

Heat-related effects on population health and emergency services

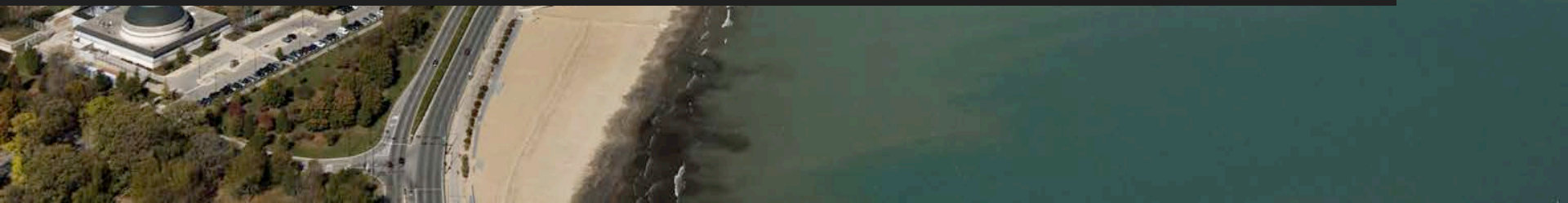
May 2020 | Jeremy Lacocque, DO

Disclosures

I have no conflicts of interest.



About me:





ILLINOIS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

TM







ZUCKERBERG SAN FRANCISCO GENERAL
HOSPITAL AND TRAUMA CENTER

Care.
Zuckerberg San Francisco General Hospital and Trauma Center

Objectives

Understand the following:

- Definition of heat emergency
- What makes a population vulnerable
- What makes an individual vulnerable
- What the effects of heat are on our EMS and hospital systems
- What you can do to help



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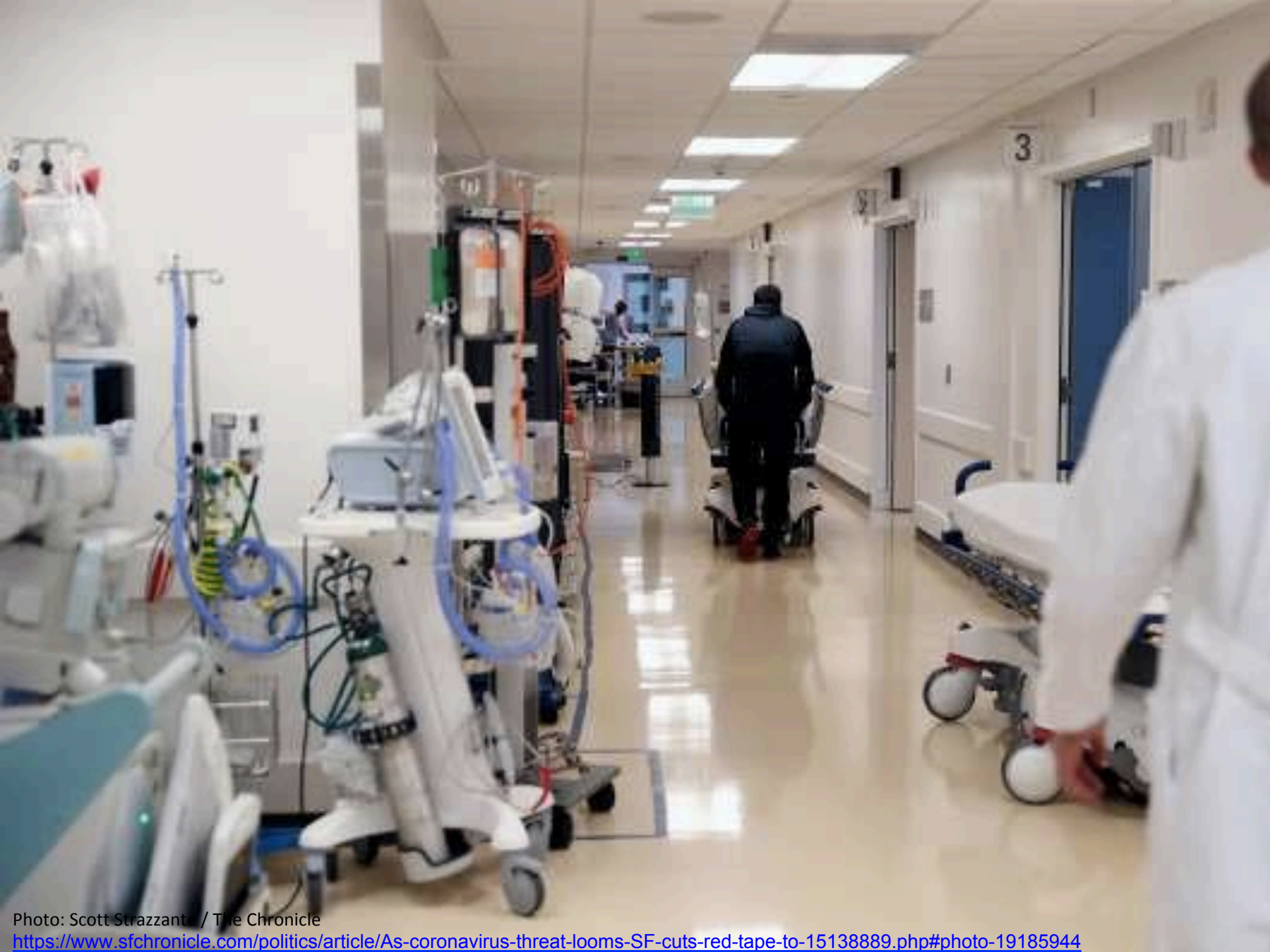


Photo: Scott Strazant / The Chronicle

<https://www.sfchronicle.com/politics/article/As-coronavirus-threat-looms-SF-cuts-red-tape-to-15138889.php#photo-19185944>





BE PREPARED FOR EXTREME HEAT

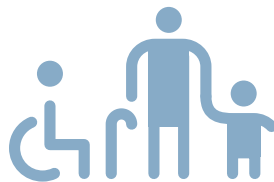
**Extreme heat often results
in the highest annual
number of deaths among all
weather-related disasters.**



FEMA

FEMA V-1004/June 2018

In most of the U.S., extreme heat is a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees.



