

Oakridge-Westfir Smoke and Air Quality: Community Survey

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About the Ecosystem Workforce Program:

The Ecosystem Workforce Program is a program of University of Oregon's Institute for Resilient Organizations, Communities, and Environments. We conduct applied social science research and extension services at the interface of people and natural resources. Our publications aim to inform policy makers and practitioners, and contribute to scholarly and practical discourse.

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Introduction

This report summarizes the results of a 2024 Oakridge Air community survey on air quality and smoke from wildfire and woodstoves. This community survey was informed by interviews conducted with community leaders to identify key information needs and actions related to air quality and smoke locally¹.

Air Quality Context in Oakridge

Oakridge, in Lane County, Oregon, has historically been ranked among the top 20 communities in the United States with the worst air quality due to high concentrations of particulate matter (PM_{2.5}) from home wood heating (woodstove) and wildfire smoke. Due to the steep topography of the area and Oakridge's location in a basin-shaped valley bottom, the community is prone to atmospheric inversions that trap seasonal wildfire smoke and wintertime home heating woodsmoke in the community. The Oakridge-Westfir is a "mile-wide valley along the middle fork of the Willamette River, [that] has been a "nonattainment area" for particulate matter since 1987, meaning it did not meet the federal health-based Clean Air Act standard for that pollutant."²

Oakridge Air and EPA Targeted Airshed Grant

The City of Oakridge and community stakeholders have worked together over the past two decades to improve air quality and meet the fine particulate National Ambient Air Quality Standard under the Clean Air Act. In 2019, the EPA awarded a \$4.9 million Targeted Airshed Grant to the Lane Regional Air Protection Agency (LRAPA) on behalf of the Oakridge and Westfir communities. This grant provided funding to formally launch Oakridge Air, a project to establish the infrastructure and programs to sustain smoke reductions into the future. Oakridge Air is managed by Good Company, South Willamette Solutions, and Lane Regional Air Protection Agency (LRAPA). In 2022, the EPA awarded an additional \$2.7 million for the program, thus extending it through 2027. The goal of the Oakridge Air program is to permanently

reduce and sustain the average 24-hour PM_{2.5} concentration below 30 µg/m³. The program uses a combination of strategies to reduce air quality impacts to the community's health, including home heating interventions (weatherization, ductless heat pumps, certified woodstoves), seasonal firewood program, air monitoring, code enforcement, and school and community education (<https://www.oakridgeair.org>.) The collaborative efforts through these partners and strategies allowed the Oakridge-Westfir communities to meet the fine particulate National Ambient Air Quality Standard under the Clean Air Act in Fall 2022.

UO Research & Technical Assistance

This project was led by a University of Oregon (UO) research team in collaboration with Oakridge Air, LRAPA, Good Company, and South Willamette Solutions. Following initiation of the Oakridge Air program in 2019, project partners recruited the UO research team to inform the effectiveness of the program elements, outreach, and communications aimed at increasing awareness, sharing resources, and understanding public perceptions about air quality and smoke in the community. The survey was distributed to households in Oakridge-Westfir to assess communication practices and lived experiences of community members.

Approach

The survey aimed to document Oakridge-Westfir residents' concerns about their local air quality, perspectives and responses to recent wildfire smoke, and their preferences and interests in air quality communications and other Oakridge Air programs. Survey questions are available in Appendix I of this report.

The survey was launched and delivered in electronic and paper format. We used the online survey application Qualtrics for the electronic version. In collaboration with Oakridge Air, we distributed a link to subscribers of Oakridge Air's text alert service that is managed by LRAPA. As of May 2024, there are currently 913 subscribers. Oakridge Air also promoted

1. <https://scholarsbank.uoregon.edu/xmlui/handle/1794/27869>

2. <https://www.epa.gov/newsreleases/oakridge-westfir-communities-attain-clean-air-act-standards-fine-particle-pollution>

the survey through their e-newsletter, which had 1,094 subscribers as of January 2023. We distributed the paper version of the survey at five public locations in Oakridge. Each location had a confidential drop box (“Blue Box”) for depositing completed surveys. We also included a QR code on the outside of the Blue Box as an additional option to take the Qualtrics version of the survey on a smart phone. At the end of the survey, respondents were given the opportunity to receive a \$25 gift card to a local business by providing us with their mailing address. More details on the survey methods and response validation are available in Appendix II of this report.

