

Smoke Sense

Citizen Science Study
on Health Risk and
Health Risk
Communication
During Wildfire
Smoke Episodes

Ana G. Rappold
— ORD, US EPA



Disclaimer

The presentation represents the opinions of the speaker and does not necessarily represent the policies or views of the US EPA.

The mention of trade names of commercial products does not constitute endorsement or recommendation for use.

Motivation

Severity of large fires has increased.

Science is there: smoke produces a range of health outcomes, impacts productivity, and wellbeing in communities.

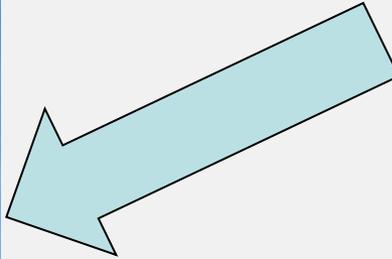
Education + Engagement, before and during, smoke events are key to better health outcomes.

Can we construct communication strategies that deliver information when we most need it and when we perceive salience of intervention?

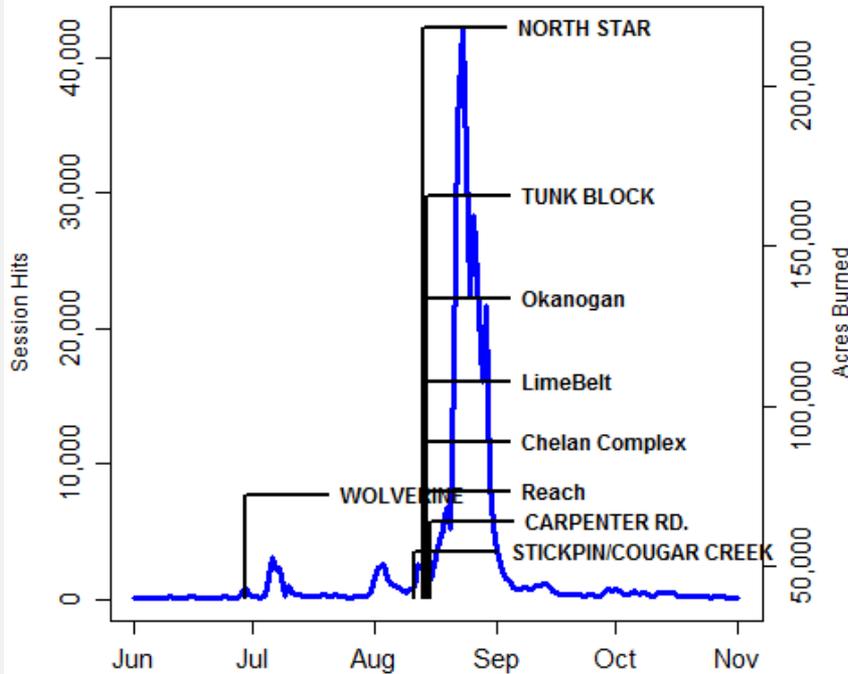
Would communication strategies that educate and engage improve health outcomes?

How effective would we be? What are the barriers?

