Household Perceptions and Preparedness for Wildfire Smoke:

Findings from a Community Assessment for Public Health Emergency Response in Spokane, Washington

Presented by:

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Image source: The Atlantic

Agenda

1. Spokane Context
2. Motivating Work
3. Study Questions
4. Methods
5. Findings
6. Implications and Next Steps



Source: Seattle Met

Spokane Context

- Classified as an “overburdened community highly impacted by air pollution” *(Ellison, 2023)*
- Experiences an annual average of 7.3 “unhealthy” air quality days, compared to the Washington state annual average of 6.7 days *(Ellison, 2023)*
- Experienced its three hottest summers from 2015-2024 *(Loyd & Weiford, 2024)*
- 19 heat-related deaths from June 26 - August 31, 2021 *(Washington DOH, 2023)*



Source: KREM

Prior Work

- Urban heat island mapping, 2022
- Extreme heat community survey, 2022 (Lau et al., 2024)
- Extreme heat symposium, 2023 (Reed et al., 2024)
- Smoke Ready Spokane, 2024 - present
  - Wildfire smoke symposium (Reed et al., 2025)
  - Wildfire smoke health risk & educational campaign
  - Indoor air quality sensing & informational dashboards
  - HVAC improvements in community buildings
  - Community survey



Source: Gonzaga Climate Institute

Prior Work

- Spokane Community Resilience Collaborative, 2024
- Publication of extreme heat and wildfires smoke resilience plans, 2025
- Establishment of the Spokane Community Resilience Hub Network, 2026
- Distribution of 400+ portable air cleaners, 2026
- Revisions to the climate resilience plans
- Establishment of the Spokane Wildfire Academic Consortium (SWAC)



August 2026 Spokane Complex Fires

- Three related fires (Old Trails, Autumn Lane, and Fairview) that were started by arson on August 1st, 2026
- 10,363 acres burned
- 65,000 people evacuated
- 846 structures destroyed
- $1 billion+ in damages
- 0 direct fatalities and injuries
- Indirect impacts have yet to be estimated

Source: Young Kwak/AP





Academic and Community Partners









Research Questions

1. What community resources do people already use for wildfire smoke safety and which resources are underutilized or lacking?
2. Is wildfire smoke perceived as a threat that requires action on the household level?
3. What motivates Spokane community members to take action to keep themselves and their neighbors safe during a wildfire smoke event?

Methods

Hypothesis: There will be unmet preparedness needs dependent on household- and community-level characteristics in a region that frequently experiences severe wildfire smoke and extreme heat.

Framework: Centers for Disease Control and Prevention's (**CDC**) Community Assessment for Public Health Emergency Response (**CASPER**)

Study Population: Residential households within the municipal boundary of the City of Spokane

Sampling Method: Two-stage cluster sampling

- Selection of 30 "clusters" with a probability proportional to the number of households within them
- Systematic random selection of 7 households per cluster
- Goal of 210 completed survey responses (168 needed to generalize findings to entire community)

Survey Tool: 35 questions related to concerns about environmental hazards, wildfire smoke health impacts, community wildfire smoke impacts, exposure reduction strategies, Resilience Hub preferences, air quality and wildfire smoke information preferences, and demographics









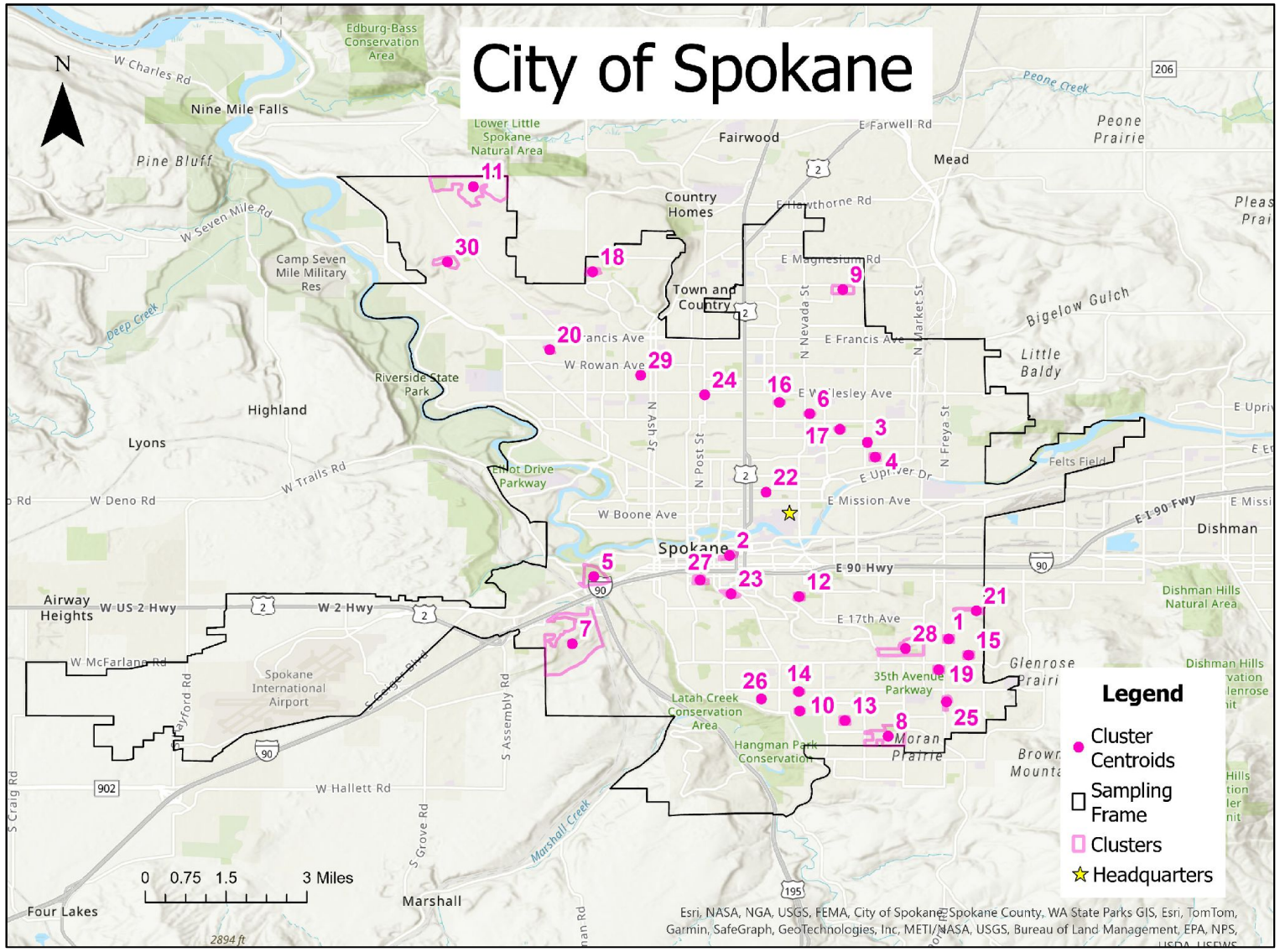
CASPERs can be conducted throughout the disaster cycle (preparedness, response, recovery, mitigation) and in non-disaster situations to provide public health leaders and emergency managers household-based information about a community.





