



Wildfire impacts on education and healthcare: Paradise, California, after the Camp Fire

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Abstract

The 2018 Camp Fire caused significant damages to the education and healthcare systems in the town of Paradise, CA. This paper presents the findings of a qualitative case study about disaster impacts and disparities, interdependencies, and recovery strategies of schools and hospitals in Paradise. Four major themes of findings emerged from the qualitative analysis of interviews with teachers, counselors, and administrators in Paradise education and healthcare systems and extensive archival research. First, complex and long-standing mental health challenges are the dominant impact on the educational system. Second, educational and healthcare impacts are shaped by social vulnerability. Third, educational and healthcare systems play a critical role for recovery of socially vulnerable groups due to the interconnectedness of community components. Fourth, adapting to new communication norms and technologies is effective for supporting educational and community recovery. Several specific recommendations are provided based on the findings for building back more resilient and equitable education and healthcare services.

Keywords Wildfire impacts · Education and healthcare · Social vulnerability · Community resilience · Equitable recovery · Interdependencies

1 Introduction

Expansion of wildland–urban interface (WUI) communities in recent decades has increased the wildfire exposure of approximately one-third of US residents who live in these places (Radeloff et al. 2018). In the state of California, 35% of WUI land burned between 2000 and 2016 (Schoennagel et al. 2017) and 16 of the 20 most destructive wildfires in the state’s history occurred in the last 20 years. Climate change and fire suppression policies, among other factors, have been identified as contributing to these impacts (Cal Fire 2019a, b).

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The 2018 Camp Fire was the most destructive wildfire in California's history. The fire started around 6:30 am on November 8, 2018, due to electrical transmission lines owned and operated by Pacific Gas & Electric (PG&E) in Pulga, California (in the foothills of the Sierra Nevada Mountains). Due to weather conditions—strong winds, warm temperatures, and low humidity—coupled with the dry vegetation, the fire spread rapidly, engulfing 18,000 acres of land by 2:00 pm on November 8 (Cal Fire 2019a, b). According to Cal Fire, the fire burned at a rate of approximately 106 acres per minute, destroying public buildings, trees, and portable homes and a total of 153,000 acres. The fire caused \$12.5 billion total insured losses (Cal Fire 2019a, b) making it the costliest disaster in the world in 2018. Camp Fire grew in intensity and size quickly, surrounding the town of Paradise and neighboring communities without much warning. Eighty six people died in the Camp Fire, the majority of whom were over the age of 60 and over 11,300 housing units were destroyed (90% of the housing stock) in Paradise (Cal Fire 2019a, b; Governor Newsom's Strike Force Report 2019). The Camp Fire displaced 83% of Paradise's population, caused significant structural and financial damage to the Paradise Unified School District (PUSD) and Adventist Health Feather River Hospital, and caused significant damage to the water distribution system (Cal Dept of Finance 2019) (Fig. 1).

The study presented in this paper builds upon and integrates two ideas in the community disaster resilience literature. First, the concept of social vulnerability recognizes that the inequalities embedded in sociopolitical systems prior to a disaster inhibit the ability of different groups to cope with and rebound from disasters (Cutter et al. 2003, 2010; Elliott



Fig. 1 2018 Camp Fire perimeter and location of Paradise, California

and Pais 2006; Sutley et al. 2019). Although several studies have explored the aggregate impact of damage and disruption of schools and hospitals after disasters (Lai et al. 2016, 2018; Robinson 2012; Zhong et al. 2014), there is limited research on the disparities of impacts across educational and healthcare services based on various levels of vulnerability. To address this gap, we adopt the lens of social vulnerability for understanding the patterns of education and healthcare services impact and recovery within and across Paradise schools and healthcare systems.

This study relies on the social vulnerability theory which implies that households are not equally affected in a disaster, and their preparation, disaster impact, response, and ability to recover can be different based on household demographics (Cutter et al. 2003; Van Zandt et al. 2012; Wisner 2004) and a dynamic interaction between their exposure, sensitivity, and adaptive capacity (Gallopín 2006). The socioeconomic vulnerability indicators used in this study include age, gender, education level, income, employment status, and poverty (Blaikie et al. 1994; Saldaña-Zorrilla 2007) selected based on the premise that vulnerability is a dynamic and localized construct embedded in the conditions of Paradise before the Camp Fire.

Second, previous research shows that interdependence among different community sectors, like education, housing, public services, healthcare, and commerce directly impact the well-being of a community (Feng et al. 2017), and a loss in one sector causes a domino effect in others (Hassan & Mahmoud 2021). Recovery of schools, healthcare facilities, and other infrastructure services are essential for the ability of a community to recuperate from disasters (Mítsova et al. 2019). These services are even more essential for certain groups such as disabled, medically fragile, children, and elderly since they rely more heavily and more frequently on them to meet their basic needs. Therefore, following a disaster, disruption and recovery of certain community infrastructure services affects these vulnerable groups disproportionately (Blaikie et al. 1994; Elliott and Pais 2006; Cutter et al. 2010). We hypothesize that disproportionate impacts from the loss of individual services compound for socially vulnerable groups due to the interdependencies across various services. This study examines how these interdependencies exacerbate disaster impacts for socially vulnerable communities and the consequences of these dynamics in the recovery process.

By answering the following research questions, this case study provides further knowledge on disaster impacts, interdependencies, and recovery strategies of schools and hospitals:

1. What were the different types and disparities of wildfire impacts on educational and healthcare services? How did other community sectors, like housing, affect education and healthcare services after the disaster?
2. What strategies were effective for recovery and improving the resilience of schools and healthcare services?

This paper begins with a literature review on the role of schools and hospitals in disaster recovery, followed by a description of the socioeconomic composition and the Camp Fire damages to Paradise schools and healthcare facilities. The third section describes the data and methods of the study. The fourth section presents the four key themes from our qualitative analysis that characterize the direct and indirect Camp Fire impacts on educational and healthcare services, along with the successes and challenges in the recovery process. Finally, contributions to the disaster literature are summarized and recommendations are provided for building back resilient and equitable education and healthcare services.

2 Literature review

The concept of social vulnerability provides a lens to recognize that due to the inequalities embedded in our society, population groups with certain sociodemographic features such as old age, disability, low-income, racial minority, and renters are at higher risks of adverse impacts and face more challenges to recover from disasters (Bolin 1982, 1985, 1986; Bolin and Bolton 1983; Cutter et al. 2003, 2010; Fothergill and Peek 2004; Maly and Shiozaki 2012; Peacock and Girard 1997; Van Zandt et al. 2012; Gotham 2014; Highfield et al. 2014; Peacock et al. 2014). Some of the communities in the foothills of the Sierra Nevada, including Paradise, present a combination of elderly and low-moderate-income families who choose to live there not only for the natural beauty of the region, but also due to the affordability of housing compared to most of the urban metro areas in the state (sometimes up to six times lower for comparable square footage) (Gee and Anguiano 2020). These characteristics of California WUI communities increase the vulnerability of such high-risk places (Kellenberg and Mobarak 2011).

One of the recovery challenges faced by socially vulnerable communities is the compounding effects of losses due to the interdependencies across community infrastructure, educational and healthcare services, and housing (Van de Lindt et al. 2018). Previous research finds that service-providing infrastructure and institutions, like utilities, businesses, education, and healthcare support and influence the recovery of the primary housing in communities (Hamideh 2015; Mieler et al. 2015; Mitsova et al. 2019). For example, without access to clean water or electricity, a community cannot function to its full capacity, and without functional businesses, there is limited employment or tax generation, which severely hinders the recovery of other sectors, in particular housing (Mieler et al. 2015; Feng et al. 2017).

Schools play an important role in disaster recovery, not only as access points to households (Robinson 2012), but also by providing access to basic amenities such as food and water, daycare services for working parents, and a sense of normalcy, routine, and belonging for children and families (Jimmerson et al. 2005; Fothergill and Peek 2006; Convey et al. 2015; Lai et al. 2016, 2018; Peek et al. 2018). Schools also provide critical mental health support following a disaster to staff, parents, and kids, whose post-disaster trauma is often entangled with other recovery concerns, such as housing displacement and employment (Lai et al. 2018; Cannon, Davis and Fuller 2020; Davis, Cannon and Fuller 2021). This mental health support role makes schools one of the fundamental pillars of community recovery (Lai et al. 2014, 2016), and is especially important for vulnerable communities with pre-existing conditions of trauma, because accumulation of stress over time deteriorates mental health more than a one-time trauma incident (Lai et al. 2018; Meltzer, Merdjanoff and Abramson 2021).

Due to the inequalities in recovery across communities, educational systems experience differential post-disaster recovery trajectories (Lai et al. 2018). Schools with a higher percent of vulnerable population and low rate of attendance tend to recover slower than schools with a stable, high rate of attendance (Lai et al. 2018). Challenges in population return and recovery in turn can hinder schools' recovery because educational systems receive funding based on attendance, and these inequitable community recovery trends can impact schools' financial ability to recover and their ability to offer long-term recovery assistance to families (e.g., additional meals, mental health). In the state of California, school districts' base funding is based upon student attendance; however, school districts receive additional funding if they have a large percentage of high-need students (Murphy and Paluch 2018). This directly impacts other

components of recovery like housing, since parents have to decide to stay or leave in a community according to their child's best interests (Fothergill and Peek 2006; Peek and Fothergill 2008). These social factors can also lengthen the time of school closure after the disaster, indirectly impacting the recovery of vulnerable communities to great extents (Esnard et al. 2018). While these inequalities have been noted in previous research, further examinations are needed to understand the various disparities in short and long-term impacts to different groups associated with the education system. In our study, we examine the disparities in type and magnitude of varied impacts that students, families, and school staff experience from the damage and disruption of schools both directly and indirectly.

