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RESEARCH

The Deadly Mati Wildfire in Greece: Long-Term Psychosocial Impact on Adolescents

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Abstract

The Mati wildfire on July 23, 2018, was the deadliest in Europe and the second deadliest globally in the 21st century. Beyond its devastating human and material losses, concerns arose regarding its long-term psychosocial effects on adolescents. This study assessed the prevalence of posttraumatic stress disorder (PTSD), emotional and behavioral difficulties, and high sleep problems in adolescents 10 months post-disaster, identifying associated disaster-related exposures and sociodemographic factors. In May 2019, 393 adolescents (mean age 14.3 years; 61.2% girls) from Nea Makri and Rafina participated in a cross-sectional survey. Participants completed questionnaires on socioeconomic status, wildfire-related exposure, PTSD, emotional/behavioral problems, social support, and insomnia. Logistic regression analyses were performed to identify independent predictors of PTSD and post-fire insomnia. PTSD prevalence was 46.3%, with boys having a 42% lower probability than girls (OR = 0.58; 95% CI: 0.35–0.95; $p = 0.029$). PTSD risk increased significantly among adolescents who had a loved one seriously injured (OR = 1.86; $p = 0.043$) or trapped (OR = 1.96; $p = 0.005$). High sleep problems rose from 21.3% pre-fire to 32.3% post-fire ($p < 0.001$), and were associated with pre-existing insomnia, parental separation, and worry for missing loved ones. Higher levels of social support mitigated emotional difficulties and insomnia. The Mati wildfire had profound psychosocial effects on adolescents, highlighting the need for early intervention, targeted mental health support, and enhanced social systems in post-disaster recovery efforts.

Keywords Adolescent mental health · Disasters · Psychological trauma · Post-Traumatic stress disorder · Wildfires

Introduction

Natural disasters are not only defined by their immediate physical devastation but also by their profound and enduring psychosocial effects (Dyregrov et al., 2018; Heanoy & Brown, 2024). The trauma associated with such events often disrupts community structures, severs support networks, and inflicts deep emotional scars on survivors (North & Pfefferbaum, 2013; Sweeney et al., 2018). In particular, children and adolescents—whose coping mechanisms and emotional regulation skills are still developing—are exceptionally vulnerable to the psychological sequelae of such catastrophic incidents (Danzi & La Greca, 2021; Eroglu & Yaksı, 2025). Exposure to natural disasters has been repeatedly linked with a spectrum of adverse mental health outcomes, including posttraumatic stress disorder (PTSD), depression, anxiety, and sleep disturbances (Keya et al., 2023; Qi et al., 2020; Wang et al., 2020). Numerous studies have documented that the intensity and duration of exposure to disaster-related stressors, such as loss of property,

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life-threatening experiences, and separation from loved ones, significantly predict the severity of these psychological outcomes (North & Pfefferbaum, 2013; Overstreet et al., 2011; Shultz et al., 2013).

The scientific literature underscores that the impact of natural disasters extends far beyond the initial period of crisis. In many cases, the emotional and behavioral disturbances experienced by survivors can persist for months or even years, potentially altering developmental trajectories and impairing social, academic, and emotional functioning (Morganstein & Ursano, 2020; Pereira et al., 2021; Zhou & Wu, 2021). Long-term stress may disrupt neurobiological pathways, contributing to a chronic state of dysregulation that manifests in persistent psychopathology (Girotti et al., 2024; North & Pfefferbaum, 2013). Moreover, the presence of pre-existing vulnerabilities—such as prior mental health issues or limited access to supportive resources—can exacerbate the psychological toll of disasters, emphasizing the need for targeted and sustained interventions (Makwana, 2019; Wickrama & Wickrama, 2008).

Over the past decades, Greece has experienced a number of natural disasters, including earthquakes, floods, and wildfires, each leaving its mark on the nation's collective psyche (Giannopoulou et al., 2006; Goenjian et al., 2011; Kolaitis et al., 2003, 2011; Papadatou et al., 2012). Among these, the wildfire that struck Mati, east Attica, on July 23, 2018, stands out as a watershed event. This catastrophic fire, which claimed 102 lives and injured 187 people, was not only the deadliest wildfire in Europe but also the second deadliest worldwide in the 21 st century (Efthimiou et al., 2020). The rapid spread of the blaze, coupled with its indiscriminate destruction of life and property, rendered it a national tragedy of unparalleled scale. While the Mati wildfire drew extensive media attention and emergency responses largely prioritized physical recovery, these efforts were not accompanied by systematic investigation into adolescents' long-term psychological outcomes, leaving a notable evidence gap.

