SUPPORTING HOUSEHOLD HEALTH ADAPTATION

TO THE COMPOUND EVENTS OF EXTREME HEAT AND WILDFIRE SMOKE

cnap
California Nevada
ADAPTATION PROGRAM
A NOAA CAP/RISA Team

MISSION

To increase opportunities for achieving optimal, equitable household health outcomes in northern Nevada related to the compound events of extreme heat and wildfire smoke.

PROJECT DESCRIPTION

In the western US, when extreme heat and wildfire smoke occur simultaneously (i.e., as compound events), many households face serious challenges for mitigating vulnerability given lack of or financial inability to operate a central air-conditioning (AC) system, a primary tool for limiting exposure. This is the case for roughly 22% of households in Nevada.[1] During compound events, unless these households evacuate, they must choose between minimizing heat exposure but increasing air pollution exposure (e.g., by opening windows/doors or operating evaporative coolers) or minimizing air pollution exposure but allowing heat to accumulate (i.e., indoor heat waves). Given the increasing frequency and intensity of both extreme heat and wildfire smoke events in the western US,[2] there is a critical need to support health adaptation in vulnerable households.

The goal of this project is to support household health adaptation to the compound events of extreme heat and wildfire smoke in Washoe County, Nevada. During winter 2023 and spring 2024, a sample of 25 households (20 without and five with Central AC) will be recruited to participate in the project. Prior to summer 2024, the following activities will be conducted to establish baseline heat and air quality data, physical and mental health data, and protective action decision-making data corresponding to each household:

1. Small, portable indoor/outdoor sensors (e.g., PM, CO_2, temperature, humidity) will be installed to establish baseline indoor environmental data at each participating household;

2. Small, non-invasive instruments (e.g., spirometer, pulse oximetry, and ECG/heart rate device) will be utilized with heads of household to establish baseline physical health metrics;
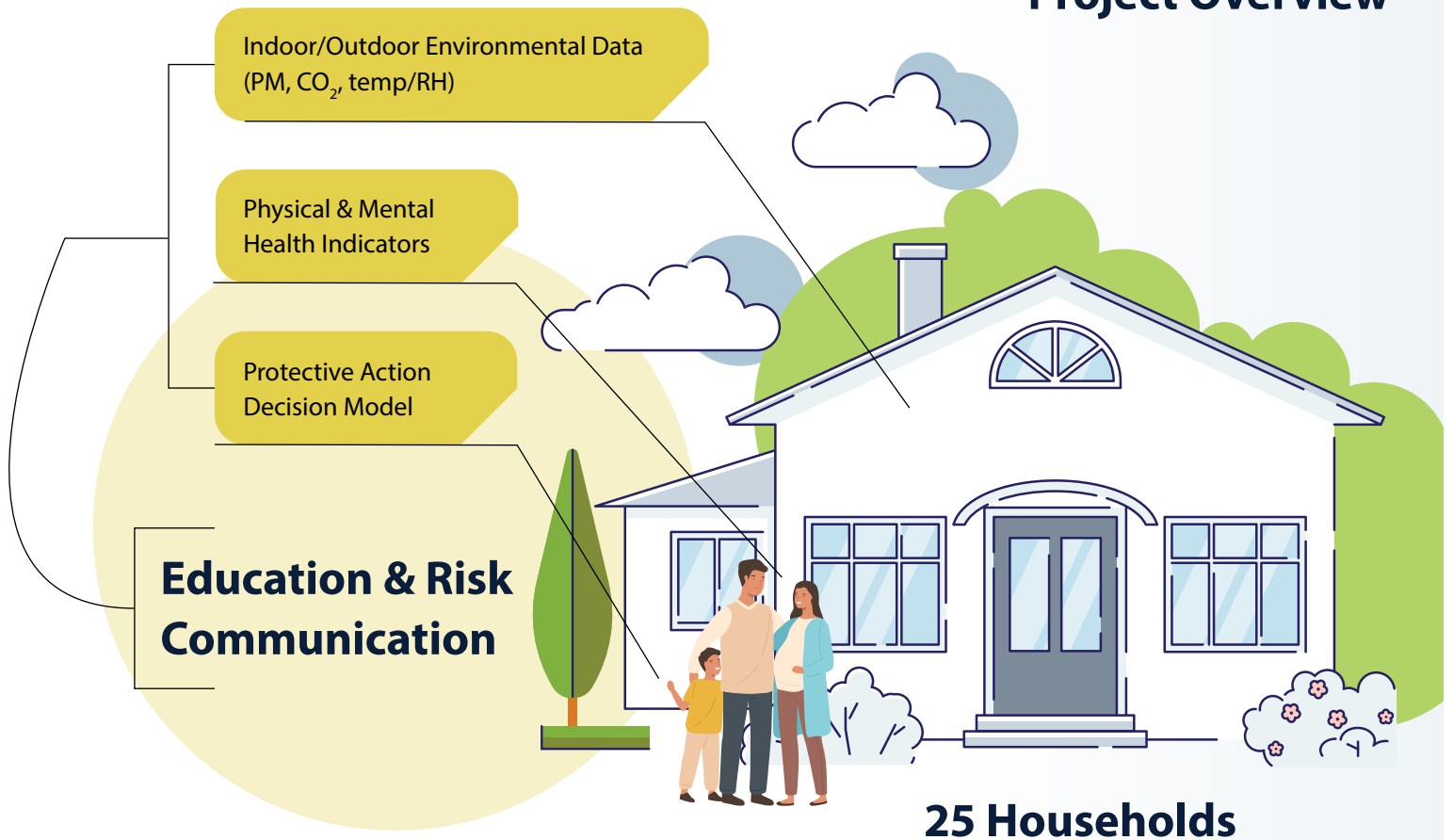
1   US Energy Information Administration (2023), 2020 Residential Energy Consumption Survey Data. Available: https://www.eia.gov/consumption/residential/data/2020/.
2   Abatzoglou, J. T., and A. P. Williams (2016), Impact of anthropogenic climate change on wildfire across western US forests, Proc. Natl. Acad. Sci. U. S. A., 113(42), 11770-11775, doi: 10.1073/pnas.1607171113.

Indoor/Outdoor Environmental Data (PM, CO$_2$, temp/RH)

Physical & Mental Health Indicators

Protective Action Decision Model

Education & Risk Communication

25 Households

3. Standardized stress tests (perceived stress scale; PSS-14)[3] will be applied with heads of household to establish baseline mental health metrics;

4. Semi-structured interviews, guided by the Protective Action Decision Model (PADM),[4] will be conducted with heads of household to establish baseline understanding of typical protective action decision-making.

As compound events occur during the summer/fall 2024, each household will be visited three times to repeat activities 2 and 3 (i.e., to collect physical and mental health data). Informal "check-in" interviews, also guided by the PADM, will be conducted during each of these visits to understand whether individual household-level decision-making remains consistent or varies and why. All data types will be correlated and analyzed in comparison to baseline data to understand the physical and mental health impacts and corresponding protective action decision-making associated with compound events. These analyses will be summarized both at the individual household and collective household levels and used to inform compound events education and risk communication materials for Washoe County Health District, the primary project partner.

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3   Cohen, S., Kamarch, T., and R. Mermelstein, R. (1983), A global measure of perceived stress. Journal of health and social behavior, 385-396.
4   Lindell, M. K., and R. W. Perry (2012), The protective action decision model: theoretical modifications and additional evidence, Risk Anal., 32(4), 616-632.