National Center for
HEALTHY HOUSING

WILDFIRE INTERVIEWS:
SUMMARY AND KEY TAKEAWAYS

2021 | AUGUST

TABLE OF CONTENTS

INTRODUCTION

In 2020, the National Center for Healthy Housing (NCHH) began the process of an informal needs assessment with state and local public health departments and other agencies that engage in wildfire response and communications. From December 2020 to February 2021, NCHH interviewed 17 individuals who are directly engaged in work around wildfires and wildfire smoke to identify needs where public health and healthy housing professionals can assist and bridge gaps through creating resources, facilitating connections, or amplifying and disseminating information. These individuals hail from state government agencies, local government agencies, nonprofits, and universities and have backgrounds and experience in public health, environmental health, emergency management, early childhood education, structural engineering, research, and community engagement.

Organized into topics and subtopics, this report summarizes the key findings gleaned from NCHH's 13 interviews with these various experts. While this information may be of interest to a general audience, this document is intended for the various stakeholders invested in this multifaceted and evolving space. The insights reported here are especially relevant to sectors of environmental health, housing, public health, indoor air quality, building codes, early care and education, building science, and others that intersect with the issues of wildfire smoke and damage.

Due to the variety of these interviews and the richness of their insights, this material will inform future opportunities for cross-sector collaboration and the role of healthy housing in future work that ensures the health and safety of residents during wildfires and significant smoke events.

KEY SECTORS

Throughout this report, interviewees observed several topic areas where cross-sector collaboration will be beneficial to advance the work related to wildfires and wildfire smoke events. NCHH has observed and identified groups where connections are needed including housing/homeowner associations, housing codes and building standards, (including new construction), early childhood care, and medical providers. See page 3 for more information on the different groups involved in this work.

housing/homeowner associations	housing codes/building standards (includes new construction)	early childhood care providers	medical providers

Wildfire Interviews: Summary and Key Takeaways

PARTNERSHIPS: WHO'S AT THE TABLE?

KEY TAKEAWAYS

- Increased and intensified wildfires have broadened the variety of local, state, and federal agencies involved in this work.
- State and federal agencies serve a critical role in providing technical assistance and resources to local agencies that are short on resources.
- Partnerships with community organizations are critical to reaching populations impacted by smoke, and these organizations need to be financially supported in this work.
- Different communities have additional key partners.
- Wildfires should be understood as being an interdisciplinary problem.

Increased and intensified wildfires have broadened the variety of local, state, and federal agencies involved in this work.

As wildfires have gotten larger, longer, and more frequent, more agencies have had roles to play in governmental response. The governmental partners that interviewees mentioned included local partners (public health, fire department, city council and county commissioners, regional air quality agencies, community development departments, municipal energy), state partners (departments of health, forestry, environmental quality, and energy; public utilities), and federal partners (forest service, bureau of land management, parks service, EPA, NASA).

Interviewees discussed how the high number of agencies involved means that, communication between partners is frequent during wildfire events and often leads to collaboration on communications to the public, with partners sharing materials and audiences.

State and federal agencies serve a critical role in providing technical assistance and resources to local agencies that are short on resources.

The state-level interviewees we spoke to stressed their role in serving as a conduit for local agencies during a wildfire, who may lack specialized staff, technical expertise, and resources. State agencies can also navigate relationships with all the other state-level agencies involved in this work, something for which individual local agencies may not have the capacity.

> "
>
> *We need to have the capacity at the state level to be the source of technical information and support. We are the ones in the position to get our sister agencies that have an impact engaged: Department of Forestry, Department of Environmental Quality, Department of Energy, Public Utilities Commission. Our local folks can't navigate those relationships, but we can.* (Oregon)

Partnerships with community organizations are critical to reaching populations impacted by smoke, and these organizations need to be financially supported in this work.

Interviewees stressed the importance of partnering closely with community organizations and members of the communities who are most impacted by wildfires and smoke events. State and local agencies recognized that people are more likely to listen to and trust messages and information is if it comes from someone with whom they

already have a relationship. And for those messengers to be effective, they need to be full partners in the work and compensated appropriately.

Interviewees also recognized that, in addition to serving as trusted messengers, community organizations and community members will know better than other agencies where the most vulnerable populations are, where support is most needed, and what kind of support is most critical.

