



SAN MATEO COUNTY HEALTH
**PUBLIC HEALTH,
POLICY & PLANNING**

San Mateo County Health CSTE Climatic Exposures and Respiratory Health Outcomes Pilot (CERHOP)

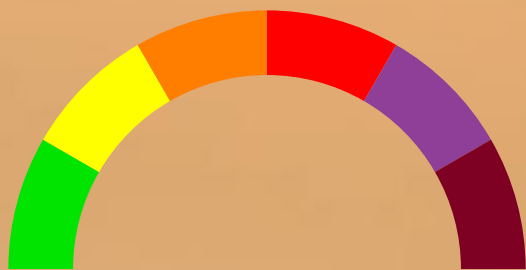
PRESENTED BY

Karen Pfister, MS
Supervising Epidemiologist



Overview

1. Background
2. Syndromic Surveillance
3. CERHOP



BACKGROUND

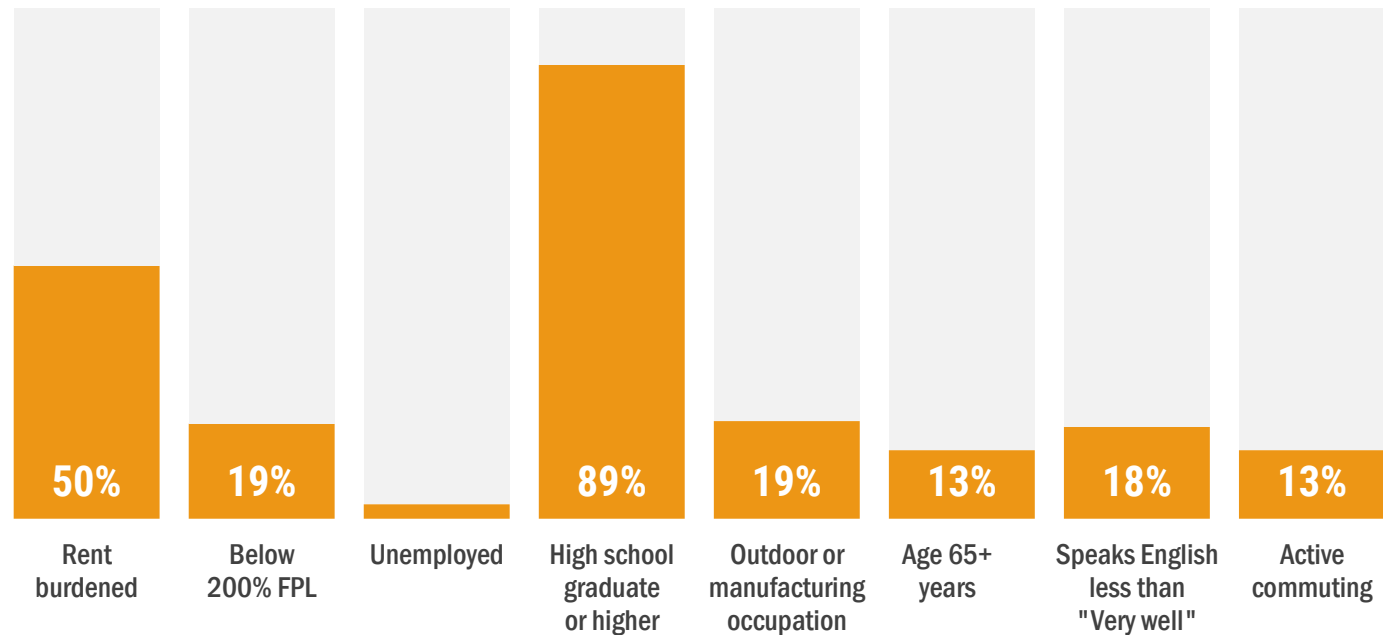
Wildfires and Public Health



San Mateo County Population Profile

San Mateo County stretches the San Francisco Bay Area Peninsula and the northward boundary of Silicon Valley.¹ Among all California counties, San Mateo County ranks 2nd in overall health outcomes and health factors.²

Key Socioeconomic Indicators of Inequity and Vulnerability



Sources: ¹San Mateo County Manager's Office 2017-2019 San Mateo County Profile, ²University of Wisconsin Population Health Institute and Robert Wood Johnson Foundation County Health Rankings, ³U.S. Census Bureau 2013-2017 American Community Survey 5-Year Estimates

San Mateo County Fire Hazard Severity Zones

Includes both proposed Fire Hazard Severity Zones for State Responsibility Area lands and draft Very High Fire Hazard Severity Zones for Local Responsibility Area lands.

