASPERs represent a snapshot in time, which should be considered when attributing chronic health effects to a multi-year natural disaster. TCHHSA might consider a drought-related public health assessment of areas outside the North Tulare and South Tulare sampling frames, and might also consider a follow-up assessment of the North and South sampling frames at a later date to assess the effectiveness of strategies recommended above, if they are implemented. TCHHSA might also use these findings to generate hypotheses for further investigations of the impact of the drought on the health of residents of Tulare County.

The CASPERs described here were a successful collaboration between CDPH and TCHHSA, and helped characterize potential drought-associated health effects, assistance seeking behaviors and barriers to assistance, and household water use and reduction practices. We hope that the results presented here will be useful in allocating resources for response to the drought and strengthening the emergency preparedness capacity of Tulare County.

**FIGURES AND TABLES**

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**Figure 1. Tulare County CASPER sampling frames for the North Tulare and the South Tulare CASPERs.**

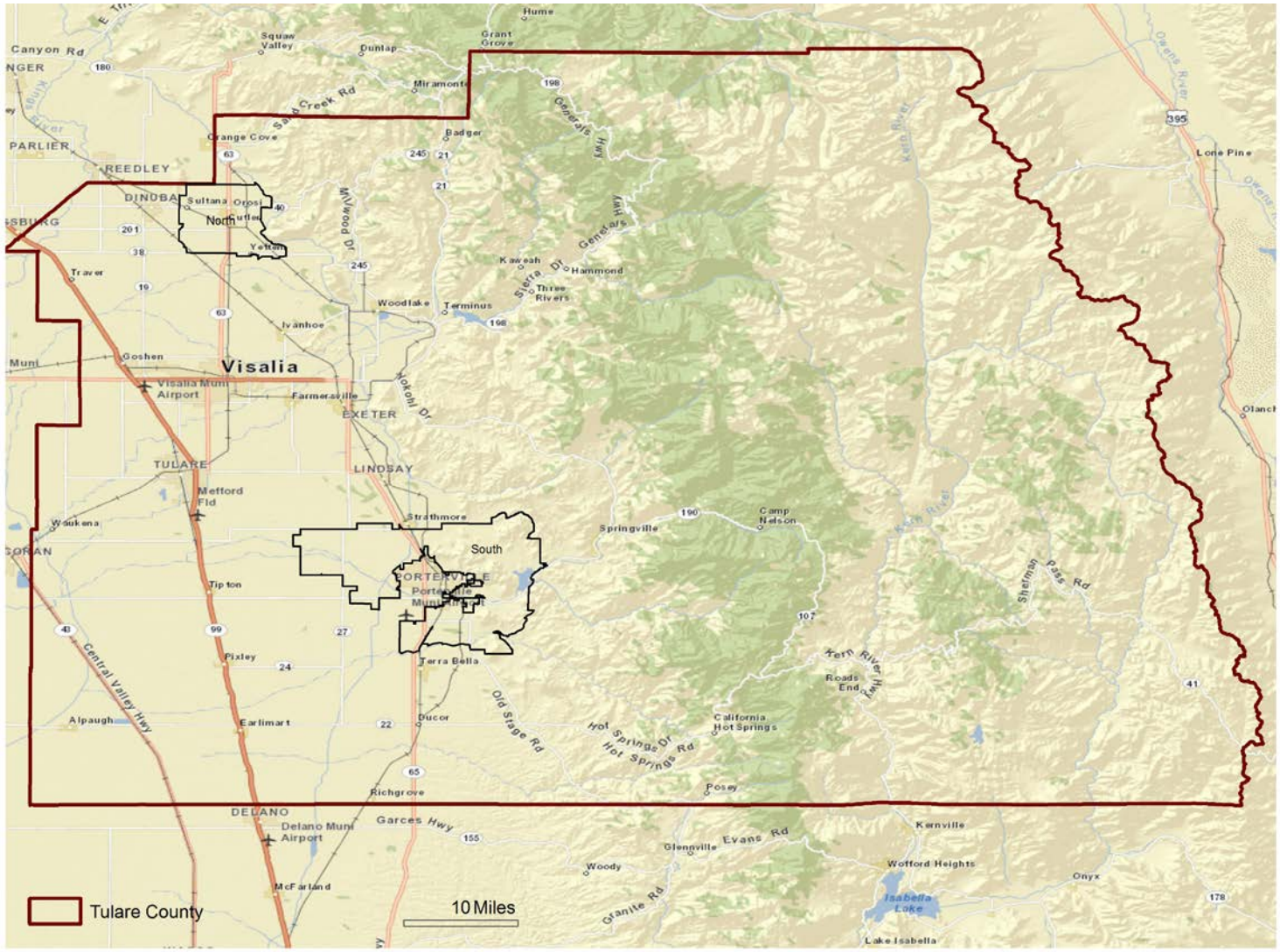

**Figure 2. CASPER sampling frame and selected clusters for the North Tulare CASPER.**

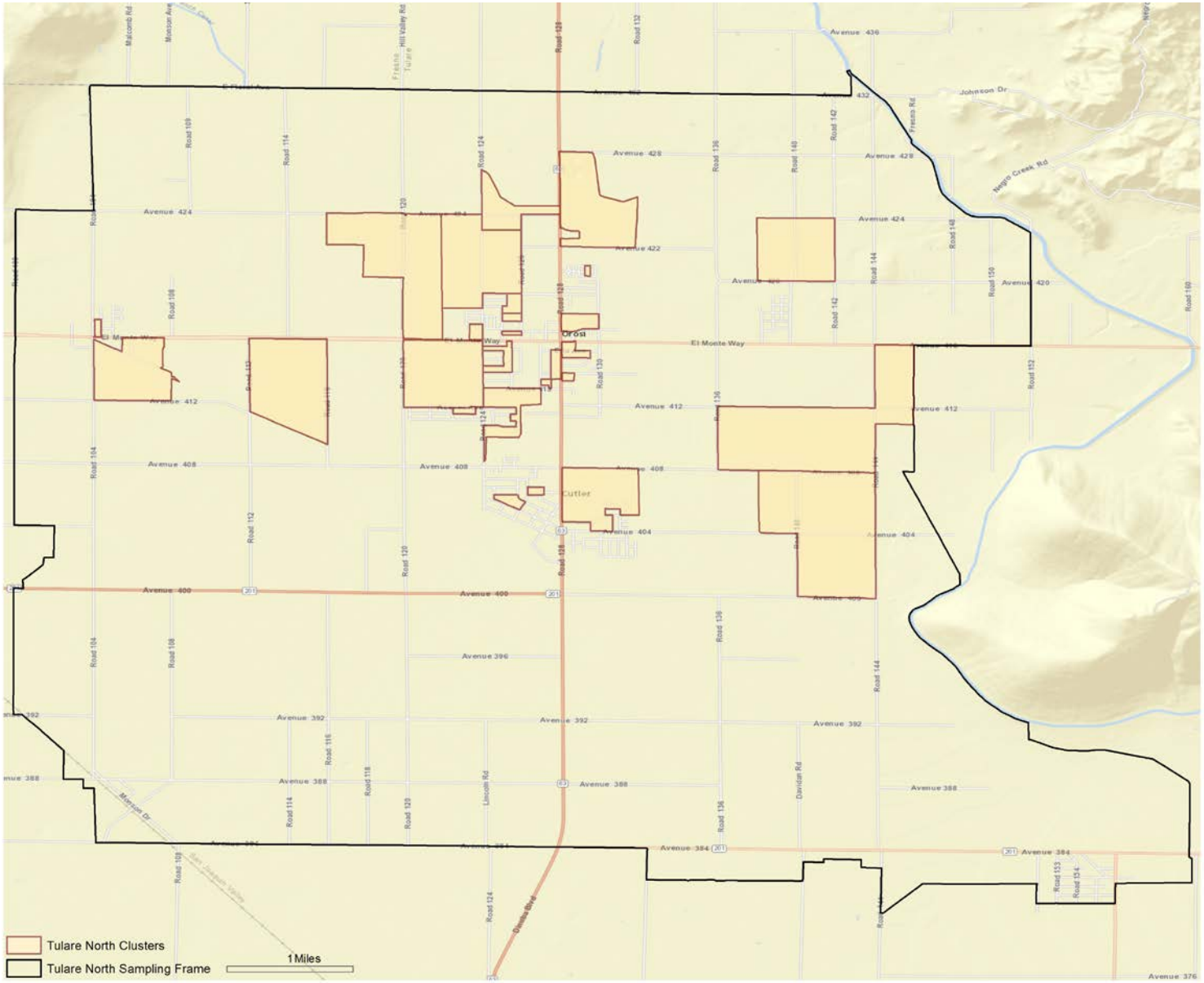

**Figure 3. CASPER sampling frame and selected clusters for the South Tulare CASPER.**

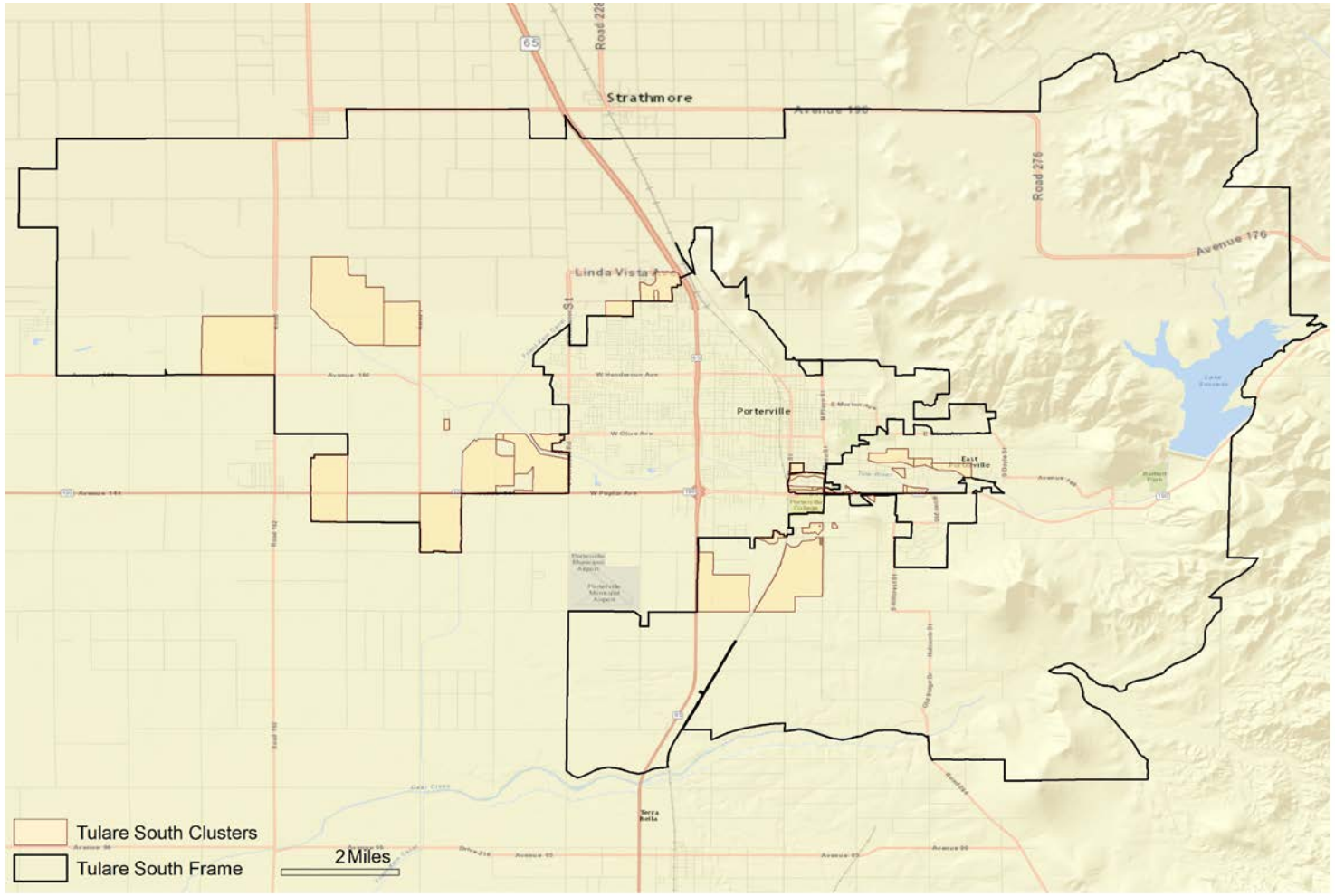

**Table 1. Questionnaire response rates for CASPER conducted in Tulare County, California.**

| | North Tulare | | South Tulare | |
|---|---|---|---|---|
| **Questionnaire response** | **Percent** | **Rate** | **Percent** | **Rate** |
| **Completion*** | 88.1 | 185/210 | 98.6 | 207/210 |
| **Cooperation†** | 76.4 | 185/242 | 80.5 | 207/257 |
| **Contact‡** | 49.7 | 185/372 | 63.1 | 207/328 |

*Percent of surveys completed in relation to the goal of 210

†Percent of contacted households that were eligible and willing to participate in the survey

‡Percent of randomly selected households which completed an interview

**Table 2. Demographics and information sources about the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Households with ≥1 member in the following age categories** | | | **n=172*** | | | | **n=196*** | |
| ≤17 years old | 107 | 62.21 | 2659 | 62.97 (55.53, 70.42) | 99 | 50.51 | 2474 | 50.38 (42.45, 58.30) |
| ≥65 years old | 47 | 27.33 | 1092 | 25.85 (20.00, 31.71) | 54 | 27.55 | 1354 | 27.58 (21.16, 33.99) |
| **Own or rent home** | | | **n=185** | | | | **n=207** | |
| Own | 91 | 49.19 | 2293 | 50.73 (42.42, 59.05) | 107 | 51.69 | 2675 | 51.59 (40.23, 62.94) |
| Rent | 92 | 49.73 | 2205 | 48.56 (40.44, 56.68) | 100 | 48.31 | 2511 | 48.41 (37.06, 59.77) |
| Other | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| Missing | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| **Primary language spoken at home** | | | **n=185** | | | | **n=207** | |
| English | 53 | 28.65 | 1304 | 28.71 (22.01, 35.41) | 121 | 58.45 | 3021 | 58.25 (48.32, 68.19) |
| Spanish | 124 | 67.03 | 3055 | 67.29 (61.46, 73.11) | 73 | 35.27 | 1840 | 35.48 (26.28, 44.68) |
| English & Spanish | 6 | 3.24 | - | - | 10 | 4.83 | 251 | 4.84 (1.57, 8.11) |
| Other | 2 | 1.08 | - | - | 3 | 1.45 | - | - |

* Household size and age categories of residents could not be determined for 13 households of North Tulare and 11 households of South Tulare because of errors by interviewers

**Table 3. Perceptions about the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Primary drought information source** | | | n=185 | | | | n=207 | |
| Newspaper | 10 | 5.41 | 270 | 5.94 (2.20, 9.69) | 24 | 11.59 | 609 | 11.75 (7.33, 16.16) |
| TV | 141 | 76.22 | 3390 | 74.66 (66.11, 83.20) | 108 | 52.17 | 2708 | 52.22 (44.92, 59.52) |