Greater risk



Can happen anywhere

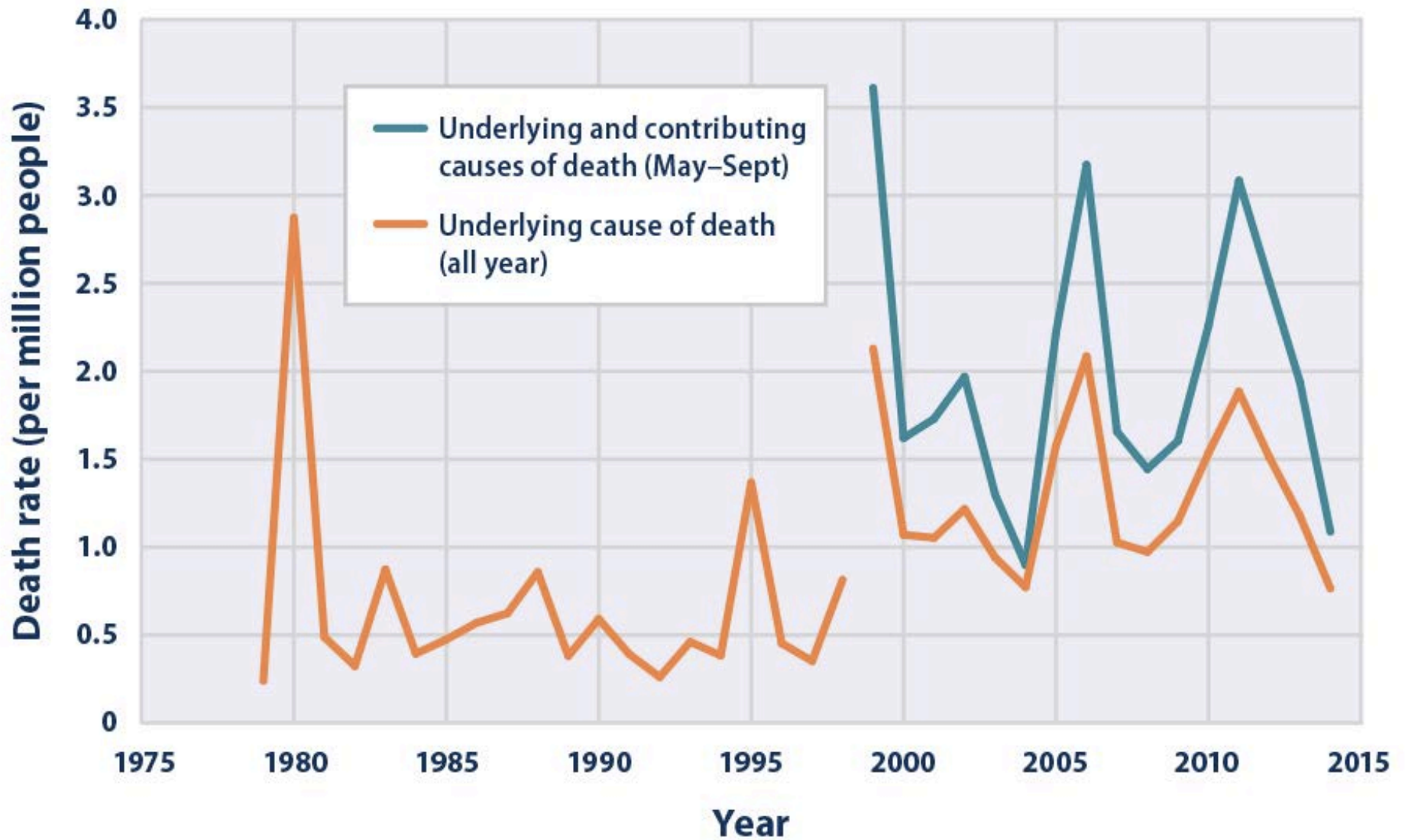


Humidity increases the feeling of heat as measured by a heat index

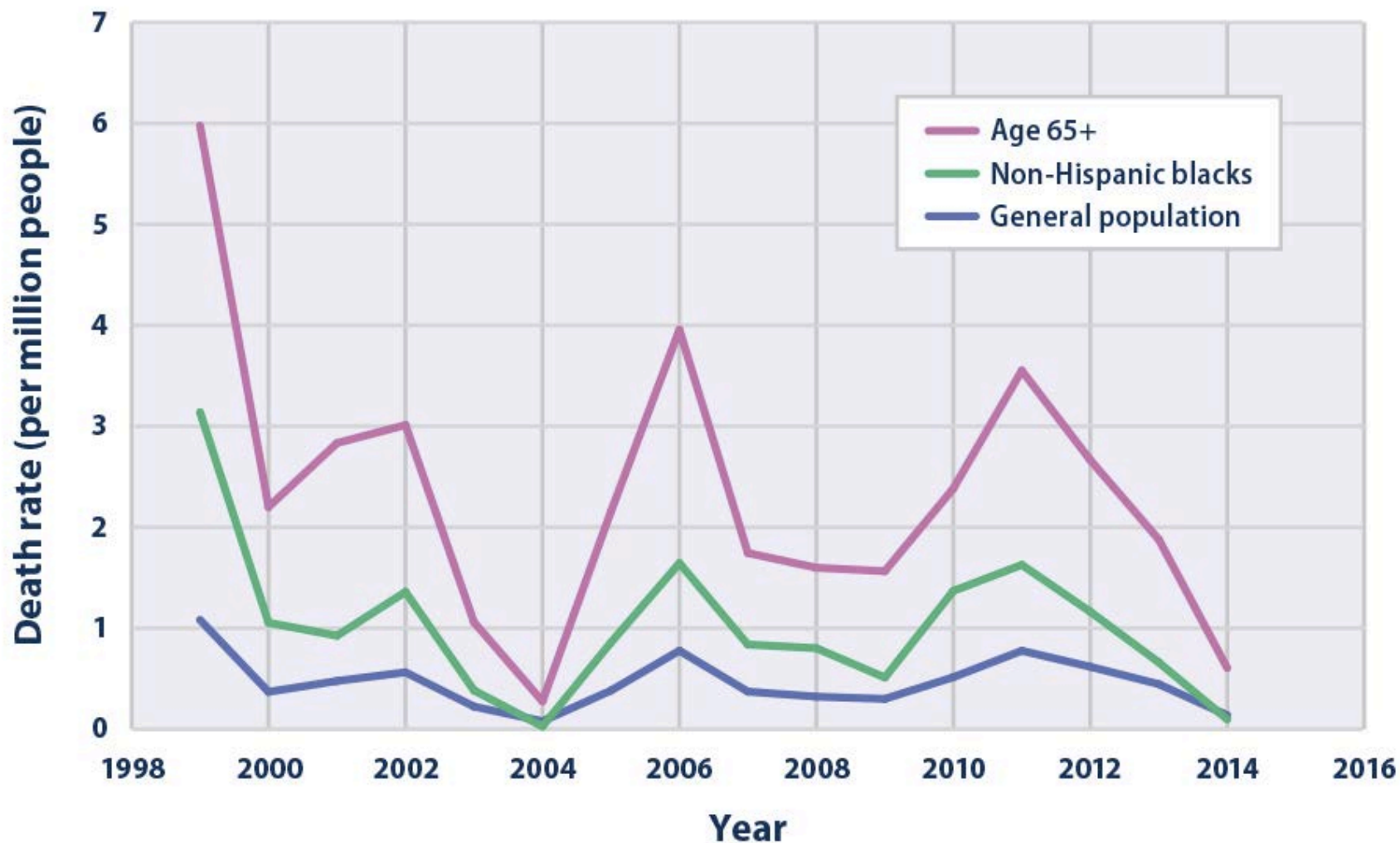
World Health Organization

- Between 2000 and 2016, the number of people exposed to heat waves increased by around 125 million. In 2015 alone, 175 million additional people were exposed to heat waves compared to average years.
- Single events can last weeks, occur consecutively, and result in significant excess mortality.
- Exposure to excessive heat has wide ranging physiological impacts for all humans, often amplifying existing conditions and resulting in premature death and disability.
- The negative health impacts of heat are predictable and largely preventable with specific public health actions. WHO has issued public health guidance for the general public and medical professionals on coping with extreme heat.