FHSZ in Local Responsibility Areas (LRA)

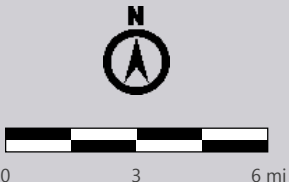
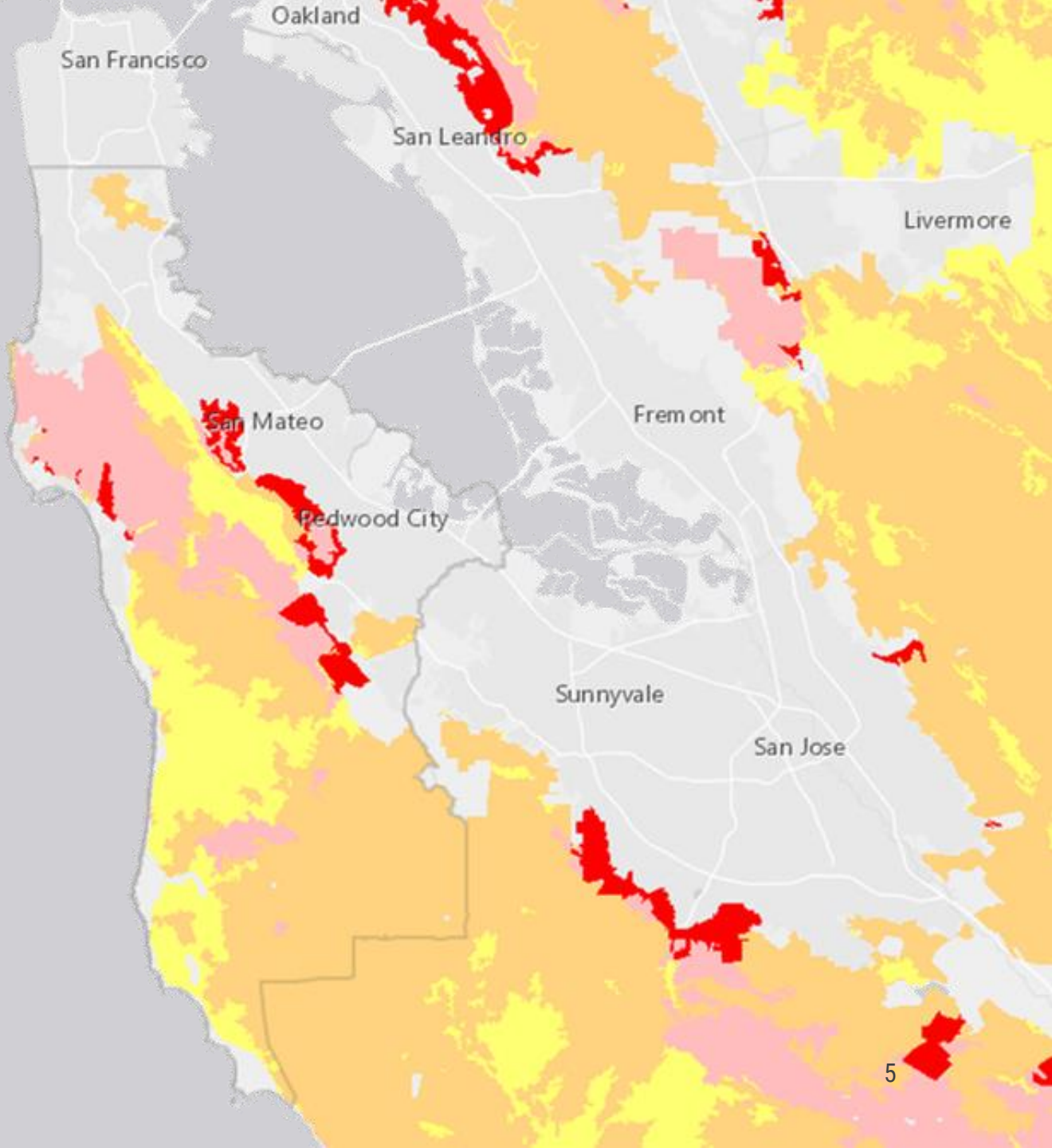
■ Very High FHSZ

FHSZ in State or Federal Responsibility Areas (SRA)

■ Very High

■ High

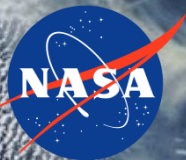
■ Moderate



November 9, 2018

Natural color satellite image of the Butte County Camp Fire on November 9th (second day of the fire) provided by the NASA Earth Observing System Data and Information System (EOSDIS).

Strong winds pushed the fire to the south and southwest, tripling its size and spreading smoke over the Sacramento Valley and down to the San Francisco Bay Area.