| Friends | 9 | 4.86 | - | - | 11 | 5.31 | 276 | 5.32 (2.31, 8.32) |
| Family members | 2 | 1.08 | - | - | 9 | 4.35 | - | - |
| AM/FM radio | 3 | 1.62 | - | - | 6 | 2.90 | - | - |
| Work | 2 | 1.08 | - | - | 2 | 0.97 | - | - |
| Internet | 6 | 3.24 | - | - | 21 | 10.14 | 519 | 10.00 (5.54, 14.46) |
| Place of worship | 0 | 0.00 | - | - | 0 | 0.00 | - | - |
| Other | 3 | 1.62 | - | - | 15 | 7.25 | 370 | 7.14 (3.50, 10.78) |
| Couldn't choose one | 7 | 3.78 | - | - | 9 | 4.35 | - | - |
| DK | 0 | 0.00 | - | - | 1 | 0.48 | - | - |
| None | 1 | 0.54 | - | - | 1 | 0.48 | - | - |
| Missing | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| **Identified the following statements as "true"** | | | n=185 | | | | n=207 | |
| There is an increased demand for water | 160 | 86.49 | 3983 | 87.71 (82.79, 92.64) | 174 | 84.06 | 4363 | 84.13 (79.62, 88.63) |
| There is poor water management by the government | 127 | 68.65 | 3145 | 69.26 (62.85, 75.67) | 133 | 64.25 | 3317 | 63.97 (54.71, 73.23) |
| Some people not cutting usage enough | 142 | 76.76 | 3464 | 76.29 (69.36, 83.23) | 160 | 77.29 | 4013 | 77.38 (72.18, 82.58) |
| Cities use too much water | 135 | 72.97 | 3334 | 73.41 (65.44, 81.39) | 147 | 71.01 | 3692 | 71.19 (64.49, 77.89) |
| Agriculture/farming uses too much water | 83 | 44.86 | 2094 | 46.10 (37.39, 54.82) | 96 | 46.38 | 2420 | 46.67 (38.75, 54.59) |

**Table 3. Perceptions about the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Too much water is used to protect wildlife | 71 | 38.38 | 1782 | 39.24 (30.14, 48.33) | 76 | 36.72 | 1902 | 36.67 (27.51, 45.82) |
| Droughts are caused by lack of rain/snow | 173 | 93.51 | 4269 | 94.02 (90.87, 97.16) | 197 | 95.17 | 4939 | 95.24 (92.32, 98.15) |
| Droughts are caused by climate change | 162 | 87.57 | 3943 | 86.83 (81.67, 91.98) | 158 | 76.33 | 3959 | 76.35 (69.56, 83.14) |
| Droughts are caused by a “higher power” | 90 | 48.65 | 2261 | 49.80 (41.50, 58.11) | 102 | 49.28 | 2548 | 49.13 (42.21, 56.05) |

**Table 4. Household water source before the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Household water source before drought (not mutually-exclusive)** | | | **n=185** | | | | **n=207** | |
| Town water | 133 | 71.89 | 3168 | 69.76 (54.48, 85.05) | 62 | 29.95 | 1560 | 30.08 (15.58, 44.58) |
| Private well | 49 | 26.49 | 1300 | 28.62 (13.08, 44.16) | 130 | 62.80 | 3260 | 62.86 (47.99, 77.72) |
| Small water system | 1 | 0.54 | - | - | 16 | 7.73 | 399 | 7.70 (0.31, 15.09) |
| Bottled water | 37 | 20.00 | 860 | 18.93 (7.18, 30.68) | 11 | 5.31 | 276 | 5.32 (0.00, 10.67) |
| Other water source | 0 | 0.00 | - | - | 1 | 0.48 | - | - |
| DK | 4 | 2.16 | - | - | 1 | 0.48 | - | - |
| Refused | 0 | 0.00 | - | - | 0 | 0 | - | - |
| **If private well, has well ever been tested?** | | | **n=49** | | | | **n=130** | |
| Yes | 23 | 46.94 | 606 | 46.62 (34.14, 59.09) | 71 | 54.62 | 1790 | 54.92 (41.54, 68.31) |
| **For what has the well been tested?** | | | **n=23** | | | | **n=71** | |
| Unspecified or "standard" testing | 6 | 26.09 | - | - | 23 | 32.39 | 568 | 31.72 (14.97, 48.48) |
| Potability or non-specific contaminants | 5 | 21.74 | - | - | 24 | 33.80 | 609 | 34.02 (21.85, 46.20) |
| Well depth or flow rate | 3 | 13.04 | - | - | 11 | 15.49 | 284 | 15.86 (6.84, 24.88) |
| Specific chemicals | 4 | 17.39 | - | - | 6 | 8.45 | - | - |
| Bacteria/biologicals | 2 | 8.70 | - | - | 8 | 11.27 | - | - |
| Other | 1 | 4.35 | - | - | 5 | 7.04 | - | - |

**Table 4. Household water source before the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Does household currently have running water?** | | | n=185 | | | | n=207 | |
| Yes | 167 | 90.27 | 4126 | 90.86 (84.55, 97.17) | 181 | 87.44 | 4532 | 87.38 (82.10, 92.66) |
| No | 16 | 8.65 | 372 | 8.19 (2.67, 13.71) | 24 | 11.59 | 605 | 11.67 (6.44, 16.89) |
| DK | 2 | 1.08 | - | - | 1 | 0.48 | - | - |
| Ref | 0 | 0 | - | - | 1 | 0.48 | - | - |

