Measuring the Effects of Crime on Walking in New Jersey

MÁSDAT

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About

This report was developed by the Bicycle and Pedestrian Resource Center within the Alan M. Voorhees Transportation Center (VTC) at Rutgers, The State University of New Jersey. The research team included Devajyoti Deka, Ph.D., Charles Brown, MPA, Lisa Cintron, and James Sinclair.

The Alan M. Voorhees Transportation Center (VTC) is a national leader in the research and development of innovative transportation policy. Located within the Edward J. Bloustein School of Planning and Public Policy at Rutgers University, VTC has the full array of resources from a major research university on transportation issues of regional and national significance.

The New Jersey Bicycle and Pedestrian Resource Center (BPRC) assists public officials, transportation and health professionals, and the public in creating a safer and more accessible walking and bicycling environment through primary research, education and dissemination of information about best practices in policy and design. The Center is supported by the New Jersey Department of Transportation through funds provided by the Federal Highway Administration.

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Introduction

Published literature on walking provides evidence of its undeniable benefits. Walking is a physical activity proven to improve health that can be easily performed in any environment with no specialized skills, training or facilities required. Despite widespread knowledge of the physical health and psychological benefits of walking, many Americans prefer not to walk at all in their daily lives. The propensity and frequency of walking in low-income and minority neighborhoods is far less than other neighborhoods, where people suffer disproportionately from ailments that can be prevented by walking.

Despite low-income and minority neighborhoods being more conducive to walking because of grid street systems, sidewalks, and stores, people in such neighborhoods often walk less than other neighborhoods. Researchers often suggest that fear of crime is the cause of this low propensity for walking in low-income and minority neighborhoods. However, studies on the relationship between crime and walking have often been inconclusive and contradictory. Some studies found that crime and fear of crime affect recreational walking but not transportation walking, whereas other studies found that crime affects transportation walking but not recreational walking, and vet other studies found no evidence of crime or fear of crime affecting recreational walking or transportation walking.

With that background, this study examines the association between police-reported violent crime and daily walking duration for recreation and transportation for a predominantly low-income and minority region of New Jersey located about 15 miles west of New York City. Much of the study area consists of the City of Newark, but it also includes the Township of Bloomfield and the Township of Verona, located northwest of Newark (see Figure 1).

Newark is the largest of the three municipalities with a population of approximately 282,000, followed by Bloomfield with 49,000, and Verona with 14,000 residents. Non-white persons in the three municipalities consist of approximately 74%, 40%, and 9%, respectively. The share of people in poverty in the three municipalities is 29%, 8%, and 3%. With a violent crime rate of 937 per 100,000 persons, Newark ranked 8th among the 491 of New Jersey's 565 municipalities for which 2016 crime data are available from the FBI's Uniform Crime Reports. Bloomfield ranked 141st and Verona ranked 383rd. Although the populations of Bloomfield and Verona are economically better off than the population of Newark, the two municipalities were included to add heterogeneity to the neighborhoods to be analyzed. Furthermore, like Newark, geocoded crime data was available for the two municipalities from their police departments.

To examine the relationship between crime and walking, an intercept survey was conducted at 87 randomly selected intersections of the three municipalities. In addition, street audits were conducted for the areas where surveys were distributed. Data from the 2015 American Community Survey (five-year summary) was also used.

Data Collection

The Intercept Survey

The intercept survey was conducted in the summer and early fall of 2017. The intercept survey method was chosen over a random-digit dialing telephone survey because of the exorbitant cost of the latter. The intercept locations were chosen by a random sampling method with an emphasis on heterogeneity of the locations. In the first step, all intersections within the three municipalities were geocoded. In the second step, the census block groups where the intersections were located were identified. In the third step, by using 2015 American Community Survey (ACS) data, the socioeconomic characteristics of the populations of the census block groups were attached to the intersections located therein. When intersections were located at the border of multiple block groups, the average for the block groups was attached to the intersections. The intersections were then divided into three equal groups based on block group socioeconomic status: high status, medium status, and low status. Education, race, and income were used as indicators of socioeconomic status with equal weight for each indicator. In the fourth step, an equal number of intersections was selected by simple random sampling from the three socioeconomic classes. The selection was done separately for each municipality. Investigators were allowed to roam within blocks of the selected intersection for the purpose of intercepting

Figure 1. Intercept Survey Locations

people on sidewalks. The intersections where surveys were distributed are shown in Figure 1.

Survey agents intercepted respondents at or near 87 intersections, of which 48 (55%) were in Newark, 30 (35%) were in Bloomfield, and the remaining 9 (10%) were in Verona. The survey was taken by 1,173 adults aged 18 or over, of which 819 (70%) were from Newark, 236 (20%) were from Bloomfield, and 118 (10%) were from Verona. For comparison, the population of Newark, Bloomfield, and Verona are 82%, 14%, and 4%, respectively. Thus the number of respondents from the largest municipality was the highest and the number of respondents from the smallest municipality was the lowest, but the respondent proportions were not identical with population proportions primarily because of deliberate oversampling in Bloomfield and Verona.

Out of the 1,168 respondents who provided information about their home and work location, 69% lived or worked within a mile of the location where they were intercepted. Among those who lived in the area, 56% lived there for 5 years or longer. In both Newark and Bloomfield, the share of respondents living in the area that long was 54%, but in Verona, the share was as high as 71%. Only 10% of the respondents in the three municipalities combined lived in the area for less than six months.

Most of the respondents were either walking to or from their homes when they were intercepted. The other common origins and destinations were shopping, work, transit stations, and parks/playgrounds.

Street Audits

The students who collected and distributed intercept surveys also collected data on the built environment surrounding each surveyed intersection by using the Built Environment Assessment Tool presented by the Centers for Disease Control and Prevention (2015). At each survey location, data was collected on roadway infrastructure (lanes, signals, speed limits, etc.), pedestrian infrastructure (sidewalk width, crosswalk type, ADA access, etc.), type and condition of amenities (trees, garbage cans, bus shelters, etc.), driver behavior (speeding, failing to yield, etc.), and police presence. Additional data was collected on indicators such as the presence of graffiti, loitering, litter, vandalism, abandoned properties, and noise. Scores were estimated for each location from the collected data using criteria provided by the tool. The result was a score for

each location that would summarize the pedestrian friendliness of the survey area. It was expected that the scores would be positively associated with the amount of walking by the respondents within the neighborhood.

Crime Data

Data on actual crime for the past 15-month period was obtained in geocoded format from the police departments of the three municipalities. Because only violent crime data were available from Newark, only the violent crime records were retained from the other two municipalities for the sake of consistency. All six types of violent crime were included in the analysis: murder, aggravated assault type-1 (i.e., assault with a weapon), aggravated assault type-2 (simple assault on persons of particular occupations such as transit bus driver or emergency personnel), rape and sexual assault, robbery, and shooting.