Camp Fire

CALIFORNIA

San Mateo
County








Hill and
Woolsey Fires

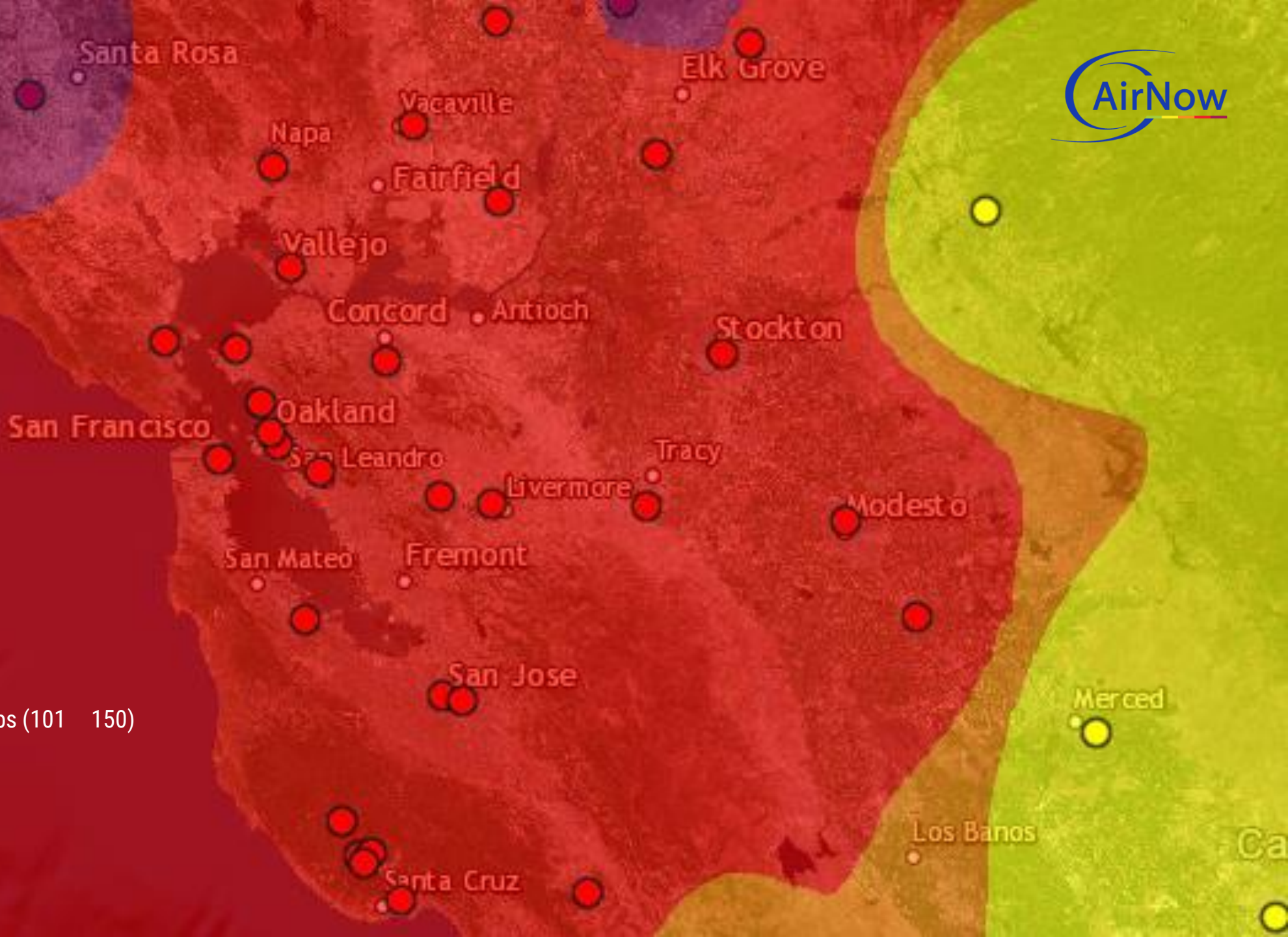
Los Angeles

PM_{2.5}

On November 10th (third day of the Butte County Camp Fire) PM_{2.5} levels reached unhealthy levels.

U.S. Air Quality Index

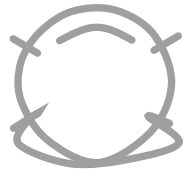
-  Good (0 - 50)
-  Moderate (51 - 100)
-  Unhealthy for Sensitive Groups (101 - 150)
-  Unhealthy (151 - 200)
-  Very Unhealthy (201 - 300)
-  Hazardous (301 - 500)
-  No Data





Wildfire Smoke in San Mateo County: Public Health Inquiries & Emerging Concerns

During the 2018 Camp Fire, San Mateo County public health and emergency medical services officials received inquiries from staff, fire officials, hospitals, schools, media, and the public regarding these concerns:



**Masking and Respirator
Guidance & Effectiveness**



**Cleaner Air Shelters
& Home Air Filtration**



**Outdoor &
Agricultural Workers**



**Mobile Clinic &
Outreach Services**



**ED Visits &
Hospitalizations**



**School Safety
& Closures**



**Respiratory Health
Inequities**



**Animal Control
& Sheltering**



**Interagency Communication
& Real-Time Resourcing**



**Incident Command &
All-Hazards Activation**

A blurred city street scene with people wearing face masks, suggesting a health or environmental concern. The background shows a street with a traffic light and other pedestrians. The text is overlaid on the left side of the image.