**Table 5. Perceptions of available assistance, households that report having running tap water, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Where would household go for help during a severe water shortage?** | | | n=167 | | | | n=181 | |
| Faith community | 75 | 44.91 | 1854 | 44.94 (34.07, 55.82) | 60 | 33.15 | 1511 | 33.33 (23.58, 43.09) |
| Family | 108 | 64.67 | 2662 | 64.53 (55.89, 73.16) | 105 | 58.01 | 2630 | 58.04 (47.91, 68.16) |
| Neighbors | 71 | 42.52 | 1755 | 42.54 (33.88, 51.20) | 63 | 34.81 | 1589 | 35.06 (25.09, 45.03) |
| Utility/water company | 84 | 50.30 | 2007 | 48.65 (37.59, 59.70) | 47 | 25.97 | 1189 | 26.25 (15.52, 36.98) |
| Non-profits (e.g., ARC) | 100 | 59.88 | 2502 | 60.63 (50.49, 70.77) | 74 | 40.88 | 1869 | 41.24 (30.65, 51.82) |
| Food bank | 79 | 47.31 | 1973 | 47.82 (37.55, 58.09) | 43 | 23.76 | 1095 | 24.16 (14.64, 33.68) |
| Fire/police/emergency agency | 99 | 59.28 | 2393 | 57.99 (49.28, 66.70) | 77 | 42.54 | 1939 | 42.78 (31.41, 54.15) |
| County/state/federal government | 97 | 58.08 | 2368 | 57.39 (47.01, 67.77) | 71 | 39.23 | 1799 | 39.69 (29.08, 50.30) |
| Employer | 32 | 19.16 | 797 | 19.32 (11.99, 26.65) | 18 | 9.94 | 461 | 10.17 (3.71, 16.64) |
| Other source | 9 | 5.39 | - | - | 6 | 3.31 | - | - |
| None | 3 | 1.80 | - | - | 10 | 5.52 | 247 | 5.45 (1.35, 9.55) |
| DK | 2 | 1.20 | - | - | 1 | 0.55 | - | - |
| Ref | 0 | 0.00 | - | - | 0 | 0.00 | - | - |
| Missing | 1 | 0.60 | - | - | 0 | 0.00 | - | - |

**Table 6. Experiences of households that report *not having* running tap water, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Main barrier to getting running tap water in home** | | | n=16 | | | | n=24 | |
| Too expensive | 5 | 31.25 | - | - | 9 | 37.50 | - | - |
| Well drillers not available | 0 | 0.00 | - | - | 2 | 8.33 | - | - |
| Landlord's responsibility | 3 | 18.75 | - | - | 6 | 25.00 | - | - |
| Waiting for government financial assistance | 0 | 0.00 | - | - | 2 | 8.33 | - | - |
| Other | 4 | 25.00 | - | - | 2 | 8.33 | - | - |
| DK | 2 | 12.50 | - | - | 3 | 12.50 | - | - |
| Missing | 2 | 12.50 | - | - | 0 | 0.00 | - | - |
| **Where has household obtained/is obtaining water?** | | | n=16 | | | | n=24 | |
| Neighbors | 0 | 0.00 | - | - | 4 | 16.67 | - | - |
| Community tank | 1 | 6.25 | - | - | 6 | 25.00 | - | - |
| County tank | 1 | 6.25 | - | - | 6 | 25.00 | - | - |
| Private tank | 2 | 12.50 | - | - | 4 | 16.67 | - | - |
| Bottled water | 8 | 50.00 | - | - | 18 | 75.00 | 457 | 75.51 (58.61, 92.41) |
| Other | 4 | 25.00 | - | - | 1 | 4.17 | - | - |
| DK | 0 | 0.00 | - | - | 1 | 4.17 | - | - |
| Missing | 2 | 12.50 | - | - | 0 | 0.00 | - | - |
| **Where did household obtain bottled water?** | | | n=8 | | | | n=18 | |
| Purchased | 6 | 75.00 | - | - | 7 | 38.89 | - | - |
| Government | 2 | 25.00 | - | - | 7 | 38.89 | - | - |

**Table 6. Experiences of households that report *not having* running tap water, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Private or non-profit donation | 0 | 0 | - | - | 6 | 33.33 | - | - |
| Landlord | 0 | 0 | - | - | 0 | 0.00 | - | - |
| Place of worship | 0 | 0 | - | - | 4 | 22.22 | - | - |
| Other | 1 | 12.50 | - | - | 1 | 5.56 | - | - |
| DK | 0 | 0 | - | - | 1 | 5.56 | - | - |
| **Has purchasing bottled water caused difficulty in affording other necessities?** | | | **n=6** | | | | **n=7** | |
| Yes | 3 | 50.00 | - | - | 3 | 42.86 | - | - |
| **Where has household sought assistance to get water?** | | | **n=16** | | | | **n=24** | |
| Family | 1 | 6.25 | - | - | 7 | 29.17 | - | - |
| Neighbors | 1 | 6.25 | - | - | 4 | 16.67 | - | - |
| Faith community | 0 | 0.00 | - | - | 6 | 25.00 | - | - |
| Non-profit (e.g., ARC) | 0 | 0.00 | - | - | 5 | 20.83 | - | - |
| Food bank | 1 | 6.25 | - | - | 3 | 12.50 | - | - |
| Utility or water company | 0 | 0.00 | - | - | 2 | 8.33 | - | - |
| Fire/police/emergency agency | 0 | 0.00 | - | - | 4 | 16.67 | - | - |
| County/state/federal government | 2 | 12.50 | - | - | 4 | 16.67 | - | - |
| Employer | 0 | 0.00 | - | - | 0 | 0.00 | - | - |
| None | 10 | 62.50 | 225 | 60.47 (25.36, 95.57) | 3 | 12.50 | - | - |
| Other | 1 | 6.25 | - | - | 1 | 4.17 | - | - |

**Table 6. Experiences of households that report *not having* running tap water, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Missing | 1 | 6.25 | - | - | 0 | 0.00 | - | - |
| DK | 0 | 0.00 | - | - | 1 | 4.17 | - | - |

**Table 7. Perceptions of water quality, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Does your household use tap water for drinking and cooking?** | | | **n=185** | | | | **n=207** | |
| Yes | 127 | 68.65 | 3095 | 68.17 (60.37, 75.96) | 129 | 62.32 | 3239 | 62.46 (53.78, 71.14) |
| No | 57 | 30.81 | 1424 | 31.36 (23.71, 39.01) | 78 | 37.68 | 1947 | 37.54 (28.86, 46.22) |
| Don't Know | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| **Does household use tap water for cooking but not drinking? (answer volunteered by respondent)** | | | **n=127** | | | | **n=129** | |
| Yes | 15 | 11.81 | 350 | 11.32 (3.67, 18.97) | 14 | 10.85 | 358 | 11.05 (4.01, 18.10) |
| **Is household aware of problems with tap water?** | | | n=185 | | | | n=207 | |
| Yes | 51 | 27.57 | 1302 | 28.67 (20.59, 36.76) | 67 | 32.37 | 1671 | 32.22 (23.40, 41.04) |
| No | 119 | 64.32 | 2906 | 63.99 (55.67, 72.32) | 135 | 65.22 | 3387 | 65.32 (56.32, 74.31) |
| DK | 13 | 7.03 | 290 | 6.38 (1.56, 11.20) | 5 | 2.42 | - | - |
| Missing | 2 | 1.08 | - | - | 0 | 0.00 | - | - |
| **Has household noticed changes in tap water quality?** | | | **n=185** | | | | **n=207** | |
| Color | 36 | 19.46 | 925 | 20.37 (14.32, 26.43) | 51 | 24.64 | 1268 | 24.44 (17.98, 30.91) |
| Clarity | 47 | 25.41 | 1189 | 26.18 (19.59, 32.77) | 36 | 17.39 | 897 | 17.30 (11.08, 23.52) |
| Odor | 24 | 12.97 | 615 | 13.54 (7.27, 19.80) | 20 | 9.66 | 506 | 9.76 (5.14, 14.39) |
| Taste | 44 | 23.78 | 1149 | 25.31 (16.88, 33.73) | 24 | 11.59 | 593 | 11.43 (5.76, 17.10) |
| No changes | 104 | 56.22 | 2542 | 55.98 (47.00, 64.96) | 127 | 61.35 | 3198 | 61.67 (53.04, 70.29) |
| DK | 4 | 2.16 | - | - | 7 | 3.38 | - | - |

**Table 7. Perceptions of water quality, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Has well water production fallen in the past year?** | | | n=185 | | | | n=207 | |
| Yes | 39 | 21.08 | 1012 | 22.29 (11.21, 33.37) | 110 | 53.14 | 2749 | 53.02 (44.37, 61.66) |
| No | 41 | 22.16 | 981 | 21.60 (14.36, 28.84) | 66 | 31.88 | 1663 | 32.06 (24.90, 39.22) |
| Don't have well | 99 | 53.51 | 2383 | 52.48 (38.50, 66.46) | 22 | 10.63 | 547 | 10.56 (2.39, 18.72) |
| DK | 5 | 2.70 | - | - | 7 | - | - | - |
| Missing | 1 | 0.54 | - | - | 2 | - | - | - |

