

Cumulative Impact Assessment and Risk Factors Disparately Impacting Tribal Nations and EJ Communities

Clean Air Act Advisory Meeting, September 2024

Dr. Gillian Mittelstaedt, Director, Partnership for Air Matters

Tribal Healthy Homes Network/Tulalip Tribes



BIA BUILDING: MOLD, LEAD PAINT, ASBESTOS, FUNGICIDES

OCCUPANTS:

- HEADACHES
- NAUSEA
- EYE, NOSE AND THROAT IRRITATION
- IMMUNE SUPPRESSION
- SINUS AND LUNG INFECTIONS
- MISCARRIAGES
- PRE-TERM DELIVERY (11/11)







A. Weyrhaeuser

Stahl-Wood

Stahl-Wood

A. Weyrhaeuser

Stahl-Wood

Stahl-Wood

TJ is a Tulalip grass dancer. As a child, he had severe asthma.

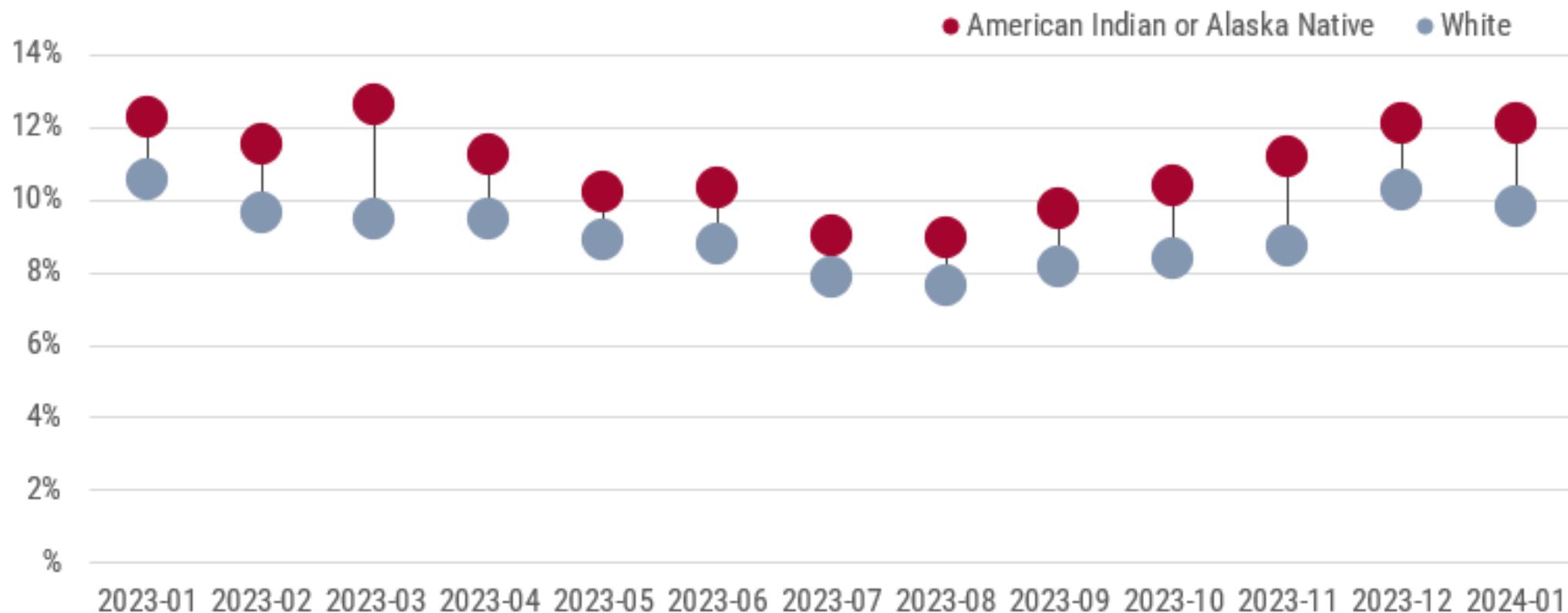


“People are living in these homes...it starts from the little ones on up...from the babies on up to the elders...they all have some kind of asthma. This is huge...they’ve been breathing this stuff for years.”

Dean Henry, Tulalip Tribal Member and OSHA Manager.



A higher percentage of AI/AN emergency department visits in Washington State are for air quality related respiratory illness.