SYNDROMIC SURVEILLANCE

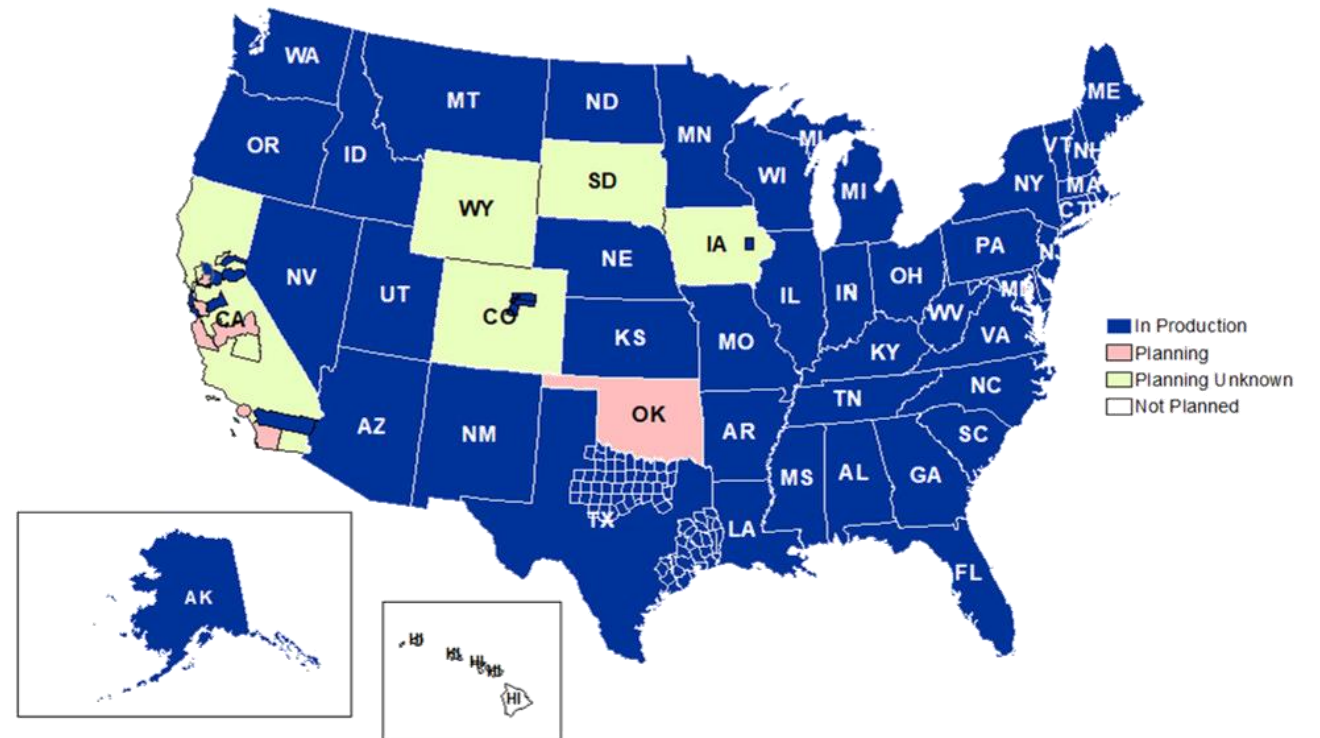
Wildfires & Health



Syndromic Surveillance

- › The CDC National Syndromic Surveillance Program manages the nationwide syndromic surveillance (SyS) BioSense Platform and Community of Practice (CoP).
- › SyS data are used in combination with other surveillance data, such as prehospital, ED visit, hospital utilization, environmental monitoring, and poison control data, to detect, monitor, and characterize unusual activity for further public health investigation or response.
- › Syndromic data can include patient encounter data from EDs, urgent care, ambulatory care, and inpatient healthcare settings, as well as pharmacy and laboratory data.