**Table 8. Water conservation practices, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Household has done the following to reduce water usage:** | | | n=185 | | | | n=207 | |
| Reduced water usage | 174 | 94.05 | 4286 | 94.38 (90.39, 98.37) | 198 | 95.65 | 4964 | 95.71 (92.24, 99.19) |
| Capturing and reusing water | 52 | 28.11 | 1318 | 29.03 (21.91, 36.15) | 86 | 41.55 | 2153 | 41.51 (34.07, 48.94) |
| Installed aerators | 82 | 44.32 | 2055 | 45.26 (35.18, 55.34) | 112 | 54.11 | 2795 | 53.89 (45.33, 62.45) |
| Repaired leaks | 106 | 57.30 | 2606 | 57.40 (47.92, 66.87) | 124 | 59.90 | 3091 | 59.60 (51.52, 67.69) |
| Replaced appliances | 70 | 37.84 | 1727 | 38.02 (29.75, 46.30) | 106 | 51.21 | 2651 | 51.11 (43.61, 58.61) |
| Reduced frequency of laundry | 147 | 79.46 | 3614 | 79.59 (73.17, 86.01) | 164 | 79.23 | 4112 | 79.29 (72.89, 85.68) |
| Flush toilet less | 100 | 54.05 | 2409 | 53.04 (43.99, 62.09) | 136 | 65.70 | 3412 | 65.79 (56.28, 75.31) |
| Reduced shower time | 159 | 85.95 | 3862 | 85.05 (80.03, 90.07) | 181 | 87.44 | 4536 | 87.46 (82.19, 92.73) |
| Reduced shower frequency | 111 | 60.00 | 2720 | 59.90 (49.95, 69.84) | 143 | 69.08 | 3581 | 69.05 (59.46, 78.63) |
| Reduced handwashing frequency/duration | 108 | 58.38 | 2650 | 58.37 (49.40, 67.33) | 141 | 68.12 | 3523 | 67.94 (61.16, 74.71) |
| Reduced food washing frequency/duration | 116 | 62.70 | 2823 | 62.17 (55.19, 69.16) | 132 | 63.77 | 3309 | 63.81 (56.70, 70.92) |
| Stopped washing hands with water | 32 | 17.30 | 788 | 17.35 (11.56, 23.14) | 45 | 21.74 | 1115 | 21.51 (15.29, 27.72) |
| Quit farming | 93 | 50.27 | 2307 | 50.79 (41.93, 59.66) | 141 | 68.12 | 3519 | 67.86 (57.19, 78.53) |
| Quit gardening | 111 | 60.00 | 2755 | 60.66 (52.59, 68.73) | 161 | 77.78 | 4017 | 77.46 (69.41, 85.51) |
| Reduced water used for lawn | 151 | 81.62 | 3759 | 82.78 (76.26, 89.30) | 190 | 91.79 | 4766 | 91.90 (85.85, 97.96) |
| Use swamp cooler less | 79 | 42.70 | 1907 | 41.99 (32.58, 51.41) | 71 | 34.30 | 2161 | 41.67 (33.05, 50.28) |
| Reduced water-using recreation (e.g. sprinklers) | 118 | 63.78 | 2882 | 63.47 (55.28, 71.65) | 137 | 66.18 | 3412 | 65.79 (56.25, 75.34) |
| Reduced time spent outdoor | 98 | 52.97 | 2359 | 51.95 (42.56, 61.34) | 114 | 55.07 | 2865 | 55.24 (46.73, 63.74) |

**Table 8. Water conservation practices, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Could household further reduce water usage if drought continues?** | | | n=185 | | | | n=207 | |
| Yes | 133 | 71.89 | 3261 | 71.80 (62.90, 80.70) | 150 | 72.46 | 3766 | 72.62 (62.11, 83.13) |
| No | 35 | 18.92 | 837 | 18.44 (11.58, 25.29) | 52 | 25.12 | 1292 | 24.92 (14.10, 35.75) |
| DK | 16 | 8.65 | 422 | 9.29 (3.34, 15.23) | 5 | 2.42 | - | - |
| Missing | 1 | 0.54 | - | - | 0 | 0.00 | - | - |

**Table 9. Impacts of the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Drought has negatively affected household's:** | | | n=185 | | | | n=207 | |
| Property | 71 | 38.38 | 1779 | 39.18 (28.59, 49.77) | 100 | 48.31 | 2511 | 48.41 (38.09, 58.74) |
| Finances | 71 | 38.38 | 1757 | 38.68 (29.46, 47.91) | 83 | 40.10 | 2087 | 40.24 (30.00, 50.48) |
| Health | 18 | 9.73 | 456 | 10.05 (5.96, 14.14) | 42 | 20.29 | 1054 | 20.32 (12.34, 28.30) |
| Peace of mind | 62 | 33.51 | 1505 | 33.13 (23.75, 42.52) | 102 | 49.28 | 2560 | 49.37 (39.87, 58.86) |
| DK | 16 | 8.65 | 400 | 8.80 (1.65, 15.95) | 13 | 6.28 | 321 | 6.19 (1.61, 10.77) |
| Other | 9 | 4.86 | - | - | 7 | 3.38 | - | - |
| Missing | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| **Is anyone in the household medically fragile or have a chronic medical condition** | | | n=185 | | | | n=207 | |
| Yes | 43 | 23.24 | 1035 | 22.80 (16.42, 29.18) | 59 | 28.50 | 1486 | 28.65 (21.98, 35.32) |
| Has the condition gotten worse since the drought began? | | | n=43 | | | | n=59 | |
| Yes | 10 | 23.26 | 271 | 26.17 (11.10, 41.25) | 27 | 45.76 | 679 | 45.71 (30.81, 60.60) |
| Has household sought additional medical attention for this condition? | | | n=185 | | | | n=207 | |
| Yes | 9 | 21.43 | - | - | 12 | 20.34 | 300 | 20.22 (9.39, 31.05) |

**Table 9. Impacts of the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Has anyone in the household been diagnosed with depression or another emotional or mental health problem?** | | | n=185 | | | | n=207 | |
| Yes | 13 | 7.03 | 307 | 6.76 (2.66, 10.87) | 37 | 17.87 | 938 | 18.10 (12.66, 23.53) |
| If yes, has the condition gotten worse since the drought began? | | | n=13 | | | | n=37 | |
| Yes | 7 | 53.84 | - | - | 14 | 37.84 | 358 | 38.16 (22.13, 54.19) |
| If yes, has your household sought additional medical attention for this condition? | | | n=185 | | | | n=207 | |
| Yes | 5 | 30.77 | - | - | 8 | 21.62 | - | - |
| **Has anyone in household experienced any of the following the past 30 days related to the drought?** | | | n=185 | | | | n=207 | |
| Trouble concentrating | 9 | 4.86 | - | - | 20 | 9.66 | 498 | 9.60 (4.67, 14.54) |
| Trouble sleeping | 16 | 8.65 | 398 | 8.76 (3.51, 14.02) | 31 | 14.98 | 790 | 15.24 (8.50, 21.98) |
| Loss of appetite | 1 | 0.54 | - | - | 15 | 7.25 | 375 | 7.22 (3.83, 10.61) |
| Racing heartbeat | 9 | 4.86 | - | - | 16 | 7.73 | 403 | 7.78 (3.51, 12.04) |
| Agitated behavior | 8 | 4.32 | - | - | 30 | 14.49 | 749 | 14.44 (9.39, 19.50) |
| Witnessed violence/ threats | 2 | 1.08 | - | - | 7 | 3.38 | - | - |
| Intent to harm self | 0 | 0.00 | - | - | 2 | 0.97 | - | - |
| Increase alcohol | 0 | 0.00 | - | - | 4 | 1.93 | - | - |

**Table 9. Impacts of the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Increase drug use | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| Other | 5 | 2.70 | - | - | 7 | 3.38 | - | - |
| Any of these experiences | 29 | 15.68 | 700 | 15.41 (9.33, 21.50) | 54 | 26.09 | 1358 | 26.19 (18.11, 34.27) |
| **Has anyone in household experiencing any of the above sought help from any of the following sources?** | | | n=29 | | | | n=54 | |
| Faith community | 3 | 10.34 | - | - | 1 | 1.85 | - | - |
| Support group | 1 | 3.45 | - | - | 0 | 0.00 | - | - |
| Emergency department | 1 | 3.45 | - | - | 2 | 3.70 | - | - |
| 1° care provider | 13 | 44.83 | 298 | 42.64 (20.72, 64.56) | 7 | 12.96 | - | - |
| Social worker | 2 | 6.90 | - | - | 1 | 1.85 | - | - |
| County mental health | 1 | 3.45 | - | - | 2 | 3.70 | - | - |
| Private mental health | 4 | 13.79 | - | - | 2 | 3.70 | - | - |
| Other | 0 | 0.00 | - | - | 3 | 5.56 | - | - |
| DK | 0 | 0.00 | - | - | 1 | 1.85 | - | - |
| None | 12 | 41.38 | 294 | 42.02 (22.08, 61.96) | 37 | 68.52 | 930 | 68.48 (53.85, 83.12) |
| **Has anyone in your household experienced any of the following economic impacts related to the drought?** | | | n=185 | | | | n=207 | |
| Decreased income | 65 | 35.14 | 1635 | 36.02 (30.00, 42.03) | 61 | 29.47 | 1535 | 29.60 (23.26, 35.95) |
| Lost a job | 16 | 8.65 | 426 | 9.37 (4.59, 14.16) | 14 | 6.76 | 358 | 6.90 (2.85, 10.96) |
| Less work hours | 64 | 34.59 | 1600 | 35.24 (29.03, 41.45) | 41 | 19.81 | 1029 | 19.84 (13.68, 26.01) |
| Had to change jobs | 26 | 14.05 | 658 | 14.48 (8.56, 20.41) | 24 | 11.59 | 609 | 11.75 (6.38, 17.11) |

**Table 9. Impacts of the drought, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Had to travel further to find work | 28 | 15.14 | 688 | 15.14 (9.60, 20.68) | 26 | 12.56 | 654 | 12.62 (7.93, 17.31) |
| Adults skip/reduce meals | 27 | 14.59 | 667 | 14.70 (9.96, 19.44) | 21 | 10.14 | 523 | 10.08 (5.83, 14.33) |
| **Has household considered moving?** | | | n=185 | | | | n=207 | |
| Yes | 27 | 14.59 | 639 | 14.06 (7.71, 20.42) | 70 | 33.82 | 1766 | 34.05 (25.99, 42.11) |

**Table 10. Assistance-seeking behaviors, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Did household seek assistance related to the drought?** | | | n=185 | | | | n=207 | |
| Yes | 24 | 12.97 | 629 | 13.86 (5.40, 22.32) | 53 | 25.60 | 1329 | 25.63 (17.56, 33.70) |
| No | 161 | 87.03 | 3912 | 86.14 (77.68, 94.60) | 153 | 73.91 | 3832 | 73.89 (65.74, 82.04) |
| DK | 0 | 0.00 | - | - | 1 | 0.48 | - | - |
| **What assistance did household seek?** | | | n=24 | | | | n=53 | |
| Well-drilling | 4 | 16.67 | - | - | 15 | 28.30 | 379 | 28.48 (16.01, 40.95) |
| Drinking water | 18 | 75.00 | 479 | 76.06 (59.02, 93.10) | 44 | 83.02 | 1099 | 82.66 (68.43, 96.90) |
| Health services | 0 | 0.00 | - | - | 3 | 5.66 | - | - |
| Utility or energy assistance | 2 | 8.33 | - | - | 8 | 15.09 | - | - |
| Financial help | 5 | 20.83 | - | - | 10 | 18.87 | 251 | 18.89 (6.66, 31.11) |
| Food assistance | 4 | 16.67 | - | - | 3 | 5.66 | - | - |
| Employment services | 3 | 12.50 | - | - | 1 | 1.89 | - | - |
| Other | 1 | 4.17 | - | - | 6 | 11.32 | - | - |
| **From where did household get assistance?** | | | n=15 | | | | n=42 | |
| Other family members | 2 | 13.33 | - | - | 8 | 19.05 | - | - |
| Neighbors | 2 | 13.33 | - | - | 4 | 9.52 | - | - |
| Food bank | 2 | 13.33 | - | - | 4 | 9.52 | - | - |
| Faith community | 0 | 0.00 | - | - | 7 | 16.67 | - | - |
| Non-profit ( e.g., ARC) | 0 | 0.00 | - | - | 10 | 23.81 | 247 | 23.44 (7.17, 39.70) |
| Utility or water company | 2 | 13.33 | - | - | 3 | 7.14 | - | - |

