# Chapter 14
# Comparing Fear of Crime and Crime Statistics on a University Campus

**Sven Fuhrmann, Niem Tu Huynh, and Ruojing Scholz**

**Abstract**  Campus crime at colleges and universities has resulted in a call for more safety and preventive measures from policymakers, students, to citizens. While research highlights students' fear on campus crime, few studies have examined this topic from a spatial and cognitive perspective. In this chapter the authors report on a novel methodology to compare campus crime data with participants' self-reported cognitive fear of crime maps. In this study, 313 undergraduate students provided fear of crime maps at a middle-sized university in the southwestern United States. The students' perceptions were aggregated and compared to university crime statistics to produce five bivariate maps. These maps represent perceived fear of crime in relation to four broadly observed crime categories namely burglary, theft, harassment, and sexual assault. In this research effort, students' fear of crime is aligned with data for actual burglary and theft occurrences but their fear is exaggerated for harassment and sexual assault. The implications of this study are multifold, extending from potential safety improvements and better decision-making (e.g., aid law enforcement to target specific areas for crime monitoring) to developing educational workshops to dispel myths and present facts on campus safety. The introduced bivariate mapping technique provides another step towards safer university and college campuses.

S. Fuhrmann (✉) • R. Scholz
Department of Geography, Texas State University – San Marcos, San Marcos, TX, USA
e-mail: fuhrmann@txstate.edu; rw1283@txstate.edu

N.T. Huynh
Association of American Geographers, Washington, DC, USA
e-mail: nhuynh@aag.org

## 14.1   Introduction

College campuses have been described as microcosms of society (Rund 2002).
Although a generally safe place for students, faculty and staff, campuses are also
subject to criminal activity like its surrounding communities. The majority of
offences recorded on campuses are property crimes while violent crimes are rare
(Robinson and Roh 2001). Nevertheless, the frequency and severity of events
have made campus crime a priority for Congress and state-level policymakers with
parents and students demanding more preventative measures (Fisher et al. 1997).
College-related crime has received major public awareness with the murder of
Jeanne Clery in 1986. Her case resulted in the Clery Act of 1990 (20 U.S.C § 1092(f))
which requires all institutions of higher education to disclose campus crime informa-
tion publicly on an annual basis. The campus security report includes crime
statistics, information about safety, prevention, and security measures on campus.
Overall, the published reports suggest that campus crimes are relatively low compared
to the larger community (Fox and Burstein 2010). However, there is continued fear
of campus crime by students, administrators, faculty, and parents.

The current literature offers foundational research on student perception of
campus crime but few studies have examined this topic from a spatial perspective.
Some studies have accomplished this by producing maps marking the location of
reported crimes (e.g., Robinson and Mullen 2001; Robinson and Roh 2007) while
others have mapped participants' fear of crime (e.g., Brantingham et al. 1977; Nasar
and Fisher 1993; Astor et al. 1999). Few studies have brought the two sets of data
together as a way to compare cognitive maps of fear with reported crime incidents.
This paper aims to bridge university crime statistics with fear of crime perceptions
denoted on a map and analyzed using Geographic Information Systems (GIS).

Each human maintains a cognitive map – a subjective and dynamic spatial repre-
sentation of the environment around them. These cognitive maps are complex and
reflect personal assessments of the environment. Cognitive map content includes
preferred spatial areas, landmarks, routes, experiences, and also areas humans
want to avoid or are afraid of visiting. Cognitive maps include areas of fear, areas of
comfort, and ways to move within these spaces (Downs and Stea 1973; Gould
and White 1974). Using the cognitive map as data source, this research attempts to
intersect two campus crime mapping efforts: (a) university police crime data with
(b) the students' mental fear of crime maps. Both datasets enable the researchers
to investigate two research questions: (a) What are the aggregated fear of crime
patterns? and (b) Is there a relationship between students' fear of crime maps and
reported crime activities?.

To answer the research questions, this research analyzes 313 undergraduates'
fear of crime maps at a middle-sized university (29,105 full and part-time students

enrolled during the fall 2009 semester) located in southwestern United States. The analysis provides a neoteric method that combines human perception and mapping of fear with geospatial data and technology to produce bivariate crime maps. These bivariate crime maps show similarities and discrepancies between reported crime and perceived areas of fear on campus. The practical use of the maps are to support university police and administrators to better assess and react to safety situations and concerns on campus.

## 14.2 Literature Review

### 14.2.1 Campus Crime Statistics and Policy Making

When parents send their children to colleges and universities they usually expect a safe living and learning environment. Unfortunately campuses are not excluded from violence and crime, which can range from theft and car break-ins to more violent crimes such as sexual assault to death. Up until 1990 institutions of higher education were not required to publish information about the safety of their campuses or to report crime statistics (McNeal 2007). It wasn't until the murder of Jeanne Clery, who lived in residence and studied at Lehigh University (Pennsylvania), that provided the major incident for developing and passing "The Student Right-to-Know and Campus Security Act" (Public Law 101–542) in 1990 (Janosik and Gregory 2003). Amendments to this act in 1998 renamed it to the "Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act" (20 U.S.C § 1092(f)). One purpose of the "Clery Act" was to provide students and parents with sufficient campus crime statistics to help them make informed college enrollment decisions. Another purpose of the law was to establish pressure on colleges and universities to take campus crimes seriously and to ensure a safe learning environment (Fisher et al. 2002). The Clery Act requires all institutions of higher education to disclose campus crime information to the public on an annual basis and to submit a crime report by October 1, reflecting three prior years, to the United States Department of Education (Lipka 2009). The report needs to include information about (a) the type of crime (e.g., criminal homicide, sexual offenses, robbery, aggravated assault, burglary, arson, motor vehicle theft, and arrests), (b) locations (e.g., on campus, on campus residential facilities, non-campus buildings, and public places), (c) a statement of current policies regarding procedures for reporting crime, (d) descriptions of security and crime prevention programs, (e) information about security and access to campus facilities, and (f) current policies concerning campus law enforcement (Fisher et al. 2002; Janosik and Gregory 2009; Lipka 2009).

