Caleb Armbrust, Department of Safety, Security, and Emergency Management, Eastern Kentucky University
Paul Grant, Department of Safety, Security, and Emergency Management, Eastern Kentucky University
Dr. David C. May, Department of Sociology and Social Work, Mississippi State University

An Examination of Fire Safety Perceptions and Behaviors Among Students at a Regional Midwestern University

Abstract

In this study, we use data from 223 undergraduate students at a regional Midwestern university to examine students' behaviors and perceptions of fire safety on the university campus. The findings presented here indicate that the vast majority of students feel safe from fire, although a significant number engage in behaviors that make them more likely to be injured by fire. These behaviors are most prevalent among students living off-campus. Implications for university policy and future research are discussed.

Introduction

Most people have their own perceptions about fire safety, fire danger, and the risk that fire poses to them in their daily lives. Little is known, however, about how these perceptions impact decisions regarding daily activities, either on college campuses or in other settings. The extant research regarding college students and fire is generally related to on-campus fires, and even that body of research is limited. Almost nothing is known about students' perceptions and behaviors in the area of fire safety off-campus.

The research reported here adds to the body of knowledge in this area by answering two important research questions: First, do university students have attitudes and engage in behaviors that make them more likely to be fire victims than the general public? Second, do students living off-campus have different attitudes and behaviors than students living on-campus? We use survey data from approximately 200 undergraduate students at a Midwestern university to answer these questions.

Fire Safety on College Campuses

In this article, the terms *student residence hall* and *dormitory* are used interchangeably. According to the National Fire Protection Association® (NFPA®), the word dormitory is defined in the life-safety code as a:

> building or space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without cooking facilities, but without individual cooking facilities (National Fire Protection Association®, 2012, p. 101–29).

In June 2010, the United States Fire Administration (USFA) released a report that examined data gathered from the National Fire Incident Reporting System regarding the approximately 3,800 university housing fires (e.g., residential buildings on university campuses) (USFA, 2010). One of the most surprising findings from the report was that more than half (57%) of university housing fires occurred in buildings with no automatic extinguishing system in operation (USFA, 2010).

Isner (1996) wrote about a fatal fire in Chapel Hill, North Carolina, at a fraternity house. He listed four contributing factors to the severity of the fire: (1) lack of automatic fire-detection and fire-alarm systems, (2) presence of combustible interior finish materials throughout the building, (3) lack of automatic sprinkler-system protection, and (4) improper use or disposal of smoking materials. The NFPA® also states that these four factors were present when they studied four fatal fires that occurred: three in the 1970s and one in 1990 at a fraternity house.

In written testimony concerning the need for enhanced fire safety in off-campus housing, Comeau (2003) reported that between 1994 and 1998, an average of 141 fires per year occurred in Greek housing, causing $2.8 million annually in property damage and the deaths of 18 students. Comeau stressed that fire safety cannot rely solely on one component. He stated that fire safety involves three mechanisms: (1) prevention — the need to ensure that protocols are in place that will help reduce the likelihood of fires occurring; (2) detection — smoke detectors are a necessary factor in alerting occupants of fire and giving the fire department early warning; and (3) suppression — if a fire does occur, it must be controlled. In most cases, by the time the fire department arrives, it is too late to prevent fatalities. Comeau suggested that the use of sprinkler systems is the only viable suppression solution.

Most scholars agree with Comeau. In fact, there is a strong consensus among fire-prevention experts that buildings used to house students at higher education institutions should be required to have sprinkler systems. The sprinkler-system recommendation is

also extended to apartment buildings, condominiums, and fraternity and sorority houses that house students (Comeau, 2003).