Deaths Classified as "Heat-Related" in the United States, 1979–2014



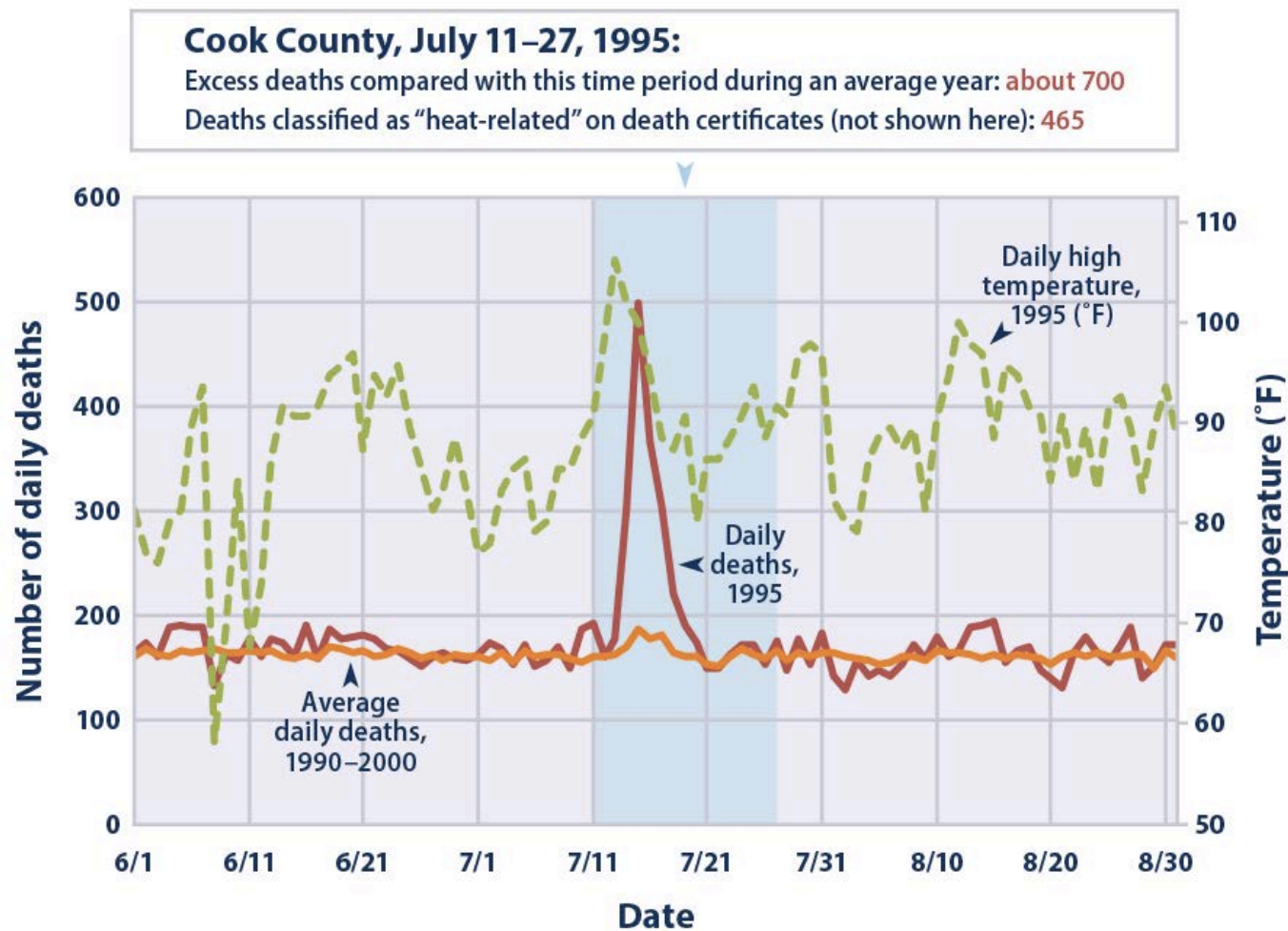
Summer Deaths Due to Heat and Cardiovascular Disease in the United States, 1999–2014



Data source: CDC (U.S. Centers for Disease Control and Prevention). 2016. CDC WONDER database: Multiple cause of death file. Accessed July 2016. <http://wonder.cdc.gov/mcd-icd10.html>.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.
<https://www.epa.gov/sites/production/files/styles/large/public/2016-07/heat-deaths-download1-2016.png>

Example: Examining Heat-Related Deaths During the 1995 Chicago Heat Wave



This graph shows data for the Chicago Standard Metropolitan Statistical Area.

Data sources:

- CDC (U.S. Centers for Disease Control and Prevention). 2012. CDC WONDER database. Accessed August 2012. <http://wonder.cdc.gov/mortSQL.html>.
- NOAA (National Oceanic and Atmospheric Administration). 2012. National Climatic Data Center. Accessed August 2012. www.ncdc.noaa.gov.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.
<https://www.epa.gov/sites/production/files/styles/large/public/2016-07/heat-deaths-example-download-2016.png>

Who is most affected?

Rising global ambient temperatures affect all populations. However, some populations are more exposed to, or more physiologically or socio-economically vulnerable to physiological stress, exacerbated illness, and an increased risk of death from exposure to excess heat. These include the elderly, infants and children, pregnant women, outdoor and manual workers, athletes, and the poor. Gender can play an important role in determining heat exposure.

Multiple vulnerabilities increase the risk of health impacts:



The less abled, pregnant, or already infirm



The poor, displaced, and homeless



Children & the elderly

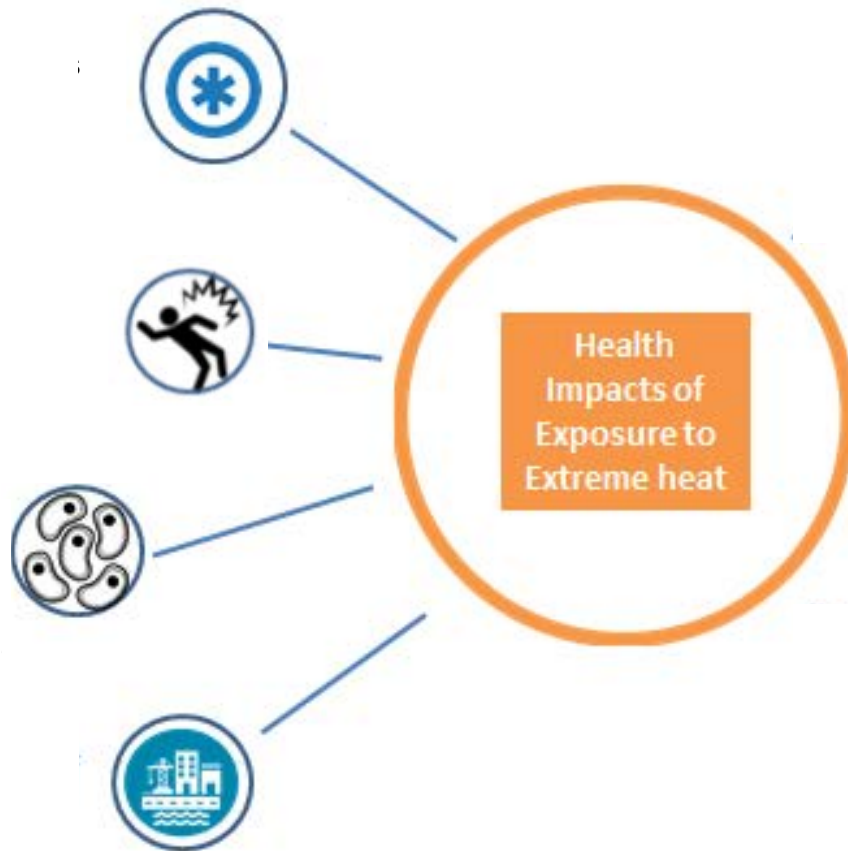


Athletes



Outdoor & manual workers

Indirect Impacts



Direct versus indirect effects of heat on health



HEAT-RELATED ILLNESSES

WHAT TO LOOK FOR

WHAT TO DO

HEAT STROKE

- High body temperature (103°F or higher)
 - Hot, red, dry, or damp skin
 - Fast, strong pulse
 - Headache
 - Dizziness
 - Nausea
 - Confusion
 - Losing consciousness (passing out)
- Call 911 right away—heat stroke is a medical emergency
 - Move the person to a cooler place
 - Help lower the person's temperature with cool cloths or a cool bath
 - Do not give the person anything to drink

HEAT EXHAUSTION

- Heavy sweating
 - Cold, pale, and clammy skin
 - Fast, weak pulse
 - Nausea or vomiting
 - Muscle cramps
 - Tiredness or weakness
 - Dizziness
 - Headache
 - Fainting (passing out)
- Move to a cool place
 - Loosen your clothes
 - Put cool, wet cloths on your body or take a cool bath
 - Sip water
- Get medical help right away if:**
- You are throwing up
 - Your symptoms get worse
 - Your symptoms last longer than 1 hour