CDC National Syndromic Surveillance Program Participation





Syndromic Surveillance During Wildfire Events

Health effects known to be caused by wildfire smoke:

- › Eye irritation, sore throat, wheeze and cough
- › Asthma and chronic obstructive pulmonary disease (COPD) exacerbations
- › Bronchitis and pneumonia
- › Childhood respiratory disease

Health effects suspected to be caused by wildfire smoke:

- › All-cause mortality
- › Cardiovascular outcomes
- › Adverse birth outcomes
- › Persistent or latent health effects related to smoke exposure are not well understood



Susceptible Populations

At-risk populations:

- › People with respiratory and cardiovascular diseases
- › Middle-aged and older adults
- › Children
- › Pregnant women and the fetus

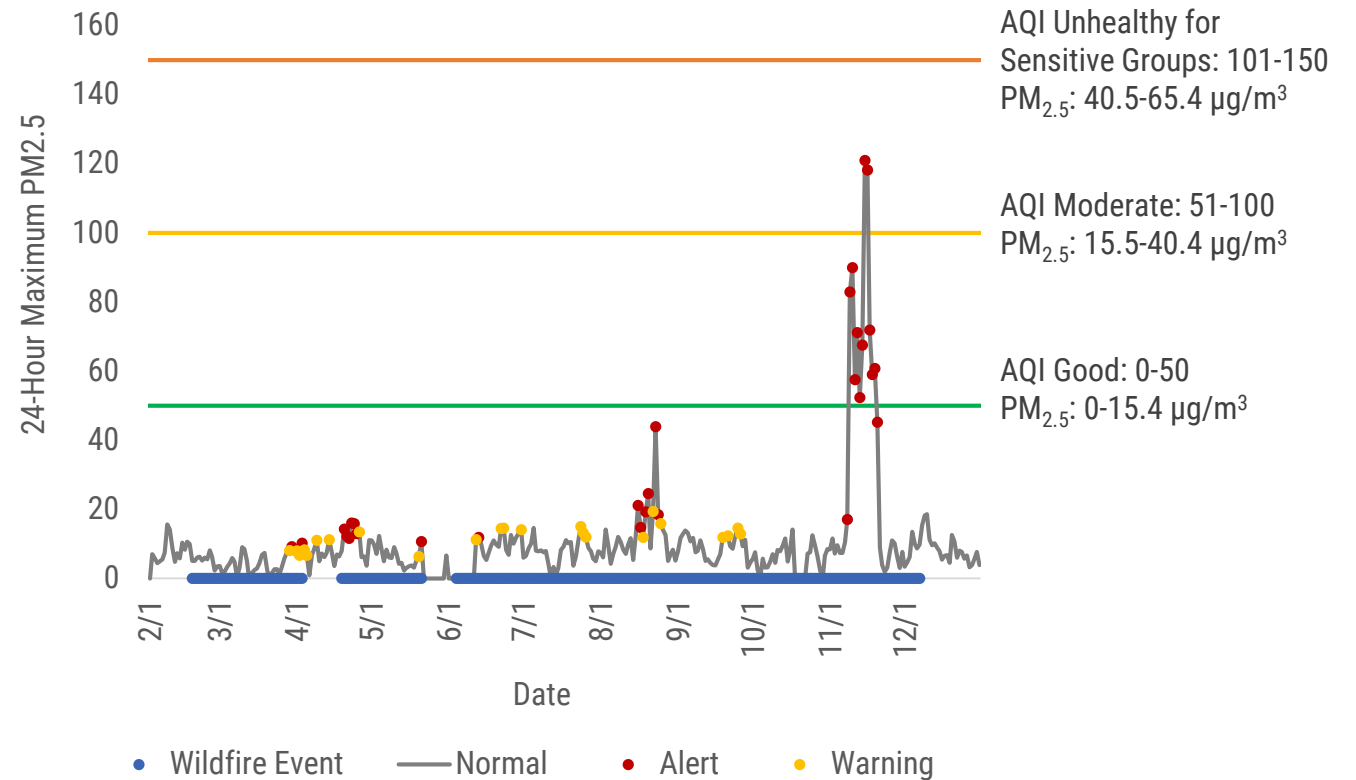
Populations suspected of being at great risk:

- › People living with chronic inflammatory diseases (e.g., diabetes, obesity)
- › Women, Blacks or African-Americans, and populations with lower socio-economic status



California Wildfires and Air Quality (PM_{2.5}) in San Mateo County

In 2018, there were **6,294 fires** consuming over **876,147 acres** in California. Last year's Camp Fire in Butte County is the deadliest and most destructive wildfire in California history. During the Camp Fire, 24-hour maximum PM_{2.5} concentrations exceeded moderate AQI levels in San Mateo County.