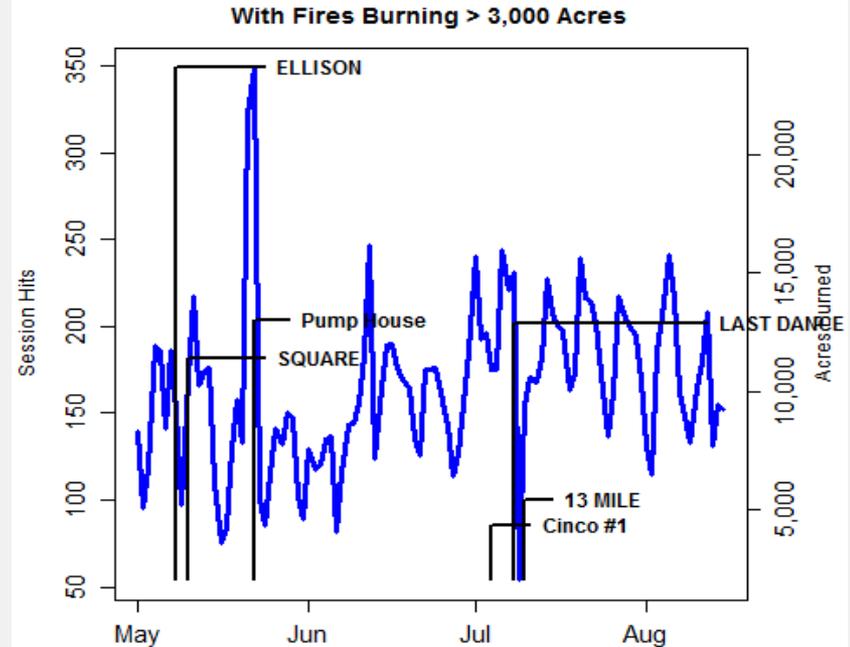




AirNow Sessions, WA



AirNow Sessions, FL



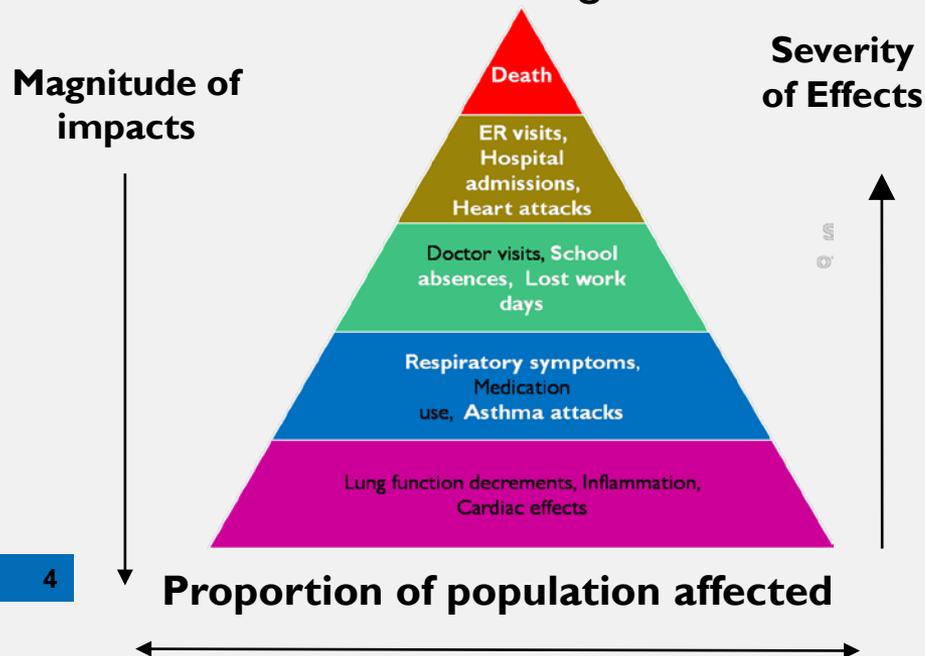
Source: AirNow

Smoke Sense

Citizen Science Study

Objective :

- 1) Understand the context - determine the extent to which exposure to wildland fire smoke affects health and productivity, what are the prior beliefs and experiences that define individual level response.
- 2) Develop contextual health risk communication strategies.



4



Smoke Sense

Study is facilitated through the use of Android and iOS app

Why citizen science?

- Citizen science is a “model for the democratization of research and policy making” (2016 NACEPT Report, Environmental Protection Belongs to the Public)
- Smoke Sense invites open participation and supports stakeholders affected by smoke by:
 - 1) promoting issue engagement and education
 - 2) sharing what we learn about the influence of exposure on individual and public health
 - 3) supporting federal, state, tribal, and local strategies to protect & improve health.
- This approach supports the goals of better understanding EPA’s constituents so that their experiences, perspectives, needs, and priorities are reflected in EPA’s work.

Smoke Sense Citizen Science Study

For participants:

- Current and forecast air quality
- Satellite imagery of smoke
- Public health risk messaging
- Gamification module to promote desired behaviors and air quality – issue engagement

For state and local communities:

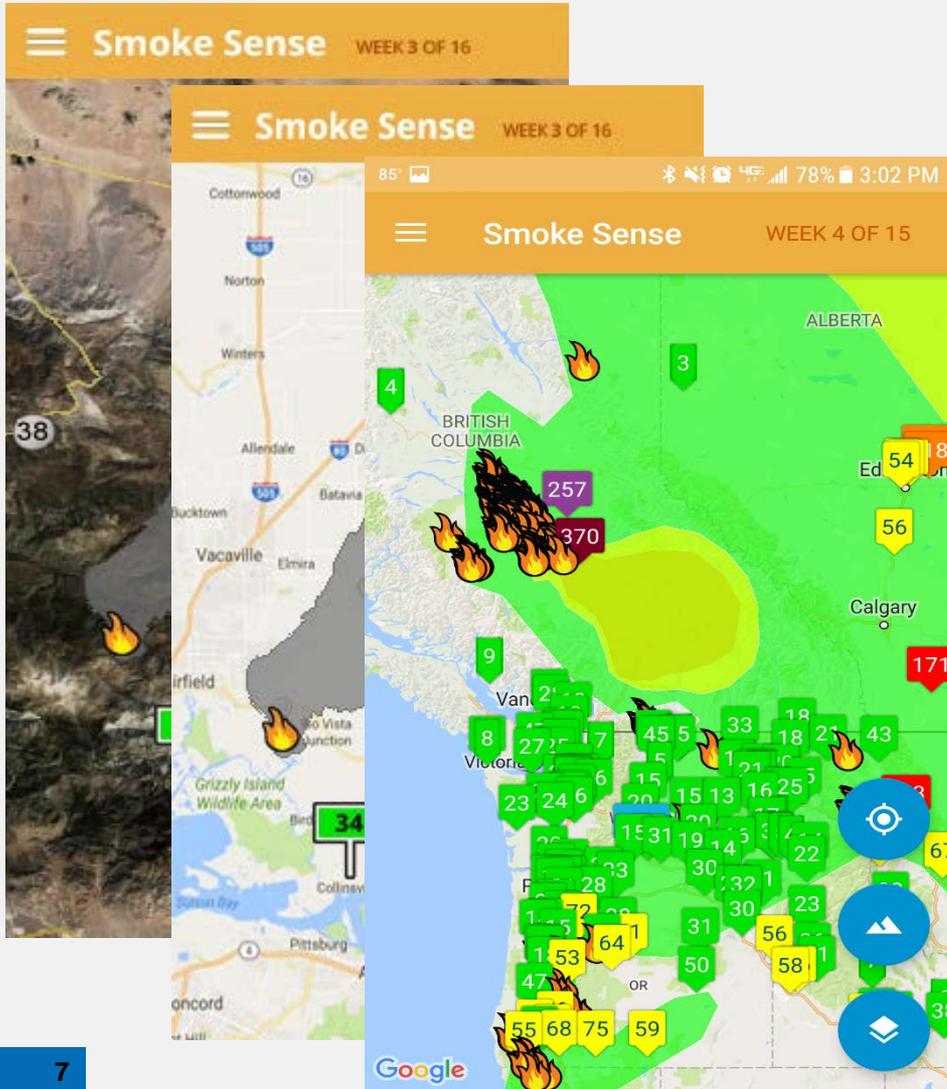
- Regional and national data on reported exposure and subclinical health outcomes