HEAT CRAMPS

- Heavy sweating during intense exercise
 - Muscle pain or spasms
- Stop physical activity and move to a cool place
 - Drink water or a sports drink
 - Wait for cramps to go away before you do any more physical activity
- Get medical help right away if:**
- Cramps last longer than 1 hour
 - You're on a low-sodium diet
 - You have heart problems

SUNBURN

- Painful, red, and warm skin
 - Blisters on the skin
- Stay out of the sun until your sunburn heals
 - Put cool cloths on sunburned areas or take a cool bath
 - Put moisturizing lotion on sunburned areas
 - Do not break blisters

HEAT RASH

- Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases)
- Stay in a cool, dry place
 - Keep the rash dry
 - Use powder (like baby powder) to soothe the rash



When a Marathon Goes Wrong

By S. James Snyder/Chicago | Monday, Oct. 08, 2007

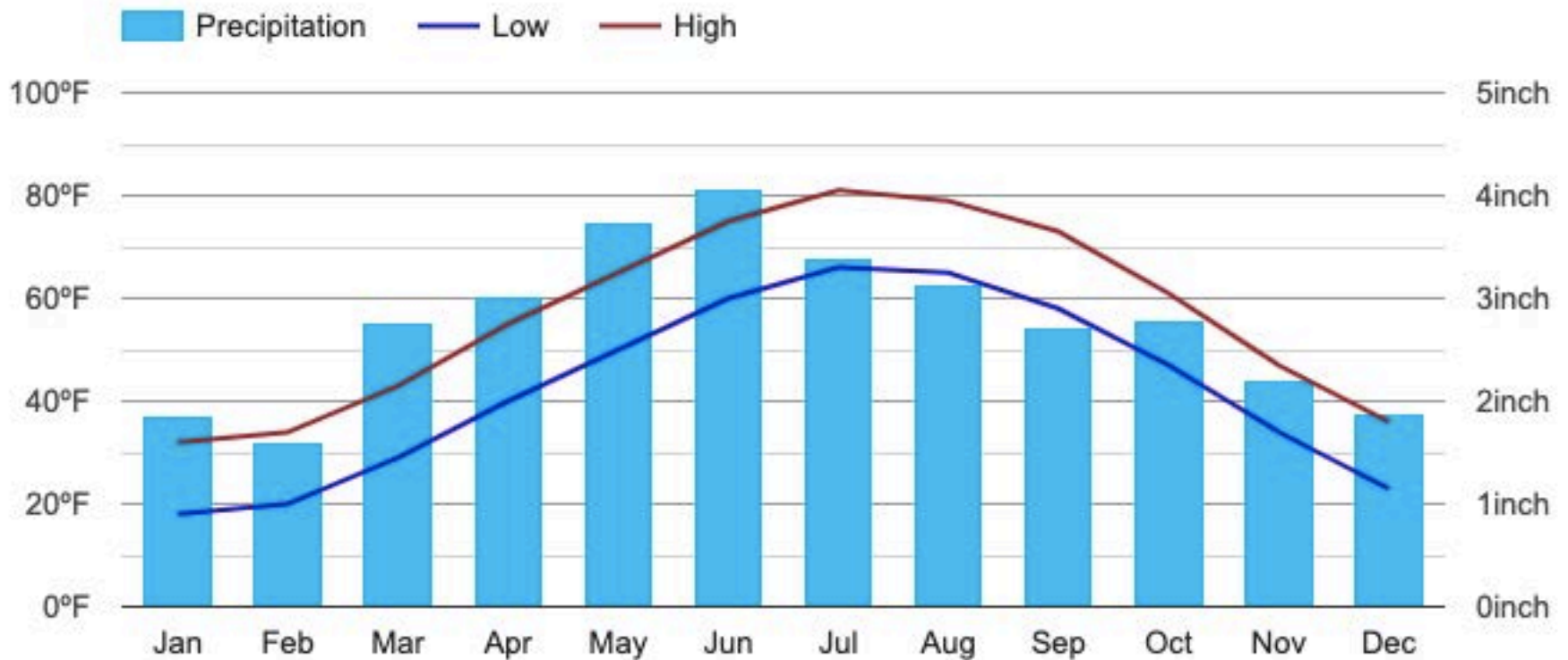
The numbers alone told much of the story: At the 30th annual Chicago Marathon Sunday morning, one man died, more than 300 needed medical attention from the city's overloaded emergency services — which were forced to reach out to the suburbs for additional ambulances — and fewer than 25,000 of some 45,000 registered runners actually finished the 26.2-mile course on an early October day where the midday temperature reached a record 87 degrees.



What is a heat emergency?

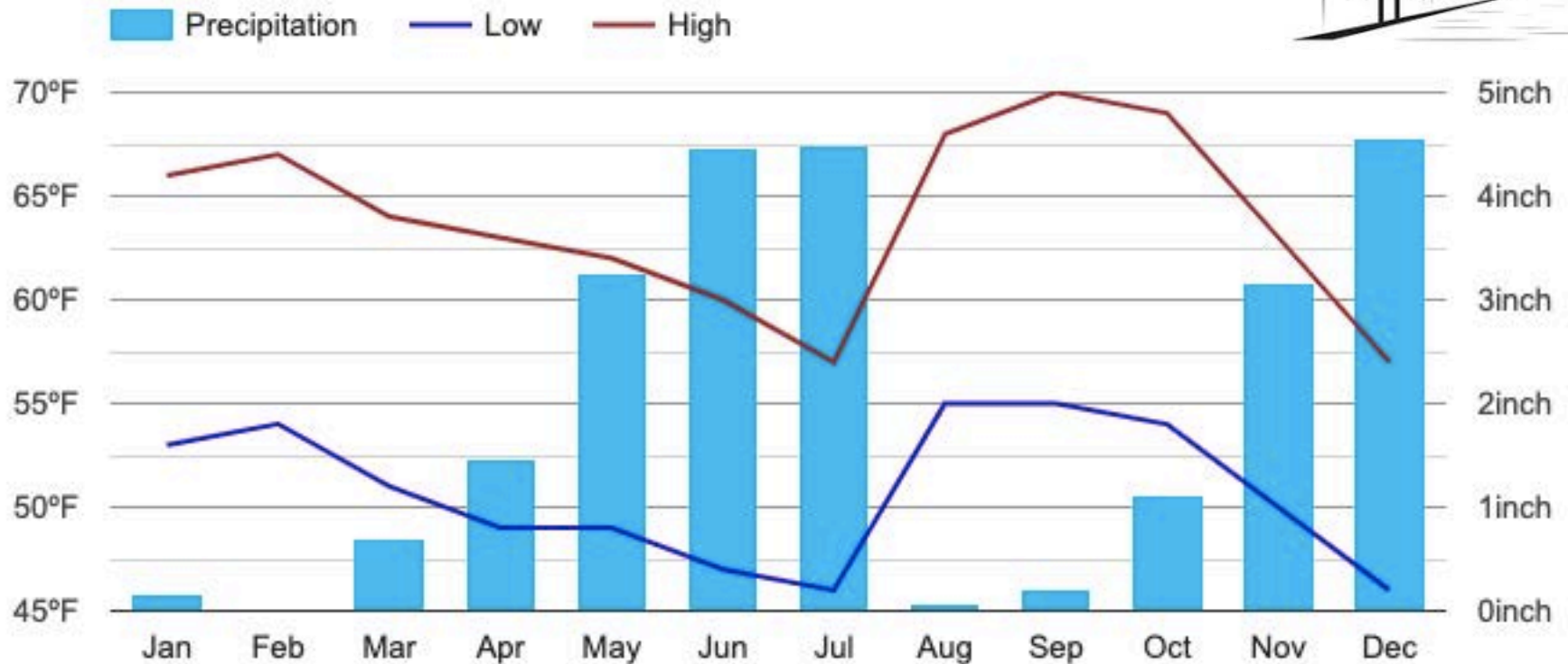


Chicago Climate Graph - Illinois Climate Chart



What is a heat emergency?