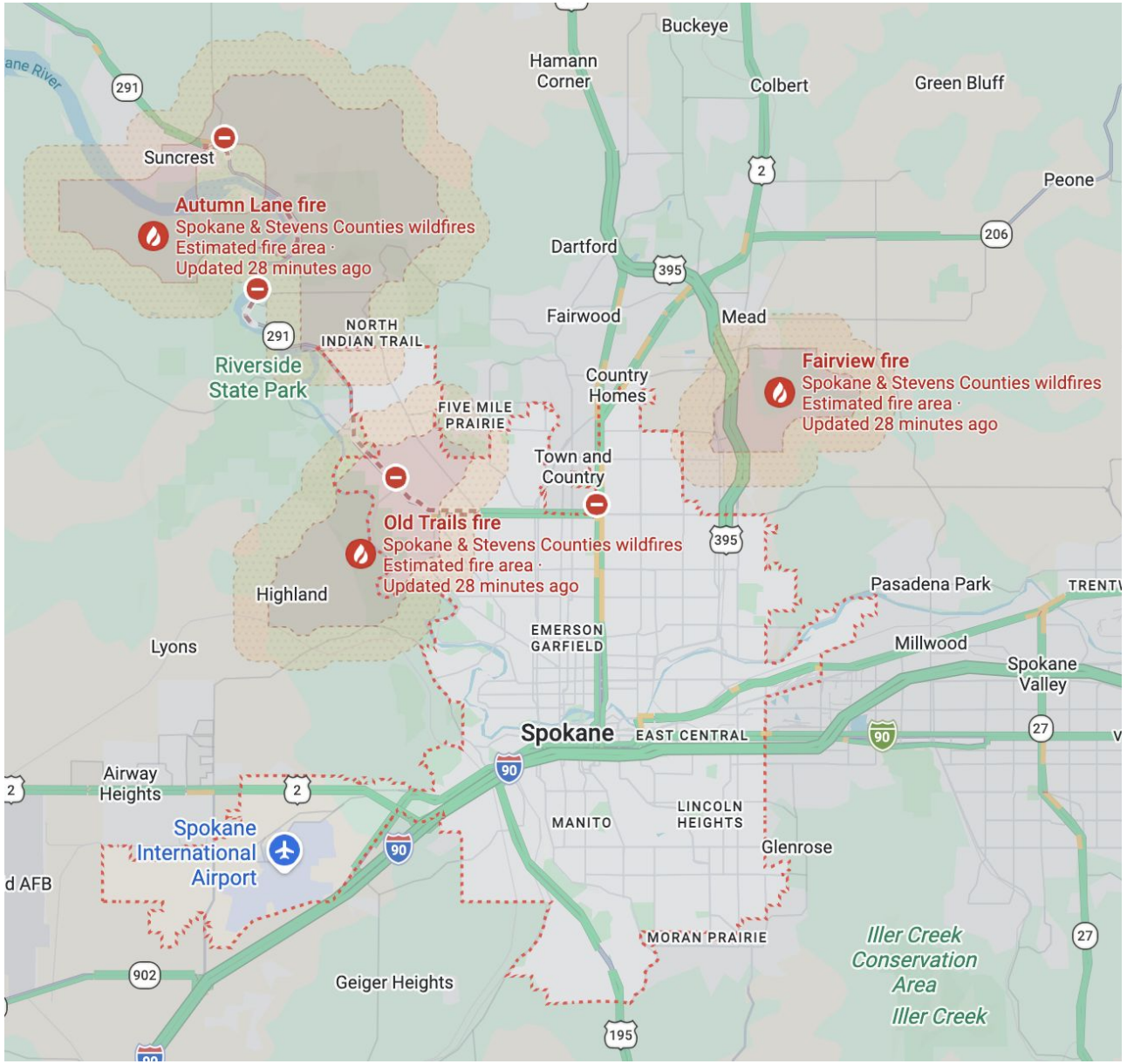
Source: CDC

Sampling Frame



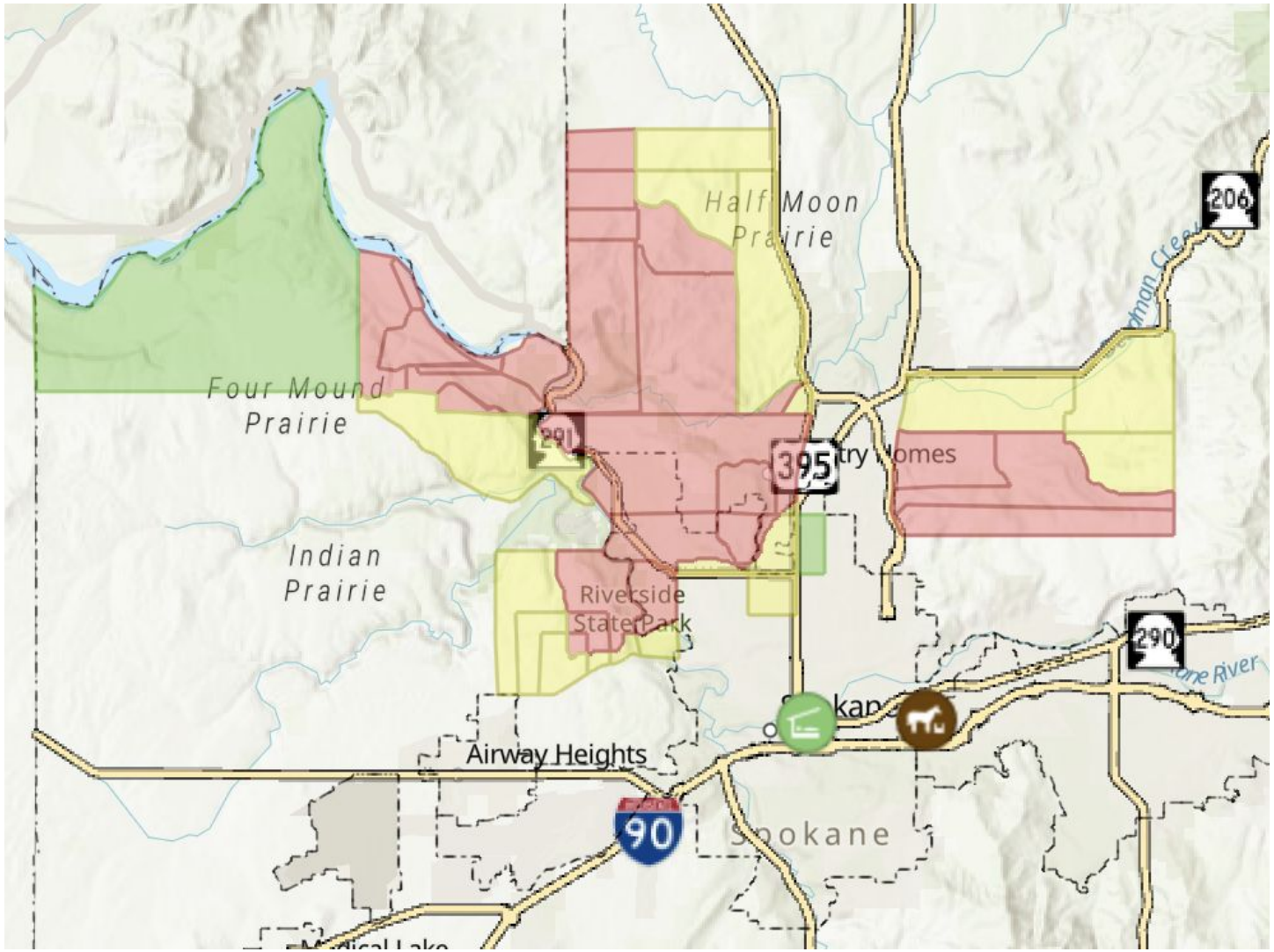
Data from the U.S. Census Bureau, ArcGIS Pro.

August 2026 Spokane Complex Fires



Source: Google Maps

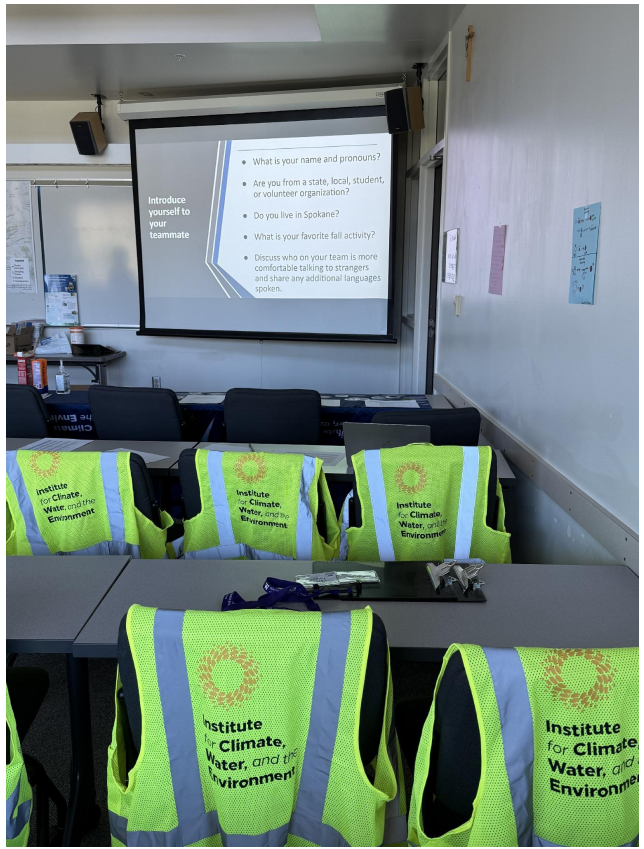
Evacuation Zones



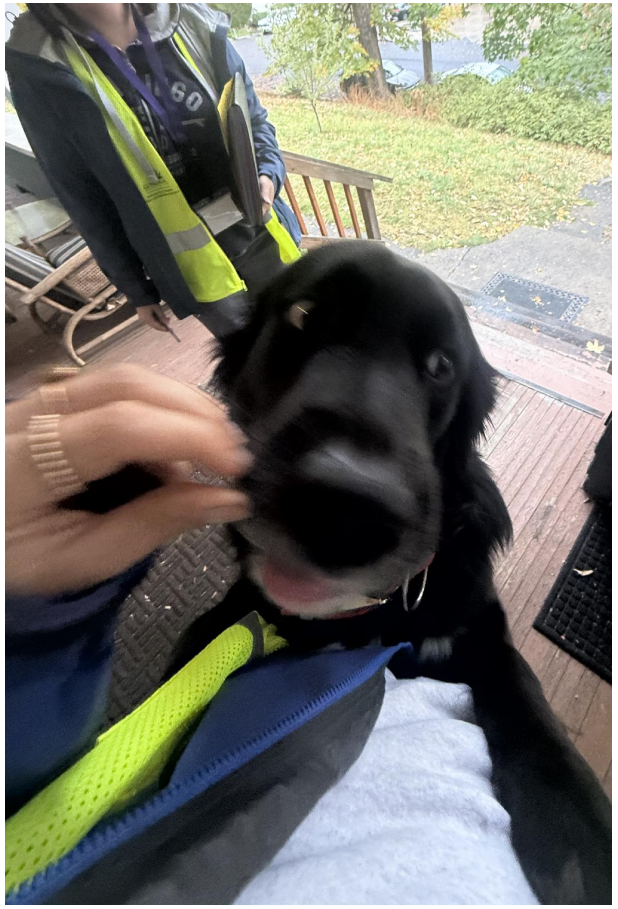
Source: City of Spokane

What Happened

- Volunteers were trained on household identification, survey administration, and safety protocols
- Volunteer teams administered the survey from October 10-13, 2025 (Friday – Monday)
- Contacted 422 households → 94 completed the survey







