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Apple picking: The rise of electronic device thefts in Boston subways

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APPLE PICKING:
THE RISE OF ELECTRONIC DEVICE THEFTS IN BOSTON SUBWAYS

by

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ABSTRACT

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As mobile technology advances and the demand for WiFi and phone coverage increases, electronic device theft is becoming an international problem in metropolitan public transportation systems. Using transit police reports, this dissertation applies crime opportunity theories to understand which factors increased electronic device theft in Boston subway stations from 2003-2011.

This approach addresses previous studies regarding crime on public transportation, robbery and larceny on subways and electronic device theft – as none have focused on this problem as the theft of a "hot product" within a "hot environment." Negative binomial regression, crime script analysis, sign tests and temporal pattern identification are used.

This study identifies 24 subway stations where electronic device theft is concentrated. The findings suggest that district crime rates and subway station characteristics may help transit police understand why certain stations serve as activity spaces for electronic device theft. It also recognizes "hot times," risky passenger behavior and potential offender tactics. Policy implications and recommendations are discussed.

DEDICATION

For my mother, Brenda Gentry.

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CHAPTER 1: INTRODUCTION

1.1 Problem statement

As mobile technology advances and increases in popularity – and the demand for WiFi and cell phone coverage booms, electronic device theft in public transportation systems is becoming a growing problem in metropolitan areas around the world. According to a report by the New York Police Department, of the 16,000 robberies in the entire city of New York during the first 10 months of 2011, about 50 percent were electronic devices (Parascandola, 2011). According to the report, electronics were the single most stolen property type, surpassing cash. This report also stated that the Apple iPhone consisted of 70 percent of the thefts on NYC subways and buses. The problem in New York has also led to violence. In 2012, an 81-year-old man was pushed into the subway tracks in Brooklyn while chasing down teenage thieves who stole his iPhone (Noel & Prokupecz, 2012). In 2013, a Philadelphia man dragged a woman onto the subway tracks after stealing her phone. (Smith, 2013c). Electronic device theft is also causing concern in public transit systems overseas. In the Shanghai subway, police say thieves snatch phones from unsuspecting victims who sit near doorways (Minjie, 2011). In 2010, 53 percent of the 1,071 violent thefts on Paris subways, buses and trams involved smartphones. This led Paris police to warn riders to guard all of their electronic devices, especially the iPhone, following the death of a woman who was pushed down the stairs by an offender after he stole her phone. Fliers provided by the police remind riders that their cell phone is “so valuable that others would like to get their hands on it too.”

Overall, electronic device theft in public transportation particularly fits both the study areas of “crime and place” and “crime and opportunity” – since electronic devices are the epitome of a “hot product” and a transit environment provides many opportunities for theft.

Yet, the literature related to this topic is limited. There are studies on the theft of electronic devices. There are studies on crimes in public transport. However, there has been limited scholarly research on electronic device theft *within* public transportation systems. This converging crime topic is important; and should be considered by the academic community, especially from environmental criminology and situational crime prevention perspectives.

This dissertation uses the Massachusetts Bay Transportation Authority (MBTA) subway system in Boston, Massachusetts as a study site because of its unique characteristics. First, it is among the cities that have seen a spike in electronic device theft. Second, it is one of the first major underground public transportation systems in the U.S. to provide both cell phone coverage and WiFi access to a majority of its subway lines and stations. Third, the MBTA specifically collects information about each type of electronic device stolen, its manufacturer and its market value.

According to the MBTA Transit Police, many factors contribute to this problem within the Boston subway system. One of the most notable is the fact that a majority of subway riders own smartphones, which are cell phones with computer-like capabilities such as Internet connectivity, games, music, texting, e-mail, social media and camera functions. Smartphone owners carry their device with them at all times and often display, check or use the devices on the subway. This alerts offenders of potential suitable targets. Police officers have said that this need to stay connected and entertained while riding on public transportation is a major distraction; and since subway riders are "tuned in" to their electronic device screens while on the subway, they are often "zoned out" from everything around them (personal communication, January 10, 2012).

This research applies crime opportunity theories to better understand electronic device theft and tailor crime prevention measures to high-risk subway stations, locations within cars and stations, and lines. This approach addresses a gap in the previous literature regarding crime on public transportation, as no studies have focused specifically on the problem of electronic device theft in subways. Using police reports, this dissertation examines the increase in electronic device thefts in the subway system from 2003-2011. Incident files are reviewed for relevant information and coded. Additionally, physical locations within subway stations and subway cars that are prone to electronic device theft are identified, such as areas near stairways or exits. Finally, the before-and-after effects of introducing cell phone coverage and WiFi access to subway stations is examined and recorded, focusing on its relationship with electronic device theft.

This dissertation is organized as follows. Chapter 2 presents a review of research literature about the following topics: crime on public transportation; robbery and larceny on subways; and electronic device theft. Also in this chapter is an outline of the theoretical framework used in the current study, which draws upon routine activity theory, crime pattern theory and rational choice theory. Next, Chapter 3 provides the conceptual framework, research design and research questions. The methodology section is covered in Chapter 4. This includes the data sources, measures and analytical strategy. Chapters 5, 6 and 7 explain the results of the transit-related, space-related and time-related research questions, respectively. The discussion section is in Chapter 8 – along with contributions, limitations and thoughts on future research.

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Literature review

a. Crime on public transportation

Public transportation ridership in the US has grown during the last three decades. Since 1972, overall public transit ridership has increased about 55 percent – with more than 10.2 billion trips recorded in 2010 on all modes of public transportation. Modes include buses, trolleys, light rails, subways, commuter trains, streetcars, cable cars, ferries, water taxis, monorails and tramways, van pool services, and paratransit services for Senior citizens and people with disabilities (American Public Transportation Association, 2012).

Crime can occur on any of these modes of public transportation. In general, public transportation seems to provide a unique environment that could be considered the textbook definition of the "crime triangle" – by creating situations that repeatedly bring potential victims/targets and motivated offenders together in space and time at a particular location.

Crimes that can occur within public transportation systems vary and can be grouped into the following three categories: crimes against the transit authority (fare evasion, vandalism, graffiti); crimes against transit authority employees (assault and robbery); and crimes against passengers (theft, robbery, assault, sexual harassment).[1] Research regarding crime on public transportation often refers to the field of study as "transit crime" (Hoel, 1992).[2] Of the transit crime research that have been published, studies have focused on various modes of transit, including: crimes on buses and at bus stops (Ingalls et al., 1994; Levine et al., 1986; Loukaitou-Sideris, 1999; Newton, 2004; Pearlstein & Wachs, 1982; Yu, 2009); crimes on light rails (Loukaitou-Sideris et al., 2002; Sedelmaier, 2003); and crimes on subways (Beller et al. 1980; Clarke et al., 1996; Burrows, 1980; Felson et al., 1990; Gaylord & Galliher 1991; Kenney, 1987;

La Vigne, 1996a, 1996b; Myhre & Rosso 1996; Newton, 2014; Sloan-Howitt & Kelling, 1990; Uittenbogaard & Ceccato, 2014; Weidner, 1996).

b. Robbery and larceny on subways

Electronic device theft in Boston subways is typically a crime against a passenger. The subway environment has many features, including subway platforms, mezzanines, corridors, access/turnstile points, waiting areas, ticket kiosks, token booths, exit stairways and opening/closing subway car doorways. Since the crimes that occur in a subway system are partly affected by the environment's settings, all of these features can be conducive to electronic device theft, especially robbery and larceny (Richards & Hoel 1980).

According to Smith and Clarke (2000), subway robbery relate to lack of supervision – or lack of capable guardians, one component of routine activity theory (Cohen & Felson, 1979). Offenders use three different approaches when committing a subway robbery. First, offenders often seek vulnerable victims in deserted subway stations. For example, Falanga (1988) found that passengers are at risk of robbery in stations that are large and sprawling. During the day, these stations accommodate hundreds of people, but at night such large stations are sparsely populated. Individuals are also at risk of robbery when there is lower passenger density within subway cars and on platforms (Clarke et al., 1996). Second, passengers are at risk of robbery when waiting at isolated stations during off-peak hours. (Shellow et al., 1975). Third, offenders can prey on victims as they exit – either while leaving the subway car or platform (Block & Davis, 1996). This last approach seems to be popular in Boston, according to the MBTA. For example, police have explained that many offenders prey on victims who sit next to the subway doors, waiting to steal their devices and run when the cars stop at a station and the doors open (Seeyle, 2010).

Electronic device-related larceny is different than robbery, as it does not include force, intimidation or a weapon. For example, pickpocketing (a stealth measure) and snatching (a surprise measure) are forms of larceny. These types of larceny usually relate to the overcrowding of areas within the subway system, which allow for the thefts to occur (Smith & Clarke, 2000). Four dimensions of overcrowding can facilitate such larceny offenses in the subway system (Morgan & Smith, 2006). First, overcrowding decreases the distance between offenders and potential victims without causing immediate concern. Passengers who ride the subway every day may become accustomed to crowded subway cars during rush hours. Second, the crowded conditions may distract people who may have been able to detect or react to a theft under other circumstances. Third, the constant movement of passengers on subway cars and platforms may provide a convenient cover for offenders. Lastly, crowded areas may help offenders avoid identification and escape.

Several studies have examined the different prevention measured used to combat subway crime, specifically robbery and larceny. Webb and Laycock (1992) found that CCTV in the London Underground reduced robberies, and increased passenger confidence. A previous study of the London Underground also found a decrease in thefts once CCTV was implemented (Burrows, 1980). La Vigne (1996a) found that spacious platforms, use of kiosks and lack of bathrooms, lockers and vendors reduced crime in Washington, D.C. subway stations. This redesigning measure also eliminated long, winding corridors, which could facilitate offenders hiding in corners and dark places. Finally, in a landmark study, Chaiken et al. (1974) found that an increase of NYPD officers from 8pm-4am reduced subway robberies and did not displace crimes to other times.

c. Electronic device theft

Electronic devices, also known as portable or mobile devices, include smartphones, cell phones, tablet and laptop computers, e-readers, MP3 and other music players and handheld gaming systems. Most electronic devices have WiFi (Internet connectivity) and Bluetooth (device connectivity). They are used for communication (phone calls, texting, e-mail) and entertainment (games, music, social media, camera). Because of these functions, electronic devices are considered to be the epitome of "hot products," or items that are most suitable for theft by motivated offenders (Ekblom, 2008). In addition, such devices are also CRAVED – which is discussed in the next chapter under theoretical framework (Clarke, 1999). Given this, it is important that stakeholders in law enforcement and government realize that spikes in thefts of criminogenic products like electronic devices could lead to crime harvests, or crime waves (Clarke & Newman, 2005a). According to Roman and Chalfin (2007), prior crime waves have centered around expensive sneakers (Nike Air Jordan), jackets (Starter and North Face) and media players (Walkman and iPod). However, what sets electronic device apart from these other crime waves is that it is very common for almost every American to own at least one electronic device. For example, according to findings from the September 2012 Pew Internet and American Life Project, 85 percent of American adults own cell phones, while 45 percent have smartphones (Pew Internet & American Life Project, 2012).

Electronic device theft, in general, is not only a problem in the U.S. It has also emerged as an international crime trend. In the Netherlands, cell phone theft was already considered a problem in the early 2000s. Theft decreased by 50 percent after Amsterdam police began using a "bombing" strategy, which bombarded stolen cell phones with text messages from the police department, such as: "You are in possession of a stolen cell phone.

Did you know that stealing a cell phone is a crime punishable by imprisonment? Using a stolen cell phone is too, and you are risking a prison term of one year" (Harrington & Mayhew, 2001).

Using victimization statistics from the British Crime Survey between 1994-2010/2011, Thompson (2014) found that mobile phones had the largest increase of all thefts over time. The study reiterated that mobile phones are crave-able hot products that are snatched and robbed from people at a high rate in comparison to other property items. When attempting to prevent cell phone theft in the United Kingdom, the National Mobile Phone Crime Unit focuses on the handlers, re-programmers and exporters of stolen cell phones (National Mobile Phone Crime Unit, 2009). The unit was created in December 2003 and is a collaborative effort between law enforcement, the government and the telecommunications industry. Since its introduction, more than 22 million phones have been registered. The main goal of the unit is to work with phone companies to register all cell phones in a database, known as Immobilise. If a registered phone is ever stolen, police are able to identify it quickly. It also makes the cell phone unusable after being reported as stolen, which again denies the benefits of reselling stolen phones or stealing for practical use. According to the unit, thefts of cell phones have reduced since cell phone owners have started using the registration system.

In 2012, similar legislation was proposed in the U.S. to create a database of all stolen cell phones with the intention of blocking thieves from continued use or resale (U.S. Federal Communications Commission, 2012). Smartphone manufactures responded to pressure from law enforcement agencies nationwide in 2013 by promising to implement anti-theft features on future devices. One Apple feature is said to be a "kill switch" that remotely disables a phone once it is reported stolen. Another applies an "activation lock" requiring thieves to enter a password specific to a stolen phone before it can be accessed.

However, some critics argue that these features will not deter thieves, who will learn how to work around them (Smith, 2013b). It is important to note the lag in the implementation of such anti-theft design features by major manufactures, despite past research calling for such needed security enhancements to secure mobile phones (Whitehead et al., 2008). These suggestions included: new legislation that would discourage reprogramming devices and ultimately blacklist stolen devices at a global scale; making the tampering with IMEI codes – a device's unique identifier – illegal; software and hardware hardening; and the creation of wearable phones, as shown in Photo 2-1.

Source: Whitehead et al., 2008

Photo 2-1. Concept of wearable phone

While there has been research on crimes that relate to electronic device theft like identity theft and cybercrime (Allison, 2005; Clarke & Newman, 2005b; Gerard et al., 2004; Lynch, 2005; Wall, 2003) – the stealing of personal information from a device for illicit or illegal use; and cell phone fraud (Clarke et al., 2001) – the act of cloning cellular devices, this dissertation focuses solely on the theft of the electronic device itself.

The current study also recognizes recent research indicating that cell phone theft and cell phone ownership may play a role in the various explanations for the crime drop since 1990. Some studies highlight the fact that cell phone (and smartphone) theft has rapidly increased in the United States and abroad, while other crime types have dramatically decreased (Farrell, 2013; Farrell, et al., 2011). Other studies suggest that cell phones may provide both a deterrent and capable guardianship effect from other crimes because of the ability to call police or identify offenders with photos or videos (Orrick & Piquero, 2013; Klick, MacDonald, & Stratmann, 2012). Interest in the international increase in phone theft – despite "the crime drop" – emphasizes why it is important to continue to study this crime type.

Reviewing the theft of a specific object (hot product) within a specific location (hot environment) is the goal of this dissertation. This literature review is extended in the following section detailing the theoretical framework of this study. There is a discussion of additional transit crime studies focusing on crime on public transport and hot product theft through the lens of the three environmental criminology theories -- routine activity theory, crime pattern theory and rational choice theory.

2.2 Theoretical Framework

Environmental criminology is especially well-suited to learn more about electronic device theft on subways. Three major theories – routine activity theory, crime pattern theory and rational choice theory – all focus on the criminal event and not the criminal offender.

a. Routine Activity Theory

The routine activity theory (Cohen & Felson, 1979) is focused at the macro, or societal level. The assumption of this theory is that a crime may occur when a likely offender and a suitable target converge in space and time with the absence (or presence) of capable guardianship. This is further illustrated by Figure 2-1, the modified crime triangle – or problem analysis triangle (Eck, 1994; Clarke & Eck, 2005). A likely offender can be motivated by many factors, including gain, need or the desire to own some attractive consumer product. A suitable target can either be a person or an object. Finally, there can be numerous capable guardians, such as a police officer, a nearby person, retail employees, a well-lit area, a locked door or an alarm system.

Source: Clarke & Eck, 2005 (p.28)

Figure 2-1. Crime Triangle

This theory can easily be applied to electronic device theft on Boston subways. In order for this specific theft to occur, a likely and motivated offender must find a suitable electronic device. Once found, the offender will evaluate the capable guardianship available on the platform, mezzanine or in the subway car. If this is adequate and guardianship is judged to be lacking, the crime can proceed. As for the type of motivated offender, previous research found that in the United Kingdom, more than 50 percent of the individuals who stole cell phones were youth offenders, around 16 years old (Design Council, 2011; Harrington & Mayhew, 2001). Additionally, an overwhelming percent of offenders were male. These data are similar to accounts of Boston Transit Police officers assigned to subway detail. When asked to describe typical offenders who stole cell phones on the subways, the officers all agreed on teenage males (personal communication, January 10, 2012).

When considering the suitable target, electronic devices can be considered "hot products" (Clarke et al., 2001). Consider the cell phone, for example. In October 2008, Motorola released a new cell phone with touch-screen capability named the Motorola Krave ZN4. Cell phones also fit the CRAVED model of suitable targets – meaning that cell phones are concealable, removable, accessible, valuable, enjoyable and disposable (Clarke, 1999). As with other items such as cash (Clarke, 1999), cloned cell phones (Clarke et al., 2001), purses and wallets (Smith, 2003) and even exotic parrots (Pires, 2012) – electronic devices, in general, are both CRAVED items and hot products. Electronic devices are small and often look alike, so they are concealable. Electronic devices are often free standing and lack any sort of tethering, so they are also very removable. The frequent use or display of electronic devices also allows the hot products to be easily accessible. Many models, especially smartphones, are expensive and exclusive, which makes them valuable.

This also allows for electronic devices to be highly entertaining and enjoyable devices. Given the demand for electronic devices, the fact that many can be resold easily allows for a disposable product (CBS 2 New York, 2011).

Another useful tenet of environmental criminology is the "80-20 rule," which states that 20 percent of any particular group of things is responsible for 80 percent of outcomes (Kock, 1999). When applying this rule of thumb to electronic device theft on Boston subways, only a few devices are stolen a majority of the time, according to the MBTA Transit Police (personal communication, January 10, 2012). For example, of the dozens of cell phones available on the market, smartphones, such as the Apple iPhone, Android and BlackBerry, are the most popular phones stolen on Boston subways – probably because all three models have computer-like functions, cameras and music players (Rocheleau, 2011; Lohr, 2009). In fact, the frequency of iPhone thefts nationwide has led many news outlets to refer to the burgeoning crime trend as "apple picking" (Smith, 2013a). The 80-20 rule can be applied even further given that Apple only made up 34 percent of the U.S. smartphone market in 2012 (Nielsen, 2012). Android, on the other hand, held 51 percent of the smartphone market. And Blackberry, once a leader in the smartphone industry, now claims about 5 percent of national ownership. This pattern of certain models being stolen more often has been found in the United Kingdom too (Mailley et al., 2008; Mailley, 2011; Home Office, 2014). As shown in Figure 2-2, Apple iPhone, Blackberry and Samsung (Android) phones made up a majority of the mobile phones stolen within all of London from August 2012 to January 2014, according to the Crime Survey for England and Wales (Home Office, 2014).

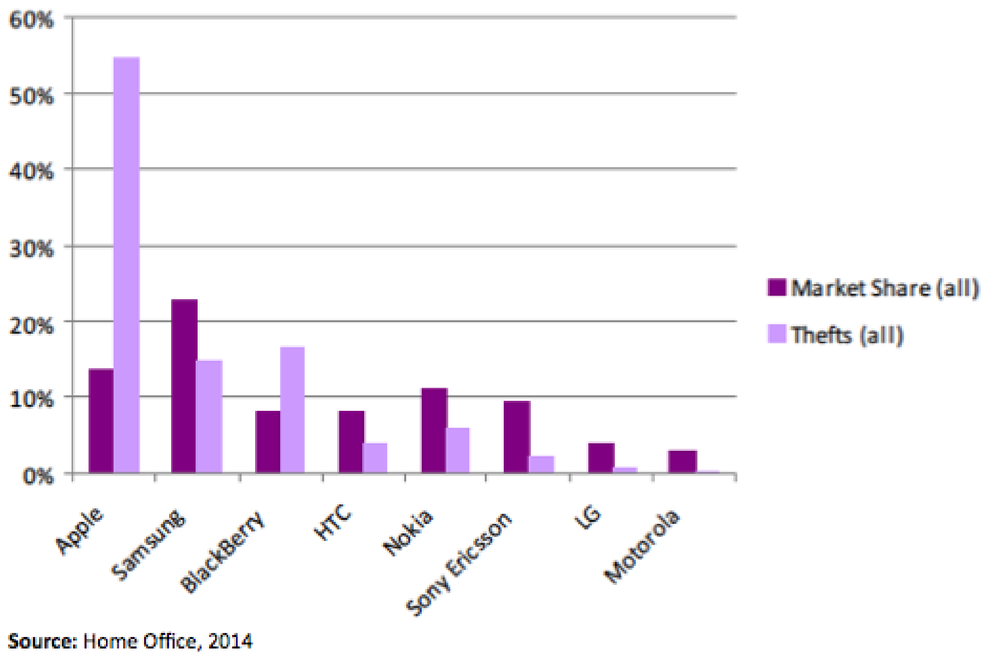


Figure 2-2. Percentage of thefts by brand and relative market share, London

Finally, when taking the guardianship portion of the crime triangle into account, a study found that the fewer number of people on subway platforms and in cars increases the risk of robbery (Clarke et al., 1996; Belanger, 1999). This research illustrates the absence of capable guardianship, which is opportunistic for offenders. The opportunity also arises due to lack of supervision, which reiterates the previous discussion on robbery in subways (Newton, Partridge & Gill, 2014b).

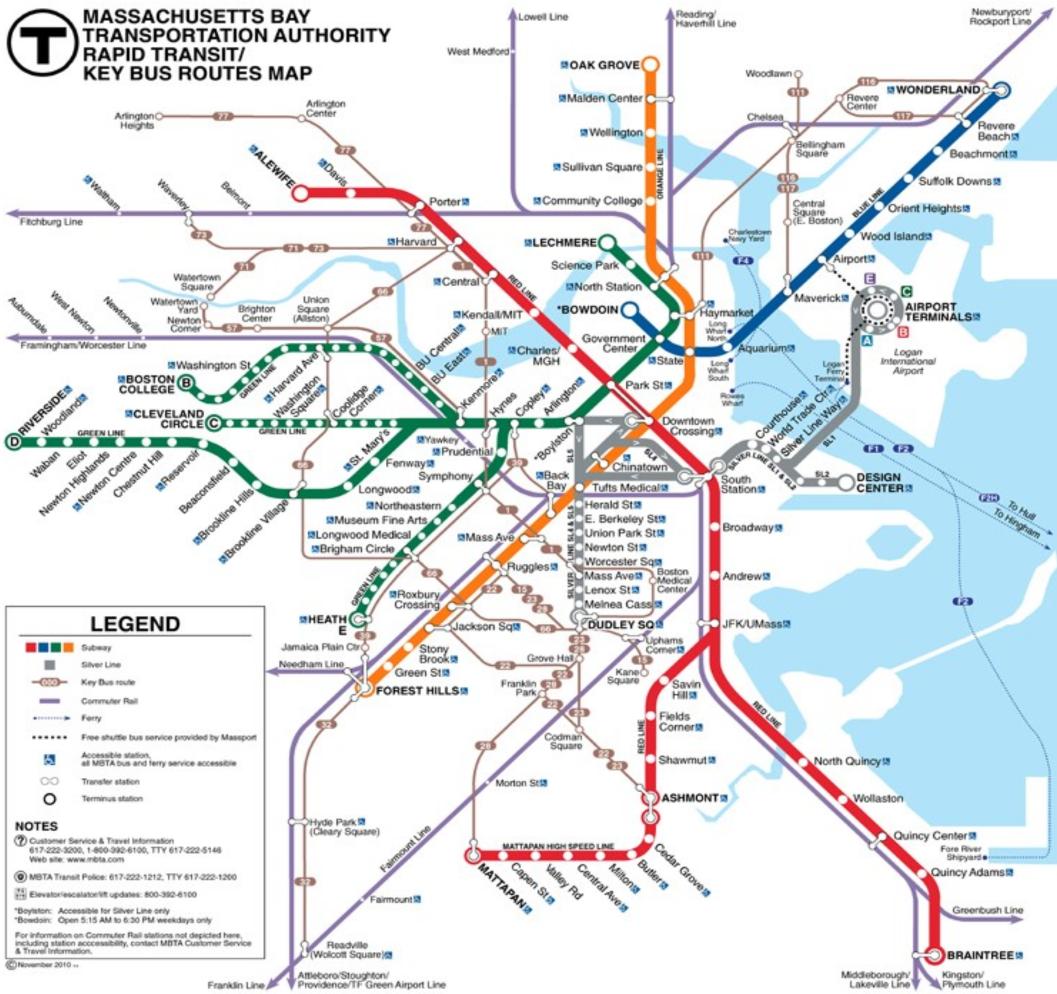
b. Crime Pattern Theory

The crime pattern theory (Brantingham & Brantingham, 1981) is focused on the meso, or neighborhood-local level. Given that crimes have a tendency to occur and cluster based on routine, daily activities, this theory focuses on how offenders and victims converge in space and time along nodes, paths, and edges, with crimes occurring in activity spaces. Nodes are centralized activity places, where people travel to and from, such as home, work, or school.