> "
>
> *We can't compete against big names for eyeballs. We're not going to put billboards up because they're too expensive, and they get a lot of commercials all day long. We quickly realized that particularly in communities in East Austin, the best way to get information out is through people to people, like people talk to their neighbors and community groups.* (Austin)
>
> *Those local voices — the local public health authorities and the community-based organizations — are the trusted voices locally. And they need to have the capacity to engage their populations around these issues, to identify those populations as being vulnerable, and to come to the table to develop plans for how to increase resilience and respond when there's an event that threatens health.* (Oregon)

Different communities have additional key partners.

Interviewees spoke to the localized and geographic nature of this work that dictates who needs to be involved, and how that will change from place to place. For example, a participant from Pitkin County and the surrounding area in Colorado mentioned how ranchers own huge tracts of land in that area and therefore are important stakeholders in conversations about wildfire management and risk of fires starting.

Wildfires should be understood as being an interdisciplinary problem.

Interviewees agreed that there are many groups involved in this work but also discussed how much of this work, especially in wildfire prevention and resilience, is siloed, with different sectors (such as public health and forestry) not collaborating as much as possible. In particular, interviewees identified several groups where more connections are needed:

Housing/homeowner associations. Participants reported that they didn't often work with housing groups but that groups including homeowner associations and neighborhood associations may be interested in discussing wildfire smoke or helping to communicate key messages to residents since wildfire smoke is an IAQ issue.

Housing codes and building standards (including new construction). Interviewees discussed a lack of connection between public health and building/housing codes. Interviewees were aware that these sectors may be already discussing the issue, but if those conversations are happening, public health is not at the table. There is a clear connection between interest in energy efficiency and making homes more resilient in the face of wildfire smoke, and as these issues continue to rise in priority, the two sectors should be communicating and sharing expertise with one another. Interviewees also recognized that this collaboration can be challenging if a sector has an established way of working or is focused on other issues.

Early childhood care and education providers. Interviewees mentioned that early care and education providers and stakeholders, especially family childcare providers, are often excluded. Early care and education as a field has less visibility than K-12 education, and family childcare providers can be difficult to reach. For more on this specific sector, see our later section on page 10.

Medical providers. One participant discussed the importance of physicians as messengers to communicate with higher-risk individuals about the need to prepare for wildfire smoke intruding into their homes.

> **"**
>
> *With the COPD population, it was really interesting because I was able to interview and survey and a Better Breathers group, learning that […] they weren't hearing about it from their doctors in advance. So one of the men who I talked to said, 'Why don't our medical providers sit down with us before a wildfire season and say, "Hey, you know, this is about to happen. Here's how to find out what the particulate levels are in your home. And here's the best filtration," or at least just give them a reference.'* (Mittelstaedt)

Ultimately, interviewees agreed that because the intensity and frequency of wildfires are expected to grow, collaboration between these different sectors is needed to be able to meet the challenge. Interviewees also mentioned some specific cross-sector partnerships that they'd found particularly helpful, including work with researchers who were able to provide data that government agencies had not previously had, and ASHRAE, who several participants mentioned as trusted experts.

> **"**
>
> *We need more national discussions about communities and wildfires. And not about like, how do we prevent the wildfire from encroaching on the community? It's going to encroach on the community. But how do we design our communities to lessen the impact? And it's a hard discussion to happen.* (Fischer)

WHAT MESSAGES ARE INCONSISTENT OR MISSING?

KEY TAKEAWAYS

- Communities need clear and consistent messaging on air quality and actions to take.
- Nearly every interviewee identified information on ventilation and air filtration as a gap.
- Agencies need additional guidance or a decision tree to determine which actions to take when there are overlapping or multiple disasters (i.e., wildfires and pandemic, power outage, or heat wave).

Communities need clear and consistent messaging on air quality and actions to take.

Interviewees felt that communities are adjusting to being more regularly aware of their outdoor air quality during wildfire events, but additional messaging could help people fully understand what measurements mean and what actions they should be taking. Several interviewees discussed the challenges of helping people understand the nuances of what different air quality levels mean, how effective certain protections are, and what they need to do at certain times. Interviewees also discussed how government agencies can struggle with issuing the right guidelines in the first place, trying to juggle providing enough information at a level that the public can understand and that will compel them to act.

Location relative to the wildfire also affects what messaging will be appropriate and necessary for the community. For example, communities close to the fire may be dealing with additional direct impacts like power outages, while those further away may only require guidance on smoke exposure.