Data source: Washington State RHINO records

Existing Indoor Air Hazards

Secondhand Smoke

Woodsmoke

Radon Gases

Lead Paint

Mold and Moisture

Chemicals – Household, Personal Care and
Building Products

Combustion Gases

Asthma and Allergy Triggers

Source Control is/was Primary Strategy

Emerging Airborne Hazards *(Ambient & Indoor)*

Wildfire Events (Wildfire Smoke)

**Prolonged and Extreme Heat Events
(Ground-level Ozone)**

**Flooding Events (Microbial
Contamination)**

**Infectious Disease Outbreaks (e.g.,
SARS CoV-2)**

Source Control is More Difficult

Climate events are a risk multiplier.

Wildfire Smoke Events

Exposure to Smoke and Gases



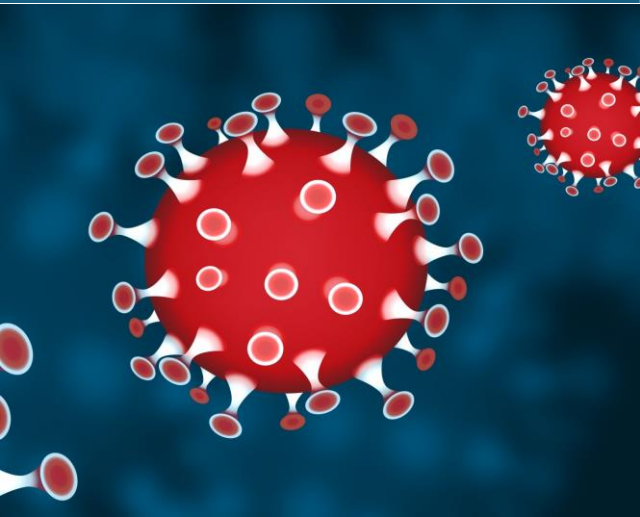
Extreme Heat Events

Exposure to High Heat, Ozone and Chemicals



Infectious Disease Events

Exposure to Lethal Viruses



Precipitation Events

Exposure to Mold and Bacterial Contamination

Homes and buildings are becoming a refuge.

Refuge from Heat

Seeking cooler, more comfortable environment.



Refuge from Smoke

Seeking less smoky, less irritating environment where easier to breathe.



Refuge from Precipitation

Seeking protection from floods, torrential rain or excess snow.