**Table 10. Assistance-seeking behaviors, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Fire/police/emergency agency | 0 | 0.00 | - | - | 2 | 4.76 | - | - |
| County/state/federal government | 6 | 40.00 | - | - | 11 | 26.19 | 276 | 26.17 (10.91, 41.43) |
| Employer | 0 | 0.00 | - | - | 1 | 2.38 | - | - |
| DK | 2 | 13.33 | - | - | 1 | 2.38 | - | - |
| **How difficult was it for household to get assistance?** | | | n=24 | | | | n=53 | |
| Very difficult | 6 | 25.00 | - | - | 7 | 13.21 | - | - |
| Difficult | 5 | 20.83 | - | - | 12 | 22.64 | 305 | 22.91 (9.99, 35.83) |
| Easy | 13 | 54.17 | 353 | 56.13 (36.28, 75.98) | 22 | 41.51 | 552 | 41.49 (26.90, 56.07) |
| Very easy | 0 | 0.00 | - | - | 10 | 18.87 | 247 | 18.58 (4.69, 32.46) |
| Missing | 0 | 0.00 | - | - | 2 | 3.77 | - | - |
| **Did household get this assistance?** | | | n=24 | | | | n=53 | |
| Yes | 15 | 62.50 | 409 | 64.95 (44.70, 85.20) | 42 | 79.25 | 1054 | 79.26 (69.66, 88.86) |
| **What is household's greatest need right now?** | | | n=185 | | | | n=207 | |
| Nothing or DK | 78 | 42.16 | 1850 | 40.75 (30.17, 51.32) | 61 | 29.47 | 1527 | 29.44 (22.20, 36.69) |
| Water for household | 29 | 15.68 | 735 | 16.18 (9.49, 22.88) | 73 | 35.27 | 1819 | 35.08 (26.24, 43.92) |
| Work, money, or financial assistance | 48 | 25.95 | 1143 | 25.17 (17.76, 32.59) | 29 | 14.01 | 729 | 14.05 (9.22, 18.88) |
| Rain | 0 | 0.00 | - | - | 6 | 2.90 | - | - |

**Table 10. Assistance-seeking behaviors, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| No answer recorded | 9 | 4.86 | - | - | 5 | 2.42 | - | - |
| Well maintenance or drilling | 7 | 3.78 | - | - | 8 | 3.86 | - | - |
| Home repair or renovation | 6 | 3.24 | - | - | 11 | 5.31 | 272 | 5.24 (2.27, 8.20) |
| Food | 2 | 1.08 | - | - | 9 | 4.35 | - | - |
| Health/medical needs | 5 | 2.70 | - | - | 3 | 1.45 | - | - |
| Other | 6 | 3.24 | - | - | 21 | 10.14 | 523 | 10.08 (5.83, 14.33) |

**Table 11. Disaster threats and emergency communications, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Three greatest emergency or disaster threats to household?** | | | n=185 | | | | n=207 | |
| Chemical releases | 22 | 11.89 | 589 | 12.97 (7.90, 18.03) | 12 | 5.80 | 305 | 5.87 (2.49, 9.25) |
| Drought | 144 | 77.84 | 3 | 78.18 (72.71, 83.65) | 183 | 88.41 | 4577 | 88.25 (83.21, 93.29) |
| Earthquakes | 83 | 44.86 | 1936 | 42.63 (35.14, 50.13) | 71 | 34.30 | 1799 | 34.68 (25.58, 43.78) |
| Floods | 43 | 23.24 | 1014 | 22.33 (15.60, 29.06) | 29 | 14.01 | 729 | 14.05 (8.89, 19.20) |
| Heatwave | 86 | 46.49 | 2184 | 48.10 (39.12, 57.09) | 95 | 45.89 | 2395 | 46.19 (36.82, 55.56) |
| Mudslides | 11 | 5.95 | 247 | 5.43 (2.05, 8.81) | 15 | 7.25 | 370 | 7.14 (2.77, 11.52) |
| Terrorist attacks | 23 | 12.43 | 569 | 12.54 (7.40, 17.68) | 19 | 9.18 | 477 | 9.21 (5.88, 12.53) |
| Wildfires | 83 | 44.86 | 1996 | 43.95 (36.22, 51.68) | 75 | 36.23 | 1877 | 36.19 (28.04, 44.34) |
| Winter storms | 20 | 10.81 | 461 | 10.14 (4.90, 15.39) | 40 | 19.32 | 1004 | 19.37 (12.87, 25.86) |
| Other | 10 | 5.41 | 234 | 5.14 (1.18, 9.11) | 6 | 2.90 | - | - |
| Respondent chose >3 | 2 | 1.08 | - | - | 1 | 0.48 | - | - |
| DK | 5 | 2.70 | - | - | 4 | 1.93 | - | - |
| Ref | 1 | 0.54 | - | - | 2 | 0.97 | - | - |
| **Household's preferred method of receiving information during an emergency?** | | | n=185 | | | | n=207 | |
| TV | 119 | 64.32 | 2924 | 64.39 (56.06, 72.72) | 111 | 53.62 | 2774 | 53.49 (44.21, 62.77) |
| Cell phone | 19 | 10.27 | 448 | 9.86 (5.12, 14.59) | 37 | 17.87 | 934 | 18.02 (10.92, 25.11) |
| Reverse 911 | 6 | 3.24 | - | - | 3 | 1.45 | - | - |
| Radio | 8 | 4.32 | - | - | 16 | 7.73 | 395 | 7.62 (3.03, 12.21) |
| Landline | 9 | 4.86 | - | - | 10 | 4.83 | 251 | 4.84 (1.28, 8.40) |
| Word of mouth | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| Text | 15 | 8.11 | 358 | 7.88 (3.70, 12.07) | 16 | 7.73 | 403 | 7.78 (4.09, 11.46) |

**Table 11. Disaster threats and emergency communications, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| Internet | 5 | 2.70 | - | - | 13 | 6.28 | 325 | 6.27 (2.62, 9.92) |
| Other | 1 | 0.54 | - | - | 1 | 0.48 | - | - |
| DK | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| Couldn't choose one | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| **Does anyone in household have a condition that could be a communication barrier during an emergency or a disaster?** | | | n=185 | | | | n=207 | |
| Impaired vision | 22 | 11.89 | 493 | 10.86 (6.59, 15.13) | 16 | 7.73 | 399 | 7.70 (3.78, 11.62) |
| Impaired hearing | 16 | 8.65 | 355 | 7.81 (2.96, 12.66) | 16 | 7.73 | 403 | 7.78 (3.51, 12.04) |
| Cognitive/developmental disability | 10 | 5.41 | 245 | 5.40 (1.67, 9.12) | 7 | 3.38 | - | - |
| Difficulty understanding written material | 19 | 10.27 | 432 | 9.51 (4.87, 14.14) | 16 | 7.73 | 395 | 7.62 (3.03, 12.21) |
| Difficulty understanding English | 72 | 38.92 | 1785 | 39.32 (33.29, 45.34) | 42 | 20.29 | 1062 | 20.48 (12.58, 28.38) |
| DK | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| Ref | 1 | 0.54 | - | - | 0 | 0.00 | - | - |
| None | 85 | 45.95 | 2133 | 46.97 (39.02, 54.92) | 134 | 64.73 | 3346 | 64.52 (54.48, 74.57) |
| Missing | 5 | 2.70 | - | - | 2 | 0.97 | - | - |

**Table 12. County-specific questions, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Does anyone in the household need special medical equipment or supplies?** | | | n=185 | | | | n=207 | |
| Yes | 29 | 15.68 | 731 | 16.10 (9.66, 22.55) | 26 | 12.56 | 659 | 12.70 (8.68, 16.72) |
| **If yes, what kind of special medical equipment or supplies?** | | | n=29 | | | | n=26 | |
| Oxygen | 5 | 17.24 | - | - | 8 | 30.77 | - | - |
| Dialysis | 3 | 10.34 | - | - | 6 | 23.08 | - | - |
| Breathing equipment | 5 | 17.24 | - | - | 3 | 11.54 | - | - |
| Ventilator | 3 | 10.34 | - | - | 2 | 7.69 | - | - |
| Feeding tube | 0 | 0.00 | - | - | 0 | 0.00 | - | - |
| Insulin | 11 | 37.93 | 259 | 35.39 (9.93, 60.85) | 3 | 11.54 | - | - |
| Other | 10 | 34.48 | 275 | 37.56 (16.64, 58.47) | 7 | 26.92 | - | - |
| Missing | 1 | 3.45 | - | - | 1 | 3.85 | - | - |
| **If "other" special medical equipment or supplies, describe (categories not mutually-exclusive).** | | | n=10 | | | | n=7 | |
| Other medication | 2 | 20.00 | - | - | 3 | 42.86 | - | - |
| C-PAP | 1 | 10.00 | - | - | 3 | 42.86 | - | - |
| Durable medical equipment | 1 | 10.00 | - | - | 2 | 28.57 | - | - |
| Other | 6* | 60.00 | - | - | 0 | 0.00 | - | - |