The crime variable for each neighborhood was created by taking the survey distribution intersections as reference. Murder was weighted by 6, rape/sexual assault was weighted by 5, type-1 aggravated assault was weighted by 4, shooting was weighted by 3, robbery was weighted by 2, and type-2 aggravated assault was weighted by 1. Eight distance buffers were created around each selected intersection (from less than 0.25 miles to more than 2.0 miles) and the weighted crime scores for each buffer were then normalized by the area of the buffers. The aggregated scores were then divided by 1,000. Mathematically, the crime score (C) for a neighborhood can be defined as:

$$C = \frac{\sum_{j} (\sum_{i} (X_{ij} W_{ij}))}{1,000}$$

where X_{ij} is the number of crime events of type i in buffer j, W_i is the weight for crime type i, and A_j is the area (square mile) of buffer j.

Other Data

Data was also used from the 2015 ACS. In addition to using that data for the selection of survey locations, several socioeconomic variables from the data were used for analysis of the relationship between crime, fear of crime, and walking. These variables included share of non-white population, poverty rate, unemployment rate, use of cars for commuting, and use of transit for commuting.

Literature Review

There is undeniable evidence that walking has many physical health benefits (Warburton et al., 2006; Lee and Buchner, 2008; Tschentscher et al., 2013). According to these studies, walking helps to prevent obesity, diabetes, hypertension, cardiovascular diseases, colon cancer, breast cancer, osteoporosis, and other diseases. Studies have also shown that significant psychological benefits can be achieved by walking in virtually all types of environments (Roe and Aspinall, 2011; Johansson, 2011).

In addition to providing health benefits to people who walk, walking also provides benefits to society at large in a number of ways. First, by preventing diseases, it reduces healthcare costs (Lee and Buchner, 2008). Second, when people in large numbers walk instead of using motorized modes of transportation, walking reduces air pollution (Pucher and Dijkstra, 2003; Woodcock et al., 2009). The U.S. Department of Health and Human Services (2015) emphasizes that walking can also aid local economies, improve public safety, and enhance social cohesion. Compared to other forms of physical activity, the requirements for walking are the least because it needs no preparation, training, skills, or facilities (Lee and Buchner, 2008).

Despite the widespread knowledge about the benefits from walking, many Americans refrain from walking altogether for recreation or transportation. Physical activities, such as walking, are least common among African Americans, Hispanics, older adults, women, and people with lower levels of education (Eyler et al., 2002; Vandegrift et al., 2004; U.S. Department of Health and Human Services, 2015). According to the American Heart Association (2017), racial and ethnic minorities and people with lower levels of education and income are also more likely to be obese and suffer from diseases that can be potentially prevented by walking.

By defining walkability in terms of physical elements such as street connectivity, sidewalk availability, land use mix, and residential density, a number of studies explored its effect on walking and concluded that high walkability is associated with greater levels of walking and lower prevalence of obesity (Sallis et al., 2004; Frank et al. 2005; Owen et al., 2007). However, the relationship does not appear to hold for neighborhoods with lower socioeconomic status.Finding that lowincome, unemployed, and minority persons are often sedentary and obese despite living in neighborhoods with high walkability, Frank et al. (2008) concluded that crime and other social factors could be responsible for the lower level of physical activity of people in minority and low-income neighborhoods. Loukaitou-Sideris (2006) and Scott et al. (2009) similarly suggested that fear of crime could be an important factor for the lower level of physical activity of people living in such neighborhoods.

A recent review by Wang et al. (2016) shows that a large number of studies have been conducted on the relationship between crime and walking, but the results are mixed. The U.S. Department of Health and Human Services (2015) also concluded that the evidence on the effect of crime on walking is unclear. A reason for the mixed results in studies on the relationship between crime and walking is that empirical studies have considered different types of walking in different types of neighborhoods. Some studies considered recreational or leisure walking, whereas others considered walking for transportation. Similarly, some studies considered actual crime, whereas other studies considered only fear of crime. Yet another reason is that many studies examining the relationship between crime and walking lack a rigorous theoretical framework. Jackson (2005), Foster and Giles-Corti (2008) and Foster et al. (2014) are laudable in this regard because these studies schematically describe how neighborhood characteristics, fear of crime, and walking may be interlinked.

Notwithstanding feedback loops, in the Foster and Giles-Corti (2008) model, physical environment, social environment, and individual factors affect real and perceived safety, the physical environment affects natural surveillance, and real and perceived safety together with natural surveillance affect outdoor physical activity. In the Foster et al. (2014) model, neighborhood design affects neighborhood attractiveness and collective efficacy, both of which affect judgment about crime, judgment about crime affects fear of crime, and fear of crime affects walking. The primary focus of these models is perceived crime rather than actual criminal incidents or crime events. The Jackson (2005) model is similar in this regard, but it focuses on the factors affecting fear of crime rather than fear of crime affecting walking or physical activity.

Many past studies are beneficial for the valuable information they provide on survey design, variable selection, analytical methods, and findings. Regarding surveys on fear of crime, Ferraro and Grange (1987), Farrall et al. (1997), and Chataway and Hart (2016) emphasize the importance of providing specific contexts when asking questions to respondents about fear of crime. Ferraro and Grange (1987) also suggested that respondents should be given a graded scale to choose from instead of binary responses when asking about fear of crime.

Box et al. (1988), Foster et al. (2008), Foster et al. (2013), Cossman et al. (2016), and Boessen et al. (2017) show that a large number of variables of different types can potentially affect fear of crime. These variables can be broadly categorized as (a) individual characteristics (e.g., age, gender, education, and income), (b) social characteristics (e.g., socioeconomic status of neighborhood, policing, community cohesion, and trust), (c) physical characteristics (e.g., street lighting, street features, and visual cues), (d) police-recorded crime events; and (e) past experience with crime (i.e., victimization). In addition to affecting fear of crime, some of these variables may directly affect walking or other physical activities.

The statistical methods used in most empirical studies examining the effect of crime or fear of crime on walking are associative or correlative. For example, Box et al. (1988) used binary logit models, Bennett et al. (2007) used random effects regression model, Roman and Chalfin (2008) used multilevel logit model, Foster et al. (2010) used generalized logit model, Mason and Kearns (2012) used a multi-level regression model, Astell-Burt et al. (2015) used logit and multilevel regression models, and Kerr et al. (2015) used fixedeffects regression model. In contrast to these studies that used associative methods, Jackson (2005) used confirmatory factor analysis, Foster et al. (2016) used longitudinal models, and Chatway and Hart (2016) used confirmatory factor analysis and structural equations modeling.

Findings in some studies are also highly insightful for this research. For example, it is evident from literature that the variables affecting walking for recreation or leisure are not necessarily the same as the variables affecting transport walking. Van Dyck et al. (2013) and Foster et al. (2016) found that safety perceptions are more likely to affect recreational walking than transport walking. Nordfjærn et al. (2015) also concluded that crime safety is more important for recreational walking than transport walking. In contrast, Janke et al. (2015) found that violent crime has a significant effect on transport walking but not on recreational walking. In another study, Kerr et al. (2015) found no effect of perceived crime on leisure walking or transport walking.