Adolescence is a developmental period characterized by rapid neurobiological and psychosocial change that can heighten susceptibility to disaster-related stress. Reward and threat systems mature earlier than prefrontal control networks, creating heightened emotional reactivity with still-developing regulatory control (Olk et al., 2025; Roberts & Lopez-Duran, 2019). Identity formation, increasing autonomy from caregivers, and stronger reliance on peers may reduce access to buffering adult support during and after crises (Audet et al., 2021; Sahi et al., 2023). In addition, normative circadian phase delay and high sleep need make adolescents vulnerable to trauma-related sleep disruption that amplifies internalizing symptoms (Agorastos & Olff, 2021; Meyer et al., 2024). Consistent with these mechanisms, the disruption of daily routines, potential loss or separation from family members, and the pervasive sense of insecurity that follows such events can leave an indelible mark on adolescents' psychological well-being (Danzi & La Greca, 2021; Meltzer et al., 2021). Previous research conducted in Greece following wildfires has revealed elevated rates of PTSD, depression, and anxiety among young survivors (Kolaitis et al., 2011; Papadatou et al., 2012; Papanikolaou et al., 2011). However, to our knowledge, no peer-reviewed studies have examined the psychosocial effects of the 2018 Mati wildfire on adolescents. This gap is particularly concerning given that adolescence is a critical developmental period during which the establishment of emotional stability and resilience is paramount (Ungar, 2015).

The present study aims to address this significant gap by providing a comprehensive evaluation of the long-term psychosocial effects of the Mati wildfire on adolescents. Ten months after the disaster (May 2019), we conducted a cross-sectional survey of 393 adolescents attending schools in Nea Makri and Rafina. Our objectives were to: (1) estimate the prevalence of PTSD symptoms, emotional/behavioral difficulties, and insomnia; (2) examine associations with fire-related exposures (temporary separation from a parent, serious injury of a loved one, a loved one trapped, and worry about a missing loved one); and (3) evaluate whether higher social support was associated with fewer symptoms.

In a broader context, this investigation advances understanding of how catastrophic events affect youth mental health and informs both clinical practice and public policy. The findings can guide targeted interventions and resilience-building strategies that support recovery in post-disaster settings. By identifying specific risk exposures (e.g., parental separation, injury or entrapment of a loved one, worry about a missing loved one) and the protective role of social support, this study provides actionable evidence for designing comprehensive school- and community-based support systems for adolescents after natural disasters.

Methods

Participants

The study included 393 adolescents aged 12–18 years (M = 14.3) from the regions most affected by the Mati wildfire in East Attica, Greece (Nea Makri and Rafina). The sample comprised predominantly girls (61.2%) and mainly Greek nationals (91.5%). Most participants lived with both parents (83.2%) and had at least one sibling (86.2%); in 71.9% of families, at least one parent had a university-level education (Table 1).

Table 1 Demographic and Fire-Related psychosocial characteristics of the sample ($N = 392$)

	N (%)
Gender	
Girls	240 (61.2)
Boys	152 (38.8)
School	
Primary	40 (10.3)
Middle	249 (63.8)
High	101 (25.9)
Nationality	
Other	33 (8.5)
Greek	356 (91.5)
Living with:	
Both parents	326 (83.2)
One parent	65 (16.6)
None of the parents	1 (0.3)
Siblings	337 (86.2)
Parental education level	
Primary school	3 (0.8)
Middle school	19 (4.9)
High school	87 (22.4)
University	279 (71.9)
Separation from at least one parent for some time during the fire	41 (10.5)
Loved one gone missing during the fire and being worried about him/her	197 (51.2)
Serious injure of loved one	52 (13.4)
Loved one trapped in fire	104 (26.7)
Social support	
Low	24 (6.5)
Moderate	137 (37.2)
High	207 (56.3)
Total SDQ score, mean (SD)	10.9 (5.6)
Presence of PTSD	175 (46.3)

PTSD = Post-Traumatic Stress Disorder, *SDQ* = Strengths and Difficulties Questionnaire, *SD* = Standard Deviation

Procedures

Data collection took place in May 2019, approximately 10 months after the wildfire of July 23, 2018. Prior to study initiation, ethical approval was secured through the Ministry of Education's institutional review process. The research team coordinated with local school administrations to facilitate recruitment and classroom-based data collection. Standardized information about the study's purpose, procedures, and confidentiality was provided to school officials, teachers, parents, and adolescents. Written informed consent was obtained from parents or legal guardians, and assent from adolescents.