Hospitals play a critical role after a disaster by providing access to emergency healthcare services and urgent medical needs for disaster survivors, especially older populations and those with special medical needs, helping reduce mortality rates following disasters (Zhong et al. 2014). Hospitals also provide subsidized healthcare in socially vulnerable communities, making them an important pillar of recovery for these groups (Flanagan et al. 2011). Hospital resilience depends on factors such as robustness of the structural system, nonstructural components such as equipment, partition walls, ceilings, and medical functions such as staff, medication, emergency medical functions, and disaster management capacity (Zhong et al. 2014).

Hospital resilience is defined not only by the capacity of a hospital within the community, but also medical services proximate to it. When local healthcare facilities experience damage and loss of functionality, patients are transferred to other nearby care facilities (Mitrani-Reiser et al. 2012; Jacques et al. 2014; Hassan and Mahmoud 2020), creating a surge of patients that may exceed these other facilities' capacity and cause undue pressure on operations (Runkel et al. 2012). Further, healthcare benefits especially emergency services that are provided within small rural communities may not be accessible in nearby care facilities, creating an added burden for recovery of the vulnerable population (Cutter et al. 2003). Our study of healthcare facilities in Paradise illustrates the various impacts of medical function loss on different population groups.

Interdependencies across various community subsystems can be classified into functional, physical, budgetary, social, and economical (Ouyang 2014). Considering the relationship between educational, healthcare, and other community functions, all above classes of interdependencies are expected and will be described in this study between Paradise schools, healthcare facilities, businesses, and housing. For example, the analysis by Hassan and Mahmoud shows a high degree of interdependence between the education and healthcare systems where a complete drop of healthcare functionality can reduce that of the education by 47% and a complete drop of education functionality is expected to reduce that of healthcare by 43%. Considering other community systems, healthcare is highly dependent on alternate power sources and water supply after disasters to conduct daily operations. Similarly, ambulatory health services, pharmacies, and nursing homes strongly depend on backup electrical power, water supply, and wastewater treatment and can be rendered inoperable without timely provision of these infrastructure services (Arboleda et al. 2006; Mitsova et al. 2020).

3 Background: Paradise schools and healthcare facilities

Paradise was a lumber town that grew rapidly in the mid-twentieth century from about 5,000 residents in 1950 to over 20,000 by 1966. The town was incorporated in 1979 and considered an affordable place to live for moderate-income households. In 2018, the town population was 26,500 with median household income as \$49,270 and median

property value at \$218,400 (DataUSA, 2018a, b). Before the 2018 Camp Fire, PUSD and the Adventist Health Feather River Hospital were the two primary employers in Paradise and served the community in various capacities, including access to free meals and subsidized healthcare.

Paradise represents high proportions of residents with some of the key factors of social vulnerability: low-income and poor, elderly and children, and individuals with disability and fragile health (Flanagan et al. 2011). Marketed in the 1970s as a retirement community, Paradise became home to a relatively large number of elderly and fragility, with 18.4% of the population who were 65 years or older (16.5% nationally), 12.6% of the population under 65 suffered from health issues or disabilities (8.6% nationally), and 7.8% under 65 years were without health insurance (9.5% nationally) (U.S. Census Bureau 2019). Paradise has a high percentage of Whites (70.9% Vs. 60.1% nationally). The poverty rate in Paradise is estimated at 12.6% (DataUSA 2018a, b; U.S. Census Bureau 2019), adding to other aspects of social vulnerability like excessive opioid use (Cal Dept of Public Health 2020). According to a 2019 report by the nonprofit Center for Youth Wellness, Butte County reported the highest proportion of ACE in the state of California at 76.5% (A Hidden Crisis 2019). Some of these children either experienced violence, abuse, or neglect, witnessed violence in the home, or had a family member attempt or die by suicide (Centers for Disease Control and Prevention, 2021). In addition to social vulnerabilities, the average age of homes in Paradise is 43 years old, with a significant number of homes built before California adopted the International WUI Code in 2008 (Bestplaces 2021).

Before the 2018 Camp Fire, there were a total of eight schools in PUSD with over 500 employees, over 4,000 students, and five charter schools (Public School Review 2021). Many of the students in PUSD represent socially vulnerable communities. Seven out of the eight PUSD schools were declared as Title 1 schools. Title 1 is a federally funded program under the Elementary and Secondary Education Act of 1965, designed to support low-income students. It provides supplemental funds for instructional support to achieve the students' educational goals (Cal Dept of Education 2021). As Table 1 shows, of the seven PUSD schools receiving Title 1 funds, two were under targeted assistance, signifying the need for Title 1 services for a select group of children mostly at risk of failing to meet challenging content and performance standards (Table 1).

Two school buildings, Paradise Elementary and Ridgeview High School, completely collapsed during the Camp Fire. Achieve Charter High School and Ponderosa Elementary School experienced significant structural and nonstructural damage due to the fire burning inside of the buildings. Pine Ridge Elementary School had wildfire mitigation performed prior to the Camp Fire, and other schools had natural defensible space around them in the forms of parking lots and playing fields. At these schools (Pine Ridge Elementary School, Paradise Intermediate School, and Paradise High School), only portable structures were damaged (Schulze and Fischer 2020; Schulze et al. 2020). Cedarwood Elementary and Pine Ridge Elementary, both in Magalia, were the only public schools to reopen in their original locations shortly after the fire. The other schools either closed, merged with schools in surrounding areas, or moved to temporary locations within the city of Chico, located 14 miles east of Paradise. For instance, Ridgeview High was temporarily operating out of The Boys and Girls Club in Chico and Paradise Intermediate School was temporarily operating out of the former Orchard Supply Hardware store in Chico. The Chico Teachers' Association also offered extra rooms in their home to teachers from Paradise who lost their homes in the fire (Washburn and Lambert 2018). Table 2 provides details on school locations before and after the fire.

Table 1 Title 1 schools in Paradise Unified School District

Name of school	Grade	Title 1 Program	Enrolled percentage receiving free and reduced lunch (2015–19)
Cedarwood Elementary	K-6	Schoolwide	Approx. 80%
Paradise Elementary	K-5	Schoolwide	Approx. 60%
Ponderosa Elementary	K-5	Schoolwide	Approx. 60%
Pine Ridge Elementary	K-6	Schoolwide	Approx. 80%
Paradise Intermediate	6–8	Schoolwide	Approx. 60%
Honey Run Academy Secondary	8–12	Targeted	Approx. 80%
Ridgeview High School (Continuation)	10–12	Targeted	Approx. 80%

California public school state-wide average of enrolled students receiving free and reduced lunch is approximately 60% for 2015–2019. Three schools show a higher rate in Paradise than the state-wide average. Source: <https://www.ed-data.org/state/CA>

Adventist Health, the primary healthcare provider in Paradise, had two locations in Paradise, the Feather River Hospital on the eastern edge of town along the Feather River Canyon and a standalone Feather River Health Center clinic in southwest Paradise. In addition, Adventist Health operated various smaller care facilities in town. The hospital was the largest employer of Paradise with over 1,000 full-time and part-time employees, and catered to local residents, sixty percent of whom are the elderly or low-income uninsured population (Johnson 2018a, b; Adventist Health). Further, it provided healthcare services to surrounding communities, like Chico and Oroville, from where patients traveled to Paradise to avail the discounted healthcare provided by the Feather River Hospital.

The hospital, with numerous buildings throughout its campus, was one of the first facilities affected by the fire. With several structures on the hospital campus damaged beyond repair, or collapsed, it became a matter of concern if rebuilding the 101-bed hospital in its previous capacity would be worth the investment if sufficient population did not return to Paradise (Colliver 2019). One of the buildings that collapsed was the emergency ward and regulations put forth by California's Office of Statewide Health Planning and Development stipulate that hospitals cannot operate a free-standing emergency department without the rest of the hospital (Adventist Health Feather River 2020). Without this facility, the hospital could not reopen. The priority for Adventist Health became reopening facilities that could be quickly restored to help provide patient care in Paradise. The Feather Health River Clinic suffered some smoke damages leading to its closure briefly after the fire, but was repaired and reopened December 20, 2018, to operate with a limited scope of care services.