FINDINGS

Demographics

Household Demographics *(N = 94)*	n (%)
Housing structure type	
Multiple unit (e.g., apartment, condo)	22 (23%)
Single family	72 (77%)
Home ownership status	
Own	66 (70%)
Rent	28 (30%)
Household has at least one member who identifies as:	
American Indian/Alaska Native	7 (7.4%)
Asian	5 (5.3%)
Black or African American	2 (2.1%)
Mixed	8 (8.5%)
Native Hawaiian or Other Pacific Islander	2 (2.1%)
White	84 (89%)
Hispanic/Latino/Latinx	9 (9.6%)
Identify as choice not listed above	2 (2.1%)
Prefer not to say	2 (2.1%)
Household member prefers non-English materials	4 (4.3%)

Demographics (cont'd)

Household has at least one member in the age bracket:	
>1 year old	2 (2.1%)
1–4 years old	7 (7.4%)
5–11 years old	15 (16%)
12–17 years old	14 (15%)
18–29 years old	33 (35%)
30–44 years old	33 (35%)
45–64 years old	30 (32%)
65+ years old	25 (27%)
Chronic health condition present in household	
Yes	32 (34%)
No	60 (64%)
Unsure	2 (2.1%)
Household use of essential medical equipment	
Yes	24 (26%)
No	67 (71%)
Unsure	3 (3.2%)

Issues of Concern

Top Three Household Concerns *(N = 94)*	n (%)
Cost of living	66 (70.2%)
Environmental impacts on my household's health	44 (46.8%)
Crime or violence	35 (37.2%)
Housing affordability	31 (33.0%)
Healthcare access	26 (27.7%)
Civil unrest	14 (14.9%)
Racial and ethnic inequality	14 (14.9%)
Job security	13 (13.8%)
Food security	10 (10.6%)
Other	4 (4.3%)
Unsure	1 (1.1%)

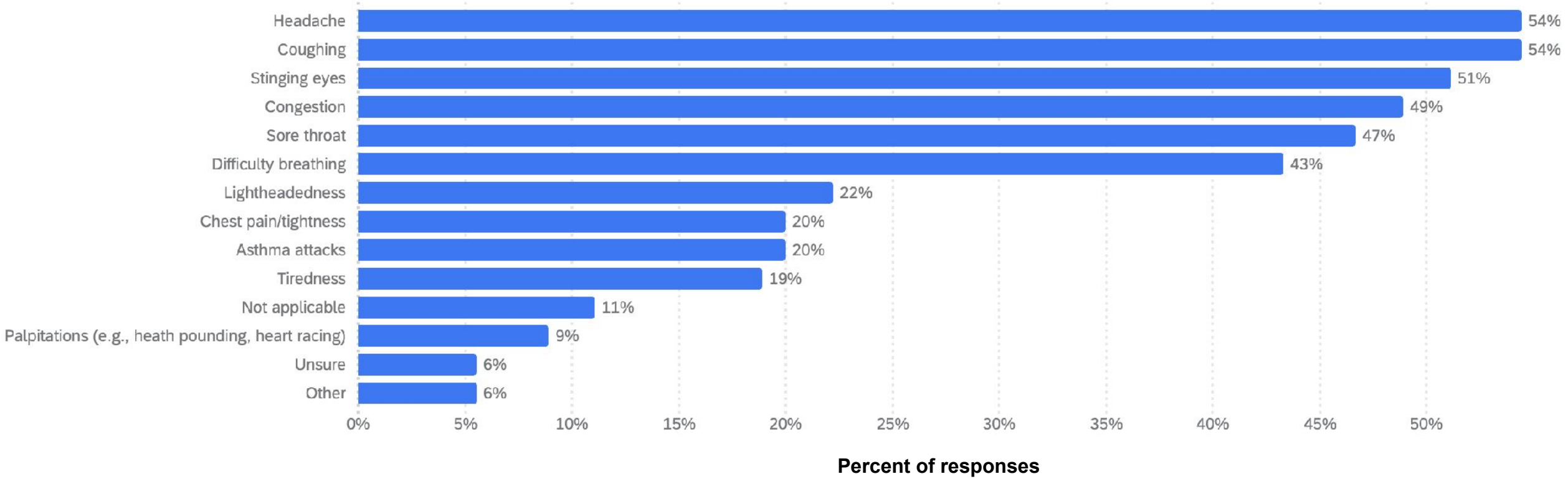
Environmental Hazards of Concern

Experience and Concern of Environmental Hazards* *(N = 94)*

Hazard	Experienced	Low Concern	Medium Concern	High Concern
Wildfire smoke	82 (92.1%)	9 (9.9%)	26 (28.6%)	56 (61.5%)
Poor air quality	82 (92.1%)	11 (12.0%)	41 (44.6%)	40 (43.5%)
Extreme heat	61 (71.8%)	23 (24.7%)	47 (50.5%)	23 (24.7%)
Wildfires	50 (58.8%)	17 (18.7%)	35 (38.5%)	39 (42.9%)
Fine particulate matter	50 (58.1%)	26 (31.0%)	31 (36.9%)	27 (32.1%)
Extreme cold weather	49 (56.3%)	39 (41.9%)	38 (40.9%)	16 (17.2%)
Severe winter storms	47 (54.7%)	36 (38.7%)	44 (47.3%)	13 (14.0%)
Drought or water shortage	23 (26.4%)	48 (53.3%)	26 (28.9%)	16 (17.8%)
Ozone	22 (25.9%)	42 (51.9%)	25 (30.9%)	14 (17.3%)
Earthquakes	10 (11.8%)	83 (91.2%)	6 (6.6%)	2 (2.2%)
Contaminated local food	7 (8.0%)	66 (75.0%)	14 (15.9%)	8 (9.1%)
Flooding	6 (7.2%)	66 (86.8%)	9 (11.8%)	1 (1.3%)