The study employed a cross-sectional design with a battery of self-report questionnaires administered in a quiet classroom setting during school hours. Trained research assistants supervised sessions, provided standardized instructions, and offered clarifications as needed. Participation was voluntary; students could withdraw at any time without consequences. Responses were anonymous and were anonymized before analysis.

Measures

Demographics

Adolescents' sociodemographic characteristics were assessed with a self-reported questionnaire developed by the investigators, obtaining sociodemographic data such as age, gender, socioeconomic status, and educational level.

Exposure To the Wildfire Questionnaire

The respondents were asked 20 questions regarding exposure to fire-related stressors. Four types of stressors were sufficiently common to be included in the analysis: Separation from at least one parent for some time during the fire, loved one gone missing during the fire and being worried about him/her, serious injure of loved one, and loved one trapped in fire.

Children's Revised Impact of Events Scale

The Children's Revised Impact of Events Scale (CRIES-8) (Perrin et al., 2005) was used to measure post-traumatic stress symptoms. This cross-culturally validated self-report scale includes eight items rated on a four-point scale (0 = "not at all" to 5 = "often") and has two subscales: intrusion and avoidance. A score of 17 has been identified as the clinical threshold for detecting PTSD (Perrin et al., 2005). The CRIES-8 has been validated and used internationally, including in Greece (Koutsopoulou et al., 2024; Lianos et al., 2023).

Athens Insomnia Scale

The Athens Insomnia Scale (AIS-5) (Soldatos et al., 2000) was used to identify insomnia and sleep complaints in adolescents. The scale was completed twice in the same sitting with different reference frames: (a) the month before the wildfire (pre-fire) and (b) the month preceding the survey (post-fire). The AIS is an 8-item self-administered scale that measures insomnia severity based on the International Classification of Diseases, 10th Revision (ICD-10) insomnia criteria. These items assess sleep onset, night and early-morning waking, sleep time, sleep quality, frequency and duration of complaints, distress caused by the experience of insomnia, and interference with daily functioning. Using

Likert-type scales, respondents rated the severity of specific sleep difficulties they experienced during the month preceding the wildfire and during the past month. Scores range from 0 (meaning that the item in question has not been a problem) to 3 (indicating more acute sleep difficulties). A cutoff of 7 points was used to discriminate between absence of insomnia/subthreshold insomnia and moderate/severe insomnia (Chung et al., 2011). The AIS-5 has demonstrated good psychometric properties (Soldatos et al., 2000).

Strengths and Difficulties Questionnaire

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) was administered to evaluate adolescents' adjustment difficulties and prosocial behavior. The SDQ consists of 25 items organized into five subscales: emotional problems, conduct problems, hyperactivity, peer problems, and prosocial behavior. Each item is rated on a 3-point Likert scale (0 = not true, 1 = somewhat true, 2 = certainly true). For negatively worded items, scores are assigned as rated, while positively worded items are reverse-scored (2–0). A total difficulty score is computed by summing the scores of the first four subscales, yielding a range from 0 to 40, with higher scores indicating more adjustment difficulties. The instrument's factor structure and psychometric properties have been documented in a representative nationwide sample of Greek adolescents (Giannakopoulos et al., 2009).

Oslo 3 Social Support Scale

To assess the level of social support, the Oslo 3 Social Support Scale (OSS-3) (Dalgard et al., 2006) was used. The OSS-3 is a 3-item self-administered rating scale, with Item 1 rated on a 4-point scale and Items 2 and 3 on 5-point scales. Respondents indicate their perceptions of social support from family, friends, and neighbors. Total scores range from 3 to 14, with scores between 3 and 8 indicating poor support, 9–11 moderate support, and 12–14 strong support. The instrument has been applied in several large-scale population-based surveys in different settings, e.g. the European KIDSCREEN Study (Ravens-Sieberer et al., 2008).