Specific topics where interviewees identified a need for better messaging were:

Mask use. Interviewees discussed the challenges around messaging about when to wear masks and how they protect (and don't protect) against hazards from wildfire smoke. Typical guidance in the past has been that simple face masks do not protect against wildfire smoke; some participants said that they'd seen guidance shifting to recommending simple masks after all. The COVID-19 pandemic and recommendations to use masks to reduce the spread of the virus caused additional complications on this topic.

Cleanrooms. One participant expressed the desire for detailed but clear guidance on setting up a cleanroom (or cleaner air room) in your home. In general, interviewees stressed the need for all guidance to be clear and easy for people to follow.

Ash removal. One participant mentioned a need for information about ash removal outside for those whose exposure falls short of having evacuated and returned but who are still seeing ash and air pollution outside that requires safe cleanup.

Nearly every interviewee identified information on ventilation and air filtration as a gap.

Interviewees explicitly stressed gaps in information and resources around indoor air quality during wildfires. In general, participants saw both a huge need for technically detailed information that could be shared with residents to understand how they can improve their own air quality and for financial and technological resources to be available to residents of low-income communities.

Residents lack the resources to purchase products, especially when wildfire events heighten demand. Many participants described the high demand for air filters and purifiers during wildfire events, with products quickly selling out or prices going up. Furthermore, even when there is adequate supply, the cost of products can be prohibitive for low-income households. Funding to distribute filters or small grants to property owners to purchase or install filters would help serve this need.

In response to the lack of supply and low-cost options, the West Coast saw a remarkably high interest in homemade box fan filters during the 2020 wildfire season. Several groups published guides or videos showing how to construct such a filter by attaching HVAC filters to standing box fans, which are then used inside the home to filter air and remove particles. Only some of the agencies we interviewed were able to endorse and share that information. Some of the agencies were unable to endorse the box fan filters due to a lack of capacity to perform a technical review, a lack of clarity about current research, and concerns about fire hazards. Some interviewees were interested in having a well-vetted recommendation from the federal level to help local agencies share that information.

> "
>
> *I want to say this to whoever will listen: I would love to see private industry come up with a product that is affordable. There has been significant DIY innovation, but manufacturers could help ensure a product is safe, such that local government could promote its use in a menu of protective actions. We want our recommendations to be accessible, so the more affordable, the better.* (Alameda County)

Residents want highly specific technical information for dealing with their specific HVAC infrastructure/needs, which state and local health agencies are unable to provide. Unmet need for technical information was a significant barrier raised by many interviewees. Participants discussed how much information is needed for residents to be able to make the best decision about how to keep their indoor air clean. Information is really needed to address two different but related issues. First, people need to understand their own homes, which ventilation systems or tools they already have, and how to use them during a wildfire. Second, they need to know what to look for when purchasing products such as air purifiers and how to use them against wildfire smoke. Combined, these points result in a lengthy list of specific situations and products for which people are seeking

Wildfire Interviews: Summary and Key Takeaways

RESEARCH

While not called out as a specific sector, many interviewees noted that engaging with researchers has been very beneficial in the past and would be helpful for additional identified needs around data collection and analysis.

i

more information. State and local agencies often do not have the capacity to create guidance at this technical level, nor are they able to respond to many questions from partners and residents.

Some agencies we interviewed were working on or had published resources to help residents select products and use ventilation correctly, but everyone agreed that more information bridging the gap between ventilation experts, public health, and the general public is needed. We also discussed the possibility of having an image-based guide to help people navigate HVAC systems and settings.

> **"**
>
> *How do you figure out what you have? And if you have this kind of system, here's what you can do that you can afford, or here's a good thing to do, here's a better thing to do, and here's the best thing to do. Those kinds of resources are needed to bridge that technical information to the real world.* (Oregon)
>
> *The questions we are asked by the public are increasingly more specific and technical. We get questions like, 'Can I put a MERV 13 filter in my window to filter air coming inside my home?' […] Or, 'I have this X, Y, and Z air cleaner or air conditioning system, will it work?' We don't have the capacity during a wildfire smoke event to assess the individual characteristics of each person's equipment and their options to provide unique recommendations.* (Washington)
>
> *The challenging part is that there are a lot of details and expense to consider when improving filtration in your home for outside smoke […] either through your HVAC system or HEPA portable air cleaners. For example, when purchasing a HEPA portable air cleaner, it's important to select one that doesn't produce ozone and is rated for the size of the room. Options for filtration are not always affordable or easy for the public to implement. The challenge in developing messages around indoor air and filtration is to find a balance in providing enough technical information such that it is still accessible.* (Washington)

Agencies need additional guidance or a decision tree to determine which actions to take when there are overlapping or multiple disasters (i.e., wildfires and pandemic, power outage, or heat wave).