Paths are the actual routes that people take during these everyday activities, which usually involve major traffic thoroughfares or transit systems. Edges are the boundaries of areas where different people live, work, or do other recreation or interaction. Given that most offenders follow the "journey to crime" (Phillips, 1980) and commit most of their crimes close to home because they are familiar with the area, there is an automatic distance decay, which means that crimes are less likely to occur farther away from an offender's home. This also relates to the least effort principle, which explains that offenders exert the minimum effort possible when committing their crimes, such as limited travel.

Crime pattern theory can be applied to electronic device theft on Boston subways. In 2008, the MBTA subway system included 669 subway cars and 121 subway stations. Each weekday, an average of 767,634 passengers rode the subway (MBTA, 2009). This figure is important, given that on average, 32 percent of Boston residents use public transit to travel to work (U.S. Census Bureau, 2008). This ridership saturation of the subway allows for offenders and victims to converge along nodes, paths and edges. Nodes can represent a static, or stationary, subway station near an offender's or victim's home or workplace (Newton, 2004). For example, Belanger (1999) found that New York subway offenders commit most crimes in stations and on subway cars near their homes, which follows the journey to crime and least effort principles. Paths can represent the non-static subway lines that subway cars travel on or transfer stations, which create intersections for offenders and victims to converge (Newton, 2004). If crime is concentrated on a subway line or segment of a subway line, this could be considered a "hot route" (Partridge, 2013).

Expanding on the concepts of nodes and paths, Gill, Partridge and Newton (2014) applied crime pattern theory to further understand where thefts can occur within a transit network. The authors noted that it is often difficult to pinpoint where victims have items stolen on a transit line because most are pickpocket thefts. Therefore, the victims usually only know their starting point and end point – and realize that the theft occurred at some time in between. In order to calculate that unknown time, the authors developed interstitial crime analysis (ICA). This analysis could also be used to map hot segments of a transit line where thefts are concentrated.[3]



Source: MBTA

Figure 2-3. MBTA subway, commuter and key bus map

As Figure 2-3 indicates, many subway lines intersect with one another, allowing a multitude of potential crime activity spaces. Relatively short travel times allow offenders and victims to travel easily throughout the city to outer boundaries, which in turn transcend edges.

In 1986, the first study focusing on crime patterns in a subway system was released by the New York City Criminal Justice Agency. The study described several "hot spots," with 24 percent of subway robberies occurring on platforms and 30 percent occurring in cars (Smith, 1986).

In comparison, a study of the London Underground and London South subway systems found that more than 50 percent of subway robberies occurred in cars, while about 25 percent occurred on a platform (Smith, 2003).

Given these hot spots, it is easy to understand why the Boston subway system would also be considered a crime attractor, or a place where offenders go to commit crimes. Subway platforms and cars provide plenty of opportunities and plenty of electronic devices to choose from. However, in order to fully determine if the Boston subway system is a crime generator, or a place where large numbers of people travel to for reasons that are unrelated to criminal motivation, one must compare the subway crime rate to the overall crime rate of nearby surface areas (see Chapter 6). Del Castillo (1992) conducted such a study in 1988 and found that subway robbery within the New York subway system was in fact disproportionate to the robberies that occurred above ground.

c. Rational Choice Theory

Rational choice perspective (Cornish & Clarke, 1986) focuses on the micro, or individual level. This theory is based on how offenders weigh the costs and benefits of committing crimes. It also assumes that offenders seek to benefit from crime and therefore consider the risks, efforts and rewards of each crime opportunity (Clarke, 2012). Committing a crime involves a series of decisions and processes made by the offender. Several principles underlie the rational choice perspective, including the notion that criminal behavior is purposive, rational and specific to individual crimes. Additionally, an offender's decision to commit a crime is based on the stages of involvement (initiation, habituation and desistance) or the specific criminal event being committed. These choices are then decided either during preparation, target selection, commission of the crime, escape following the crime or the crime's aftermath.

All of these decisions are part of a crime script, or the step-by-step procedures take into account by offenders during crimes (Cornish, 1994; Cornish & Clarke, 1986).

Numerous crime scripts may apply to electronic device theft on the subway. Offenders must consider: (a) the risks of getting noticed, caught, photographed, chased, arrested, or sentenced; (b) the level of involvement and the time of day, location and area; and (c) the benefits of having anonymity in a crowded, unsupervised area and how the stolen device will be used. All of these decisions also involve target selection, how the theft will be committed, the method of escape and the outcome of the theft of the electronic device. The use of crime scripts to explore electronic device thefts in MBTA subway stations is discussed in Chapter 5.

d. Risky Facilities

The concept of "risky facilities" argues that certain establishments with special functions that fall under the same type (banks, bars, stores, schools) are more criminogenic than others (Clarke & Eck, 2007; Clarke & Eck, 2005; Eck, Clark & Guerette, 2007). Crime is usually concentrated at a few establishments, while a majority of the establishments experience little to no crime – which also follows the 80-20 rule. Therefore, the risky facilities concept can be used as a tool to identify problem locations.

The classification of risky facilities as problem locations has led to several place-based crime prevention publications.[4] For example, a recent project focusing on high- crime and disorder "nuisance" motels in Chula Vista, California lowered Part I and Part II offenses (Bichler, Schmerler, & Enriquez, 2013). This was done by regulating management, code and ordinance enforcement – as well as requiring motel administration to meet operation and performance standards.

Bowers (2014) extended the scope of risky facilities research by examining crimes that occur within a problem location in comparison to crimes that occur externally, but within close vicinity. The results found that some risky facilities serve as “crime radiators” – establishments with high internal theft that also create high theft rates in the external environment nearby.

Recent public transit studies have also focused on internal vs. external crimes in relation to risky facilities. Newton, Partridge and Gill (2014a) found that offenders who commit property crimes below ground (internally) may also commit crimes above ground (externally). Additionally, when studying the exposure of nearby criminogenic facilities, Groff and Lockwood (2014) found that subway stations positively influence nearby violent, property and disorder crimes at the surface-level.

The risky facilities concept has also been used to understand why concentrations of offenders are drawn to certain locations. Bichler, Malm and Enriquez (2010) suggest that certain facilities are magnetic – pulling offenders together from multiple jurisdictions. The researchers explore this kind of offender convergence when studying delinquent youth “hangouts.” Again, the results are similar to the 80-20 rule, since some places are more magnetic than others (shopping centers and movie theaters near schools).

The risky facilities and magnetic facilities frameworks can both be applied to electronic device theft in MBTA subways, as most of the thefts that occurred during the study period were concentrated at a small proportion of all subway stations (see Figure 4-1).

MBTA subway stations fit many of the reasons outlined by Clarke and Eck (2005) why a facility may be deemed “risky,” in relation to electronic device theft. First, subway stations have many vulnerable targets/victims since they are located within a 24-hour public transportation system.

Next, a majority of these victims carry electronic devices that are “hot products” to offenders. Some of the subway stations may be located in high-crime neighborhoods where offenders live or frequently travel to, while other subway stations may be located in an area with high victimization rates. Both of these factors label those subway stations as crime attractors. And finally, some subway stations without proper guardianship of surveillance may suffer from poor management of the facility itself. The application of risky facilities is discussed in Chapter 6 when examining electronic device theft at stations in comparison with surface-level crimes.

MBTA subway stations can serve as magnetic facilities because offenders, especially youths, may use the subway to travel from one magnetic facility to another, which follows the journey to crime tenet. This is explored in Chapter 7 when discussing the influence on school dismissal times and electronic device theft at subway stations.

This chapter reviewed previous studies involving crime on public transportation. Additionally, crime opportunity theories were discussed. The research design for the current study was developed based off of the theoretical framework mentioned above. Chapter 3 discusses how the pilot study evolved into the concept of the current study.

CHAPTER 3: CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

3.1 Study area

Source: MBTA, 2014a

Photo 3-1. MBTA subway trains

Besides being the home of the fifth largest public transportation system in the United States (American Public Transportation Association, 2012), Boston was selected to study electronic device theft within subway systems because the MBTA collects incident-level data of electronic device thefts, which is rare (Ketola & Chia, 2000). Additionally, Boston is an appropriate research site because it is one of the first transit systems to add WiFi and phone coverage within subway cars and stations, which makes it more likely that phones and WiFi devices will be used.

The MBTA public transportation system has subways, buses and a commuter train rail (MBTA, 2009). For the purposes on this study, only Boston subways and streetcars were considered. As shown in Figure 2-3 and Photo 3-1, the subways travel the Blue, Green, Red and Orange subway lines. All four of these lines include 120 stations that are either underground, elevated or at grade-level. Underground stations are located below ground, with trains traveling along tracks inside tunnels. Elevated stations are located above ground, with train tracks often situated on platforms hundreds of feet above. Grade-level stations are located on the street, with train tracks running along roadways.

Of the four subway lines, some have special features. The Red, Orange and Blue lines are rapid transit lines, with either underground or elevated subway stations. The Green Line is a light rail line, with streetcars both underground and at grade-level on the street. Once traveling outside of the downtown Boston core, the Red and Green lines split into separate branches. The Red Line has two branches in the south: “Ashmont/Mattapan” and “Braintree.” The Green Line has four branches located in the west: “B,” “C,” “D” and “E.” Figure 2-3 shows a map of these lines.

3.2 Pilot study: Cell phone theft in Boston subways

A pilot study focused only on theft of cell phones in the Boston subway system. It examined how such thefts were related to surface-level crime rates and Census characteristics (Gentry, 2010). Data were compiled from 556 MBTA Transit Police reports between January 1, 2005 and December 31, 2010. It is important to note that the MBTA only indicates the nearest subway station address of each cell phone theft.

Additional information was collected from the 2008 Boston Police Department Crime Summary Report, including the number of armed robberies and larceny thefts over $250 in each police district. Total population, number of subway commuters and median income within each block group was collected from the 2008 American Community Survey by the United States Census Bureau.

Cell phone thefts occurred at or near 74 of the 120 subway stations on either the Blue, Green, Red or Orange subway lines. Downtown Crossing station had the most cell phone thefts, with 57 (considered a "hot spot" for crime), while the Orange Line had the most cell phone thefts, with 275 (considered a "hot route" for crime). Additional results suggest that surface-level crime statistics and Census characteristics can help us understand why cell phone thefts occur more at certain stations. Specifically, key findings were as follows:

a. Stations where armed robbery is high within the police district above also have the most armed robbery of cell phones
b. Stations where larceny is high within the police district above also have the most larceny thefts of cell phones
c. Most cell phone thefts occur at stations where the block groups have a low-to-moderate population
d. Block groups with a higher number of subway commuters have more cell phone thefts
e. The most cell phone thefts occur within block groups that have low to moderate income levels, from $15,000 to $55,000

3.3 Current study: Electronic device theft in Boston subways

This dissertation was developed to build findings from the pilot study. The main objective is to expand the scope of the previous study and examine the increase in all electronic device theft in the Boston subway system, not only cell phone theft.

a. Research questions

To better understand electronic device theft in Boston subways, the research questions for this dissertation are separated into three categories: transit-related questions, space-related questions and time-related questions. The hypotheses were derived from the framework of the three major environmental criminology theories (Appendix A presents a question-method matrix that lays out research questions and hypotheses, linking each to a theoretical framework and analytic strategy).

Transit-related research questions

RQ 1.1 Which subway station features are associated with higher counts of electronic device theft?

RQ 1.2 Which locations within subway stations and subway cars are the most at-risk of electronic device theft?

RQ 1.3 How has the introduction of phone and WiFi service on subway lines influenced electronic device theft?

Space-related research question

RQ 2.1 How does electronic device theft in the MBTA subway system compare to surface-level property crimes, larcenies and robberies near stations?

Time-related research question

RQ 3.1 Is the time of day, week or year related to electronic device theft at subway stations?

b. Important terms

cell phone	the predecessor to smartphones, sometimes referred to as dumbphones or mobile phones. Cell phones do not have computer-like functions and only allow users to send/receive phone calls or send/receive SMS and MMS messages through a cellular network
electronic device	potable electronic devices – including smartphones, cell phones, tablet and laptop computers, e-readers, MP3 music players, CD players and handheld gaming systems
phone coverage	access to a cellular network in order to send/receive phone calls, access the internet or send/receive text messages
pickpocketing	a stealth measure of theft. Offenders typically steal electronic devices from a victim without their knowledge (pockets, bags)
ridership	the number of commuters entering a subway station
robbery (current study)	a tactic using force or threatening to use force to steal a electronic device – this force can be physical and/or include a weapon
smartphone	cell phones with computer-like capabilities such as WiFi (Internet connectivity) and Bluetooth (device connectivity), games, music, texting, e-mail, social media and camera functions
snatching	a surprise measure of theft. Offenders typically steal electronic devices from the hands, person or surrounding area of the victim
surface-level crimes	incidents that occur above ground and not within the subway environment
text messaging	SMS messaging (text only) and MMS messaging (audio, video, photo)
WiFi hotspot	areas that allow electronic devices to connect to the Internet wirelessly through routers

CHAPTER 4: METHODOLOGY

4.1 Data sources

This study is restricted to subway lines and excludes the commuter rail and buses. Only electronic device thefts that occurred on or near the Blue, Green, Red and Orange subway lines were included. All of the data used for this dissertation was compiled from MBTA Transit Police incident-level case reports between August 19, 2003 and December 31, 2011. The beginning of this time period corresponds with the implementation of the police department's digital records management system (RMS), known as Larimore, in August 2003. Larimore is a specialized RMS for law enforcement and fire and rescue. The previous RMS used before Larimore was not readily available for review or data extraction. Once the target dates were selected, MBTA crime analysts and IT personnel used Crystal Reports and Microsoft Access reporting/database software to assist with the export of cases from the Larimore system. Only stolen property cases were queried. Then the list of property types was reviewed and only cases with stolen electronic devices were considered. The fields used from each case file were: case year, date, day of week, time, subway station and subway line.

ELECTRONIC DEVICE	NUMBER OF THEFTS	PERCENTAGE OF ALL 1,163 THEFTS	CUMULATIVE %
CELL PHONE	814	69.9	69.9
MP3 PLAYER	131	11.3	81.2
LAPTOP COMPUTER	92	7.9	89.1
CD PLAYER	66	5.7	94.8
DIGITAL CAMERA	37	3.2	98.0
VIDEO GAME	14	1.2	99.2
DVD PLAYER	9	0.8	100
TOTAL	**1,163**	**100**	**--**

Table 4-1a. Counts and percentages of stolen electronic devices at MBTA subway stations, 2003-2011 (n = 1,163)

	CELL PHONE	MP3 PLAYER	LAPTOP COMPUTER	CD PLAYER	DIGITAL CAMERA	VIDEO GAME	DVD PLAYER	TOTAL
2003	25	0	4	9	1	0	0	**39**
2004	63	0	6	21	7	0	4	**101**
2005	67	1	8	13	3	1	0	**93**
2006	90	17	16	10	4	2	1	**140**
2007	74	26	7	4	3	2	0	**116**
2008	127	28	8	2	5	1	1	**172**
2009	105	21	13	2	6	3	2	**152**
2010	116	19	14	3	3	3	0	**158**
2011	147	19	16	2	5	2	1	**192**
TOTAL	**814**	**131**	**92**	**66**	**37**	**14**	**9**	**1,163**

Table 4-1b. Counts of stolen electronic devices, by year (n = 1,163)

Electronic device theft in subways

During the 2003-2011 study period, 1,163 electronic devices were stolen at subway stations. As indicated in Table 4-1a, the types of stolen electronic devices included cell phones (*n*= 814), MP3 players (*n*=131), laptop computers (*n*= 92), CD players (*n*= 66), digital camera (*n*= 37), video games (*n*= 14) and DVD players (*n*= 9). Again following the CRAVED model, smaller devices, such as cell phones and MP3 players were stolen the most often. This also aligns with the literature stating that theft of cell phones has dramatically increased in recent years. It is important to note that unlike the differentiation of CD players and MP3 players as music devices, the cell phones category includes both smartphones and regular cell phones – since the study period is from 2003-2011.This grouping is also because, unfortunately, the MBTA Transit Police did not identify cell phones vs. smartphones in the Larimore recordkeeping system. As shown in Table 4-1b, cell phone theft has increased over time. Again, this finding coincides with statistics from the United Kingdom (Home Office, 2014; Thompson, 2014). Yet, when looking at MP3 players and CD players in the middle of the study period, both of these devices were stolen less often after 2007-2008.

Certain popular devices/models and their release dates may have an impact on electronic device theft in the MBTA subway system. This is discussed in Chapter 5.

Subway station characteristics

The 2007 MBTA Blue Book of Ridership and Service Statistics was used to collect subway station features. This report is publically provided on the MBTA website. The year 2007 was chosen because it was in the middle of the study period. The features included from this report include average weekday ridership at each station, whether or not there was a park-n-ride lot and whether or not there was a bus connection at each station. The Central Transportation Planning Staff (CTPS) of the Boston Region Metropolitan Planning Organization provided the data related to terminus subway stations and grade levels at all subway stations.

Surface-level crime

In Boston, police precincts are considered "districts." To collect surface-level crime statistics for each district, 2007 crime statistics from the Boston Police Department and surrounding townships were used. The number of larceny, robbery and all property crime offenses were collected. Again, 2007 was selected due to being in the middle of the study period. These reports were collected from the Massachusetts Crime Reporting Unit website. The Massachusetts Crime Reporting Unit is part of the criminal information section of the Massachusetts State Police. This official unit collects, maintains, analyzes, and reports crime data for state, local, campus and federal police agencies in Massachusetts.

For this study, all of the variables from the various data sources were stored and maintained in Microsoft Excel spreadsheets. SPSS and Stata statistical software were used for analysis.

4.2 Measures

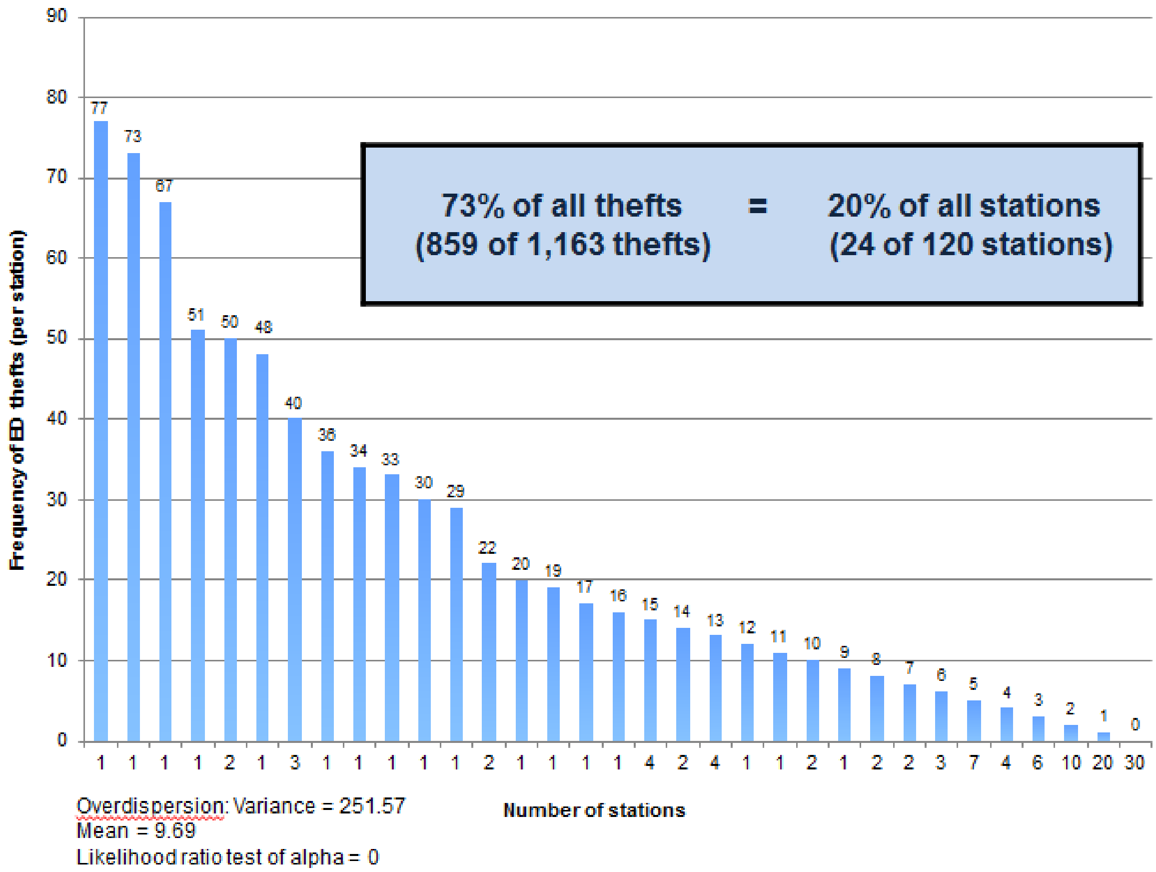
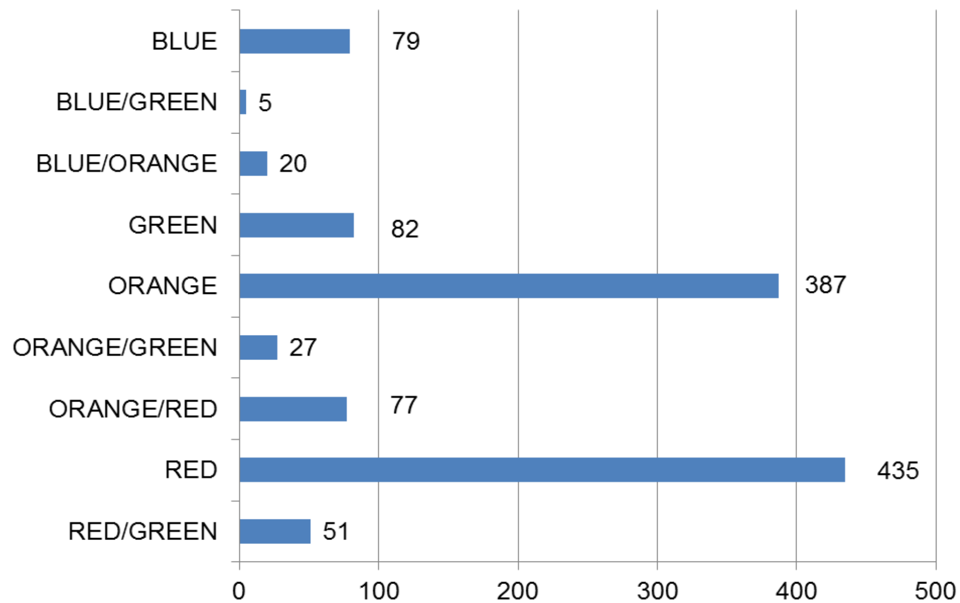


Figure 4-1. Histogram: Electronic device theft frequency and station count, 2003-2011

Table 4-1c. Descriptives for electronic device (ED) thefts at all subway stations (n = 1,163)

Source	Variable	Description	Minimum	Maximum	Mean	SD
MBTA (Larimore RMS)	ED Thefts	Number of thefts (per station)	0.00	77.00	9.69	15.86



**Two subway lines indicate transfer stations*

Figure 4-2. Electronic device theft count by MBTA subway line

a. Dependent variable

As shown in Table 4-1c, the dependent variable is the number of electronic device thefts at all Boston subway stations during the study period (*n*= 1,163, mean= 9.69, SD= 15.86). The unit of analysis is each individual subway station – because the MBTA Transit Police only indicates the nearest subway station address when reporting electronic device theft. It is difficult to know whether victims reported thefts occurring on subway cars traveling between stations, since only 8.4 percent of the cases (98 of 1,163) included both an origin and departure station in the incident report. The remaining cases only included one subway station as the location of the theft. This could be an administrative oversight and should be considered for future research.