Statistical Analysis

Data analysis was performed using SPSS software (version 29.0). Descriptive statistics were first computed to characterize the study sample. Continuous variables (e.g., age, SDQ scores) were summarized as means and standard deviations (SD), whereas categorical variables (e.g., gender, school level, exposure to disaster-related stressors) were expressed as absolute frequencies and percentages.

We compared the proportion of adolescents meeting the AIS-8 cutoff (≥7) for the month before the wildfire versus the month preceding the survey using McNemar's test for paired binary outcomes. Both ratings were provided by the same participants during a single survey session with two reference periods, so the test accounts for within-person pairing. This analysis evaluates within-individual change in insomnia classification associated with the wildfire.

To examine associations of fire-related exposures and social support with PTSD and post-fire insomnia while adjusting for potential confounders, we fitted multivariable logistic regression models and reported adjusted odds ratios (aOR) with 95% confidence intervals. Predictors were entered simultaneously (enter method) based on prior literature and our conceptual model: demographics (gender, school level, nationality, living arrangement, siblings, parental education), disaster exposures (temporary separation from a parent, serious injury of a loved one, a loved one trapped, worry about a missing loved one), and psychosocial variables (SDQ total score, OSS-3 social support). Pre-fire insomnia (AIS-8 ≥ 7) was included as a covariate in models of post-fire insomnia. All tests were two-tailed with $\alpha = 0.05$.

Results

Participant characteristics are summarized in Table 1. Regarding disaster-related exposures during the wildfire, 10.5% experienced separation from at least one parent, 51.2% reported being worried about a loved one who had gone missing, 13.4% indicated that a loved one had been seriously injured, and 26.7% reported that a loved one was trapped during the fire. In addition, 56.3% of the adolescents perceived high levels of social support, and the overall level of emotional and behavioral difficulties, as measured by the Strengths and Difficulties Questionnaire (SDQ), had a mean score of 10.9 (SD = 5.6). Notably, 46.3% of the participants met the criteria for posttraumatic stress disorder (PTSD).

Multivariate logistic regression analysis was performed to identify independent predictors of PTSD, and the findings are summarized in Table 2. Gender emerged as a significant predictor, with boys exhibiting a 42% lower likelihood of developing PTSD compared to girls (OR = 0.58; 95% CI: 0.35–0.95; $p = 0.029$). Furthermore, specific disaster exposures increased the risk of PTSD; having a loved one seriously injured (OR = 1.86; 95% CI: 1.15–3.31; $p = 0.043$) and having a loved one trapped during the fire (OR = 1.96; 95% CI: 1.23–3.11; $p = 0.005$) were both significantly associated with higher odds of PTSD. Other demographic and exposure variables did not reach statistical significance in this model.

Table 2 PTSD prevalence among students by demographic and Fire-Related characteristics: descriptive statistics and multivariate logistic regression analysis

	PTSD			
	No	Yes		
	N (%)	*N* (%)	OR (95% CI)+	*P*
Gender				
Girls	112 (48.1)	121 (51.9)		
Boys	90 (62.5)	54 (37.5)	0.58 (0.35 — 0.95)	0.029
School				
Primary	23 (60.5)	15 (39.5)		
Middle	125 (51.7)	117 (48.3)	0.92 (0.39 — 2.18)	0.851
High	53 (55.2)	43 (44.8)	0.84 (0.33 — 2.12)	0.709
Nationality				
Other	15 (45.5)	18 (54.5)		
Greek	184 (54)	157 (46)	0.66 (0.27 — 1.59)	0.355
Living with both parents				
No	32 (50.8)	31 (49.2)		
Yes	170 (54.1)	144 (45.9)	0.77 (0.39 — 1.52)	0.450
Siblings				
No	33 (62.3)	20 (37.7)		
Yes	169 (52.3)	154 (47.7)	1.99 (0.93 — 4.25)	0.076
Parental education level				
Primary/Middle/High school	63 (60.6)	41 (39.4)		
University	136 (50.6)	133 (49.4)	1.33 (0.76 — 2.34)	0.318
Separation from at least one parent for some time, during the fire				
No	186 (55.4)	150 (44.6)		
Yes	16 (40)	24 (60)	1.32 (0.61 — 2.88)	0.482
Loved one gone missing during the fire and being worried about him/her				
No	111 (61.7)	69 (38.3)		
Yes	88 (45.8)	104 (54.2)	1.42 (0.87 — 2.31)	0.164
Serious injury of loved one				
No	179 (55.2)	145 (44.8)		
Yes	21 (41.2)	30 (58.8)	1.86 (1.15 — 3.31)	0.043
Loved one trapped in fire				
No	160 (58.4)	114 (41.6)		
Yes	43 (41.7)	60 (58.3)	1.96 (1.23 — 3.11)	0.005
Social support				
Low	11 (52.4)	10 (47.6)		
Moderate	78 (58.6)	55 (41.4)	0.88 (0.29 — 2.65)	0.824
High	105 (51.5)	99 (48.5)	1.36 (0.44 — 4.17)	0.591
Total SDQ score, mean (SD)	10.3 (5.3)	11.4 (5.8)	1.02 (0.98 — 1.07)	0.363