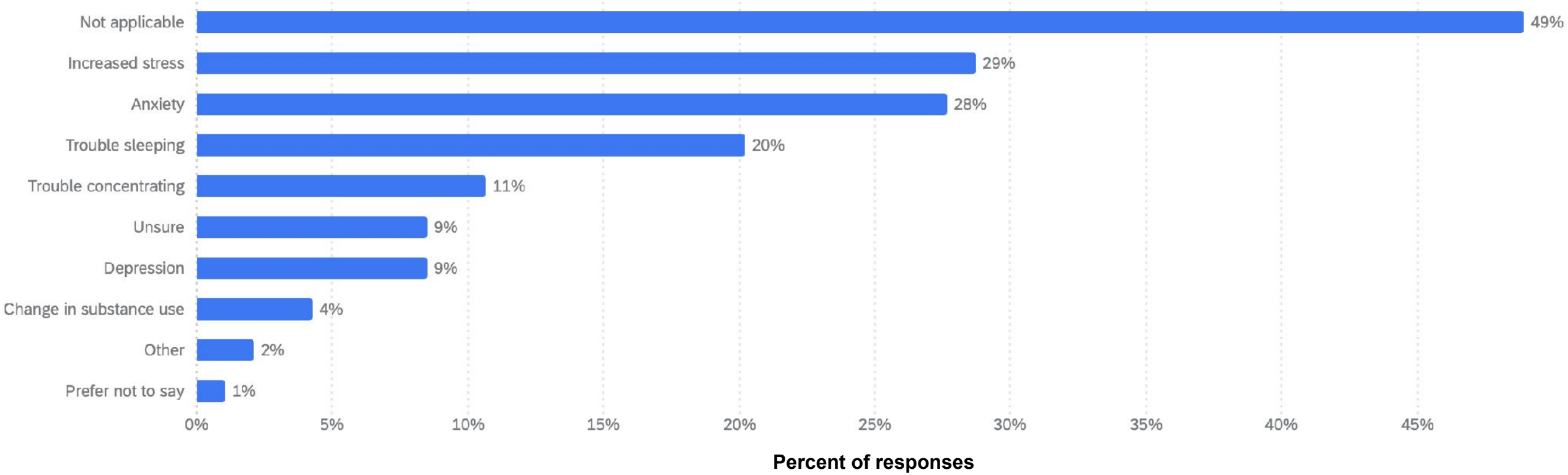
Household-level Impacts

In the past year, did any household member(s) experience any of the following physical health symptoms that are believed to be associated with wildfire smoke exposure? *(N = 90)*



Household-level Impacts

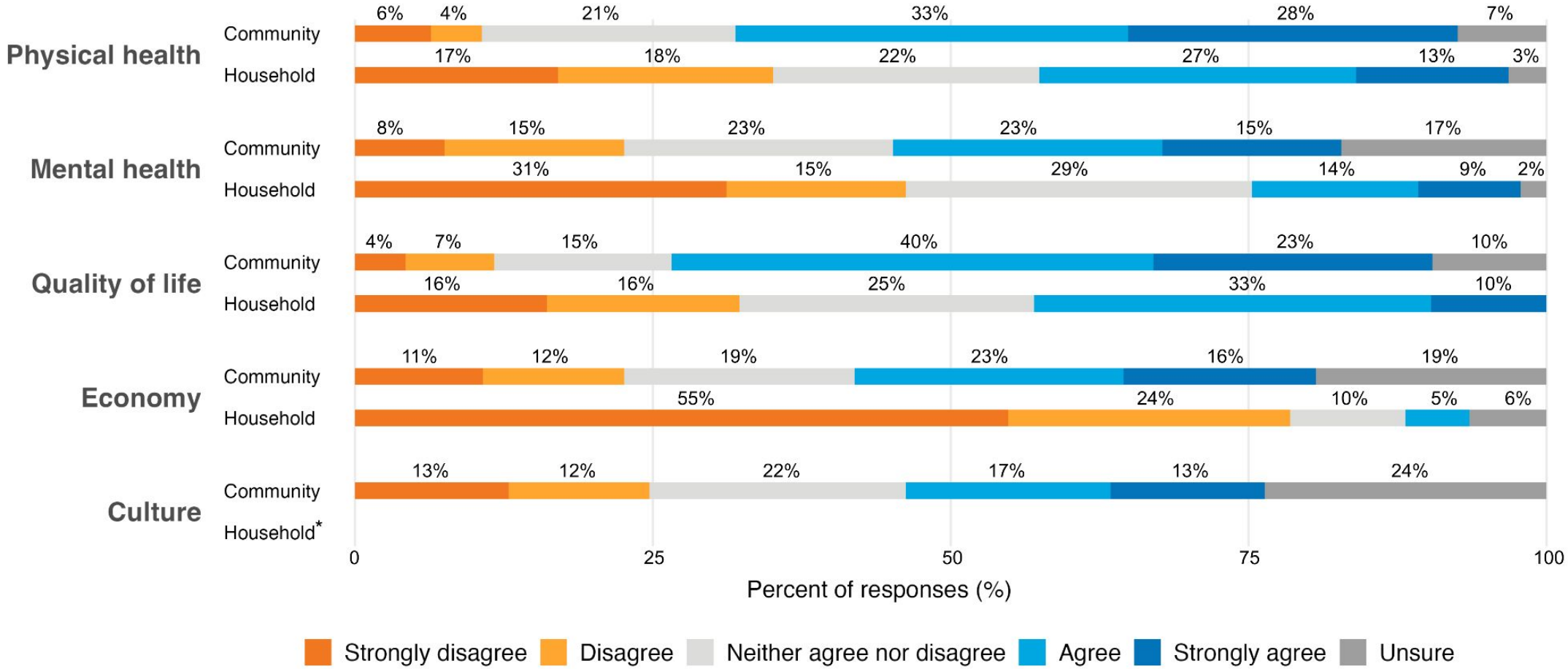
In the past year, did any household member(s) experience any of the following mental health or well-being impacts that are believed to be associated with wildfire smoke exposure? *(N = 94)*