Of the 120 subway stations on these lines, electronic device thefts occurred at 90 stations, as shown in the histogram in Figure 4-1. This distribution follows the 80-20 rule, as 73 percent of all electronic device thefts (859 of 1,163) occurred at 20 percent of the subway stations (24 of 120). This histogram is also in the shape of a J-curve, meaning that thefts are concentrated on the left side of the graph where there are fewer stations; and taper off to the right as the number of stations increases.

b. Thefts by subway line and transfer stations

Figure 4-2 separates the 1,163 electronic device thefts by subway line. A majority of the thefts occurred at stations on the Orange and Red lines. These two lines would be considered "hot routes" (Partridge, 2013). Six MBTA subway stations allow commuters to transfer between subway lines. All of the transfer stations intersect two subway lines only:

- Blue/Green transfer station: Government Center
- Blue/Orange transfer station: State
- Orange/Green transfer stations: Haymarket; North Station
- Orange/ Red station: Downtown Crossing
- Red/Green station: Park Street

All of the six transfer stations have high weekly ridership and are located in or near the downtown core Boston area. It is very interesting that only a few of these stations have concentrations of electronic device theft (see Table 4-2). As discussed in Chapter 5, of the six transfer stations, only Downtown Crossing, Park Street, State and Haymarket stations land of the "Top 24 list" of stations with the most electronic device theft. North Station and Government Center have very few thefts. This suggests that high ridership and transfer station status alone do not necessary relate to electronic device theft at stations.

TRANSFER STATION	SUBWAY LINES	NUMBER OF THEFTS	PERCENTAGE OF ALL 1,163 THEFTS
DOWNTOWN CROSSING	ORANGE/RED	77	6.6
PARK STREET	RED/GREEN	51	4.3
STATE	BLUE/ORANGE	20	1.7
HAYMARKET	ORANGE/GREEN	19	1.6
NORTH STATION	ORANGE/GREEN	8	0.6
GOVERNMENT CENTER	BLUE/GREEN	5	0.4
TOTAL	**--**	**180**	**15.2**

Table 4-2. Counts and percentages of electronic device theft at transfer stations (n = 1,163)

4.3 Analytical strategy

The analytical approaches vary by transit, space, time-related research question, as shown in Appendix A.

<u>RQ 1.1</u> Which subway station features are associated with higher rates of electronic device theft?

<u>RQ 2.1</u> How does electronic device theft in the MBTA subway system compare to surface-level property crimes, larcenies and robberies near stations?

Negative binomial regression

Since this study involves count data (number of electronic device thefts at subway stations), negative binomial regression is used for the two research questions above (Hilbe, 2011). This method fits because 30 stations have zero thefts during the study period (see Figure 4-1). Additionally, because the variance of the dependent variable (251.57) is larger than the mean (9.69), overdispersion exists. The intent is to identify the factors that contribute to electronic device theft at subway stations. The results of these two research questions are presented in Chapter 5 (RQ 1.1) and Chapter 6 (RQ 2.1).

RQ 1.2 Which locations within subway stations and subway cars are the most at-risk of electronic device theft?

Field observations

Since the data follows the 80-20 rule, the top 24 subway stations that have the most electronic device theft (73 percent) were visited to provide situational context to the analyses conducted for this dissertation. During the visits, the subway station environment and the behavior of commuters using electronic devices were observed. The observations occurred between Friday, October 4, 2013 and Monday, October 7, 2013. The period was chosen to observe both weekday and weekend activity. The goal of the observations was to document the behavior of individuals using electronic devices on subway mezzanines, platforms and subway cars. The types of devices most commonly used and the manner in which they are used was also recorded. Finally, photos of commuters using electronic devices were collected.

The results of these observations are used as supplemental information for the crime script analysis described below. Multiple studies have depended upon structured observations to examine the behavior of commuters on various modes of public transportation (Lyons et al., 2007; Ohmori & Harata, 2008; Russell et al., 2011, Timmermans & Van der Waerden, 2008).

Crime script analysis

The purpose of crime script analysis is to organize the behavioral processes that occur during a crime event in sequential order (Clarke & Eck, 2005; Cornish, 1994; Cornish & Clarke, 1986). For instance, Tompson and Chainey (2011) suggest that crimes should be broken down into acts and scenes with actors engaging in multiple activities throughout the scenario.

The next step would be to organize the script into actions that occur during four different stages: preparation, pre-activity, activity and post-activity. To illustrate this, the authors outline an everyday example of the type of script that would be used when visiting a restaurant for lunch.

1. Choose where to eat
2. Enter the restaurant
3. Wait to be seated
4. Get the menu
5. Order
6. Be served
7. Eat
8. Get the bill
9. Pay
10. Leave the restaurant

Step 1 would be set under the preparation stage, while steps 2-6 are all part of the pre-activity stage. Step 7 is the actual activity and the remaining steps 8-10 all occur during the post-activity stage.

Crime script analysis has been used to study several crime trends over the years. A recent edited book by Leclerc and Wortley (2013) highlights studies that have applied crime script analysis to understand offender decision-making processes. The chapters discusses everything from drug dealing in Amsterdam (Jacques & Bernasco, 2013) to sex trafficking in Italy (Savona, Giommoni, & Mancuso, 2013).

For the purposes of this dissertation, potential crime scripts are organized in a matrix indicating factors that can occur before, during and after electronic device theft in subways. Different types of theft are examined, such as pickpocket theft, snatch theft and robbery. Additionally, different areas within the subway environment are examined, including platform areas, mezzanine areas and subway cars.

These factors are further informed by what was recorded during the field observations within the MBTA subway system during October 2013, as well as police PSA videos, transit security CCTV videos and online videos of recent “caught on tape” thefts. The intent is to rationalize the areas within the subway environment where electronic device theft occurs and the risky behaviors of subway commuters, based on the field observations of the top stations with the most theft. The observational and crime script analysis results are discussed in detail in Chapter 5.

<u>RQ 1.3</u> How has the introduction of phone and WiFi service on subway lines influenced electronic device theft?

The intent is to analyze the number of electronic device thefts over time based on two interventions: the introduction of phone service and the introduction of WiFi service. The results of the analysis outlined below are covered in Chapter 5.

Sign tests

The method used is a sign test, also known as a paired-samples sign test. This method is applicable because the dependent variable has a ratio level of measurement; and the purpose is to compare means of two correlated values (or matched pairs) – in this case by analyzing pre- and post- service implications (Gibbons, 1993). Comparing the difference of means is a standard practice in crime and criminology research methods (Walker & Maddan, 2012). To reiterate, this study uses count data – electronic device thefts at subway stations. As illustrated by the histogram in Figure 4-1, theft is positively skewed, meaning that it is not normally distributed nor symmetrical. This is because many subway stations have zero theft, while fewer stations have several thefts. Sign tests are used when working with such data. This non-parametric approach is an alternative to traditional paired t-tests, which require normally distributed observations. It is also an alternative to the Wilcoxon signed rank test, which allows for non-normality, but requires symmetrical observations. Non-parametric statistics are appropriate in the social sciences (Wilcox, 1987); and the sign test procedure is often used when measuring the difference in before and after treatments. Finally, because sign tests do not depend on normality, the test statistic is resistant to the influence of outliers. Outliers are expected in the current study because, again, electronic device thefts are concentrated at a few stations – which follows the 80-20 rule.

RQ 3.1 Does the time of day, week or year influence electronic device theft at subway stations?

Temporal patterns identification

It is important to identify the frequency of crimes at specific places over time (Weisburd, Lum & Yang, 2004). Given this, the intention is to determine which times of day, week and year indicate the most electronic device thefts at stations. Peak and off-peak hours and seasonal usage are also important. To do this, the results are organized in descriptive tables, line charts and bar charts.

The descriptive tables feature summary indicators for hourly electronic device theft patterns. Felson and Poulsen (2003) developed this approach to summarize hour-of-day variations with the following indicators: median hour of crime, crime quartile minutes, crime's daily timespan and the 5-to-5 share of criminal activity. After determining what time should be used as the start of the day, the median hour of electronic device theft is calculated – with half of all thefts occurring before that time and the other half occurring after. Next, crime quartile minutes are calculated by dividing the first and second halves of the day into four equal quartiles. Then the daily timespan of electronic device theft is calculated by adding the minutes between the first and third quartiles. Finally, the 5-to-5 share of electronic device theft is calculated to indicate how theft is dispersed throughout the day, typically from 5am to 5pm.

The line charts identify trends, cycles and noise patterns. Wild & Seber (2000) explain that this approach visually identifies daily, seasonal and yearly variation (see Figure 4-3). Trends represent gradual fluctuations in one direction, cycles represent repetitive patterns and noise represents irregular patterns.

Bar charts are the final graphic representation of time data. These also identify monthly and yearly patterns of electronic device theft.

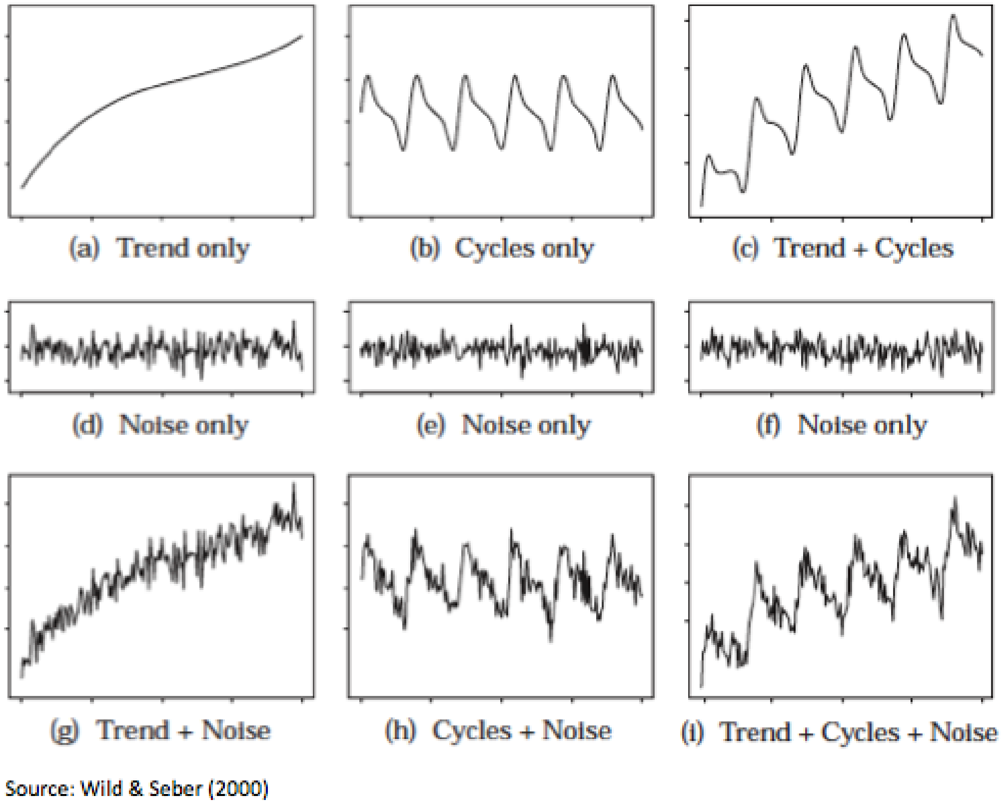


Figure 4-3. Line charts: trends, cycles and noise

Overall, the use of descriptive tables, line charts and bar charts help reveal more about why certain stations encounter more theft than others. The results of this analysis are covered in Chapter 7.

4.4 Formatting of analytical chapters

Chapters 5, 6 and 7 are formatted in a similar fashion. The first section of each chapter restates the research question and provides an overview of the hypothesis. This section also explains how the hypothesis was derived from environmental criminology theories and relevant studies. The second section of each chapter outlines the independent variables used in the analysis. The third section of each chapter describes the results of the analysis. The fourth and final section of each chapter discusses the interpretation of the results – and also links the results to theoretical perspectives and past literature.

Chapter 5: TRANSIT-RELATED RESEARCH QUESTIONS

5.1 Research Question 1.1

RQ 1.1 Which subway station features are associated with higher rates of electronic device theft?

a. Hypothesis

H 1.1 Thefts will increase at stations with higher ridership, bus connections, parking lots. Thefts will also increase at above-ground and terminus stations; and on subway lines with more stations.

The first transit-related question asks which subway station features are associated with higher rates of electronic device theft. It is hypothesized that electronic device thefts will increase at stations with higher ridership, bus connections and parking lots. It is also assumed that thefts will increase at above-ground and terminus stations; and on subway lines with more stations. All of these assumptions stem from crime pattern theory. Because offenders and victims converge in space and time at subway stations (nodes), this environment creates the opportunity (activity space) for crimes to occur.

Studies on this topic align with the different parts of this hypothesis. Belanger (1999) found that the higher the average ridership at a subway station, the higher the crime rate at that station. This means that the more people who enter and commute from a certain station may increase the number of offenders, victims and targets at the station – which in turn increases crime. Studies have found that crimes on subway platforms also increase at stations with higher ridership (Burrows, 1980; Loukitau-Sideris, 2002; Shellow et al., 1975). The same can be true for subway stations near bus connections, where commuters exchange or transfer to a local bus once exiting the subway station (Yu, 2009). Yu found that bus stops are associated with increased crimes. Finally, subway stations near park-n-ride parking lots have more Type 1 crime (Loukitau-Sideris, 2002).

This study found that 60 percent of the crimes that occurred on a subway line actually occurred within the park-n-ride lots where commuters pay to park their vehicles near a subway station for short-term periods. Only 20 percent of crime occurred on the platform. Shellow et al. (1975) also found that offenders target passengers in elevated stations, while Block and Davis (1996) hypothesize that terminus stations with a high volume of riders departing to reach suburban areas would generate more street robberies.

b. Independent variables

The independent variables are referred to as ridership, bus and parking, subway line, transfer station, terminus station and grade level of each station (see Table 5-1). The average number of weekday riders at each Boston subway station ranged from 48 to 23,500 (mean= 4386.88, SD= 4830.740). Of the 120 subway stations, 68 percent had a bus station (mean= 0.68, SD= 0.47) and 22 percent had a park-n-ride lot (mean= 0.22, SD= 0.41). As for subway line, 8 percent were Blue Line stations (mean= 0.08, SD= 0.28), 52 percent were Green Line stations (mean= 0.52, SD= 0.50), 12 percent were Orange Line stations (mean= 0.12, SD= 0.33) and 23 percent were Red Line stations (mean= 0.23, SD= 0.22). Five percent of the stations were transfer stations – with two subway lines intersecting (mean= 0.05, SD= 0.22). As for terminus status (mean= 0.11, SD= 0.31), 11 percent were end-of-line stations. And finally in regard to grade level of each station, 72 percent were street-level and above-ground stations (mean= 0.72, SD= 0.45), 25 percent were underground stations (mean= 0.25, SD= 0.43) and 3 percent were elevated stations (mean= 0.03, SD= 0.18).[5]

Table 5-1. Descriptives for subway station characteristics (n = 120 subway stations)

Source	Variable	Description	n	Minimum	Maximum	Mean	SD
MBTA (2007)	Ridership	Avg. number of weekday riders	--	48.00	23500.00	4386.88	4830.74
	Bus	Bus connection	82	(no=0)	(yes=1)	0.68	0.47
	Parking	Park-n-Ride lot	26	(no=0)	(yes=1)	0.22	0.41
	Blue	Blue subway line stations	10	(no=0)	(yes=1)	0.08	0.28
	Green	Green subway line stations	62	(no=0)	(yes=1)	0.52	0.50
	Orange	Orange subway line stations	15	(no=0)	(yes=1)	0.12	0.33
	Red	Red subway line stations	27	(no=0)	(yes=1)	0.23	0.42
	Transfer	Transfer stations with 2 lines	6	(no=0)	(yes=1)	0.05	0.22
CTPS	Terminus	End-of-line stations	13	(no=0)	(yes=1)	0.11	0.31
	Above Ground	Street and above-ground stations	86	(no=0)	(yes=1)	0.72	0.45
	Underground	Underground stations	30	(no=0)	(yes=1)	0.25	0.43
	Elevated	Elevated stations	4	(no=0)	(yes=1)	0.03	0.18

MBTA: Massachusetts Bay Transportation Authority
CTPS: Central Transportation Planning Staff, Boston Region Metropolitan Planning Organization

Table 5-2. Negative binomial regression for 2003-2011 electronic device thefts at MBTA subway stations and subway station characteristics (n = 120 subway stations)

Variable	B	(SE)	IRR	Z
Ridership	0.0001	(0.0003)	1.0001*	3.24
Bus (no=0; yes=1)	0.5504	(0.2526)	1.7340*	2.18
Parking (no=0; yes=1)	- 0.0429	(0.2593)	0.9579	- 0.17
Blue (no=0; yes=1)	- 0.0032	(0.5739)	0.9967	- 0.01
Green (no=0; yes=1)	- 1.5501	(0.5042)	0.2122*	- 3.07
Orange (no=0; yes=1)	0.9653	(0.5022)	2.6256*	1.92
Red (no=0; yes=1)	0.3550	(0.4909)	1.4262	0.72
Terminus (no=0; yes=1)	0.6050	(0.2978)	1.8314*	2.03
Above Ground (no=0; yes=1)	- 1.1089	(0.4727)	0.3299*	- 2.35
Under (no=0; yes=1)	- 0.9930	(0.4986)	0.3704*	- 1.99

*$P < 0.05$
Pseudo R^2 = .1779
Log likelihood = -305.3541
Likelihood ratio chi-square = 132.13
Cronbach's α = 0.0005

c. Results: Negative binomial regression

The results of the negative binomial regression for predicting electronic device theft in Boston subway stations from subway station characteristics are displayed in Table 5-2. The model is significant ($p<.01$), meaning that all of the predictors, when taken together, are associated with electronic device theft in subways. The log-likelihood of this model (-305.3541) is closer to zero than the base model without any predictors (-371.41806). This indicates a better fit. The independent variables explain 17.7 percent of the variance of electronic device theft. This most likely could be since only a few subway characteristics and other predictor variables were included in the model. Additionally, the ridership, bus connection, Green Line, terminus station, above ground station and underground station variables are significant, meaning that their p-values are less than 0.05. The Orange Line variable has a p-value that is close to $p<.05$ ($p=0.055$). This significance is indicated by the asterisks next to the incidence rate ratios. The incident rate ratios (IRR) are obtained by exponentiating the regression coefficients. This determines the percentage change in the risk of electronic device theft for each unit increase in the independent variable. When an independent variable has an IRR value that is greater than 1, there is a positive change in the dependent variable. Conversely, when an independent variable has an IRR value that is less than 1, there is a negative change in the dependent variable.

The IRR values for the ridership, bus, Orange Line and terminus variables are greater than 1. This means that the presence of these variables increased the number of electronic device thefts at subway stations. On average, electronic device theft increases by: 0.0001 for every additional subway rider at a subway station, 0.7340 when there is a bus connection at a station, 1.6256 on the Orange Line and 0.8314 at terminus stations. The IRR values for the Green Line, above ground station and underground station variables are less than 1.

This means that the presence of these variables did not increase the number of electronic device thefts at subway stations. Instead, electronic device theft decreases by: 0.2122 on the Green Line, 0.3299 at above ground stations and 0.3704 at underground stations.

Finally, the parking, Blue Line and Red Line variables were not significant, meaning that their p-values were greater than 0.05; and their presence did not impact electronic device theft at subway stations. The transfer station and elevated station variables were omitted from the model because of multi-collinearity.

d. Discussion: Summary of key findings and linking theory

Ridership and bus connections

The ridership and bus connection variables are significant within the model (see Table 5-2). These findings reject the null hypothesis and support crime pattern theory. When there are more riders at a subway station, the opportunity for the electronic device theft increases. The higher the subway station ridership, the more targets that offenders can choose from. These targets are potential victims with suitable electronic devices. Ridership can also increase when there is the presence of a bus connection at a subway station. This attracts more people, both motivated offenders and suitable targets, to a given node (subway station).

Parking

The parking variable is not significant within the model. This finding suggests that park-n-ride lots do not influence electronic device theft at subway stations. This result could be because offenders who visit subway stations with park-n-ride lots may be more interested in committing motor vehicle theft or burglary/larceny theft from vehicle, instead of electronic device theft, which is a more intimate and personal crime of larceny from a person (snatch theft or pickpocketing). This assumption is consisted with Loukitau-Sideris (2002), who found that theft of or from vehicles made up at least half of the crime that occurred at subway stations with park-n-ride lots.

Subway station grade level

The above ground variable is significant within the model, but it has an IRR value that is less than 0. This finding accepts the null hypothesis and indicates that electronic device thefts actually decrease at above ground stations. This could be because above ground stations are more open than underground stations, which may increase sight lines for potential capable guardians. This heightened visibility may serve as a deterrent for offenders.

The underground variable is also significant within the model – with a below-zero IRR value. This means electronic device theft decreases at underground stations too. This finding supports the original hypothesis that electronic device theft would be less likely to occur at underground stations because it is more difficult for offenders to escape. Offenders may have to venture through many areas in order to leave a subway station. This could be problematic when trying to avoid detection or apprehension.

For example, if an offender pickpockets a phone on a subway car, he or she may have to exit the subway car, walk from the platform to the mezzanine and then exit the turnstile area. The route that an offender uses to escape after committing an offense could be considered a path, as per crime pattern theory.

Terminus stations

The terminus variable is significant within the model. This finding rejects the null hypothesis and suggests that electronic device theft increases at terminus (end-of-line) stations. This could be because offenders have more opportunities and more targets to choose from due to terminus stations accommodating large numbers of suburban commuters. This finding relates to the "edges" concept of crime pattern theory because suburban areas lie on the outer edges of the Boston metropolitan area and MBTA subway system. Alternatively, it could also be because victims may realize that their device was stolen when they reach the end of the line and indicate the terminus station as the location of the theft in the police report.