4 Data and methods

This paper presents a qualitative case study on Paradise, a WUI community with some unique features such as a high concentration of older and low-moderate-income residents and precedents of drug and other health issues (Gee and Anguiano 2020). The schools and healthcare facilities were critical for providing employment, livelihood, and essential services as well as community attachment in Paradise. While unique elements from this single case study cannot be generalized, they can show new ways of conceptualizing the

Table 2 PUSD locations before and after the Camp Fire

School	Grades	Location before the fire	Temporary location (distance from Paradise)	New location
Paradise Elementary School	k-5	Paradise, CA	Bird Street School in Oroville (21.4 miles)	Paradise Ridge Elementary (old Paradise Intermediate School)
Ponderosa Elementary School	k-5	Paradise, CA	Durham Elementary School in Durham (20 miles)	Paradise Ridge Elementary (old Paradise Intermediate School)
Cedarwood Elementary School	k-6	Magalia, CA	None—reopened in original location	Cedarwood Elementary School
Pine Ridge School	k-8	Magalia, CA	None—reopened in original location	Pine Ridge Elementary School
Paradise Intermediate School	6–8	Paradise, CA	Orchard Supply Hardware (17 miles)	Paradise Junior & Senior High School (old Paradise High School)
Paradise High School	9–12	Paradise, CA	Independent study with drop-in hours at Chico Mall, then moved to the old Facebook Warehouse (20 miles)	Paradise Junior & Senior High School (old Paradise High School)
Ridgeview High School	9–12	Magalia, CA	Independent study with drop-in hours at Chico Mall, then moved to the Boys & Girls Club (18 miles)	Pine Ridge Elementary School
Honey Run Academy	7–12	Paradise, CA		Permanently closed
Children's Community School	k-8	Paradise, CA	CORE Butte Gymnasium (15 miles)	Grace Community Church
Paradise Charter Middle School	6–8	Paradise, CA	CORE Butte Gymnasium (15 miles)	
Achieve Charter School of Paradise	k-8	Paradise, CA	Life Church (15 miles)	
Achieve Charter High School	9–12	Paradise, CA	Living Hope Fellowship (18 miles)	CLOSED 2019/20 school year
Home Tech Charter School	k-12	Paradise, CA	Living Hope Fellowship (18 miles)	

interdependencies of schools and hospitals with other sectors of a community and their role in population return and housing recovery.

We collected data for this case study through both semi-structured qualitative interviews and archival research. A variety of sampling methods were used to develop an initial sample of interviewees and then supplemented with a snowball technique. Media reports were first consulted to identify study participants from local organizations in particular PUSD and Adventist Health. Using purposive sampling, we interviewed individuals with diverse perspectives involved in various Camp Fire response and recovery activities related to schools and healthcare. After each interview, the participant was asked to recommend other contacts for the interview until reaching theoretical saturation (Biernacki and Waldorf 1981; Lincoln and Guba 1985). From April through October 2019, we conducted 33 interviews in Paradise, 19 female and 14 male, representing 18 Butte County organizations. The organizations represented are Butte County Education Trauma Team, Employment and Social Services, Economic and Community Development, several schools from PUSD, Paradise Ridge Chamber of Commerce, Water Works Engineers, Rebuild Paradise, Butte County Fire Safe Council, Chico State University, and Adventist Health. Each interview lasted approximately 45 min, and was transcribed professionally.

We developed the interview protocols based on a review of the literature on disaster impacts on community services, our prior background study of Paradise community, history and the Camp Fire details, and the research questions outlined for the study. In the interviews, we asked questions about the impacts of the Camp Fire on their school or healthcare facility, staff, students or patients, recovery progress and challenges of schools and healthcare facilities, and disparities in Camp Fire impacts and recovery within and across schools and on healthcare recipients.

In addition to interviews, we collected and reviewed secondary documents, reports, newsletters, and media content about the Camp Fire impact and recovery on schools and hospitals. A comprehensive internet search yielded 41 media articles speaking to the impact of the fire on education and health services. We collected 116 archived newsletters from April 2019 through July 2020 by Butte County Recovers group and the Town of Paradise. These monthly newsletters provide information on multiple issues such as tree removal, school recovery, and recovery funds for individuals and businesses. The media and newsletters provided added valuable information and context to the interviews. We also analyzed the community recovery meetings—live and recorded—shared by the Town local government on YouTube and Facebook for information related to recovery on schools and hospitals. Through these meetings, we found relevant details on school recovery proposals for our analysis. All of the archival datasets used for these analyses are publicly available.

We uploaded all the documents, both interviews, and secondary archival data into the Atlas.ti software to code and conduct the qualitative analysis and synthesis. Coding was conducted in three stages of open coding, axial coding, and selective coding (Saldana 2009). First, we conducted open coding, and identified basic themes in the data through constant comparison methods. Second, we examined the relationship between the basic themes, and conducted axial coding to identify larger overarching concepts and patterns in the data. Third, we selectively coded the data to identify links to the larger concepts identified through axial coding. Through these three stages, we generated theoretical memos that described key arguments and evidence in the data. Theoretical memos clarify the assumptions, connections, and evidence drawn through the various levels of coding to answer the research questions (Saldana 2009; Atlas.ti9 User Manual). For reliability check, we employed concept mapping triangulation of coding between primary and secondary data to produce more objective and valid data-driven findings (Jonsen and Jehn 2009). Table 3

shows the major themes, codes that support each theme, and number of quotations for each theme.

5 Findings

Four major themes emerged from the analysis: mental health as the dominant impact on the educational system, educational and healthcare impacts shaped by social vulnerability, critical role of educational and healthcare systems for recovery of socially vulnerable groups due to the interconnectedness of community components, and effectiveness of new communication norms and technologies for recovery. Below, we elaborate on each theme drawing upon the results of the data analyses. As shown in Table 3, each major theme in the findings is based on the connections among several sub-themes in the data.

5.1 Impact of the Camp Fire destruction on the education system

The planned wildfire evacuation of Paradise was supposed to be performed by zones. To successfully perform zone-by-zone evacuation, the residents of Paradise would be alerted through the town's emergency alert system, a system that required residents to sign up before the disaster. At the time of the 2018 Camp Fire, less than half of the town's residents had signed up for the alert system (Todd et al. 2019). Hence, this zone evacuation did not work as planned. To overcome the lack of evacuation communication, Paradise used the FEMA alert system; however, that did not work properly either. Therefore, to encourage evacuations, residents were driving down streets and knocking on doors one-by-one to get the neighbors out.

The traumatic evacuation and enormity of the destruction affected both the young and the old in Paradise schools. A total of 4,832 students and staff members were evacuated from the 13 schools in PUSD, amazingly without any casualties. The chain of extremely challenging experiences starting with the pace at which the fire grew, the delayed process of evacuation from Paradise, loss of 85 lives and near total destruction of the town, and a prolonged disruption of normal life had profound mental health effects in the short and long term (Todd, Trattner, & McMullen, 2019).

5.1.1 Extent, complexity, and longevity of the mental health impacts in the education system

When the study participants were asked about the impacts of the Camp Fire on the education systems, the majority spoke extensively about mental health. The extent and longevity of mental health effects of the Camp Fire can be best understood by examining short and long-term impacts triggered by challenging experiences extending from escaping the fire to months of displacement and disruption of normal life at home and school. As Table 3 illustrates, there is an overwhelming number of comments made by the study participants and in the archival sources about complex and long-standing mental health impacts of the Camp Fire (Theme 1, sub-theme 1.1).

On the day of the Camp Fire, schools started evacuation as early as 8 am, some after the school hours had begun and others sending students back with parents from the parking lot before they drop them off. Evacuation from the school buildings took place in a matter of a few hours, in school buses', teachers' or parents' cars. Previous research has shown

Table 3 Summary of Atlas.ti qualitative analysis themes

Themes	Sub-themes	Codes	Number of quotations
1. Impact of the Camp Fire destruction on education	1.1. Extent, complexity, and longevity of the mental health impacts in the education system	Impact: emotional students Impact: emotional teachers Impact: parents Impact: staff Impact: health & nutrition Impact: employment Impact: physical damage Impact: administrative Impact: functional Impact: organizational Impact: location of classes Impact on housing: staff Impact on housing: student Impact on housing: performance Impact surroundings areas: personnel Impact surrounding areas: student numbers Impact surrounding areas: quality of service Impact surroundings areas: functioning Overwhelming loss	1007
	1.2. Mental health considerations in schools' recovery	Long slow progress Recovery: funds Recovery: challenges Recovery: fatigue Recovery: lessons Recovery: mental health Recovery: success	1198

Table 3 (continued)

Themes	Sub-themes	Codes	Number of quotations			
2. Social vulnerability shaped various dimensions of the camp fire impact	2.1. Disparities in the Camp Fire Impacts exacerbated by vulnerability	Impact: disparities	1088			
		Impact: employment				
		Impact: financial				
		Impact: vulnerable group				
		Recovery funds				
		Recovery: challenges				
		Recovery: property				
		Recovery: vulnerable group				
		Impact: patient				
		Impact: reach of healthcare service				
3. Interconnectedness of community components	2.2. Critical role of Paradise schools and hospitals in recovery of vulnerable communities	Impact: health and nutrition	147			
		Recovery: vulnerable group				
		Recovery: voluntary service				
		Impact on housing: staff				
		Impact on housing: student				
		Impact on housing: patient				
		Impact other: business				
		Impact other: local government				
		Impact: water				
		Impact: functional				
3. Interconnectedness of community components	3.1. Interconnected disaster impacts	Impact surroundings areas: functioning	626			
		Mitigation lessons				
		Mitigation practices				
		Recovery: challenges				
		Recovery: personnel				
		Recovery: property				
		Social media communication				
		Recovery: success				
		4. Adopting new communication ways and norms for recovery		3.2. Interconnected recovery challenges	Impact: functional	755
					Mitigation lessons	
Mitigation practices						
Recovery: challenges						
Recovery: personnel						
Recovery: property						
Social media communication						
Recovery: success						
4. Adopting new communication ways and norms for recovery	4.1. Importance of social media in connecting the school community		Impact: functional		176	
			Mitigation lessons			
		Mitigation practices				
		Recovery: challenges				
		Recovery: personnel				
		Recovery: property				
		Social media communication				
		Recovery: success				

that evacuation experience depends on the location of the schools, and the routes taken for evacuation (Hu et al. 2017). Those schools located in the north of the town faced an extra urgency due to the direction of the wind and speed of the fire.