Although the enforcement of fire-safety policies and procedures in residence halls varies from state to state, this expert advice is not always followed. For example, an alleged arson fire on the third floor of a Michigan State University dormitory seriously burned one student and put several other students suffering from smoke inhalation in the hospital in the late 1990s. After years of debate, however, Michigan still lacks a standard code that addresses fire-safety issues in student housing. Those close to the code-adoption process say that the cost of implementing a fire-safety code is the major factor preventing passage. New Jersey (Gold, 2000) and New York (New York Governor's Task Force, 2000) both face similar difficulties. In fact, the New York Governor's Task Force report on campus fire safety (2000) argued that even though findings from annual fire inspections are reported to both the university and the state education department, no follow-up mechanisms are in place to ensure compliance with the inspectors' recommendations. Thus, campus fire safety is often reliant on decisions made by individual campus administrators.

Mowrer (1999) argued that it is easy to underestimate the risk of fire in student housing because of the many fires that do not make the headlines. He believes that college students should be afforded the same protection that the hospitality industry gives to those who travel throughout the nation, citing the 15-year program that has installed sprinkler systems in lodging facilities across the country. He suggested that in addition to the lasting physical impact campus fires have on university physical structures, campus fires have tremendous emotional impacts on the student body and university as a whole. Empirical data support his claim. The College Fire Prevention Act makes note that the NFPA® has no record of a fire killing more than two people in a public assembly, educational, institutional or residential building that had a complete sprinkler system installed and operating properly (United States House of Representatives, 2005).

Mowrer (1999) has studied factors that contribute to fires in the university environment. Alcohol was cited as a significant factor in most college fires; however, Mowrer also mentioned the "sense of immortality" that young adults often feel. This sense of immortality, coupled with alcohol, freedom, and a lack of education when it comes to dealing with fire, all contribute to the dangers presented to campus-housing administrators when dealing with student housing.

Mowrer (1999) addressed the duties that should be assigned to administrators of campus dormitories, fraternities, and sororities. He identified four primary elements of fire safety in student housing as (1) prevention, (2) occupant awareness and training, (3) detection and alarm, and (4) suppression. Mowrer highlighted the fact that college students generally have a high amount of easily combustible materials in their housing. Items such as paper products, materials, and clothing have the potential to aid in the rapid development of a fire if they are not appropriately stored or protected. He further stressed that smoke detectors and fire sprinklers are essential elements in a successful fire-protection program for residential buildings as well as off-campus student housing. He concluded the guide by arguing that the cost of a sprinkler system is minuscule when compared to the potential costs (both financial and emotional) that a university will incur in a severe fire.

Smoke alarms continue to be a critical element when dealing with fire safety. According to the USFA (2010), smoke alarms operated and alerted occupants in 83 percent of fires; in an additional 13.3 percent of fires, the effectiveness of the smoke detectors was unknown. The data clearly show that smoke alarms are a critical component in early notification and evacuation.

These risks are not limited to students living in on-campus housing. According to the USFA (2005), for every student who dies in a fire on-campus, five students die in off-campus housing. In a residential setting (whether on- or off-campus), students often underestimate the danger of a fire and frequently make decisions that place themselves at risk. College students (whether housed on- or off-campus) have sleeping patterns that are often different than those of most other demographic groups. According to the USFA (2010), the peak time for university housing fires was between 8 p.m. and 9 p.m., which the study asserts corresponds to when students are most active. Fires were least likely to occur during the early morning hours (USFA, 2010). Furthermore, approximately 23 percent of all university housing fires occur during the months of September and October, which corresponds to the beginning of the academic year.

The second area of interest is the cause of fires. According to the USFA (2010), the primary cause of confined fires (those extinguished before causing severe damage) was cooking mishaps (83.1%), while unconfined fires were largely due to open flames, other heat-inducing devices, and other unintentional or careless causes (34.6% of the uncontained fires).
The results of a similar USFA report that was published in 2001 reaffirmed the data presented earlier and further demonstrated that 33% of dormitory fires are the result of arson (USFA, 2001). The USFA study also reported that smoke alarms were present in 93% of all dormitory fires and operated in 79% of these fires. This report was published shortly after a fatal fire occurred at Seton Hall University and put universities in the spotlight for installing sprinkler systems. This study was revealing in that it represents the time when significant attention began to be given to the importance of the installation of sprinkler systems in dormitories.