The Clery Act provides better safety information and crime protection for college students, but two major drawbacks have been reported. First, few students and parents read the crime statistic reports and second, the numbers provided may not reflect true crime patterns and occurrences due to data entry errors and that not all crimes are reported (Gregory and Janosik 2002; Janosik and Gehring

2001; Lipka 2009). Furthermore, many students are completely unaware of the Clery Act (Janosik 2001; Gregory and Janosik 2002). Most students do not base their college decisions on it (Janosik 2002), and thus do not read the annual reports nor use them for on-campus safety decision making, e.g. which route to walk home at night. In addition to public awareness there have also been a number of implementation and compliance issues with the Clery Act (Carter 2001; Lipka 2009; McNeal 2007). Some of the issues are systematic while others are institution related. One criticism is the lack of guidance on compliance issues set by the U.S. Department of Education. Some institutions are reluctant to publish potentially negative information which is made worse by internal errors caused by data processing and reporting issues such as missing policies and personnel changes (Carter 2001; Lipka 2009; McNeal 2007). Sources interviewed by Lipka (2009) go as far as saying that crime statistics do not provide safety, only the integration of basic security reporting equipment (e.g., blue-light telephones, emergency signboard systems, and monitored security cameras) will lead to safer campuses.

### 14.2.2   Spatial Cognition and Fear of Crime

Downs and Stea (1973) define cognitive mapping as "a process composed of a series of psychological transformations by which an individual acquires, codes, stores, recalls and decodes information about the relative locations and attributes of phenomena in his everyday spatial environment. […] The product of this process at any point in time can be considered as a cognitive map" (pp. 9–10). Cognitive maps are personalized memories about human spatial experiences. These spatial memories can consist of many components such as landmarks, paths, edges, images, stories, and areas of fear (Golledge 1999; Kitchin 1994; Kitchin and Freudschuh 2000).

The cognitive map research attracted attention from numerous fields including geography, planning and psychology. The theories, applications, methodologies and knowledge resulting from this research on cognitive maps collectively formed a significant contribution to the spatial cognition literature (e.g., Banai 1999; Kearney and Kaplan 1997; Kuipers et al. 2003; Singh 1996) and play a role in criminology research (Brantingham and Brantingham 1993). The extraction of information from people's cognitive maps has not been widely used in campus crime research although a thread of this research exists (e.g., Brantingham et al. 1977; Astor et al. 1999).

Brantingham and Brantingham (1995) describe fear of crime as a complex concept that includes fear of being attacked, suffering physical harm and/or loosing privacy and dignity. In the context of this manuscript we study 'fear of crime' as the fear of becoming a victim of crime in different parts on a university campus. Fear of crime is an emotional reaction to potential victimization and a natural response to an individual's perception of threat in their environment. It may influence peoples' actions to avoid becoming a victim (Balkin 1979; Baumer 1985). Fear of crime can be classified into three aspects: cognitive, affective, and behavioural fear of crime (Hale 1996; Jackson 2006). While behavioural fear of crime highlights people's actions to avoid becoming a victim; affective fear of crime tries to assess the fear

towards a specific offense. This study investigates the cognitive aspect of students' fear of crime, in particular, participants' beliefs regarding the likelihood of becoming a victim on campus will be documented. Accuracy of student perception is of importance and the literature suggests peoples' cognitive perception of crime is generally reliable. Cognitive fear of crime generally matches occurrences and proximal locations of actual crime events within familiar areas such as neighbourhoods or districts (Brantingham et al. 1977; Lewis and Maxfield 1980).

Literature on campus crime generally focuses on three broad areas: (a) the role of legislature and university's role in crime prevention (Fisher and Sloan 1993; Gregory 2001; Hudge 2000; Janosik 2001), (b) the types and frequency of crime occurring on campus (Fisher and Nasar 1995; Fisher and Sloan 2003, 2007; Fisher et al. 1995; Robinson and Roh 2001), and (c) student perception of crime on campus (McConnell 1997; Nasar and Fisher 1993; Starkweather 2007; Tseng et al. 2004; Wilcox et al. 2007). An area of paucity in crime research is the inclusion of spatial research, and only a small number of publications can be found (Astor et al. 1999; Brantingham et al. 1977; Nasar and Fisher 1993; O'Kane et al. 1994; Rengert and Lowell 2005; Robinson and Mullen 2001; Robinson and Roh 2007). In the above listed studies, campus maps were used to visualize areas of criminal activity as clusters or hot spots while survey responses provided information about victimization fears.

One branch of criminology that applies maps to identify crime pattern analysis is known as environmental criminology. The concept, introduced by Brantingham and Brantingham (1993), provides a framework to analyze crimes in relation to the physical environment, paired with the activity patterns of both victims and offenders. The framework provides a geographic space to describe crimes, with observations that people commit offenses near central nodes (e.g., home, work), along paths that are connecting these nodes, and around edges that distinguish the landscape. Conclusions using this framework explain that victimization patterns are related to the *paths* and *nodes* of the victim (Brantingham and Brantingham 1993). The underpinning assumption is that offenders commit criminal activities close to their activity nodes and routine activity paths as these are the spaces they know best. Land use plays a critical role in environmental criminology, with crime occurring along physical and perceptual edges within a region (Brantingham and Brantingham 1993). Rivers, railroads, highways are physical edges while residential-commercial, or city-campus edges are perceptual borders (Brantingham and Brantingham 1993, 1995). While environmental criminology is an important theory within criminal justice research, this manuscript's focus is on comparing cognitive areas of fear with reported crime statistics.

### 14.2.3   Crime Mapping

Pin mapping can be described as the most elementary crime mapping technique in which dots represent the locations or concentration of crimes (Groff and La Vigne 2001; Vann and Garson 2001). Modern crime mapping has extended beyond this method. For example, Vann and Garson (2001) identified 21 different crime

mapping and analysis functions while Groff (2007) describes agent-based modeling as a way to predict potential crime patterns. Criminology has been strongly influenced by crime mapping (Wilson 2007), which has gained prominence and acceptance. This method uses software to effectively combine crime theory with geographic analysis principles. New developments such as GIS and remote sensing have improved crime analysis in the past several years, supporting crime mapping and analysis through advanced spatial analytical methods.