San Francisco Climate Graph - California Climate Chart



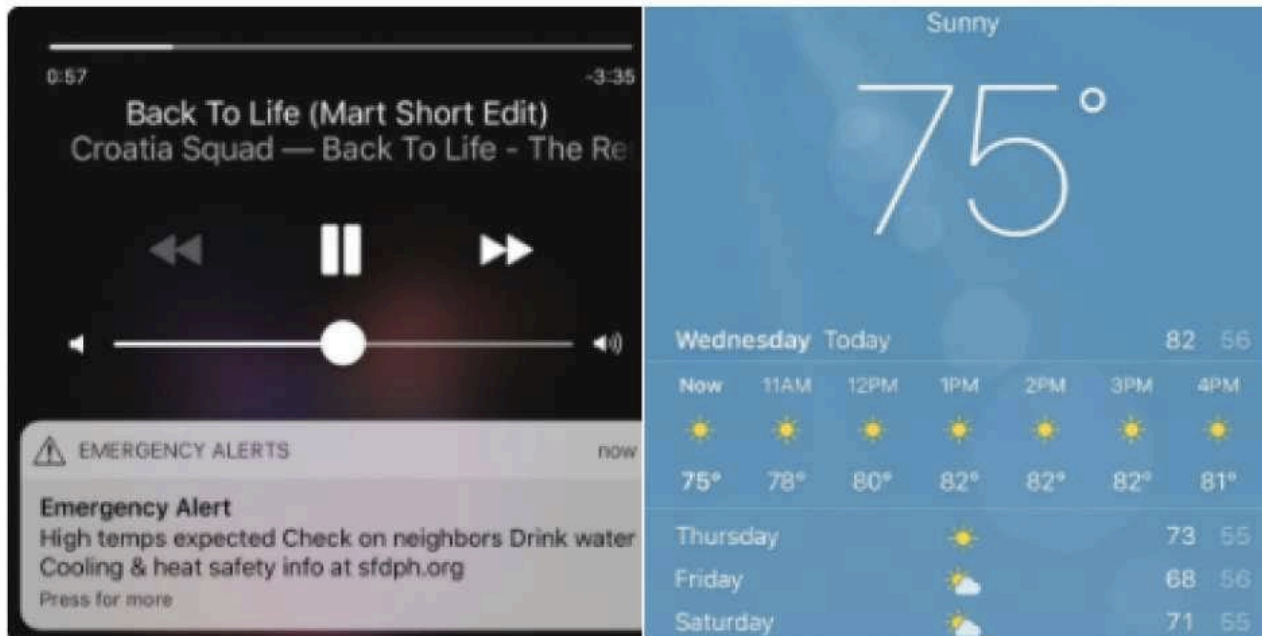
What is a heat emergency?

Only in SF will you get an emergency alert for temp. over 75 degrees...



What is a heat emergency?

Literally just got an emergency alert on my phone because it's going to be slightly over 80 in SF today



What is a heat emergency?

It's going to be 80 degrees in San Francisco today. That has apparently necessitated this EMERGENCY ALERT. Twice so far. Insane.



June 2019

Temperature Profile

While San Francisco's microclimates makes average Citywide temperature measurements limited in utility, the following National Weather Service (NWS) data demonstrates the extent of the heat wave as measured by the NWS downtown weather station. Normal temperatures are an average from the period 1981 to 2010. Record temperatures are from the period 1850 – 2019.

Date	High	High Normal	Low	Low Normal
06/07/2019	67F	51F	66F	52F
06/08/2019	80F	66F	56F	52F
06/09/2019	91F (Record)	66F	61F	53F
06/10/2019	97F (Record)	66F	72F	53F
06/11/2019	92F (Record)	66F	68F	53F
06/12/2019	79F	66F	58F	53F
06/13/2019	63F	66F	65F	53F



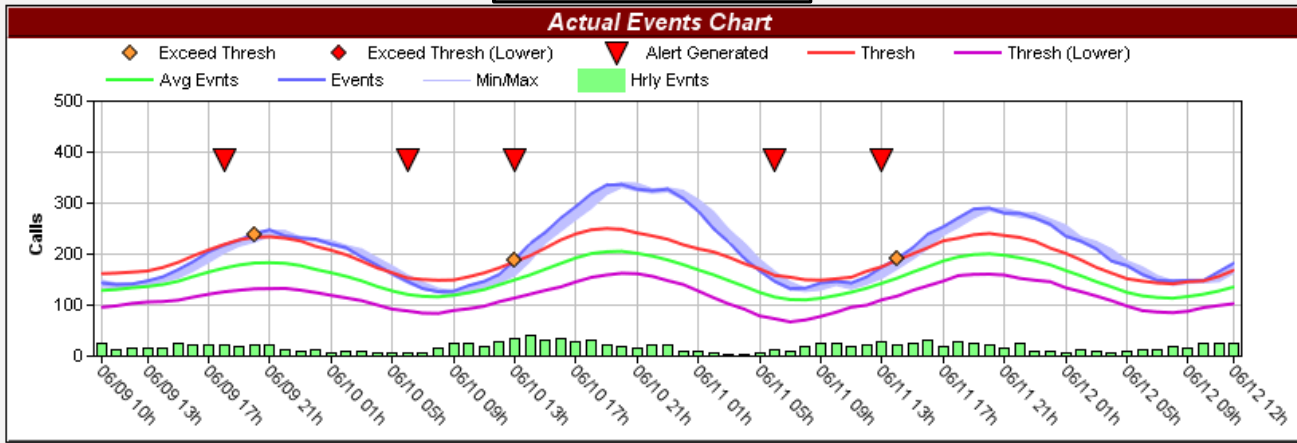
Extreme Heat Impact to Emergency Medical Services

EMS Data

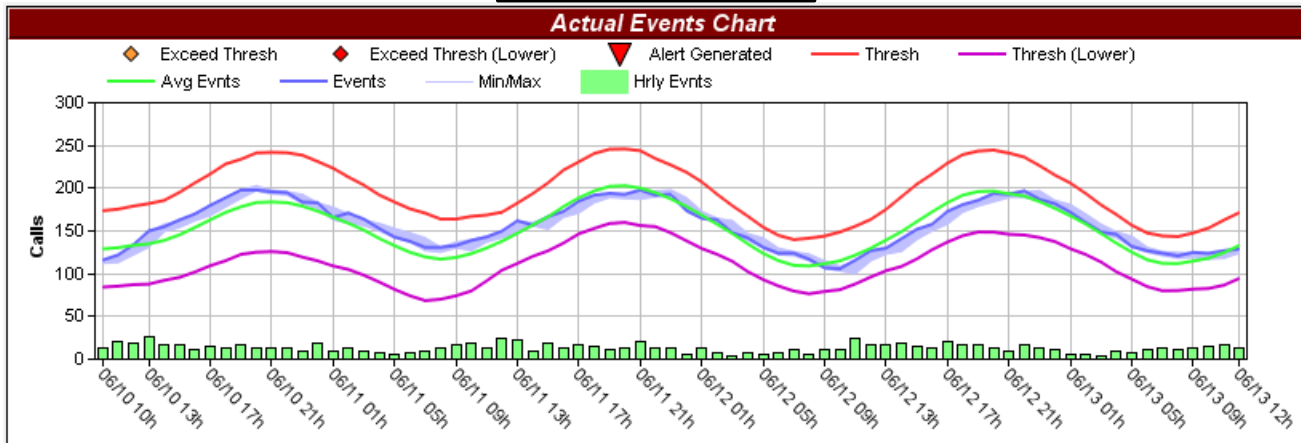
The following EMS data is from 6/10/2019 at 10am – 6/12/2019 at 12pm. The 2018 EMS data is a comparison data set and represents EMS medical calls from 6/10/2018 at 10am – 6/12/2018 at 12pm.