Paradise had five roads leading out of town, but the fire forced officials to close down three of the roads, leaving one exit toward the south and one toward the north. Most people used the south route to reach the shelter at Oroville and the evacuation destination at the Silver Dollar Fairgrounds in Chico causing gridlock traffic (John, Lin II and Sern 2018; Maranghides et al. 2021). Those who evacuated via the north route were able to do so faster. Even though teachers responded heroically to evacuate students in an efficient manner, the roads were congested with over 20,000 people trying to leave the town at the same time, delaying the evacuation by several hours and creating significant lasting trauma for those who experienced this delay (Kaplan, Yi and Domb Sadaf 2018; Wylog 2019). The comment below from an educator illustrates the long-lasting disparities in trauma effects from prolonged evacuation.

Going South to Chico, and for the people that evacuated down, there's much more traumatization. There's much more. And for the kids that attended Ponderosa and Paradise Elementary, and were evacuated from those schools that burned that day, you can tell that trauma is much more severe.

The immediacy and chaotic nature of the evacuation process from such a frightening fire left an indelible mark in the short-term, and for some students, for a much longer time afterward. Students who evacuated south toward Chico had to sit through hours of traffic in the heat of the fire which left severe impacts on their mental health. School teachers and counselors shared some of those experiences and their effect:

[you think] ...You're not going to make it because with so much traffic...they were dead stopped in traffic. Many of the kids were feeling the heat, the car was getting hot, the tires were melting. So, many of them had to just leave [the car and continue on foot].

In the immediate aftermath of the evacuation, the teachers did an incredible job ensuring that each and every student was accounted for until midnight when the last student was picked up in Chico. Teachers and staff reported that the shared experience created an immense positive bond among them and students. Participants were often emotional when talking about their gratitude for the successful evacuation of all students. For example, staff from different schools mentioned:

Kids were evacuated in teachers' cars together who didn't otherwise really know each other... they made a connection for life in the backseat of that car.

In a few hours, the entire community of Paradise was destroyed, with 90% of the housing stock significantly damaged or destroyed, displacing most Paradisians to surrounding communities. Many months after the fire, people we interviewed were either dealing with or had students, friends, and family dealing with long-term disaster impacts and challenges such as displacement, temporary housing, overcrowding, insurance, triggering feelings of grief, uncertainty, fear, and trauma among other mental health challenges. Avoiding the conversations of loss became impossible not only at homes, but also in schools adding on to further collective fatigue and distress along with the challenge of adjusting to all the sudden changes at school.

The radical transitions -their housing, their family, their dispersal, their loss of their friends -... Just one disruption after another.... Their administrators have changed, their teachers have changed, their location has changed; everything is different and I think that's probably one of the most unsettling things for them [students].

Given the magnitude of the impact and overwhelming loss across all areas of life, students started showing collective memories of the evacuation and fire. Over time, small things like a fire in a fireplace, smoke out of a chimney, and alarms in fire drills became extremely triggering for students, reminding them of the day of the fire. Most of the educators we interviewed were concerned about the consequences of even simple and common reminders of fire such as wind on the emotional state of their students as the comment below illustrates.

Because that day is still very much alive in their head and they're still having problems with sleeping and intrusive memories. They don't want to think about it. Or, they have triggers...if the wind blows it can start kids acting out because it was a windy day. If the fire alarms go off because we're having a practicing drill, it can trigger them. If they smell smoke, it can trigger them.

With the loss of their houses, most students had to either move in with extended family outside of Paradise or were sharing their home with relatives who moved in temporarily. Challenges created by these living environments such as lack of personal space or easy access to basic necessities, instability of housing, and stressful family interactions further exacerbated mental health issues among many students by adding to the accumulation of stress. Interviews with staff, teachers, and counselors showed that many students were barely coping with the adversities around them even several months after the fire.

As much as they're trying emotionally to recover, there's a lot of secondary concentric circles of recovery. Even though they may have recovered from that initial fleeing the fire— some of them have not yet—they still have to then deal with the secondary issues. The next wave...we have to find housing. Or, we have to move away. Now your dad has to find a job.

Not only did this create disruption in living conditions and a daily exhaustion, but also affected their higher-order functioning skills and academics. Many students could not focus on schoolwork.

It's that higher order functioning that they are not able to really focus and concentrate as well as they once did. Math, reading, sequencing, those all become more difficult for them. Organizing is more difficult.

Over time, the impact of this tragic event on mental health became more complex and differential for both students and educators. The effects were different across age and developmental levels in children and between students and educators. Counselors reported that the older kids were more prone to engaging in disruptive behavior than younger kids. It seemed easier for younger kids to talk about the fire than older kids:

The honeymoon-we're glad to be back together-is not showing up anymore. It's now we have kids cutting class. We have kids mouthing off to the teacher, mouthing off to one another. That hadn't been happening, and I don't have an exact reason for that except that trauma has set in and they're really sick of living in the RV or now they have a new location but it's not their old location.

I think tempers are really short. Kids are really quick to anger. I notice [that] in the older kids, the fifth and sixth graders, more groups that are kind of hanging together.

Schools were closed from November 8–December 3, 2018, and reopened either by merging with other schools inside or outside Paradise or shifting to new locations setting up temporary schools. Temporary spaces were provided to students and teachers in surrounding communities of Durham, Oroville, Magalia, and Chico. Some schools had to move more than once, like Paradise High and Ridgeview High School. Paradise Intermediate School had a temporary location in a hardware store in Chico. Teachers, staff, and counselors from these schools noted that while reopening schools created a sense of normalcy, familiarity, and routine in the student's lives, it was quite difficult to maintain discipline in the new settings. Teachers at Ridgeview High School, which operated out of the Chico Boys and Girls Club until June of 2018, mentioned several issues with noise or boundaries that they faced on a daily basis, and how it impacted both the teachers and the students. They also noted that Ridgeview High School was the last to receive a permanent site, citing a gap in recovery resources between the different schools in Paradise.

The noise levels, everybody's kind of in an open structure now. It's a difficult learning environment. It's been hard to get into the flow for teachers or kids. ... The Boys and Girls Club didn't really have classrooms. We were able to utilize their space. But our teachers, because they lost everything, they lost all the books, all their resources, we weren't able to get those back because we had no storage at the Boys and Girls Club. Basically, the teachers each had a bin for all their things that we had to put in a closet at two o'clock every day so that the Boys and Girls Club could run their after-school programs. Unlike some of our other schools that ended up [in their own space] and bought a lot of supplies and everything, we just didn't have that storage ability so we got pretty creative.

The complexity and acuteness of the impact on mental health were not confined to children, but adults—staff, teacher, and parents—alike suffered from mental health effects of the disaster. Not only did adults experience the same level of exposure to the fire as the children, but had to be present for the more fragile members of their families while facing complex and challenging tasks such as adjusting to a new job or home while dealing with insurance applications in the aftermath of the disaster. Some teachers in Paradise left jobs to deal with their personal and family challenges. Those who returned to work expressed stress due to housing loss and work overload with shortage of staff. Several of them were living in motels and commuting to work from far away distances, adding to their daily stress and recovery fatigue. Like the students, school staff also reported trigger symptoms reminding them of the quick movement of the fire and its aftermath. Several counselors mentioned impacts such as the following:

The staff seemed really pretty fractured and shook up and people's lives were so chaotic. They were living in hotels and driving up here, they were camped in a fifth wheel on somebody's driveway. Their lives were very unsettled. They're trying to rebuild their life and they are having to make phone calls, navigate the insurance companies, get rejections from the insurance companies, be told no they're not getting this check or no they're not getting this money, or they got to jump through another hoop. And, they're trying to do all of that and teach a class from nine to three with very little time to fill out paperwork, make phone calls, go do the business they need to do Monday through Friday.

5.1.2 Mental health considerations in schools' recovery

It became difficult and important for parents to decide if their kids would continue to attend their old school in the temporary location or attend a new school in their new community. The answer was not straightforward. On the one hand, students, especially middle and high schoolers, were extremely attached to their friends and teachers, and wanted to attend the same schools with them. In fact, some students who attended new schools in surrounding communities felt out of place unable to connect with others who did not go through the Camp Fire. On the other hand, commuting back to Paradise or Magalia to attend their old schools, now merged in different buildings, created emotional, cost, and time burdens for the students and families, especially those who were living in temporary homes far outside Paradise.

Most of them are taking buses but they could be coming from upper Magalia, Chico or Orville, and I have students that are commuting up to two hours a day to get to school. Probably the average is about an hour to an hour and fifteen minutes, so when I factor that in, that again is another challenge for both students and parents both economically and time wise.