A foundation for campus crime mapping was laid in the late 1970s. Seminal work include Brantingham et al. (1977) who analyzed and mapped residents' perceptions of crime sites in a student housing complex. The researchers encountered many residents in the housing complex who misperceived the location of the most dangerous crime sites and unconsciously increased their risk of victimization. Brantingham et al. (1977) concluded that general policing and management service improvements for the student housing complex are needed. Astor et al. (1999) investigated areas of violence on high school campuses. They asked students and teachers to mark the most violent events and dangerous areas on maps of their school campus. Results indicated that most crimes occurred in unsupervised spaces coined as "un-owned places" (Astor et al. 1999). The authors recommend students and staff to take ownership of these areas through increased security and interventions but also through getting to know students personally and extending behavioral interactions between students from the classrooms into the hallways, dining and parking areas. Robinson and Roh (2007) investigated crime statistics on a university campus in the southeast United States. They mapped out campus crime data for a 2 year period and found crime hotspots in campus dormitories (which the authors call "crime generators") and high-traffic areas between educational buildings and parking places. Hot spots are defined as places that have more than average occurrences of criminal activity (Sherman and Weisburd 1995; Fisher and Nasar 1995). Hot spots are classified into one of three categories: crime generators, crime attractors, and crime enablers (Clarke and Eck 2005).

Brower and Carroll (2007) reviewed alcohol-related aspects of a college town and used GIS to map the relationships among high-density alcohol outlets and different neighborhoods in the City of Madison, Wisconsin. The researchers mapped student address data and incident report data which they grouped in four low level crime categories: liquor law violations, assaults and batteries, vandalism, and noise complaints. Brower and Carroll (2007) found that noise complaints bordered along long-term resident and high-density student housing. Assaults and batteries peaked after bar closing time in the vicinity of student bars, and vandalism was mostly reported in the morning. The results of the study were applied to mitigate noise problems through a better university-community partnership, to change drinking policies in dormitories, and to modify practices for bar licensing and alcohol-related fines. Overall, map and GIS-based campus crime studies have shown huge potential in analyzing and mitigating crime on college and university campuses. This study borrows from and builds on the methods applied in these publications in order to add to the understanding of campus crime patterns.

## 14.3   Method

Two primary data sets are used in this study, (1) official crime data collected by the University Police Department and (2) students' self-reported fear of crime locations. A description of participants, measurement instrument, and the data collection procedure follows.

### 14.3.1   Participants

Three hundred and thirteen randomly participating undergraduate students across six different geography classes completed the survey in the fall 2009 semester. One hundred and seventy-eight undergraduate students were recruited from the world geography course (freshman level), 73 participants took the introduction to GIS course (sophomore level), 29 students volunteered in the junior level cartography course, and 33 subjects were recruited in two advanced level GIS courses (junior and senior level). One third of students surveyed were Geography majors while the remaining students specialized in a range of university disciplines (see Table 14.1).

Students participating in this study are representative of the larger student body. The gender was close to evenly split (48.2% females, 51.8% males) and reflected the general undergraduate enrollment ratio at the university well (53.4% females, 45.6% males, fall 2009 data). The average age of the total sample was 24.6 years (average undergraduate student age at university 21.5years; geography department 23.6 years) and included 91freshmen (mean age of 20.0 years old; university level 18.8 years; geography department 20.2 years), 57 sophomores (mean age of 24.6; university level 20.6 years; geography department 21 years), 69 juniors (mean age of 25.8; university level 22.3 years; geography department 23.8 years), 69 seniors (mean age of 26.9; university level 23.9 years; geography department 25.3 years). Twenty-seven students did not enter their study level information. Seven participant responses were excluded from the study because of incomplete answers. Overall the age and gender distribution of the study participants is representative of the undergraduate student population (see Table 14.2).

Since the university has a large commuter student enrollment the researchers also compared the areas of fear between commuter students and residents. Thirty percent of participants (n=92) lived in student residences on campus, 33% (n=103) of participants were living within the city limits, and 36% (n=112) were commuters. In the fall 2009 semester 5,994 (30.3%) undergraduate students lived on campus, 4,760 (23.8%) undergraduate students lived within the city limits, while 9,193 (45.9%) of the university's undergraduate students commuted. Overall the residence distribution of the study participants is representative of the university's undergraduate student population.

**Table 14.1** Participants' academic major

| Major | # | Major | # | Major | # |
|---|---|---|---|---|---|
| Accounting | 4 | English | 2 | Math | 4 |
| Anthropology | 2 | Environmental studies | 1 | Music | 1 |
| Architecture | 1 | Exercise and sports science | 7 | Nutrition | 1 |
| Art | 2 | Fine arts | 2 | Political science | 1 |
| Biochemistry | 1 | Geography | 99 | Psychology | 1 |
| Biology | 12 | History | 4 | Recreation Admin. | 1 |
| Business | 4 | Interdisciplinary studies | 4 | Sociology | 1 |
| Communication design | 2 | Interior design | 1 | | |
| Computer science | 2 | International business | 7 | | |
| Criminal justice | 1 | International studies | 16 | Undeclared | 19 |
| Education | 54 | Marketing | 2 | Major not provided | 54 |

**Table 14.2** Characteristics of study participants compared to university undergraduate student body (data for fall 2009)

| | Study participant characteristics | Geography department characteristics | University undergraduate student characteristics |
|---|---|---|---|
| Females | 48.2% | 30.3% | 53.4% |
| Males | 51.8% | 69.7% | 45.6% |
| Average age | 24.6years | 23.6 years | 21.5 years |
| Average age freshmen | 20 years | 20.2 years | 18.8 years |
| Average age sophomores | 24.6 years | 21 years | 20.6 years |
| Average age juniors | 25.8 years | 23.8 years | 20.6 years |
| Average age seniors | 26.9 years | 25.3 years | 23.9 years |

## 14.3.2 Measurement Instruments

A questionnaire and a campus map were used as primary survey tools. Participants were asked to provide three sets of information. First, demographic and residence information were collected, followed by marking and labeling campus areas the students considered unsafe to walk in. Finally, students were asked to identify areas that they were frequently visiting. In order to mark unsafe areas students received an official campus map that included all buildings, streets, parking lots, and other infrastructure information. The map also included a predefined reference grid that allowed the researchers to geo-reference and aggregate the collected data. In addition to identifying unsafe areas, participants were also asked to indicate the time of the day they considered these areas unsafe, what kind of crime they feared in these locations, and what improvements they would recommend. The questionnaire also assessed if the university escort service was used by the participants if they felt unsafe on campus.