Past studies show that the effect of being a victim of crime on fear of crime is inconclusive. Although in one of the early studies, Skogan and Maxfield M. (1980) maintained that being a victim of crime increases fear of crime, Taylor and Hale (1986) countered by noting that young men are victimized the most and older women are victimized the least, but the former have the least fear of crime and the latter have the most. Regarding the relationship between age and victimization, Greve et al. (2017) also noted that victimization decreases but fear of crime increases with age.

This literature review showed that relative to the large number of studies that have been written on fear of crime, a relatively smaller number of studies have studied the impact of actual events. Oh et al. (2010), Kerr et al. (2015), and Janke et al. (2016) are some studies that examined the effects of both actual crime and fear of crime. Ball et al. (2010) and Astell-Burt (2015) examined the effect of different types of crime events on physical activity in two Australian contexts. Both studies concluded that it is important to consider crime events at a local level instead of a global level for crime to show a significant effect on physical activity.

It is evident from Foster and Giles-Corti (2008), Ball et al. (2010), Timperio et al. (2015) and Boessen et al. (2017) that interpersonal trust and social networks within the community can reduce fear of crime for residents and thus increase their propensity for walking. Roman and Shalfin (2008) found that people living in a neighborhood for a prolonged period of time have less fear of crime than new residents. Because longevity helps to grow social connections, one can surmise from these studies that people living in the same neighborhood for a long period of time would have less fear and thus a greater propensity to walk than new residents.

The Survey Respondents

Sex, Age, Race and Ethnicity

The male-female split of the respondents for the three municipalities is shown in Table 1. Of the population of Essex County, where all three municipalities are located, 52% are female and 48% are male. Although it is generally believed that men are more likely to be intercepted because they are outdoors more often, the survey results showed that the share of female respondents in Bloomfield and Verona was noticeably higher than male respondents, whereas the share of male respondents was slightly higher in Newark. However, of the total respondents from all three municipalities, the male-female split was almost identical with Essex County's population.

The age distribution of the respondents is shown in Table 2. A comparison showed that the proportion of persons age 18-24 among the survey respondents is higher (21% against 13%) and the proportion of persons age 65 and over is lower (8% against 15%) than the area's general population, but the proportions for other age groups are fairly similar. The differences are not surprising because young adults are known to be outdoors more often than the elderly. As shown

in Table 3, approximately 29% of all respondents in the three municipalities combined are white, but significant variations exist between the municipalities. Of the general population, 29% in Newark, 62% of Bloomfield, and 93% in Verona are white. Thus the survey was taken by a larger share of non-whites in all three municipalities. A reason could be lower exposure of the white residents to the survey agents because of their higher automobile ownership. Among non-whites, the share of African Americans was the highest in both Newark (54%) and Bloomfield (26%), but not in Verona (9%).

The proportion of Hispanics among the respondents is higher than the general population for Verona (18% of respondents compared to 6% of population), but the share of Hispanic respondents in Newark and Bloomfield is slightly lower. For Bloomfield, Hispanics constitute 25% of the population, but the share of Hispanics among the respondents is 21%. For Newark, the share of Hispanics is 34%, whereas the share of Hispanics among the respondents is 29%. For all three municipalities combined, the share of Hispanic respondents is slightly lower than the share of the Hispanic population.

Sex	Bloomfield Newark Vero		Verona	Total
Male	44.2	50.9	32.2	47.6
Female	55.8	48.7	67.0	52.0
Other	0.0	0.4	0.9	0.4
Total	100.0	100.0	100.0	100.0
Sample size (N)	224	760	115	1099

 Table 1. Sex distribution of the respondents

Table 2. Ag	ge distribution	of the re	spondents
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Age	Bloomfield	Newark	Verona	Total
18-24	16.9	22.5	15.4	20.6
25-34	24.0	21.7	11.1	21.1
35-44	16.0	17.1	15.4	16.7
45-54	17.8	18.8	20.5	18.8
55-64	15.6	14.4	18.8	15.1
65 or over	9.8	5.4	18.8	7.7
Total	100.0	100.0	100.0	100.0
Sample size (N)	225	759	117	1101

Race	Bloomfield	Newark	Newark Verona	
White	47.3	15.9	75.9	28.7
Non-white	52.7	84.1	24.1	71.3
Total	100.0	100.0	100.0	100.0
Sample size (N)	220	744	116	1080

Table 3. Race of the respondents

Education, Income, and Car Ownership

The level of educational attainment of the survey respondents is summarized in Table 4. It is evident from the table that the respondents of Verona have the highest educational attainment, followed respectively by the respondents of Bloomfield and Newark. These characteristics are consistent with the characteristics of the population of the three municipalities.

The distribution of annual household income of the respondents is shown in Table 5. It shows that the respondents in Newark have the lowest income, followed by the respondents of Bloomfield and Verona, respectively. Among the Newark respondents, almost 27% have an income less than \$15,000 and more than 46% have an income less than \$25,000. The proportions for Bloomfield (13% and 19%, respectively) and Verona (3% and 4%, respectively) are significantly smaller. The proportions at the highest income brackets also show that the respondents of Verona are far more affluent than the respondents of Bloomfield, whereas the respondents of Bloomfield are far more affluent than the respondents of Newark.

Table 6 shows the number of cars in household for the respondents in the three municipalities. Consistent with their incomes, Newark has the highest proportion of respondents with no car in household, whereas Verona has the smallest share of such households. When all respondents are combined together, about 30% of the respondents are from households without cars.

To summarize, the male-female split of the survey respondents is similar to the area, but the survey respondents included a larger share of young adults and a smaller share of persons age 65 and over. For all three municipalities combined, the respondents have a low level of income and car ownership, but the respondents from Verona are economically better off. The share of non-white respondents is larger among the respondents than the study area population.