+Odds Ratio (95% Confidence Interval)

PTSD = Post-Traumatic Stress Disorder, *SDQ* = Strengths and Difficulties Questionnaire, *SD* = Standard Deviation

The impact of the wildfire on sleep was also assessed. As shown in Table 3, the prevalence of moderate/severe insomnia among the adolescents increased significantly from 21.3% before the fire to 32.3% after the fire ($p < 0.001$). This notable rise underscores the profound effect that the disaster had on sleep patterns within this vulnerable population.

Further analysis using logistic regression was conducted to explore factors associated with post-fire moderate/severe

Table 3 Prevalence of Moderate/Severe insomnia among students Pre- and Post-Fire

Pre-fire		Post-fire	
Moderate/Severe Insomnia	N (%)	N (%)	P
No	258 (78.7)	222 (67.7)	< 0.001
Yes	70 (21.3)	106 (32.3)	

Moderate/severe insomnia were *not* measured in students attending primary school

insomnia, with results presented in Table 4. In this model, several predictors were found to be independently associated with an increased likelihood of high sleep problems following the wildfire. Adolescents attending high school were more than twice as likely to experience moderate/severe insomnia post-fire compared to middle school students (OR = 2.42; 95% CI: 1.28–4.57; $p = 0.007$). Pre-fire moderate/severe insomnia were a strong predictor, with those reporting prior insomnia having markedly higher odds (OR = 10.62; 95% CI: 2.51–44.91; $p = 0.001$) of post-fire

Table 4 Associations of student characteristics and Fire-Related factors with Moderate/Severe insomnia Post-Fire: descriptive statistics and multivariate logistic regression analysis

	Moderate/severe insomnia post-fire			
	No	Yes		
	N (%)	*N* (%)	OR (95% CI)+	*P*
Gender				
Girls	133 (65.5)	70 (34.5)		
Boys	89 (71.8)	35 (28.2)	0.80 (0.42 — 1.53)	0.506
School				
Middle	167 (71.7)	66 (28.3)		
High	54 (57.4)	40 (42.6)	2.42 (1.28 — 4.57)	0.007
Nationality				
Other	17 (60.7)	11 (39.3)		
Greek	204 (68.7)	93 (31.3)	0.64 (0.23 — 1.83)	0.405
Living with both parents				
No	33 (63.5)	19 (36.5)		
Yes	189 (68.5)	87 (31.5)	1.27 (0.54 — 2.97)	0.590
Siblings				
No	35 (81.4)	8 (18.6)		
Yes	187 (65.8)	97 (34.2)	1.18 (0.43 — 3.25)	0.752
Parental education level				
Primary/Middle/High school	61 (68.5)	28 (31.5)		
University	159 (67.4)	77 (32.6)	1.41 (0.69 — 2.87)	0.349
Moderate/severe insomnia pre-fire				
No	218 (84.5)	40 (15.5)	10.62 (2.51–44.91)	0.001
Yes	4 (5.7)	66 (94.3)		
Separation from at least one parent for some time, during the fire				
No	205 (70.9)	84 (29.1)		
Yes	16 (43.2)	21 (56.8)	2.77 (1.16 — 6.61)	0.022
Loved one gone missing during the fire and being worried about him/her				
No	117 (75.5)	38 (24.5)		
Yes	101 (59.8)	68 (40.2)	2. 33 (1.14— 3.20)	0.024
Serious injure of loved one				
No	196 (69.8)	85 (30.2)		
Yes	24 (53.3)	21 (46.7)	1.20 (0.48 — 3.00)	0.692
Loved one trapped in fire				
No	168 (70.9)	69 (29.1)		
Yes	52 (59.1)	36 (40.9)	0.98 (0.48 — 2.01)	0.963
Social support				
Low	9 (45.0)	11 (55.0)		
Moderate	75 (64.1)	42 (35.9)	1.10 (0.33 — 3.64)	0.874
High	136 (72.3)	52 (27.7)	0.79 (0.23 — 2.71)	0.711
Total SDQ score, mean (SD)	9.4 (4.8)	14 (5.9)	1.15 (1.08 — 1.22)	<0.001
PTSD				
No	135 (78.5)	37 (21.5)		
Yes	83 (55.3)	67 (44.7)	2.54 (1.39 — 4.63)	0.002