For investigators:

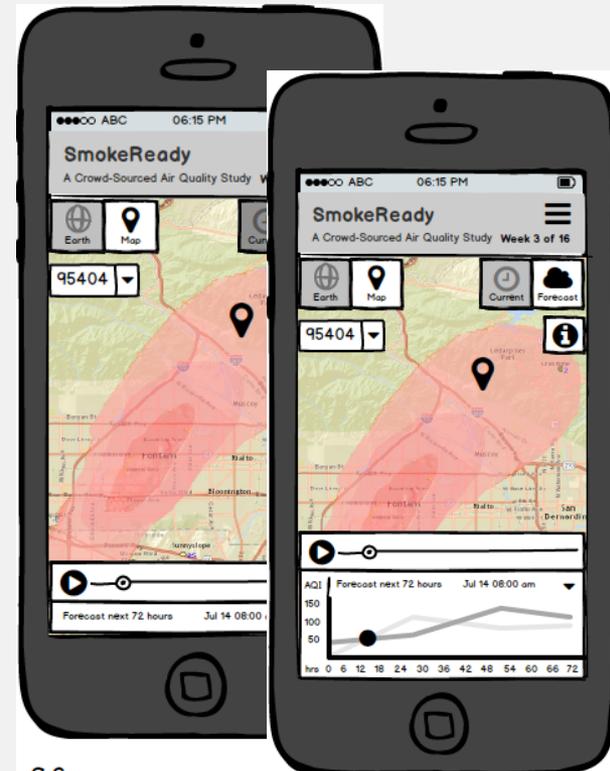
- Demographic profile of users
- Symptom and medication usage survey
- Behavioral survey
- App usage statistics
- Score card on behavior from the gamification module



Features: Satellite images of smoke plumes hourly smoke forecasts



Incorporates NOAA, NASA, and USFS data



9.2

9.3

Features: Smoke and Health Observations

Pilot Year:

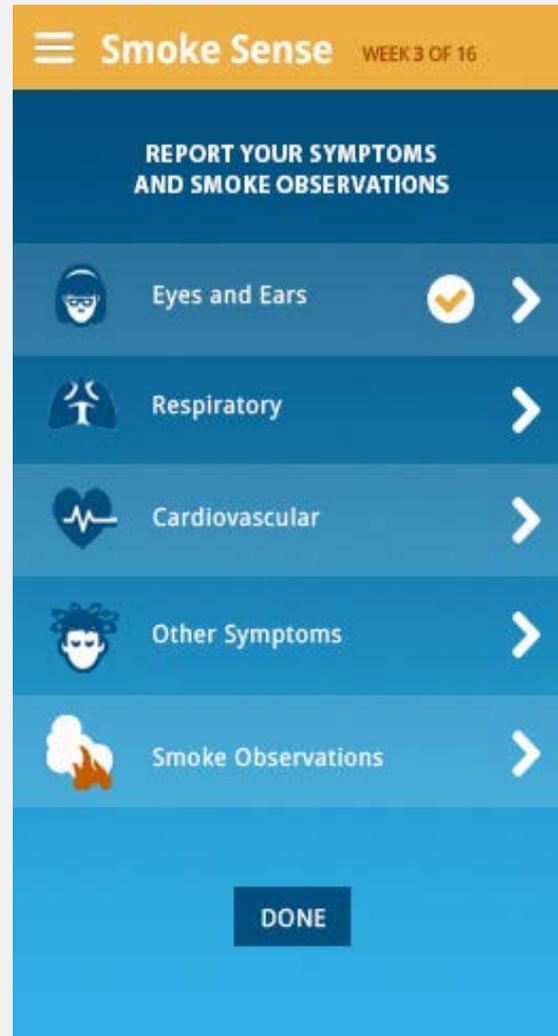
Profile – demographic information and baseline levels of health symptoms, baseline activity level and perceptions about health risks of air pollution.

Symptoms Observations- users are invited to report weekly observations of health symptoms (Yes/No).

Smoke Observations – questions about smoke exposure during the previous week including their actions (did you miss days from work) and perceived or actual exposures (did you smell smoke inside your home) during the past week.

Year 1 Changes:

Incorporating data playground, attitudinal valences, and refinements to location and exposure assessments



Smoke Sense WEEK 3 OF 16

REPORT YOUR SYMPTOMS AND SMOKE OBSERVATIONS

- Eyes and Ears
- Respiratory
- Cardiovascular
- Other Symptoms
- Smoke Observations

DONE



Smoke Sense WEEK 3 OF 16

EYES AND EARS SYMPTOMS

DID YOU EXPERIENCE THE FOLLOWING SYMPTOMS IN THE PAST WEEK: WATERY EYES, STINGING EYES OR EAR INFECTION?

MON	TUE	WED	THU	FRI	SAT	SUN
6	7	8	9	10	11	30

WERE YOU TREATED BY A PHYSICIAN FOR THESE SYMPTOMS?

No

Yes (Outpatient or Clinic)

Yes (Inpatient Hospitalization)

DID YOU USE MEDICATION TO TREAT YOUR SYMPTOMS?

No

Yes (Prescription)

Yes (Over the Counter)

WERE YOU TRAVELING MORE THAN 50 MILES FROM HOME WHEN YOU EXPERIENCED THESE SYMPTOMS?