Educational attainment	Bloomfield	Newark	Verona	Total
High school graduate or less	20.2	40.4	13.2	33.4
Some college or associate degree	21.1	31.4	12.3	27.3
Bachelor's degree or higher education	58.7	28.2	74.6	39.3
Total	100.0	100.0	100.0	100.0
Sample size (N)	218	748	114	1080

Table 5. Annual household income of the respondents

Table 4. Educational attainment of the respondents

Annual household income	Bloomfield	Newark	Verona	Total
Less than \$15,000	12.8	26.9	3.1	21.7
\$15,000-\$24,999	6.2	19.4	1.0	14.9
\$25,000-\$49,999	14.4	22.4	7.3	19.3
\$50,000-\$74,999	21.5	15.0	20.8	16.9
\$75,000-\$99,999	16.4	6.5	10.4	8.9
\$100,000-\$149,999	14.4	4.0	27.1	8.4
\$150,000-\$199,999	9.2	3.7	16.7	6.1
\$200,000 or more	5.1	2.1	13.5	3.8
Total	100.0	100.0	100.0	100.0
Sample size (N)	195	674	96	965

Number of Cars	Bloomfield	Newark	Verona	Total
None	14.8	38.1	2.6	29.6
One	32.7	30.2	25.9	30.3
Two	33.2	21.0	47.4	26.3
Three or more	19.3	10.6	24.1	13.8
Total	100.0	100.0	100.0	100.0
Sample size (N)	223	761	116	1100

 Table 6. Number of cars in the respondents' households

Walking Frequency

Published literature has often suggested that survey respondents should be given specific contexts when asking questions about fear of crime and walking. Following that suggestion, survey respondents were asked how often they walked in daytime and after dark for recreation/exercise and transportation. Because many published studies showed that the relationship between fear of crime and walking is not the same for recreational walking and transportation walking, making a distinction between the two types of walking was important for this study.

The survey results on amount of walking by the survey respondents are shown in Tables 7 through 10. Table 7 shows a comparison of walking for recreation/exercise on weekdays at daytime and after dark. Table 8 shows a comparison of walking for transportation on weekdays at daytime and after dark. Table 9 shows a comparison of weekend walking for recreation/exercise between daytime and after dark. Table 10 shows a comparison of weekend walking for transportation between daytime and after dark.

The most significant observation from Tables 7 through 10 is that the amount of time spent walking after dark for both recreation/exercise and transportation is significantly less after dark than in daytime in all three places. However, for both types of walking, the difference between weekdays and weekend is modest. As expected, daytime transportation walking is a little more common on weekdays than weekends because of work trips on weekdays, but the difference is smaller after dark.

The tables show some interesting differences between the three municipalities. First, the share of respondents not walking at all for recreation/exercise in daytime is the smallest for Verona, but the share of the city's respondents is the largest for the same type of walking after dark. Second, the respondents of Verona are less likely to walk for transportation than the respondents from Newark and Bloomfield for transportation both in daytime and after dark. It indicates that higher car ownership and car dependence in the city may play a role. Third, although Verona has the lowest crime rate among the three municipalities, the share of respondents not walking at all after dark for recreational purposes is highest in Verona. People in Newark and Bloomfield may be more accustomed to walking after dark because they see other people walking or they may not feel as unsafe as non-residents may think.

		Daytime				After d	ark	
Minutes Walking	Bloomfield	Newark	Verona	Total	Bloomfield	Newark	Verona	Total
0 minutes (Never)	14.3	16.3	8.7	15.1	39.4	42.8	48.5	42.7
Less than 15 minutes	15.2	22.1	9.6	19.4	22.8	21.6	18.4	21.5
15-29 minutes	21.3	23.3	11.3	21.7	14.0	15.0	11.7	14.5
30-59 minutes	30.4	18.5	36.5	22.8	15.5	10.3	18.4	12.2
60-89 minutes	11.7	7.7	22.6	10.0	6.2	4.7	1.9	4.7
90 minutes or more	7.0	12.2	11.3	11.0	2.1	5.6	1.0	4.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size (N)	230	780	115	1125	193	699	103	995

Table 7. Weekday walking for recreation/exercise: Daytime versus after dark

	Daytime					After d	ark	
Minutes Walking	Bloomfield	Newark	Verona	Total	Bloomfield	Newark	Verona	Total
0 minutes (Never)	21.6	8.3	31.0	13.1	40.9	34.4	60.2	38.2
Less than 15 minutes	23.6	27.6	23.0	26.3	25.8	23.3	27.6	24.2
15-29 minutes	26.6	25.0	17.0	24.6	16.7	18.2	5.1	16.6
30-59 minutes	15.6	19.4	16.0	18.3	9.1	11.3	5.1	10.3
60-89 minutes	7.5	8.0	11.0	8.2	5.1	6.5	1.0	5.7
90 minutes or more	5.0	11.7	2.0	9.5	2.5	6.3	1.0	5.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size (N)	199	715	100	1014	198	726	98	1022

Table 8. Weekday walking for transportation: Daytime versus after dark

Table 9. Weekend walking for recreation/exercise: Daytime versus after dark

		Daytir	ne			After d	ark	
Minutes Walking	Bloomfield	Newark	Verona	Total	Bloomfield	Newark	Verona	Total
0 minutes (Never)	15.1	22.0	12.2	19.5	40.9	43.0	49.5	43.2
Less than 15 minutes	16.8	22.7	5.2	19.7	21.7	21.8	18.6	21.5
15-29 minutes	19.8	18.7	14.8	18.6	15.2	15.4	12.4	15.0
30-59 minutes	31.0	17.7	33.9	22.1	11.1	8.9	11.3	9.6
60-89 minutes	9.9	7.4	20.9	9.3	9.1	5.2	7.2	6.1
90 minutes or more	7.3	11.5	13.0	10.8	2.0	5.7	1.0	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size (N)	232	774	115	1121	198	697	97	992

Table 10. Weekend walking for transportation: Daytime versus after dark

		Daytiı	ne			After d	lark	
Minutes Walking	Bloomfield	Newark	Verona	Total	Bloomfield	Newark	Verona	Total
0 minutes (Never)	23.9	20.1	34.0	22.2	39.3	38.6	56.3	40.4
Less than 15 minutes	24.4	22.3	16.0	22.1	26.5	23.1	27.1	24.1
15-29 minutes	25.9	20.8	16.0	21.3	18.9	15.8	6.3	15.5
30-59 minutes	15.2	19.2	21.0	18.6	8.7	10.7	7.3	10.0
60-89 minutes	5.6	6.5	10.0	6.7	5.1	5.4	2.1	5.0
90 minutes or more	5.1	11.0	3.0	9.1	1.5	6.5	1.0	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Sample size (N)	197	725	100	1022	196	723	96	1015

Perception of Neighborhood

As indicated in the literature review, a number of past studies have shown that fear of crime is affected by people's perception of their neighborhood. Those studies show that when one's neighborhood perception is positive, his/her fear of crime is less. Because of the evidence in literature about the effect of neighborhood perception on fear of crime, several questions were included in the survey about perception of neighborhood. The responses to those questions are described below.

Frequency of Other People Walking

Using an 11-point scale where 0 represents least frequent and 10 represents most frequent, respondents were asked how frequently people in their neighborhoods walked during daytime and after dark. The results are summarized in Figure 2. It shows that there is a clear difference between their perception of people walking in daytime and nighttime. This difference is the clearest when one looks at the share of respondents giving a score of 10 at daytime and nighttime. Among all respondents in the three municipalities, 43% gave a score of 10 for people walking in daytime, whereas only 13% gave that score for nighttime. Among the three municipalities, the respondents from Newark gave the highest scores for both daytime and nighttime walking, whereas the respondents from Bloomfield gave the lowest scores for both.

