Factors Influencing Adherence to Wildfire Evacuation Orders:

A Case Study of the Woolsey & Hill Fires

AP Research

May 2, 2019

Word Count: 4938

Introduction

As the number of people living in fire-vulnerable areas continues to increase and a changing climate extends and exacerbates wildland fire seasons, wildfire events continue to impact a growing number of households throughout the United States. On November 8, 2018, two wildfires ignited in Ventura County, California, that would eventually destroy over 1,600 structures and prompt the evacuation of 295,000 people, including approximately 75% of residents in Ventura's Conejo Valley (The California Department of Forestry and Fire Protection, 2019a, 2019b). Interest in understanding how residents react to fire threats, such as deciding when and whether to follow evacuation orders, has grown. For instance, why some individuals decide to ignore or not fully comply with evacuation orders issued by public safety officials. Residents that decide either not to evacuate or to return before evacuation orders have been lifted often pose a significant safety risk, as the majority of fatalities occur during last-minute evacuations (McCaffrey & Rhodes, 2009). Last-minute evacuation dangers include being overrun by flames or having the evacuation process impeded by poor visibility or limited evacuation routes. Existing evidence from wildfires suggests there are three main patterns of response to impending wildfire threats: residents who decide to evacuate early or immediately upon receiving an evacuation order; those who wait to see if the conditions justify evacuating; and residents who commit to staying at their property and may attempt to defend it (McLennan, Paton, & Wright, 2015).

Many studies have examined the factors that influence residents' emergency evacuation decisions, however, the bulk of disaster research focuses on hurricanes. These emergency evacuations vary drastically from wildland fires in several ways that impact the evacuation process. Namely, there is often ample warning of hurricanes, leaving residents adequate time to

prepare, officials can reasonably predict the area of impact for storms, and evacuation is evidently the ideal form of protective action for residents (McCaffrey, Wilson, & Konar, 2017). Wildfire events, on the other hand, often ignite and progress rapidly, with less predictability due to influences such as weather conditions and topography, which can drastically accelerate or alter the course of a fire. This decreased warning capability and increased variability introduces complexities to wildfires not seen in other natural disasters.

There is a considerable need to examine how factors that have been found to impact other natural hazards apply to wildfire events. Due to the significant consequences evacuation decision making and behavior can have, understanding the factors that influence residents' evacuation responses is crucial to ensuring public safety policies and outreach efforts are strategic and maximally effective.

Literature Review

Research on evacuations has largely concentrated on evacuation preparation and initial responses to disaster events, as well as focusing on the creation of evacuation models to aid public safety officials. However, relatively little research has looked at the rationale and experience of residents who are issued evacuation orders, especially in regard to those who choose not to evacuate or decide to return home before the official orders are lifted. According to Dr. Erica Kuligowski (2009) at the National Institute of Standards and Technology, actions during fire evacuations are the result of a behavioral process, in which cues and information from the physical and social environment are perceived and interpreted in order to decide what actions will be undertaken. While the majority of natural disaster evacuation research focuses on hurricanes, researchers McCaffrey, Wilson, and Konar (2017) highlight how hurricane literature is still relevant in explaining various wildland fire evacuation decisions. For example, they

identified that although the wildfire evacuation decision process is much more complex and unpredictable, a range of factors identified in hurricane evacuations including physical and environmental cues, the actions of others, and information provided by officials all influence the decision to leave in fire evacuations as well.

Most research on wildfire evacuation processes comes from a number of Australian studies, heavily influenced by the 2009 Black Saturday fires. This series of brushfires that ignited across the state of Victoria on Saturday the 7th of February, 2009, resulted in the death of 173 citizens, and led to a large interest in understanding what influences peoples' decisions to evacuate during a wildfire compared to staying at one's residence. The literature highlights the dynamic and circumstantial nature of wildfire evacuation behavior and decisions. Melbourne-based psychological science researchers McLennan, Elliott, and Omedie (2012) identified that over one-third of those who had initially decided to stay during the Black Saturday fires eventually left, while over half of residents who had planned to leave early still felt they left too late. Experiences such as these illustrate the dependence on context and the variability of evacuation decisions during unpredictable wildfire events. Yet while the decision to evacuate is clearly dynamic in nature, there is also evidence suggesting that individual evacuation plans remain fairly unaltered over time. For instance, Whittaker and colleagues (2013) surveyed residents who had reported issues involving visibility, road hazards, smoke, and traffic while evacuating during the Black Saturday fires. Of those residents, nearly three-fourths reported that they had evacuated "late" during the fires, but also indicated they would take the same or similar action in the event of a future wildfire, as they ultimately reached their destination safely.

A crucial aspect of wildfire evacuations is the distribution of official orders from government and public safety officials and their efficiency in getting residents to evacuate during

a fire emergency. In a study of the Bridge Fire in southern California, Taylor et al. (2005) found that communication, especially from government sources, was a considerable issue for evacuees and identified the need for real-time information. Evacuees particularly desired quicker, more frequent, area-specific information than was provided or even available. However, the researchers' analysis also found that attempts by officials to regulate the quality of information being released to the public were often perceived as delaying the flow of information by residents. In their respective studies, Professors Ronald Perry (1994) and Kathleen Tierney et al. (2001) identified several sociological components that influence the effectiveness of orders from public safety officials and contribute to wildfire evacuation behavior: the amount of perceived personal risk, personal traits and family circumstances, hazard features, level of preparation, social networks, and the belief that an event will occur. Tierney et al. (2001) summarize these factors describing that "an evacuation order, no matter how clear, scientifically based, specific, urgent, and authoritative, nevertheless is embedded in a particular social context and influenced by social-structural factors and ongoing social routines" (p. 222).

Methods

While there are a handful of studies examining wildfire evacuation decisions in Australia, few U.S. studies look into the topic, especially outside of rural settings. This study seeks to assess *what criteria influences resident's decisions to adhere to or disregard wildfire evacuation orders* for a sample of residents in Ventura County impacted by the Woolsey and Hill fires. As well as evaluate w*hat changes to public safety messaging and procedures can be implemented by public safety officials in order to increase compliance* with evacuation orders.

Participants

The target population for the survey was limited to Ventura County residents living in areas issued evacuation orders during the Woolsey and Hill fire events and excluded Los Angeles County residents. Although the two counties (and the State of California and U.S. Forest Service) coordinate fire responses, they have separate, autonomous safety agencies that manage and oversee emergency response for their respective areas, including fire and law enforcement response and evacuation orders. For instance, Ventura County is overseen by the Ventura County Fire Protection District (VCFPD) and the Ventura County Office of Emergency Services (VCOES), which utilize a different emergency alert system and different communication platforms than Los Angeles County.