No

Yes

SAVE

Gamification: Participation Component + Education Component

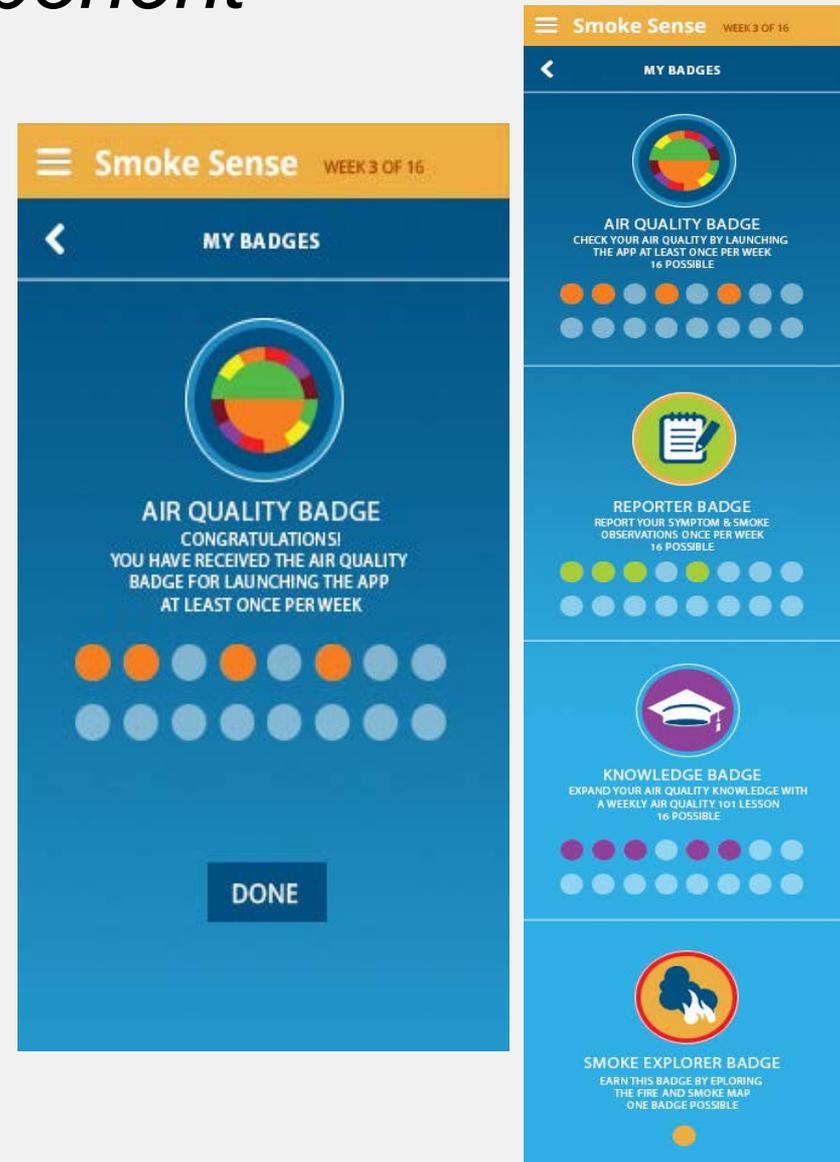
Badge Reward System facilitates and measures engagement.

Air Quality Badge - for participating and launching the app at least once per week.

Science Science/ Reporter Badge - for reporting symptoms and smoke observations once per week.

Knowledge Badge – for expanding air quality knowledge with a weekly air quality 101 lesson.

Smoke Explorer Badge – for exploring fire and smoke maps.

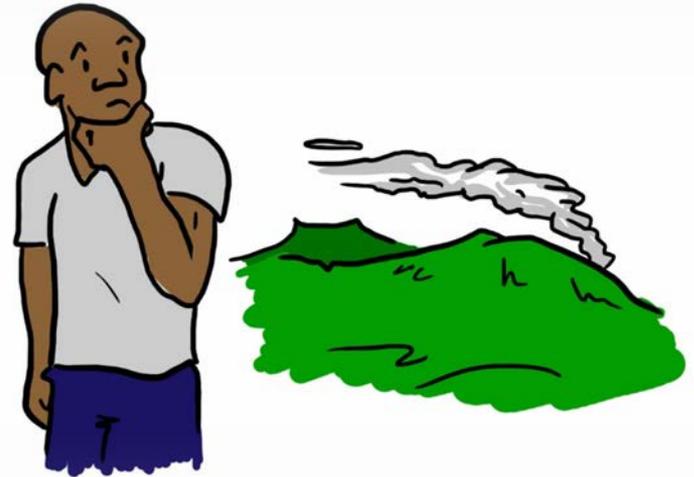


Gamification - Education component

Weekly Air Quality 101 module:

Week #8 Question:

*“Kai is healthy and young.
Can he assume that the smoke
From the wildfire won’t affect him?”*



Answer:

NO. High concentrations of smoke can trigger a range of symptoms even in healthy individuals. Common symptoms include burning eyes, a runny nose, cough, phlegm, wheezing and difficulty breathing. Smoke may also reduce your lungs’ ability to protect against inhaled substances such as pollen, bacteria or viruses. If you have heart or lung disease, smoke may make your symptoms worse. Learn about the

health effects from smoke at <https://go.usa.gov/xXa8c>

Feedback to the Users

Weekly observations are aggregated and visible to users.

Year 1 will expand to include interactive “playground” for users to further explore the data and social norms.