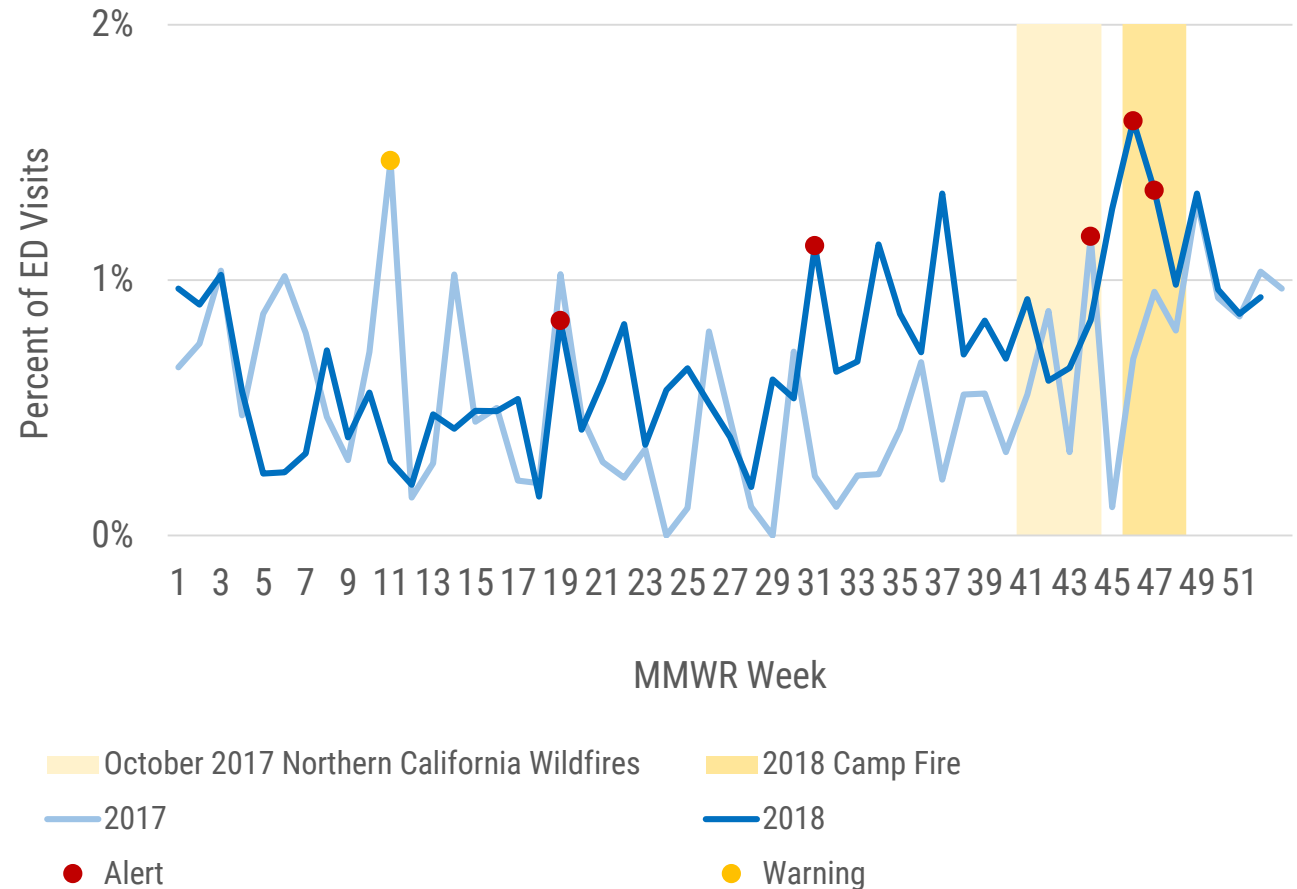


Sources: Centers for Disease Control and Prevention National Syndromic Surveillance Program ESSENCE, San Mateo County Health, February to December, 2018



Enhanced Syndromic Surveillance: Weekly Percentage of ED Visits Due to Asthma or RAD