Subway lines

It was hypothesized that the more stations on a subway line, the more at-risk the subway line. More stations on a line offer thieves more opportunities to look for suitable electronic devices to steal. Using this assumption, the Green Line would be the most at risk, the Red Line would be next, followed by the Orange Line and finally the Blue Line (see *n* totals in Table 5-1). Yet, as shown in Figure 4-2, more electronic device theft is concentrated on the Orange and Red lines, while the Green and Blue lines have the least theft. This concentration contradicts the regression results, however, which indicate that the Green and Orange lines are the only lines that are significant predictors influencing electronic device theft.

In particular, thefts decrease at subway stations on the Green Line – since the IRR value is less than 0. This finding, which accepts the null hypothesis, is very interesting because the Green Line has the most subway stations and has high ridership.

Electronic device theft increases at subway stations on the Orange Line. This finding partially rejects the null hypothesis because the Orange Line does not have as many stations as other lines, but is still found to increase electronic device thefts when considering the regression model.

The Red and Blue lines were not significant variables in the model. This is understandable when considering the Blue Line, since it has the fewest subway stations and the lowest ridership. However, it is interesting that the Red Line does not influence electronic device theft since it ranks second in the most subway stations and has a high ridership.

It is important to note that when running this negative binomial model with the Red Line omitted as a reference category, the results, significance and variance all remain the same. Therefore, the full model – with all four of the train lines – serves as the base model for this research question.

5.2 Research Question 1.2

<u>RQ 1.2</u> Which locations within subway stations and subway cars are the most at-risk of electronic device theft?

a. Hypothesis

<u>H 1.2</u> Crowded areas, secluded areas and areas near subway car exits/stairs are the most at-risk

The second transit-related question asks which areas within subway stations and subway cars are the most at-risk for electronic device theft. It is hypothesized that crowded areas and secluded areas both offer opportunities for thieves, as discussed in Chapter 2. Offenders could also steal devices in areas where they can make a quick escape, such as near subway car doors or platform/mezzanine exits. This assumption is developed from rational choice theory because offenders mentally evaluate the benefits of stealing devices in certain areas, while also calculating the costs of being seen or apprehended. In order to understand criminal decisions, you have to focus on individual criminal events. For this study, the criminal event is electronic device theft in MBTA subway stations.

Thieves have several options to choose from when stealing electronic devices from public transit passengers, in general. Lyons et al. (2007) found that rail passengers use a variety of electronic devices, such as mobile phones, handheld and laptop computers, and music players when traveling in Great Britain. In another U.K. study surveying university students and part-time working mothers, Line, Jain and Lyons (2011) found that electronic device use had become "embedded into the participants' everyday travel and communications." The participants depended on their devices to pass the time while traveling by bus. They placed calls, browsed the internet, sent emails and texts, watched TV, listened to music and studied for class.

Similar patterns were observed with bus and train passengers in New Zealand (Russell et al., 2011) and commuter train passengers in Tokyo (Ohmori & Harata, 2008). Axtell, Hislop and Whittaker (2008) found that business passengers on a U.K. commuter train mostly reserved electronic device use for work tasks (email, phone calls, texts) when cellular and WiFi signal was free and available. These studies can be used to further hypothesize where in the subway environment offenders steal devices from passengers.

	STATION	LINE	# OF THEFTS	CUM. PERCENT	RIDERSHIP RANK
1	DOWNTOWN CROSSING	ORANGE/RED	77	6.6	# 1
2	RUGGLES	ORANGE	73	12.9	# 25
3	FOREST HILLS	ORANGE	67	18.7	# 10
4	PARK STREET	RED/GREEN	51	23.0	# 4
5	JACKSON SQUARE	ORANGE	50	27.3	#38
6	JFK/UMASS	RED	50	31.6	# 27
7	FIELDS CORNER	RED	48	35.7	# 50
8	WONDERLAND	BLUE	40	39.1	# 34
9	ANDREW	RED	40	42.5	# 36
10	ALEWIFE	RED	40	45.9	# 15
11	ASHMONT	RED	36	49.0	# 31
12	QUINCY CENTER	RED	34	51.9	# 26
13	MASS AVE STATION	ORANGE	33	54.7	# 37
14	ROXBURY CROSSING	ORANGE	30	57.3	# 53
15	QUINCY ADAMS	RED	29	59.8	# 39
16	BACK BAY	ORANGE	22	61.7	# 6
17	BRAINTREE	RED	22	63.6	# 46
18	STATE	BLUE/ORANGE	20	65.3	# 11
19	HAYMARKET	ORANGE/GREEN	19	66.9	# 16
20	SAVIN HILL	RED	17	68.4	# 75
21	SHAWMUT	RED	16	69.8	# 70
22	SULLIVAN SQUARE	ORANGE	15	71.1	# 21
23	WELLINGTON	ORANGE	15	72.4	# 28
24	MATTAPAN	RED	15	73.7	# 67
--	**--**	**--**	**859**	**73.7**	**--**

Table 5-3. Top 24 subway stations with the most electronic device theft, 2003-2011

b. Top 24 subway stations

Following the 80-20 rule, the following crime script analysis and field observations focus only on the subway stations where a majority of the electronic device theft was concentrated during the study period.

Again, as illustrated in Figure 4-1, only 20 percent of the subway stations system-wide (24 of 120 stations) experienced 73.7 percent of all electronic device theft (859 of 1,163 thefts). Table 5-3 highlights these “top 24” stations, including their subway line color, number of thefts, cumulative percent of all thefts and ridership rank.

The ridership rank was assigned by using 2007 MBTA average weekday ridership totals and listing subway stations in descending order. The station with the highest ridership is ranked #1. The station with the lowest ridership is ranked #120. This is outlined in Appendix B. Most of the top 24 stations have moderate to low average weekday ridership, based on their ridership rank. Only four of the six transfer stations (intersecting two subway lines) are on the top 24 list. Both of these findings could lead to the assumption that a high concentration of commuters is not an obvious predictor of electronic device theft in Boston. Finally, 11 of the top stations are on the Red Line, eight are on the Orange Line, one is on the Blue Line and zero are on the Green Line. This is important to consider when comparing with the results of the negative binomial regression from Table 5-2.

c. Independent variables: Crime script analysis

Crime script analysis is used here to understand the steps offenders take during electronic device theft in subways. The intent is to conceptualize the different tactics offenders use to steal electronic devices. These tactics are identified as: snatch theft, pickpocket theft and robbery. As defined in Chapter 3, snatch theft is a surprise measure that offenders use to steal electronic devices from the hands, person or surrounding area of the victim. Pickpocket theft is different because thieves use a stealth measure to steal a victim’s electronic device without being seen.

Finally, robbery is an overt tactic using force (or threatening to use force) in order to take an electronic device. The reasoning behind using these three tactics is emphasized since both the NYPD and British Transport Police have featured them in crime prevention-commuter awareness videos (see Photo 5-1 and Photo 5-3, respectively). There have also been viral online videos featuring cell phone and CCTV recordings of thieves using these tactics (see Photo 5-2 and Photo 5-4, respectively).

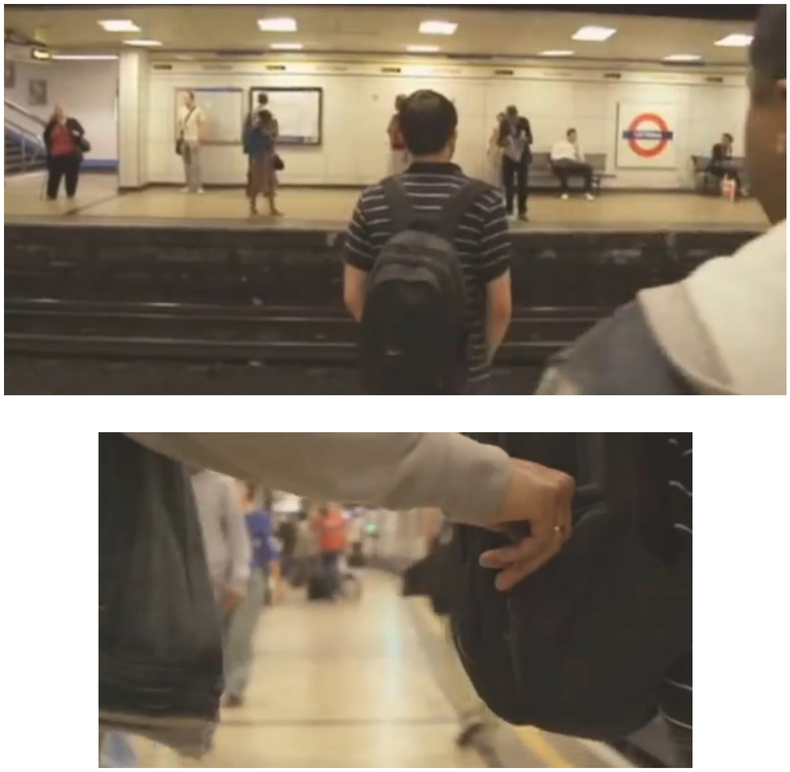
As a side note, it is interesting that it is difficult to differentiate between a real "caught on tape" theft and a staged theft produced by police when watching these videos. It could be that the non-police videos are staged as well. However, their questionable authenticity does not negate the fact that police have confirmed similar tactics used by real thieves (personal communication, October 5, 2013).

Source: NYPD, 2012

Photo 5-1. Stills from NYPD PSA video (example of snatch theft)

Source: Garcia, 2013

Photo 5-2. Stills from cell phone recording of thief stealing headphones from NYC man (example of snatch theft)



Source: BTP, 2013

Photo 5-3. Stills from British Transport Police PSA video (example of pickpocket theft)

Source: NBC 4 New York, 2014

Photo 5-4. Still from CCTV video of man stealing a cell phone from sleeping NYC woman (example of pickpocket theft)

d. Results: Crime script analysis

Although snatch theft, pickpocket theft and robbery all qualify as electronic device theft, each would be categorized as a separate "criminal event" because each have different modi operandi (Clarke & Cornish, 1985). Therefore, it is important to deconstruct the sequence of rational choices that an offender (or co-offenders) can make during each offense type.

This section models its crime scripts based on the format used by Tompson and Chainey (2011). This approach considers offenders (and any secondary individual who an offender interacts with) to be *cast* members. Cast members engage in *activities* during various scenes of electronic device theft. Scenes occur before, during and after a device is stolen. The criminal event is divided into four scenes: preparation, pre-activity, activity and post-activity. During the *preparation scene*, an offender thinks about and chooses the opportunity to steal an electronic device. The *pre-activity scene* is when the offender takes the preparatory steps necessary to steal the device. The theft of the device occurs during the *activity scene*, while the *post-activity scene* is when the offender takes the steps to escape/exit the subway station and either use, sell or dispose of the device. Next is a discussion explaining in detail the crime script for each type of electronic device theft.

	CAST	ACTIVITIES
PREPARATION	Offender	1. Offense decision: cost vs. benefit 2. Station selection 3. Day and time selection; or next opportunity
PRE-ACTIVITY	Offender	1. Internal location selection 2. Device/victim selection 3. Nearby guardians 4. Disguise options 5. Snatch tactic options 6. Timing options 7. Escape options
ACTIVITY	Offender	1. Surprise victim by snatching device from his/her hands, person or surrounding area
POST-ACTIVITY	Offender Black market broker Black market buyer	1. Escape area and exit subway station 2. Remove or change disguise 3. Unlock security measures on device, if any 4. Usage decision: personal use or black market sale?

Table 5-4. Crime script for snatch theft – electronic device theft in MBTA subways

Snatch theft

The first step in the preparation scene is for the offender to decide whether or not to commit electronic device theft at a subway station – after considering the benefits of stealing the device compared to the costs of being apprehended (see Table 5-4). If the offender believes the costs outweigh the benefits, it is assumed that he or she will not decide to go through with the crime. However, if the offender believes that the benefits outweigh the costs, then he or she moves on to the next step, which is selecting a subway station that is suitable to steal a device. The offender may specifically choose a certain day and/or time to visit their selected station; or the offender may simply decide to steal a device the next time he/she is at that station.

(Alternatively, an offender may decide upon a particular location within *any* subway station – such as a mezzanine or platform. The offender could then steal a device based on the next opportunity they have. This decision would also skip the sequence to the first step in the pre-activity scene.)

When the offender arrives at their selected subway station, the pre-activity scene begins. First, the offender selects a location within the subway station to steal the device.
Next, the offender chooses a target. This could be a certain victim who the offender deems vulnerable. Vulnerability could be gauged as: distracted or preoccupied before the theft; incapable of protecting themselves during the theft; or incapable of pursuing the offender after the theft. The target could also be a certain electronic device, which the offender may deem as fitting one of the CRAVED components (see Chapter 2). Once a device or victim is selected, the offender checks the surrounding area for capable guardians. Guardians could be other commuters, transit employees, transit police, CCTV or people recording using personal cameras. If the offender believes guardians are nearby, then he or she may choose to disguise their appearance or alter their clothing in order to not be detected later.

As part of their "BeAware" campaign in 2013, the British Transport Police (BTP) released videos highlighting some of the various tactics a thief can use when snatching an electronic gadget from a public transit passenger (BTP, 2013a). The three tactics were named: the snatcher, the grabber, and the plucker. The video dramatizing "the snatcher" tactic shows a woman grabbing a distracted female victim's phone and escaping through the train doors right before they close. In "the grabber video," a man snatches an iPod that a woman places on her chair while she handles her luggage and is not watching the device.

Lastly, in “the plucker” video, a male offender takes the phone of a man who has fallen asleep on a train and has left the device in his lap.

The next step in the pre-activity scene, timing, is paramount to snatch thefts. An offender chooses the most opportune time to snatch an electronic device from an unsuspecting victim. Again, this could be when the victim is distracted or preoccupied. Timing could also be considered when the theft occurs inside a subway car. MBTA Transit Police officers said that many electronic device thefts occur when victims are seated next to open car doors (personal communication, October 5, 2013). Offenders time their snatch thefts immediately before the doors open or close when departing a station (see Photo 5-1; Photo 5-2). This ensures that the surprised victim can’t follow once the device is snatched and the doors are shut. (This tactic is also featured in the BTP awareness “the snatcher” video.) Offenders could also consider timing during these instances: when a victim is using a device on an escalator or staircase; when a victim is using a device in an elevator, when a victim is using a device when entering or exiting the subway station. The last step in the pre-activity scene is when the offender evaluates his/her escape options. An offender may plan the best way to exit an area before stealing a device, in order to escape faster or not be noticed.

As described in the previous section, a snatch theft is when an offender takes a device from a person’s hands, body or the area surrounding them. This is the activity scene.

Once the offender escapes the immediate area of the theft or proceeds to exit the subway station, the post-activity scene begins. The offender may choose to change their clothing or alter their appearance. When in a safe location free of the victim or guardians who witnessed the theft, the offender may check the device for any security measures, such as lock screens, passwords or anti-theft features.

Depending upon these security measures and the technical savvy of the offender, he or she will decide how they plan to use the electronic device. The offender may choose to keep the device for their own personal use, or give it to an acquaintance. Or they may decide to sell the device on the black market. If this decision is made, then the crime script case expands to include any individuals who the offender comes in contact with to facilitate the sale. This could be a broker, someone who solicits thieves to bring them stolen devices in exchange for quick cash. In New York City, these brokers are often owners or employees of local businesses, such as convenience stores or barbershops (CBS 2 New York, 2011). The brokers then go on to sell the devices at a higher price than what they bought them for, but lower than retail value. The offender may also choose to eliminate the broker "middle man" and sell the stolen device directly to a willing buyer.

	CAST	ACTIVITIES
PREPARATION	Offender	1. Offense decision: cost vs. benefit 2. Station selection 3. Day and time selection; or next opportunity
PRE-ACTIVITY	Offender	1. Internal location selection 2. Device/victim selection 3. Nearby guardians 4. Pickpocket tactic options 5. Timing options 6. Escape options
ACTIVITY	Offender	1. Remove device from victim's person or bag without being detected
POST-ACTIVITY	Offender Black market broker Black market buyer	1. Escape area and exit subway station 2. Unlock security measures on device, if any 3. Usage decision: personal use or black market sale?

Table 5-5. Crime script for pickpocket theft – electronic device theft in MBTA subways

Pickpocket theft

For pickpocket theft of an electronic device in a subway station, the entire preparation scene and the beginning of the pre-activity scene are nearly the same as the snatch theft script (see Table 5-5). After deciding to commit electronic device theft and choosing a subway station and/or area within a station, the offender waits for the next opportunity to steal a CRAVE-able device or target a vulnerable victim. Again, this theft occurs without guardian supervision.

The next step in the pre-activity scene is when an offender considers all of the pickpocket tactics available to them at the moment. The BTP also released videos showing the various techniques that pickpocket thieves use (BTP, 2013b). The six tactics, which featured pickpocket thefts of personal items ranging from wallets to phones, were coined: the concealed hand, the distraction, the diversion, the easy dip, the helpful stranger and the stall.

"The concealed hand" video shows a thief using a newspaper to cover his hand while standing next to a woman in a subway car. He then reaches into her purse and walks away with an item. "The distraction" video shows a female accomplice distracting a woman by asking her directions in a busy subway station. A male pickpocket strolls behind the unsuspecting woman and quickly reaches into her open purse to take something. In "the diversion" video, a woman acting as a decoy drops change on the stairs of a transit station. As another woman bends down to help her pick up the coins, a man walking up the stairs steals the wallet from the victim's purse. "The easy dip" video shows a male victim walking on a subway platform and waiting for an arriving subway car (see Photo 5-3). A male thief follows behind him and reaches into his backpack, just as he boards the train and the doors shut. The offender then walks away on the platform, while the unknowing victim remains inside the subway car. In "the helpful stranger" video, a woman using a subway station ATM machine is momentarily stopped by a female thief who tells her that she has something on her jacket. As the woman looks down at her clothing, the thief takes the phone out of her pocket. Then the victim thanks the stranger for noticing the stain and the thief walks away with her device. Lastly, "the stall" video shows a co-ed pair of thieves working together. The man walks in front of a male victim as both of them are approaching a turnstile at a transit station. When his metro card does not work, the offender backs up away from the turnstile. He pushes the male victim into the woman behind him – the female accomplice. As the two collide, the woman takes the wallet out of the victim's back pocket and leaves.

The BTP awareness videos included actor portrayals of pickpocket offenders and victims. However, police PSA videos are not the only footage that can be used to demonstrate pickpocketing tactics. As shown in Photo 5-4, CCTV cameras in New York City subway station caught a man stealing an item from a sleeping woman's coat.

This sneaky approach exemplifies the next two steps in the pre-activity scene – timing and escape options. Not only does an offender have to choose the perfect tactic to use, they have to make sure to act at the perfect time and have an escape plan. (Fortunately for the sleeping NYC woman, nearby police officers witnessed the theft. They immediately approached and apprehended the offender, as shown on video.)

The activity scene in a pickpocket theft is when the offender steals the device from either the victim's body or clothing (pocket, belt clip); or from their bag (purse, backpack, luggage). The post-activity scene of a pickpocket theft is similar to those listed in the snatch theft script above.

	CAST	ACTIVITIES
PREPARATION	Offender	1. Offense decision: cost vs. benefit 2. Station selection 3. Day and time selection; or next opportunity 4. Weapon selection, if any
PRE-ACTIVITY	Offender	1. Internal location selection 2. Device/victim selection 3. Nearby guardians 4. Disguise options 5. Timing options 6. Escape options
ACTIVITY	Offender	1. Confront victim and take device by threat, force/assault or weapon
POST-ACTIVITY	Offender Black market broker Black market buyer	1. Escape area and exit subway station 2. Dispose of, hide or clean weapon 3. Remove or change disguise 4. Unlock security measures on device, if any 5. Usage decision: personal use or black market sale?

Table 5-6. Crime script for robbery – electronic device theft in MBTA subways

Robbery

The script for an electronic device theft in a subway station is different when the method is robbery in comparison to snatch and pickpocket thefts (see Table 5-6). During the preparation scene after an offender is motivated to steal the device and has selected a subway station, he or she decides if their robbery offense will include a weapon or not. The offender may choose to use a weapon because they already possess one, or they have easy access to one.

The steps of the pre-activity scene are the exact same as the snatch theft script. This similarity is because a robber may decide to wear a disguise or alter their look in order to evade. The activity scene for robbery is more aggressive than the previous scripts because the offender must confront the victim in order to steal the electronic device.

This could be with a threatening demeanor, force, serious physical assault or with a weapon. The intention of this confrontation is to intimidate or harm the victim into giving up the device. In this instance, the robbery method is used to evoke fear in the victim.

The post-activity scene includes the escape from the area where the crime occurred and from the subway system entirely. If a weapon was used, the offender hides, cleans or disposes of it – in order to not be linked with it later. This scene may also include changing or removing a disguise, if one was used. Finally, the offender may choose to use the stolen device themselves or sell it to a broker or buyer, as described in the previous scripts.

e. Independent variables: Field observations

Since the above passenger behavior studies do not address exactly where riders use their electronic devices within public transit modes; and the above crime scripts only offer hypothetical situations of electronic device theft in subway stations – observations of MBTA subway riders are used here to further address the research question. Again, only the top 24 stations with the most electronic device theft were observed (see Table 5-3). This approach identifies risky commuter behaviors at three locations within these subway stations: the mezzanine area, the platform area and in the subway car. The mezzanine is an entrance/exit area where tickets are purchased and turnstiles are located (see Photo 5-5a; Photo 5-5b) – before ascending or descending the stairs/escalator/elevator to the platform level in elevated or underground stations, respectively. Newsstands, restrooms and food shops are typically located here too (see Photo 5-5c). This is also where services are provided, such as police assistance and customer information (see Photo 5-5d; Photo 5-5e). The platform is a boarding area near subway trains in elevated, underground and above ground stations.

It is accessed by the street level in above ground stations; or by the mezzanine level in underground and elevated stations (see Photo 5-5f). Subway cars are areas within a subway train where commuters sit or stand while traveling between subway stations (see Photo 5-5g). It is accessed by the platform level.