Park in Neighborhood

Respondents were asked if there was a park in their neighborhood where they could safely walk. The responses to that question are summarized in Table 11. It shows that only a small proportion of the respondents in all three places said that there was no park in their neighborhood. Newark appears to be noticeably different in this regard. Compared to the other two places, a significantly larger share of respondents from the city said there was no park (20% versus 7% and

Figure 2. Frequency of other people walking in the neighborhood: Daytime versus after dark

Table 11. Presence of park in neighborhood

Is there a park in the area where you could safely walk?	Bloomfield	Newark	Verona	Total
No	6.5	20.4	1.7	15.6
Yes, it is safe to walk there	90.9	61.9	95.7	71.3
Yes, it is unsafe to walk there	2.6	17.7	2.6	13.1
Total	100.0	100.0	100.0	100.0
Sample size (N)	223	761	116	1100

Table 12. Whether people sit and relax in front of homes

Do people sit and relax in front of home?	Bloomfield	Newark	Verona	Total
No	30.0	25.5	50.0	28.9
Yes, only in daylight	37.9	47.7	27.3	43.6
Yes, in daylight and after dark	32.2	26.8	22.7	27.5
Total	100.0	100.0	100.0	100.0
Sample size (N)	227	761	110	1098

2% in Bloomfield and Verona respectively), and even among those who said there was a park, a large share (18%) said the park was not safe to walk (versus 3% in both Bloomfield and Verona).

People Sitting and Relaxing Outside Home

It is often postulated in existing literature that when residents spend more time outside their homes, there is less fear of crime in the neighborhood. For that reason, the respondents were asked whether people in their neighborhoods sat and relaxed in front of their homes. The results are summarized in Table 12. Somewhat surprisingly, the share of respondents who felt people sat and relaxed outside their homes was the smallest in Verona, where only half the respondents felt people sat and relaxed outside their homes. A reason for this finding may be that in Verona a larger share of the respondents lived in apartments, where no private space is available to sit and relax outside homes. Another explanation could be cultural because the share of white respondents was far higher in Verona than the other two places.

Figure 3. Perceived positive effect of police presence in the three municipalities

Effect of Police Presence

The respondents were also asked how positive police presence was in their neighborhoods. They were given an 11-point scale where 0 represented very negative and 10 represented very positive. The scores for the three places are shown in Figure 3. It shows that police presence is perceived more favorably in Bloomfield and Verona than in Newark. The figure clearly shows that the share of respondents giving a high score, especially a score of 7 to 10, is significantly lower in Newark than the two other places. A reason could be the significantly higher crime rate in Newark than the other two places, but partly it could also be that the Newark sample contains a significantly larger share of non-white respondents.

Stores/Shops in Neighborhood

Past studies have shown that the fear of crime is often higher when a neighborhood contains stores that are used by outsiders. The reasoning is that the fear is high because people from outside are considered strangers by the local people. On the one hand, stores/shops generate pedestrian traffic, which can reduce fear of crime. On the other hand, stores/shops bring outsiders, which can increase fear of crime. In view of the contention in past studies, the survey respondents were asked if their neighborhoods contained store/shops and whether they were used by outsiders. The responses to the question are summarized in Table 13.

Table 13 shows that for only a very small proportion of respondents there are no shops/stores in their neighborhood. However, the share of respondents who thought the stores were used exclusively by outsiders is even smaller in all three places. Because a large proportion of respondents perceive the stores/shops being used by neighborhood residents and outsiders, it is possible that stores/shops in the study area may not have any effect on fear of crime.

Threatened by Gangs

To examine the perceptions of street gangs, the respondents were asked how threatened they felt by

Are there shops/stores in the area?	Bloomfield	Newark	Verona	Total
No	6.1	6.9	7.0	6.8
Yes, they mostly serve neighborhood residents	37.6	39.6	32.2	38.4
Yes, they serve neighborhood residents and outsiders	55.0	50.3	60.0	52.3
Yes, they mostly serve outsiders	1.3	3.2	0.9	2.6
Total	100.0	100.0	100.0	100.0
Sample size (N)	229	752	115	1096

Table 14. How threatened by people walking in groups in neighborhood

 Table 13. Whether shops/stores are present in neighborhood

Score	Bloomfield	Newark	Verona	Total
0	42.2	24.1	58.1	31.4
1	17.2	7.4	19.7	10.7
2	13.4	9.8	9.4	10.5
3	9.5	11.2	5.1	10.2
4	4.7	8.0	0.9	6.6
5	3.4	11.9	4.3	9.3
6	5.2	5.7	0.9	5.1
7	1.7	5.5	0.9	4.3
8	0.9	4.6	0.9	3.5
9	0.9	2.3	0.0	1.8
10	0.9	9.4	0.0	6.7
Total	100.0	100.0	100.0	100.0
Sample size (N)	232	775	117	1124

people in groups walking in their neighborhoods. They were given an 11-point scale to choose from, where 0 signified least threatened and 10 signified most threatened. The responses are summarized in Table 14. It shows that the respondents from Newark are more likely to be threatened and the respondents from Verona are least likely to be threatened. Only 24% of the Newark respondents are not threatened at all whereas 58% of the Verona respondents feel the same way.

Threatened by Neighborhood Characteristics

To examine what type of neighborhood characteristics threatened the respondents, a question was included in the survey with a list of characteristics that could potentially threaten people. For each type of activity, an 11-point scale was given to the respondents to choose from, where 0 represented not at all threatened and 10 represented extremely threatened. The share of respondents not at all threated (Score=0) is shown in Figure 4. A greater share for any characteristic in the figure indicates less fear.

Figure 4 shows that the respondents of Verona are less threatened and the respondents from Newark are more threatened by each characteristic. In many cases, the share of respondents not feeling threatened at all in Verona is more than twice the share of similar respondents in Newark. Thus in all regards, the respondents in Newark feel more threatened. For all three places combined, theft seems to threaten people the most because only 38% respondents felt they were not threatened at all, followed by poor lighting because only 39% was not threatened at all. On the other hand, kidnapping seems to be the least threatening, followed by vandalism, and neglected property. The share of respondents not feeling threatened at all for the three types are 57%, 51%, and 49%. Poor lighting is the most threatening in Verona and Bloomfield, whereas theft seems to be the most threatening in Newark. An examination of the median scores revealed that the respondents in Newark are also threatened to a larger degree by gang violence and drug/alcohol use in addition to theft.

13

Afraid to Walk

Afraid to Walk by Time and Type of Walking

The respondents were asked how afraid they were to walk on weekday/weekend daytime and after dark. In each case, they were given an 11-point scale, where 0 represented not afraid at all and 10 represented always afraid. The responses for the three places are summarized in Figures 5 through 8. Figure 5 shows how afraid they are to walk in daytime on weekdays, Figure 6 shows how afraid they are after dark on weekdays, Figure 7 shows how afraid they are to walk in daytime on weekdays, and Figure 8 shows how afraid they are after dark on weekends.