### 14.3.3   Data Collection Procedures

Data were collected at the start of each class; the process taking approximately 15–20 min. The scope of the study was first explained followed by an invitation for voluntary participation. It was made clear that student identity would be anonymous and participants would not receive any extra course credit. Participants received a questionnaire and an official campus map on which they were asked to mark up to five areas that they would feel unsafe walking by themselves. Participants were asked to number these areas on the map and use the alphanumerical coordinate system (e.g., A1) to answer corresponding questionnaire questions. These questions were concerned with why and when students would feel unsafe at these areas. Once these tasks were completed, participants returned the questionnaire and the map to the study facilitator. Participants were thanked for their participation. No additional follow-ups or make-up opportunities were given to students who missed class.

## 14.4   Results and Discussion

### 14.4.1   Findings from University Police Department Data

The university police crime statistics database is freely accessible on the university website, providing data about reported crimes for the period 2007–2009. These crime incidents (539 cases) were categorized into five general offence types, plotted in their location of occurrence, and then aggregated into reference grids to create crime statistics maps (Fig. 14.1). The campus crime statistics revealed that the five major crimes were burglary (270 cases), theft (209 cases), assault (32 cases), sexual assault (16 cases), and harassment (10 cases). Thus, categories of the highest occurrence were selected to represent the five general offence types.

The majority of burglaries occurred in the parking lots whereas thefts mostly occurred in academic and administration buildings. Harassment, assault and sexual assault were recorded in and around the residence halls, whereas robberies (2 cases) and other criminal offences were not as widespread on campus. These findings are similar to but also depart from past studies. While other studies (e.g., Robinson and Mullen 2001; Robinson and Roh 2001) found drugs (legal and illegal) to be a leading criminal activity, this study did not find these results. Instead, non-violent crimes (burglary and thefts) followed by violent attacks (e.g., assault and sexual assault) were dominant on the investigated campus. In comparison, sexual assaults were higher on this campus than in Robinson and Roh's (2001) study. Hence, criminal activity numbers and types vary by campus. This study used the reported campus crime data for the spatial analysis and did not aim to include or model unreported campus crimes.
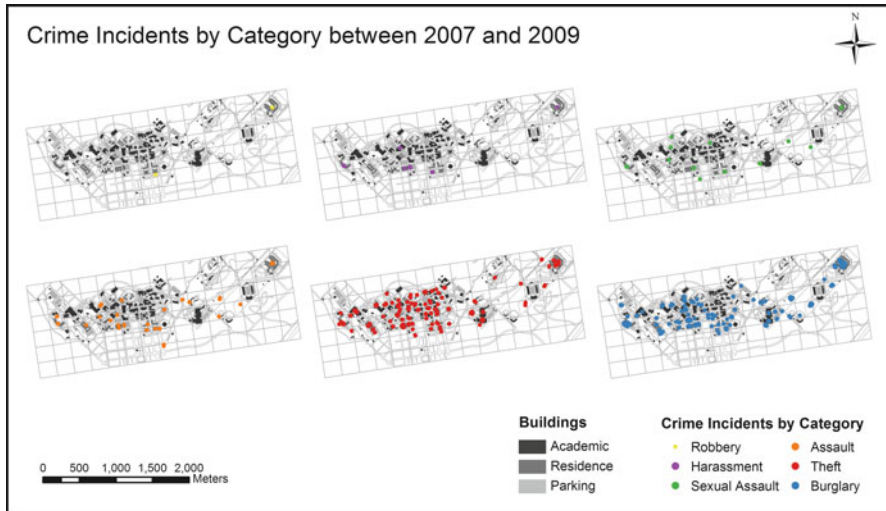
**Fig. 14.1** Reported crime incidents between 2007 and 2009 (University Crime Statistics)