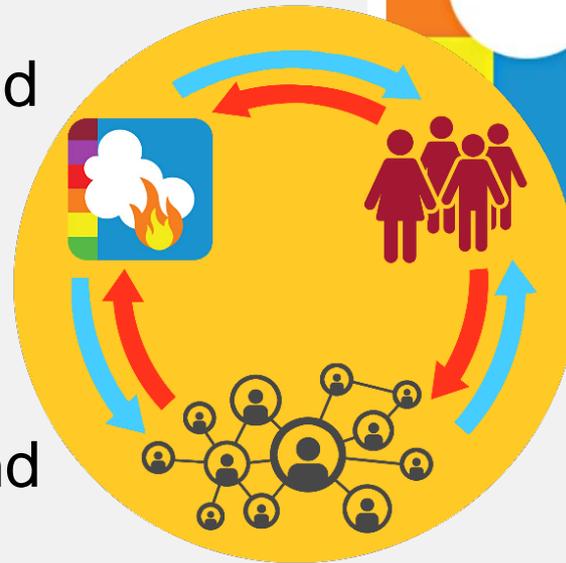


Engagement at Individual & Community Levels



How we plan to get there...

1. Broadly increasing awareness of the project and fostering interest in the app
2. Working to establish and grow collaborations with partner agencies
3. Working to better understand end users' experiences, motivations, and ideas for the project's future development.



Pilot Season

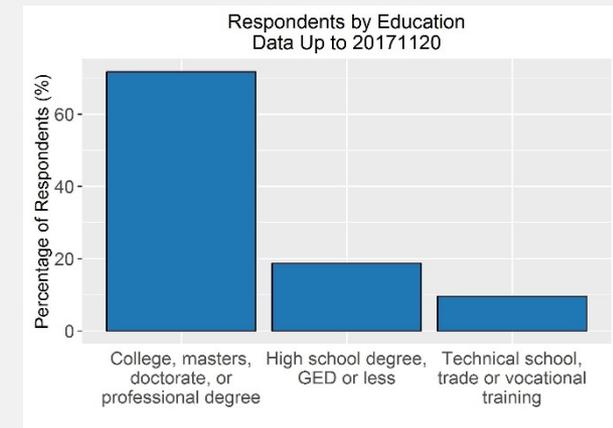
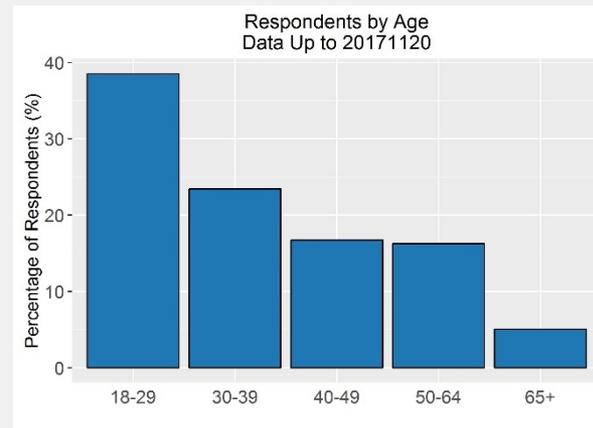
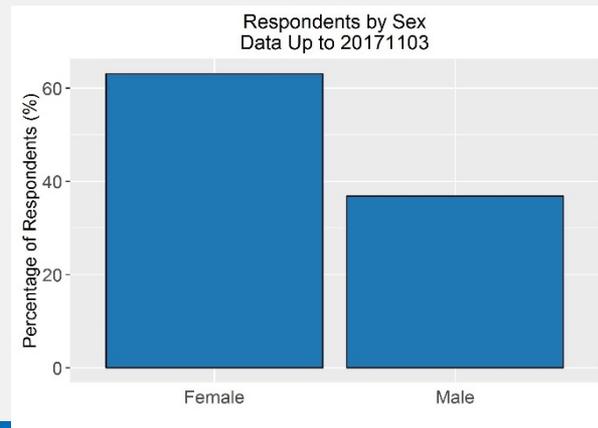
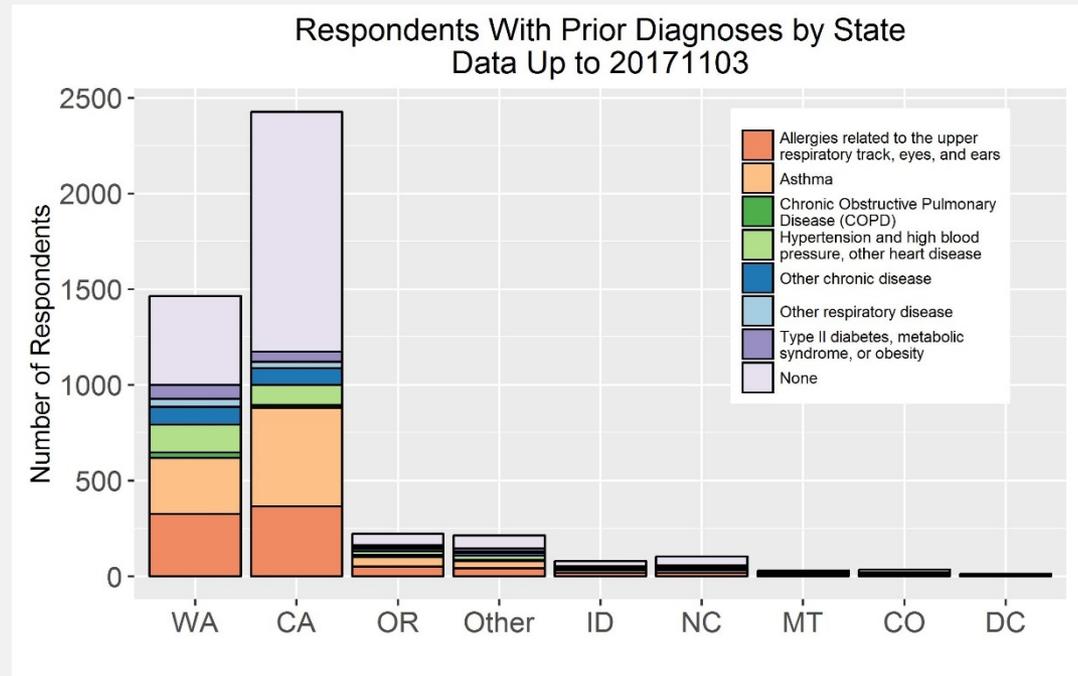
Aug 1st – Oct 31st Android
Oct 5th – January 7th iOS