Perceptions of Household vs Community-level Impacts

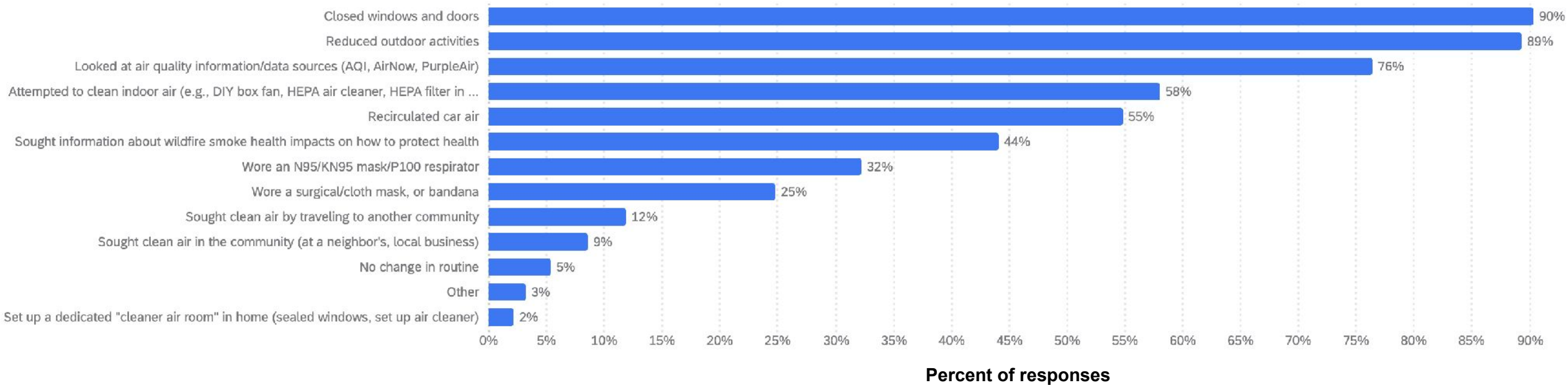
Rate your household's level of agreement with these statements *(N = 94)*:

Wildfire smoke has negatively impacted …



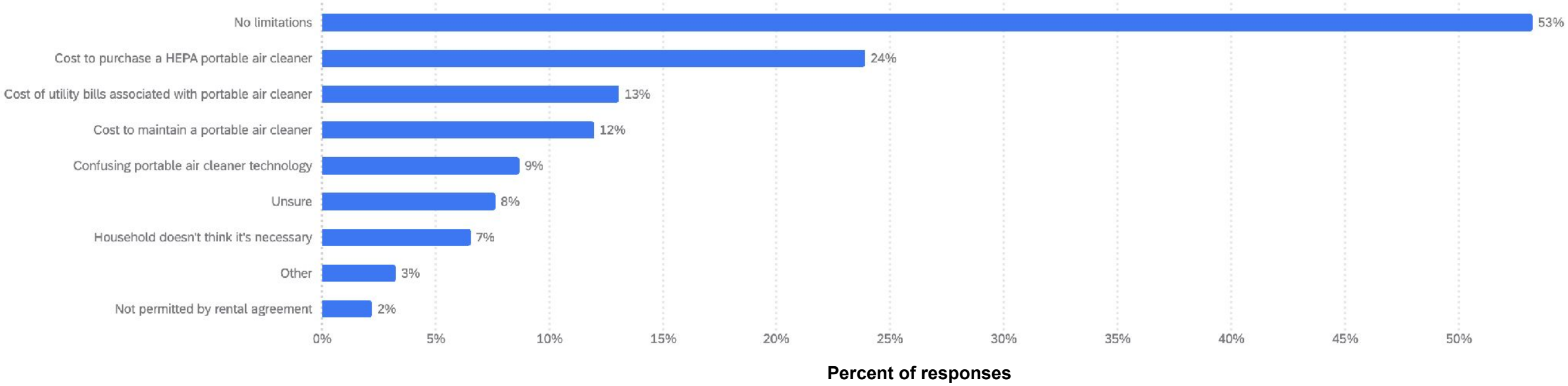
Exposure Reduction

In the past year, did any household member(s) take any of the following steps when wildfire smoke was present? *(N = 93)*



Exposure Reduction

In the past year, what limited your household from actively cleaning your indoor air while wildfire smoke was present? *(N = 92)*



Exposure Reduction

Top three actions to increase community resilience to wildfire smoke *(N = 93)*	n (%)
Cell phone alerts on smoky days	44 (47.3%)
Dedicated funding for local K-12 schools to improve their indoor air quality	41 (44.1%)
Financial assistance for HEPA portable air cleaners	38 (40.9%)
Financial assistance for household HVAC infrastructure (furnace filter upgrade, heat pump installation, system repairs)	31 (33.3%)
Financial assistance for home weatherization/energy audits	27 (29.0%)
Wildfire smoke health awareness resources	25 (26.9%)
Resilience hubs with programming on smoky days	16 (17.2%)
Utility bill assistance	15 (16.1%)
Improved public transportation to resilience hubs	7 (7.5%)
Other	7 (7.5%)
Financial assistance for accessing indoor spaces that cost money	4 (4.3%)
Unsure	3 (3.2%)

Resilience Hub Preferences

Would you or your household member(s) visit a resilience hub during a **wildfire smoke** event? *(N = 93)*