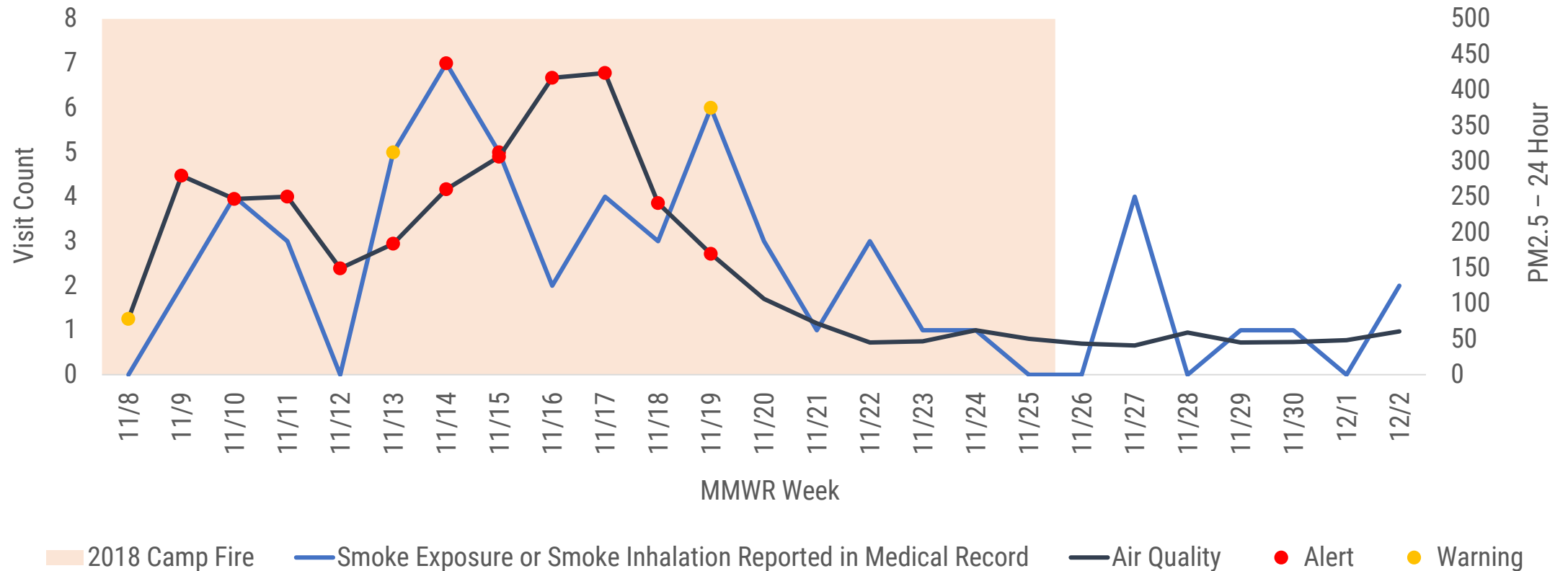
During the first two weeks of the Camp Fire, there were higher than expected increases in 24-hour PM_{2.5} levels, weekly percentage of ED visits for possible smoke exposure or smoke inhalation, and weekly percentage of ED visits for asthma or reactive airway disease (RAD) exacerbation and other respiratory health effects associated with wildfire smoke exposure.



Source: Centers for Disease Control and Prevention National Syndromic Surveillance Program ESSENCE, San Mateo County Health (2018)



Possible Smoke Exposure or Smoke Inhalation



¹ The following terms were queried from chief complaints, triage notes, discharge diagnosis, and clinical impression: 'smoke,' 'smk,' 'wildfire,' 'wild fire,' 'fires.'



Enhanced Syndromic Surveillance: Free Text Search

The chief complaints, triage notes, discharge diagnosis, and clinical impression fields were queried for possible smoke exposure or smoke inhalation using these key terms: 'smoke,' 'smk,' 'wildfire,' 'wild fire,' 'fires.'

"follow up after smoke/fires"

"sorethroat due to smoke?"

"from the smoke"

"possible do to the smoke in the air. patient would like to get tested for possible asthma (some time next year)"

"smoke inhalation cold sweat x 2 days"

"for the last week pt relates to smoke. states she feels tight in her chest. Cough productive for yellow sputum. no fevers. pmhx health. no resp distress."

"since smoke resp even and unlabored. x 3 days. no pmh."

"coming in for asthma due to smoke she is having trouble breathing and chest pain"

"using albuterol to help control symptoms. Does help but get triggered by the extra smoke"

"requesting inhalers due to smoke"



CERHOP

Deliverables &
Technical Approach



CERHOP Statement of Purpose



Mission

Increase San Mateo County Health’s readiness to effectively monitor the socioeconomic, environmental, and climate-related determinants of health and health equity, and respond to the anticipated health and safety needs of sensitive or susceptible populations during a wildfire-related air pollution event.



Goal

Identify and engage priority populations, particularly sensitive or susceptible and historically hard-to-reach populations, in risk-reducing actions prior to, during, and following a wildfire-related air pollution event.



Expected Outcome

The resulting vulnerability index and surveillance action plan will have information that public health and emergency response officials can use to inform strategies for prioritizing and targeting public health and health care resources and services.



Deliverable 1: Vulnerability Index

Problem Formulation

Assessment and Analysis

Vulnerability Characterization

Step 1:

Review Literature and Verify Assumptions

Step 2:

Estimate Prior Respiratory Disease Burden and Relative Risk

Step 3:

Compile Vulnerability Index Candidate Data Sources

Step 4:

Develop Vulnerability Index

Step 5:

Characterize Vulnerability



- › Identify risk and vulnerability factors associated with wildfire smoke exposure.
- › Verify priority populations with subject matter experts, key informants, and stakeholders.
- › Define the problem and scope the assessment and analysis activities.
- › Develop a conceptual model.

- › Estimate 2013 to 2017 age-adjusted rates of pediatric and adult asthma, and COPD.
- › Estimate relative risks of asthma- and COPD-related ED visits and hospitalizations at exceedance of 24-hour average PM_{2.5} of 15.5 µg/m³.