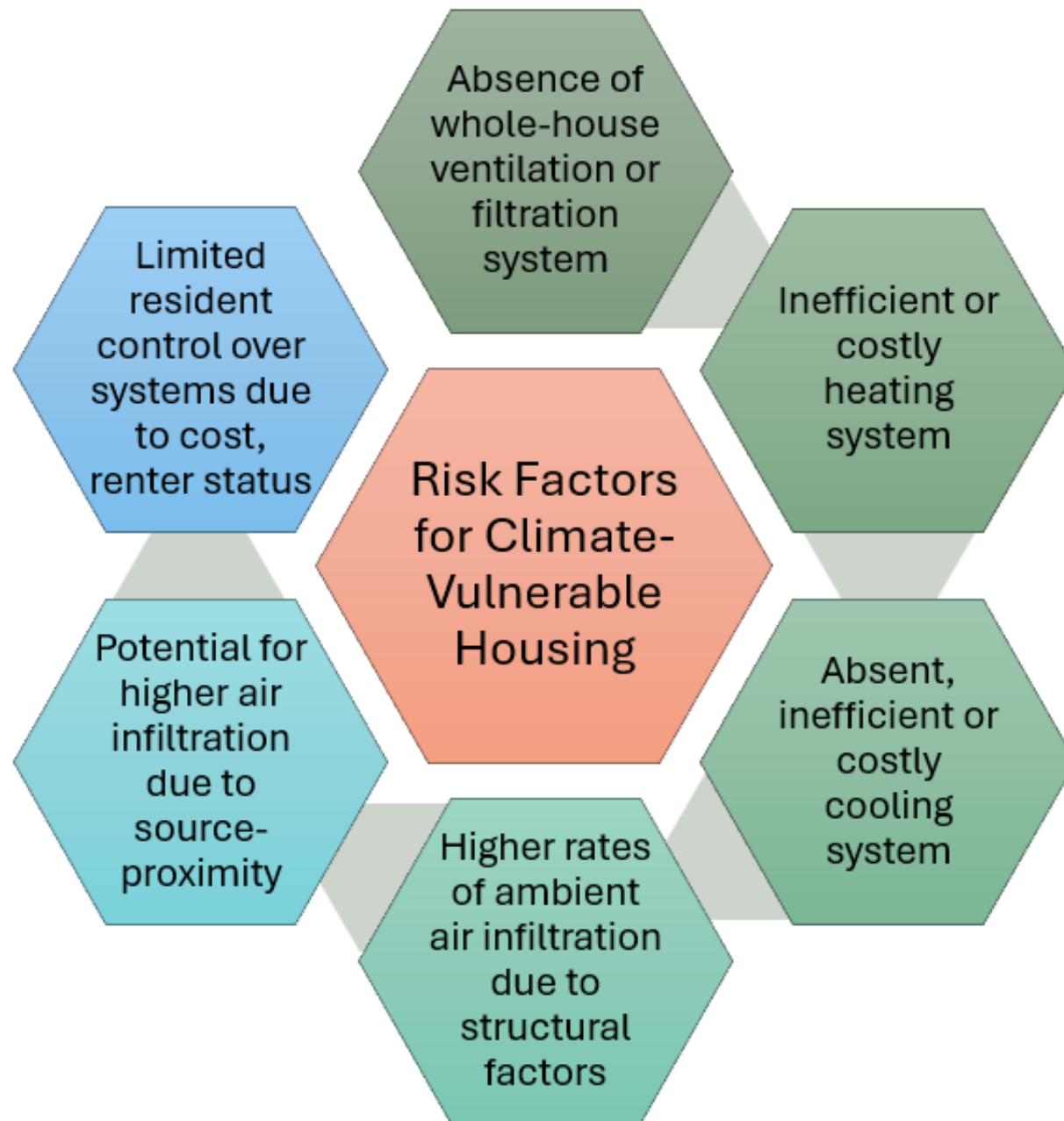
Refuge from Pandemics

Seeking to avoid public spaces where viruses circulate.



"Housing characteristics that modify ambient air pollution exposures have the potential for widening or narrowing the exposure inequality gap."

Rosofsky et al., 2019



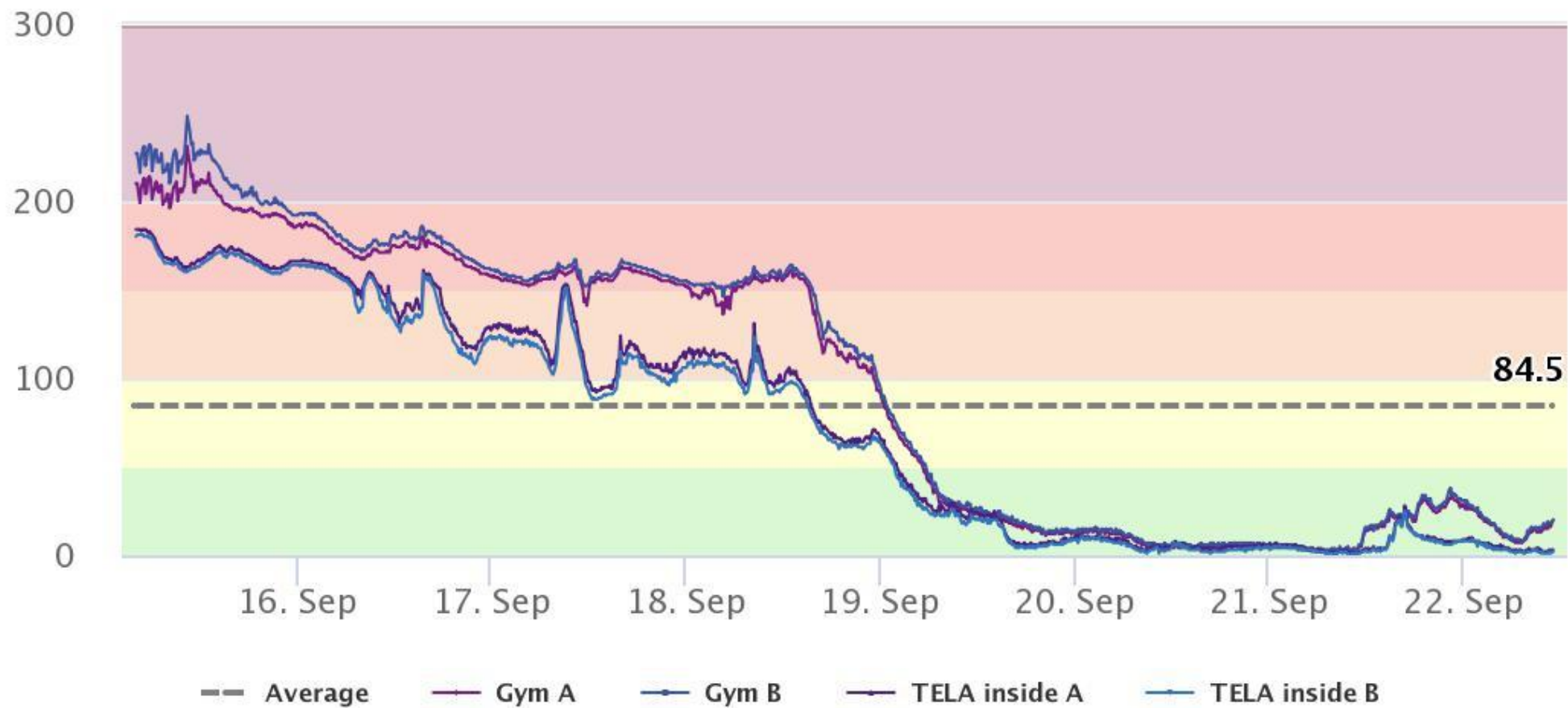
Risk Factor	Example of Implications
Age of Housing	Presence of Lead Paint, Deterioration of Building Components.
Ownership Status	Fewer levers to ensure adequate maintenance of rental housing (i.e., lead abatement, mold remediation).
Housing Condition	Deferred maintenance linked to broken or inadequate mechanical ventilation.
Build Quality	Lower quality linked to use of materials with high VOC emissions (i.e., formaldehyde).
HVAC Systems	Older or non-existent HVAC systems mean whole-house ventilation is not available.
Zip Code	Industrial and mobile air pollution sources sited near communities of color, emitting ultrafine particles with a high rate of intrusion into indoor environments.
Occupancy Rates	Overcrowding contributes to higher levels of humidity and Carbon Dioxide, both of which induce chemical reactions.
Heat Type	Wood as primary heat source more prevalent in low-income, rural, cold-climate and Tribal communities, with aging stoves or wet wood contributing to high indoor particulate levels.
Cooling Systems	Lack of A/C linked to high indoor temperatures, posing heat stroke risks and volatilizing chemicals inside the home.
Occupancy Patterns	Consumer products used in the home can introduce PFAS (“forever chemicals”).