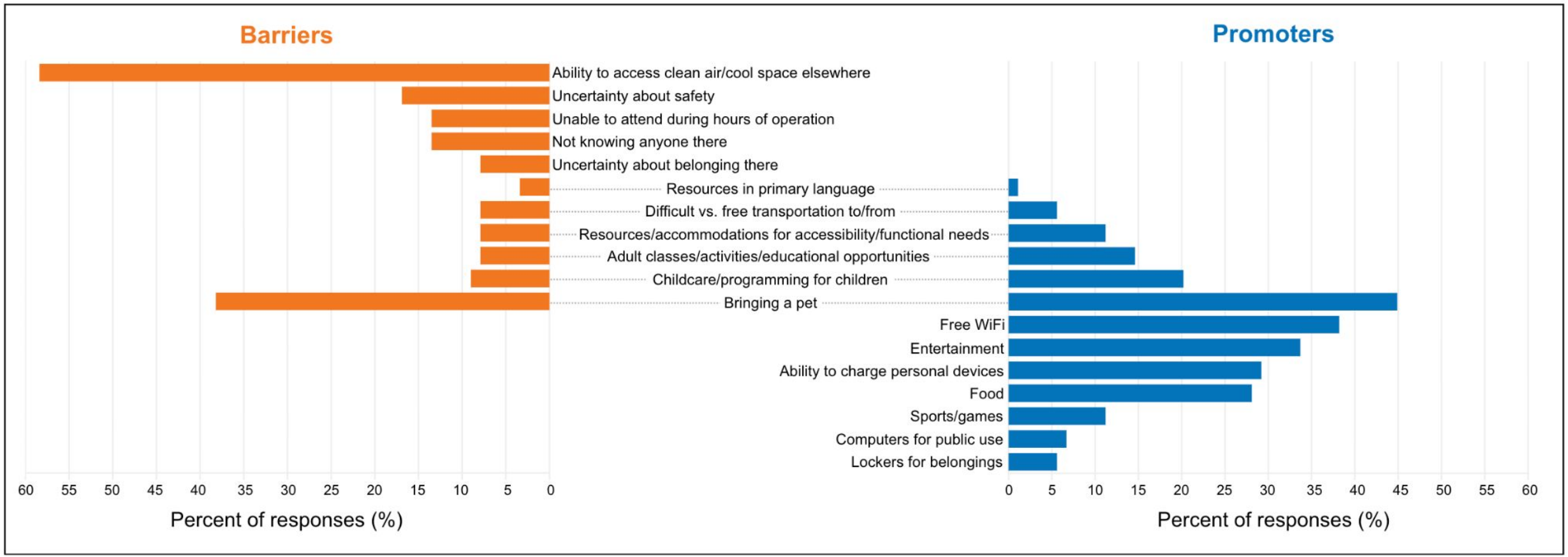
Response	Count (%)
Yes	30 (32%)
No	54 (58%)
Unsure	9 (10%)
Prefer not to say	1 (1%)

Would you or your household member(s) visit a resilience hub during an **extreme heat** event? *(N = 93)*

Response	Count (%)
Yes	30 (32%)
No	54 (58%)
Unsure	9 (10%)

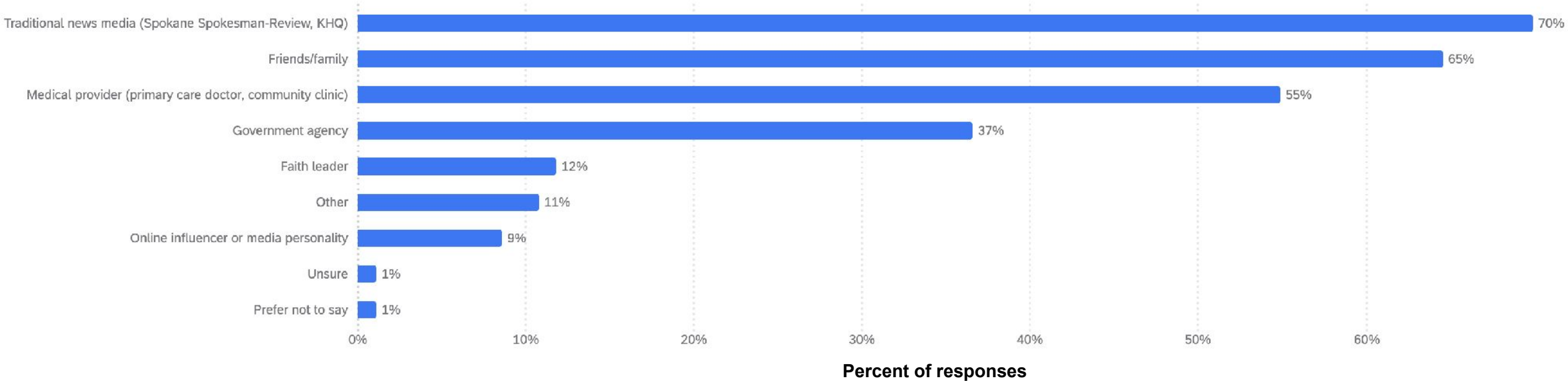
Resilience Hub Preferences

Comparison of the barriers and promoters to visiting Resilience Hubs.



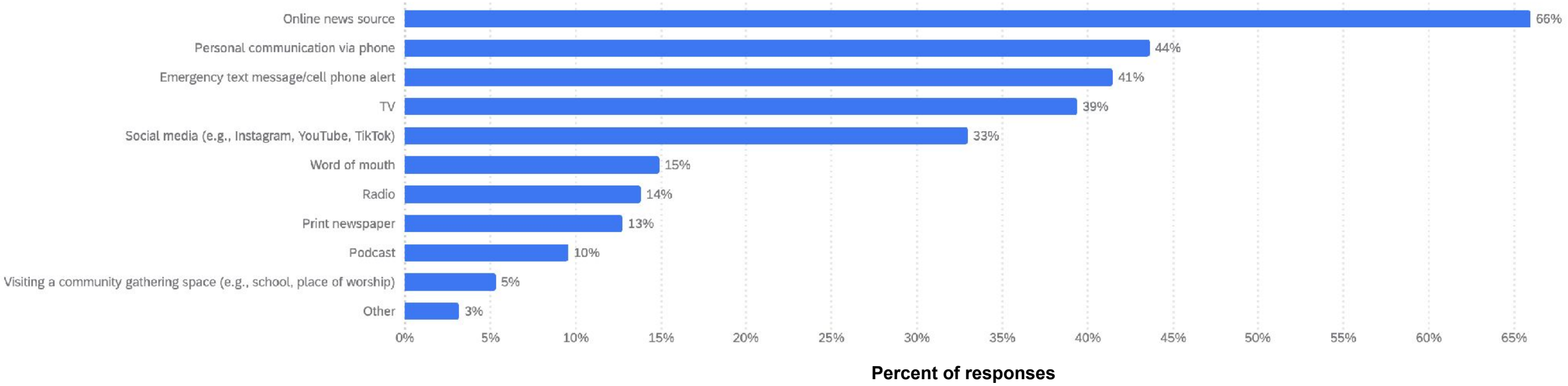
Information Access & Preferences

What are your household's top 3 trusted sources of information about environmental hazards? *(N = 93)*