Results

Who took the survey?

Our validated electronic and paper responses totaled 214. This represents approximately 13 percent of the 1,600 households in the Oakridge-Westfir community. Overall, those who responded to the survey on behalf of their household were primarily:

- White (89%)
- Women (77%)

- 65 and older (48%)
- English speakers (98%)
- Full-time Oakridge-Westfir residents (94%)
- Residents of Oakridge-Westfir for over a decade (88%)

Figure 1 provides more details on the survey respondents.

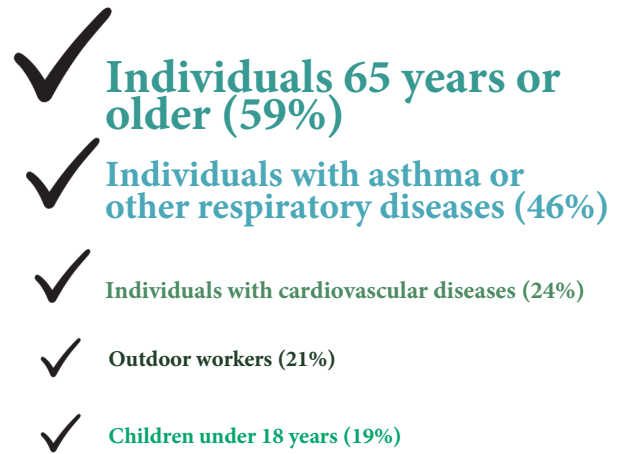
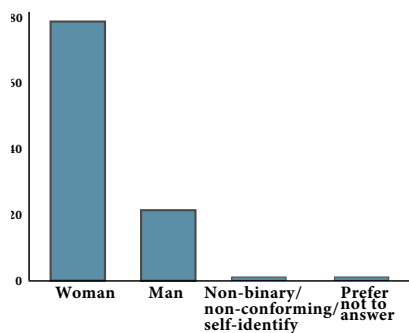
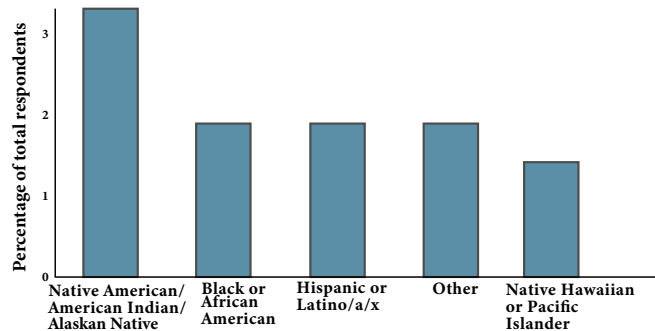


Figure 2. Percentage of households with individuals particularly sensitive to poor air quality (because respondents could select more than one, responses do not add to 100%).

What is your gender identity?



How do you identify yourself? (the remaining 89% identified as white)



What is your age?

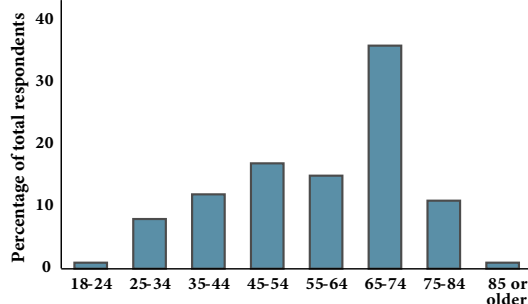


Figure 1. Distribution of respondents' responses to identity and age questions.

3. Refer to Oregon Health Authority’s “Health threats from wildfire smoke” website: <https://www.oregon.gov/oha/ph/preparedness/prepare/pages/prepareforwildfire.aspx>.

Household composition

A relatively high percentage of survey respondents reported that their household included one or more individuals that are considered by the Oregon Health Authority (OHA)³ to be more sensitive to poor air quality as shown in Figure 2.



Figure 3. Information sources respondents reported using to access air quality information (because respondents could select more than one response, percentages do not add to 100).