Thus, parents had to decide if a long and costly commute through burned trees and signs of destruction was worth keeping the kids with familiar teachers and friends. Despite the struggles of the temporary locations, the schools continued to provide a sense of familiarity and normalcy for students. Staff from different schools noted:

Even though there's a commute, there's still some real pride about we're back in our home ...the reality is there's a familiarity. And for some people I think that's one of the bridges that helps them overcome the distances and the other hardships because there's such a desire to have some sense of what is familiar because everything else in their life, if they've been displaced, is unfamiliar.

Following the Camp Fire, PUSD responded to the mental health needs in the schools, hiring counselors using funds provided by the North Valley Community Foundation to the Butte County Office of Education (North Valley community Foundation, 2020). PUSD also reached out to nonprofit organizations specializing in behavioral health to fill the gap of mental health needs in the schools. Several retired counselors also came back to serve the school district, often in a volunteering capacity, adding to the resource resilience capacity of the community. Part-time and full-time counselors from the schools and the Office of Education noted that without the volunteering retired counselors, addressing the needs would be impossible.

Probably half or more of [the] counselors that we have now came out of retirement to do this work. So, without retirees the capacity to provide services would be almost nil.

Despite all the local resources for addressing mental health issues, the disparity in mental health resources was especially notable in schools with higher numbers of special needs children. History of wildfires, like the Tunnel Fire, Humboldt Fire and Tubbs fire, and a significant number of Title 1 and higher ACE (adverse childhood experiences) score students in the PUSD had provided clear indications of a greater need for mental health resources in those vulnerable schools even before the Camp Fire. ACE are traumatic events that occur in one's childhood (0–17 years), including but not limited to violence, abuse,

neglect, unstable households (CDC, 2021). Nevertheless, the lack of behavioral and mental health services in the special needs schools created a significant resource gap after the Camp Fire. For example, teachers and staff from one of the schools for the academically at-risk students noted:

I cry foul because it's emotional support we should've had in place, especially for my kids at ninety percent poverty, at risk kids, we should have had this therapeutic counselor on my campus to begin with. We shouldn't be reacting this way because of this; we should have those systems in place to begin with. So, shame on us for not and shame on everybody for not having these emotional supports in place prior to an event happening. We need to be way more proactive on mental health issues.

This gap in behavioral and mental health services clearly added to the stress of the staff working at certain schools, who did not receive enough support for their own mental health. The overwhelming loss in the staff's lives created the need for different types of mental health support, the lack of which further added to the burden.

I wish that we had more counseling for staff. And I wish that it was offered in varied formats, either onsite or offsite. Because when we polled the staff, some people were like I will only go to counseling if it's here at work. And then there were other staff who were like, "I will only go to counseling if it's available outside of work."

5.2 Social vulnerability shaped various dimensions of the Camp Fire impact

Social vulnerability is the human dimension of disasters. Paradise is a uniquely appropriate WUI case study for illustrating the profound consequences of fires on vulnerable communities because of its high social and physical vulnerability to disasters. Social vulnerability is a multi-dimensional concept, dependent on both individual and community-level social and economic factors (Cutter et al., 2003). The overlapping physical and social vulnerabilities along with high exposure to fires as a WUI community magnified disaster risks that were realized through catastrophic and tragic losses when the Camp Fire ravaged through Paradise. Impacts of the Camp Fire on education and healthcare were shaped and exacerbated based on the social vulnerabilities of individuals, families, and groups that were served by or were part of these systems. Remarkably within this context of high vulnerability, Paradise schools and healthcare facilities played critical roles in providing stability and support for recovery. Hence, disruptions in these institutions had clear and compounding adverse effects on the lives of those vulnerable community members, and further slowed down their recovery.

5.2.1 Disparities in the Camp Fire Impacts exacerbated by vulnerability

Pre-disaster vulnerabilities of many Paradise children created different dimensions of disaster impacts and recovery challenges for them. Most notably, conditions of poverty, unstable housing, and health issues in the family before the Camp Fire exacerbated both the disaster impacts and recovery challenges for children. When asked about the vulnerability of Paradise families based on their pre-fire conditions, the study participants were unanimous in the view that life was challenging for many families and especially the children due to challenges with poverty, substance abuse in the family or unstable living environments which put them in precarious situations when faced with the impacts of the Camp Fire. The Camp Fire added an extra layer of trauma for these children, especially those who

were unsure of their housing situation or where their next move was going to be, as shown by the following interview excerpts:

There were already really high ACEs (Adverse Childhood Experience) scores...families already had high levels of trauma due to generational poverty, sometimes generational drug use. I mean people lived here because it was a really economical place to live. You could live here with a pretty low standard of living...So I'd say it's that sort of marginalized groups... folks who were already struggling with poverty, that when they lost their homes or lost their jobs, had less of a way to get their footing underneath them.

Difficult pre-fire conditions made certain families further susceptible to experiencing more challenges after the Camp Fire such as emotional distress, losing sources of income or shelter, overcrowding with relatives or friends, or separation from family members which made educational recovery extremely hard for the children. In particular, schools with a higher number of special needs students manifested a concentration of these vulnerabilities. Counselors and educators reported that the conditions of these children got exacerbated after the Camp Fire.

People were probably working but I don't think people up here make a lot of money. Now, people are struggling just to get food, clothing, and the day-to-day essentials. You know, am I going to buy propane, or are we going to buy medicine, or can we afford to buy new shoes. So, sometimes decisions are being made. I would say the population most at risk for the kids are those that really already were at risk [and] are now more so. I think they're going to have a more difficult time recovering from it.

Despite the well-known pre-fire vulnerabilities in certain schools, Camp Fire recovery resources were not distributed with consideration of those disparities. There was a significant gap of unmet recovery assistance among different schools. Staff from some of the Title I schools said:

A lot of times the perception of [some] students is that they're the bad kids. So, I think that often they tend to get fewer resources because of that. I think that's a challenge. Although, we did get an extra counselor which has been really helpful for our kids. But we do tend to get, I don't know, seem to be the low man on the totem pole in a lot of ways because of the perception of who our kids are. I know that's not intentional most times, [but] sometimes it is. It's not just in the school district. A lot of the community feels that way.

These disparities find further confirmation when we contrast it with recovery resources received by other non-Title I schools. For instance, one interviewee at another school mentioned:

There were new coats, there were backpacks, there were blankets, there were quilts, there were stuffed animals, there were lunch boxes, there were clean canteen water because our kids had to drink from water stations for a long time because there wasn't running water that worked. There was just a wealth of gifting coming from all over the US and from different parts of the world as well...and there was a lot of discretion given to staff members to distribute them to families as they saw the need.

Another critical dimension of vulnerability in the Paradise education system is the large number of children and youth in the foster system who lived with families that were inevitably displaced after the Camp Fire. Participants mentioned across several interviews that

approximately 110 foster students lived in Paradise and Magalia out of the 500 foster students in Butte County. An organization called Youth for Change provided twelve beds to foster students before the fire in Paradise but their facility was completely destroyed. Following the fire, the foster children were left with no resources or homes, either with loss of housing at their foster parents' or due to the loss of the foster agency shelter. Some foster parents who did manage to find temporary housing remained foster parents to these children. But a larger number of foster children that could not be supported by Paradise families anymore were transferred to new foster homes in other California counties, like Shasta or Bay Area counties. This shows unstable family conditions can create multiple layers of vulnerability for youth after disasters that extend from living conditions to education to health. One of the counselors highlighted this particular group with extreme mental health struggles:

I'm actually dealing with a couple of students right now, between the ages of fourteen and seventeen, who we have referred on for suicide evaluation...it's also the compounded effects to those kids because many of them are also either currently or have been foster children.

5.2.2 Critical role of schools and hospitals in recovery of vulnerable communities

A recurrent theme in the data is that the role of schools in supporting students and the larger Paradise community after the Camp Fire went beyond education and extended into addressing issues that arose at home due to the disaster. For the socially vulnerable students, reliance on schools for some of the daily life needs was common before and regardless of the disaster. However, after the Camp Fire, schools became an important pillar for recovery beyond education especially for students from families with recovery challenges, confirming findings of previous studies (Lai et al. 2014, 2016). First, the schools provided basic necessities, like food and potable water which were not easily affordable for many families after Camp Fire damaged the town's water infrastructure. Second, the schools acted like free daycare for children in elementary school when parents had to look for jobs after losing their jobs due to the Camp Fire. Third, the schools provided some relief to these vulnerable students from their rather unstable temporary living conditions after displacement due to the Camp Fire. Fourth, schools provided familiarity and normalcy on a daily basis to students by restoring some sense of routine and connection to their teachers and friends. Counselor and staff from different schools highlighted these essential support services:

There's a section I know in Magalia [that] was a trailer park, but it was so substandard ... I dealt with kids who were living in a trailer with their mom, their dad, brothers and sisters in a twelve-foot trailer and that's what their life is. How do you deal with that every day and how do you get these kids to understand that, I understand it's terrible right now, I understand your life is not the best, but when you get here, I want you to feel that you're loved and you feel safe and you feel secure here. You have food here. We've got breakfast, we've got lunch. We'll get you a snack in the afternoon. Just something to give them some sort of, okay, there is something better than what I have to go home to. Because a lot of times what they have to go home to is not the best.

Healthcare services in Paradise also played a critical role in supporting the community, particularly the socially vulnerable groups. In the immediate aftermath of the fire, when

the hospital closed down due to extensive damages, not only the community of Paradise was affected, but also the vulnerable population from the surrounding communities who traveled to the hospital to avail discounted healthcare facilities.