Photo 5-5a. Charlie ticket kiosk (subway train fare)

Photo 5-5b. Subway turnstile (entrance/exit)


Photo 5-5c. Concessions stand

Photos 5-5a – 5-5c. Various features located in MBTA subway stations

Photo 5-5d. Police assistance call box

Photo 5-5e. Customer service information center

Photos 5-5d – 5-5e. Various features located in MBTA subway stations (continued)

Photo 5-5f. Platform staircase

Photo 5-5g. Subway car interior

Photos 5-5f – 5-5g. Various features located in MBTA subway stations (continued)

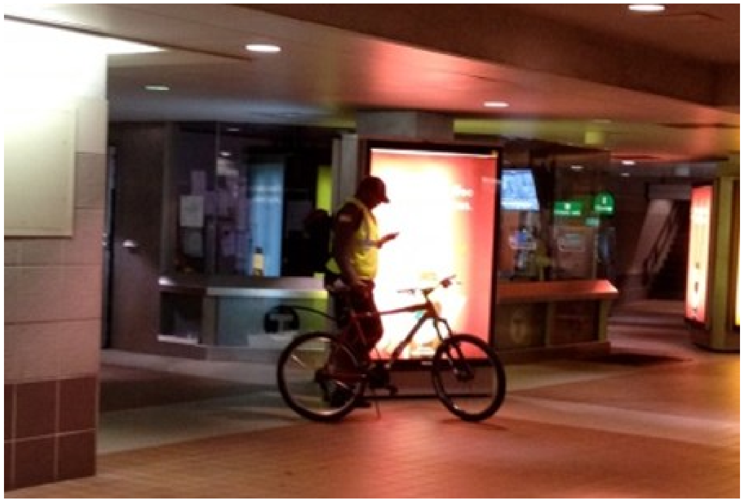


Photo 5-6a. Transit Police officer using phone

Photo 5-6b. Woman using phone while ordering

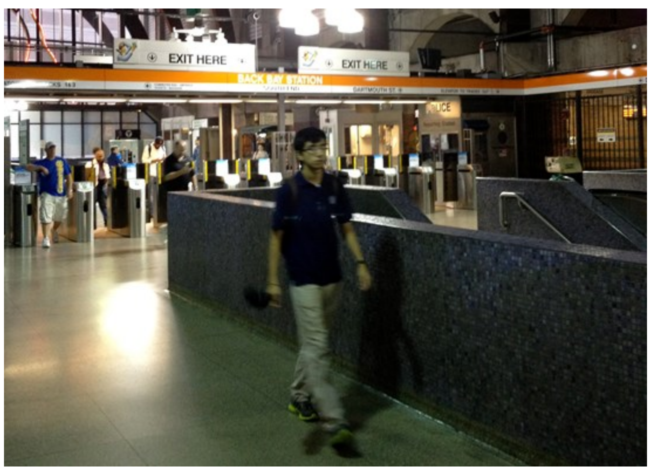


Photo 5-6c. People using devices when exiting mezzanine

Photo 5-6d. Man using phone while waiting to purchase fare

Photos 5-6a – 5-6d. People using electronic devices in MBTA mezzanine areas

Photo 5-7a. Woman using phone on outdoor platform

Photo 5-7b. People using phones on outdoor platform

Photo 5-7c. Men using devices on underground platform

Photo 5-7d. Woman using video chat on underground platform

Photo 5-7e. Man using, then holding phone on underground platform

Photos 5-7a – 5-7e. People using electronic devices in MBTA platform areas

Photo 5-7f. Woman using phone on underground platform

Photo 5-7g. Man using tablet on underground platform

Photo 5-7h. People listening to headphones on underground platform

Photo 5-7i. People using devices on platform stairs

Photos 5-7f – 5-7i. People using electronic devices in MBTA platform areas (continued)

Photo 5-8a. People using phones and a laptop in a subway car

Photo 5-8b. People using phones in a subway car

Photo 5-8c. Woman using phone in a subway car

Photo 5-8d. Man using phone in a subway car

Photos 5-8a – 5-8d. People using electronic devices in MBTA subway cars

Photo 5-8e. Man using e-reader in a crowded subway car

Photo 5-8f. People using devices in a crowded subway car

Photo 5-8g. People using devices in a subway car

Photo 5-8h. People using devices in a subway car, near door

Photos 5-8e – 5-8h. People using electronic devices in MBTA subway cars (continued)

Source: Goldberg, 2011

Photo 5-9. Apple iPod advertisement on U.S. subway car

f. Results: Field observations

This section describes the electronic device use and risky behaviors of observed MBTA subway passengers in mezzanine areas, platform areas and subway cars. A primary observation for all of three areas is that people hold on to their devices even when not using them. For example, passengers were observed standing, sitting or walking with their phone in hand, but not looking at the device. This idle behavior puts the passenger in a vulnerable state because the device is in full view. These passengers chose not to place their devices in their pocket, bag or purse when not in use. Another finding across all observed areas is that when most people are holding and using their device simultaneously, it is only with one hand. The other hand is either carrying/securing a bag or personal item, or is left free. For example, when using a smartphone with one hand, several passengers were seen scrolling and tapping the screen with their thumbs. One female passenger was seen single-handedly using the speakerphone feature on her phone, while holding the device a few inches in front of her face. When using two hands, most passengers were observed to be typing on the screen or playing a game.

The last major observation is that some passengers listen to headphones while their electronic devices are tucked inside a pocket or bag. This leaves their hands free, but can still alert others to a device being used. This is important since white headphones are a tell-tale indicator that someone is using a potentially expensive Apple device. Interestingly, Apple once featured their white headphones in marketing posters located inside U.S. transit stations (see Photo 5-9).

Mezzanine areas

Individuals in the mezzanine area were seen using their devices at many of the 24 stations visited. As shown in Photo 5-6a, a MBTA Transit Police officer uses his phone while in an underground station. This officer was observed for several minutes looking at his device until a person approached him to ask a question. Photo 5-6b shows a concession stand at the above-ground JFK/UMass station. People mostly visited this vendor when waiting for a train to arrive at the station. Here a woman checks her phone while the man in front of her purchases a soft drink. Passengers were also observed using their devices while walking in, out and around the mezzanine area, as shown in Photo 5-6c. A man in the background of the photo looks down at his phone after exiting the turnstile at Back Bay station. Finally, Photo 5-6d shows passengers purchasing Charlie Tickets in order to enter the subway system. While waiting for the people in front of him to finish their transactions, a man glances down at his phone, which is in his right hand (not shown).

Platform areas

Passengers were observed using various electronic devices in platform areas too – no matter if the platform was underground, elevated or above ground. Photo 5-7a shows a woman typing on the screen of a phone while sitting at the remote outdoor platform at Wellington station. In Photo 5-7b, a group of individuals, who do not seem to know one another, stand on an outdoor platform at Massachusetts Avenue station. During the few minutes that the group was observed, all four passengers displayed their devices at least once. The photo clearly shows the two men in the foreground looking down to use their phones – one man with one hand and the other man with two hands. Photo 5-7c shows a group of three male friends talking with each other while standing on the underground platform at Central station. One of the men is seen checking his phone, while another prominently displays his camera, which hangs around his neck.

Photo 5-7d shows several people standing or walking on the narrow underground Park Street station platform. In the background, a man against the wall talks on his phone, while the woman next to him looks down at hers. Both use their devices, unfazed, as people quickly walk by in front of them at the busy downtown transfer station. This kind of behavior is what thieves look for, said a male MBTA employee. “When a station is packed, that is when most of the crime activity is happening” (personal communication, October 5, 2013). Nearby in the foreground, a woman uses her device to video chat. She smiles as she holds the device in front of her with one hand and talks into the microphone on her headphones. On the elevated platform at Fields Corner station, a teenage boy is observed using his phone while waiting for the train to arrive. As the train pulls into the station, the teen walks toward the subway car without securing his phone. Instead, choosing to leave it exposed in his hand, as shown in Photo 5-7e.

Similar behavior was witnessed by an older woman standing at the end of the Jackson Square underground platform. While waiting for her train, she uses both hands to view her phone. Although most passengers were observed using smartphones and cell phones, some were seen using other electronic devices. At the Harvard station, a man in Photo 5-7g swipes his finger across the screen of a tablet computer. He uses the device while waiting for the train to arrive at the underground station. Photo 5-7h and Photo 5-7i both show people listening to headphones while waiting and walking at underground platforms.

Subway cars

Similar patterns of electronic device use were observed from passengers traveling inside subway cars. Photo 5-8a shows three women using their devices. One woman sits and checks her Android phone, while another woman stands next to the door and types on her phone. The last woman sits across the car (also next to a door) looking down and typing on her Apple Mac laptop computer. Law enforcement officials discourage such electronic device use when inside a subway car. “You have to be smart, if people see an opportunity – times are hard. Don’t walk around with your computer out. Just be safe,” said a female Boston PD officer (personal communication, October 5, 2013).

This common sense thought process did not stop five subway passengers from using their phones in a crowded subway car, as shown in Photo 5-8b. Each of them sat next to each other and used or listened to their devices, even while the doors opened at a stop. In Photo 5-8c, a woman is seen multitasking while typing on her phone. Since one hand is holding the device and the other is holding her bag, she places her coffee cup in her mouth in order to continue typing. The man sitting next to her closes his eyes while listening to large headphones. Photo 5-8d also shows a passenger doing several tasks at once while sitting in a subway car.

Not only does the man in the photo listen to his headphones while using one hand to tap on the screen, he uses the other hand to pet his small dog, which is wrapped around his body in a cloth carrier.

Crowded subway car conditions did not seem to bother several observed passengers, as many continued to use their devices even as space became limited. Photo 5-8e shows a man reading his e-reader while holding on to the railing inside a moving subway car. Photo 5-8f shows an aerial view of a subway car packed with passengers. In the picture, one woman stands and reads an e-reader, while the man next to her uses his phone. Both do so while maintaining their balance on the moving train. Photo 5-8g shows two people sitting next to each other in a moderately crowded subway car that is traveling between stations. As the woman talks on the phone, the man seated next to her intently plays a game on his device, while also listening to headphones. Lastly, Photo 5-8h shows three people using their devices while in close proximity to an open subway car door.

g. Discussion: Summary of key findings and linking theory

"There is just something about people wanting to use their phones on the subway," said a male MBTA Transit Police officer (personal communication, January 10, 2012). People are so interested in their devices that they tune out what is going on around them, he said, adding that it has become second nature for people to use their devices to "pass the time" while traveling on the subway. This trait is what makes passengers susceptible to victimization. They are often too distracted to pay attention to their surroundings.

One reason commuters may not be aware that they are engaging in risky behavior by using their devices in subways because many believe their electronic devices, especially their cell phones, provide a sense of security (Tennakoon & Taras, 2012).

It also seems the decision to sit or stand next to a subway car doorway is related to concept of "personal space" – the desire to *not* sit or stand directly next to another person. By sitting at an end seat next to a door, it only allows one person to sit next to you in the middle seat, if the train becomes crowded. The other side of the seat is often blocked with a partition. The same reasoning is assumed by standing next to a door. Passengers may choose to do this because the area next to the door is away from others. This is also a prime area because it is near the exit, which allows for a quicker exit upon arrival at your destination. However, few passengers may realize that they put themselves at risk for snatch theft by sitting or standing near a subway car door *and* using an electronic device.

This research question is linked to rational choice theory and the "criminal event" decisions of offenders. The risky behaviors highlighted in the field observations allow offenders to commit the snatch, pickpocket and robbery thefts, which are outlined in crime scripts section. Therefore, the field photos and notes further expand the crime script analyses mentioned for electronic device theft in MBTA subway stations. It is concluded that mezzanines, platforms and subway cars can all be considered risky areas for electronic device theft, if passengers are engaging in certain risky behaviors within these areas that attracts offenders. These observations support the original hypothesis.

This section serves as "potential perpetrator scripts" that describe the general hypothetical sequences that an offender could engage in when committing different types of electronic device thefts (Borrion, 2013). Crime scripts are useful because it is important to understand the steps of a crime from beginning to end, which can potentially be used to develop crime prevention measures by law enforcement.

Additionally, observing passenger behavior at the top 24 stations is consistent with advice to become a "local crime expert" as it pertains to electronic device theft in MBTA subway stations (Clarke & Eck, 2005).

5.3 Research Question 1.3

RQ 1.3 How has the introduction of phone and WiFi service on subway lines influenced electronic device theft?

a. Hypothesis

H 1.3 Thefts will increase on subway lines after phone and WiFi service are introduced

The third transit-related question considers the influence of phone and WiFi service. A WiFi hotspot and an area where there is cellular signal could both be considered nodes, as crime pattern theory suggests. Routine activity theory also relates to this question because motivated offenders looking to steal devices would occupy specific places where WiFi and phone service were available. It is therefore hypothesized that electronic device thefts will increase at stations once phone and WiFi service are introduced. Since "apple picking" relies on people using (or displaying) their smartphones to connect to the Internet and/or make phone calls, it is assumed that crimes will spike at subway stations where that service is available. This research question is unique, as few studies have explored if WiFi or cell tower accessibility increases thefts of devices in a given area. Additionally, 85 percent of an individual's daily usage of their smartphone, for example, relies on Internet or cellular tower connectivity (Fetto, 2013). Of this, 39 percent is devoted to checking e-mail, web surfing and social media – all of which require an Internet or phone connection; as well as 26 percent spent talking on the phone and 20 percent spent texting – which require only a cellular signal.

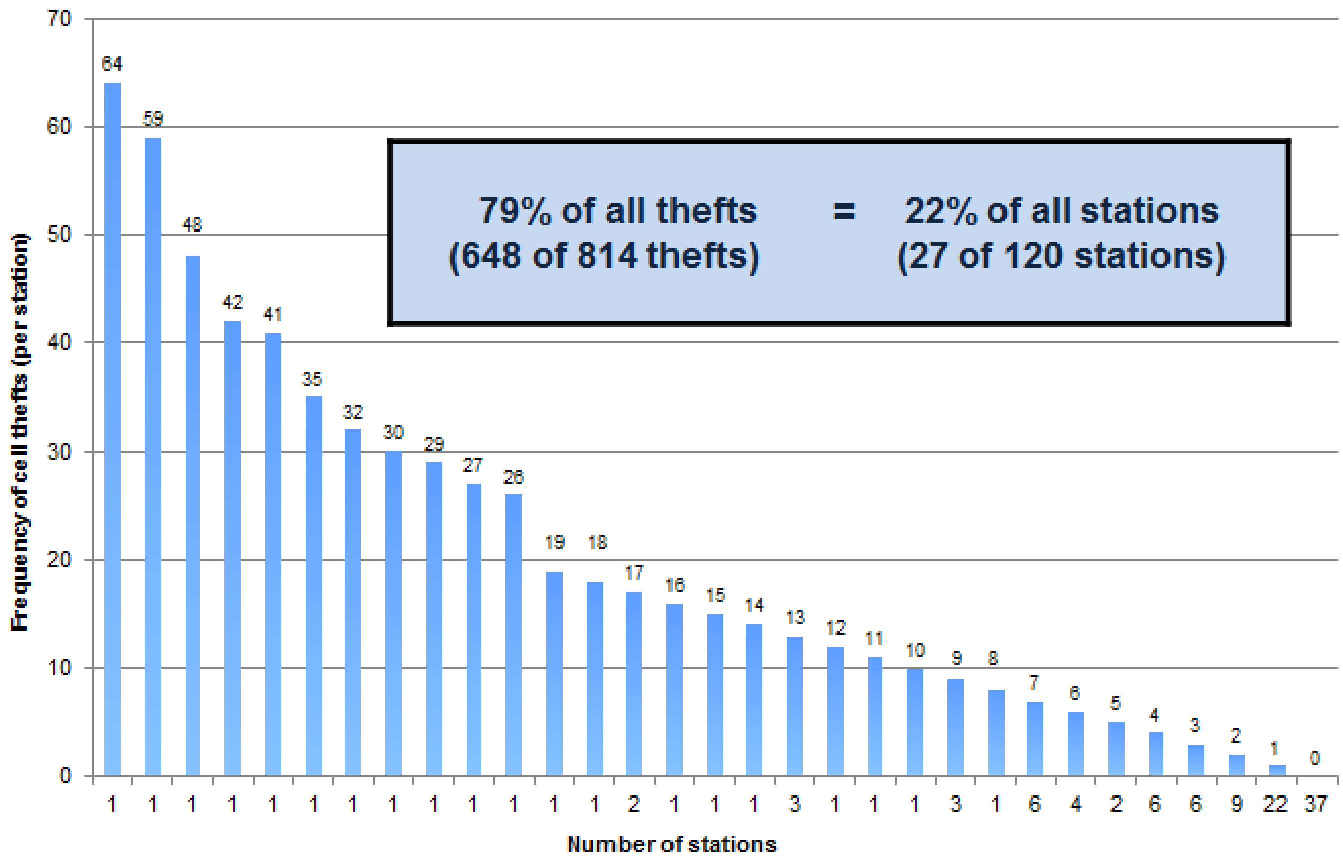


Figure 5-1. Histogram: Cell phone theft frequency and station count, 2003-2011

Table 5-7. Descriptives for cell phone thefts at all subway stations (n = 814)

Source	Variable	Description	Minimum	Maximum	Mean	SD
MBTA (Larimore RMS)	Cell Thefts	Number of thefts (per station)	0.00	64.00	6.78	11.96

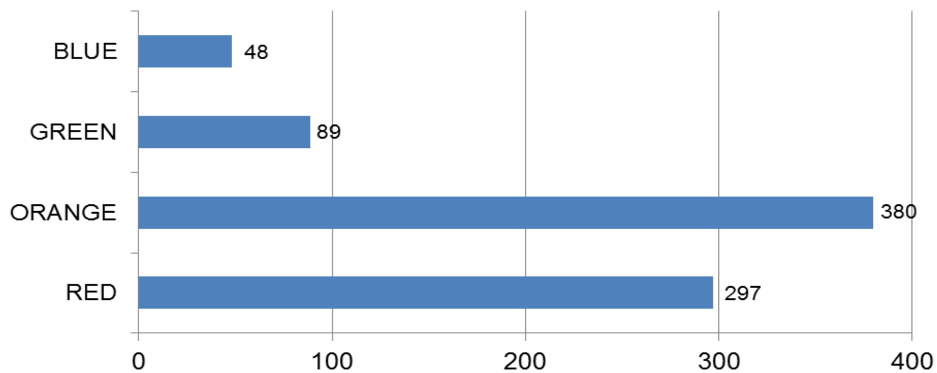


Figure 5-2. Cell phone theft by MBTA subway line (n= 814)

b. Variables

Dependent variable

To address the research question about whether or not phone and WiFi service impact electronic device theft in subway stations, a specific electronic device was selected. Cell phones ("dumbphones" and smartphones) were selected because these devices regularly rely upon both phone and WiFi signal. This device type was also selected because many people carry cell phones with them each day. Therefore, the dependent variable (for this research question only) is the number of cell phone thefts per station – during the study period of August 2003 to December 2011 (see Table 5-7; *n*= 814, mean= 6.78, SD= 11.96).

Of the 120 subway stations, cell phone thefts occurred at 83 stations, while 37 stations had zero thefts – as shown in Figure 5-1. This is similar to the histogram in Chapter 4 (see Figure 4-1), since both are positively skewed J-curves that follow the 80-20 rule. Again, this illustrates that thefts are concentrated at a few stations. For this histogram, 79 percent of all cell phone thefts (648 of 814) occurred at 22 percent of the subway stations (27 of 120).

Instead of focusing on the total 814 cell phone thefts in the entire subway system, the focus here is broken down to individual subway lines. This is because each subway line can serve as a separate environment (various track length, number of stations, grade level of stations). As shown in Figure 5-2, a majority of the cell phone thefts occurred at stations on the Orange Line, followed by the Red, Green and Blue lines.

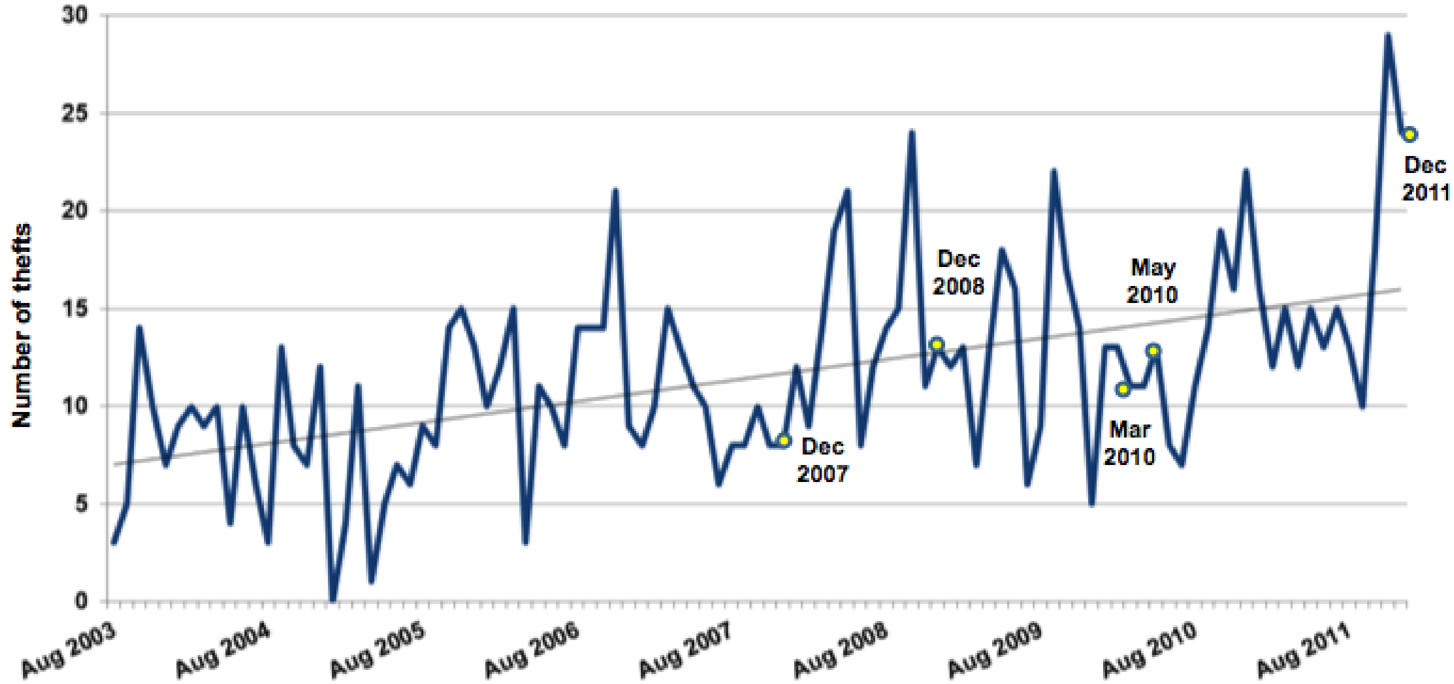
Once it was determined that cell phone theft would be examined by subway line, the next task was to create a rate of the number of cell phone thefts based on the number of opportunities there are to steal cell phones on each subway line. This process took several steps, which are outlined below and shown in Table 5-8.

First, U.S. mobile cellular subscriptions were collected for each year of the study period, 2003-2011. These totals were provided in a dataset by the International Telecommunication Union (ITT, 2014). The next step was to compare these national subscription totals with U.S. population data, in order to create a percentage. To do this, U.S. census population totals were collected for each year of the study period (U.S. Census Bureau, 2014). Then for each year, the U.S. subscription total was divided by the U.S. population total. This created an estimated national percentage of Americans with cell phones for each year.

The next step was to take that yearly percentage and multiply it by the average weekday ridership total for each subway line during each year. This created an estimated number of subway passengers with cell phones for each year on each subway line.