Existing familiarity with information sources

The majority of survey respondents reported using the internet (74%) or a mobile phone device (77%) to access information on air quality. They also reported familiarity with a number of air quality information sources as shown in Figure 3. Less than 20 percent of respondents reported using the Purple Air⁴ or PAKU App⁵ and 16 percent reported using the U.S. EPA's AirNow app.⁶

Most of the households in the survey (79%) reported using a plug-in air purifier specifically distributed by Oakridge Air during the recent wildfire events.

How has smoke affected households?

Nearly all respondents (86%) reported being highly or somewhat concerned about the air quality in Oakridge-Westfir. Most respondents (88%) reported that 2022 Cedar Creek Fire increased their concerns about air quality in Oakridge-Westfir. Over half of the survey respondents (57%) also thought that the air quality in Oakridge-Westfir is sometimes polluted and unhealthy. Even those who thought that the air quality in Oakridge-Westfir was good most of the time (35%) still reported that their air quality concerns were increased by the Cedar Creek fire.

Most respondents (93%) described their air quality concerns as being highest in the summer season. However, respondents who reported that they were highly or somewhat concerned about air quality in Oakridge-Westfir were also significantly⁷ concerned with air quality during the winter season.

“I am deeply concerned about the long-term effects of poor air quality despite using masks and air purifiers. I can't afford to leave for a month or more each summer and am seriously wondering if I should move.”

4. Purple Air website: <https://www2.purpleair.com/>

5. PAKU app is a Mac iOS application for PurpleAir data. For more information, refer to website: <https://paku.app/>.

6. U.S. EPA's AirNow app: <https://www.airnow.gov/airnow-mobile-app/>

7. This finding was statistically significant with a p-value of less than 0.05. Refer to Appendix II. Detailed Survey Methods and Results.

Concern for smoke varies by sources

Most respondents (97%) expressed some level of concern about the impacts of wildfire smoke on air quality and 74 percent indicated that they were very concerned with wildfire smoke. Forty-two percent of respondents indicated concern for prescribed fires and 47 percent indicated concern with smoke from woodstoves (Figure 4).

Health impacts

Most respondents (78%) believed that smoke and long-term exposure to smoke poses a risk for all people. Nearly all respondents (97%) reported experiencing some type of negative health impact from poor air quality. Types of negative health impacts and the percent reporting them are displayed in Figure 5.

Mental health

Eight respondents wrote in impacts smoke had on their mental health, noting things such as:

- "A lot of times when AQI is poor, we are secluded in our homes. It's a recipe for depression."
- "Cabin fever during the most outdoor sports months"
- "Psychological distress – hazardous smoke feels enormously unnatural and oppressive, especially when I can't go outside to exercise for weeks on end, as happened during the Cedar Creek Fire."

"I take extreme precautions against inhaling the smoke. Therefore, I have no personal health issues with it. However, it grieves me greatly to see adults and children in my town of Oakridge walking around with no smoke protection. My friends and neighbors here complain about coughing and headaches from it. I'm very concerned we're going to have a rash or resulting health concerns in the future."

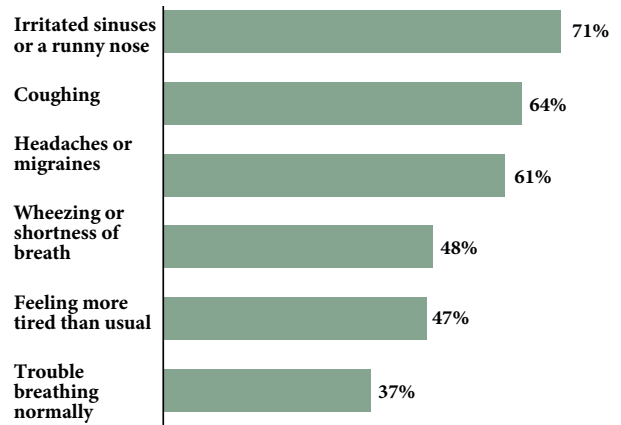


Figure 5. Smoke-related health concerns reported by respondents. (because respondents could select more than one response, percentages do not add to 100).