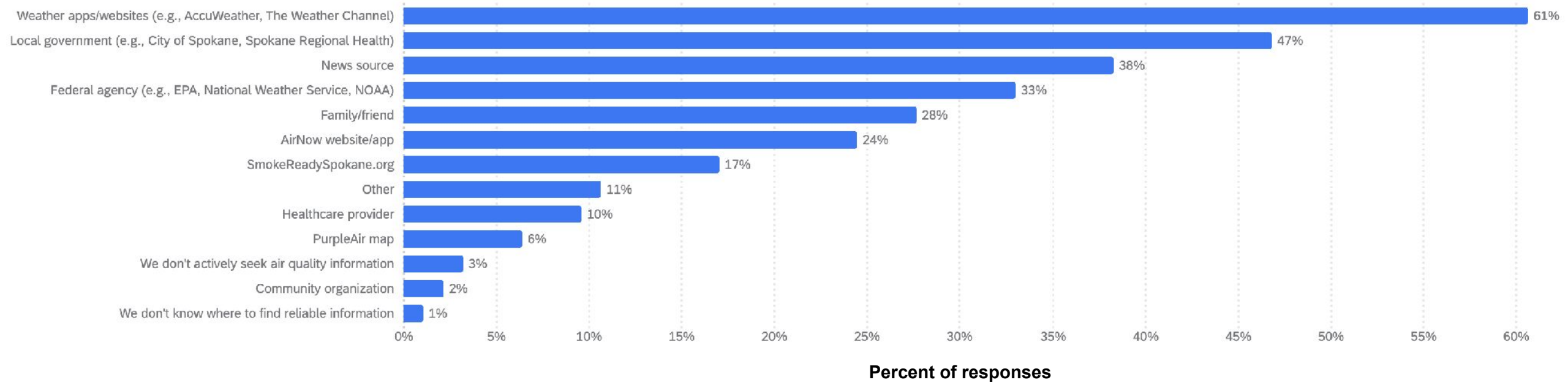
Information Access & Preferences

What are your household's top 3 ways of obtaining information about environmental hazards? *(N = 94)*



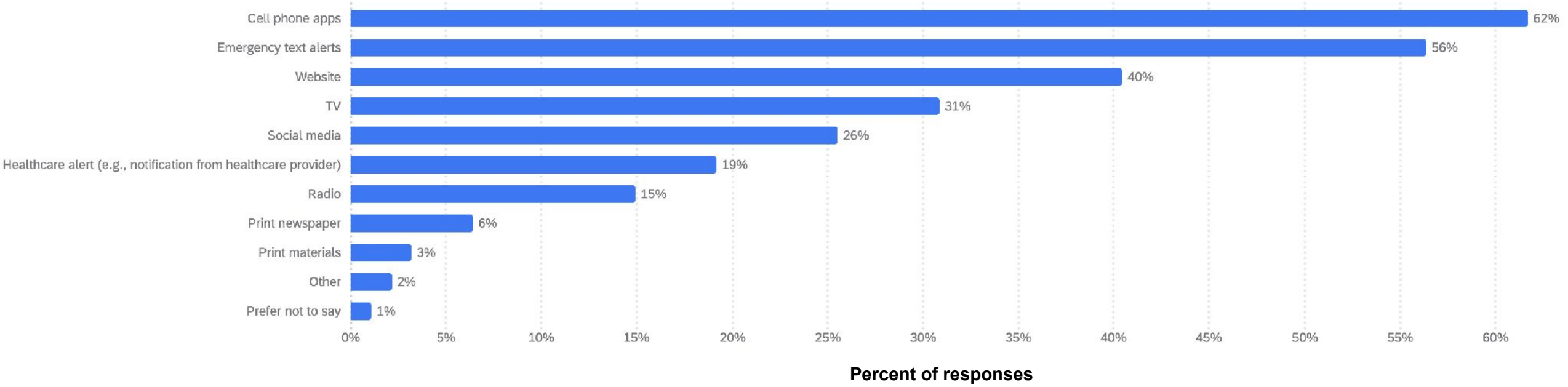
Information Access & Preferences

During a wildfire smoke event, who or what is your household's trusted source for air quality information? *(N = 94)*



Information Access & Preferences

Which way(s) would your household prefer to access air quality information? *(N = 94)*



Analysis of Volunteer Experience



Common themes across volunteer responses revealing four main barriers to survey implementation:

- Navigation struggles (27%)
- Survey needs (33%)
- Inaccessibility of homes (40%)
- CASPER methodology difficulty (67%)

Based on feedback, we have developed the following recommendations:

1. Survey locations should be researched thoroughly and notified in advance
2. Volunteers should be paired with a member of the survey design team, or trained extensively
3. Prepare a visual aid accompanying the survey, minimizing challenges with comprehension and recall bias
4. Leave informative flyers with online survey option at non-responsive homes
5. Include a local community member serving as a community liaison on each survey team

Next Steps

- Manuscript currently under review at Disaster Medicine & Public Health Preparedness
- Gonzaga Climate Institute shared findings at summer community engagement and neighborhood council events:
  - Solicit community members' feedback on accuracy of survey findings
  - Provide community members with resources on resilience hubs, air quality information, and ways to protect their health during wildfire smoke events
  - Identify persistent unmet needs
- Publication and implementation of the revised **Spokane Climate Resilience Plan**
- Formation of the **Spokane Wildfire Academic Consortium (SWAC)**:
  - Support the region's recovery from the August 2026 wildfires
  - Advance wildfire-related research, inform evidence-based decision making, support public communication, and strengthen community resilience

Wildfire Relief in Spokane

City of Spokane H.O.M.E. Starts Here Fund

Second Harvest Inland Northwest

Spokane Humane Society

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