A comparison of Figure 5 and Figure 6 shows that the respondents in all three municipalities are far more afraid to walk after dark than in daytime on weekdays. Similarly, a comparison of Figure 7 and Figure 8 shows that they are far more afraid to walk after dark than in daytime on weekends. Together the charts show that the respondents have a greater fear of walking after dark than in daytime. A comparison of Figure 5 with Figure 7 and Figure 6 with Figure 8 shows that the difference in being afraid between weekday and

Figure 5. Afraid to walk in daytime on weekdays

Figure 7. Afraid to walk in daytime on weekends

weekend is relatively small. All four charts show that the respondents from Newark are significantly more afraid to walk than the other two municipalities. The difference between Bloomfield and Verona is smaller in all four charts.

Giving up Walking Because of Fear of Crime

Respondents were also asked how often they decided not to walk because of fear of crime. Once again, they were given an 11-point scale with 0 representing never and 10 representing always. The responses for the three places are summarized in Figure 9. Consistent with Figures 5 through 8, which showed that the respondents from Newark are the most afraid to walk because of fear of crime, Figure 9 shows that they are also most likely not to walk because of fear of crime. Only 30% of the respondents from the city mentioned never giving up walking because of fear of crime, whereas the other 70% gave up walking at least some of the time. In contrast 70% of the respondents from Verona never gave up walking and only 30% decided not to walk because of fear of crime.

Cross-tabulation of Afraid to Walk and Walking

To examine how being afraid to walk relates to walking for recreation/exercise and transportation, the number of survey respondents were cross-tabulated by how afraid they are to walk and how much they walked. These cross-tabulations are shown in Tables 15 through 18. Data for only weekdays are shown because the data for weekends are very similar to data for weekdays. In each of the four tables, the expectation is that if walking duration is entirely or very highly dependent on fear of crime, the number of respondents in the

Figure 9. Frequency of deciding not to walk because of fear of crime

top right corner (high fear score and low walking time) and bottom left corner (low fear score and high walking time) would be larger than the number of respondents in the top left corner (low fear score and low walking time) and the bottom right corner (high fear score and high walking time).

The number of respondents in the top left corner (low fear and low walking duration) is very high in all four tables, indicating that despite not being afraid to walk many people do not walk or walk for very short durations for both recreation and transportation. However, fear becomes a more important factor after dark because the number of respondents in the top right corner (high fear and low walking duration) is noticeably larger in Tables 17 and 18 than Tables 15 and 16. The main takeaway from this analysis is that fear of crime affects walking duration, but other factors may also be important.

Walking Duration						Afra	id Sca	ale				
	0	1	2	3	4	5	6	7	8	9	10	Total
0 minutes (Never)	81	16	14	17	9	17	3	2	2	1	3	165
Less than 15 minutes	82	31	18	26	9	15	10	5	3	1	10	210
15-29 minutes	118	25	22	16	10	12	7	4	6	1	10	231
30-59 minutes	146	29	18	12	7	9	9	5	4	2	5	246
60-89 minutes	64	18	7	8	1	3	2	2	2	0	2	109
90 minutes or more	65	14	4	2	3	9	2	5	1	1	13	119
Total	556	133	83	81	39	65	33	23	18	6	43	1080

Table 15. Afraid to walk versus walking duration for recreation/exercise in weekday daytime

Walking Duration						Afra	id Sca	ale				
	0	1	2	3	4	5	6	7	8	9	10	Total
0 minutes (Never)	73	19	8	9	4	8	1	0	3	0	4	129
Less than 15 minutes	108	35	27	24	14	16	8	5	4	2	7	250
15-29 minutes	137	22	22	16	8	14	6	7	3	1	9	245
30-59 minutes	87	22	11	17	5	9	9	3	6	1	8	178
60-89 minutes	43	12	3	6	2	4	2	3	1	1	2	79
90 minutes or more	49	14	7	1	3	5	2	3	0	0	9	93
Total	497	124	78	73	36	56	28	21	17	5	39	974

Table 16. Afraid to walk versus walking duration for transportation in weekday daytime

Table 17. Afraid to walk versus walking duration for recreation in weekday after dark

Walking Duration						Afra	id Sca	ıle				
	0	1	2	3	4	5	6	7	8	9	10	Total
0 minutes (Never)	87	16	29	42	20	45	16	28	30	22	63	398
Less than 15 minutes	53	21	22	21	16	24	9	14	11	4	15	210
15-29 minutes	44	8	20	20	10	7	4	9	3	2	13	140
30-59 minutes	44	8	9	13	9	12	6	4	2	2	6	115
60-89 minutes	15	5	4	5	3	4	0	3	2	0	4	45
90 minutes or more	21	1	1	1	1	4	0	6	1	2	2	40
Total	264	59	85	102	59	96	35	64	49	32	103	948

Table 18. Afraid to walk versus walking duration for transportation in weekday after dark

0 1 2 3 4 5 6 7 8 9 10 Total 0 minutes (Never) 83 17 27 39 19 40 17 25 29 16 53 365 Less than 15 minutes 55 22 30 27 22 21 12 10 12 5 19 235 15-29 minutes 54 10 20 23 12 12 4 10 6 4 13 168 30-59 minutes 32 8 3 7 11 12 5 5 4 3 9 99 60-89 minutes 20 2 2 8 2 8 0 5 2 1 6 56 90 minutes or more 25 2 1 0 1 4 3 5 0 2 6 49	Walking Duration						Afra	id Sca	ıle				
0 minutes (Never) 83 17 27 39 19 40 17 25 29 16 53 365 Less than 15 minutes 55 22 30 27 22 21 12 10 12 5 19 235 15-29 minutes 54 10 20 23 12 12 4 10 6 4 13 168 30-59 minutes 32 8 3 7 11 12 5 5 4 3 9 99 60-89 minutes 20 2 2 8 2 8 0 5 2 1 6 56 90 minutes or more 25 2 1 0 1 4 3 5 0 2 6 49		0	1	2	3	4	5	6	7	8	9	10	Total
Less than 15 minutes55223027222112101251923515-29 minutes541020231212410641316830-59 minutes328371112554399960-89 minutes2022828052165690 minutes or more25210143502649	0 minutes (Never)	83	17	27	39	19	40	17	25	29	16	53	365
15-29 minutes 54 10 20 23 12 12 4 10 6 4 13 168 30-59 minutes 32 8 3 7 11 12 5 5 4 3 9 99 60-89 minutes 20 2 2 8 2 8 0 5 2 1 6 56 90 minutes or more 25 2 1 0 1 4 3 5 0 2 6 49	Less than 15 minutes	55	22	30	27	22	21	12	10	12	5	19	235
30-59 minutes 32 8 3 7 11 12 5 5 4 3 9 99 60-89 minutes 20 2 2 8 2 8 0 5 2 1 6 56 90 minutes or more 25 2 1 0 1 4 3 5 0 2 6 49	15-29 minutes	54	10	20	23	12	12	4	10	6	4	13	168
60-89 minutes 20 2 2 8 2 8 0 5 2 1 6 56 90 minutes or more 25 2 1 0 1 4 3 5 0 2 6 49	30-59 minutes	32	8	3	7	11	12	5	5	4	3	9	99
90 minutes or more 25 2 1 0 1 4 3 5 0 2 6 49	60-89 minutes	20	2	2	8	2	8	0	5	2	1	6	56
	90 minutes or more	25	2	1	0	1	4	3	5	0	2	6	49
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Total	269	61	83	104	67	97	41	60	53	31	106	972