	2018		2019	
Total Calls	978		1315	
Most Common Call Types	Call Type	Number	Call Type	Number
	CODE 2 AMB	121	CODE 2 AMB	124
	SICK EVAL	51	CODE 3 MEDIC	76
	CODE 3 MEDIC	45	UNC EFF BREATH	50
	SOB DIF SPEAKING	42	SICK EVAL	40
	UNCONSCIOUS	42	SOB DIF SPEAKING	36
	SICK NOT ALERT	30	SICK NOT ALERT	36
	FAINTED NOT ALERT	23	UNKNOWN PROBLEM	33
	UNKNOWN PROBLEM	23	FAINTED NOT ALERT	25
	ASSAULT	18	ASSAULT	25
SICK ABNL BREATH	17	INTERFACILTY TX	24	
Greatest Increase in Call Type *Due to inconsistencies in coding (i.e. 'UNC EFF BREATH' appears 50 times in 2019, but no times in 2018, while 'UNCONCIOUS' appears 42 times in 2018 but only 2 times in 2019), this dataset does not necessarily demonstrate which types of morbidities may have increased during the 2019 extreme heat event.			Call Type	Number
			CODE 3 MEDIC	31
			ARREST + APNEA	14
			UNKNOWN PROBLEM	10
			INTERFACILTY TX	9
			ASSAULT	7
			FALL BRAVO INJ	7
			SICK NOT ALERT	6
			SICK ALOC	6
			FALL NOT ALERT	6
		MVA MC/BIKE	6	