Many interviewees discussed specific challenges of messaging around both the COVID-19 pandemic and wildfires when best practices for the two disasters were often contradictory (for example, agencies often open cooling centers during high heat but were unable to do so or recommend them when people were being encouraged to avoid crowds and gatherings).

To help handle this quandary, some interviewees wanted clear guidance from CDC or other federal agencies about what to do and prioritize in the case of concurrent disasters or a decision tree to help agencies prioritize certain messages depending on the local conditions and adaptable as those conditions change.

EARLY CHILDHOOD AND EDUCATION

All ECE interviewees agreed that childcare providers need resources and funding specifically targeted to childcare providers to address wildfire smoke. See the special *Focus Area* on page 10 for more detail.

REACHING VULNERABLE AND HIGH-RISK POPULATIONS

<table>
<tr><td>

KEY TAKEAWAYS

</td></tr>
<tr><td>

- Targeted populations for smoke exposure across the interviewees include outdoor workers, unhoused/homeless population, older adults, undocumented families, and families with small children, along with city-specific geographic areas.

</td></tr>
</table>

Targeted populations for smoke exposure across the interviewees include outdoor workers, unhoused/homeless population, older adults, undocumented families, and families with small children, along with city-specific geographic areas.

Interviewees discussed several common challenges with reaching these populations, including the following:

There is a need for translated materials. To serve minority groups whose primary language is not English, informational materials need to be available in the target languages; however, interviewees also stated that having a single resource available in the language is not sufficient. Agencies frequently compile or share links to other resources or host multiple pages that all link to each other, and if those linked resources aren't also available in the target language, they will not be as useful. Interviewees discussed having a limited pool of translated resources to draw from when sharing materials with the community.

> "
>
> *We share smoke protection information in multiple languages. When in-depth resources put out by state or federal agencies are available only in English, we can't refer to them in many of our communications.* (Alameda County)

Residents are conflicted between short- and long-term priorities. Interviewees also recognized that communicating the importance of wildfire smoke, especially before wildfire season, can be difficult when people are worried about and focused on more immediate survival needs. Interviewees noted the inequities of the fact that people who prepare for wildfires are those who have the resources to do so, while people who must prioritize things like food and housing may not be able to prioritize wildfires and will then be further affected by smoke.

There is a need for specificity regarding which groups are being targeted and knowing those audiences. Several interviewees stressed the importance of understanding their target groups and understanding the specific needs of that audience rather than communicating broadly. For example, interviewees in Austin discussed their need for data disaggregating specific ethnic and linguistic populations within the Asian American population in the city.

Certain populations don't trust government agencies. Interviewees were aware that government agencies and officials are not always seen as trustworthy messengers to groups who have experienced neglect, mistreatment, or discrimination. In particular, several interviewees mentioned immigrant and undocumented populations as communities that are particularly reluctant to engage with government actors.

To address this challenge, interviewees stressed the need to *work with community groups and communicate through trusted messengers to get information to the target audience*. Agencies identified ongoing programs (for example, a program for children with asthma) and community partners who serve as conduits for key messages.

The following example from Alameda County demonstrates how the agency identified trust as a barrier to communication and worked with community partners to get communications to the community.

The agency reached out to a set of groups identified as most likely to be impacted by wildfire smoke, including outdoor workers, families with small children, older adults, unhoused residents, and undocumented residents, and asked them how they received information about protective actions during recent hazardous air quality conditions linked to smoke. Respondents reported that they didn't receive information from the county and did not have enough trust in local government to sign up for the county emergency alert system. They also cited technology and language barriers to both signing up and receiving messages. Respondents did report that they would trust information coming to them from community institutions, including churches, youth groups, and senior centers, as well as caseworkers and the local fire department. The county surveyed nonprofits and caseworkers and discovered that these groups do have access to email and online signups and were generally willing to register for information and share it with their community members or clients. The county created a new subscription within its alert system just for these trusted community organizations. This channel has already been used to share COVID-19 information. Alameda County plans to integrate this approach further with other channels to community organizations established around COVID information-sharing and to further tailor the information so it can easily be shared.