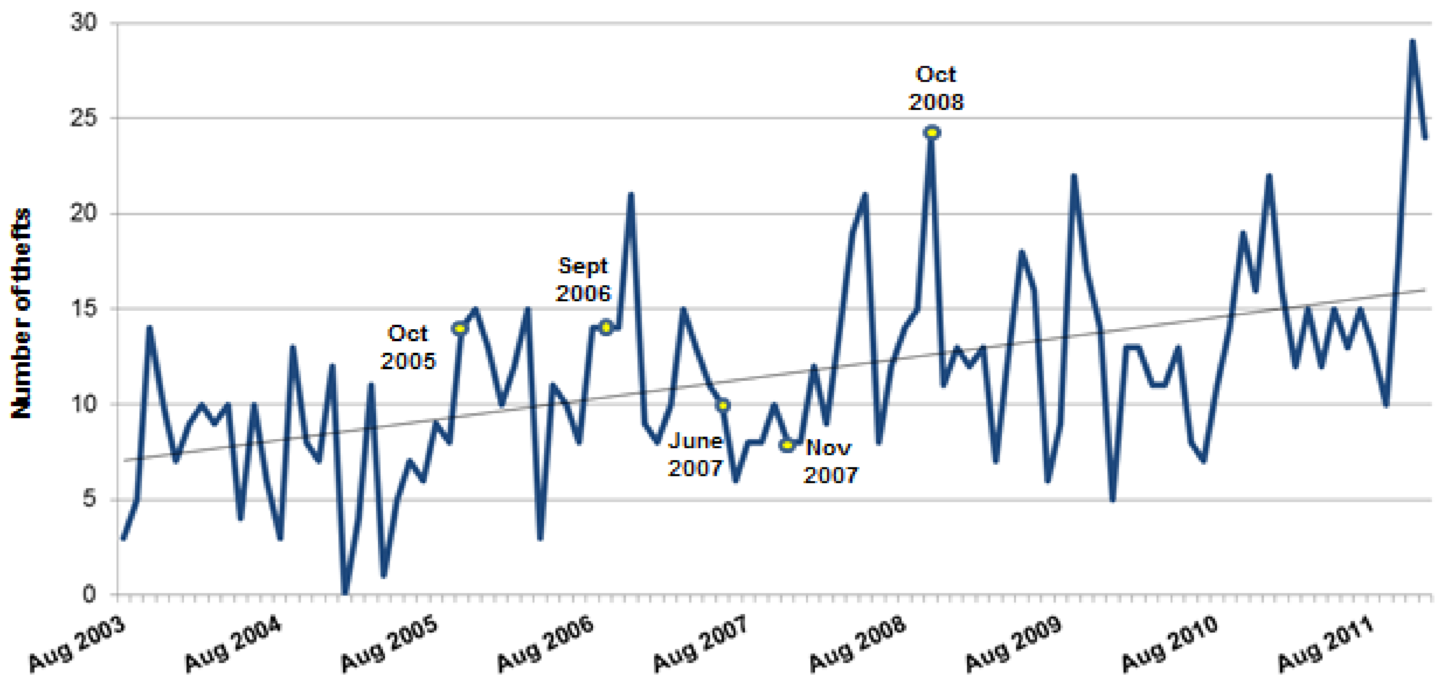
The final step was to divide the number of cell phone thefts by the estimated number of subway passengers with cell phones. This final calculation was multiplied by 1,000 to provide the rate of the number of cell phone thefts based on the number of available cell phones on each subway line, during each year.

These yearly rates were used in the before/after analyses to determine if phone and WiFi service influenced cell phone theft on subway lines (see results in following section).



December 2007 – Downtown Stations adds cell service
December 2008 – Free WiFi added at all stations and in cars
March 2010 – Orange Line adds cell service
May 2010 – Red Line adds cell service
December 2011 – Green and Blue lines add cell service

Figure 5-3a. Time series scatter plot: Electronic device thefts at MBTA subways and cell phone/WiFi coverage introduction dates



October 2005 – Apple releases 5th generation iPod that plays music, photos and videos
September 2006 – Research in Motion (RIM) releases Blackberry Pearl smartphone
June 2007 – Apple releases 1st generation iPhone smartphone
November 2007 – Amazon releases Kindle e-reader
October 2008 – T-Mobile releases the G1, the first Android smartphone

Figure 5-3b. Time series scatter plot: Electronic device thefts and release dates of popular devices, Aug. 2003 - Dec 2011

Independent variables

The independent variables are the dates that phone service and WiFi were first introduced to subway lines. The MBTA subway system was a pioneer in bringing phone coverage to its subway stations and cars. In December 2007, subway stations located in the downtown core added cell service. Free WiFi service was introduced in December 2008 to a majority of subway stations and cars.

Although only the first introduction dates are used for this analysis, it is important to note that the entire Orange Line received cell phone service by March 2010, while the Red Line did in May 2010 and the Green and Blue lines did in December 2011. Figure 5-3a is a time series scatter plot of electronic device thefts and all of the dates phone and WiFi service were introduced on various MBTA subway lines and stations. Time series scatter plots visually represent changes in the dependent variable over time, before and after an intervention. This approach is a sufficient way to identify patterns (Albright, Winston, & Zappe, 2011). The value of the dependent variable is along the vertical axis, while the period of time (in months) is along the horizontal axis. Overall, this figure shows both an upward trend and cycle (as described in Chapter 4) between the beginning of the study period in 2003 and the end of the study period in 2011.

The dates that phone service and WiFi were first introduced to subway lines are marked in yellow on the horizontal axis in Figure 5-3a. Phone and WiFi services were introduced during winter and spring months (December and March/May, respectively). These months appear to have had less electronic device theft system-wide.

The same times series scatter plot is used when overlapping the release dates of popular electronic devices during the study period (see Figure 5-3b).

For most of the years, the highest spike of electronic device theft occurred during the fall months of September, October or November. This is interesting because many manufactures released popular devices during the fall, including the 5th generation iPod in October 2005; the Blackberry Pearl in September 2006; the Amazon Kindle e-reader in November 2007; and the first Android smartphone, the G1, in October 2008. It is important to note that one of the first phones to feature both Internet capability and a full keyboard was the T-Mobile Sidekick, which was released in 2002. Although this release date was before the beginning of the study period, it can be assumed that the popularity of this phone may have driven electronic device theft in the earlier years. In fact, the MBTA Transit Police once distributed a PSA flier specific to Sidekick theft (see Photo 5-10).

Photo 5-10. Sidekick theft awareness, MBTA Transit Police flier

	2003	2004	2005	2006	2007	2008	2009	2010	2011
RED LINE									
Number of cell phone thefts	11	23	29	34	23	43	49	39	46
Average weekday ridership	214,100	210,500	202,250	213,700	226,417	242,926	245,457	241,603	258,182
Estimated number of passengers with cell phones	118,463	132,760	139,300	164,322	187,167	208,547	219,292	222,694	247,160
Rate: Cell phone thefts / # of passengers with phones	0.09	0.17	0.21	0.21	0.12	0.21	0.22	0.18	0.19
ORANGE LINE									
Number of cell phone thefts	8	27	32	45	37	61	45	53	72
Average weekday ridership	155,750	154,350	152,800	161,350	216,183	182,071	183,318	184,961	190,939
Estimated number of passengers with cell phones	86,178	97,346	105,241	124,068	178,707	156,304	163,777	170,485	182,788
Rate: Cell phone thefts / # of passengers with phones	0.09	0.28	0.30	0.36	0.21	0.39	0.27	0.31	0.39
GREEN LINE									
Number of cell phone thefts	3	6	4	8	11	11	9	20	17
Average weekday ridership	217,750	212,550	192,700	202,400	237,410	250,219	234,513	236,096	219,513
Estimated number of passengers with cell phones	120,483	134,052	132,722	155,633	196,254	214,808	209,514	217,618	210,142
Rate: Cell phone thefts / # of passengers with phones	0.02	0.04	0.03	0.05	0.06	0.05	0.04	0.09	0.08
BLUE LINE									
Number of cell phone thefts	3	7	2	3	3	12	2	4	12
Average weekday ridership	55,900	55,600	56,750	60,950	50,515	58,421	56,074	57,273	58,004
Estimated number of passengers with cell phones	30,930	35,066	39,087	46,867	41,758	50,153	50,097	52,790	55,528
Rate: Cell phone thefts / # of passengers with phones	0.10	0.20	0.05	0.06	0.07	0.24	0.04	0.08	0.22
Number of U.S. cellular subscriptions (millions)	160.64	184.82	203.70	229.60	249.30	261.30	274.28	285.12	298.29
U.S. population (millions)	290.33	293.05	295.75	298.59	301.58	304.37	307.01	309.33	311.59
U.S. cellular subscriptions / U.S. population	55.33%	63.07%	68.88%	76.89%	82.66%	85.85%	89.34%	92.17%	95.73%

** U.S. population totals rounded up for table. Exact totals were used for calculations.*

Table 5-8. Cell phone thefts and ridership in MBTA subways, by cellular subscriptions and population

RED LINE

	Before Phone Service: 2004-2007	After Phone Service: 2008-2011
2004	0.17	0.21
2005	0.21	0.22
2006	0.21	0.18
2007	0.12	0.19
Mean	**0.18**	**0.20**

ORANGE LINE

	Before Phone Service: 2004-2007	After Phone Service: 2008-2011
2004	0.28	0.39
2005	0.30	0.27
2006	0.36	0.31
2007	0.21	0.39
Mean	**0.29**	**0.34**

GREEN LINE

	Before Phone Service: 2004-2007	After Phone Service: 2008-2011
2004	0.04	0.05
2005	0.03	0.04
2006	0.05	0.09
2007	0.06	0.08
Mean	**0.05**	**0.07**

BLUE LINE

	Before Phone Service: 2004-2007	After Phone Service: 2008-2011
2004	0.20	0.24
2005	0.05	0.04
2006	0.06	0.08
2007	0.07	0.22
Mean	**0.10**	**0.15**

** 2003 eliminated*

Table 5-9a. Rate of cell phone thefts on MBTA subways (by number of available phones), before/after phone service

RED LINE

	Before WiFi Service: 2006-2008	After WiFi Service: 2009-2011
2006	0.21	0.22
2007	0.12	0.18
2008	0.21	0.19
Mean	**0.18**	**0.20**

ORANGE LINE

	Before WiFi Service: 2006-2008	After WiFi Service: 2009-2011
2006	0.36	0.27
2007	0.21	0.31
2008	0.39	0.39
Mean	**0.32**	**0.32**

GREEN LINE

	Before WiFi Service: 2006-2008	After WiFi Service: 2009-2011
2006	0.05	0.04
2007	0.06	0.09
2008	0.05	0.08
Mean	**0.05**	**0.07**

BLUE LINE

	Before WiFi Service: 2006-2008	After WiFi Service: 2009-2011
2006	0.06	0.04
207	0.07	0.08
2008	0.24	0.22
Mean	**0.12**	**0.11**

** Years 2003-2005 eliminated*

Table 5-9b. Rate of cell phone thefts on MBTA subways (by number of available phones), before/after WiFi service

Table 5-10a. Sign test results: Mean rate of cell phone thefts on MBTA subways (by number of available devices), before/after phone service

	Before Phone Service: 2004-2007	After Phone Service: 2008-2011	Mean Difference (sign)	Model Significance (p=)
Red Line	0.18	0.20	+	0.125
Orange Line	0.29	0.34	+	
Green Line	0.05	0.07	+	
Blue Line	0.10	0.15	+	

(2003 eliminated)

+ positive difference
- negative difference
= no difference
* p < 0.05

Table 5-10b. Sign test results: Mean rate of cell phone thefts on MBTA subways (by number of available devices), before/after WiFi service

	Before WiFi Service: 2006-2008	After WiFi Service: 2009-2011	Mean Difference (sign)	Model Significance (p=)
Red Line	0.18	0.20	+	1.000
Orange Line	0.32	0.32	=	
Green Line	0.05	0.07	+	
Blue Line	0.12	0.11	-	

(2003-2005 eliminated)

+ positive difference
- negative difference
= no difference
* p < 0.05

c. Results: Sign tests

By examining the rate of cell phones that are stolen on different subway lines before and after each intervention (based on the estimated number of available phones), more will be learned about whether the crime actually increased due to riders' having the option to connect their devices; and offenders utilizing the opportunity of more devices being displayed and used. The reason the rate is considered is because it is important to see if the number of thefts were increasing simply because there were more devices to steal, or not.

The first step in the analysis organized the rates in groups of years before and after phone/WiFi service were introduced to each subway line (see Table 5-9a; Table 5-9b). It is important to make the before and after groups equal because it allows for proper comparison. Therefore, 2003 was eliminated in the phone service analysis in order have four years in the before groups and four years in the after groups. The same was done for the WiFi service analysis, with years 2003-2005 eliminated to have three years in each group.

Next, the mean of each group was calculated, as shown in bold in Table 5-9a and Table 5-9b. Examining means is a standardized way to compare across distributions and estimate central tendency. The mean here represents the sum of rates for each year, divided by the number of years. The final step was to run sign tests comparing the before/after mean rates described above.

Two models were created, one for before/after phone service (see Table 5-10a); and one for before/after WiFi service (see Table 5-10b). For each model, the mean rates of each subway line were included. The mean difference for each line is shown with a positive, negative or equal sign – indicating the mean increased, decreased or stayed the same. Each table also shows the significance value of the sign test.

Although the mean difference before and after phone service increased on each subway line, the model is not significant as a whole, as shown in Table 5-10a. There is more variation in the mean differences for the before/after analysis of WiFi service, as shown in Table 5-10b. The means for the Red and Green lines both increased, while the Blue Line mean decreased and the Orange Line mean stayed the same. However, when taken together, the model is not significant.

d. Discussion: Summary of key findings and linking theory

The results of the sign test models before/after phone service and WiFi service accept the null hypothesis. This finding is surprising, as one would think increased use of electronic devices due to phone and WiFi service access and the increase in electronic device theft would be related. Even though the model results do not support the hypothesis, it could be further assumed that access to phone and WiFi service can cause certain stations to be crime radiators (Bowers, 2013), similar to the way cellular and wireless signals radiate from a tower or router. The notion of some subway stations serving as beacons for electronic device theft coincides with the risky facility concept. However, since the sign test results do not align with this hypothesis, future research – as discussed in Chapter 8 – should revisit this.

This research question does have a deeper underlying importance, though. It directly involves the evolution of electronic devices from the beginning of the study period in 2003 and the end in 2011. Since smartphones have become popular, the theft of other devices such as MP3 players, laptop computers, CD players, digital cameras, video games and DVD players have decreased. This is because smartphones can do all of the same functions in one small device. Now, as new smartphones are released, people are more likely to display/use them (on the subway) because it is fashionable to own the "next big thing" on the market.

This "showcase" behavior then alerts offenders to all of the available targets to choose from. And as the "phablet" (phone meets tablet) trend continues to create larger-sized smartphones, such as the iPhone 6 plus and Samsung Galaxy Note, the targets are becoming easier to notice.

Today, almost everyone owns an electronic device, especially a cell phone or smartphone. This relates to the literature about product life cycles and the vulnerability of stolen products (Clarke, 1999; Guerette & Clarke, 2003; Thompson, 2014). Electronic devices never quite reach a saturation point now because there is always a new device just around the corner – with new, cutting-edge features. This shorter cycle starts the CRAVED and hot products process all over every time a new release date is announced. This makes electronic devices different than other stolen products because they are always in demand (Mailley et al., 2008; Home Office, 2014).

Yet, even though electronic devices have become more technologically advanced over the years, many of the hot products and CRAVED aspects still apply – no matter if the device is a bulky Walkman or an iPhone with a kill-switch feature. The unique environment of the subway system still presents opportunities for theft to occur, no matter the device or year. This relates back to the core premise of this dissertation: the study of hot products *within* a hot environment.

Chapter 6: SPACE-RELATED RESEARCH QUESTION

6.1 Research Question 2.1

RQ 2.1 — How does electronic device theft in the subway system compare to surface-level property crimes, larcenies and robberies near stations?

a. Hypothesis

H 2.1 — Thefts will increase at stations with higher surface-level robbery, larceny and property crimes near stations.

This space-related research question asks how electronic device theft in the MBTA subway system compares to district crime rates near subway stations, as reported by the Boston Police Department. In Boston, precincts are called districts. It is hypothesized that thefts will increase at stations with higher surface-level robbery, larceny and property crimes. This relates to all three environmental criminology theories – crime pattern, routine activities and rational choice – because surface-level offenders may use the subway system when travelling to and from incident sites, which could also lead to finding opportunities to steal electronic devices within the subway environment as well.

As stated in previous chapters, past studies have found that certain crimes increase at subway stations situated in high-crime areas (Richards & Hoel, 1980; Pearlstein & Wachs, 1982; Falanga, 1988; DeGeneste & Sullivan, 1994; La Vigne, 1996a, 1996b; Block & Block, 2000). This hypothesis, however, focuses solely on the concept of subway stations serving as "crime absorbers." Bowers (2014) explains that a facility can absorb the risk of crime from its external environment. Since offenders have already chosen to look for opportunities within a suitable area, this attraction makes it likely that facilities within that area will become suitable targets too. Subway stations can qualify as absorbing facilities – whether the selection is intentional because offenders are already in the area, or unintentional because they are already using public transit.

Table 6-1. Descriptives for surface-level police district crime rates (n = 120 subway stations)

Source	Variable	Description	Minimum	Maximum	Mean	SD
Boston PD (2007)	Property Crime	Total number of property crimes	238.00	4950.00	2310.60	1294.917
	Larceny	Total number of larcenies	172.00	4009.00	1729.69	1075.657
	Robbery	Total number of robberies	6.00	436.00	160.62	129.621

Table 6-2. Negative binomial regression for 2003-2011 electronic device thefts at MBTA subway stations and surface-level police district crime rates (n = 120 subway stations)

Variable	B	(SE)	IRR	Z
Property crime	0.0015	(0.0007)	1.0015*	1.93
Larceny	- 0.0018	(0.0008)	0.9981*	- 2.12
Robbery	0.0034	(0.0020)	1.0034	1.70

*$P < 0.05$
Pseudo R^2 = .0190
Log likelihood = -364.370
Likelihood ratio chi-square = 14.10
Cronbach's α = 0.79

b. Independent variables

The independent variables are referred to as property crime, larceny and robbery (see Table 6-1). The number of property crimes in each Boston Police district with at least one subway station ranged from 238 to 4,950 (mean= 2310.60, SD= 1294.917). The number of larcenies in each Boston Police district ranged from 172 to 4,009 (mean= 1729.69, SD= 1075.657). The number of robberies in each Boston Police district ranged from 6 to 436 (mean= 160.62, SD= 129.621).

Crime definitions are outlined in the General Laws of Massachusetts (Massachusetts Legislature, 2014). Massachusetts general criminal law defines larceny as stealing property, whether such property is or is not in the person's possession. Robbery is defined as the stealing or taking of a person's property while disguised and armed or unarmed. Both types of robbery were included in the calculations for surface-level crime rates. Finally, property crimes in general are all offenses involving the theft of property, including burglary, larceny and motor vehicle theft.

c. Results: Negative binomial regression

The results of the negative binomial regression for predicting electronic device theft in Boston subway stations from surface-level police district crime rates are displayed in Table 6-2. The model is significant ($p<.01$), meaning the predictors are positively related to electronic device theft in subways when taken together. This model has a better fit since the log-likelihood (-364.370) is higher than the base model (-371.41806). The independent variables explain 1.9 percent of the variance of electronic device theft. This is likely because this approach only considers the external crime factors that contribute to internal electronic device theft.

Of the three independent variables, only property crime and larceny are significant with p-values less than 0.05. The robbery variable is not significant with a p-value greater than 0.05.

Again, as with the negative binomial regression model in Chapter 5, IRR values are used to see the percentage change in the risk of electronic device theft for each unit increase in the independent variable. The IRR value for the property crime is greater than 1, which means that on average, for every additional property crime at the surface level, electronic device theft in that police district's subway station(s) increases by .0015. The larceny variable has an IRR value that is less than 0, indicating that the number of larcenies at the surface level do not increase the number of electronic device theft at subway stations. Instead, for every additional larceny above ground, electronic device theft decreases by .9981 at subway stations within the district.

d. Discussion: Summary of key findings and linking theory

The model results do not fully support the hypothesis since only one of the three predictors are positively related. Only surface-level property crime has a positive relationship with electronic device theft at subway stations within the same police district. This could mean that stations within high-property crime districts absorb the surface-level criminal activity (Bowers, 2014), thus increasing electronic device theft at stations. Further comparison of "above vs. below" electronic device theft is needed to study this more closely, however (Newton, et al., 2014a). This finding does support the idea that the subway system environment serves as a physical facilitator (Clarke & Eck, 2005) to help offenders steal electronic devices. The thefts then become incidental offenses of using public transit to travel through the city.

The presence of larcenies above ground decrease electronic device theft at stations. This could be because subway riders take more precautions when in districts known for larcenies. They may be more careful with their electronic devices when at stations within the district. This could mean that certain external environments already deemed “risky” by potential victims actually provide a deterrent buffer zone around facilities within the areas. This finding would add on to the crime radiators vs. crime absorbers framework developed by Bowers (2014).

Chapter 7: TIME-RELATED RESEARCH QUESTION

7.1 Research Question 3.1

RQ 3.1 Does the time of day, week or year influence electronic device theft at subway stations?

a. Hypothesis

H 3.1 Thefts will increase during time periods when stations are the most busy

The only time-related question focuses on the temporal patterns of electronic device theft in Boston subways. It is hypothesized that thefts will increase when stations are the most busy/active:

- During weekdays – due to the work force and school children using public transit
- During rush hour – due to peak morning and afternoon travel
- After school dismissal times – due to school children using public transit to return home

This assumption also suggests that electronic device thefts will decrease during summer and winter months due to fewer workers and school children using public transit because of vacation breaks. This hypothesis is rooted in routine activity theory.

Past criminologists have focused on the temporal distribution of transit crime. Smith (1986) found that larceny theft on subways was mostly concentrated on weekdays during the afternoon and evening. Others found that rush hour was when a majority of thefts occurred on rail systems (Pearlstein and Wachs, 1982; Smith, 1986; Jochelson, 1994).

In order to examine these hypotheses, temporal distributions of electronic device theft in MBTA subways were organized into the following: hourly patterns, daily patterns, monthly patterns and yearly patterns.