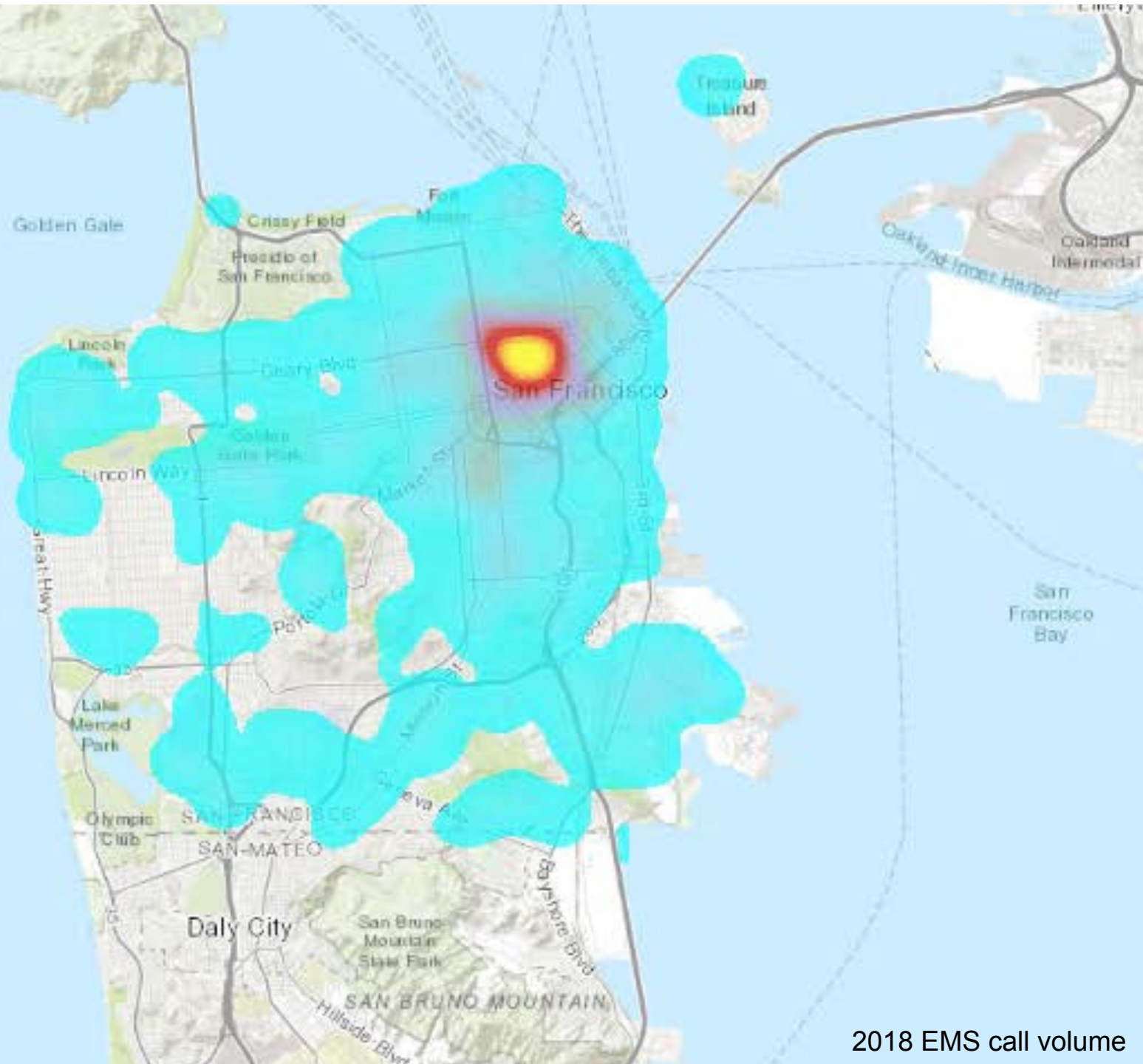
2019 Events Chart



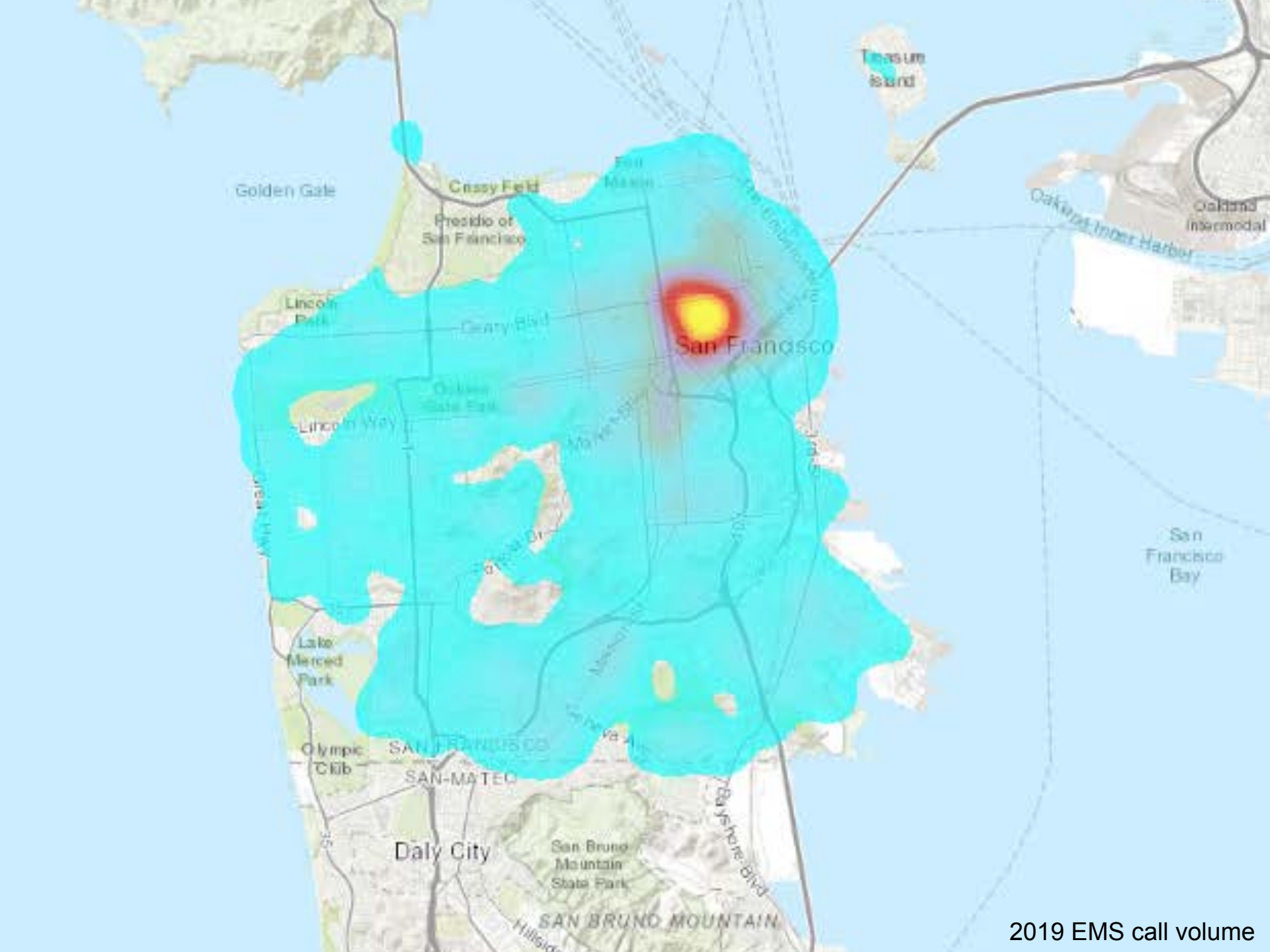
2018 Events Chart



Data Source: FirstWatch – “San Francisco – All 911 EMS Incidents” trigger. The data in the FirstWatch “San Francisco – All 911 EMS Incidents” trigger is pulled directly from the CAD. It includes all medical 911 calls with a valid incident number, and excludes duplicate calls and calls found to have no merit (i.e. final disposition is “NOM” or “No Merit”).



2018 EMS call volume



2019 EMS call volume

Extreme Heat Impact to Health Care Facilities

Impact to San Francisco Hospitals

Diversion

Hospital	Total Diversion Hours	Comments
Bernal Campus CPMC	0:28	Staffing
Kaiser San Francisco	4:27	Critical Volume Saturation, Census and Acuity, Overcrowding
San Francisco General Hospital	8:49	Overcrowding
St. Francisco Memorial Hospital	1:34	Saturation
St. Mary's Medical Center	0:03	Overcrowding
UCSF Medical Center	6:07	Overcrowding, ED and ICU Saturation, No Code Room
Van Ness Campus CPMC	8:17	ED Overcapacity
Total Hours on Diversion	31:46	

Diversion

Total Trauma Override Diversion: 25 Hours, 41 Minutes

Relationship Between Ambient Air Temperature and Internal Temperature at SFDPH Facilities

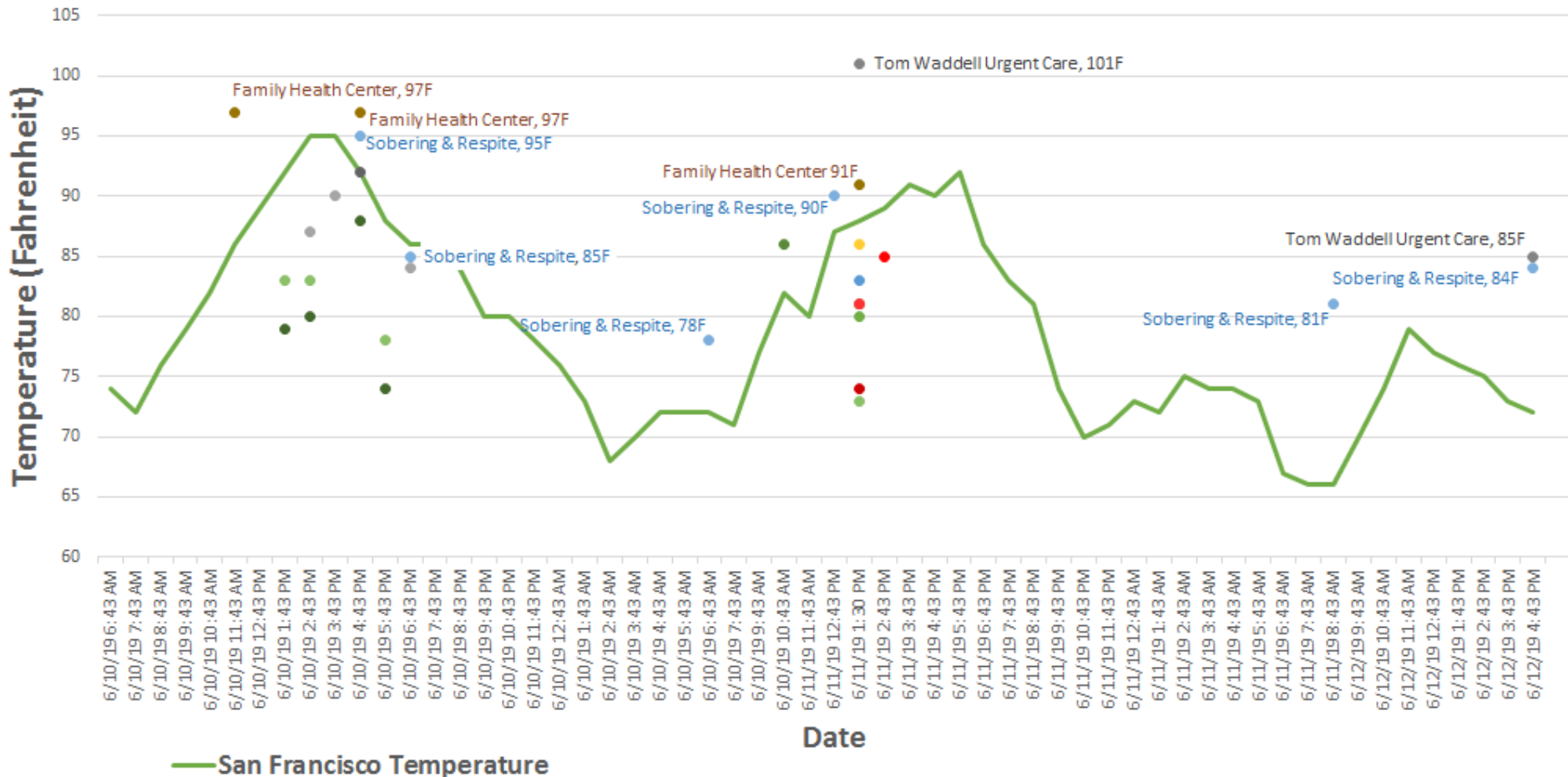




Photo by Scott Strazzante





American Red Cross

Disaster Relief



American Red Cross

**SHELTER
REFUGIO**





Out-of-Hospital Cardiac Arrests and Wildfire-Related Particulate Matter During 2015–2017 California Wildfires