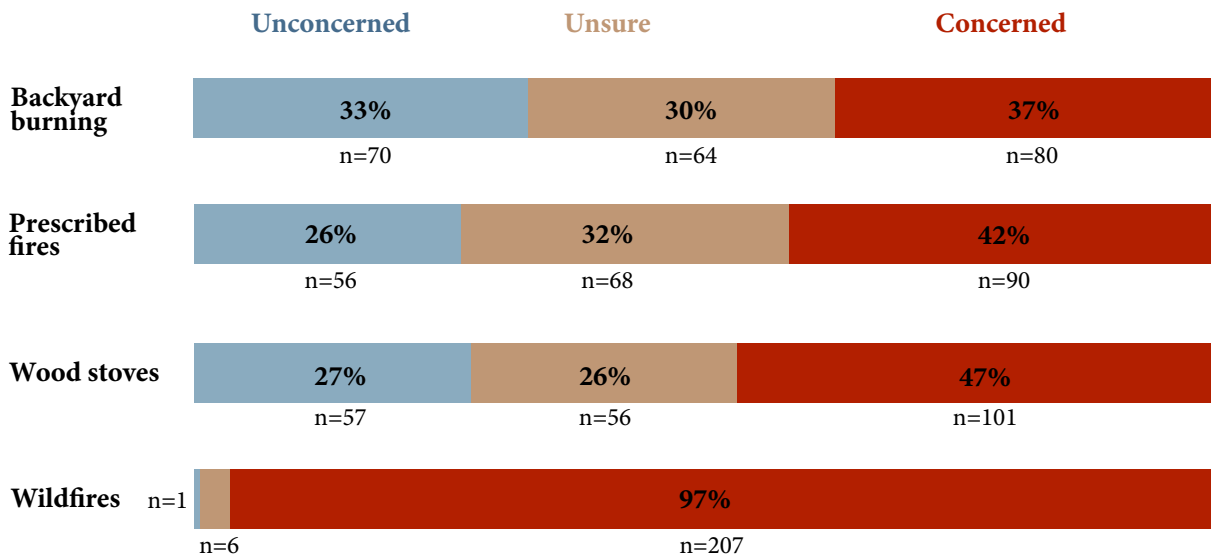


Figure 4. Respondents' reported concern by smoke source

What are households doing in response to poor air quality?

Household adaptation to poor air quality

Nearly all respondents (94%) reported making changes to their behavior due to poor air quality, both indoors and outdoors. Only two respondents reported no changes to their behaviors. Most respondents (90%) reported using plug-in air purifiers in their homes during a smoke event. For those that used air purifiers, nearly all used a HEPA air purifier (98%), most of which were distributed to households by Oakridge Air (79%). Only five respondents reported using a non-HEPA certified air purifier. A majority of respondents (86%) also kept windows and doors shut in their homes. In terms of outdoor activities, many (80%) reduced the amount of time they spent outdoors doing their usual physical activities (running,

dog walking, running, biking) and over half of respondents (65%) reported that they stayed at home or reduced the number of times they left their homes. A smaller percentage (34%) said that they left the community and went to an area with better air quality.

“In desperation, I made hundreds of fast walking laps around my living room to get some exercise.”

“I taped the windows shut, but our house is so old it doesn't help, and neither does the landlord.”

“With my job, I'm forced to go out in it, so I would make my trips from the car to the worksite as fast as possible.”

“During the summer, we avoided outdoor activities which included walking our dogs and going on our much-loved hikes.”

Protective actions taken while...