## 14.4.2 Generating and Generalizing Students' Fear of Crime Maps

The use of mapping to illustrate aggregated offenses is found in the crime literature (e.g., Groff and La Vigne 2001). Similar methods but different variables are used here. Students' fear of crime perceptions (mostly point locations) were aggregated into reference grids for each section of the campus and then used to create cognitive fear of crime maps (Fig. 14.2). Aggregating individual fear of crime perceptions into predefined grids allowed analysis using hot spot visualizations which helped with spatial pattern analysis. The grid size was based on the predefined reference grid of the original campus map and each grid represents 12.5 acres. A shortcoming of the aggregation method, formation of squares, is that there is less accurate spatial data compared to discrete (e.g. point) data. Openshaw (1984) and Ratcliffe and McCullagh (1999) describe this problem as the modifiable areal unit problem (MAUP) in which spatial data aggregation into artificial regions, e.g. administrative borders, grids, etc. might cause the generation of different spatial patterns. MAUP exists because of scale and zoning effects that change numerical representations depending on the scale and region categorization. These artificial spatial areas, i.e. the grid in this research, might change or mask spatial patterns. However for the purpose of this study the selected grid should work fine because cognitive maps are often distorted from reality. Mapping crime fears onto a reference grid will provide a reasonable area for fear of crime estimation.
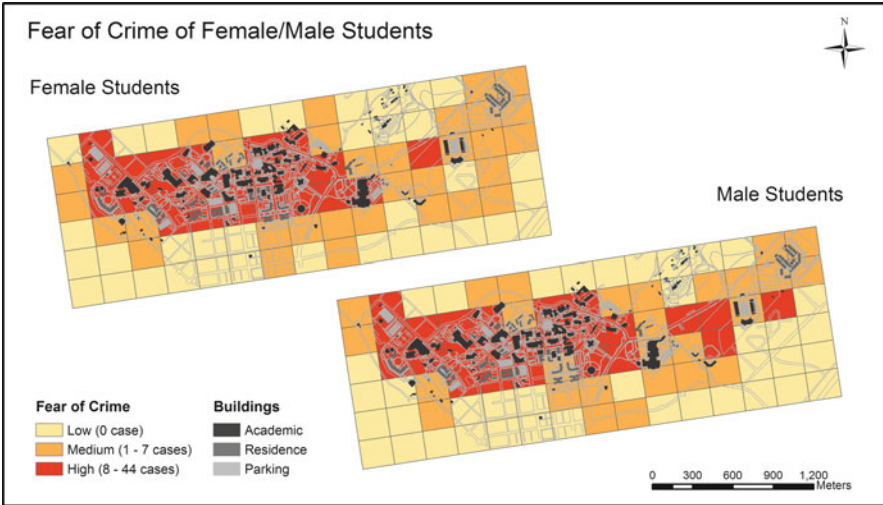
**Fig. 14.2** Female and male students' fear of crime

### *14.4.3 Fear of Crime Patterns*

The fear of crime maps of female and male participants show similar patterns (Fig. 14.2). Most fear is oriented towards the central campus and less towards the peripheral and remote areas of the campus. This is an interesting finding, since the central campus usually has a higher student/visitor concentration. However, the central campus has only a higher student/visitor concentration during the day. During night time there are fewer visitors in the central campus area which could lead to fear of crime, especially in the parking lots. In addition the central campus area contains mostly walk-only access with almost no car traffic during the evening/night, thus the mode of transportation might trigger a higher fear of crime perception in students. Current major construction work (large new buildings) and as a result smaller and dimmer pathways on the central campus cause several darker areas, thus a more fearful environment at night.

The participants' fear of crime explanations, provided on the questionnaire, highlight some of the reasons for fear. Most students describe that they fear crime in areas around academic buildings and in parking lots between the hours of 8:00 PM and 7:00 AM. Areas outside academic buildings, such as walkways, have been described as "not well lit", "wooded", having "no security presence", being "unmonitored" and providing "hiding places". Students described parking lots as "isolated", "dark", "vacant" and also as being "not monitored". One student wrote: "Nobody will see if you get attacked at night."

Residency status (students living on campus and off campus) provides a change in spatial crime perception patterns. These different patterns are related to parking

spaces that are in remote areas off campus. It is noticeable that commuter students (who park on the outer parking spaces) have a higher fear of crime in these areas than students who live on campus and park their car close to their residence.

Campus residents do not feel safe at night around the areas outside their residential halls since these are perceived to be "very dark", "not well lit" and have only "few people" present. One student described it as being "a very scary walk" when passing through those areas. However, students continue with their activities at night and go out for dinner, visit a friend living in another part of campus, or go shopping. Some students noted that they do not feel safe inside the residential halls either, because they received police warnings about recent home invasions and heard stories about break-ins and assaults in the students' residences. Overall these findings will need a follow-up study to investigate in greater detail the extent of fear of crime on this specific campus.

### 14.4.4  Bivariate Crime Mapping

In a final data analysis and mapping step, bivariate maps comparing crime statistics and fear of crime were created. The observed crime and fear of crime rates (residents and commuters) for four categories namely burglaries, thefts, harassments, and sexual assaults were classified into three classes using the quantile classification method. The resulting classes were named low, medium, and high crime rate as well as low, medium, and high fear of crime. The individual values for each of these three classes are plotted in Figs. 14.3, 14.4, 14.5, 14.6, and 14.7. A set of four bivariate maps was created. These maps represent fear of crime in relation to observed burglaries, thefts, harassments, and sexual assaults. A final bivariate map compares the total number of observed crimes against fear of crime values. All bivariate maps contain a special bivariate color scheme to visually represent low-low to high-high fear-reality relations, wherein light violet represents low-low and dark violet visualizes high-high fear-reality relations (Figs. 14.3, 14.4, 14.5, 14.6, and 14.7). Low-low fear-reality relations indicate that observed and fear of crime are both low whereas high-high fear-reality relations visualize that observed and fear of crime are both high. In both cases the fear-reality relations indicate that students' fear of crime maps match observed crime statistics. All low-high (red) or high-low (blue) fear-reality relations indicate a mismatch between students' level of fear and actually observed crime. Thus red areas indicate regions of major concern in the created bivariate maps. Data combinations that result in medium results (e.g. low-medium, medium-high) were categorized and represented in light yellow. In so doing, the maps represent major agreement and differences between observed and perceived crime rates.

None of the bivariate maps revealed an inverse relationship between fear of crime and actual crime rate (i.e., low fear of crime and high crime rate). Generally, participants overestimated crime incidences. These so called "fear spots" are areas that do not have frequent offenses but are feared to be dangerous (Fisher and Nasar 1995).
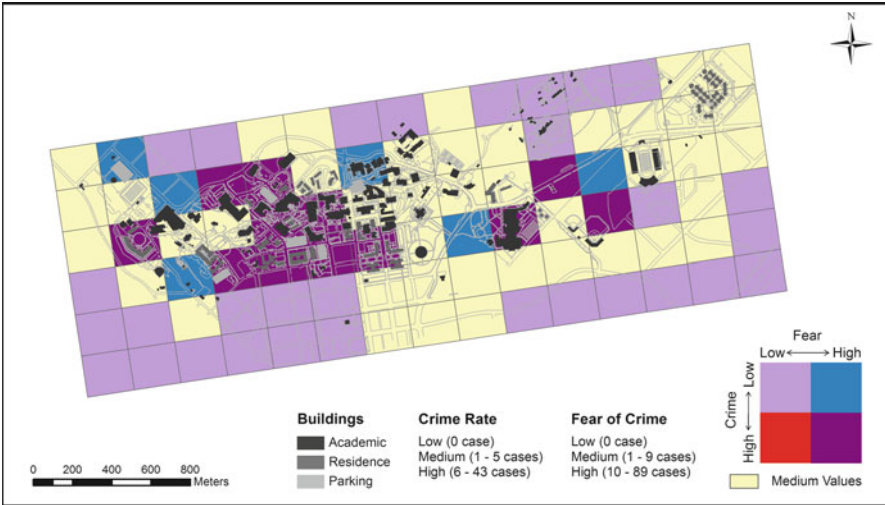
**Fig. 14.3** Crime rate vs. Fear of crime: burglary