MESSAGING FORMATS, DELIVERY METHODS, AND TIMING

KEY TAKEAWAYS

- Agencies utilize many different communications methods, including social media, websites, blogs, and press conferences.

- There is a desire among audiences for clear resources and guidelines about what they should be doing that lays out choices and actions they can take.

- There is a strong need to get messages about preparedness out before the wildfire season, but agencies are struggling with how to make that most effective and connect to the right communities.

- There are concerns about both an oversaturation of information as well as lack of consistency among agencies.

Agencies utilize many different communications methods, including social media, websites, blogs, and press conferences.

Interviewees agreed that no single platform or method will be sufficient for communications. Disseminating information to the public effectively requires multiple avenues, including linking to other resources and agencies. Interviewees at the state level also discussed their role in fielding questions from the press, who serves as a key liaison between government and the public.

Generally, the most-discussed communications methods were various digital avenues, including social media and websites. Several interviewees described how social media tools have been a growing area in recent years.

There is a desire among audiences for clear resources and guidelines about what they should be doing that lays out choices and actions they can take.

Several interviewees discussed the fact that audiences want clear information and that vague statements or unclear guidance from public health agencies can be frustrating. People especially appreciate checklists and

FUNDING

Specific funding needs mentioned by many interviewees highlight the strong need for funding to support preventative measures, interventions, and resources for residents. This funding is especially critical at the local level and is ideally distributed through trusted community members and organizations.

guides that present the options and allow them either to choose their own response or to select from a menu of options. And there's a role for both simple communications tools and more in-depth publications; interviewees described how they've found success with simple messages over social media, but also how public health still has a role to play in hosting more in-depth information and technical answers.

> "
> *We always have to respect that when we're talking to somebody about a health issue, or an environmental issue, that we're talking to an adult with existing experience and knowledge. We want to meet people where they are. And people want information so that they can make good choices for themselves.* (UCSF)

There is a strong need to get messages about preparedness out before the wildfire season, but agencies are struggling with how to make that most effective and connect to the right communities.

Interviewees shared a goal to reach audiences before wildfires start. Agencies are moving toward the idea of smoke readiness and sharing information well in advance of events. One cited challenge here is simply how to make this information connect with people at times when wildfires may not seem like an imminent threat or when they have many other priorities competing for attention.

There are concerns about both an oversaturation of information as well as lack of consistency among agencies.

Many interviewees noted that, due to the huge impact of wildfires in recent years and the high number of agencies in the space, there is much information available to the public. That information is not always consistent, however: both because authors may be working from different sources and because the nature of the fires can change quickly, quickly outdating the published information. Several interviewees described the sheer number of questions about specific resources or information they hear from the public, at work, and in their personal lives during fires, with people encountering and sharing seemingly contradictory resources.

In the realm of consistency between agencies, interviewees discussed the role of federal agencies like EPA in providing overarching guidance and tools. Interviewees have noted the availability of information and tools but also heard from partners that there is not enough federal-level support. One challenge here is that different local agencies can have very different needs; for example, larger cities may not want support from the state while smaller localities must rely on state- or federal-level information. Local resources, capacity, and politics can all affect those needs.

LOOKING FOR MORE INFORMATION?

Visit these resources:

- Center for Disease Control and Prevention's **"Wildfires"** website
- Center for Disease Control and Prevention's "**Wildfire Smoke and COVID-19**" website
- Environmental Protection Agency's ***Wildfire Smoke: A Guide for Public Health Officials*** publication
- National Center for Healthy Housing's "**Wildfires**" website

FOCUS AREA:
EARLY CHILDHOOD AND EDUCATION

Of the three interviewees that work primarily in or closely with the early childcare and education field, all agreed that childcare providers need resources and funding specifically targeted to childcare providers to address wildfire smoke. Notably, organizations in the Bay Area were able to provide funding from the City of San Francisco, California, for air filtration in 2020 to childcare providers. This funding came in the form of stipends to licensed providers to spend on facility modifications. Interviewees stressed the need for funding and resources to help modify facilities to withstand natural events. Especially considering the COVID-19 pandemic, childcare providers are clearly "frontline status" essential workers, and there needs to be a national effort to ensure that they have the proper guidance and materials to provide high-quality, healthy services to the children and families they serve.