Outdoors -and- Indoors

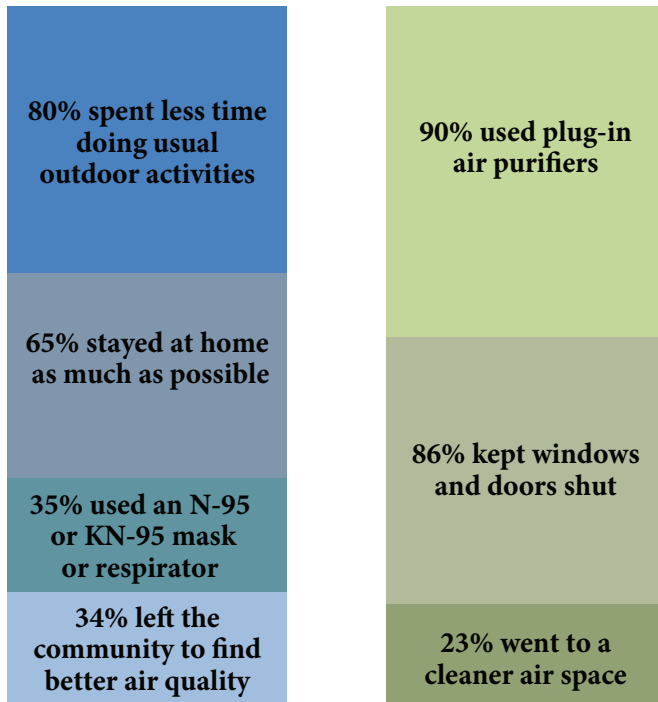


Figure 6. Protective actions respondents took related to indoor and outdoor activities (because respondents could select more than one response, percentages do not add to 100).

Household preparedness for poor air quality

Many respondents (66%) felt their household was prepared for smoke events. When asked why they felt prepared, respondents (n=141) selected a combination of reasons, described further in Figure 7.

What do people need to feel more prepared?

What would help the community feel more prepared? Most survey respondents (72%) thought their community would be more prepared for poor air quality if there was more assistance for weatherizing homes to address indoor air quality. Many respondents noted they would feel more prepared if they had community-wide distribution of air purifiers and replacement filters (67% of respondents) as well as personal protective equipment such as masks and asthma medication (54% of respondents). Nearly half of respondents (48%) suggested that their community could be more prepared with additional information about what to do in case of poor quality.

- ✓ **More assistance for weatherizing homes (72%)**
- ✓ **Air purifier distribution (67%)**
- ✓ **Access to personal protective equipment (54%)**
- ✓ **Additional information about what to do when there is poor air quality (48%)**

Figure 8. Assistance that would help the community feel more prepared for smoke events (because respondents could select more than one response, percentages do not add to 100).

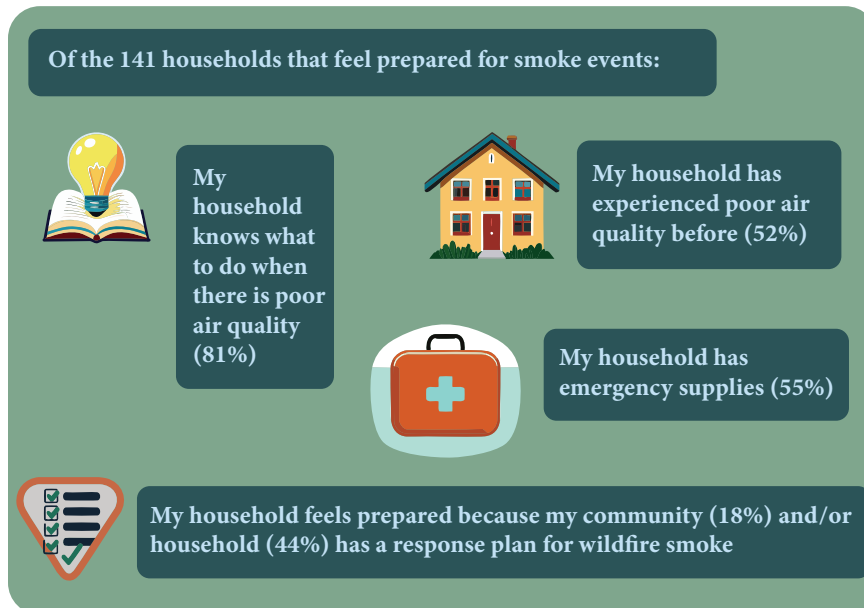


Figure 7. Common reasons households felt prepared for smoke events (of the 141 households that reported feeling prepared).

What would help households feel more prepared?

Thirty-four percent of respondents indicated that they did not feel prepared or were unsure if they felt prepared for poor air quality. When asked what would make them feel more prepared, nearly half of those who felt unprepared (48%) selected access to personal protective equipment, such as respirators, masks, and asthma medication. Most of respondents who felt unprepared (79%) also said they would feel more prepared with adequate household protections such as air purifiers and weatherization for their doors and windows. Over half of the respondents also said that they would feel more prepared if they had information about the possibility of a smoke event (58%), up to date information about air quality (53%), or more information about what to do during a smoke event (52%).