Victimization and Harassment

Past studies have often examined if being a victim of crime increases fear of crime. In order to assess the effect of victimization on fear of walking, four questions were included in the survey inquiring whether (a) the respondent had ever been a victim of crime, (b) whether he/she had ever been harassed, (c) whether his/her friends and family members had ever been victims of crime, and (d) whether the respondent felt he/she had been harassed or unfairly stopped by police. Table 19 shows the results to the question on oneself becoming victimized, Table 20 shows the results of the question on him/her being harassed, Table 21 shows the results of the question on friends/family members being victimized, and Table 22 shows the responses to the question on police harassment.

A comparison between the three places in Tables 19 and 20 shows that the respondents from Newark were victimized and harassed more often than the respondents from the other two places. Similarly, Table 21 shows that the friends and family members of the respondents from Newark were victimized more often. Table 22 shows that the respondents from Newark felt they had been harassed or unfairly stopped by police more often. A comparison between Table 19 and Table 20 shows that the respondents in all three places are more likely to be harassed than to be victims of crime. A comparison between Table 19 and Table 21 shows that friends and family members became victims more commonly than the respondents, but that is not surprising because one respondent can have many friends and family members.

Further analysis with data from all three places combined showed that 22% of men reported being a victim of crime at least once, whereas only 15% of women mentioned being a victim at least once. The greater victimization of men could be because of greater risktaking, exposure, or both. Another analysis showed that 32% of the female respondents reported being harassed at least once compared to only 27% men. However, men appear to be harassed or unfairly stopped by police more often than women. Of the male respondents, 30% reported being harassed or unfairly stopped by police, whereas only 10% of the female respondents reported being harassed or unfairly stopped by police.

	Bloomfield	Newark	Verona	Total
No	93.4	75.9	98.3	81.8
Yes, only once	5.7	17.8	1.7	13.7
Yes, more than once	0.9	6.4	0.0	4.6
Total	100.0	100.0	100.0	100.0
Sample size (N)	227	771	115	1113

 Table 19. Whether the respondent has been victim of crime

Table 20. Whether the respondent has been harassed

	Bloomfield	Newark	Verona	Total
No	83.5	62.9	92.2	70.1
Yes, only once	10.7	17.8	5.2	15.1
Yes, more than once	5.8	19.3	2.6	14.8
Total	100.0	100.0	100.0	100.0
Sample size (N)	224	763	115	1102

Table 21. Whether the respondent has been harassed

	Bloomfield	Newark	Verona	Total
No	88.8	54.6	97.4	66.0
Yes, only once	8.5	27.4	2.6	21.0
Yes, more than once	2.7	18.1	0.0	13.1
Total	100.0	100.0	100.0	100.0
Sample size (N)	224	764	114	1102

Table 22. Whether the respondent felt he had been harassed or unfairly stopped by police

	Bloomfield	Newark	Verona	Total
No	89.2	75.3	95.6	80.2
Yes, only once	5.4	10.3	2.6	8.5
Yes, more than once	5.4	14.4	1.8	11.3
Total	100.0	100.0	100.0	100.0
Sample size (N)	222	765	114	1101

Gender Differences in Fear of Crime and Walking

A number of studies found that women have a greater fear of crime than men. An analysis was conducted to examine how afraid men and women are to walk in daytime and nighttime in the entire study area consisting of the three places with the anticipation that women would be more afraid than men. Figure 10 shows the results for weekdays, where 0 represents not at all afraid and 10 represents extremely afraid. (Because weekday and weekend results are very similar, the weekend results are not shown.)

As expected, both men and women are more afraid to walk after dark than in daytime. In both daytime and after dark, women are more afraid to walk than men. However, the level of fear between men and women is greater for walking after dark than in daytime. For instance, 57% of the men and 48% of the women are not at all afraid to walk in daytime, showing a difference of only 9 percentage points. In contrast, 38% men and 20% women are not at all afraid to walk after dark, showing a difference of 18 percentage points.

To examine whether the greater fear of walking among women translates to less walking, their duration of recreational walking and transportation walking is compared with the duration of the two types of walking for men in Figures 11 and 12. The two figures show duration of walking separately for daytime and after dark with the anticipation that the difference between men and women would be larger after dark.

Figure 10. Afraid to walk in daytime and after dark: Male versus Female

Figure 11. Duration of walking for recreation/exercise: Male versus Female

Figure 11 shows that women clearly walk less than men for recreation/exercise after dark, but they walk almost similarly as men during the daytime. Similar is the case with transportation walking in Figure 12, which shows that the share of women not walking at all is significantly higher than men after dark, but in daytime their share is only slightly higher. These results are consistent with women's greater fear because fear is generally greater after dark than in daytime.

Because women have greater fear of crime, they are also expected to decide not to walk more often than men because of fear of crime. Figure 13 shows how often men and women decide not to walk because of fear of crime. It shows that the share of men who never give up walking because of fear of crime (score = 0) is more than 45% whereas the share of women never giving up walking is a little over 30%. The share of women is slightly smaller for score 1 also, but for every higher score, the share of women is larger than the share of men, indicating clearly that women give up walking more often than men because of fear of crime.

Figure 12. Duration of walking for transportation: Male versus Female

Figure 13. Share of men and women deciding not to walk because of fear of crime (0=Never, 10=Always)

Race Differences in Fear of Crime and Walking

Similar to the analysis on gender differences in fear of crime and walking, an analysis was undertaken to examine the differences between white and non-white respondents. Figure 14 shows the white-non-white differences in fear of walking at daytime and nighttime. It shows that the share of respondents with no fear at all (score 0) in daytime is larger for whites than non-whites, whereas the share of whites and non-whites is almost the same after dark. However, the share of non-whites giving higher scores is greater after dark than in daytime (especially score 10), indicating that non-whites have a greater fear after dark. Non-whites also seem to have a slightly greater fear in daytime. The differences between the two groups may be the result of where whites and non-whites live.