**Table 12. County-specific questions, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **Has the drought made it more difficult to obtain or maintain this equipment or supplies?** | | | n=29 | | | | n=26 | |
| Yes | 4 | 13.79 | - | - | 4 | 15.38 | - | - |
| No | 19 | 65.52 | 465 | 63.63 (43.67, 83.59) | 16 | 61.54 | 407 | 61.88 (41.81, 81.94) |
| Missing | 6 | 20.69 | - | - | 6 | 23.08 | - | - |
| **Have outdoor dust levels changed since the drought began?** | | | n=185 | | | | n=207 | |
| No | 60 | 32.43 | 1440 | 31.71 (23.60, 39.81) | 49 | 23.67 | 1231 | 23.73 (15.66, 31.80) |
| Yes, decreased | 6 | 3.24 | - | - | 11 | 5.31 | 272 | 5.24 (2.27, 8.20) |
| Yes, increased | 107 | 57.84 | 2671 | 58.82 (50.46, 67.18) | 137 | 66.18 | 3437 | 66.27 (58.41, 74.13) |
| DK | 8 | 4.32 | - | - | 5 | 2.42 | - | - |
| Missing | 8 | 4.32 | - | - | 5 | 2.42 | - | - |
| **Does household have health concerns about the increased dust?** | | | n=107 | | | | n=137 | |
| Yes | 72 | 67.29 | 1807 | 67.67 (57.47, 77.87) | 84 | 61.31 | 2107 | 61.32 (51.57, 71.07) |
| No | 24 | 22.43 | 613 | 22.97 (13.07, 32.86) | 51 | 37.23 | 1276 | 37.13 (27.29, 46.96) |
| Missing | 11 | 10.28 | 250 | 9.36 (3.37, 15.36) | 2 | 1.46 | - | - |

**Table 12. County-specific questions, Tulare County CASPER, California**

| | North Tulare | | | | South Tulare | | | |
|---|---|---|---|---|---|---|---|---|
| | Unweighted | | Weighted | | Unweighted | | Weighted | |
| | Frequency | % | Frequency | % (95% CI) | Frequency | % | Frequency | % (95% CI) |
| **What are household's health concerns about the increased dust?** | | | n=72 | | | | n=84 | |
| Asthma | 19 | 26.39 | 482 | 26.66 (13.91, 39.41) | 20 | 23.81 | 493.9 | 23.44 (14.69, 32.18) |
| Allergies | 22 | 30.56 | 554 | 30.67 (17.41, 43.92) | 25 | 29.76 | 629.7 | 29.88 (17.55, 42.22) |
| Other respiratory issue | 2 | 2.78 | - | - | 8 | 9.52 | - | - |
| Lack of water | 2 | 2.78 | - | - | 4 | 4.76 | - | - |
| Chemicals/pesticides in dust | 5 | 6.94 | - | - | 0 | 0.00 | - | - |
| Unspecified health concern | 7 | 9.72 | - | - | 10 | 11.90 | 251.1 | 11.91 (4.91, 18.92) |
| Unspecified respiratory issue | 18 | 25.00 | 427 | 23.61 (11.81, 35.41) | 18 | 21.43 | 461.0 | 21.88 (12.02, 31.73) |
| Valley fever | 1 | 1.39 | - | - | 3 | 3.57 | - | - |
| Other | 2 | 2.78 | - | - | 8 | 9.52 | - | - |

*Six respondents in North Tulare indicated special medical equipment or supplies that could not be categorized

**Appendix I: Letter from CDPH Director to local health departments, August, 2015**

State of California—Health and Human Services Agency

California Department of Public Health

KAREN L. SMITH, MD, MPH
*Director & State Health Officer*

EDMUND G. BROWN JR.
*Governor*

August 30, 2015

Dear Local Health Officer:
As you know, California is facing ongoing water shortfalls and the Governor has declared a State of Emergency in response to this historic drought. Relatively little is known about the human health impacts of drought. CDPH is interested in working with counties to fill some of the information gaps. Rapid assessments, such as those used in other natural disasters, might allow us to better quantify the human health effects of the drought, inform state and local policy decisions, and identify community needs requiring immediate attention. We believe that an assessment would best be conducted in mid-October of this year. We realize that mid-October is a very tight timeline but believe it is important to gather this information before the rainy season begins.

CDPH would like to partner with severely impacted counties in conducting in a rapid assessment of drought-related health impacts using the Community Assessment of Public Health Emergency Response (CASPER) methodology. Below you will find a description of the CASPER methodology and more details of our proposal.. An appendix with additional details is also enclosed. Drought impacts vary by county but, while this letter is primarily intended for health officers in counties that are most significantly impacted, I am sending it to all health officers so you are all aware of our proposal and have an opportunity to respond with any interest you may have.

There are several benefits to the CASPER methodology. Unlike many surveys, it provides statistically valid information in a very short time with a preliminary report usually available within one week of the field survey. Also, the survey content can be adapted to include specific topics of interest to you and your County. Participating in a drought-related CASPER will also provide county staff with training and experience increasing your County's capacity for conducting future CASPERs.

To conduct a CASPER, CDPH will provide staff with expertise in conducting CASPERs who will oversee the administration of the assessment and handle its technical aspects. With your input CDPH will also: 1) design the questionnaire; 2) provide Just-in-Time training for all field volunteers and local headquarters staff; 3) provide logistical support during field administration of the survey; 4) analyze collected data ; and 6) write the report.

We will need participating counties to: 1) reach out to and communicate with local communities about the CASPER; 2) secure cooperation of cities within the selected

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sampling frame(s); 3) assist with recruiting local volunteers to conduct field surveys; 4) provide space for local CASPER headquarters; 5) assist with logistical support during field administration of the survey; and 6) provide personnel to staff local headquarters and do real-time data entry.

We will hold an informational webinar for interested jurisdictions on Thursday, September 3, 2015, 2 p.m. – 3 p.m (call in information below). Please feel free to join the webinar to learn more about CASPER and ask questions of our team.

If you are interested in conducting a CASPER in your jurisdiction or would like to get more information about the process, please contact Jason Wilken (jason.wilken@cdph.ca.gov); 510-620-3622) by Tuesday, September 8. If you know you are interested in participating, it will be very helpful if you can provide the following information when you call:

- What part of your County would you like to survey (i.e. what is your recommended sampling frame)?
- What resources (e.g. headquarters, meeting rooms, planners, field surveyors) could you provide?
- What additional domains of knowledge (see appendix) would you like the CASPER to cover?

I look forward to your response and to partnering with you in conducting this important assessment of the human health impacts of the ongoing drought.

Sincerely,

*(Original signed by Karen L. Smith)*

Karen L. Smith, MD, MPH
Director and State Health Officer

Enclosure

Webinar: Thursday, September 3, 2015, 2 p.m. – 3 p.m
To connect to the Web Conference and Telephone Audio:

1. Click here: https://connect4.uc.att.com/calnet/meet/?ExEventID=88035637
2. Toll-Free Number (in USA): 888-363-4734
3. Caller-Paid number: 215-446-3656
4. When prompted, enter the Meeting Access Code: 8035637#

**Community Assessment for Public Health Emergency Response (CASPER)** http://www.cdc.gov/nceh/hsb/disaster/casper.htm) is a situational awareness tool developed by the Centers for Disease Control and Prevention (CDC) to determine the health status and basic needs of a community. CASPER uses valid statistical methods to analyze household-level data. The data generated by a CASPER is representative of the entire selected community, and might therefore be more valuable to emergency management and public health practitioners than anecdotal information.

Previous CASPERs have addressed impacts of a diversity of disasters, as well as household emergency preparedness in non-disaster settings. However, no CASPER has assessed communities in the setting of a drought. Development and validation of a drought CASPER questionnaire will require use of existing questions, input from subject matter experts and approval from participating partners.

Using CASPER methodology, we can define any geographic area as the sampling frame (e.g., a particular town, city, county, water district, etc.), and results generated from analysis of CASPER data are generalizable to that sampling frame. CASPER methodology selects 30 clusters (usually Census blocks) and field interviewers select seven households in each cluster, with the goal to survey 210 households in total. There are no specified geographic or population size requirements to conduct a CASPER and the areas within a sampling frame do not need to be contiguous; however, the CDC recommends a minimum of 800 households in the sampling frame. CASPERs are most efficiently conducted in areas with fairly high population density, but have been conducted in less dense areas (e.g., semi-rural and rural). Drought impact in terms of health effects, economic effects, and preparedness will likely vary by region, city, and urban vs. rural areas.

The results of CASPER data analysis are applicable only to the selected *sampling frame* (e.g., a particular town, city, district, etc.) and separate or parallel CASPER surveys might be required depending on the CASPER purpose and region(s) surveyed. Multiple jurisdictions could be assessed using the same CASPER tool. There is no specific limit to the number of jurisdictions assessed by a given CASPER, with the following caveats: (1) meaningful comparisons between jurisdictions is only possible with identical CASPER questions, and CASPERs should be conducted as close together in time as possible; and (2) each CASPER should be conducted with similar resources. Each assessed jurisdiction will require resources to complete the CASPER, most notably interviewers (typically 30 interviewers available each day over a three-day period). The health and/or environmental health officials of any jurisdiction where a CASPER would be performed should become project partners and provide input on the design and execution of the CASPER, as well as conduct outreach and community awareness of CASPER.

We envision two possible approaches: **(1)** complete uniformity between all drought CASPERs in different jurisdictions. This approach will maximize comparability among communities, and will require consensus among all participating local health jurisdictions; or **(2)** a core set of identical questions to be used in each CASPER, with additional questions unique to each community as selected by local jurisdictions and other stakeholders.

## Appendix
## Conduct of CASPER and Questionnaire Content

Conduct and execution of a CASPER requires substantial planning and logistical coordination including three phases (not counting the questionnaire design) as follows:

**1. Preparation** phase, sampling frame(s) is/are selected based on CASPER geographic priorities. Clusters (census blocks or block groups) within the sampling frame(s) are chosen using random sampling proportional to the number of households. The clusters are shared with the local stakeholders to assess potential safety concerns and language issues. All partners identify the dates to conduct the CASPER (typically three consecutive days). The local jurisdiction identifies CASPER headquarters and, in collaboration with CDPH, a minimum of 30 interviewers available for three days (accounting for language skills appropriate for the selected census blocks and vehicle availability). Interviewers might be recruited from various local sources; the local health jurisdiction might consider the CASPER as an exercise opportunity for PHEP-funded departments and recruit accordingly. A leadership team (typically consisting of CDPH representatives and one to two persons from the local health department) is selected. Go-kits for field work are assembled (including printing 210 questionnaires, field team instructions, and other auxiliary materials). CDPH prepares field safety kits.