Participants were recruited through varied methods of distribution. First, 200 informational flyers with a link to an online survey were distributed to a subset of homes (including apartments and townhomes) in the Woolsey and Hill fire evacuation zones. A master list of all streets in the evacuation areas was generated with information provided by the Ventura County Office of Emergency Services (VCOES) and each street was assigned a number. Streets were then randomly selected using a random number generator and a flyer was delivered sequentially to one out of every 5 homes on that street. Additionally, flyers were posted at community centers, such as libraries, senior centers, and parks in order to collect information from a variety of residents located throughout the various evacuation zones. Finally, the survey was distributed on social media platforms such as Twitter through the accounts of local newspaper reporters as well as private emergency notification accounts widely followed by Ventura County residents.

Survey Construction

Survey questions were developed based on existing literature in the field of emergency disaster evacuations. The work of Sarah McCaffrey (2017) provided model wildfire evacuation questions that could be adapted for the Woolsey and Hill Fires. Additionally, studies concerning residents' experiences during alternative natural disasters such as hurricanes were consulted in order to compare evacuations across differing calamities (Huang et al., 2012). However, this study expands on the current body of research in terms of assessing the real impacts of evacuation factors. Whereas the existing literature largely examines individuals' disaster preparedness or responses to hypothetical wildfire events, this study seeks to understand how identified variables can be applied to the unique experiences of residents during an actual wildfire event.

The survey included a range of questions to assess: evacuation responses, factors and cues impacting decisions, information sources used during the fires, resident's household makeup, beliefs about the effectiveness of current evacuation notification systems, and future risk perception and attitude. The survey was administered as a conditional, branching questionnaire through the Google Forms application and was available online for four weeks. An online survey was chosen in order to efficiently sample a large and diverse proportion of residents.

Evacuation process.

Residents were first asked whether they lived in Ventura County and indicated the location of their residence on a map by zone. If the respondent lived in an evacuated area within Ventura County, they were able to complete the survey. Respondents were then asked to indicate whether their area of residence was issued an evacuation order during the entire course of either

the Woolsey or Hill Fires, or if they believe they had not received an evacuation order, despite indicating previously on the map that they resided within an evacuated area. Participants were then asked whether they left their residence in response to either of the fires. Those who did evacuate were given questions focused on their evacuation experience and asked to indicate whether they "left before there was a mandatory evacuation order for their area," "left as soon as possible when they heard there was a mandatory evacuation order," "waited to see what happened but left when the danger felt too great," "waited until they were personally told to leave by an authority," or another option. Respondents who indicated that they did not evacuate were then asked if they "chose not to leave" or did not evacuate because they were "never informed there was an evacuation order" and separated according to their responses.

Evacuation influences.

Respondents who evacuated were asked to indicate to what extent they considered eight factors when making their decision of when and whether to evacuate. These factors were identified in previous studies and used to create the following variables: official cues (three items), physical cues (three items), and social cues (two items). Respondents ranked to what extent they considered the provided factors on a scale of 1 (not at all) to 5 (very great extent), with an option to leave the question blank if the question was not applicable (e.g., not all respondents had a law enforcement or fire official personally tell them to leave).

Evacuation motives.

Residents who chose not to leave could select from the following options to indicate why they chose not to evacuate during the Woolsey or Hill fire: (i) did not perceive my home/household to be under threat, (ii) chose to protect my property, (iii) stayed to care for

another individual, (iv) stayed to care for pets/animals, (v) had no place to go, (vi) too sick or disabled to leave, (vii) inadequate money and/or transportation, and (vii) other.

Additionally, residents who evacuated were asked if they returned home before the official evacuation order was lifted for their area, also known as a "repopulation notice." Similar to those who did not evacuate, they were asked to select if they decided to returned early due to the following options: (i) believed that the threat had passed, (ii) returned to protect my property, (iii) returned to check on pets/animals, (iv) remaining evacuated was too expensive or inconvenient, (v) no longer had a place to stay, or (vi) other.

Information sources and future compliance.

All respondents, excluding those who did not evacuate because they were not aware they had been issued an evacuation order, were asked to select all information sources they relied on during the course of the fires from the following options: (i) government websites, (ii) official evacuation notifications sent to phone, (iii) television news outlets, (iv) local newspapers, (v) official government Twitter or Facebook accounts, (vi) non-governmental Twitter or Facebook accounts, (vii) information supplied by friends, neighbors, or family, (viii) no external sources, or (ix) other. Similarly, respondents who did not evacuate or returned home before the repopulation notice were asked to choose whether they would have complied fully with evacuation orders if a range of changes to public safety policy or procedures were implemented, including: (i) evacuation orders and maps were more specific to your street/neighborhood/area, (ii) there was more information about the specific risks to your neighborhood, (iii) more public safety and law enforcement officials were present in your neighborhood, (iv) evacuation routes / road closures impacting your neighborhood were more clear, (v) there were penalties for

returning early (e.g., fine or citation), (vi) better, more convenient shelter options were available, or (vii) other.

Finally, residents were asked if their experience during the Hill and Woolsey fires would affect how they might comply with future evacuation orders, with the following responses (i) more likely to comply, (ii) no effect on future compliance, (iii) less likely to comply, or (iv) other. Then subjects were asked to rate the likelihood that their residence would be threatened by a wildfire in the next five years on a scale of 1 (extremely unlikely) to 5 (extremely likely). Although existing literature has not identified any consistent correlations related to sociodemographic variables and disaster evacuation behavior, questions concerning home ownership and household makeup were included as variables.