Key Takeaways: Communications Specific to Childcare

Communications/messaging needs for home-based childcare facilities may not be significantly different from other homes but need to be targeted and accompanied by resources.

In terms of communication needs for home-based childcare providers, interviewees noted that the messaging topics and needs may not be significantly different from homes generally but do need to be targeted to childcare providers and accompanied by resources. All homes can benefit from the same information, but resources need to be prioritized for childcare. Some examples of messaging needs communicated to NCHH during these interviews were specific recommendations of when to keep children inside (not allowing for outside activities), when to cancel school, or other operational recommendations based on specific air quality index readings. Additionally, an interviewee conveyed the need for specific guidance for filtering childcare centers based on filtration needs per square foot of the facility or home.

Communication networks among childcare providers vary by location. Trusted/used networks include peer groups like family childcare associations and social media groups (e.g., Facebook).

There appears to be no formal communication network among or to childcare providers, and the communications pathway varies by location, depending on local infrastructure and the strengths of those relationships. Some providers are leery of outsiders trying to enter their homes and "selling" them; therefore, information needs to come from a reliable source. Trusted and used networks include peer groups like family childcare associations (local childcare referral agencies), social media (Facebook groups), and local public health agencies.

Interviewees discussed in depth the possibility of using licensing agencies as communicators and/or including smoke preparedness in licensing requirements as well as the pros and cons of doing so.

It was noted that licensing agencies have an opportunity to play a larger role supporting and offering solutions to providers in addition to their administrative and regulatory responsibilities. Because every licensed childcare home must interact with and maintain community care licensing requirements, licensing agencies should engage and communicate with providers regarding wildfire smoke and public health. In California specifically, community care licensing is the entity that is not only communicating on licensing but also on health and safety issues. Interviewees discussed the pros and cons of including smoke preparedness in licensing requirements. If required, one benefit of this would be that providers would automatically be a part of this service and information delivery. Conversely, there may be some resistance to these requirements, and licensing agencies would bear the brunt of implementing them.

> "
> *Licensing could have a big role in being supportive in offering solutions […]. I also feel like there should be a closer relationship between local public health departments and licensed childcare providers.* (LIIF)

COMMUNITY RESILIENCE

KEY TAKEAWAYS

- The opportunity exists for building codes and standards to include climate and resilience features and measures, especially in new construction.

- There is a connection and desire to bridge resilience with sustainability efforts.

- Communities need funding, better risk assessment, and to ensure residents still have access to essential services and affordable housing when considering mitigation.

- Low-income communities risk not mitigating and suffering secondary impacts more harshly than others who have put these practices into place.

The opportunity exists for building codes and standards to include climate and resilience features and measures, especially in new construction.

Among our conversations, interviewees discussed how the nexus between wildfire smoke can be addressed on a broader level and specifically the opportunity to include climate and resilience into building codes and standards, especially in new construction. Due to the increasingly deleterious effects of climate change, there needs to be a national effort to incorporate climate resilience requirements in new construction to mitigate smoke in the built environment. This way, states can adopt a model ordinance upon which localities can expand.

There is a connection and desire to bridge resilience with sustainability efforts.

There seems to be an obvious connection between resilience and sustainability. Although they are two different methods with two different goals, resilience and sustainability overlap. One request was to have a menu of cost-effective recommendations, so that those who work on sustainability efforts and measures can expand their expertise in this area and make recommendations for resilience.

Communities need funding, better risk assessment, and to ensure residents still have access to essential services and affordable housing when considering mitigation.

While some small grants are available to communities, there are not many resources available for adaptation or for preparation. Additional resources to develop communications plans and to offer support networks can be hugely useful to communities. In addition to resources, it was noted that communities need better risk assessment. Currently, most localities' wildfire risk assessments are based on vegetation and weather patterns but do not consider homes as fuel load. As a result, communities that are considered "low risk" are actually at higher risk and are not mitigating when they should be. Lastly, in terms of needs when considering community resilience, it is critical to ensure residents still have equitable access to essential services like hospitals and affordable housing. Hospitals are slow to be replaced and affordable housing typically does not get replaced, so in order to build resilient communities, essential and affordable services need to be prioritized.