A study entitled *Fatal Fires* (USFA, 2005) examined the data from the estimated 3,300 fatal fires that accounted for the loss of 3,380 lives in 2002. The data show that 74% of fatal fires occurred in structures, with 94% of structures being residential properties.

Because college students moving off-campus generally rent apartments or homes that have been converted to apartments, the fact that fatal fires are overwhelmingly residential fires is particularly relevant to this effort. The next major finding from the data is that smoke alarms were not present in 42% of fatal residential fires and in an additional 21% of fires, the alarms failed to operate. Furthermore, the study showed that 50% of all fatal residential fires start in the sleeping or lounge areas of the residence, and 57% of fatalities occurred in the area of origin.

In 2002, the USFA produced a report that dealt specifically with fires in fraternity and sorority houses (USFA, 2002). The findings from this research are similar to those of studies using students living in dormitories but are closer to those that might be found in off-campus housing. Aside from incendiary or suspicious fires, the top three causes of fire in fraternity and sorority houses were (1) open flames, (2) cooking mishaps, and (3) smoking. These three factors accounted for approximately 45% of all fires. The data further reveal that weekends and Wednesdays were the peak times when fire incidents occur, which the authors suggested correspond well with times when activity in these houses increases. The data also revealed that smoke alarms activated in 71% of all fraternity and sorority house fires as opposed to a mere 38% of residential structure fires. The most logical reason for this finding was that, in most cases, the university was responsible for the maintenance of smoke alarms once installed (USFA, 2002). The final recommendation of the study was that more stringent regulations need to be imposed to require the installations of smoke alarms and sprinkler systems.

Installation of smoke alarms and sprinkler systems is not enough, however. Sactor (2002) stressed the need for fire-safety inspection programs in all off-campus housing. While conducting fire drills, personnel from the university's department of public safety observed deteriorated conditions within the off-campus facilities, which could lead to disaster in the event of a fire. According to Sactor (2002), universities should enter into a partnership with local and county inspectors to report any off-campus infractions to help ensure proper fire safety and enforcement within these properties. Flanagan (2003) supported this suggestion and stated that an amendment to a proposed sprinkler ordinance that would include apartments and condominiums in its jurisdiction would provide protection to more than 1,000 students who occupy these facilities.

Nevertheless, codes are not the only way to ensure increased fire safety of students living in residential housing off-campus. Diment (2008a) addressed some of the ways that apartment owners could provide for the safety of their tenants. Diment demonstrated how the "Three Es" (education, engineering, and enforcement) utilized by fire-safety educators can be applied by landlords to ensure tenant safety. Diment argued that tenants should be educated about the importance of smoke alarms and detectors as well as the ways to reduce and prevent false alarms, and this education should occur when a tenant moves into a residence. He also demonstrated how practical engineering changes can go a long way to help ensure working smoke detectors, including changing the type of detectors available and using more diverse battery types in available detectors.

Diment (2008a) also stressed the important of enforcement. Enforcement can be accomplished by landlords who schedule regular inspections of their properties to ensure that tenants are appropriately utilizing fire-detection equipment and have not disabled it. Diment concluded by suggesting that the most effective fire-prevention programs use all the aforementioned elements together.

In Part 2 of his series, Diment (2008b) elaborated on his first article and wrote about creating escape plans for each apartment unit. He also addressed installing sprinkler systems in the apartment units and argued that landlords should seek the help of the local fire department or other professionals in developing plans and inspection criteria. While many jurisdictions do not require this type of monitoring, the author made the case that it is important that landlords do "everything reasonable and prudent" for the safety of one's tenants.

Denker and West (2009) posited that administrators should take a new look at fire-prevention efforts. They suggested that fire prevention involves far more comprehensive planning than posting rules about residence-hall living and argue that insurers provide an excellent source of expertise when it comes to fire protection. Denker and West (2009) supported the research in this area that recommends the use of smoke detectors, escape plans, enforcement and, more importantly, the installation of automatic sprinkler systems to protect students. They also cited alcohol as a major contributing factor to fire and suggested that administrators educate staff members on the role that alcohol plays in fires.