Findings

Demographics

A total of 609 survey responses were submitted. 89 respondents who did not reside in Ventura County, did not live within an evacuation zone (as indicated on a provided map)

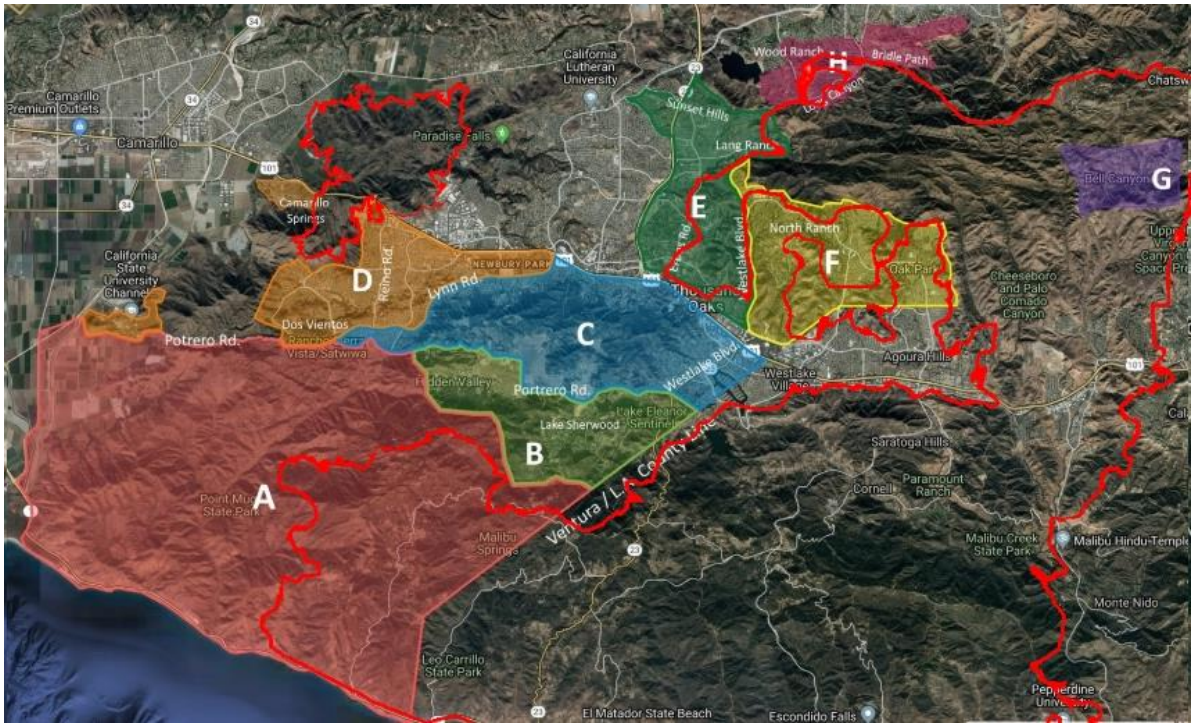

Figure 1. Map of areas issued evacuation orders during the Hill and Woolsey fires presented to survey respondents to indicate their location of their residence

(Figure 1), or did not provide a zip code located within an evacuation zone were excluded from the results.

520 residents of Ventura County, who lived within evacuation zones, completed the survey. Respondents were largely homeowners (77%) who had owned their current home for an average of 13.4 years (ranging from 3 months to 55 years). Those who did not own their current home (23%) had lived in their current residence for an average of 5 years (ranging from 1 month to 20 years). The ages of respondents were divided into five categories (under 18, 18-39, 40-59, 60-79, and 80+) with the largest group of respondents (44%) being between 40 and 59 years old, 33% ranging from 18 to 39, 18% from 60 to 79, and finally the smallest groups, those aged under 18 or over 80, making up 5% of total respondents combined.

A slight majority of respondents (54%) had children under the age of 18 residing in their household. A large proportion of respondents (71.5%) had small pets (cats, dogs, etc.), while only a few respondents (2%) owned livestock, such as horses or cows. The majority of those surveyed (91%) did not have decision-making constraints related to mobility or health issues.

To assess if the survey respondents were representative of the target population, chi-square goodness of fit tests were conducted to compare sample data to the known population data for the county or for the geographic evacuation area (Table 1). Population data were obtained from the U.S. Census Bureau (2017a, 2017b) and the Ventura County Public Health Department (2019). The goodness of fit tests indicate that the survey participants accurately represented the age distribution of Ventura County residents and the number of residents who live in each targeted evacuation zone. However, more residents with children under the age of 18 responded to the survey than would be expected by county demographics.

Table 1

Comparison of Study Sample and Target Population Data

	Sample Characteristics		Population Characteristics		Goodness of Fit Test*	
	n	%	N	%		
Zone[1]						
A and B	21	4%	1868	2%	χ^2	0.084
C	97	19%	14137	13%	p value	0.99
D	169	33%	38748	36%	p >	0.05
E	127	25%	28337	26%		
F	68	13%	14737	14%		
G	1	0%	2369	2%		
H	26	5%	7212	7%		
Age[1 3]						
18-39	170	34%	247224	38%	χ^2	6.59
40-59	229	46%	230492	36%	p value	0.09
60-79	95	19%	136931	21%	p >	0.05
80+	5	1%	30846	5%		
Children[2]						
Children Under 18	237	54	44356	40	χ^2	8.17
No Children	283	46	66811	60	p value	0.004
					p <	0.05

Note: For Chi-Square Goodness of Fit test, p values greater than .05 indicate a good fit, with alpha .05

[1]Population Data Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

[2]Population Data Source: Ventura County Public Health Department Healthy Communities Dashboard

[3]Respondents under 18 years of age are excluded from the goodness of fit analysis to aid comparison

Evacuation Behavior

All residents who indicated that they resided within an evacuation zone on a provided map were known to have been issued a mandatory evacuation order, according to Ventura County Fire Department records. 76.5% of respondents evacuated during the Woolsey and Hill Fires (Figure 2).