**Fig. 14.4** Crime rate vs. Fear of crime: theft

Additional research needs to be conducted to better understand why participants overestimate crimes in certain areas.

The bivariate burglary and theft maps show that student fears match the actual crime rate for the central campus in most areas. Remote areas of campus generally have higher crime fears than recorded statistics (Figs. 14.3 and 14.4). This may be attributed to student observations (residents and commuters) of dim lighting, minimal
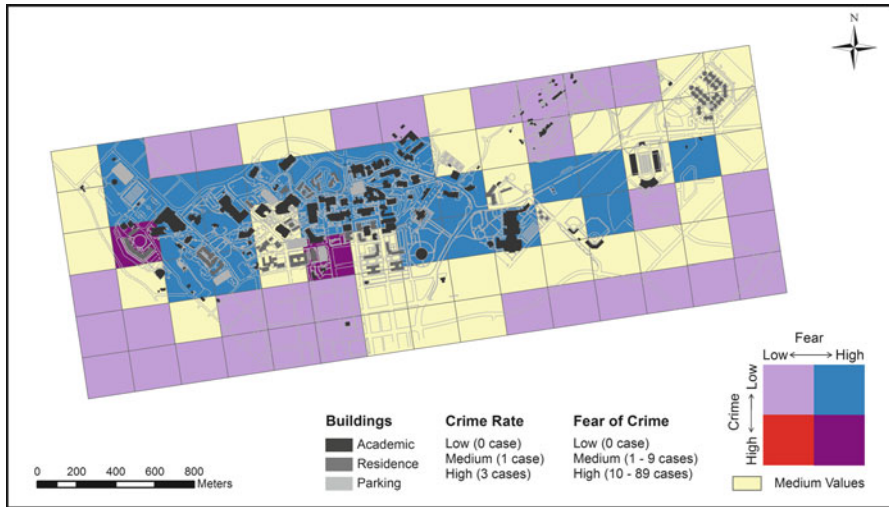
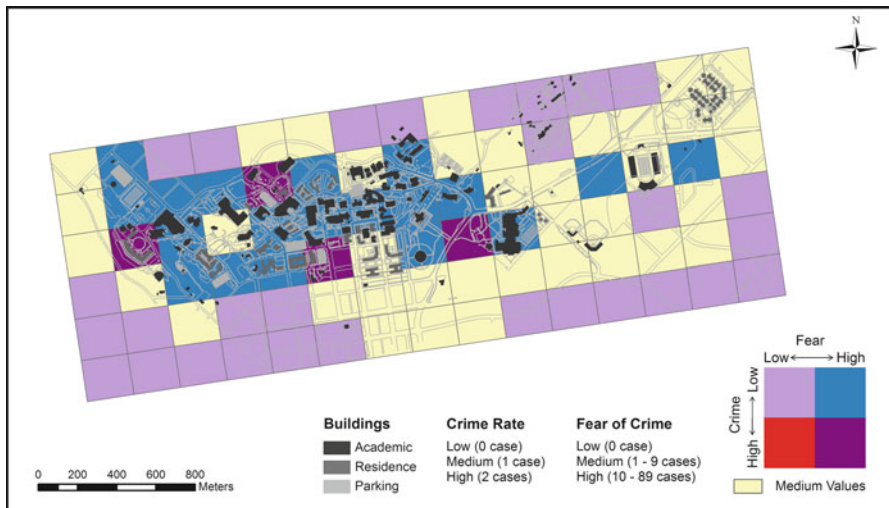**Fig. 14.5** Crime rate vs. Fear of crime: harassment



**Fig. 14.6** Crime rate vs. Fear of crime: sexual assault

patrol/surveillance in these areas or the notion that the chance of theft is directly proportional to the distance object is away from its owner. In addition participants reported hearing stories about attempted rape and assaults in these remote and isolated campus areas.

The harassment and sexual assault bivariate maps highlight different patterns. Both maps show high fears of crime for the central campus but an actual low observed crime rate. These patterns are true for most of the central campus except

**Fig. 14.7** Crime rate vs. Fear of crime: all crimes reported

for a few grids (mostly in student housing areas) in which a higher crime rate matches a higher fear of crime indicator (Figs. 14.5 and 14.6). Thus, the areas of fear might not only to be in public campus areas but in student residences itself which some researchers also describe as "crime generators" (e.g., Brantingham et al. 1977, 1995; Robinson and Mullen 2001; Robinson and Roh 2001). Overall the bivariate maps in this study suggest that students might over estimate cases of sex related offenses on campus, or that some cases might not have been reported to law enforcement. However, the high perception of sex crimes matches with the data of this campus and also nationwide. The rate of forcible rate per 100,000 people was 12.38 in 2006 and dropped slightly in 2007 to 12.18. This is the highest value amongst listed violent crimes of robbery and aggravated assault (Fox and Burstein 2010).

Figure 14.7 compares all crime observations for 2007–2009 and the reported fear of crime. The data reveal a close match between areas with higher crime occurrences and higher fears of crime. Two areas in Fig. 14.7 report higher fears of crime and lower crime rates. These areas represent remote parking facilities in the football stadium area and the recreation center. Both locations are about a 20–30 min walk away from campus center. University police and administrators might consider reviewing these areas to assess if additional patrolling or safety features are needed in these regions.