Despite the recommendations reviewed previously and the general acceptance that these recommendations are important for campus fire safety, a number of fatal campus fires still occur on- and off-campus. Since January, 2000, Campus Firewatch (2012) has tracked fatal campus-related fires, including off-campus fires. According to the records, there have been over 130 off-campus fire fatalities and a large number of other fires that did not result in fatalities. Analysis of the Campus Firewatch data reveals that several of the assumptions from other studies prove to be true. For example, in most of the fatalities, a smoke detector was either not present or had been disabled in some way. The use of alcohol also proved to be a factor in a number of the off-campus fire fatalities. Data from a Federal Emergency Management Agency (FEMA) report (1999) supported this finding when the authors highlighted the fact that drinking patterns have more to do with alcohol's relationship with fire danger than the total amount of

alcohol consumed. The study also found that drinking and smoking seem to go hand-in-hand. Adults 18 to 24 years old tend to smoke socially when binge drinking, a phenomenon more prevalent in this age group than older age groups. This finding is significant because of the high percentage of fires started by smoking materials.

Calderwood (2004) cited data by Campus Firewatch that indicated that 73% of all fires involving college students occur in off-campus units. Calderwood proposed that universities create inspection task forces with the help of the community and others who know what to look for when inspecting a home. Calderwood further argued that it is the responsibility of the university to educate students via some sort of class on what to expect when living off-campus, with the main focus being on safety but also covering other topics. He further argued that local jurisdictions should require that sprinkler-system codes be enacted for apartments. Additionally, he advocated that fire departments educate themselves on problem housing areas and make every effort to enforce codes and punish landlords who are not following those codes.

Statement of the Problem

The research reviewed previously suggests that we currently know how to reduce the likelihood of fatal fires. As the studies suggest, reducing drunkenness and tobacco use will reduce the number of fires, particularly among college-age adults. Additionally, properly installed and maintained smoke detectors and sprinkler systems significantly reduce the likelihood of fatal fires as well. Furthermore, the extant research suggests that, in general, most university residence halls are designed and maintained in such a way that students living in university residential settings live in environments that are relatively safe settings.

Nevertheless, the extant research reveals almost nothing about student safety in off-campus residential housing. We were able to uncover only one study that directly addressed this issue (USFA, 2005). Consequently, it is essential that a knowledge base be developed about university student safety from fire in off-campus settings. In this study, we attempt to lay that foundation in an exploratory manner. Using data from 221 students at a Midwestern university, we attempt to understand their perceptions of fire safety (both on- and off-campus) along with the behaviors in which they participate that make them more or less safe. In doing so, we explore two research questions: First, do university students have attitudes that cause them to engage in behaviors that make them more likely to be fire victims than the general public? Second, do students living off-campus have different attitudes and behaviors than students living on-campus?

Methods

In this section, we describe the study participants and discuss the process through which research data were collected. We close with data analyses using descriptive statistics to demonstrated differences in perceptions and behaviors of students living in on- and off-campus housing.

Participants

The sampling frame for this study was 1,200 students enrolled in classes at a Midwestern university in either the honors program or the fire and safety program in the Spring 2011 semester. Students were chosen from these two programs for two reasons. First, the lead author was a student in both of those programs at the time and had access to all email addresses of students enrolled in both programs. Second, given the interests and education of students with fire-safety majors and the generally more responsible personalities of honors students, we believed these groups would provide the perspectives of the most conscientious students in the area of fire safety. Thus, we intentionally took a conservative approach to this endeavor.