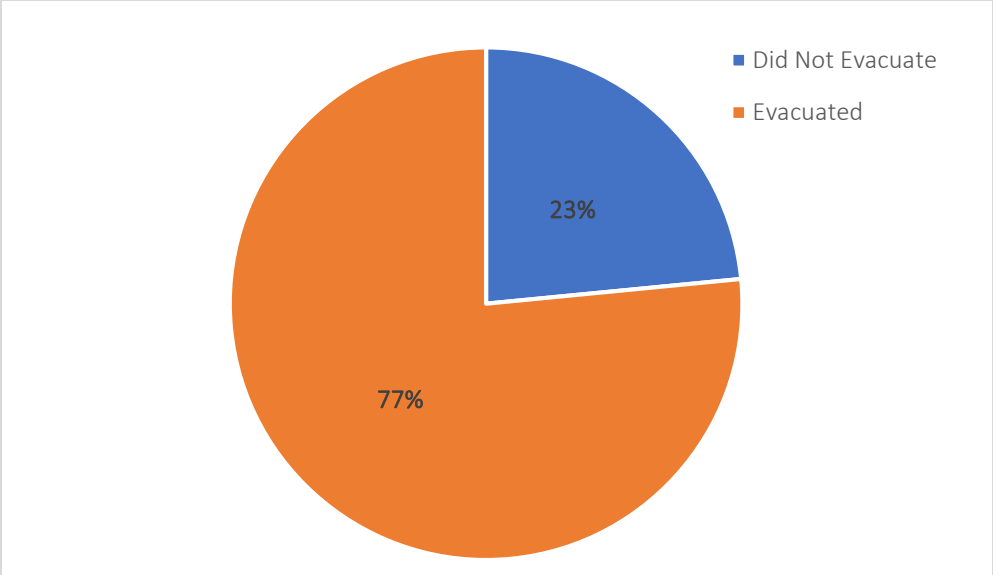

Figure 2. Residents' evacuation decision

While the majority of residents indicated that they immediately received a mandatory evacuation notice (44.5%) or were issued a mandatory order following a voluntary one (40%), some residents indicated that they only knew about a voluntary evacuation order (8%), were unsure what type of order it was (2%), or believed they had not received any evacuation order at all (5.5%). 85% of residents who knew they had been issued a mandatory evacuation order evacuated during the Woolsey and Hill Fires. This compares to only 38% of residents who believed they received only a voluntary order and 20% of those who were unaware they were issued an evacuation order. Indicating that official evacuation orders have great influence on a resident's decision to evacuate, especially mandatory orders.

Of the total respondents who evacuated during the fires (76.5%), 25% left before the mandatory evacuation order was issued for their area, 57% left as soon as possible once they heard there was a mandatory evacuation order, 14% waited to see what happened but eventually left once they felt the danger was too great, and 4% only left once they were personally told to leave by an authority (Figure 3).

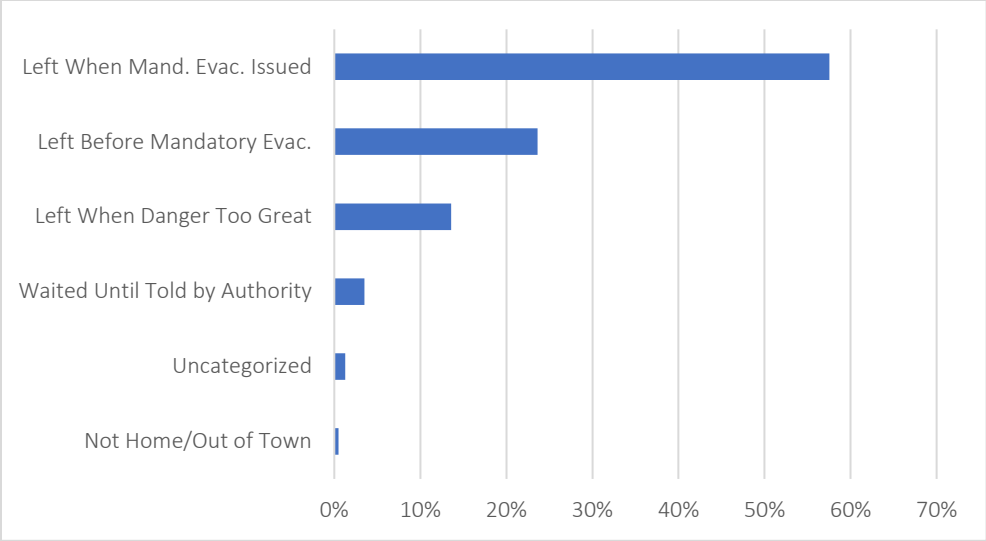

Figure 3. Evacuation response for residents who evacuated

Additionally, 59.5% of those who initially evacuated did not fully comply with evacuation orders and returned home before the official order was lifted, despite still being under a mandatory evacuation order (Figure 4).

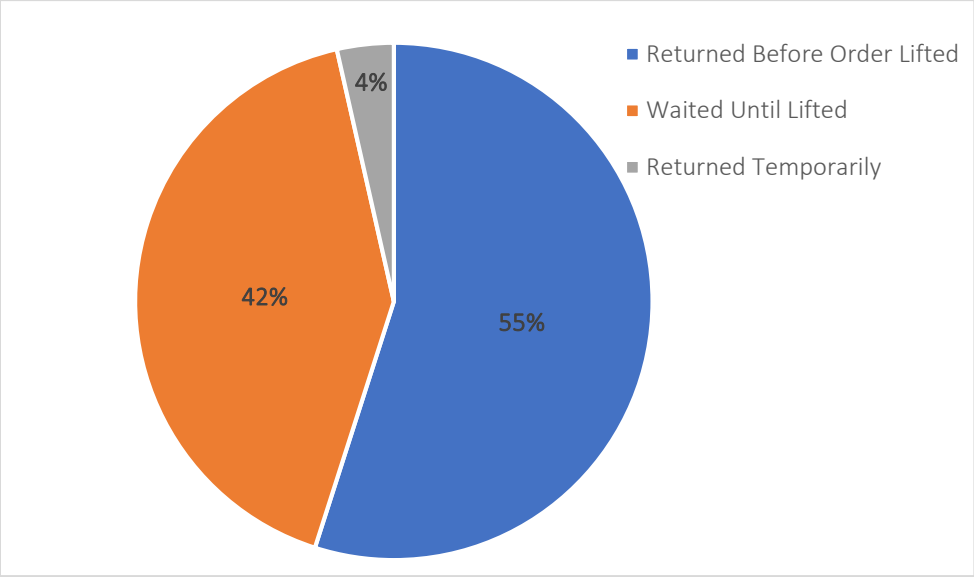

Figure 4. Evacuated residents' decisions to remain evacuated or return early

Evacuation Influences

Respondents who answered that they had evacuated during the fires were asked to indicate to what extent they considered certain factors when deciding when and whether to

evacuate according to a scale of 1 to 5 (1 being not at all and 5 being a very great extent). The factors that influenced resident's decisions to evacuate in order from greatest to least impact were: learning that a mandatory evacuation order was issued for their area (M = 4.32), wind patterns were blowing the fire in their direction (4.12), smoke or flames were visible close to their residence (4.09), concern about limited evacuation routes (3.82), receiving notice that they should be prepared to evacuate (3.64), seeing others leaving in their neighborhood (3.41), family members or friends telling them they should leave (3.17), a law enforcement or fire official instructing them to leave (2.10) (Figure 5).