Our prime service area was probably the Paradise and Magalia...Our secondary service area would have been Oroville, Chico, and some of the surrounding areas like Gridley and others because we do serve more of the low-income MediCal, Medicaid patients. And often they have a hard time accessing care in a lot of places especially for specialty care, so we had a very large patient population here.

Adventist Health was reputed for their nonprofit Christian mission of serving people in need, and their role in serving the community by free medical services, subsidized community healthcare, and aid to the poor and elderly (Adventist Health). Discounted healthcare through MediCal and Adventist Health helped the patients in need to access the necessary medical services at the Feather River Hospital before the fire as noted by our interviewees.

[community benefit] It's something we really cater to and it's part of our mission. And so, we're not walking away from that, ... I think it's also a huge need, because if those patients have gone other places, or have left they may have challenges with health care. Which is again, why we're seeing a lot of people who are willing to commute if they are still kind of in the greater area within an hour drive, but they're driving because they, you know, can't go anywhere else.

In the months following the Camp Fire, recovery of hospital services proved essential for the return of residents to the community. Right after the fire, when the hospital and clinic had to close down, volunteer medical services were provided by local nurses (Meyers 2019). However, with various services of the Feather River Hospital relocated to surrounding communities, and no guarantee that the hospital would reopen in its pre-fire capacity or rebuild, there was a critical question regarding the long-term recovery of medical services for the vulnerable population (Colliver 2019). Employees in the hospital who lost their jobs and several doctors from the clinic moved to surrounding towns to work in other facilities or their private healthcare practices (Urseny 2019a, b). One year later, in October 2019, the State of California passed Senate Bill 156 allowing a free-standing emergency room (Epley 2019a, b) which led to reopening of the only emergency care facility in Paradise after the fire and making it a symbolic "piece of healing" (Adventist Health Feather River 2020; Epley 2019a, b).

5.3 Interconnectedness of community components

After the fire, several interdependent factors became crucial in determining both the extent of impacts and recovery of the education and healthcare services.

5.3.1 Interconnected disaster impacts

Examining impacts of the Camp Fire on various individual dimensions of schools and healthcare systems revealed that many components were affected by the impacts of another component or whole other systems. The interconnections of the impacts become prominent when we look at the impacts across various sectors of Paradise, particularly across housing, utilities, businesses, education, healthcare, and community organizations. With the fire destroying 90% of the housing stock in Paradise, people were not only displaced from their

homes, but were also forced to find temporary homes in other communities, miles away from Paradise. Therefore, displacement extended beyond loss of home to loss of community for most of the Paradiseans.

Those families who could not afford to move to surrounding towns or other states ended up in a worse mental and financial condition because many of them started sharing temporary housing with relatives leading to overcrowding or lived in trailers on their land surrounded by the burnt landscape day in and day out uncertain about for how much longer they are allowed to stay on their land (Epley 2019a, b; Vitale, 2020). In the long-term, residents were only allowed to live in RVs on their property if they were rebuilding (makeit-paradise 2020).

For both students and educators, performance at school was compromised due to the difficulties related to the Camp Fire housing impacts including displacement, uncertainty, and low quality of the temporary housing as well as the Camp Fire employment impacts including loss of job and income in the family. Looking at Table 3, there is a large number of statements and comments made by the study participants and in the archival sources about interconnected challenges from home to school for both students and school staff. Educators in various capacities at Paradise schools emphasized these interconnected impacts highlighting their magnitude with a context of high socioeconomic vulnerability:

One of my students I took home the other day because he was really sick and his mom wasn't available. He's living with ten people in two little trailers on their property. So, the biggest impact, and we have quite a few students that are sleeping at other kids' houses because they don't have a place to stay.

What teachers are seeing with kids is their capacity to stay focused is limited, their capacity to take work home and do homework is limited both in terms of the physical ability to have a space to do the work and also in terms of their mental capacity to remember how to do it or remember to do it at all once they get home...a lot of people are calling it fire brain. Basically, that trauma has continued to impact them that way, so, the academics become really difficult for these kids.

The displacement of residents also affected businesses. Even if the structure was not burnt, there were not enough people to employ or serve as customers, and most of the businesses had to close down or move from Paradise. Several school and healthcare staff shared these concerns about businesses:

What we are hearing from local businesses is that their primary concern is that they are unable to retain and recruit people because of the challenges for finding housing. We had a small, but thriving business community with sales tax that helped fund [some of the public services], so we've lost most of our businesses. There's a fair amount that have returned or are operating elsewhere. That sales tax implication is huge.

Paradise also suffered insurmountable losses with regards to its utilities, specifically electricity and water services. The fire caused damage to the water distribution system making the water within the system unsafe for drinking. Seventeen months after the fire, Paradise Irrigation District (PID) changed its water advisory declaring water safe for those who followed regulations for testing and rebuilding, but still undrinkable for those with interim temporary permits (Paradise Post 2020). This directly affected the businesses, schools, and the healthcare facilities that could not operate without utilities even if they had not sustained structural damages (McGinty et al. 2021). Consequently, unscathed businesses like restaurants and grocery stores had to remain closed due to lack of safe water.

The reopening of healthcare facilities was also affected by the problem of the contaminated water distribution system which was an obstacle against providing safe medical conditions in these facilities. Clearly, a direct consequence of businesses and healthcare closures was loss of customers and flow of revenue into the community. One of the interviewees at Water Works Engineers said:

There were a number of businesses who had the buildings remain standing and they had a viable location. Right after the fire some of them went back to try to reopen I'm sure and they couldn't because they couldn't meet County Health Department standards for providing potable water to serve food and to wash dishes and all the things you need to do in a food service business. Other businesses that were not food service businesses also had problems because of concerns about the potability of the water.

Lack of potable water and laundry services further affected the living conditions of those who could not relocate outside Paradise. It put yet another strain on the mental health of the families and children. The residents who returned to Paradise either to their homes that were standing or in trailers, faced the burden of accessing clean water. Due to contamination in the water distribution network (Schulze & Fischer 2020), residents were required to pay for water tanks, drive frequently to potable water distributions across Butte County (either through churches, nonprofits, or the water district), and endure frequent water testing given the changing levels of contamination and uncertainties revolving water test results (Butte County Recovers 2021). One participant mentioned:

The trailer may not support the electricity that's needed for the water or the battery that's needed to power the washer and dryer. So, a lot of people are without capability of doing laundry and it shows in the kids... one little guy was kind of depressed because he was wearing the same two or three pairs of sweatpants right after the fire and they were getting pretty dirty. He said, well, my mom can't do laundry. So, when I called the mom to talk about it, she goes, yeah, it's really hard to get down to Chico and do that.

The interconnected impacts of the Camp Fire across various sectors of Paradise were not limited to the few weeks or months after the disaster. While Paradise schools, healthcare facilities, residents, community organizations, and businesses were struggling to restore functions of the town and recover, frequent power shutdowns particularly during the fire season caused various challenges that can be understood as extended impacts of the fire and created setbacks for restoration of the daily functions of the community. During the months of October and November 2019, Pacific Gas and Electric (PG&E) began public safety power shutoffs (PSPS) throughout 30 counties in Northern and Southern California, including Butte County. These shutoffs were in response to the 2018 fire season when strong and dry wind caused wildfires, including the Camp Fire. These power outages impacted over 2.5 million people throughout the state of California and added an extra stressor for the survivors of the Camp Fire.

The power outages brought back memories of the day of the fire. PG&E had not shut down the power on the day of the Camp Fire, even though they had communicated to the public that they would shut down power during dry weather combined with high wind conditions to prevent ignition. A spark from the electrical line in Pulga started the fire to begin with, which then spread far and wide down the valley due to the high winds (Cal Fire 2019b). The power outages directly affected the living conditions for those residing in Paradise leaving them in dark and cold trailers and particularly vulnerable if they depended

on medical devices that required electricity. It also resulted in many days of school being canceled while the schools were struggling to recover from the Camp Fire. Beyond academics, school shutdowns deeply impacted those from lower economic backgrounds as the schools provided food, water, and some relief from poor living conditions after the Camp Fire. In addition, the power outages caused significant financial loss to both the school district and grocery stores due to waste of perishable food without working fridges. Several Paradise officials shared frustrations about the situation:

While it's a safety power outage and you think they [students] get a break from school, the reality is they [students] are sitting in the dark in a trailer on a property somewhere which I don't think is doing anything to increase their mental health.

You are affecting thousands and thousands of lives every day and now it's getting cold and that is one of the reasons we're not in school because yesterday our classes were at thirty-five degrees in the morning up at the top of the hill and we have no heat. Even our generators don't produce heat. So, they're affecting life, lifetimes of people.

During the community information meeting on the second anniversary of the Camp Fire, officials from both schools and hospitals emphasized the need for backup power systems, via generators and solar energy batteries to deal with the PG&E public safety power shutdowns (Town Paradise 2020a, b).