- › Assess candidate data sources per inclusion criteria.
- › Compile, profile, and prepare selected data.

- › Compare existing vulnerability indices.
- › Review indicator selection approaches.
- › Select domains/policy action areas, candidate index indicator group, and decision-support indicators.
- › Develop vulnerability index.
- › Visualize spatial distribution of vulnerability.

Characterize San Mateo County population subgroups who are more likely to be sensitive or susceptible to the acute adverse respiratory health effects associated with wildfire smoke-related PM_{2.5}.



Deliverable 2: Evaluation of Surveillance Capabilities

Passive and Enhanced Syndromic Surveillance

(Prehospital/EMS Dispatch and ED)

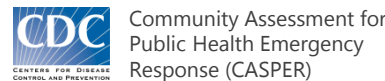


RODS LABORATORY
**REAL-TIME OUTBREAK AND
DISEASE SURVEILLANCE**
at the Department of Biomedical Informatics

Event-Based Surveillance

(Social Media, Word of Mouth, Local Press, Citizen Science)

Health Status Polls and
Community Assessments



Smoke Sense

Natural Language
Processing and Text Mining





Deliverable 3: Syndromic Surveillance Optimization

Process

1. Review literature for respiratory health effects known to be caused by wildfire smoke.
2. Define sensitive or susceptible populations.
3. Select candidate respiratory endpoints and develop respiratory syndrome definitions.
4. Test and refine CDC NSSP ESSENCE queries (percent of probable records captured by each word in a query).

ESSENCE Respiratory Subsyndromes

AsthmaOrRAD	Asthma or ReactiveAirwayDisease
AcuteBronchitis	Bronchitis and not Chronic
Bronchitis	Bronchitis
Pneumonia	Bronchopneumonia or Pneumonia

Smoke Exposure and Respiratory End Points (ICD-10-CM Codes)

X01	Exposure to uncontrolled fire, not in building or structure (includes exposure to forest fire)
T59.811	Toxic effect of smoke, accidental (unintentional)
J70.5	Respiratory conditions due to smoke inhalation
J06.9	Breathing problems
R06.02	Shortness of breath
J44.9	Chronic obstructive pulmonary disease, unspecified



Deliverable 4: Collaboration & Information Exchange

- › Establish relationships with subject matter experts from the Sean N. Parker Center for Allergy & Asthma Research at Stanford University; Northern California Center for Occupational and Environmental Health and the Center for Environmental Public Health Tracking at the University of California, Berkeley; Kaiser Permanente Northern California Division of Research; Propeller Health; and SMC Labs.
- › Consulted with Emergency Medical Services Public Health Emergency Preparedness and Response regarding the utility and feasibility of countywide mass communication systems.
- › Conducted scientific consultations with experts from Ecology and Environment, Inc. and the California Department of Public Health (CDPH) Climate Change and Health Equity Program (CCHEP) regarding the development of our vulnerability index.
- › Attended the 'Wildfires and Human Health' Lecture Series at Stanford University; 'Climate Ready San Mateo Collaborative Wildfire Summit' hosted by the San Mateo County Office of Sustainability; 'Catalyzing California Action on Health, Wildfires, and Climate Change Workshop' at University of California at Berkeley; and CSTE Climate and Respiratory Health Summit.



Acknowledgements

With gratitude to the San Mateo County Office of Sustainability, San Mateo County Information Services Division (ISD) County Geographic Information System (GIS) Services, California Department of Public Health (CDPH) Climate Change and Health Equity Program (CCHEP), and Council of State and Territorial Epidemiologists (CSTE). Data were obtained from the U.S. Census Bureau, U.S. Environmental Protection Agency (EPA), U.S. National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA), U.S. Centers for Disease Control and Prevention (CDC) National Syndromic Surveillance Program (NSSP) BioSense Platform, California Office of Statewide Health Planning and Development (OSHPD), California Department of Forestry and Fire Protection (CAL FIRE), California Environmental Protection Agency (CalEPA), California Air Resources Board (CARB), and Bay Area Air Quality Management District (BAAQMD). Specific acknowledgement is given to Corina Chung of SMC Health OEE, and Meredith Milet and Jason Vargo of CDPH CCHEP.



SAN MATEO COUNTY HEALTH

PUBLIC HEALTH, POLICY & PLANNING

Thank you! For questions or comments, please contact:

Karen Pfister

Supervising Epidemiologist/CERHOP PI
Public Health, Policy and Planning
San Mateo County Health
kpfister@smcgov.org

Edwina Williams

Epidemiologist/CERHOP Project Officer
Public Health, Policy and Planning
San Mateo County Health
ewilliams@smcgov.org

Tiffany Tsukuda

Epidemiologist/Informaticist
Public Health, Policy and Planning
San Mateo County Health
ttsukuda@smcgov.org