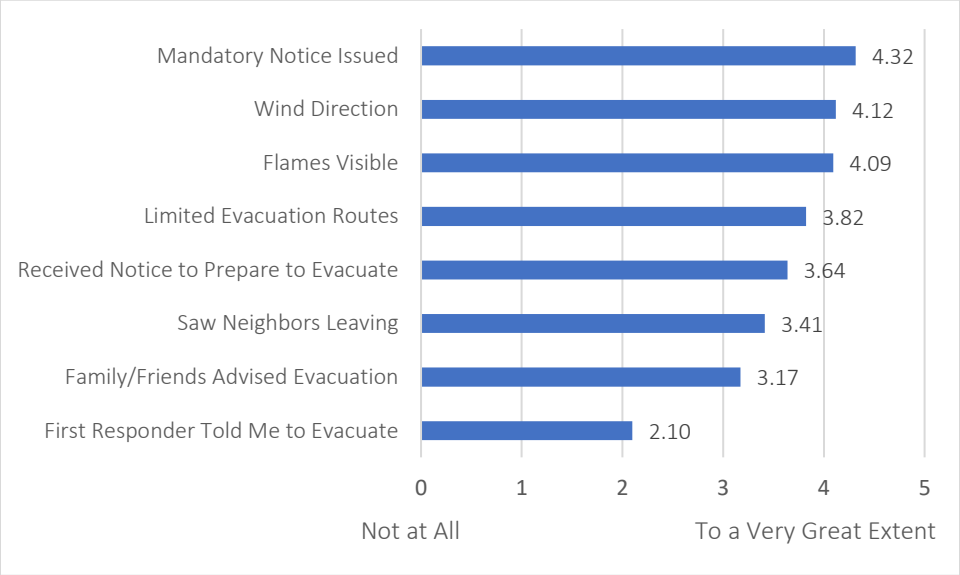

Figure 5. Mean rating of extent to which evacuated residents considered each item in making decision to evacuate

When making their decision to evacuate, residents largely relied on the initial official evacuation order distributed on cell phones and landline calls (62%). However, for residents who did not initially evacuate, limited official resources for constant updates meant that they heavily relied on unofficial Twitter accounts and other forms of social media (48%), information from family or friends (39.5%), and television networks (24%) in order to make their evacuation decisions (Figure 6). Few residents (2%) reported not utilizing any external source of

information when making their decision to evacuate, solely relying on their own senses, often due to the proximity of the fire and time gap between the fire being a threat to their home and the official evacuation notices.

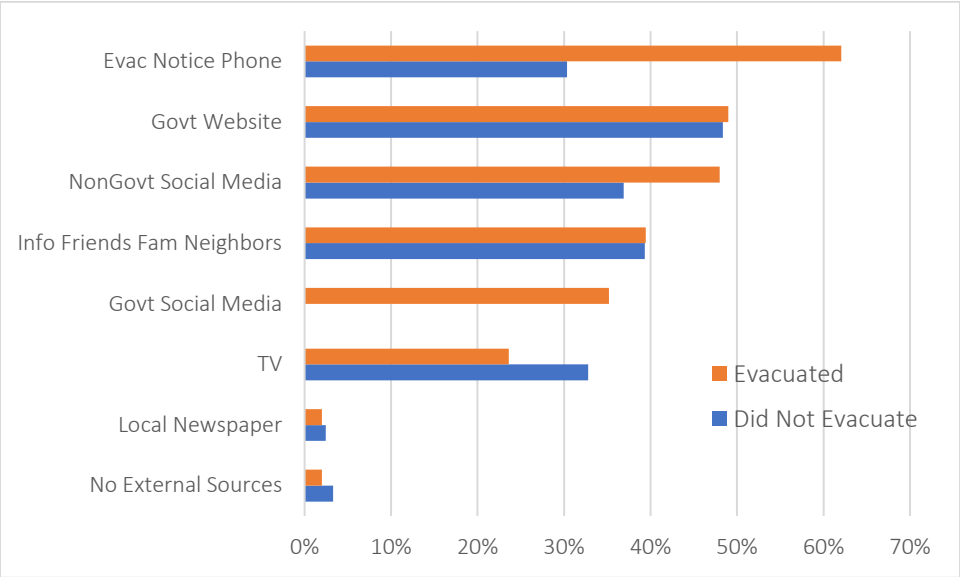

Figure 6. Percentage of residents using an information source by evacuation decision

Future Implications

Respondents were also asked how their experiences during the Woolsey and Hill Fires would impact their future wildfire evacuation compliance. 72% of those who did not evacuate during the duration of the fires said that their experiences had no effect on future compliance, meaning they are just as likely to not evacuate during wildfire events in the future. However, 56% of those who did evacuate said they were just as likely to evacuate during future wildland fires, and 41% said they were even more likely to do so ($\chi^2 = 10.08$, $p < .001$) (Figure 7).

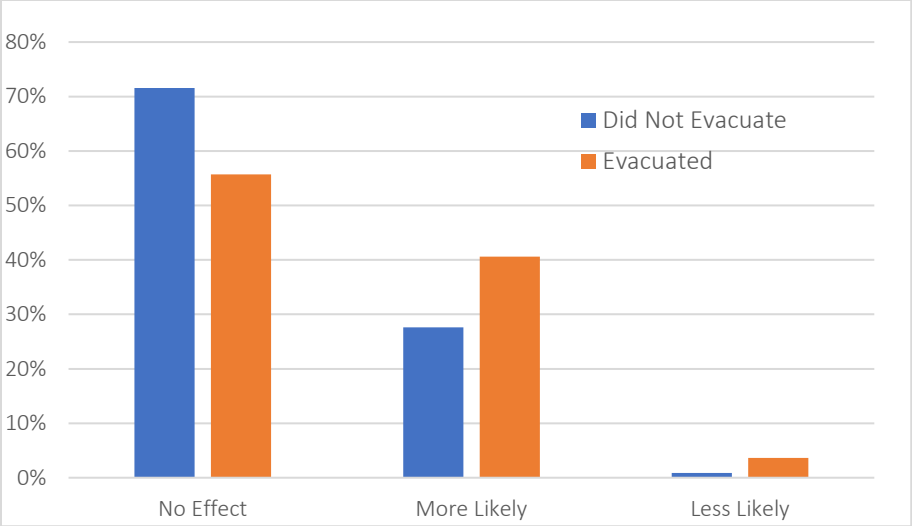

Figure 7. Effect on future compliance of experience during the Woolsey / Hill fires by evacuation decision

Interestingly, when asked to indicate what they believed the likelihood of a wildfire occurring in the Conejo Valley in the next 5 years was on a scale of 1 to 5, those who evacuated on average believed there was a greater likelihood (M = 3.49) than those who did not evacuate (2.92) ($\chi^2 = 25.01$, $p < .001$) (Figure 8).