US EPA PM2.5 AQI 10 Minute Average

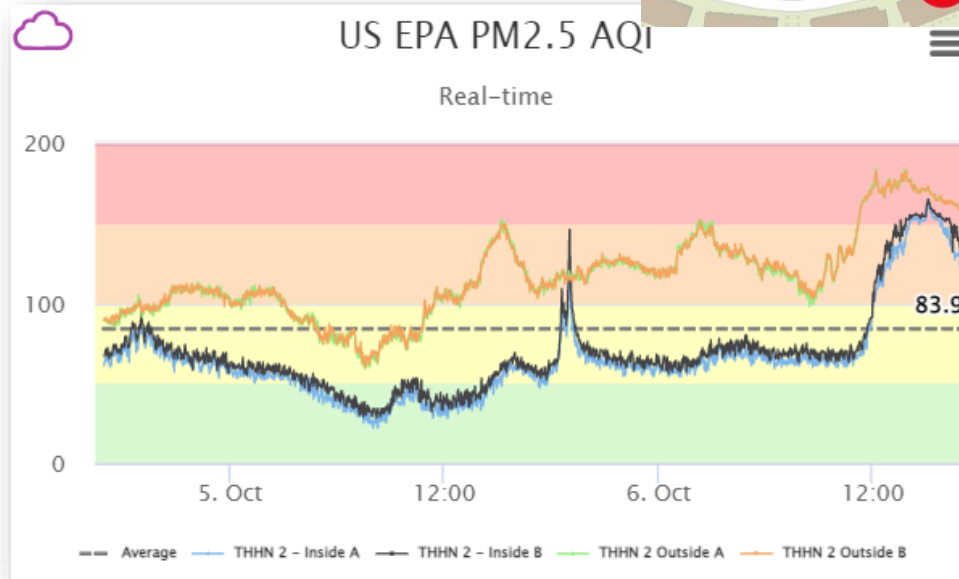
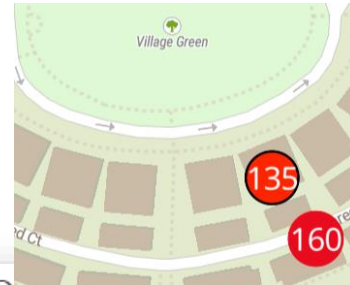
X