> "
>
> *If we put in a green belt around our town, how does that change our risk? […] I would love for it [research] to accumulate together for us to be able to better calculate the risk in these communities, so that they are more informed.* (Fischer)

Low-income communities risk not mitigating and suffering secondary impacts more harshly than others who have put these practices into place.

Conversations about community resilience also raise equity issues and considerations. Low-income communities are at risk of not mitigating in comparison to higher-income communities in the same areas. This repeats a cycle of putting low-income communities in high-risk situations and living in vulnerable areas. This pattern is demonstrated in varying community capacities and abilities to respond to other natural disasters and the recent COVID-19 pandemic. In addition to this risk of living in areas that have not been mitigated, low-income communities suffer the secondary impacts of wildfires more harshly. These residents typically lose their safety net (whether it be families, friends, or support networks) when communities are displaced due to wildfire damage and have a harder time finding affordable housing due to housing prices skyrocketing in surrounding areas. Topics and considerations of community resilience need to have equity at the forefront.

BUILT ENVIRONMENT AND HOME MODIFICATIONS

KEY TAKEAWAYS

- There is a national need for retrofitting homes for wildfire resilience regardless of location or climate.
- There are opportunities to include wildfire considerations when performing other hazard modifications by taking a multi-hazard approach.

There is a national need for retrofitting homes for wildfire resilience regardless of location or climate.

Across our conversations, NCHH heard of a nationwide need for homes to be retrofitted for wildfire resilience. Because retrofitting homes to become fully compliant is expensive, some localities have been able to provide small grants to perform these modifications and to create defensible space around property. Other communities need a menu of cost-effective options to make homes more resilient that they may recommend to their residents.

> "
> *As this is the new normal, we must be thinking about building standards for climate resilience and incorporating them into our understanding of 'green buildings.' Developing a clear idea of what a resilient home looks like and what measures can be taken in new and existing buildings to mitigate risks like smoke is key.* (Alameda County)

There are opportunities to include wildfire considerations when performing other hazard modifications by taking a multi-hazard approach.

When performing other hazard modifications, such as seismic retrofitting (to make structures more resistant to seismic activity and earthquakes), interviewees noted that it only makes sense to use fire-resistant or noncombustible materials if already opening a home to construction. It was also conveyed to NCHH that there is a lot to learn from other natural disasters (like tsunamis and earthquakes) on the West Coast as well as what has already worked in those states. Additionally, some western states provide seismic rehabilitation grants for schools

and other critical facilities like hospitals. This funding strategy and multi-hazard approach to make structures more resilient can be applied when considering wildfire resilience to the built environment and home modifications.

PRESCRIBED BURNS

KEY TAKEAWAYS

- More communities are moving toward a "prescribed burn" strategy and are willing to endure smoke year-round to reduce the risk of large fires.

- There is a need for research and data on emissions and health effects of prescribed burns versus large-scale, catastrophic wildfires.

- Communities recognize the need for a community response plan to identify and alert sensitive populations due to smoke intrusion from prescribed burns.

- Increasing the risk of smoke intrusion on communities raises additional equity concerns.

More communities are moving toward a "prescribed burn" strategy and are willing to endure smoke year-round to reduce the risk of large fires.

Interviewees noted overwhelmingly that communities are embracing a strategy of prescribed burns—smaller, controlled fires—as a fire management tool to make forests more fire resistant to future fires. While prescribed burns are used to create healthier forests, their smoke creates an indoor air and healthy homes issue for communities year-round. Interviewees noted that communities and leaders in this area oppose smoke impacting communities but support the long-term vision of reducing the risk of conflagration.

There is a need for research and data on emissions and health effects of prescribed burns versus large-scale, catastrophic wildfires.

Because communities are increasingly moving toward the strategy of prescribed burns, there is a need for more data and research on the differing health effects of prescribed burns versus wildfires. There are still unknowns and questions surrounding the chemical contents of the two different varieties of smoke and their subsequent health impacts over prolonged exposure. This research is needed to make more informed public health and forest management decisions.

Communities recognize the need for a community response plan to identify and alert sensitive populations due to smoke intrusion from prescribed burns.

To adapt to this strategy, NCHH heard an example of a response plan from one community that involves engaging a smoke management advisory committee. The committee balances the risk of smoke intrusion, secures approval from their department of forestry for prescribed burns, and collaborates with their local health department to develop a community response plan should the prescribed burns result in smoke intrusion within the community. This response plan includes identifying who and where sensitive populations are and alerting them of the increased risk.