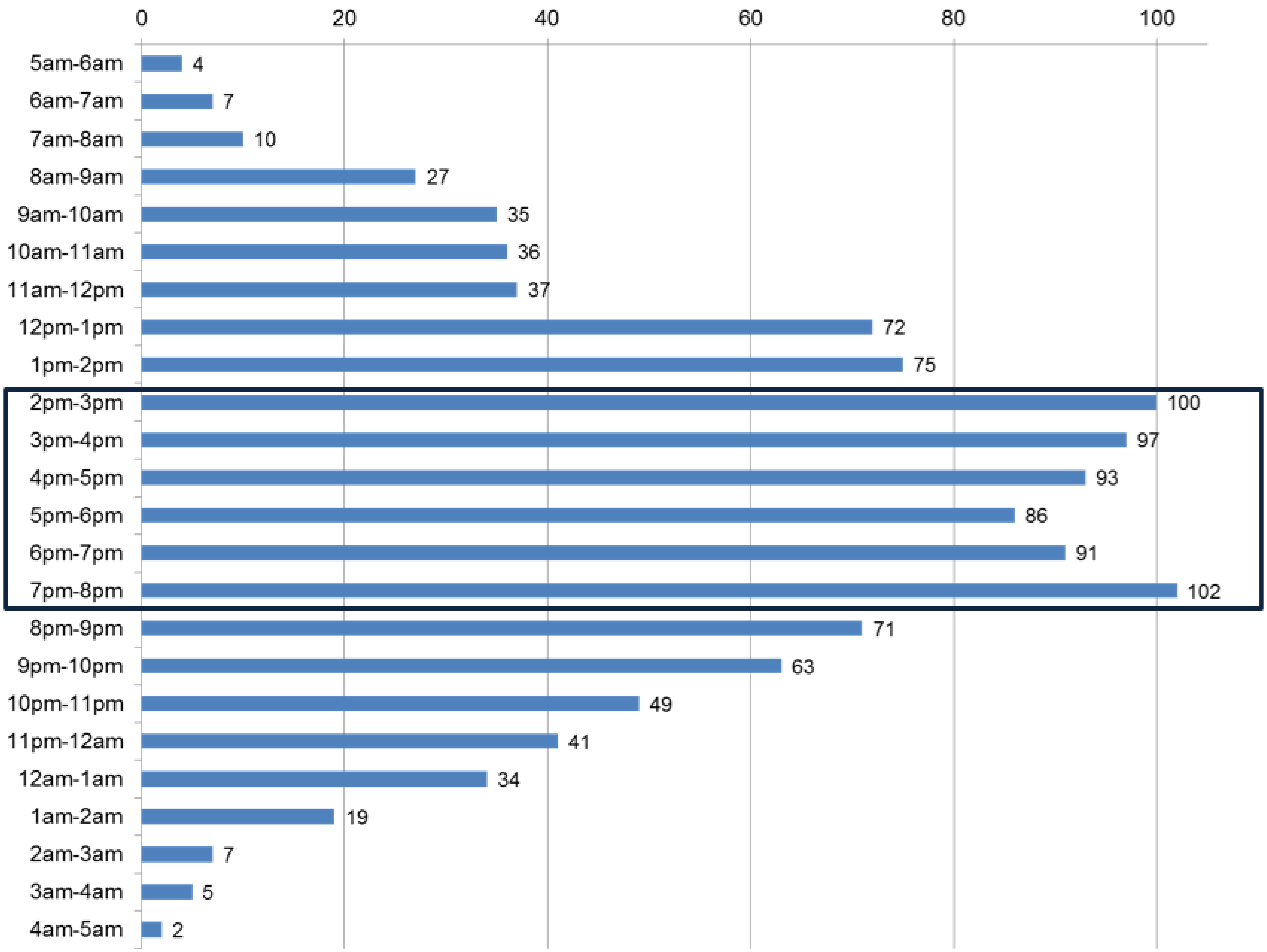


Figure 7-1. Hourly patterns of electronic device theft at MBTA subway stations, 2003-2011

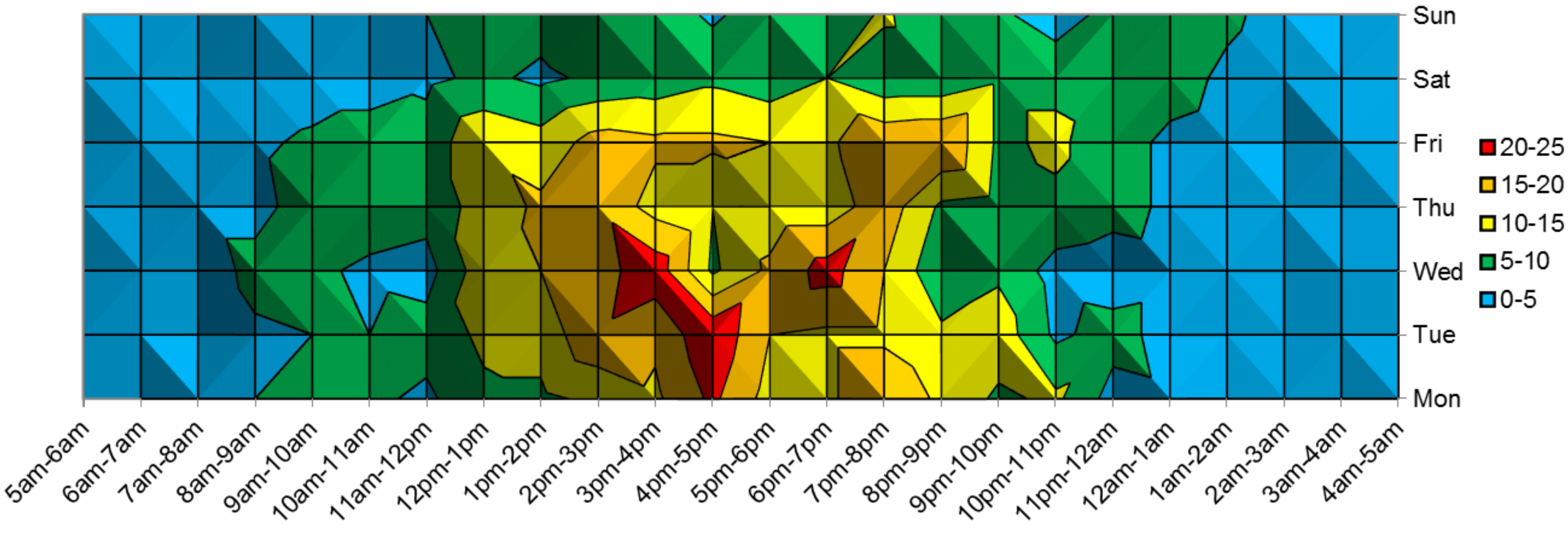


Figure 7-2. Contour chart representing hourly and daily patterns of electronic device theft at MBTA subway stations, 2003-2011

b. Results: Descriptives tables, bar charts, line graphs, contour chart

Hourly patterns

The MBTA subway system does not operate 24 hours a day (MBTA 2014a; MBTA 2014b). The first trains depart from the end-of-line stations at approximately 5:00am on weekdays; and between 4:45am-6:15am on Saturdays and Sundays. As of March 28, 2014, the last trains to depart from downtown stations leave at approximately 1:00am on Sunday through Thursday nights and approximately 2:30am on Friday and Saturday nights. The MBTA breaks down the subway schedule into the following time periods:

Morning:	5:00am – 6:30am
AM Rush Hour:	6:30am – 9:00am
Midday:	9:00am – 3:30pm
PM Rush Hour:	3:30pm – 6:30pm
Evening:	6:30pm – 8:00pm
Late Night:	8:00pm – CLOSE

This study identifies 5:00am as the start of the day for all crimes that can occur within the MBTA subway system. This time was chosen (instead of midnight) because it is the first hour of operation during weekdays; and because weekday ridership is higher than weekend ridership.

Figure 7-1 shows the hourly patterns of electronic device theft at subway stations during the study period. As noted by the selected section, crime is concentrated in the middle of the "crime day" between 2:00pm-8:00pm.

Figure 7-2 is a contour chart of both the hourly and daily patterns of electronic device theft in subway stations (see Appendix C for exact values represented in a crosstab table). Similar to Figure 7-1, thefts are concentrated in the middle of the day between 2:00pm-8:00pm, as shown in red, orange and yellow. The green and blue quadrants represent early morning and late night hours when fewer thefts occurred. This most likely is because the subway system is closed between 1:00am-5:00am.

On average, the peak time for electronic device theft in subway stations occurred around 4:00-5:00pm on Mondays and Tuesdays, as shown in red in Figure 7-2. During this time frame, about 20-25 thefts, on average, occurred. As the week progresses, the hot spot splits into two different time periods on Wednesdays – with spikes around 3:00pm-4:00pm and then again between 6:00pm-7:00pm. By Thursday and Friday, thefts were more moderate during the afternoon hours with 10 to 20 occurring each hour. Fewer thefts occurred during the afternoon hours on Saturdays and Sundays.

Table 7-1 shows the counts and percentages of electronic device theft throughout the day. It also includes summary statistics highlighting specific temporal trends. When examining robberies, Felson and Paulson (2003) calculated what they called the 5-to-5 share in order to determine the percentage of crimes that took place before, during and after the traditional work day, 5:00am-5:00pm. This study will take a different approach. Since MBTA subways are part of a public transit system, the AM rush hour and PM rush hour shares are calculated to determine the percentage of electronic device thefts that occur during peak travel times. Both follow the rush hour time periods indicated above by the MBTA: AM rush hour is between 6:30am-9:00am; PM rush hour is between 6:30pm-8:00pm.

About 40 electronic device thefts make up the AM rush hour share, which is about 3.4 percent of all thefts. The PM rush hour share is much larger, with about 147 thefts equaling 12.6 percent of all thefts. This finding suggests that electronic device theft is more problematic in the afternoon than it is in the morning.

HOUR	NUMBER OF THEFTS	PERCENT OF ALL 1,163 THEFTS	CUMULATIVE %	SUMMARY INDICATORS
5am-6am	4	0.3	0.3	MEDIAN MINUTE 4:55PM FIRST QUARTILE MINUTE 1:45PM THIRD QUARTILE MINUTE 7:58PM DAILY TIMESPAN 373 MINUTES AM RUSH HOUR SHARE 3.4% PM RUSH HOUR SHARE 12.6% HS DISMISSAL SHARE 40.8%
6am-7am	7	0.6	0.9	
7am-8am	10	0.9	1.8	
8am-9am	27	2.3	4.1	
9am-10am	35	3.0	7.1	
10am-11am	36	3.1	10.2	
11am-12pm	37	3.2	13.4	
12pm-1pm	72	6.2	19.6	
1pm-2pm	75	6.5	26.1	
2pm-3pm	100	8.6	34.7	
3pm-4pm	97	8.3	43.0	
4pm-5pm	93	8.0	51.0	
5pm-6pm	86	7.4	58.4	
6pm-7pm	91	7.8	66.2	
7pm-8pm	102	8.9	75.1	
8pm-9pm	71	6.1	81.2	
9pm-10pm	63	5.4	86.6	
10pm-11pm	49	4.2	90.8	
11pm-12am	41	3.5	94.3	
12am-1am	34	2.9	97.2	
1am-2am	19	1.6	98.8	
2am-3am	7	0.6	99.4	
3am-4am	5	0.4	99.8	
4am-5am	2	0.2	100	

Table 7-1. Counts and percentages; and summary indicators for electronic device theft at MBTA subway stations, 2003-2011

High school dismissal times are also considered for this study. High school dismissal times in the Boston area range from 1:45pm-3:55pm Monday-Thursday. Several high schools have early dismissal on Fridays, some as early as 11:25am (Boston Public Schools, 2014a). Given this, the high school dismissal share is calculated as all thefts that occur between 11:00am-5:00pm. This allows for travel and potential offending time both before and after dismissals throughout the week.

Given this calculation, the high school dismissal share consists of 475 thefts – or 40.8 percent of all thefts in the study period. This finding reiterates that electronic device thefts and school dismissal times are related.

The median crime time is 4:55pm, which is still considered the afternoon and not the evening. The daily crime span between the first quartile minute (1:45pm) and third quartile minute (7:58pm) is 373 minutes. This equals 6 hours and 13 minutes. This range could relate to Felson and Boba (2010), who discuss the narrow crime spans of juveniles during after-school hours. The authors note that when schools dismiss students in the afternoon on weekdays, these large groups of youths are "dumped" into the community – causing an increase in violent offenses and assault victimization anytime between 1:00pm and 6:00pm. Although a different offense type, the timing of criminality and victimization is consistent with the current study's findings.

TYPE OF DAY	NUMBER OF THEFTS	PERCENTAGE OF ALL 1,163 THEFTS
SCHOOL DAY	739	63.5
NON-SCHOOL DAY	424	36.5
TOTAL	**1,163**	**100**

Table 7-2. Day type with counts and percentages of electronic device theft at MBTA subway stations, 2003-2011 (n = 1,163)

Daily patterns

Electronic device thefts occur more during the week than the weekend, as indicated in Figure 7-2. When considering school days vs. non-school days, there are more electronic device thefts when school is in session than when it is not (see Table 7-2). Using Boston Public Schools 2003-2011 academic calendars, "school days" are weekdays during the school year when classes are held and "non-school days" are during holiday/administrative breaks, weekends and summer vacation (Boston Public Schools, 2014b).

Of all days when electronic device theft occurred during the study period (*n*= 931), 60.9 percent were school days (*n*= 567) and 39.1 percent were non-school days (*n*= 364). Figure 7-3 shows that electronic device thefts peak on subways around 2:00-3:00pm on school days and 4:00-5:00pm on non-school days.

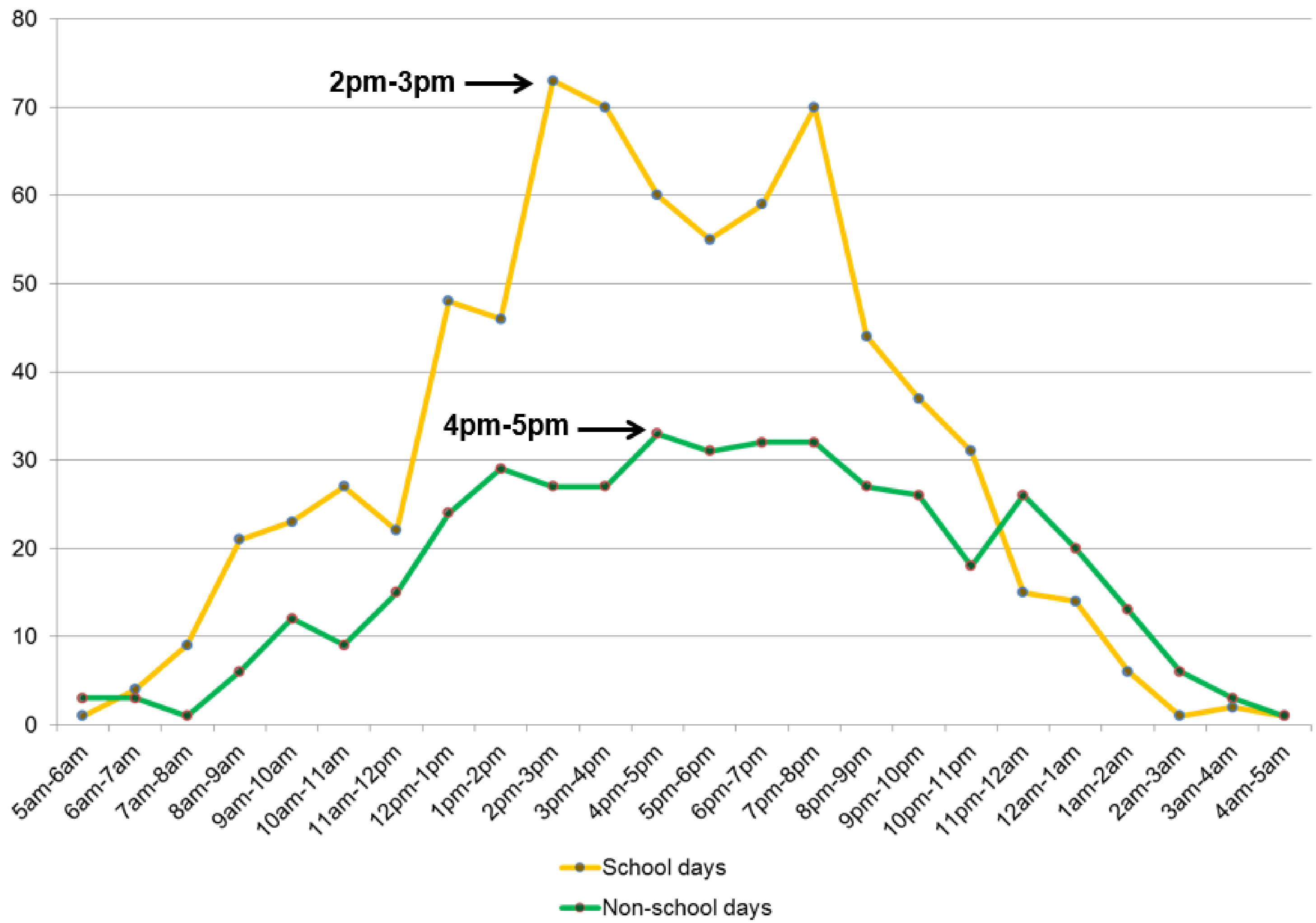


Figure 7-3. Hourly patterns of electronic device theft at MBTA subway stations on school days vs. non-school days

	MONTH OF YEAR	NUMBER OF THEFTS	PERCENTAGE OF ALL 1,163 THEFTS
	DECEMBER	113	9.7
WINTER 23.7%	JANUARY	80	6.9
	FEBRUARY	83	7.1
	MARCH	97	8.3
SPRING 23.8%	APRIL	82	7.1
	MAY	98	8.4
	JUNE	82	7.1
SUMMER 19.9%	JULY	66	5.7
	AUGUST	84	7.2
	SEPTEMBER	109	9.4
FALL 32.5%	OCTOBER	138	11.9
	NOVEMBER	131	11.3
	TOTAL	**1,163**	**100**

Table 7-3. Monthly counts and percentages of electronic device theft at MBTA subway stations, 2003-2011 (n = 1,163)

Monthly patterns

In order to examine trends of seasonality, years must be separated into seasons. When studying the clustering of offenses over time in Stockholm, Uittenbogaard and Ceccato (2012) defined the seasons as winter (December, January, February); spring (March, April, May); summer (June, July, August); and fall (September, October, November).

Using this approach, it is evident that there are seasonal patterns regarding electronic device theft at MBTA subway stations (see Table 7-3). Most thefts occur in the fall (32.5 percent). The number of thefts are comparable during the spring (23.8 percent) and winter (23.7 percent); and the least amount of thefts occur in the summer (19.9 percent).

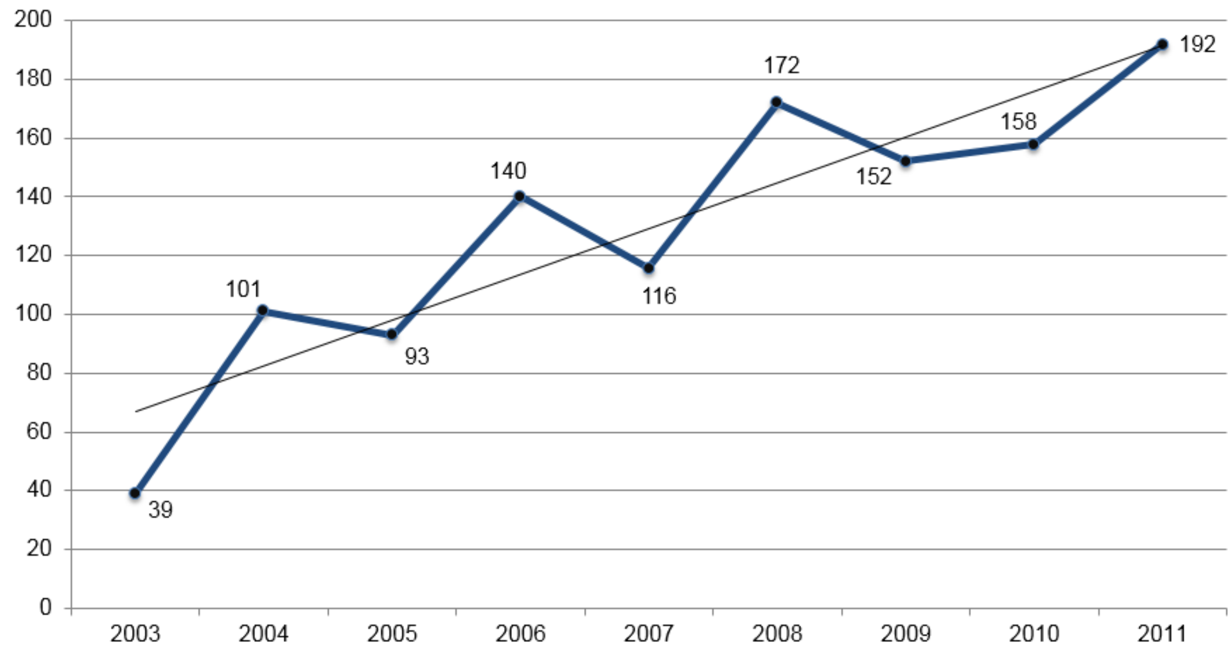


Figure 7-4. Yearly patterns of electronic device theft at MBTA subway stations, 2003-2011

Yearly patterns

Tracking the patterns of crime over the years allows researchers to see if the phenomenon has increased, decreased or fluctuated. Since 2003, electronic device theft at MBTA subway stations has gradually increased (see Figure 7-4). Between 2003-2009, there was a stair-step pattern with thefts being above the trend line in even years and below the trend line in odd years. Yet between 2009-2010, the number of yearly thefts dipped. In 2011, thefts increased again and surpassed previous yearly highs.

c. Discussion: Summary of key findings and linking theory

It is important to understand the temporal patterns of criminal events. In fact, time is an integral part of routine activity theory. The word “routine” suggests that there is a temporal sequence of behavior that is repeatedly performed, such as work, school and recreation schedules. This creates a rhythm. The convergence of victims and offenders in activity spaces relies on time and crime rhythms (Clarke & Eck, 2005; Felson, 2006).

Just as time is part of the environmental criminology fabric, it is also central to the MBTA subway system – because like any public transit system, Boston subways run on a schedule. The time it takes for a subway car to travel between stations is predetermined and recorded by transit officials. The same can be said for the amount of time a subway car waits at a station during a stop. Passengers depend on these time tables during their routine activities. Delays and interruptions in service can alter a passenger’s plan for the day, therefore reliability is essential. It can be surmised that offenders also take into account subway schedules when committing offenses in the subway system.

Identifying hourly, weekly and monthly trends can assist police in crime prevention measures and awareness campaigns. Not only can transit police warn potential victims about *how* electronic device thefts occur at subway stations (as covered by the crime scripts in Chapter 5); or *where* electronic device thefts occur (as exemplified by the field photos in Chapter 5 and regression models in Chapters 5 and 6), but they can also indicate timeframes *when* individuals are most-at risk.

The above sections explaining temporal patterns show that electronic device thefts at MBTA subway stations are concentrated in the afternoon (during PM rush hour and after school), on weekdays and during the fall. These results reject the null hypothesis.

The afternoon/evening weekday hours from 2:00-8:00pm probably have the most theft because this is when school children are dismissed and when most workers leave their jobs. This pushes a high number of potential victims and offenders into the subway system. This type of theft concentration is considered a “focused hotspot” since it is a period of a few hours (Ratcliffe, 2004). The increase in electronic device thefts during the PM rush hour also coincides with a study exploring personal property offenses in the London Underground (Newton et al., 2014a).

The literature states, in general, there is often a higher rate of offenses on school days than non-school days (Herrmann, 2012; Felson & Boba, 2010). Interestingly, Braga (2004) found that most Boston youth gun violence is concentrated after school dismissal times as well. This pattern of criminality is also at work in the city’s subways. “When you get high school kids and college students coming and going at the same subway station, they’re either going to be a victim or doing the stealing,” said a male MBTA transit police officer (personal communication, October 5, 2013). This comment directly relates to the concept of magnetic facilities, which is discussed in Chapter 2. When school is dismissed on weekdays, youths are drawn to subway stations like magnets. Since some subway stations lack formal adult supervision, this can lead to “juvenile offender convergence” (Bichler et al., 2010) – and subsequent electronic device theft.

The fact there were fewer electronic device thefts on subways during June, July, August contradicts past transit crime literature – which suggests theft from underground subway passengers is the highest during summer months (Smith, 1986). Yet, the current findings do support recent studies which have found patterns of crime seasonality on the surface-level. Andresen and Malleson (2013) report that thefts peak in both the summer and fall, when studying various crime types in Vancouver, Canada.