5.3.2 Interconnected recovery challenges

We found multiple interdependencies between restoration of education and healthcare and population return, and recovery of homes, businesses, and other sectors. Paradise was a small community with many families who had lived there for generations or moved there for retirement because of their love of the town's beautiful natural setting, tight knit community, and affordable living. This shared sense of belonging created a strong bond within the community. Many of the residents knew each other well and the Paradise High School football games were considered a big community event, which many, if not everyone looked forward to. Thus, schools played a critical part in bringing the Paradiseans together and provided a sense of community even beyond families who had kids attending schools. Following the fire, the damage, closure, and disruption of the schools' community activities created an additional layer of loss for everyone in the community beyond the students and the staff. Therefore, reopening the schools in Paradise became a priority not only for restoring the educational services but also for encouraging residents and businesses to return and for restoring the sense of community.

Everybody knows everybody around here. And it's like thirty thousand people. It's still a small community feel, and that's what's huge about it, and a lot of people want that back. They want to have that community back.

Paradise High School has always been a football school and that's always been a source of pride for them, especially the last probably ten to fifteen years with their success. And probably this year has had more attention to it than ever before...Seeing a crowd of six thousand people in that stadium to support. We had ESPN and all the major networks there. It was just unreal. But that's what this community needed. They needed that support.

One of the biggest and most critical challenges of recovery was the loss of almost all housing and the uncertainty of housing recovery. Rebuilding of homes and return of residents have clear consequences for restoring other functions including education and health-care. The much-debated reopening of the Feather River Hospital in its pre-fire capacity or with just emergency services was solely dependent on the projected number of residents rebuilding in Paradise (Town of Paradise Community Information Meeting, November 5, 2020). School enrollment and attendance directly affect their funding. The school district funding is based on the Local Control Funding Formula (LCFF), which includes student enrollment, unduplicated pupil count (UPC) of low-income students, English learners and foster youth, and average daily attendance (ADA) (Fiscal Crisis & Management Assistance Team 2020). ADA funding is dependent on the total number of days of student attendance divided by the total number of days in the regular school year. PUSD had already suffered from chronic absenteeism before the Camp Fire at about 18%, a rate significantly higher than the statewide 11% in 2017–18 (Washburn 2019).

After the Camp Fire, about 50% of students returned to Paradise schools in merged or temporary locations. Parents who had transferred their children to new schools after finding temporary or permanent housing elsewhere were unsure about returning them to Paradise schools not only due to their concerns with schools' recovery but also due to uncertainties in hazard tree removals, water contamination, and housing recovery. A survey conducted 5 months after the Camp Fire found that about 48% of residents were either unsure or decided not to return to Paradise, bringing the population to just 4,000 even 20 months after the disaster (Bliss, 2020). Therefore, slow and uncertain recovery of both schools and housing and other interconnected community sectors further exacerbated the absenteeism and by extension the funding gap problems in PUSD.

The school can only grow as fast as the community. The rebuilding is going very slow out there... One of the most painful things a school has to face is when they have declining enrollment. It just slowly bleeds your budgets; it really decimates morale. It's a very difficult process to go through when you're losing more and more kids each year.

Sweeping loss of housing during the Camp Fire directly affected other sectors not only in Paradise but also in surrounding communities that absorbed many of the residents looking for temporary housing (Rochita 2019). Chico, a WUI community not directly affected by the Camp Fire, received many Paradiseans who were seeking housing in the area. As a result, Chico housing prices that were already much higher than Paradise before the fire (\$305,300 median in Chico versus \$218,400 in Paradise and \$217,500 nationally), escalated immediately after the disaster. This surge in pricing was a barrier for vulnerable groups to relocate from Paradise (DataUSA 2018a, b; Johnson 2018a, b). The influx of population to Chico spurred public expressions of discontent toward the Camp Fire diaspora by some of Chico's native residents blaming Paradiseans for increasing traffic and customer lines in grocery stores, gas stations, and other daily services (Urseny 2019a, b). Further, the hospitals in Chico were overwhelmed with the influx of residents requiring medical assistance (Wade 2019).

Leaders in the PUSD and other local organizations were concerned that if the schools did not reopen, the community of Paradise would not come back to the town. Several school administrators suggested during the interviews that if the schools recovered quickly, it would encourage parents of younger kids to come back to Paradise and rebuild their homes. Access to schools and undisrupted education, they argued, would incentivize return to Paradise, which in turn would help the restoration of local businesses and other services.

Recovery of the schools was viewed as a key factor in facilitating parallel recoveries of the community. Administrators and staff at different schools noted:

I think schools could play a huge role in how the town grows. I know when I had an initial conversation with the manager of a local grocery store, Save Mart, and I shared our [school's] plans of returning to the community. He was overjoyed because--right now there's some energy in town because of all the debris removal. And then once that's [energy] gone, they [businesses] just need to have us [schools] to bring that infusion of energy to bring those families back to Paradise.

The amount and timing of the various housing resources have not been adequate against the enormous needs of a community that has lost 95% of its building stock, and was home to a large number of socially vulnerable households. As of February 1, 2021, only 1,464 building permit applications had been submitted, 1,308 building permits had been issued, and 607 new homes were constructed (Town of Paradise, 2020a, 2020b). Most homeowners were waiting for insurance payouts or PG&E lawsuit settlements to start rebuilding, marking a very slow and complicated housing recovery process (Bliss 2020). Some of the residents waiting for insurance payouts and recovery funds to start rebuilding could not afford temporary housing close to Paradise and eventually moved to other states (Von Kaenel 2019a). These moves led to loss of access to familiar primary physicians, and moving medical records from one pharmacy to another triggered the trauma from the fire long into the recovery process particularly for the elderly and those with chronic health issues (Von Kaenel 2019b).

5.4 Adopting new communication means and norms for recovery

Previous research finds that social media provides real-time information exchange and communication for mobilizing resources and communities both during and after disasters (Bird et al. 2012; Finau et al. 2018). Our study showed critical and interesting roles that social media played from response to recovery in Paradise and the importance of social media in connecting the school community.

After the fire, PUSD used multiple methods to get in contact with students and parents. One of these methods was social media. Social media was one of the critical tools school staff used to reach and locate their students after the Camp Fire. Tracking students through social media proved to be essential because families were dispersed across many towns or even states months after the disaster, therefore reaching them through traditional means in the absence of local networks or in-person communication was extremely challenging.

I spent some time working on a project where we very literally called or emailed or sometimes used social media, whatever we could find to locate and make contact with every single student that we had, and we still lost some.

Further, social media outlets were used extensively and effectively throughout the 2018–2019 school year to communicate PUSD updates with parents and students with regards to locations of schools, reopening plans in Paradise, and events occurring throughout the school year. School staff continued to use social media frequently during the first school year back in Paradise (2019–2020) to communicate with students during PG&E power outages that occurred in Fall 2019. Staff in various capacities noted the effectiveness of social media for communicating important updates with students:

For some reason, everyone can get on social media. They can't answer their phones, but they can get on social media so between that and word of mouth, it seemed to spread it really well on what the [school return] plans and processes were going to be.

The social media communication in the school community took various directions and forms beyond information sharing. Social media provided students with an opportunity to connect with their teachers directly and whenever they wanted, a channel that was rarely used before the Camp Fire. This also signifies a change in communication norms among students and teachers. Some teachers changed their rule of communication via Facebook for students, allowing the students to “friend” them on Facebook to increase opportunities for reaching out when they needed help. Staff at different schools noted:

Because they [the students] were scattered far and wide. Not all of them had their phones. So basically, it seemed rather patchwork-y, but pretty quickly they were able to hear from all the different teachers. We used Facebook. ... I think I even had a few kids call me on Voxer because I have a Voxer connection with some of them. And word of mouth.

Given the total destruction to their town, the school community like the rest of Paradiseans were yearning to find another common place for coexisting and connecting as a town and they found that in virtual communication platforms and/or on social media. Further, local recovery officials acknowledged the importance of reaching out to those displaced all over the country to communicate recovery plans via social media (Escalante 2019).

Most notably, because members of PUSD (teachers, parents, students) were adapted to using social media and communications technology, their online communication and virtual learning during the COVID-19 pandemic occurred more smoothly. This learning experience allows students and teachers to communicate with one another and for the school district to communicate ever changing plans to students and parents with less difficulty, according to the PUSD superintendent.

6 Discussion

Unlike hurricanes, which have a considerable time for preparation and response, wildfires provide only a few hours or minutes to respond to the warning and evacuate. The evacuation within the town of Paradise was chaotic and overwhelmed the evacuation routes (Todd et al. 2019). The successful evacuation from Paradise schools and hospital, despite the chaotic and rushed nature of it, gave the schools community a sense of pride and gratitude. Nevertheless, the chaotic, uncertain, and long process of evacuating left significant mental health impacts especially on students. Our finding about the shared evacuation experience that created an immense positive bond in the school communities supports the concept of therapeutic community in disaster literature which explains that disaster survivors experience beneficial positive effects from interacting with those who help them during the emergency (Miller 2007; Phillips 2015). Furthermore, going through an exceptionally emotional and difficult experience together, escaping the fire, strengthened the social capital that existed before the Camp Fire among students and school staff (Monteil, Simmons and Hicks 2020).