## 14.5   Conclusions

Campus crimes at universities and colleges are an unfortunate reality. Some immediate solutions to address campus crime are a stronger campus police force and campus monitoring/patrolling, quick responses to crime events through university police

and other law enforcement agencies, and mitigating crime potentials through student education. Learning about students' fear of crime could help law enforcement target specific areas for crime monitoring and also provide information for educating students about taking special precautions in some areas of a university campus.

The research presented here attempts to address this issue by introducing a non-invasive data collection method that combines cognitive fear of crime representations and observed crime rates into an effective bivariate mapping method. The resulting graphic representations identify (a) potential student misconceptions of safe versus unsafe areas on campus, and (b) potential underreported crime areas. In this study, student fear of crime is aligned with data for burglary and theft but is over predicted, compared to the reported cases, for harassment and sexual assault. It may be that students are more fearful than statistics suggest or in the case of sexual crimes students learn of them but these cases are less likely to be reported than loss of personal property. This outcome needs to be further investigated.

This study has shown several benefits of the bivariate mapping approach for improved campus safety. First, it is a proof of concept of the bivariate mapping approach and thus provides, despite limited, answers towards interpreting campus crime pattern. Since the participant demographics are similar to those of the whole student body, the current findings serve as initial indicators and should be generalizable for the university. Second, the introduced bivariate mapping approach can be replicated for any other campus in the U.S. or internationally. The results will provide researchers with an essential view on campus safety and necessary tools for campus safety improvements. Follow-up studies should investigate spatial analysis at multiple scales, usability aspects for decision making, and public accessibility issues.

This study has some limitations that need to be addressed in future research. In order to create representative results about broader fear of campus crime graduate students, faculty and staff should also be included into the research study. Here the researchers compare only a representative group of the undergraduate population to campus crime data; although the number of undergraduate participants is similar to other studies, e.g., Fisher and Nasar (1995). While focusing on one population may be a short coming, it should also be noted that the undergraduate population is probably the most vulnerable demographic on campus and deserves the research focus. Next, a larger participant group with a higher number of fear indicators might also allow analyzing the cognitive and observed data with a finer reference grid. Individual reference grids might be necessary for each campus, if this study gets replicated by other researchers in other regions. Finally, the data may not accurately reflect the actual crime occurrences due to non-reporting of all crimes and data entry errors (Groff and La Vigne 2001; Robinson and Roh 2001).

This research contributes to applied campus safety in several ways. First, general student fear of crime assessments may help law enforcement to quickly target specific areas for additional crime monitoring. In addition, law enforcement could inform the public to take special precautions in some areas of a university campus until safety measures are in place. Secondly, the bivariate analysis addresses campus safety by combining alternative spatial mappings in the form of cognitive fear of crime

maps with observed crime rates. This novel representation of two datasets allows identification of students' fear of crimes in areas where actual crime rates are low, and also can show regions where fear of crime is low, but observed criminal activity is high. The latter case would allow university administrators and police to educate students about potential threats in these areas, increase patrolling, and consider other crime mitigation measures. The bivariate crime maps are effective representations for university administrators and university police in decision and policy making tasks, for crime mitigation, and public awareness purposes. Overall this research provides a promising data collection method, analytic approach, and visualization technique for building safer university and college campuses.

# References

Astor R, Meyer H, Behre W (1999) Unowned places and times: maps and interviews about violence in high schools. Am Educ Res J 36(1):3–42

Balkin S (1979) Victimization rates, safety and fear of crime. Soc Probl 26(3):343–358

Banai R (1999) A methodology for the image of the city. Environ Behav B Plan Des 26(1):133–144

Baumer TL (1985) Testing a general model of fear of crime: data from a National sample. J Res Crime Delinq 22(3):239–255

Brantingham PL, Brantingham PJ (1993) Nodes, paths, and edges: considerations of the complexity of crime and the physical environment. J Environ Psychol 13:3–28

Brantingham PL, Brantingham PJ (1995) Criminality of place: crime generators and crime attractors. Eur J Crim Policy Res 3(3):5–26

Brantingham PJ, Brantingham PL, Molumby T (1977) Perceptions of crime in a dreadful enclosure. Ohio J Sci 77(6):256–261

Brantingham PJ, Brantingham PL, Seagrave J (1995) Crime and fear at a Canadian university. In: Fisher BS, Sloan JJ (eds) Campus crime: legal social, and policy perspectives. Charles C. Thomas Publisher, Springfield, pp 123–155

Brower AM, Carroll L (2007) Spatial and temporal aspects of alcohol-related crime in a College Town. J Am Coll Heal 55(5):267–275

Clarke RV, Eck JE (2005) Crime analysis for problem solvers in 60 small steps. U.S. Department of Justice, Center for Problem Oriented Policing. Retrieved 24 Sept, 2012, from http://www.popcenter.org/library/reading/PDFs/60steps.pdf

Carter SD (2001) Campus violence symposium – introduction. Stetson Law Rev 32(1):1–6

Downs R, Stea D (1973) Cognitive maps and spatial behavior: process and products. In: Downs R, Stea D (eds) Image and environment: cognitive mapping and spatial behavior. Aldine Publishing Company, Chicago, pp 8–26

Fisher BS, Nasar JL (1995) Fear spots in relation to microlevel physical clues: exploring the overlooked. J Res Crime Delinq 32(2):214–239

Fisher BS, Sloan JJ (1993) University responses to the University Campus Security Act of 1990: evaluating programs designed to reduce campus crime. J Secur Adm 16(1):67–80

Fisher BS, Sloan JJ (2003) Unraveling the fear of victimization among college women: is the 'shadow of sexual assault hypothesis' supported? Justice Q 20(3):633–659

Fisher BS, Sloan JJ (eds) (2007) Campus crime, 2nd edn. Charles C. Thomas, Springfield