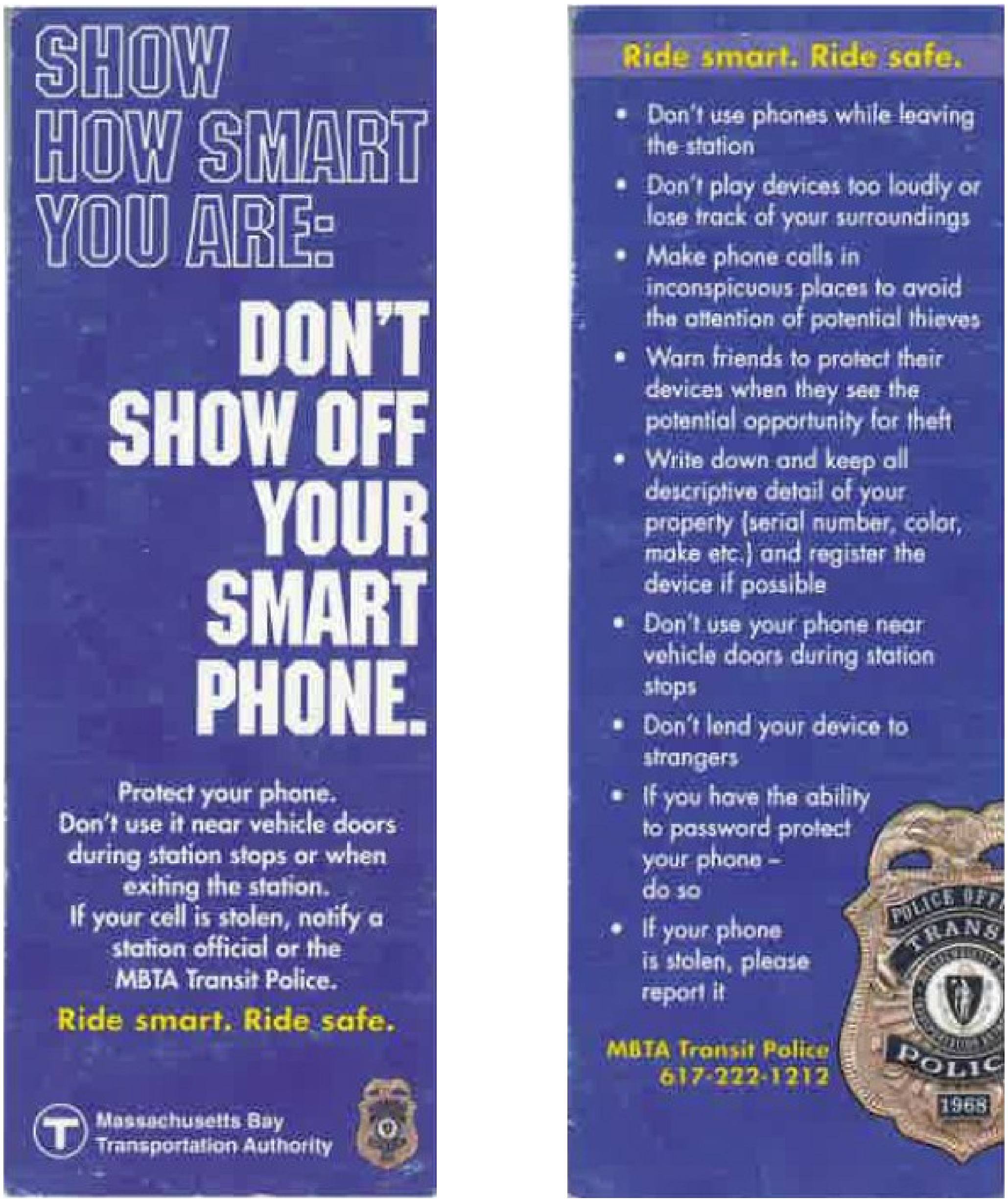
Chapter 8: CONCLUSIONS

8.1 Contributions

a. Recommendations and policy implications

Electronic device theft happens in above-ground areas too, not just in transit systems. Multiple law enforcement agencies have developed campaigns and prevention techniques to help thwart the problem. In 2003, the Metropolitan Police Service (MPS) rolled out Operation Ringtone in London. The initiative increases police officer patrols in mobile phone theft hotspots, while also raising awareness with "love your phone" posters in local cafes, bars and businesses (Tilley, Smith, Finer, Erol, Charles, & Dobby, 2004). The NYPD started using undercover stings in 2011 to expose the black market side of electronic device theft. Plain-clothes officers visit local businesses known to engage in illegal dealings; they tell employees that they are willing to sell stolen devices in exchange for cash. Those who agree are caught on tape and arrested (CBS 2 New York, 2011). The same year, the NYPD also used plain-clothes officers in decoy stings on MTA subways. In those instances, the officers acted as vulnerable subway passengers with expensive devices to tempt motivated offenders (Gardiner, 2011).

The MBTA Transit Police has published safety tips in an attempt to prevent electronic device theft in Boston subways (MBTA, 2012a). Their "show how smart you are" campaign urged passengers not to "show off" their smartphones. Tips suggested that passengers ride smart by keeping devices out of sight (see Photo 8-1). Yet, in recent years it seems that the MBTA administration and the MBTA Transit Police are encouraging passengers to use their devices while inside the subway system more and more.



Source: MBTA

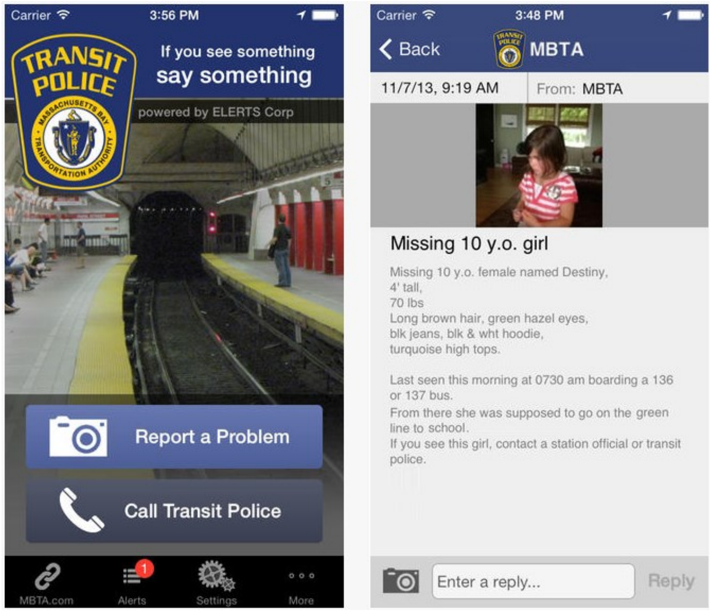
Photo 8-1. Mobile phone theft awareness, MBTA Transit Police flier

Photo 8-2. Best Buy Express kiosk at Back Bay subway station

In October 2010, the MBTA (2010) announced that various smartphone apps had been developed to display real-time tracking data on the Red, Orange and Blue subway lines. This capability was expanded to the Green Line in October 2014 (MBTA, 2014c). Since the subway system already had WiFi and cell service at a majority of stations when the apps were released, this easily allowed passengers to see arrival and depart times of trains while underground.

In November 2010, another milestone was reached when the Forest Hills and Alewife stations both received Best Buy Express kiosks, vending machines that distribute electronic devices and accessories (Grillo, 2010). Some of the for-sale items include phones, iPods, cameras, GPS systems, chargers and headphones (see Photo 8-2). It is interesting that both Forest Hills and Alewife are on the Top 24 stations list with the most 2003-2011 electronic device theft – #3 and #10 respectively (see Chapter 5). The kiosks have since been added to additional subway stations.

In April 2012, the MBTA became the first rail system in the world to launch smartphone ticketing, allowing passengers to purchase passes online via their phones and redeem them later using a barcode for train conductors to scan (MBTA, 2012b). The mobile ticketing passes – known as mTicket – can only be used on the MBTA commuter rail and ferries, and not the city subways or buses. Yet, this may change in coming years since other cities, such as Portland, Oregon, are now using mobile ticketing for buses and trains – while Chicago and San Francisco are considering it (Rose 2013; Wronski, 2014; Cabanatuan, 2014).



Source: MBTA

Photo 8-3. See Say iPhone app, MBTA Transit Police (iTunes)

In May 2012, the MBTA Transit Police released the "See Say" iPhone app, which allows passengers to anonymously report suspicious activity via text, photo or phone call (MBTA, 2012c). The launch made the MBTA the first transit system in the U.S. to incorporate a smartphone app that is also part of the "if you see something, say something" Department of Homeland Security national campaign. The app, which automatically disables the phone's flash in order to be discrete, is also unique because it allows for passengers to engage in two-way communication with a transit police dispatcher in real-time (see Photo 8-3).

While all of these advancements are appreciated by passengers and officials alike, they also seem to contradict crime prevention measures that instruct riders not to display or use their devices on the subway. This encouragement could be counterintuitive to any place-based crime prevention techniques used at problem stations with electronic device theft. At the same time, it is difficult to assume that passengers will ever stop using their electronic devices in subways now that the practice has become so common place.

To summarize, this study identified the top 24 subway stations where electronic device theft is concentrated. Officials should utilize this list to consider the different types of snatch, pickpocket and robbery crime scripts offenders may use at areas within these “risky” stations, such as mezzanine areas, platform areas and subway cars. Additionally, it was found that certain subway station characteristics increase electronic device theft at stations (that may or may not be included on the top 24 list), such as higher ridership, terminus stations, bus connections and stations on the Orange Line. Prevention efforts should be focused at stations that fit these characteristics and are also located within BPD districts with high surface-level property crime.

The most appropriate time to implement future crime prevention measures at these stations is during “hot times” on Mondays and Tuesdays from 4:00pm-5:00pm; and on Wednesdays from 3:00pm-7:00pm when Boston Public Schools are in session. This comprehensive and targeted approach will save time and resources, while hopefully reducing the number of electronic device thefts at subway stations system-wide. But the first step would be making it mandatory for victims to report (and police to collect) electronic device model, type, service provider, color, memory capacity, retail value, IMEI number and other device-specific information. This will aid in future crime analysis, hotspot identification and retrieval measures.

8.2 Limitations

There are limitations to be considered. The use of incident records collected by police can be problematic because they are collected for administrative purposes and not for research. These files may also be incomplete or contain errors. Since the data used for this study only includes reported thefts, there may be more electronic device thefts than we know. It is also difficult to distinguish between offender and victim influences when using police reports.

Regarding methodology, there may be alternative internal explanations for electronic device theft at subway stations that were not covered in Chapter 5. Crime scripts for offenders can also change as new devices fitted with more aggressive theft-prevention measures are implemented. Additionally, sign tests may not be the most powerful statistical tool available to examine the impact of phone and WiFi service. Using police districts as a unit of analysis in Chapter 6 may be problematic if there are multiple subway stations within a police district; or if most of the surface-level crimes do not actually occur near subway stations. Another limitation can be the presence of multi-collinearity since the property crimes variable consists of both robberies and larcenies, two other model variables.

As for reliability of the observations of passenger electronic device use within subway stations, only one researcher took field notes of behaviors occurring on the mezzanine and platform levels and within subway cars. This individualized approach could have skewed the observations by only representing personal viewpoints.

Lastly, it may be difficult to account for the increase in electronic device theft when compared to the overall increase in electronic device ownership and use in subways. This is especially true for cell phones, which have evolved throughout the study period into smartphones; and have become an integral part of subway passengers' commuting experience.

8.3 Future Research

Future research on this topic can relieve some of the limitations described above. In order to truly understand the total amount of electronic device theft that occurs in MBTA subways, a victimization survey may be collected as a supplement. The surveys could ask victims about their device use and whether or not they believe their behavior puts them at risk for electronic device theft. The questions could also gauge passengers' fear of theft. Additionally, interviewing offenders arrested for electronic device theft would be useful to learn more about crime scripts and theft tactics used at subway stations and in subway cars. These surveys could also help authorities learn about additional electronic device thefts that were not reported.

It may also be pertinent to examine electronic device thefts as separate crime offenses: such as larcenies vs. robberies. That would entail collecting and organizing police data under those two categories. As for the influence of the surface-level environment, future studies should further question what makes certain MBTA subway stations magnetic facilities by examining the presence of public schools within a quarter mile of the top 24 stations with the most electronic device theft – especially since this study found that a majority of thefts occur on school days and spike during school dismissal times. This is also supported by Herrmann (2012) who found that robberies are concentrated at subway stations near high schools around 3pm.

Studying electronic device theft before and after kill-switch technology and blacklists with stolen phones became standard may help police understand the evolving crime scripts of offenders. Future studies should also consider electronic device thefts that occur on subway cars moving between stations. In order to examine risk, future research would benefit from using multiple researchers to properly code and observe locations within the subway car environment, such as seating areas, standing areas and areas near or further away from exit doors.

This approach could also apply Gill and associate's (2014) interstitial crime analysis in the United States. On the same note, since this has become a crime trend in cities around the world, it would be beneficial to do a comparative analysis with U.S. and international public transit systems.

Finally, as manufactures become more innovative and electronic devices continue to evolve, it would be useful to compare theft rates of various "new-age" devices.
For example, one could examine if wearable electronic gadgets such as Google Glass (glasses), Apple Watch (watches) and Nike FuelBand (bracelets) are stolen at the same rate in subways as devices that are not wearable. This approach would revisit the "removable" aspect of the CRAVED concept.

This study contributes to environmental criminology literature and transit crime research. By focusing on hot products *within* hot environments, the concepts of crime and place and CRAVE-able items are expanded. From a practitioner's standpoint, the major impact of studying electronic device theft within the MBTA subway system is that transit police will be able to better identify problem stations, lines and locations. By addressing this issue, the problem-oriented policing approach will be used. This strategy applies problem-solving methods through scanning, analysis, response and assessment – with the goal being long-term crime prevention.

This will be beneficial for law enforcement agencies in various countries that are experiencing this crime trend. Prevention of electronic device theft can also lead to a diffusion of benefits – preventing, decreasing or blocking other crimes such as identity theft, the illegal selling of stolen electronic devices, assault within the subway system and crimes against transit employees. Also, riders will have a better sense of how, where and when to protect themselves against electronic device theft.

NOTES

1. Adapted from Transit Security: A Description of Problems and Countermeasures (1997) by U.S. Department of Transportation - Federal Transit Administration and Secure and Tranquil Travel: Preventing Crime and Disorder on Public Transport (2006) by M. Smith and D. Cornish (eds.).

2. National transit crime data is not often compiled or readily accessible for analysis (Transit Cooperative Research Program, 2001). Despite this, the most recent compilation of transit crime statistics indicates that there were 52,123 reported thefts of property on heavy rails (including subways) since 2000 (U.S. Department of Transportation - Federal Transit Administration, 2011).

Reported Thefts of Property on Heavy Rails in the United States, 2000-2010

Year	**Number of Property Crimes**
2000	7,856
2001	7,807
2002	7,158
2003	4,802
2004	4,396
2005	2,204
2006	2,527
2007	4,121
2008	4,053
2009	4,695
2010	2,504
	Total: 52,123

Source: U.S. Department of Transportation, Bureau of Transportation Statistics

3. The incident-level police reports from the MBTA Transit Police used for this study do not include the arrival subway station and departure subway station for each of the 1,163 electronic device thefts. Therefore, ICA could not be used. Chapter 9 discusses recommendations for future research using ICA.

4. See Eck, Clark & Guerette (2007) for comprehensive list of past risky facilities studies.

5. The grade level classifications provided by CTPS were modified as follows:

- Above ground – combined CTPS classifications: above ground, open cut, covered cut, light rail with reservation in street/in traffic.
- Elevated – combined CTPS classifications: elevated and elevated embankment
- Underground – (no changes)

According to CTPS, above ground stations have a dedicated right-of-way. Open cut stations have trains that run along the bottom of an outdoor trench. Covered cut stations are built over the trench. Light rail stations are on the street level and are grouped by those with reservation areas in the street or in traffic. These four different classifications were combined to create a general "above ground" grade level.

According to CTPS, elevated stations have a bridge structure with the tracks built on it, while elevated embankment stations have tracks running along dirt that has been piled up on a gradual incline and walled in on each side; with short bridges enabling traffic to pass underneath. These two different classifications were combined to create a general "elevated" grade level.

APPENDIX A. Research questions and method matrix

1) Transit Features

Research Question	Hypotheses	Derived from	Analytical Strategy
1. Which subway station features are associated with higher rates of electronic device theft?	Thefts will increase at stations with higher ridership, bus connections, parking lots. Thefts will also increase at above-ground and terminus stations; and on subway lines with more stations.	Crime Pattern Theory	Negative Binomial Regression
2. Which locations within subway stations and subway cars are the most at-risk of electronic device theft?	Crowded areas, secluded areas and areas near subway car exits/ stairs are the most at-risk	Rational Choice Theory	Crime Script Analysis Field Observations
3. How has the introduction of phone and WiFi service on subway lines influenced electronic device theft?	Thefts will increase on subway lines after phone and WiFi service are introduced	Crime Pattern Theory Routine Activity Theory	Sign tests

2) Space

Research Question	Hypotheses	Derived from	Analytical Strategy
1. How does electronic device theft in the MBTA subway system compare to surface-level property crimes, larcenies and robberies near stations?	Thefts will increase at stations with higher surface-level robbery, larceny and property crimes near stations	Crime Pattern Theory Routine Activity Theory Rational Choice Theory	Negative Binomial Regression

3) Time

Research Question	Hypotheses	Derived from	Analytical Strategy
1. Is the time of day, week or year related to electronic device theft at subway stations?	Thefts will increase during time periods when stations are the most busy	Routine Activity Theory	Descriptive Tables Bar Charts Line Graphs Contour Chart

APPENDIX B. Average weekday ridership totals per station and ridership ranking

STATION	AVERAGE WEEKDAY RIDERSHIP	RIDERSHIP RANK
DOWNTOWN CROSSING	23,500	1
SOUTH STATION	21,432	2
HARVARD	19,640	3
PARK STREET	19,348	4
NORTH STATION	16,124	5
BACK BAY	15,748	6
CENTRAL	13,537	7
COPLEY	13,536	8
KENDALL	12,518	9
FOREST HILLS	12,251	10
STATE	12,095	11
DAVIS SQUARE	10,856	12
GOVERNMENT CENTER	10,802	13
MALDEN CENTER	10,106	14
ALEWIFE	10,047	15
HAYMARKET	9,875	16
MAVERICK	9,640	17
CHARLES	9,016	18
HYNES	8,842	19
ARLINGTON	8,298	20
SULLIVAN SQUARE	8,281	21
PORTER SQUARE	8,069	22
KENMORE	7,797	23
BOYLSTON	7,566	24
RUGGLES	7,374	25
QUINCY CENTER	7,112	26
JFK/UMASS	7,018	27
WELLINGTON	6,816	28
NORTH QUINCY	6,560	29
LECHMERE - E LINE	5,792	30
ASHMONT	5,675	31
OAK GROVE	5,437	32
TUFTS MEDICAL CENTER	5,397	33
WONDERLAND	5,355	34
CHINATOWN	5,091	35
ANDREW	5,063	36
MASS AVE STATION	4,613	37
JACKSON SQUARE	4,432	38
QUINCY ADAMS	4,390	39
WOLLASTON	4,225	40

AQUARIUM	4,170	41
COOLIDGE CORNER-C LINE	4,150	42
HARVARD AVE - B LINE	4,077	43
BROADWAY	3,829	44
LONGWOOD MEDICAL AREA- E LINE	3,800	45
BRAINTREE	3,769	46
AIRPORT	3,670	47
ORIENT HEIGHTS	3,545	48
BROOKLINE VILLAGE- D LINE	3,512	49
FIELDS CORNER	3,480	50
PRUDENTIAL- E LINE	3,430	51
RESERVOIR - D LINE	3,395	52
ROXBURY CROSSING	3,380	53
COMMUNITY COLLEGE	3,327	54
GREEN ST	3,159	55
FENWAY-D LINE	3,041	56
NORTHEASTERN UNIVERSITY - E LINE	3,007	57
BU EAST- B LINE	2,862	58
BLANFORD ST -B LINE	2,840	59
REVERE BEACH	2,789	60
STONY BROOK	2,775	61
LONGWOOD- D LINE	2,749	62
WOOD ISLAND	2,646	63
BRIGHAM CIRC-E LINE	2,535	64
BU CENTRAL-B LINE	2,524	65
BEACHMONT	2,494	66
MATTAPAN	2,238	67
RIVERSIDE- D LINE	2,023	68
ST. MARY'S - C LINE	1,970	69
SHAWMUT	1,891	70
SYMPHONY-E LINE	1,887	71
BABCOCK STREET- B LINE	1,824	72
WASHINGTON ST-B LINE	1,723	73
MUSEUM OF FINE ARTS- E LINE	1,676	74
SAVIN HILL	1,661	75
BROOKLINE HILLS- D LINE	1,654	76
WARREN STREET- B LINE	1,650	77
PACKARD'S CORNER- B LINE	1,571	78
CLEVELAND CIRCLE- C LINE	1,557	79
NEWTON CENTER- D LINE	1,487	80
BOWDOIN	1,295	81
GRIGGS ST - B LINE	1,260	82
WASHINGTON SQUARE - C LINE	1,217	83
SUMMIT AVE- C LINE	1,175	84
ALLSTON ST-B LINE	1,115	85

NEWTON HIGHLAND- D LINE	1,052	86
SCIENCE PARK - E LINE	1,047	87
WOODLAND- D LINE	1,044	88
BOSTON COLLEGE-B LINE	1,042	89
PLEASANT ST-B LINE	1,014	90
ST. PAUL - C LINE	935	91
SUTHERLAND RD-B LINE	923	92
BU WEST-B LINE	899	93
BEACONSFIELD- D LINE	896	94
CHESTNUT HILL AVE-B LINE	861	95
TAPPAN STREET - C LINE	837	96
ST PAUL - B LINE	814	97
CHESTNUT HILL-D LINE	778	98
SUFFOLK DOWNS	756	99
CHISWICK RD-B LINE	735	100
CENTRAL AVE	733	101
RIVERWAY- E LINE	664	102
HEATH STREET- E LINE	622	103
ELIOT- D LINE	595	104
ENGLEWOOD AVE - C LINE	585	105
FAIRBANKS - C LINE	585	106
KENT STREET - C LINE	510	107
MISSION PARK-E LINE	462	108
WABAN- D LINE	427	109
HAWES STREET - C LINE	426	110
FENWOOD ROAD- E LINE	343	111
BRANDON HALL- C LINE	316	112
DEAN ROAD- C LINE	316	113
MILTON	300	114
SOUTH STREET- B LINE	237	115
BUTLER	234	116
CEDAR GROVE	127	117
BACK OF THE HILL- E LINE	86	118
CAPEN ST	74	119
VALLEY ROAD	48	120

Source: MBTA (2007)

APPENDIX C. Crosstab table representing hourly and daily patterns of electronic device theft at MBTA subway stations, 2003-2011

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
5am-6am	0	1	0	1	0	1	1
6am-7am	0	1	2	1	2	1	0
7am-8am	3	0	1	3	2	0	1
8am-9am	5	4	7	3	4	1	3
9am-10am	6	5	6	8	6	2	2
10am-11am	6	5	4	8	8	2	3
11am-12pm	4	7	3	7	7	4	5
12pm-1pm	9	11	13	12	14	6	7
1pm-2pm	9	12	15	16	12	4	7
2pm-3pm	11	19	18	19	17	6	10
3pm-4pm	14	16	23	13	16	7	8
4pm-5pm	21	24	9	10	16	9	4
5pm-6pm	13	15	16	12	15	7	8
6pm-7pm	14	14	22	12	14	10	5
7pm-8pm	19	14	15	18	19	6	11
8pm-9pm	14	11	6	9	20	6	5
9pm-10pm	9	13	9	8	9	9	6
10pm-11pm	11	4	3	9	11	9	2
11pm-12am	3	7	2	7	7	8	7
12am-1am	4	3	3	4	4	7	9
1am-2am	1	1	2	2	3	4	6
2am-3am	1	0	0	1	0	2	3
3am-4am	0	1	1	0	2	1	0
4am-5am	1	0	1	0	0	0	0
TOTAL	**178**	**188**	**181**	**183**	**208**	**112**	**113**

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