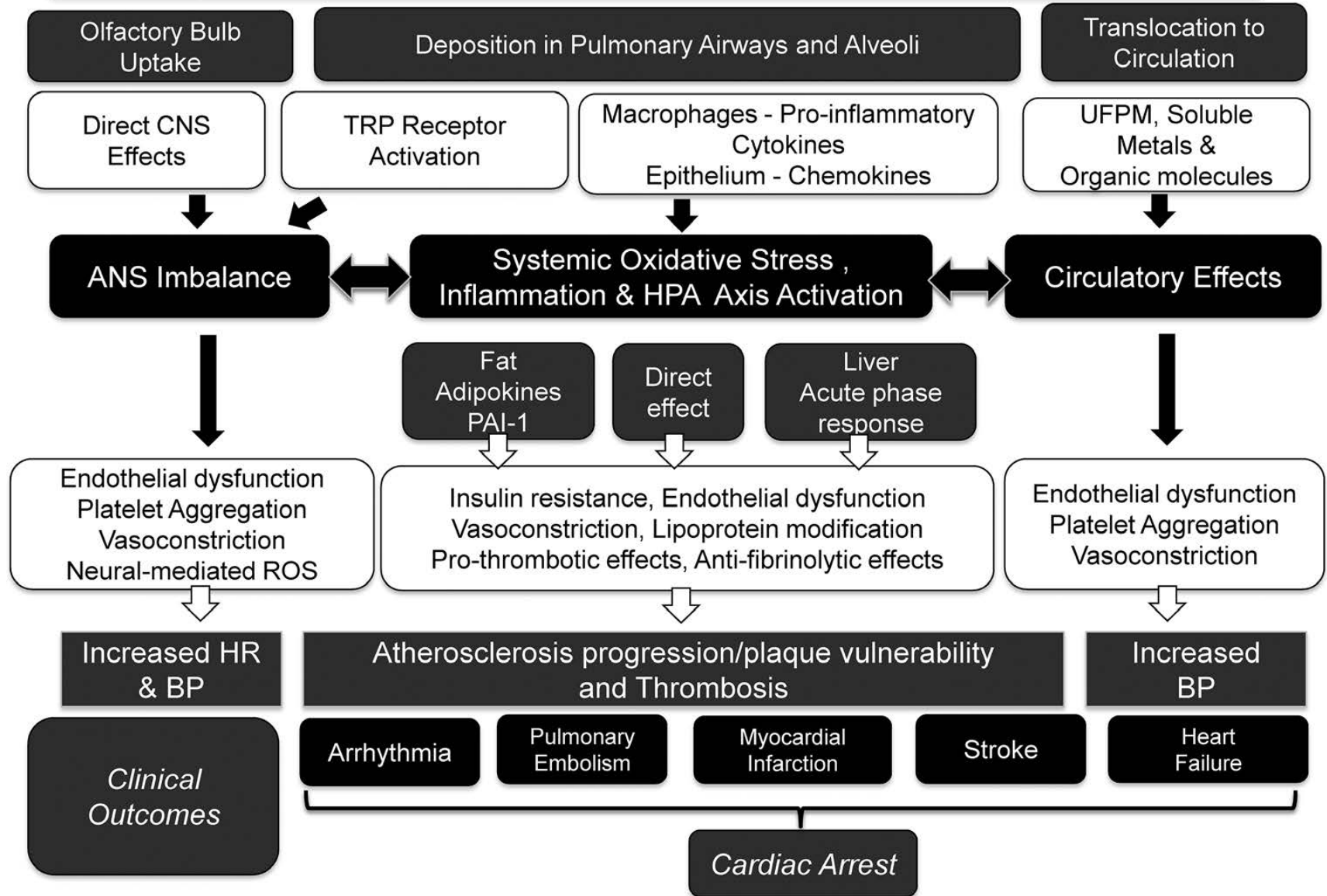
Caitlin G. Jones, MS; Ana G. Rappold, PhD; Jason Vargo, PhD; Wayne E. Cascio, MD; Martin Kharrazi, PhD; Bryan McNally, MD; Sumi Hoshiko, MPH; with the CARES Surveillance Group

Background—The natural cycle of large-scale wildfires is accelerating, increasingly exposing both rural and populous urban areas to wildfire emissions. While respiratory health effects associated with wildfire smoke are well established, cardiovascular effects have been less clear.

Methods and Results—We examined the association between out-of-hospital cardiac arrest and wildfire smoke density (light, medium, heavy smoke) from the National Oceanic Atmospheric Association’s Hazard Mapping System. Out-of-hospital cardiac arrest data were provided by the Cardiac Arrest Registry to Enhance Survival for 14 California counties, 2015–2017 (N=5336). We applied conditional logistic regression in a case-crossover design using control days from 1, 2, 3, and 4 weeks before case date, at lag days 0 to 3. We stratified by pathogenesis, sex, age (19–34, 35–64, and ≥ 65 years), and socioeconomic status (census tract percent below poverty). Out-of-hospital cardiac arrest risk increased in association with heavy smoke across multiple lag days, strongest on lag day 2 (odds ratio, 1.70; 95% CI, 1.18–2.13). Risk in the lower socioeconomic status strata was elevated on medium and heavy days, although not statistically significant. Higher socioeconomic status strata had elevated odds ratios with heavy smoke but null results with light and medium smoke. Both sexes and age groups 35 years and older were impacted on days with heavy smoke.

Conclusions—Out-of-hospital cardiac arrests increased with wildfire smoke exposure, and lower socioeconomic status appeared to increase the risk. The future trajectory of wildfire, along with increasing vulnerability of the aging population, underscores the importance of formulating public health and clinical strategies to protect those most vulnerable. (*J Am Heart Assoc.* 2020;9:e014125. DOI: 10.1161/JAHA.119.014125.)

Proposed Adverse Outcome Pathway from Wildfire Smoke Exposure to Cardiac Arrest



What do we do to help?

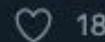


San Francisco DEM @SF_emergency · Jun 9, 2019

Heat affects people differently. What is 'beach weather' to you is potentially dangerous for someone vulnerable to heat. Check on neighbors/friends/family sensitive to heat. Call 911 immediately if you/someone you know is having a medical emergency. Info: Sf72.org

HEAT-RELATED ILLNESSES

WHAT TO LOOK FOR	WHAT TO DO
HEAT STROKE	
<ul style="list-style-type: none">• High body temperature (103°F or higher)• Hot, red, dry, or damp skin• Fast, strong pulse• Headache• Dizziness• Nausea• Confusion• Losing consciousness (passing out)	<ul style="list-style-type: none">• Call 911 right away-heat stroke is a medical emergency• Move the person to a cooler place• Help lower the person's temperature with cool cloths or a cool bath• Do not give the person anything to drink
HEAT EXHAUSTION	
<ul style="list-style-type: none">• Heavy sweating• Cold, pale, and clammy skin	<ul style="list-style-type: none">• Move to a cool place• Loosen your clothes



What can you do to help?

- If safe, try to keep your windows open during the night and closed during the day

What can you do to help?

Keep your home cool:

Below 90°F during the day and 75°F at night, especially for those over 60 years old, infants and those with chronic health conditions

What can you do to help?

- Hang shades and wet towels
- Electric fans can help, but may not be as helpful above 95°F.
- If you can't avoid heat in your home, try to spend 2-3 hours per day in a cool place, like a public building.
- If you must do any strenuous activity, try to do it in the coolest part of the day, between 4-7am
- Do not leave children and pets in parked vehicles

What can you do to help?

- Keep your body cool
- Take cool showers and baths, use cold backs, wraps, towels, foot baths
- Drink water regularly, and avoid alcohol, caffeine and sugar
- Eat small meals and more often, avoid meals high in protein

What can you do to help?

- Help others
- Check on family, friends, neighbors
- Know where your loved ones are
- Elderly and sick people living alone should be checked on daily
- Be mindful of medications, as some may affect fluid balance and thermoregulation
- Get training - know first aid

What can you do to help?

- If you or others feel unwell
- If you feel dizzy, weak, anxious, have a headache or feel thirsty, move to a cool place ASAP
- Drink water or juice to rehydrate
- Get medical attention if you have heat cramps lasting longer than an hour

First aid:

Move the person to a cool place, put him or her in a horizontal position and elevate legs and hips, remove clothing and initiate external cooling, for example, by placing cold packs on the neck, axillae and groin, fanning continuously and spraying the skin with water at 25–30 °C. Measure the body temperature. Do not give acetylsalicylic acid or paracetamol. Position an unconscious person on his or her side.

Questions?

jeremy.lacocque@ucsf.edu

EMS/Disaster Medicine Fellow