The 73 households that do *not* feel prepared for smoke would feel more prepared with:

- ✓ **Adequate household protections, such as air purifiers and weatherization (79%)**
- ✓ **Information about the possibility of a smoke event (58%)**
- ✓ **Up to date air quality information (53%)**
- ✓ **Information about what to do during a smoke event (52%)**
- ✓ **Access to personal protective equipment (48%)**

Figure 9. Assistance that would help individual households feel more prepared for smoke events (*because respondents could select more than one response, percentages do not add to 100*).

"The schools need more help when there are extremely smoky conditions. Even with air scrubbers and purifiers throughout the building last fall the high school was unable to provide a suitable environment for students which resulted in lots of headaches for my kids and others I know."

"Stop allowing yard waste burns! Put into effect a yard waste pick-up service!"

"I only wish they [Oakridge Air] could provide air purifiers to folks that don't necessarily qualify with health risks or financially, because everybody needs that kind of support here."

Are people receiving the information they need?

Satisfaction with information

Nearly all respondents agreed that they were satisfied with the information they received about *air quality and its impacts in their community* (88%). Many people (74%) agreed that they were satisfied with the information they received about *physical health impacts from poor air quality*, with only 15% disagreeing. When asked if they were satisfied with the information they received about the mental health impacts from poor air quality, 41% agreed, 23% disagreed, 21% were neutral and 15% had not received any information on the topic.

Satisfaction with Oakridge Air

Seventy-five respondents reported that they received emails or texts from Oakridge Air social media or text message services. Of those respondents who receive Oakridge Air emails or texts, 76% reported extreme satisfaction with the information they received, and another 19% were somewhat satisfied, for a total of 94% satisfied responses. Three people reported being neither satisfied or dissatisfied. Twenty-two percent of respondents (n=48) did not report using either Oakridge Air social media or text message services. However, this group's informational preferences did not otherwise differ from those who used those Oakridge Air services. This suggests that there is an opportunity to enlist new Oakridge-Westfir residents in existing Oakridge Air services.

Information households want to receive from Oakridge Air

When asked what information people would want to receive from Oakridge Air, respondents selected a range of topics, which are described in Figure 10 (and further in Appendix II).

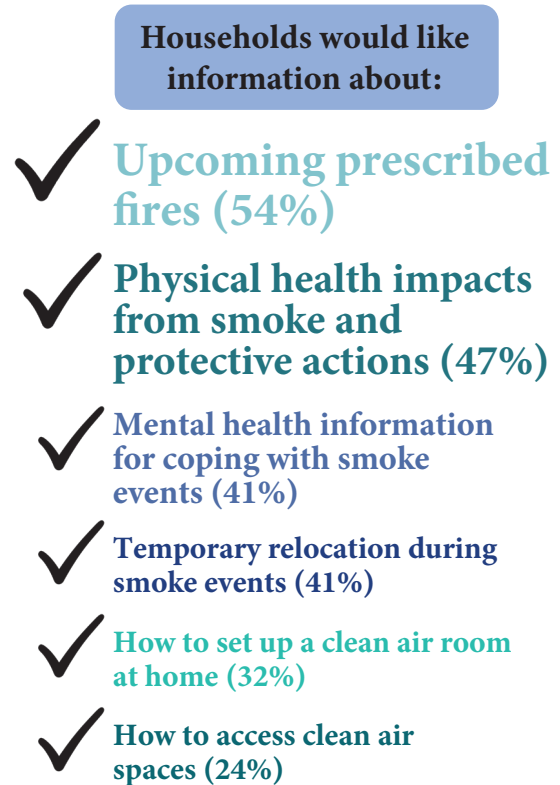


Figure 10. Information households would like to receive from Oakridge Air (because respondents could select more than one response, percentages do not add to 100).

"They [Oakridge Air] are at the core of our community, in so far as communicating and providing safety gear. They make it easy and accessible."

"The information and services provided by Oakridge Air have been critical to me surviving the smoke season and the Cedar Creek Fire smoke."

Statistically significant differences between survey respondents

To highlight some distinctions in who Oakridge Air serves, we focused here on comparison between older and younger groups of respondents to the survey.