Procedures

After obtaining permission to conduct the research from the University Institutional Review Board, participants were solicited via email using two separate email lists. One list contained email addresses of all students with fire safety majors and another list contained email address of all honors students. The instrument used was an online survey created through “Survey Monkey,” an online survey generator. The lead researcher then sent an email containing a description of the research effort and a link to the survey to each of the 1,200 students in the two programs. Approximately one in five (18.4%) of the 1,200 students contacted by the lead researcher responded to the survey for this study; thus, the data analyzed here came from 221 students. Although the response rate is certainly a low-response rate and thus limits the generalizability of the findings contained herein, we believed that the exploratory nature of this research still made this endeavor important, despite its limited generalizability.

Participants were asked for basic demographic information and then asked a series of questions designed to discover (1) how safe they perceived themselves to be from a fire, (2) the behaviors of participants in their residences as they related to behaviors that are known contributors to fire deaths, and (3) what types of appliances the students maintained in their residences.

Results

The results presented in **Table 1** indicate that slightly over half (54%) of the respondents were male and

Table 1: Demographic Characteristics of Respondents

Variable	Attribute	Number	Percentage
Gender:	Male	121	54%
	Female	101	46%
Age:	18-19	45	20%
	20-21	64	29%
	22-25	54	24%
	26-40	31	14%
	41+	21	10%
Grade:	Freshmen	27	12%
	Sophomore	41	19%
	Junior	61	28%
	Senior	84	38%
	Graduate Student	5	2%
Type of Student:	Full-Time (12+ hours/semester)	170	77%
	Part-Time (<12)	49	22%
Living Situation:	On-Campus	95	43%
	Off-Campus	125	57%
Number of Roommates:	0	54	24%
	1	112	51%
	2	18	8%
	3	25	11%
	4	6	3%
	5	4	2%

approximately three in four were between 18 and 25 years of age (73%) and full-time students (77%). The majority of the students (57%) lived off-campus and most respondents were seniors (38%) or juniors (28%). Half of the respondents had one roommate (51%); one in four lived alone (24%). The remainder had two or more roommates, with only 10 respondents (5%) having more than three roommates.

A series of questions designed to gauge participants' involvement with fire safety, training from their university, and perceptions of fire safety was then presented to the respondents. The responses to these questions are presented in **Table 2**. We divided the sample into students that lived on-campus and students that lived off-campus to determine if perceptions and behaviors differed by the place of residence of the student.

Students were first asked if they had received fire-safety training from their university. Responses were nearly identical for both on- and off-campus students; almost three in five students in each group had received fire-safety training from their university. This result was somewhat surprising because as part of their orientation to residence-hall living, students were supposed to receive some kind of training regarding fire safety.

The next question asked participants how safe they felt from fire. Students were asked to provide their responses using a Likert-style series of responses (ranging from Very Safe to Very Unsafe). Approximately three in five students from each group (60.1% of those living on-campus and 63.4% of those living off-campus) felt either safe or very safe from fire. This high proportion of students feeling safe from fire was unexpected, particularly given the fact that just over half had received training in fire safety and (in results not presented here) approximately 70% of the students in each group knew someone who had been injured or killed or who had lost property in a fire. This false sense of security has been cited in a number of tragic fires and only reiterates the university's duty to offer better