The Camp Fire was an ever-present disaster for Paradiseans including those in the education system. The seemingly never-ending chain of extremely challenging experiences starting with the pace at which the fire grew, the delayed process of evacuation, loss of 86 lives and total destruction of the town, and a prolonged disruption of normal life at home and in temporary school settings had profound mental health effects in the short and long term. The complexity and acuteness of the mental health stressors we found among adults in the schools highlights the interconnected and reinforcing disaster impacts on various components of the education system. This calls for a systematic approach toward study of disaster impacts on social institutions such as schools, where both students and educators play different roles within and outside the school. Further, the disparities observed in mental health resources among schools confirms previous research findings on inequalities in resource access (Lai et al. 2018) and further supports a call for adopting a lens of equity in process rather than static social vulnerability in studies of disaster recovery.

Dealing with the dilemma between a long and costly commute of their children to Paradise schools versus isolating their children from their familiar school community by transferring them to new schools, many parents choose the former challenge. This finding shows the significance and priority of maintaining community bonds and sense of familiarity to support recovery, indicating that sometimes what people need to recover may not seem like the most cost-effective strategy.

Our examination of the interconnections of community sectors within Paradise echoes previous research findings on the importance of school and healthcare facilities in recovery particularly in high vulnerability communities. For vulnerable households, these institutions provide not only their standard services (such as educating children) but also fulfill needs that are sometimes unmet at home (such as food and a calm environment) or by other social service institutions (such as childcare and mental healthcare) hence supporting recovery beyond their own boundaries. Considering this multifaceted role of schools and healthcare facilities, disruptions in these institutions create compounding recovery challenges in various aspects of the lives of socially vulnerable households including low-income, young and elderly, as well as those who are health-fragile.

For both students and educators, performance at school was compromised due to the difficulties related to the Camp Fire housing impacts including displacement, uncertainty and low quality of the temporary housing as well as the Camp Fire employment impacts including loss of job and income in the family. Finding temporary housing for large populations is not just about finding shelter for those who lost housing, but the housing allows people to return to their daily routines and responsibilities. Previous research on this topic confirms the findings in Paradise that loss of housing can result in loss of privacy, stability, and make people vulnerable to health issues or future disasters (Barakat 2003). For example, in Japan after the 2011 Tohoku Earthquake and Tsunami, temporary housing was constructed based on lessons learned after the 1995 Kobe Earthquake. These lessons included keeping communities together in temporary housing just as they had been in pre-disaster neighborhoods to maintain strong community bonds and a faster return to normalcy, and reduce the need for mental health services and risk of suicide (Maly and Shiozaki 2012; Bris and Bedito 2019).

In the absence of large-scale temporary housing to keep the community together, extensive use of social media and the fluidity of social communication norms and boundaries around using it after the Camp Fire enhanced community resilience by increasing and enriching connections among disaster survivors who also provided support to each other and attempted to remain together from a distance. Nevertheless, without large-scale temporary housing and uncertainties associated with rebuilding in Paradise, parents who had

transferred their children to new schools after finding temporary or permanent housing elsewhere were unsure about returning them to Paradise schools not only due to their concerns with schools' recovery but also due to uncertainties in hazard tree removals, water contamination, and housing recovery. Therefore, slow and uncertain recovery of both schools and housing and other interconnected community sectors further exacerbated the absenteeism and by extension the funding gap problems in PUSD.

7 Conclusions and Recommendations

In this study, we applied a lens of social vulnerability to understand the types and patterns of impact and recovery of the education and healthcare services in Paradise. We also examined how interdependencies among various services exacerbate disaster impacts for socially vulnerable communities and the consequences of these dynamics in the recovery process. The magnitude of compounding social vulnerabilities in this WUI community helped us to better understand the complex disparities in wildfire recovery to expect in other places. Our analysis identified several strategies that can be effective for recovery and improving the resilience of schools and healthcare services in WUI and other disaster-prone communities.

This study has identified interconnected mental health impacts for different groups in the educational system from students to educators and administrators. Both profound trauma and strong bonding were experienced by students and educators during the evacuation due to the chaotic nature of the evacuation itself. This chaos was caused by short notice of the fire and failure of the alert system for zone-by-zone planned evacuation. This calls for considering mental health effects of potential failures of the evacuation plans and preparation for potential deviations from such plans. Subsequently, the importance of temporary school locations after the fire and maintaining the emotional bond for students' mental health emphasizes the need to plan before disasters for keeping students together in new locations and preparing the receiving schools for the mental health needs of these incoming students if they are inevitably separated from their group.

Long-term struggles and behavioral issues among students resulted from the unaddressed immediate trauma and subsequent challenges of recovery at home and in school. The compounding mental health impacts spilled over from school to home and from home to school for both students and educators, particularly worse for those low-income families who were struggling with recovery at home, making schools focal points where these symptoms were manifesting and addressed to the extent possible, despite the shortage of resources. By providing adequate mental health resources to schools during recovery, some of the long-term impacts on behavioral issues and performance can be avoided. The observed spectrum on mental health issues between home and school shows the need to adopt a holistic mental health support approach to connect school and home together in understanding and addressing these impacts. It is important to note the relative neglect of the mental health impacts on teachers and staff compared to the students, especially early on. This shortage calls for a shift in our approach to post-disaster mental health needs by intentionally considering a wide range of ages and roles of individuals in the educational system and allocating adequate resources and support based on those considerations. Yet the most important takeaway is that such complex and prolonged mental health impacts reveal the urgency of a proactive approach for WUI fire risk reduction to mitigate these disasters in the first place.

The second major finding of this study is the disparities in the Camp Fire impacts based on social vulnerabilities and exacerbation of recovery challenges for vulnerable groups. Differences in mental health impacts based on age and exposure to pre-disaster trauma indicate that greater efforts are needed to ensure mental health programs are tailored to the background and needs of various groups after disasters. Showing how recovery aid can exacerbate disparities if we ignore the pre-disaster vulnerabilities, Paradise case study raises a clear need for considering and addressing the pre-disaster mental health needs, that are expected to be exacerbated after disasters, with a proactive and intentional resilience strategy.

The critical roles that Paradise schools and healthcare facilities played in providing stability and support, and affordable essential services for recovery of the vulnerable groups highlights the priority of providing rapid and timely extra recovery support to these institutions knowing that indirectly they will affect the recovery, especially for socially vulnerable groups. Further, continued efforts are needed to identify beforehand the groups served by schools and healthcare systems that are more dependent and vulnerable to disruptions of these systems for targeted recovery support.

Another takeaway of this study is the importance of asking difficult questions in recovery planning. The magnitude of interconnected losses in a community-wide disaster like the Camp Fire raises critical questions about recovery decision making. Restoring communities in place after such widespread impacts involves more than restoring individual components, such as housing or infrastructure. The restoration of these communities requires a comprehensive look at the many dependencies each component has on other sectors. For example, in Paradise, the two-way dependency of housing and population restoration on school enrollment and survival and vice versa presents a significant recovery challenge. A key local recovery priority should therefore be to develop a shared expectation among stakeholders and community members before a disaster on a loss threshold for deciding the extent to which certain sectors or the whole community should be restored given the magnitude and interdependencies of expected losses.

Finally, the effectiveness of social media and adaptability of social norms around using these virtual spaces by the Camp Fire diaspora provides a successful example of how a community can survive and stay together in virtual spaces even though its physical being is diminished. Wildfires within the WUI can cause large-scale damage across a community, specifically large-scale loss of housing. The widespread destruction of the whole community and its several subsystems in Paradise provide applicable lessons for other communities that experience the same level of destruction as a result of other disasters. While providing temporary housing in close proximity to the community is shown to provide many benefits to the affected residents, large-scale destruction and complex and prolonged housing recovery programs make such arrangements difficult. In the absence of such possibility after the Camp Fire, we showed how social media was leveraged for keeping communities together while physically apart, a strong tool that can be applied in similar post-disaster situations.

These virtual spaces can give disaster survivors an opportunity to stay connected to their familiar but now dispersed neighbors, access important information and updates in a less stressful way without making a direct or conscious effort for finding that information, or stumbling upon information and resources they did not even know can be helpful. The effectiveness of these low pressure, informal, virtual spaces for connection presents a promising avenue for maintaining the community bonds while connecting disaster survivors with information sources after the disasters.

8 Limitations and future research

One of the limitations of the study is that we did not conduct any interviews with students in the schools or patients in the healthcare system. While input from students and patients would add valuable first-hand accounts of their impacts and recovery experiences, to ensure the quick start of the data collection we acquired exempt IRB (institutional review board) approval for human subject data collection under the condition of interviewing only adults in their professional capacities. Securing IRB approval to interview students and patients would require the longer full IRB review which would have caused the significant delay in the start of the data collection, potentially beyond the timeline of the grant itself, and increased the risk of recall bias among participants.

One of the potential ways this study can be expanded is by focusing on quantifying the interconnections and dependencies across housing and educational systems. These dependencies have been documented before in disaster studies but they become even more clear and consequential when hazards cause widespread loss of housing across a community; as it occurred in Paradise due to the Camp Fire. Further, disparities in the impacts and recovery observed in both education and housing along the socioeconomic lines in Paradise (Schulze et al. 2020) increase the magnitude and significance of the interconnections between the educational system and housing. With the displacement of a large majority of Paradiseans for an extended time and recovery disparities, research can identify and measure the ways in which processes and decisions of restoring homes and educational systems are tied together and the significance of those connections for the recovery of the whole community.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The interview portion of this study was approved by the Oregon State University Institutional Review Board (IRB).

Consent to participate Each participant provided informed consent before participation in the study.

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