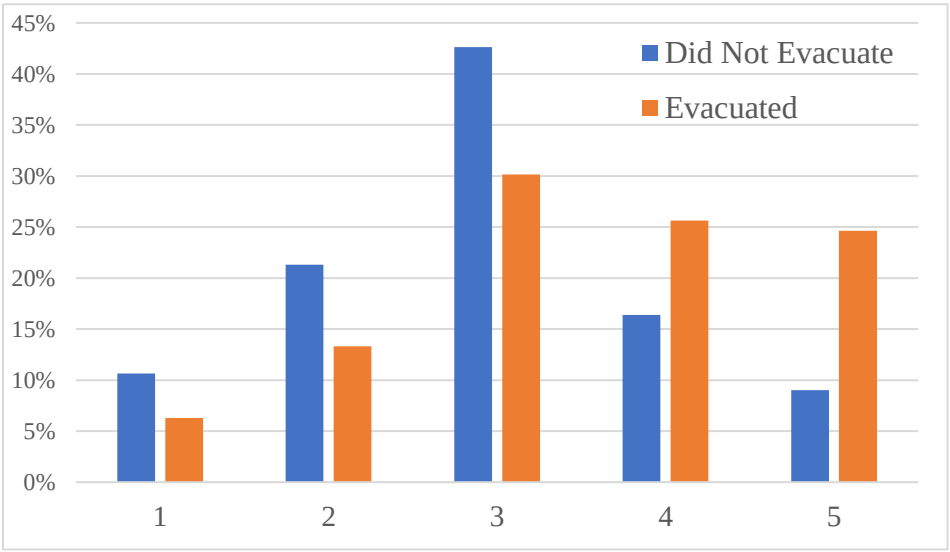

Figure 8. Predicted Likelihood of Wildfire Event Occurring in Next 5 Years

Evacuation Likelihood

Initial evacuation decisions during the Woolsey and Hill Fires were largely based on proximity to the fire line. For instance, residents residing in Zone F on the map (Figure 1) were much more likely to evacuate than those farther from the fire in parts of Zone C and D ($\chi^2 = 41.93$, $p < .001$) (see Figure 9).

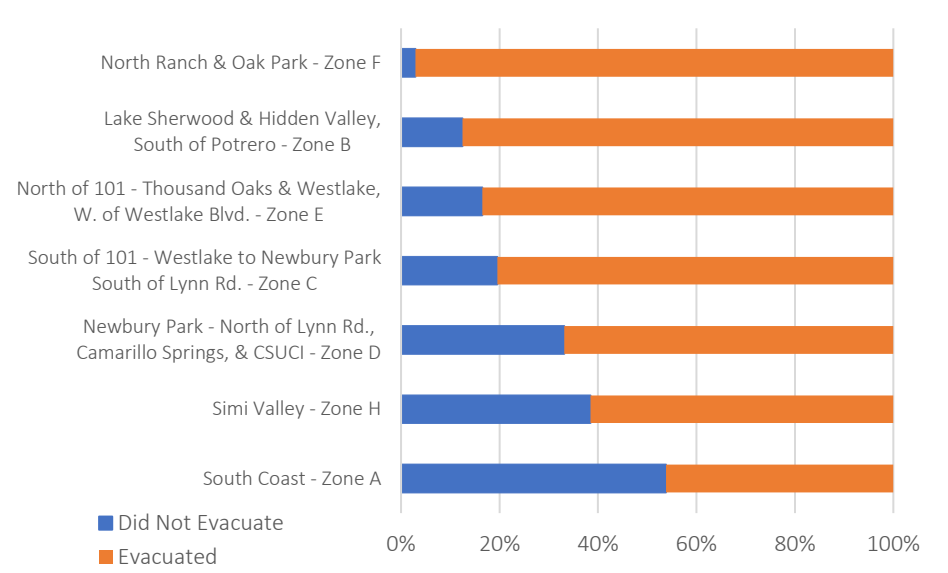

Figure 9. Evacuation decision by zone

Yet other factors were found to be statistically significant in predicting a resident's likelihood of evacuation. People who had lived in their home for 15 years or more were less likely to evacuate than those who had resided in their current home for less than 15 years ($\chi^2 = 17.07$, $p < .001$). Similarly, those who had lived in their home for more than 15 years were more likely to return early ($\chi^2 = 11.39$, $p < .001$), as well as people age 40 and older ($\chi^2 = 7.66$, $p = .006$). Additionally, a significant predictor of an individual's likelihood of returning early was whether or not they had children ($\chi^2 = 5.4$, $p = .02$). Those who had children were on average more likely to fully comply with evacuation orders and not return early than those who did not have children.

Discussion

Noncompliance

Wildfire evacuation literature often suggests the influence of a desire to protect one's property in residents' decisions to not evacuate during a wildfire. However, the motives for decisions to not evacuate during the Woolsey and Hill fires were largely based on one factor, self-assessment. Although some respondents did mention they decided to not evacuate in order to protect their property or care for pets, the majority cited that they chose not to evacuate due to their own perception of the risk of the fires to their home and their own analysis of the situation, despite the warnings of fire officials (Figure 10).