Table 2: Experiences with and Perceptions of Fire Safety

Have you received any fire safety training from your college or university?	**On-Campus N (% of Sample)**	**Off-Campus N (% of Sample)**	**Total N (% of Sample)**
Yes	53 (55.8)	72 (57.1)	125 (56.6)
No	38 (40.0)	51 (40.5)	89 (40.3)
Did not answer	4 (4.2)	3 (2.4)	7 (3.1)
How safe do you feel from fire?	**On-Campus N (% of Sample)**	**Off-Campus N (% of Sample)**	**Total N (% of Sample)**
Very Safe	14 (14.8)	37 (29.1)	51 (23.0)
Safe	43 (45.3)	44 (34.6)	87 (39.2)
Somewhat safe	27 (28.4)	31 (24.4)	58 (26.1)
Somewhat unsafe	3 (3.2)	4 (3.2)	7 (3.2)
Unsafe	3 (3.2)	4 (3.2)	7 (3.2)
Very unsafe	0 (0.0)	2 (1.6)	2 (0.9)
Missing	5 (5.2)	5 (3.9)	10 (4.5)
Do you have an escape plan out of your home in case of a fire?	**On-Campus N (% of Sample)**	**Off-Campus N (% of Sample)**	**Total N (% of Sample)**
Yes	73 (76.8)	96 (75.6)	169 (76.1)
No	19 (20.0)	27 (21.3)	46 (20.7)
Missing	3 (3.2)	4 (3.2)	7 (3.2)
Do you have smoke detectors installed in your residence?	**On-Campus N (% of Sample)**	**Off-Campus N (% of Sample)**	**Total N (% of Sample)**
Yes	91 (95.8)	118 (92.9)	209 (94.1)
No	1 (1.1)	4 (3.1)	5 (2.3)
Missing	3 (3.2)	5 (3.9)	8 (3.6)
How often do you test your smoke detectors?	**On-Campus N (% of Sample)**	**Off-Campus N (% of Sample)**	**Total N (% of Sample)**
Once a week	0 (0.0)	2 (1.6)	2 (0.9)
Once a month	12 (13.0)	27 (20.9)	39 (17.6)
3-4 times per year	16 (17.4)	29 (22.5)	45 (20.4)
Twice a year	18 (19.6)	23 (17.8)	41 (18.6)
Once a year	17 (18.5)	16 (12.4)	33 (14.9)
Less than once a year	6 (6.5)	7 (5.4)	13 (5.9)
Never	21 (22.8)	19 (14.7)	40 (18.1)
Did not answer	2 (2.2)	6 (4.7)	8 (3.6)

fire-safety training to its students. If nothing else, the dangers of fire must be presented in a way to make the threat real so that students will take effective measures to protect themselves, their property, and those around them.

Students were next asked about the preventative fire measures they had in their residences. Three in four students in each group had a fire-escape plan and almost all of the students had a smoke detector in their residence. Nevertheless, almost half of the students liv-

ing on-campus (47.5%) and one in three students living off-campus (32.5%) checked their smoke detectors less than twice a year; in fact, one in four students living on-campus and one in seven students living off-campus never checked their smoke detectors. This fact provides further evidence to support the false sense of security students feel from fire.

Students were lastly asked about behaviors that might put them at greater risk of fire and the types of appliances and other devices in their residences. Whereas the student's place of residence made little difference in their training and perceptions of safety from fire, whether a student lived on- or off-campus significantly influenced their behaviors and the types of appliances and devices they had in their residences. The responses to these questions are presented in **Table 3**.

Students were first asked whether they had drunk five or more drinks during the 30 days prior to taking the survey. One in four students (25.3%) living on-campus and almost half (43.3%) of student living off-campus had drunk more than five drinks in one sitting in the past 30 days. Additionally, while only 1.1% of those students living on-campus had smoked in their residence, 14.6% of the students living off-campus had smoked in their residence. Thus, as expected, students living off-campus were far more likely to engage in two behaviors (binge drinking and smoking) that have a strong association with accidental fires in residential settings.

Students were next asked about two other behaviors that are known to contribute to fatal fires. Students were asked whether they used candles or incense in their residence. Only 1 in 10 on-campus students (9.8%) burned candles or incense in their residence, while the vast majority (70.7%) of students living off-campus did so. This large discrepancy is likely due to university regulations that prohibit students from burning candles and/or incense in their residences. The results presented here suggest that when students leave campus, the vast majority choose to burn them.

Students were also asked whether they had a fire extinguisher in their residence. The vast majority of on-campus students (82.4%) indicated that their residence contained a fire extinguisher, while a much smaller proportion (57.9%) of off-campus residences had fire extinguishers. Although almost one in five on-campus students indicated they did not have a fire extinguisher in their residence, the presence of fire extinguishers in the majority of on-campus residences is likely due to university regulations requiring them. When students move off-campus, it appears that fire extinguishers become less important than other appliances and devices.