In comparison to younger people, people over 55 were:

- Not satisfied with information they received about physical health impacts from poor air quality.
- More likely to get information from TV, and less likely to have used Purple Air/PAKU mobile phone app or the AirNow.gov website.
- Less likely to have left the community during a smoke event to go to a cleaner air space.
- More likely to want information about temporary relocation to areas with cleaner air during a smoke event.
- More likely to have used an Oakridge Air-provided HEPA purifier.
- More likely to be concerned about woodstove smoke.
- More likely to have experienced headaches or migraines from smoke.

Although most people were concerned with air quality during the summer, people who were concerned about air quality generally were significantly more likely to be concerned about it during the winter season.

Households with individuals who have pre-existing health conditions were more likely to:

- Report trouble breathing.
- Want physical health information related to smoke events such as health risks and recommended protective measures for people with various medical conditions.
- Rely on email or family and friends for air quality information, and less likely to use roadway signs or fliers.

Discussion

Overall, these findings represent 13 percent of the approximately 1,600 households in Oakridge-Westfir. As noted previously, the people responding for their households were primarily English-speaking, white women over the age of 65 who have lived full-time in Oakridge-Westfir for over a decade.

Adaptation to poor air quality and additional needs

Overall, survey respondents in Oakridge-Westfir have made changes to their lifestyle due to poor air quality and they reported wanting additional information and resources to support themselves and their community.

Oakridge-Westfir survey respondents have adapted to poor air quality by changing their activities:

- Keeping their windows and doors closed (86%).
- Using plug-in air purifiers (90%), with the majority of those air purifiers (79%) being distributed by Oakridge Air.
- Spending less time doing their usual outdoor activities, such as dog-walking, running, and/or biking (80%).

Oakridge-Westfir survey respondents still seek resources for their community to better prevent negative impacts from poor air quality.

- In particular, respondents were interested in more resources for their community for: weatherization assistance (72%) and community-wide distribution of air purifiers and replacement filters (67%).
- Survey respondents were also interested in more information about a range of topics related to air quality, including:
 - Upcoming prescribed fires (54%).
 - Physical health impacts from smoke and protective actions individuals could take (47%).
 - Mental health and how to cope with smoke events (41%).
 - Temporary relocation during smoke events (41%).

- The most frequently used information formats were mobile phone applications or text messages (77%) and internet websites, including social media (74%).

Opportunities to increase the impacts of Oakridge Air's ongoing efforts

Overall, respondents reported satisfaction with the information they received from Oakridge Air and LRAPA. At the same time, there are opportunities to engage more residents through other information sources and topics. As Oakridge Air continues to increase their presence and engagement in the community, there are opportunities for:

Sharing more information about:

- **The Smoke Safety Plan for Oakridge-Westfir**, since only a small number of respondents felt prepared because of their community response plan for wildfire smoke. Understanding more about if this is due to lack of awareness about the plan, or about the content of the plan would provide clarity about the accessibility and utility of the plan for local residents.

- **Specific topics:** Upcoming prescribed fires, physical health impacts from smoke and protective actions individuals could take, mental health and how to cope with smoke events, and temporary relocation during smoke events.
- **Existing resources** people can use to leave the area during longer-duration smoke events. For example, reminding people that they can obtain a bus pass from the local clinic to cheaply travel to an area with better air quality.

Distributing:

- Personal protective equipment, such as masks, and work with the local clinic and community health workers to support residents in obtaining asthma medication, since over half of respondents felt the community would be more prepared if they had access to these resources.
- Air purifiers and replacement filters across the community, since many thought this would help the community be more prepared. Respondents noted that having resources such as these not restricted by regulatory, eligibility requirements would be useful. Residents over the age of 55 were more likely to have received an Oakridge Air distributed HEPA