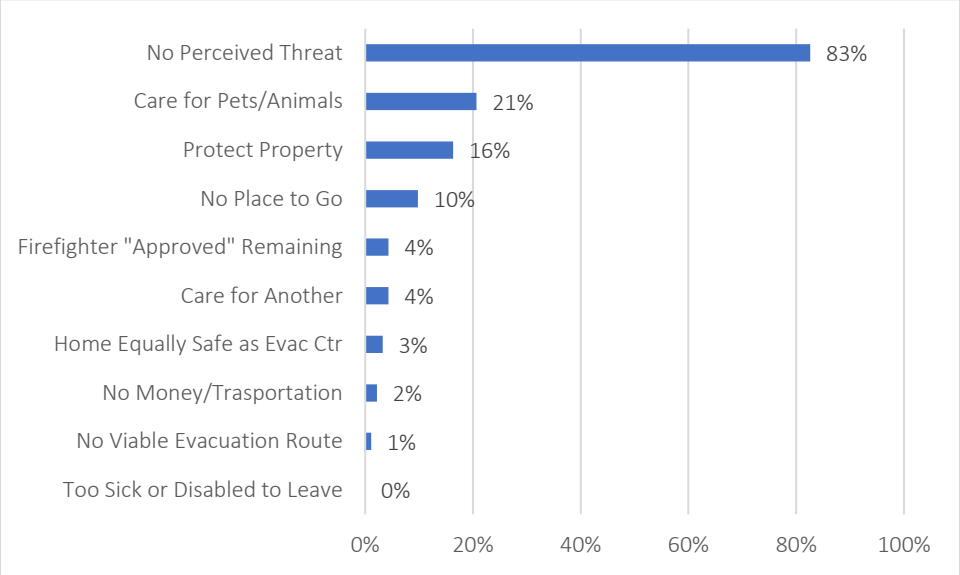

Figure 10. Residents' reasons for not evacuating

The frequency of residents who did not evacuate due to their own evaluations is alarming, especially considering the unpredictable nature of wildfire events. As discussed by Sarah McCaffrey and Alan Rhodes (2009), most civilian deaths occur during last minute evacuations, and determining not to evacuate based on personal assessments puts residents at risk of rapidly growing wildfires and the possibility of a last-minute evacuation.

These findings were paralleled in the motives of residents who did not fully comply with mandatory evacuation orders by returning home early before repopulation notices had been issued (see Figure 5). Residents who returned early, after initially evacuating, largely did so as they believed the threat had passed, not due to remaining evacuated being too expensive or inconvenient (Figure 11).

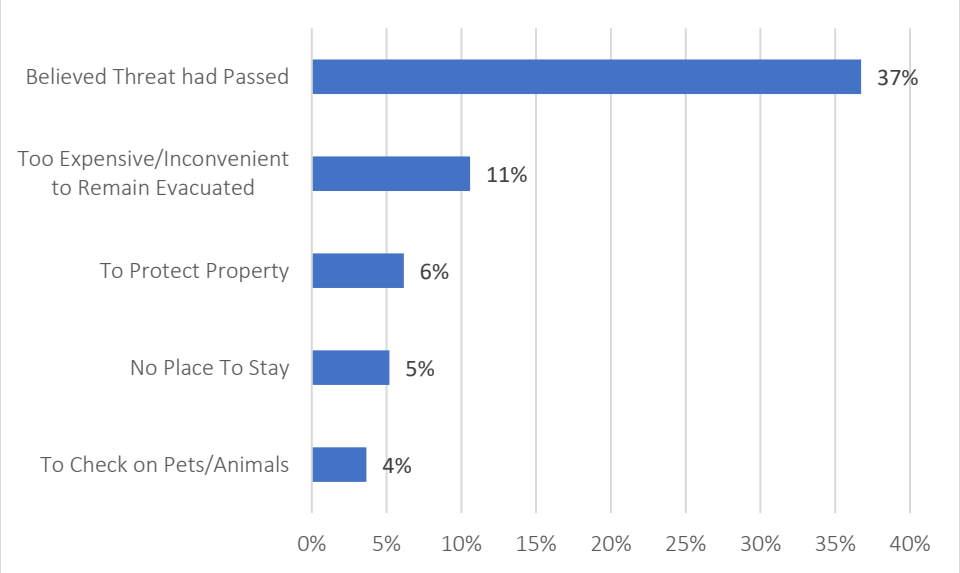

Figure 11. Evacuated residents' reasons for returning before evacuation orders were lifted

These decisions may revolve around one main aspect of the evacuation process, communication and the distribution of information. Respondents make their decisions during wildfires based on the available information at the time of the event. When information is limited, misrepresented, or misunderstood, people often resort to their own perceptions, which can be inaccurate and hazardous. Residents who evacuated during the fires used more information sources (M = 2.59) than those who chose not to evacuate (M = 1.90), ($\chi^2 = 16.55$, $p = .02$). The data also displayed a trend such that the greater number of sources an individual used, the higher their likelihood of evacuation (Figure 12).

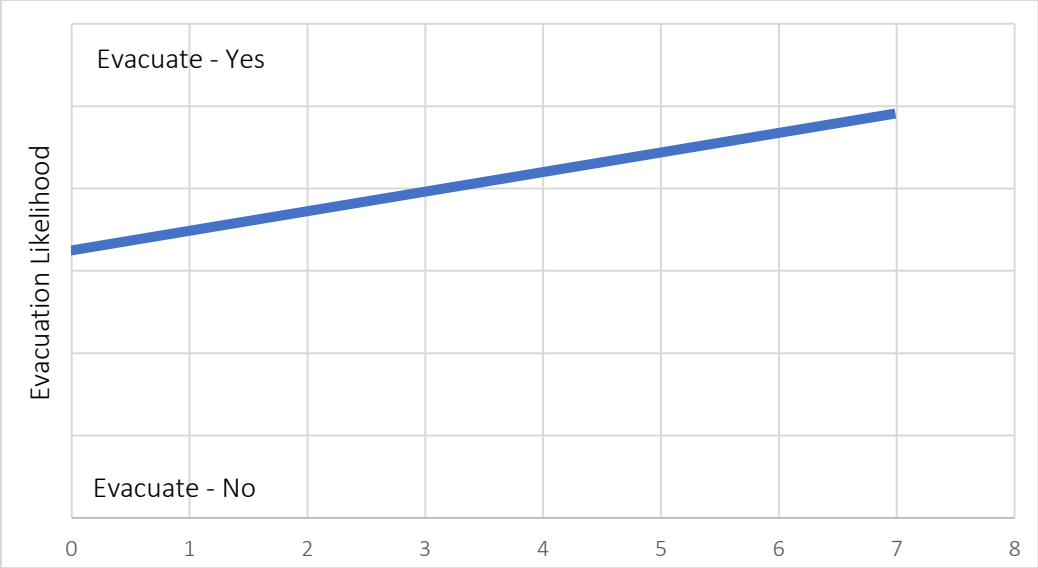

Figure 12. Trendline of evacuation decision (Y/N) by number of sources reported

Respondents who did not evacuate were half as likely to have received mandatory evacuation notices on their phones as those who did evacuate, and frequently relied on unofficial news sources such as television, social media, and updates from friends and family (see Figure 6).

Assuring residents receive information that indicates the specific threats to their area as well as the reasons fire officials want them to evacuate is crucial. Over 60% of residents who did not fully comply during the Woolsey and Hill fires indicated that they would have been more likely to evacuate or not return early if they had received more granular information. Additionally, respondents indicated more precise evacuation orders and maps would have increased their likelihood of evacuation as well (Figure 13).