The last questions presented to the students focused on determining the types of appliances that students used in their residences. For example, because of the numerous fires that electric space heaters have caused during the winter months, students were asked if they used these heaters. Because of the large number of fires due to cooking mishaps that occur on college campuses, students were also asked about their cooking appliances. Students living off-campus were more likely to have each type of appliance in their residence. In general, the more closely the appliance was linked to causing fires, the greater the difference between

Table 3: Respondent Behaviors by Residential Location

Behavior	On-Campus N (% of Sample)		Off-Campus N (% of Sample)	
In the past 30 days, have you had more than five drinks in one sitting?	24 (25.3)	71 (74.7)	55 (43.3)	72 (56.7)
Do you or your roommates …	**Yes**	**No**	**Yes**	**No**
Smoke cigarettes or cigars in your residence?	1 (1.1)	91 (98.9)	18 (14.6)	105 (85.4)
Use candles or incense in your residence?	9 (9.8)	83 (90.2)	87 (70.7)	36 (29.3)
Have a fire extinguisher(s) in your residence?	75 (82.4)	16 (17.6)	70 (57.9)	51 (42.1)
Use a microwave oven in your residence?	79 (86.8)	12 (13.2)	110 (90.2)	12 (9.8)
Use a toaster in your residence?	9 (9.9)	82 (90.1)	105 (86.8)	16 (13.2)
Use an electric range in your residence?	15 (16.5)	76 (83.5)	90 (75.6)	29 (24.4)
Use a hair dryer in your residence?	55 (59.8)	37 (40.2)	88 (72.1)	34 (27.9)
Use a straightener or curling iron in your residence?	53 (57.6)	39 (42.4)	73 (59.8)	49 (40.2)
Use an electric space heater in your residence?	5 (5.4)	87 (94.6)	43 (35.5)	78 (64.5)
Use a clothes iron in your residence?	33 (35.9)	59 (64.1)	84 (68.9)	38 (31.1)
Have firecrackers, explosives, or ammunition in your residence?	3 (3.3)	88 (96.7)	64 (52.5)	58 (47.5)

on- and off-campus students in possessing those appliances. For example, students living off-campus were seven times more likely than students living on-campus to have electric space heaters in their residences (35.5% v. 5.4%) and were almost five times more likely to have electric ranges in their residences (75.6% to 16.5%). Thus, regulations prohibiting appliances that are most likely to cause fire reduce the likelihood that students will have those appliances in their residences and, accordingly, reduce the likelihood of residential fires.

Discussion and Conclusion

This research attempted to answer two important questions. Within the limitations of the sample data, we believe that we now have evidence that addresses each question. The first question was: "Do university students have attitudes and engage in behaviors that make them more likely to be fire victims than the general public?" Results presented here suggest that university students do engage in behaviors that make them more susceptible to fire injury, whether on- or off-campus. One in four students living on-campus and two in five students who lived off-campus had engaged in binge drinking in the past 30 days. Given the strong relationship found between excessive alcohol use and accidental fires, this finding is troubling and reiterates the responsibility of university staff to educate students about the harms of excessive drinking, including its relationship with fire.

Additionally, the results presented here suggest that students should be informed in those same training sessions about their own actions and how those actions make them more or less likely to be harmed by fire. Despite the fact that only about half of the students had fire-safety training, the vast majority felt that they were safe from fire. The unfounded nature of this confidence is revealed in the fact that most students, whether living on- or off-campus, had smoke detectors in their residences but many did not check them more than once a year. Given that the general message is that homeowners should "check their smoke detectors when they change their clocks" twice a year, this finding is particularly surprising. The aforementioned fire-safety training should strongly suggest to students that while having a smoke detector is an essential part of fire prevention, having an inoperable smoke detector is not only dangerous but inexcusable, given the ease with which they are checked for serviceability.