Insomnia was *not* measured in students attending primary school

+Odds Ratio (95% Confidence Interval)

PTSD = Post-Traumatic Stress Disorder, *SDQ* = Strengths and Difficulties Questionnaire, *SD* = Standard Deviation

insomnia. Additionally, separation from at least one parent during the fire (OR = 2.77; 95% CI: 1.16–6.61; $p = 0.022$) and being worried about a loved one who had gone missing (OR = 2.33; 95% CI: 1.14–3.20; $p = 0.024$) were significantly linked to moderate/severe insomnia. Furthermore, for each unit increase in the total SDQ score, the odds of experiencing moderate/severe insomnia increased by 15% (OR = 1.15; 95% CI: 1.08–1.22; $p < 0.001$), and the presence of PTSD further elevated the likelihood of moderate/severe insomnia (OR = 2.54; 95% CI: 1.39–4.63; $p = 0.002$).

Discussion

The present study offers a comprehensive examination of the long-term psychosocial impacts of the 2018 Mati wildfire on adolescents, revealing a multifaceted pattern of adverse outcomes that extend well beyond the immediate physical devastation (North & Pfefferbaum, 2013). The prevalence of posttraumatic stress disorder (PTSD) among nearly half of the adolescents (46.3%) 10 months after the disaster underscores the profound psychological toll such catastrophic events can inflict on vulnerable populations (Wang et al., 2020). In addition, the significant increase in moderate/severe insomnia—from 21.3% prior to the wildfire to 32.3% afterward—demonstrates the pervasive disruption of daily functioning and overall well-being among these young individuals (Pereira et al., 2021). These findings are in line with earlier research on disaster-affected populations, yet they also highlight unique aspects of the Mati wildfire's impact in the Greek context.

The high rates of PTSD observed in this study are consistent with previous literature documenting that children and adolescents exposed to natural disasters are at increased risk for developing trauma-related psychopathology (Eroglu & Yaksı, 2025). Notably, the gender differences observed in our study, where girls were significantly more likely to exhibit PTSD symptoms than boys (with boys having a 42% lower likelihood of developing PTSD), reflect a broader trend in the literature (Danzi & La Greca, 2021). This disparity may be attributable to a variety of factors, including hormonal differences, socialization processes, and distinct coping strategies employed by males and females (Dörttepe et al., 2024).

Disaster-related exposures emerged as critical determinants of psychological outcomes. Adolescents who experienced direct trauma, such as having a loved one who was seriously injured or trapped during the fire, were at significantly higher risk for developing PTSD. These findings indicate that the intensity and nature of exposure play a crucial role in shaping long-term mental health. When an adolescent witnesses or learns of severe harm befalling someone close, the traumatic impact is likely magnified by feelings of helplessness, guilt, and pervasive anxiety, which can disrupt normal developmental trajectories and impair emotional regulation (North & Pfefferbaum, 2013).

In parallel with PTSD, the substantial increase in the prevalence of moderate/severe post-disaster adds an important dimension to our understanding of the wildfire's impact on adolescent health. Sleep is a critical component of healthy development, influencing cognitive performance, mood regulation, and overall physical health (Pereira et al., 2021). The regression analyses indicate that not only did pre-existing insomnia predict post-fire insomnia, but additional disaster-specific stressors such as separation from a parent and worrying about a missing loved one further compounded sleep disturbances. The association between higher levels of emotional/behavioral problems and moderate/severe insomnia suggests that overall emotional and behavioral dysregulation contributes to disrupted sleep patterns—a vicious cycle that can exacerbate PTSD and other mental health issues (Qi et al., 2020).