**2. Execution** phase (three days or longer, if needed) includes a half-day training for interviewers, and 2.5 (or more) days devoted to conducting interviews. The interviewers are divided into 15 teams of two, and each team is assigned two clusters with the goal of completing seven interviews in each. Field team training is conducted by CDPH and local jurisdiction leadership team. The leadership team staffs the local headquarters, maintains accountability for all field interviewers (regular check-ins with teams in the field, daily check-in/out), maintains a running tally of completed interviews, reviews all completed surveys at team check-in, briefs the interview teams each morning, and troubleshoots any issues throughout the CASPER. Time and resources-permitting, staff at the headquarters also do real-time data entry of completed questionnaires.

**3. Analysis and reporting** phase, the CASPER process is completed with final data entry, data management and analysis, and completion of a preliminary report. Given sufficient staff resources (including meeting the need to enter data for up to 210 questionnaires), a preliminary report can be provided to the local jurisdiction within a week of completion of the CASPER. Preliminary report is then reviewed and approved by appropriate stakeholders.

**Domains of Knowledge:** Many validated questions among multiple domains of disaster response and emergency preparedness used in previous CASPERs could be

adapted to this project; other questions specific for this CASPER can be developed. Domains which could be addressed by this CASPER include (but are not limited to):

- Water availability
- Household water use, water needs, and conservation behaviors
- Drinking water quality and contamination
- Well water usage
- Hygiene (personal and food)
- Mental health effects
- Exacerbations of chronic diseases
- Impact on work, livelihood, food access, food affordability and need for assistance
- Impact on livestock
- Perceptions of community support
- Drought-related community beliefs, perceptions, "hearsay"
- Housing assistance and displacement
- Environmental concerns
- General emergency preparedness
- Air quality (including non-chronic respiratory conditions)
- Impacts on wildfire affected areas: population displacement, air quality and water quality related concerns, resilience to future flooding
- Behavioral changes (e.g., purchasing different items; spending less time outdoors because of air quality, etc.)
- Disease vectors (e.g., perceptions of mosquito prevalence)
- Utilization of social services

The purpose of a drought-related CASPER is to fill public health knowledge gaps related to the ongoing California drought and possible mitigation actions. The local jurisdiction of the selected CASPER sampling frame(s) should help identify gaps and

priorities addressable by a household-level survey. There is no specific guideline for the number of questions to include in a CASPER questionnaire, however, longer questionnaires take more time and might result in lower completion rates.

**Data analysis, data ownership, and results dissemination:** Any CASPER should include involvement or an invitation for involvement of the local health and/or environmental health official(s). If CASPERs are planned in multiple jurisdictions, a common method for data entry and analysis and clear delineations of data ownership are recommended.

## Appendix II: CASPER questionnaire.

| To be completed by interview team BEFORE the interview | |
|---|---|
| **a.** Date (MM/DD/YY): | **b.** Time: □ AM □ PM |
| **c.** Cluster Number: **d.** Survey Number: | **e.** County: |
| **f.** Team Name: | **g.** Team Member Initials: |

**First, I would like to ask you some general questions about your household. Please respond for all members in your household.**

1. Including yourself, how many people live in your household? _____

2. Including yourself, how many people living in your household are: **(list number in each age group)**
   Less than 2 years old? ____ 2-17 years old? _____ 18-64 years old? _____ 65 years or older? ____ □ DK □ R

3. What is the main language spoken in your household?
   □ English □ Spanish □ Other_____ □ Don't Know □ Refused

4. Does your household own or rent your place of residence?
   □ Own □ Rent □ Other_____ □ Don't Know □ Refused

5. What is your household's primary source of information about the drought in California? **(choose one)**
   □ Newspaper □ TV □ Friends □ Family members □ AM/FM radio □ Work
   □ Internet □ Place of worship □ Other _____ □ None □ DK □ R

**California is in the fourth year of drought. I'm going to read you a set of statements about the drought. Please tell me whether you or your household members believe the statement is true or false.**

| | | | | |
|---|---|---|---|---|
| 6. There is an increased demand for water | □ True | □ False | □ Don't Know | □ Refused |
| 7. There is poor water management by the government | □ True | □ False | □ Don't Know | □ Refused |
| 8. There is overuse of water by cities | □ True | □ False | □ Don't Know | □ Refused |
| 9. There is overuse of water by farming or agriculture | □ True | □ False | □ Don't Know | □ Refused |
| 10. Too much water is used to protect wildlife | □ True | □ False | □ Don't Know | □ Refused |
| 11. Some people aren't cutting water usage enough | □ True | □ False | □ Don't Know | □ Refused |
| 12. Droughts are caused by a lack of rain or snow | □ True | □ False | □ Don't Know | □ Refused |
| 13. Droughts are caused by climate change | □ True | □ False | □ Don't Know | □ Refused |
| 14. Droughts are caused by a "higher power" | □ True | □ False | □ Don't Know | □ Refused |

15. Where did your household water come from before the drought? **(check all that apply)**
   - ☐ Town, city, or county water system
   - ☐ Small water system operated by property owner or homeowner association
   - ☐ Bottled water
   - ☐ Private well →
   - ☐ Other _____
   - ☐ Don't Know
   - ☐ Refused

   b. Has your well water ever been tested?
   □ Yes □ No **(go to 16)** □ DK □ R
   c. How often: _____
   d. For what: _____

16. Does your household currently have reliable running water from a well or water system?
   □ Yes **(go to 17)** □ No **(go to back page, question 35)** □ DK □ R

17. During a severe shortage of water, would your household go to any of the following for assistance? **(check all that apply)**
   □ Other family members □ People in your neighbhood □ Your faith community
   □ Non-profit organizations, such as the Red Cross □ Food Bank □ Utility or water company
   □ Fire, police, or emergency agencies □ County, state, or federal government agencies
   □ Employer □ Other _____ □ None □ DK □ R

18. Do you use tap water for drinking and cooking?

□ Yes □ No □ Don't Know □ Refused

19. Are you aware of any problems with the quality of your tap water?

□ Yes □ No □ Don't Know □ Refused

20. Have you noticed a change in the color, clarity, odor, or taste of your water? **(check all that apply)**

□ Color □ Clarity □ Odor □ Taste □ None □ Don't know □ Refused

21. In the last year, has your household seen a decrease in well water production?

□ Yes □ No □ Do not have a well □ Don't Know □ Refused

**In response to the drought, the governor has asked communities to cut back water usage by 25%. I am going to ask you a series of yes or no questions about actions your household may have taken to reduce water usage.**

22. In response to shortages of water, have you or members of your household:

| | | | | | |
|---|---|---|---|---|---|
| a. Reduced water usage | □ Yes | □ No | □ NA | □ DK | □ R |
| b. Created a system to capture and reuse water | □ Yes | □ No | □ NA | □ DK | □ R |
| c. Installed faucet aerators | □ Yes | □ No | □ NA | □ DK | □ R |
| d. Repaired plumbing leaks | □ Yes | □ No | □ NA | □ DK | □ R |
| e. Replaced appliances such as a washing machine or toilet | □ Yes | □ No | □ NA | □ DK | □ R |
| f. Decreased how frequently your household washes laundry | □ Yes | □ No | □ NA | □ DK | □ R |
| g. Reduced how often members of your household flush the toilet | □ Yes | □ No | □ NA | □ DK | □ R |
| h. Shortened shower times | □ Yes | □ No | □ NA | □ DK | □ R |
| i. Reduced how often members of your household shower or bathe | □ Yes | □ No | □ NA | □ DK | □ R |
| j. Washed your hands less often or for a shorter period of time | □ Yes | □ No | □ NA | □ DK | □ R |
| k. Washed food less often or for a shorter period of time | □ Yes | □ No | □ NA | □ DK | □ R |
| l. Stopped washing hand with water | □ Yes | □ No | □ NA | □ DK | □ R |
| m. Quit farming or let land go fallow | □ Yes | □ No | □ NA | □ DK | □ R |
| n. Stopped gardening | □ Yes | □ No | □ NA | □ DK | □ R |
| o. Reduced how much water is used for your lawn or landscaping | □ Yes | □ No | □ NA | □ DK | □ R |
| p. Used your swamp cooler less | □ Yes | □ No | □ NA | □ DK | □ R |
| q. Changed recreational activities, like playing in sprinklers, to save water | □ Yes | □ No | □ NA | □ DK | □ R |
| r. Spent less time outdoors | □ Yes | □ No | □ NA | □ DK | □ R |

23. Are there other actions your household has taken to use less water?

_____

24. If the drought continues, would your household be able to further reduce water consumption?

- ☐ Yes →
- ☐ No
- ☐ Don't know
- ☐ Refused

b. How would you conserve additional water?

_____

25. Has the drought negatively affected your...? **(check all that apply)**

□ Property □ Finances □ Health □ Peace of mind □ Anything Else_____ □ DK □ R

**Next I would like to ask you about assistance you or members of your household may have tried to obtain because of the drought.**

26. Did anyone in your household look for assistance related to the drought?

- ☐ Yes →
- ☐ No
- ☐ Don't know
- ☐ Refused

b. What type of assistance did your household need...? **(check all that apply)**

□ Well drilling □ Drinking water □ Health services
□ Utility or energy assistance □ Financial help □ Food assistance
□ Employment services □ Other_____ □ DK □ R

c. Did members of your household get the assistance they were looking for?

□ Yes □ No **(go to e)** □ DK □ R

d. Who provided the assistance? **(check all that apply)**

□ Other family members □ People in your neighbhood □ Food Bank
□ Your faith community □ Non-profit organizations, such as the Red Cross
□ Utility or water company □ Fire, police, or emergency agencies
□ County, state, or federal government agencies □ Employer
□ Other _____ □ DK □ R

e. How difficult was it to get the assistance?

□ Very Difficult □ Difficult □ Easy □ Very Easy

f. What were the barriers to getting assistance?

_____ □ No barriers

**Now, I will ask you about any health issues members of your household may have.**

27. Is anyone in your household medically fragile, or been diagnosed with a chronic medical condition?

- ☐ Yes →
- ☐ No
- ☐ Don't know
- ☐ Refused

b. Has this condition gotten worse since the drought?

□ Yes □ No □ DK □ R

c. Have you or household members sought additional medical attention outside of your normal care because of the drought?

□ Yes □ No □ DK □ R

28. Has a healthcare professional ever diagnosed you or any members of your household with depression or any other emotional or mental health condition?

- ☐ Yes →
- ☐ No
- ☐ Don't know
- ☐ Refused

b. Has this condition gotten worse since the drought?

□ Yes □ No □ DK □ R

c. Have you or household members sought additional medical attention outside of your normal care because of the drought?