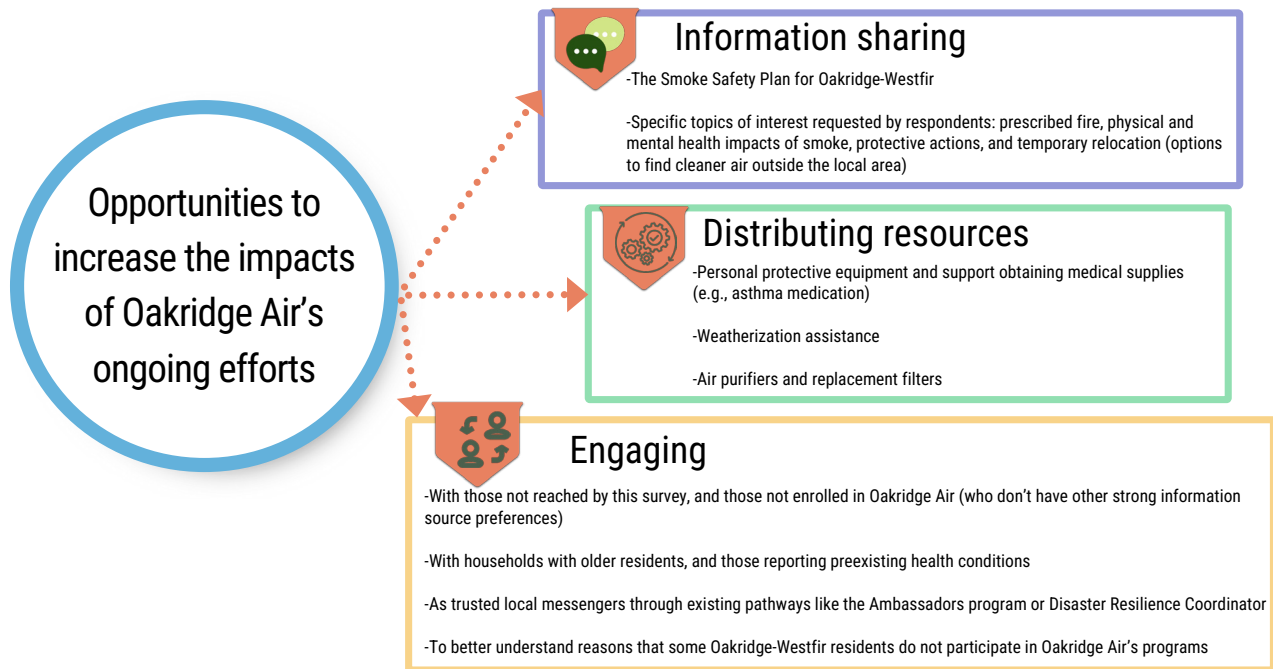


Figure 11. Opportunities to increase the impacts of Oakridge Air's ongoing efforts.

purifier, due to Medicaid and Medicare eligibility requirements, but seeking opportunities to change the requirements (for future filter replacement too) would provide air purifier access to more households.

- Weatherization resources. Oakridge Air recently applied for Oregon Health Authority's Healthy Homes grant, which can be used for home renovations to address poor indoor air quality. Most survey respondents (72%) were interested in resources for weatherization assistance to address indoor air quality.

Engaging:

- **With those not reached by this survey, and those not enrolled in Oakridge Air** text alerts or other related online resources.
- **With households with older residents and those reporting preexisting health conditions**, who were more likely to seek information from sources that were not online, such as television, family and friends. These respondents were also particularly interested in more information about temporary relocation during a smoke event and information related to the health risks of smoke and protective measures for people with various health conditions.
- **As trusted local messengers meeting people where they are.** For example, Oakridge Air's recent hire for a Disaster Resilience Coordinator will help community members prepare for future wild-fire and smoke events. As this position learns from households about the kinds of skills and resources they each have that could contribute to neighbors supporting each other during disasters, they could also use this opportunity to share information that survey respondents noted the community might need. Other local messengers include, for example, the local Ambassadors program, as well as existing gathering places such as local churches. These all serve as opportunities to engage trusted messengers in the community directly with residents, which can help direct residents that are not enrolled in current notifications and/or not using online or app-based information services for air quality information.

- **To better understand reasons that some Oakridge-Westfir residents do not participate in some of Oakridge Air's programs.** Over 50 percent of respondents have heard of most of Oakridge Air's programs, even if they did not choose to participate (including the community firewood and woodshed program, the yard waste program, and the home heating upgrades program). This may indicate a need to better understand the reasons for why people are not participating in these programs.

Appendices

This report contains two appendices, available at: <https://resilient.uoregon.edu/ewp/oakridge>.

This includes:

- Appendix I: Survey Questions (Consent form and Questions, Gift Card Form and Oakridge Air Survey Hand-Out (posted to "Blue Boxes")).
 - Appendix II. Detailed Survey Methods and Results which reports all response categories for all survey questions, in the order the survey was designed.
 - Supporting Material: De-identified survey.
-