Beyond the statistical associations, these findings have significant implications for public health and clinical practice. The elevated prevalence of PTSD and insomnia indicates that the mental health burden on adolescents following the Mati wildfire is both substantial and enduring. There is an urgent need for the implementation of long-term, targeted interventions that not only address acute trauma symptoms but also facilitate the restoration of healthy sleep patterns and overall functioning (Le Roux & Cobham, 2022). Mental health services in post-disaster settings should integrate screening procedures for PTSD and sleep disturbances into routine assessments, ensuring early identification of high-risk individuals (McDermott & Cobham, 2012). Furthermore, community-based support systems that foster social connectedness and resilience could mitigate some of the adverse effects observed in this study (Wickrama & Wickrama, 2008).

The present study also contributes to theoretical discussions about the cumulative effects of multiple stressors on youth mental health. In this cohort, the stressors we analyzed were event-proximal, occurring during the wildfire and its immediate aftermath (hours to days), and included temporary separation from a parent, a loved one being seriously injured or trapped, and worry about a missing loved one. These exposures often co-occurred, and their compounded nature appears to amplify risk for adverse outcomes; for example, separation from a parent during the fire was associated with a higher likelihood of post-fire insomnia, illustrating how disruptions in attachment and security can have profound physiological and psychological consequences (Dörttepe et al., 2024). Similarly, worrying about a missing loved one not only heightens immediate distress but may contribute to sustained

anxiety and sleep disruption (Pereira et al., 2021). We did not assess downstream post-disaster stressors (e.g., displacement, prolonged service disruption, property loss); therefore, our inferences pertain to event-proximal exposures. These observations suggest that effective post-disaster interventions must address both individual and systemic dimensions of trauma, including strategies to maintain/reunify caregiver–child contact during crises and to strengthen community supports in recovery (Self-Brown et al., 2017).

Despite the robustness of our findings, several limitations should be acknowledged. The cross-sectional design of the study limits our ability to draw causal inferences about the relationships between disaster exposure and long-term mental health outcomes. Although the use of retrospective self-report measures allowed for the comparison of pre- and post-disaster sleep patterns, this approach is inherently subject to recall bias. Moreover, while the sample is representative of adolescents from the affected areas, the findings may not be generalizable to populations with different cultural or socioeconomic backgrounds. Future research employing longitudinal designs could provide more definitive insights into the trajectory of post-disaster recovery and the persistence of trauma-related symptoms over time (Zhou & Wu, 2021).

In summary, the results of this study provide compelling evidence that the 2018 Mati wildfire has had a lasting and multifaceted impact on adolescent mental health. The elevated prevalence of PTSD and the significant increase in moderate/severe insomnia underscore the critical need for targeted mental health services and interventions that are both comprehensive and sensitive to the unique needs of this age group. The identification of key predictors—such as gender differences, direct traumatic exposures, and pre-existing vulnerabilities—offers valuable guidance for the development of intervention programs aimed at mitigating the long-term adverse effects of natural disasters. Ultimately, these findings contribute to a growing body of evidence that underscores the importance of integrating mental health support into disaster response and recovery efforts, with a particular emphasis on protecting and nurturing the resilience of our most vulnerable populations.

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Author Contributions G.K. conceived the study, reviewed and revised the manuscript; F.Z.T. drafted the manuscript and contributed to subsequent revisions; C.T. conducted statistical analyses on the survey database, contributed to quality assurance of the database, and evaluating the survey database; A.P. contributed to reviewing the manuscript; G.G. drafted the manuscript, appraised the background literature, and coordinated subsequent revisions.

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Data Availability The datasets used and/or analysed during the current study are available from the authors on reasonable request.

Declarations

Ethics Approval and Consent to Participate The present study was approved by the Ministry of Education of the Hellenic Republic and was conducted following the principles of the Declaration of Helsinki and its later amendments.

Consent for Publication Not applicable.

Informed Consent Written informed consent for all adolescents was obtained from the caregivers, and oral assent was obtained from all participating adolescents.

Conflict of interest The authors declare no competing interests.

Competing interests The authors declare no competing interests.

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