Increasing the risk of smoke intrusion on communities raises additional equity concerns.

Increasing the risk of smoke intrusion on communities raises additional equity concerns. The populations that live adjacent to forests that require more controlled burns will have a much greater exposure to smoke and its health impacts. Additionally, outdoor and agricultural workers will have no choice but to endure smoke exposure from prolonged prescribed burns.

Wildfire Interviews: Summary and Key Takeaways

> *And so how, in public health, do we help people? How do you put systems in place to alert sensitive populations when those other non-wildfire sources of smoke are around so they can protect themselves? And for the most vulnerable communities of color, low-income communities, how do they become more resilient to wildfire and smoke?* (Oregon)

INCREASING INTERSECTIONS WITH CLIMATE CHANGE: LONG-TERM OUTLOOK

KEY TAKEAWAYS

- Communities agree that wildfires are getting worse, starting sooner, lasting longer, burning hotter, intensifying in areas that already experienced them, and encroaching on areas that never had them before, and there seems to be no end in sight.

- Communities can use examples of other areas with disasters and borrow strategies to protect and create adaptive communities.

- There is a need for holistic hazard mitigation as communities may experience multiple disasters concurrently.

- Drought, extreme heat, and power shutoffs all intersect with wildfires and affect public health.

- Localities need information about what the future holds and which communities need to prepare for more intense fires.

Communities agree that wildfires are getting worse, starting sooner, lasting longer, burning hotter, intensifying in areas that already experienced them, and encroaching on areas that never had them before, and there seems to be no end in sight.

From our interviews, there is a growing focus on and universal acknowledgment of the effect of climate change on wildfires and their intensity. Due to lived experience and future projections, most interviewees noted that there is an anticipation that wildfires are only expected to get worse. This then results in the need for a prioritization of resources for community resilience and a driving force behind prescribed burning.

Communities can use examples of other areas with disasters and borrow strategies to protect and create adaptive communities.

It was noted that in response to climate change and intensifying wildfires, communities can borrow strategies from other localities responding to different natural disasters to protect and create adaptive communities. For example, the town of Paradise, California, is creating a "greenbelt" or an area of vegetated ground around it to prevent the progression of wildfire and to increase the firebreak. This is a similar concept to flood zones in that it creates space between structures and known high risk areas. From an engineering perspective, there are commonalities between disasters and approaches to mitigate them.

There is a need for holistic hazard mitigation as communities may experience multiple disasters concurrently.

Partly due to climate change, it is rare that localities are experiencing only one natural disaster. Specifically, interviewees spoke about the multiple and amplification of effects of earthquakes, tsunamis, and wildfires on the West Coast. Additionally, in central states, we discussed the role of floodplains in managing fires or vice versa, managing floods after fires. Climate change has exacerbated and synergized existing hazards as well as added threats. This highlights a need for a holistic approach to hazard mitigation and the effects of climate change on managing natural disasters.

> "
>
> *It's very rare that there's any location in the country that has a single hazard anymore. With climate change, that's out the window; everyone is exposed to multi-hazard now.* (Fischer)

Drought, extreme heat, and power shutoffs all intersect with wildfires and affect public health.

In California in particular, NCHH heard about the effects of climate change on drought, extreme heat, and power shutoffs and their resultant effects on public health. While these are all critical issues, heat and drought seem to be underemphasized in climate conversations, partially because they do not have agencies or resources dedicated to them, unlike floods and wildfires.

Localities need information about what the future holds and which communities need to prepare for more intense fires.

With projections and expectations of climate change intensifying, communities need guidance on how to prepare for the encroachment of wildfires. This is true for both localities that have historically experienced them and for localities that previously have not but are now facing the realities of wildfire encroachment.

CONCLUSION

This report summarizes the key findings from 13 interviews conducted by NCHH. Due to the variety in expertise, background, and geographic location of the 17 participants interviewed, this report offers a wide range of insights. The information gathered here will be used to help inform future healthy housing work as wildfires and wildfire smoke continue to impact the environment, housing, and human health.

Beyond healthy housing, this information can also be used by various stakeholders in their work and to increase cross sector collaboration among the fields of environmental health, housing, public health, indoor air quality, building codes, early care and education, and building science.

August 2021