Smoke Infiltration Comparison

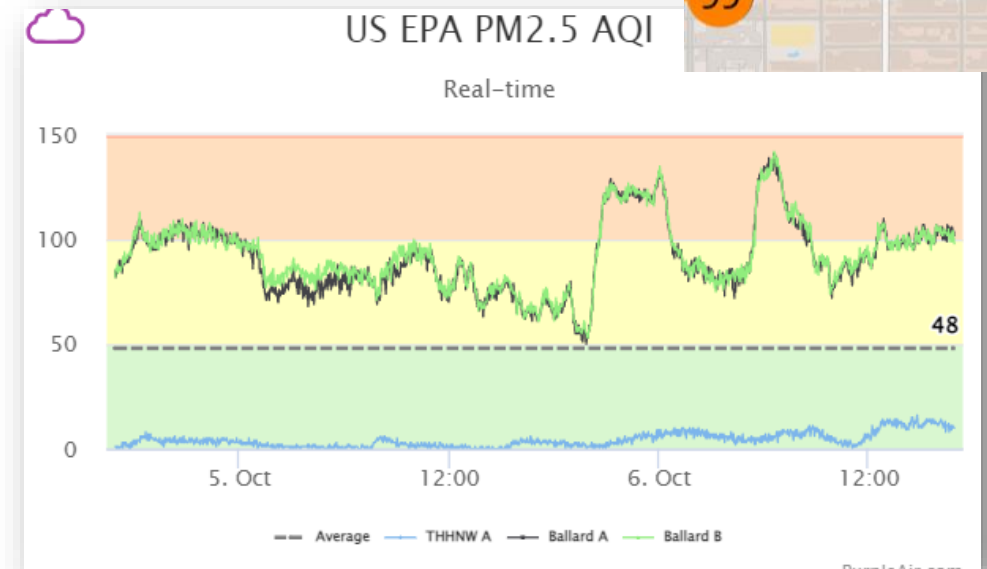
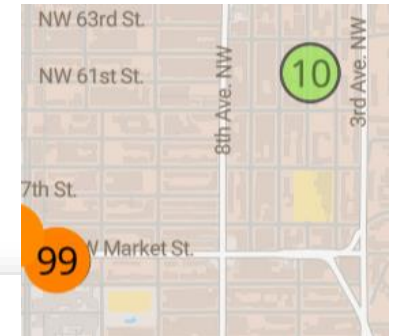
Home A (2002)
**Indoor – 84% of
Outdoor PM**

Home has an HVAC
with a MERV-13 filter,
but is poorly sealed
and insulated, and only
one air cleaner running
continuously.



Home B (1912)
**Indoor - 10% of
Outdoor PM**

Home is tightly sealed
(weatherized), has a
conditioned crawlspace,
a heat pump with MERV-
11 air filtration, and two
air cleaners running.



To Fully Characterize Risks, Cumulative Impact Assessment *Requires* Interdepartmental, Cross-Sector Engagement within Tribal and EJ Communities



Excerpt from THHN's EJG2G Grant – Climate Vulnerability Assessment Tool (CVAT)

1. *Those without access to filtered, cool, indoor air and shelter, are at higher risk of ER visits, hospitalization, and premature death* (Uejio et al., 2022, Masri et al., 2021, O'Lenick et al., 2020, Jones et al., 2020, Williams et al., 2019, Remigio et al., 2019, Gronlund et al., 2018, Hutchinson et al., 2018, Davies et al., 2018, Eisenman et al., 2016, Bassil et al., 2009).
2. Tribal, rural, low-income and communities of color are less safe inside their homes than white, middle-class Americans. *An analysis of 70,000 air leakage measurements in houses across the United States found that the two most significant predictors of air leakage are the age and size of the home*, with older homes and smaller homes having higher leakage, and thus likelihood of smoke and heat intrusion (Chan et al., 2003).
3. Climate-driven housing vulnerability is the result of *structural, mechanical, and land-use factors that increase infiltration of particles (Liu et al., 2022) and heat* (Quinn et al., 2014). Inefficient cooling, insufficient air filtration, inadequate ventilation, and limited air sealing are among multiple factors shown in the literature to produce higher infiltration rates of smoke, heat, and air pollution.
4. Air quality monitoring and source apportionment studies point to *significant indoor particulate sources as cooking emissions (with or without gas as the combustion source), and heating with a wood-burning appliance*.
5. A moderate to *high-proportion of Tribal and EJ homes have mechanical deficiencies* (Pindus et al., 2017, Bertumen et al., 2014, Blanford et al., 2013, Seltenrich, 2012), yet their housing authorities struggle to obtain adequate funding to find, repair and mitigate all of the homes in their service area.
6. Under-resourced communities have *few data-driven rapid assessment tools for identifying the most climate-vulnerable homes*. Tribal housing authorities, public health, and emergency response programs have no tools of this nature to screen for housing-based risks and assess potential health impacts.