□ Yes □ No □ DK □ R

29. Has anyone in your household experienced any of the following in the last 30 days because of the drought?

| | | | | |
|---|---|---|---|---|
| a. Difficulty concentrating | □ Yes | □ No | □ Don't Know | □ Refused |
| b. Trouble sleeping/nightmares | □ Yes | □ No | □ Don't Know | □ Refused |
| c. Loss of appetite | □ Yes | □ No | □ Don't Know | □ Refused |
| d. Racing or pounding heartbeat | □ Yes | □ No | □ Don't Know | □ Refused |
| e. Agitated behavior | □ Yes | □ No | □ Don't Know | □ Refused |
| f. Witnessed first-hand violent behavior or threats of violence | □ Yes | □ No | □ Don't Know | □ Refused |
| g. Thoughts or attempts to harm self | □ Yes | □ No | □ Don't Know | □ Refused |
| h. Increased alcohol consumption | □ Yes | □ No | □ Don't Know | □ Refused |
| i. Increased drug use | □ Yes | □ No | □ Don't Know | □ Refused |
| j. Other (specify) _____ | □ Yes | □ No | □ Don't Know | □ Refused |
| | | **If all No, skip to question 31** | | |

30. Did you or anyone in your household seek help for any of the items we've just covered using any of the following services? **(check all that apply)**

□ Counseling from a religious leader or friend □ Pre-existing support group □ Emergency Room
□ Primary Care Provider or a clinic □ Social worker or case manager □County Mental Health
□ Private mental health provider [if needed, say "such as psychologist or counselor"]
□ Other, specify:_____ □ None of the above □ DK □ R

31. **Some people experienced changes in their employment status or income because of the drought. Please tell me if any of the following apply to your household.**

| | | | | |
|---|---|---|---|---|
| a. Has your household income decreased? | □ Yes | □ No | □ Don't Know | □ Refused |
| b. Has a member of your household lost a job? | □ Yes | □ No | □ Don't Know | □ Refused |
| c. Have hours of work been reduced? | □ Yes | □ No | □ Don't Know | □ Refused |
| d. Have you or household members had to change jobs? | □ Yes | □ No | □ Don't Know | □ Refused |
| e. Have any household members had to travel further to find work? | □ Yes | □ No | □ Don't Know | □ Refused |
| f. Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? | □ Yes | □ No | □ Don't Know | □ Refused |
| f. Have you or household members considered moving? | □ Yes → Where _____ | □ No | □ Don't Know | □ Refused |

32. Of the following, which are the <u>three</u> greatest emergency or disaster threats to your household? **(check three)**

□ Accidental chemical releases □ Drought □ Earthquakes □ Floods
□ Heat waves □ Mud slides □ Terrorist attacks □ Wild fires □ Winter storms
□ Other, specify: _____ □ DK □ R

33. What is your household's most preferred method for receiving information during an emergency event? **(check one)**

□ TV □ Radio □ Text message □ Cell phone call □ Landline call
□ Internet □ Reverse 911 □ Word of mouth □ Other _____ □ DK □ R

34. Does anyone in your household have any of the following that could be barriers to effective communication during an emergency…? **(check all that apply)**

□ Impaired hearing □ Impaired Vision □ Developmental/cognitive disability
□ Difficulty understanding written material □ Difficulty understanding English □ None □ DK

**This is our final question.** What is your household's greatest need right now? _____

_____

**(The interview is complete. Please thank the participant)**

**There are no questions on this page**

## Questions for households without water ("No" to question 16)

35. What is the main barrier to getting running water in your home? **(choose one)**
    - □ Too expensive □ Well drillers are not available □ Landlord needs to do it and has not
    - □ Waiting for government financial assistance □ Waiting for government to provide goods or services
    - □Other _____ □ Don't Know □ Refused

36. Has your household obtained additional water from any of the following sources? **(check all that apply)**
    - □ Neighbor's well
    - □ Community water tanks
    - □ Household water tanks (county provided)
    - □ Household water tanks (private purchase)
    - □ Bottled Water →
    - □ Other_____
    - □Don't Know □ Refused

    b. How has your household obtained this water? **(check all that apply)**
    - □ Purchased yourselves
    - □ Received from a government agency
    - □ Received a donation from a private company (on non-profit)
    - □ Received from the landlord
    - □ Received from a place of worship
    - □ Other _____ □DK □ R

37. Where has your household gone for assistance since the drought?
    - □ Other family members □ People in your neighbhood □ Your faith community
    - □ Non-profit organizations, such as the Red Cross □ Food Bank □ Utility or water company
    - □ Fire, police, or emergency agencies □ County, state, or federal government agencies
    - □ Employer □ Other _____ □ None □ DK □ R

38. If you are purchasing bottled water, has this caused difficulty in affording other necessities?
    - □ Yes □ No □ N/A □ Don't Know □ Refused

**(Please continue the interview at the top of page 2, question 18)**

**Appendix III: Tulare County-specific questions added to the questionnaire.**

Tulare Supplemental Questions

1. Does anyone in your household need special medical equipment or supplies ___no ____yes,

If yes what type __ oxygen __dialysis ___breathing treatment machine ___ventilator ___feeding pump __insulin __other _____

If yes has there been any increase in difficulty in using or maintaining the equipment or supplies since the drought? ___ Yes ___No

2. Has there been any change in the amount of blowing dust in your community since the drought?

___ no change ___ yes, decreased __ yes, increased _____ don't know

If increased has this caused any health concerns for you? ____ Yes _____No

If yes what is the concern? _____

---

1.Hay Alquien en su Hogar que necesita equipo medico o suministros especiales?

En Caso afirmativo, que tipo: ____Oxigeno _____Dialisis _____Maquina de Tratamiento de Respiracion _____Ventilador _____Bomba de Alimentacion _____Insulina _____
Otro _____

En caso afirmativo, Ha habido algunaumento del la dificultad en el uso o el mantenimiento de los equipos o suministros ya la sequia? _____

Ha habido alguna cambio en la cantidad de polvo que sopla en su comunidad desde la sequia severa?

_____Ningun cambio _____Si, ha diminuido _____Si, ha aumentado _____
No se _____

Si ha respondido que ha aumentado, tiene algun preocupacion a como afectara su salud _____Si _____No

En caso afirmativo, cuales son las preocupaciones? _____

**REFERENCES**


1. California Data Exchange Center – Reservoirs, Statewide End-of-Month Storage. Available online at: http://cdec.water.ca.gov/cgi-progs/reservoirs/STORAGEW.11
2. California Drought - CA.gov. Drought update Wednesday, November 25, 2015. Available online at: http://ca.gov/drought/pdf/Weekly-Drought-Update.pdf
3. California Office of Emergency Services (CalOES). Drought Operation Report. September 9, 2015.
4. California Office of the Governor. Governor Brown declares drought state of emergency. Available online at: https://www.gov.ca.gov/news.php?id=18368
5. U.S. Department of Agriculture (USDA). State events: 2014 disaster designations. Available online at: http://www.fsa.usda.gov/FSA/stateoffapp?mystate=ca&area=home&subject=stev&topic=landing
6. Governor of California, Executive Order B-29-15, April 2015. Available online at: https://www.gov.ca.gov/docs/4.1.15_Executive_Order.pdf
7. Governor of California, Executive Order B-36-15, November 2015. Available online at: https://www.gov.ca.gov/docs/11.13.15_EO_B-36-15.pdf
8. National Oceanic and Atmospheric Administration (NOAA), Climate.gov. How deep of a precipitation hole is California in? September 2015. Available online at: https://www.climate.gov/news-features/event-tracker/how-deep-precipitation-hole-california.
9. Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Agency,and American Water Works Association. 2010. When every drop counts: protecting public health during drought conditions—a guide for public health professionals. Atlanta: U.S. Department of Health and Human Services. Available online at: http://www.cdc.gov/nceh/ehs/docs/when_every_drop_counts.pdf
10. Cook, A; Watson, J; Van Buynder, P; Robertson, A; Weinstein, P. 10th Anniversary Review: Natural disasters and their long-term impacts on the health of communities. J Environ. Monit., 2008, 10, 167–175.
11. Stanke, C., Kerac, M., Prudhomme, C., Medlock, J., & Murray, V. (2013). Health effects of drought: A systematic review of the evidence. *PLoS Current Disasters.* Retrieved Feb. 14, 2014, from http://currents.plos.org/disasters/article/dis-13-0001-health-effects-of-drought-a-systematic-review-of-the-evidence/
12. Community Assessment for Public Health Emergency Response. Centers for Disease Control and Prevention website. Available online at: http://www.cdc.gov/nceh/hsb/disaster/casper.htm Updated March 3, 2014.
13. Centers for Disease Control and Prevention (CDC). Community Assessment for Public Health Emergency Response (CASPER) Toolkit: Second edition. Atlanta (GA): CDC; 2012. Available online at: http://emergency.cdc.gov/disasters/surveillance/pdf/CASPER_Toolkit_Version_2_0_508_Compliant.pdf

14. United States Census QuickFacts. Available online at: http://www.census.gov/quickfacts/
15. 2010 Census Redistricting Data [P.L. 94-171] Summary File, downloaded from http://www.census.gov/rdo/tech_tips
16. TIGER/Line with Selected Demographic and Economic Data, tabblock2010_06_pophu.shp, downloaded from https://www.census.gov/geo/maps-data/data/tiger-data.html
17. Talbot, TO, and LaSelva, GD. Geographic Aggregation Tool, Version 1.31, New York State Health Department, Troy NY, July 2010.
18. Tool developed by CDC/GRASP and provided by CDC/NCEH staff, personal communication, September 2012.
19. Centers for Disease Control and Prevention. Community assessment for public health emergency response (CASPER) one year following the gulf coast oil spill: Alabama, 2011. Available online at: https://www.adph.org/CEP/assets/CASPERReport2011.pdf
20. Centers for Disease Control and Prevention. *Community experiences and perceptions of geothermal venting and emergency preparedness in Lake County, California*. Published November 2012.
21. United States Census, American Community Survey, 2010-2014. Available online at: http://factfinder.census.gov/
22. Howitt R, MacEwan D, Medellín-Azuara, J, Lund J, Sumner D. Economic analysis of the 2015 drought for California agriculture. UC Davis Center for Watershed Sciences. 2015. Available online at: https://watershed.ucdavis.edu/files/biblio/Final_Drought%20Report_08182015_Full_Report_WithAppendices.pdf