6,000+ participants
50,000 sessions initiated

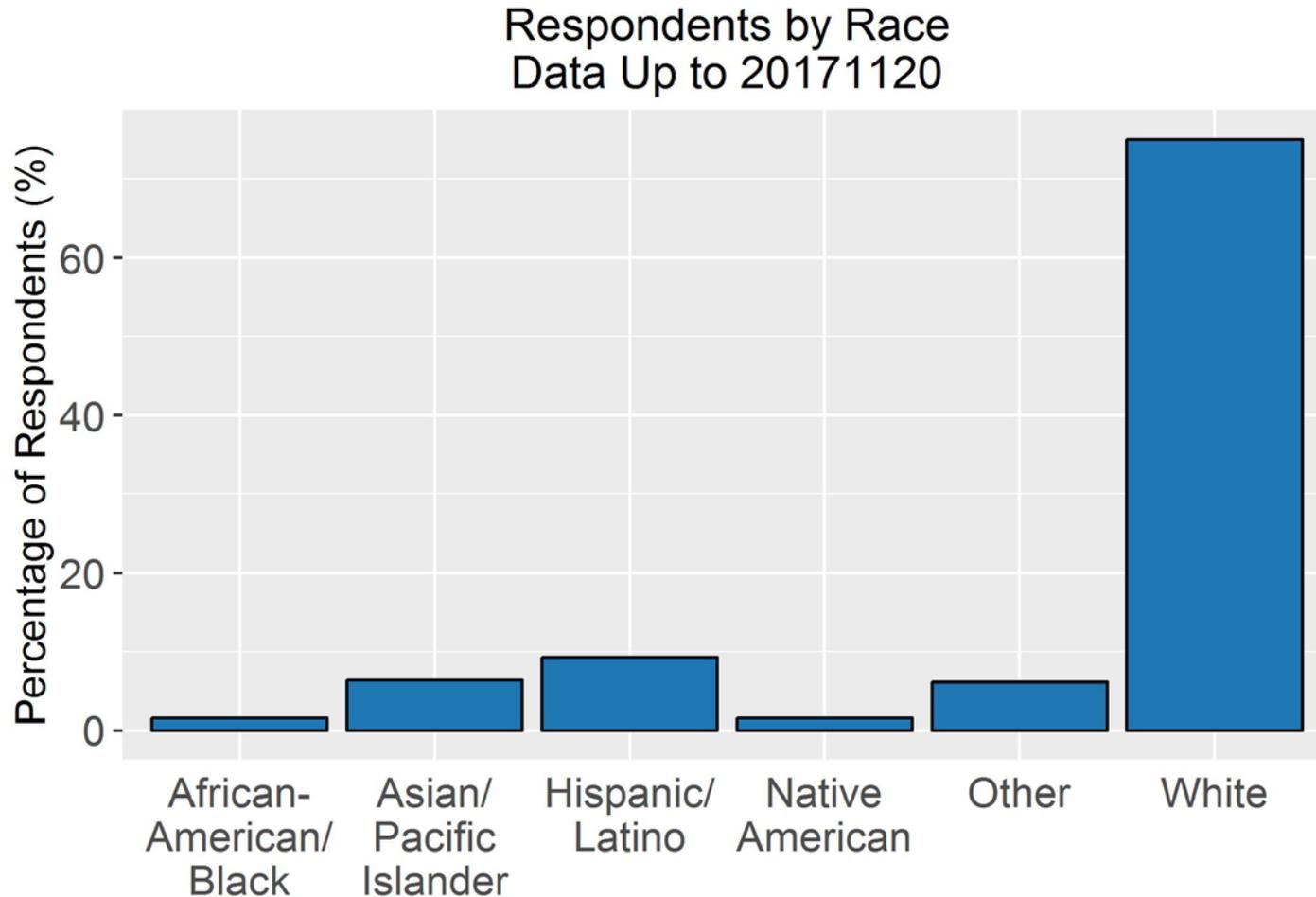


Sample Results – 11/20/2017

Large smoke events
in WA, OR, CA



Sample Results – 11/20/2017



Sample Results – 11/20/2017

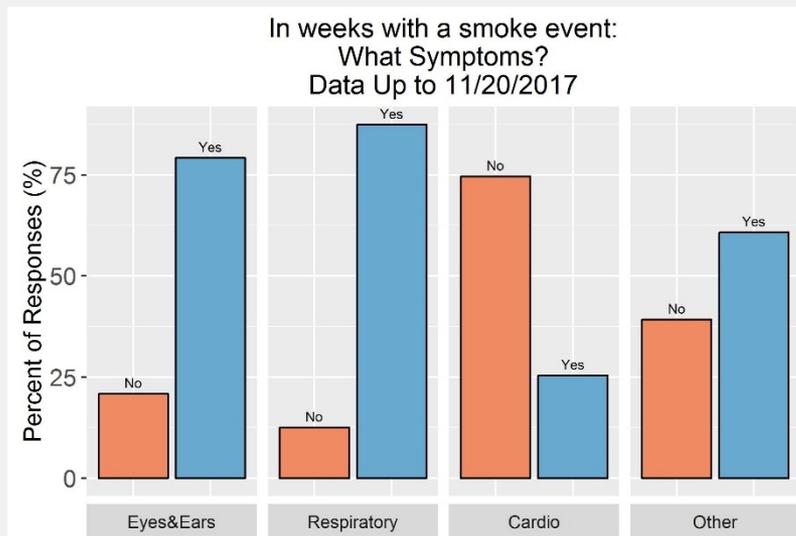
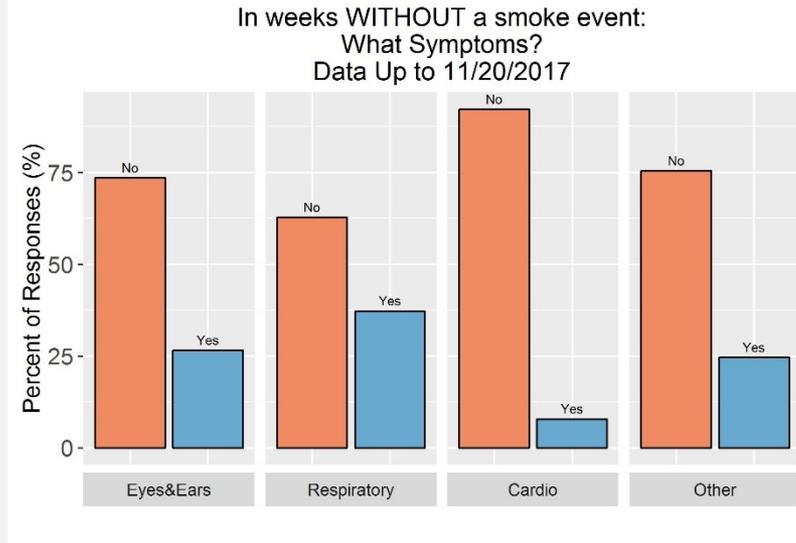
“Did you experience symptoms such as:

[Eyes&Ears] stinging, itchy, or watery eyes, ear infection, allergic symptoms, or similar?

[Respiratory] runny or stuffy nose, scratchy throat, irritated sinuses, coughing, trouble breathing normally, shortness of breath, wheezing, asthma attack, allergic symptoms, or similar?

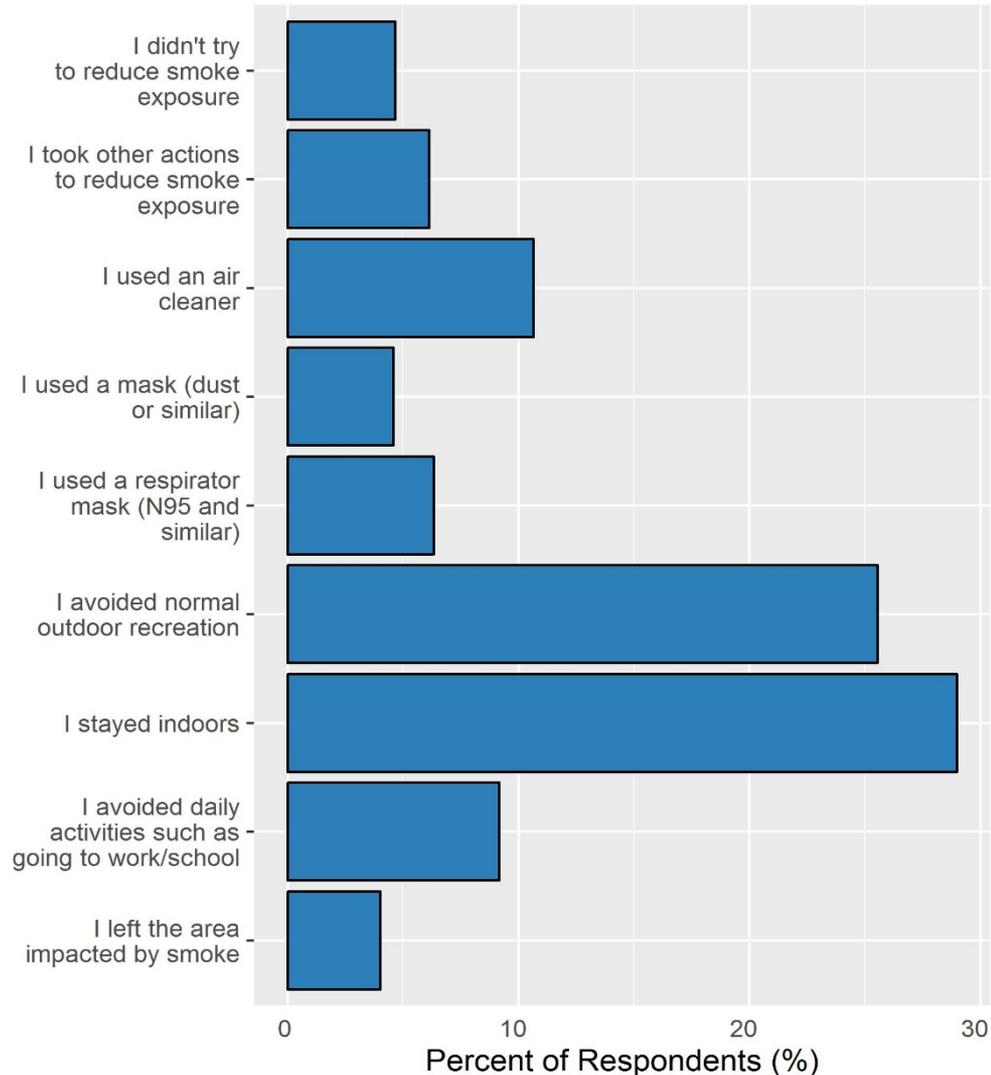
[Cardio] fast or irregular heart rate, pain or tightness in the chest, high blood pressure or similar?