Fisher BS, Sloan JJ, Wilkins DL (1995) Fear and perceived risk of victimization in an urban university setting. In: Fisher BS, Sloan JJ (eds) Campus crime: legal, social, and policy perspectives. Charles C Thomas, Springfield

Fisher BS, Sloan J, Cullen F, Lu C (1997) The on-campus victimization patterns of students: implications for crime prevention by students and post-secondary institutions. In: Lab SP (ed) Crime prevention at a crossroads. Anderson Publishing, Cincinnati, pp 101–126

Fisher BS, Hartman JL, Cullen FT, Turner MG (2002) Making campuses safer for students: the clery act as a symbolic legal reform. Stetson Law Rev 32(1):61–89

Fox JA, Burstein H (2010) Violence and security on campus: from preschool through college. Praeger, Santa Barbara

Golledge RG (1999) Wayfinding behavior: cognitive mapping and other spatial processes. The John Hopkins Press, Baltimore

Gould P, White R (1974) Mental maps. Penguin, Harmondsworth

Gregory DE (2001) Crime on campus. Compliance, liability, and safety. Campus Law Enforc J 31(4): 27–29, 31–32

Gregory DE, Janosik SM (2002) The Clery Act: how effective is it? Perceptions from the field – the current state of the research and recommendations for improvement. Stetson Law Rev 32(1):7–59

Groff ER (2007) 'Situating' simulation to model human spatio-temporal interactions: an example using crime events. Trans GIS 11(4):507–530

Groff ER, La Vigne NG (2001) Mapping an opportunity surface of residential burglary. J Res Crime Delinq 38:257–278

Hale C (1996) Fear of crime: a review of the literature. Int Rev Victimol 4(1):79–150

Hudge MA (2000) The campus security act. J Secur Adm 23(2):25–27

Jackson J (2006) Introducing fear of crime to risk research. Risk Anal 26(1):253–264

Janosik SM (2001) The impact of campus crime Awareness Act of 1998 on student decision making. NASPA J 38(3):348–360

Janosik SM (2002) Parent's views on the Jeanne Clery Campus Crime Act and campus safety. Educational Policy Institute of Virginia Tech, Blacksburg

Janosik SM, Gehring DD (2001) The impact of the Jeanne Clery disclosure of campus crime Statistics Act on college student behavior. Educational Policy Institute of Virginia Tech, Blacksburg

Janosik SM, Gregory DE (2003) The Clery Act and its influence on Campus Law enforcement practices. NASPA J 41(1):182–199

Janosik SM, Gregory DE (2009) The Clery Act, Campus Safety, and the perceptions of senior student affairs officers. NASPA J 46(2):208–227

Kearney A, Kaplan S (1997) Toward a methodology for the measurement of knowledge structures of ordinary people: The conceptual content cognitive map (3CM). Environ Behav 29(5):579–617

Kitchin RM (1994) Cognitive maps: what are they and why study them? J Environ Psychol 14(1):1–19

Kitchin RM, Freudschuh S (2000) Cognitive mapping: past, present and future. Routledge, London

Kuipers B, Tecuci D, Stankiewicz B (2003) The skeleton in the cognitive map: a computational and empirical exploration. Environ Behav 35(1):81–106

Lewis DA, Maxfield MG (1980) Fear in the neighborhoods: an investigation of the impact of crime. J Res Crime Delinq 17(2):160–189

Lipka S (2009) In campus-crime reports, there's little safety in the numbers. Chron High Educ 55(21):A1

McConnell EH (1997) Fear of crime on campus: a study of a Southern University. J Secur Adm 20:32–46

McNeal LR (2007) Clery Act: road to compliance. J Pers Eval Educ 19(3–4):105–113

Nasar JL, Fisher BS (1993) Hot spot's of fear and crime: a multitude-method investigation. J Environ Psychol 13:187–206

O'Kane J, Fisher R, Green L (1994) Mapping campus crime. Secur J 5(3):172–179

Openshaw S (1984) The modifiable areal unit problem. Geo Books, Norwich

Ratcliffe JH, McCullagh MJ (1999) Hotbeds of crime and the search for spatial accuracy. Geogr Syst 1(4):385–398

Rengert G, Lowell R (2005) Combating campus crime with mapping and analysis. Crime Mapp News 7(1):1–5

Robinson MB, Mullen KL (2001) Crime on campus: a survey of space users. http://www.pscj.appstate.edu/campuscrime.html. Last viewed on16 Feb 2012

Robinson MB, Roh S (2001) Crime on campus: a survey of space users. Crime Prev Community Saf Int J 3(4):33–46

Robinson M, Roh S (2007) Spatial aspects of calls for service at a Regional Comprehensive University. In: Fisher BS, Sloan JJ (eds) Campus crime: legal, social, and policy perspectives. Charles C. Thomas, Springfield

Rund JA (2002) The changing context of campus safety. New Dir Stud Serv 99:3–10

Sherman L, Weisburd D (1995) General deterrent effects of police patrol in crime "hot spots": a randomized, controlled trial. Justice Q 12(4):625–648

Singh RR (1996) Adapting geographic information systems to sketch planning needs. Unpublished Master thesis, Massachusetts Institute of Technology, Cambridge

Starkweather S (2007) Gender, perceptions of safety and strategic responses among Ohio University students. Gend Place Cult 14(3):355–370

Tseng CH, Duane J, Hadipriono F (2004) Performance of campus parking garages in preventing crime. J Perform Constr Facil 18(1):21–28

Vann IB, Garson GD (2001) Crime mapping and its extension to social science analysis. Soc Sci Comput Rev 19(4):471–479

Wilcox P, Jordan PE, Pritchard AJ (2007) A multidimensional examination of campus safety victimization, perceptions of danger, worry about crime, and precautionary behavior among college women in the Post-Clery Era. Crime Delinq 53(2):219–254

Wilson RE (2007) The impact of software on crime mapping – an introduction to a special journal issue of social science computing review on crime mapping. Soc Sci Comput Rev 25(2):135–142