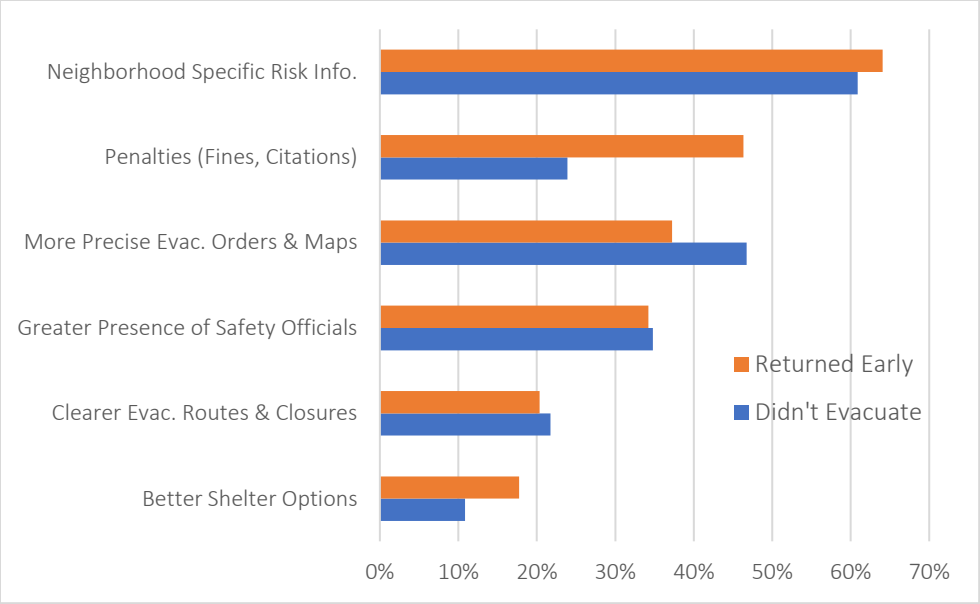

Figure 13. Noncompliant residents' assessment of factors that would their increase future compliance

Residents appear to desire neighborhood-specific information during wildfires that illustrate the direct dangers to their area. It is possible that when evacuation zones are large and encompass areas that are very diverse in topography, development, and demographics, residents do not always feel the need to follow orders they believe they do not adequately apply to themselves. Despite the best efforts of public safety officials, respondents may not always fully comply with evacuation orders if they fail to recognize the dangers that are present.

Again, problems with effective communication also apply to the structure of evacuation zones themselves and to residents receiving evacuation orders that are not applicable or strictly urgent. For instance, one resident during the Woolsey Fire reported in the free response section of the survey: "We were issued a mandatory evacuation order but live just down the street from Borchard Park which was used as an evacuation shelter. Why would we need to leave our home?" Issues exist with unnecessary evacuations and with large, diverse evacuation zones. More granular zones can help to assure the risks identified by fire officials can be effectively

communicated to the populations they apply to, as well as prevent unnecessary evacuations of those who are not at immediate risk. Whether based on neighborhood or topography, zones should be constructed so that residents feel that orders clearly apply to them. Although residents may feel that a fire is far enough away to not be a concern to them, or that winds are blowing it in a different direction, the unpredictable nature and speed of wildfires poses a threat. Effectively illustrating risks to residents, such as where fire officials believe the fire may be headed and why certain zones should remain evacuated is crucial for increasing compliance. Thus, reducing the tendency for residents to solely rely on their own perceptions of the risk of a fire during the evacuation process.

Finally, the free response section of the study suggests that residents who returned early often felt that evacuation orders should have been lifted already and were no longer applicable. Residents who lived in developed areas far from open space and the fire front often returned because they saw no need to remain evacuated, had no updates that suggested the fire was still a threat to their area, and therefore deemed it safe to return. Lifting evacuation orders promptly for areas that are no longer under threat, while simultaneously updating information for those who should remain evacuated is crucial to assure that some residents within an evacuation zone can safely return without having to wait for orders to be lifted for areas still under threat.

Conclusion

Applications

Information availability, quality, and distribution frequency is at the core of the evacuation process during complex wildfire events. Previous disaster literature has identified the impact of official warnings, along with physical and social cues, on peoples' evacuation decisions. However, much of this research focuses on single choices, such as motives to protect

one's property, rather than seeking a broader understanding of residents' actions. It has commonly been understood that residents' decisions to not fully comply with evacuation orders, either by not evacuating or returning early, stem from financial causes or feelings of attachment to personal property. Yet, this study identified one main factor for residents' decisions not to fully comply with evacuation orders during the Woolsey and Hill Fires: self-assessment.

Despite being under mandatory evacuation orders, nearly a quarter of respondents identified did not evacuate during the duration of the fires, and of those who did evacuate, over half returned home before repopulation notices were issued. Their decision to do so was mainly based on their own perception of the risk of the fire coupled with feelings that orders were not applicable to them and their home. Most residents surveyed specified their desire for more specific information during wildfire events. Those who did not evacuate indicated that based on their experiences during the Woolsey and Hill fires they would be just as likely not to comply with future orders when information is imprecise and infrequent. Thus, this study has identified opportunities to increase future compliance during wildfire evacuations by effectively improving the systematic provision of information and illustrating the risks identified by public safety officials to residents. Actions can be taken to provide more granular and frequent information to residents, as well as limit unnecessary evacuation orders and lift orders more promptly, in order to encourage residents to follow the advice of fire officials. Overall more information being supplied to residents during the evacuation process is beneficial in increasing compliance during wildfire events.

Limitations & Further Research

Although the factors and issues identified are applicable to various wildfire events, this study only looked at one community for a localized fire event, and thus a broader range of

information from a variety of disaster events would help to provide a clearer picture of the evacuation process. Wildfires are highly regional in behavior, and their impact can vary drastically based on topography, weather, and population characteristics. Future research looking into the experiences of residents during other wildfires across the United States would be beneficial in truly understanding evacuation patterns and how to improve residents' compliance.

Additionally, looking into the effectiveness of different communication methods, such as more frequent and granular information, would assist in the understanding of what changes can be feasibly implemented. Opportunities also exist examining what factors influence public safety officials and how their process for implementing evacuation orders can best be tailored to the variables that influence residents' decisions. Understanding the variety of factors that influence residents during unpredictable wildfire events can serve to increase evacuation compliance when necessary and assist officials in protecting the lives of residents.

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