The data analyzed here also provide insight into differences in students by residence that heretofore have not been examined. Findings allow us to address our second research question: "Do students living off-campus have different attitudes and behaviors than students living on-campus?" The answer is yes. Students living off-campus were much more likely than students living on-campus to engage in behaviors that increased their chances of being victimized by fire. Students living off-campus were substantially more likely to use electric space heaters, candles and incense, and electric ranges in their residences than their on-campus counterparts. Additionally, off-campus students were much more likely to have fire crackers and other explosives in their residences and to smoke in their residences. Intuitively, these findings are likely due to university regulations that prohibit these items in campus residence halls. Nevertheless, an important realization is that these university regulations make students safer from fire because these data suggest that, upon moving off-campus, the prevalence (and thus the increased fire risk to residences) of these items increases dramatically. Thus, it is imperative that universities not only continue to have these regulations but enforce them as well.

The findings presented here also suggest that it is essential for universities to find ways to convince off-campus students of the importance of abiding by regulations designed to enhance residential fire safety. Surprisingly, the residential location of the students had little impact on their views of their safety from fire or their fire training. This finding was somewhat surprising, given the regulations and equipment found in university residence halls. We expected that on-campus students would feel safer from fire injury (because of the enhanced fire-safety steps on university campuses). Nevertheless, this expectation was not the case.

Study Limitations

The research reported here has several limitations. First, and most importantly, the results from this sample have limited generalizability. Given the low response rate and the selective sample frame used here (honors students and fire-safety students at a public Midwestern university), this effort will need to be replicated in other universities with more representative samples before policy changes based on these findings should be considered.

Second, we believe that the findings presented here represent a conservative view of the attitudes and behaviors of college students in the area of fire safety. If anything, the students providing data for this research should be better trained, more responsible, and more cognizant of fire safety than their counterparts in different programs at different universities.

Finally, we are also aware of the limitations of the measures used here; better measures of attitudes and behaviors around fire safety can probably be developed. Given the findings presented earlier, future research should use these findings as a foundation and a springboard for their own research efforts.

Suggestions for Future Research

In addition to collecting data from larger, more representative samples, researchers should also expand the literature in this area by conducting postfire analyses of both on- and off-campus fires involving university stu-

dents in order to collect both qualitative and quantitative data regarding behaviors that lead to residential fires where college students live. For example, researchers could monitor the fire calls of the jurisdiction where they live and work and interview university students living in residences damaged by fire to provide more detailed information about behaviors that may have led to the fire and the prevention measures available in their residences that might have prevented the fire. Researchers could also ask students whose residences were impacted by fire whether they received fire-prevention training from the university and if so, the nature and extent of that training. These efforts should provide more knowledge about the causes and consequences of residential fires for university students.

Despite the fact that further work is required to understand more fully how fire affects college students, the present study did provide empirical evidence concerning perceptions and behaviors of university students in the area of fire safety. Based on the results of this study, it is apparent that universities must take seriously their duties to train and foster safe habits in their students. Nevertheless, it is not the responsibility of university personnel alone. As the literature review has suggested, landlords in residences where students live off-campus should use university regulations, equipment, and training as models for the residences that they supervise. Thus, while not directly related to this study, the community also has certain obligations to ensure that students have safe off-campus housing to live in while they attend the college of their choosing. When universities and communities work together to increase the fire safety of their inhabitants, positive steps in fire safety can occur. Until that situation happens, the evidence presented here suggests that students will be safer living on-campus, despite its inconveniences.

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About the Authors

Caleb Armburst recently received his B.S. in Fire Safety and Engineering Technology from Eastern Kentucky University and is currently a Fellow with the Trinity Forum Academy in Royal Oak, Maryland.

Paul Grant is an Assistant Professor in Fire Science and Technology in the Department of Safety, Security, and Emergency Management at Eastern Kentucky.

Dr. David May is an Associate Professor and Criminology Program Coordinator in the Department of Sociology and Social Work at Mississippi State University. He is the corresponding author for this article and can be contacted at **dmay@soc.msstate.edu**