[Other] tiredness, dizziness, viral infections, or other?”



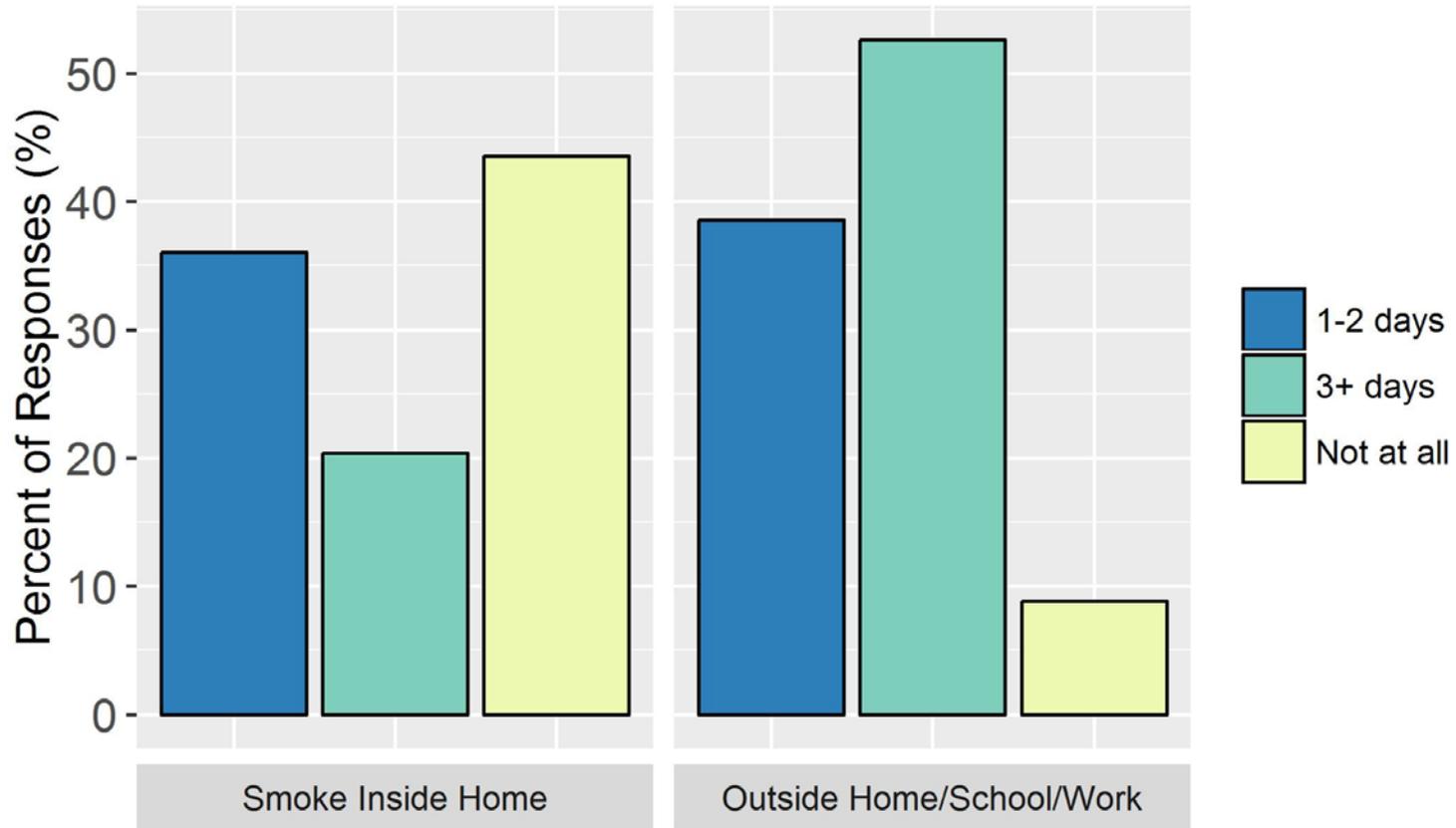
Behavioral Choices

In weeks with a smoke event:
Did You Attempt to Reduce Smoke Exposure?
Data Up to 11/20/2017



Indoor Air Quality

In weeks with a smoke event:
Where did you smell smoke?
Data Up to 11/20/2017



Need a public health strategy to address air quality during these periodic and transient exposures:

- Smoke Sense – delivers AQ information to the users directly and facilitates engagement with the issue
- Smoke Sense is reaching the affected communities and filling the gap in knowledge. 90% sessions are returning users
- Smoke Sense *does not* fill the need for surveillance
- Data validity and reliability
- Pilot year results indicate:
 - Vast impacts are experienced on low level symptoms.
 - Symptoms in all outcome groups double during smoke episodes.
 - Indoor air quality is an issue.



Smoke Sense is gearing up for its first year

- Informational components of the app are currently active – AQI, maps, etc.
- Data collection components are under revision – will start back up in late spring/early summer 2018.
- We are summarizing results which will be shared on the website and publications.
- New features – hourly forecasts of smoke, personalized messaging, satellite streaming, crowdsourcing motivations and experiences.
- Development of STEM curriculum.
- Expanding stakeholder engagement and community participation.
- Multiple languages.

www.epa.gov/air-research/smoke-sense

Follow us on Twitter: #SmokeSense

Search “Smoke Sense at EPA”

Email: smokesense@epa.gov

Participate in the interview (ICR pending):
hano.mary@epa.gov

Thank you

Ana G. Rappold
Environmental Public Health Division
ORD/NHEERL
U.S. Environmental Protection Agency
Email: rappold.ana@epa.gov