From the relationship between race and fear of crime, one would expect non-whites to walk less than whites in both daytime and nighttime, but the difference could be larger at nighttime. Figure 15 shows the amount of time spent on walking for recreation/exercise by whites and non-whites on weekdays. In daytime, the share of whites and non-whites not walking at all (score 0) is almost

Figure 14. Afraid to walk in daytime and after dark: White versus Non-White (0=Never, 10=Always)

identical, but the share of whites not walking at all after dark is greater than the share for non-whites. Figure 16 shows that the share of whites not walking at all is greater than the share of non-whites both in daytime and after dark. The results seem to indicate that non-whites walk more despite being more afraid to walk. This could be potentially due to differences between the races in car ownership.

Figure 17 shows responses of whites and non-whites to the question inquiring how often the respondents decide not to walk because of fear of crime. It shows that non-whites decide not to walk more often than whites. Because Figure 14 showed that non-whites are more afraid to walk because of fear of crime, the results in Figure 17 are consistent. Figures 14, 15, 16, and 17 together may indicate that non-whites indeed have greater fear of crime and they also decide more often not to walk because of fear of crime, but ultimately they walk slightly more because of not having a car.

Figure 15. Duration of walking for recreation/exercise: White versus Non-White

Figure 16. Duration of walking for transportation: White versus Non-White

Figure 17. Share of whites and non-whites deciding not to walk because of fear of crime (0=Never, 10=Always)

Correlation between Crime, Fear of Crime, and Walking

The simplest way to comprehend the relationship between any two variables (e.g., crime and fear of crime) is to examine their correlation coefficient. A correlation coefficient shows the strength and direction of a linear relationship between two variables. Often described by the letter r, its value theoretically lies between -1 and +1. A correlation coefficient close to -1 indicates that there is a strong negative relationship between the two variables, a value close to +1 indicates there is a strong positive relationship between two variables, and a value close to 0 generally indicates that there is a weak relationship or no relationship. Although a value close to -1 usually reflects a strong negative relationship and a value close to +1 usually reflects a strong positive relationship, it is highly important to examine whether the coefficient is statistically significant because it also depends on the distribution of the two variables and sample size. Table 23 shows the correlation coefficients between crime, fear of crime, and walking. The variables are numbered in the first column and described in the second column. The same 11 variable numbers also appear in the top row of the table so that the coefficient reflects the correlation between the variable in the first column and the first row. For example, the correlation coefficient between crime score (#1) and being victim (#2) is 0.243.

In addition to the correlation coefficients, Table 23 also shows whether they are statistically significant. When a coefficient is significant at the 1% level (indicating it is likely to be true in 99 out of 100 cases) it is noted by ** (two asterisks). When a coefficient does not have ** attached to it, it is not significant even at the 5% level (which indicates it is true in 95 out of 100 cases or 1 out of 19 cases). [There is no coefficient in the table that is significant at the 5% level but not at the 1% level, but if there were any, it would have been marked by a single asterisk.] The diagonal cells in Table 23 have 1 because the correlation of a variable with itself is 1.

The most important correlation coefficients in Table 23 are in column 1, which shows the correlation between observed violent crime scores (#1) and the other variables. The coefficient of 0.243** indicates that crime and the likelihood of being a victim of crime are positively correlated, or the likelihood of being a victim of crime is higher when the crime score for the neighborhood is higher. The coefficient of 0.370^{**} in the row below indicates that the likelihood of one's friend and family member being a victim of crime is also positively and significantly related to actual crime. Similarly, the coefficients of 0.254** in the row below indicates that the likelihood of being harassed is also higher in neighborhoods with a high crime score. The coefficients in the next two rows, 0.277** and 0.240**, are both positive and significant, indicating that people are more afraid to walk both in daytime and after dark when the neighborhood crime score is high.

The coefficient of -0.112** indicates that walking minutes during daytime for recreation/exercise is significantly lower when neighborhood crime is high, but the coefficient of 0.039 in the next row indicates that walking minutes after dark for recreation/exercise is not statistically related to neighborhood crime. The coefficients in the next two rows, 0.194** and 0.168**, indicate that people walk more (instead of less) for transportation both in daytime and after dark in neighborhoods with high crime. However, the coefficient of 0.331** in the last row indicates that people also give up walking more often in areas with high crime. Together, the last three coefficients indicate that despite people giving up walking because of crime, people still walk more for transportation in neighborhoods with high crime. Thus the relationship between actual crime and walking is not simple and straightforward. A more complex mechanism is needed to examine how crime affects victimization and fear of crime and how they in turn affect actual amount of walking.

Some other correlation coefficients in Table 23 are also highly relevant for this research. For example, the coefficients in column #5 show that fear of crime in daytime is not related in a statistically significant way with walking of any kind, but it is very strongly related with people not walking because of fear of crime. However, the coefficients in column #6 show that fear of walking after dark is negatively related to walking at daytime for recreation, walking after dark for recreation, walking after dark for transportation, and not walking due to fear of crime, but not statistically related with walking for transportation at daytime.

On the whole, the results in Table 23 show that the association between crime, fear of crime, forgoing walking because of fear of crime, and the amount of walking is complex and cannot be fully comprehended by correlation coefficients. A serious limitation of correlation coefficients is that they do not indicate which variable affects the other. A significant positive correlation coefficient between two variables does not necessarily indicate that there is no negative effect of one variable on the other. For example, even though the correlation coefficient between crime and walking for transportation after dark is positive, it does not mean that crime does not reduce walking for transportation after dark. It simply means that where crime is more frequent, walking for transportation after dark is also more frequent. People in those neighborhoods may walk more despite crime reducing walking. In order to fully understand the linkages between crime, fear of crime, and walking, more sophisticated statistical methods are needed. In the following section, structural equation (SE) modeling is used to examine how these variables interact.

Table	23.	Correlation	between	key varia	bles on	crime,	fear of	crime, an	d walking
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Var	iables	1	2	3	4	5	6	7	8	9	10	11
1	Violent crime score	1										
2	The respondent has been a victim of crime at least once	.243**	1									
3	Friend or family member has been victim of crime	.370**	.439**	1								
4	The respondent has been harassed at least once	.254**	.403**	.382**	1							
5	How afraid to walk during daytime on weekdays	.277**	.230**	.254**	.253**	1						
6	How afraid are you to walk after dark on weekdays	.240**	.190**	.256**	.307**	.578**	1					
7	Walk minutes during daytime for exercise or recreation	112**	-0.005	-0.023	-0.019	-0.031	086**	1				
8	Walk minutes after dark for exercise or recreation	0.039	.095**	0.044	-0.004	-0.016	196**	.447**	1			
9	Walk minutes during daytime for transportation	.194**	.084**	.105**	.074*	0.036	0.012	.470**	.384**	1		
10	Walk minutes after dark for transportation	.168**	.157**	.117**	0.037	0.044	117**	.301**	.656**	.515**	1	
11	Frequency of giving up walking because of fear of crime	.331**	.260**	.308**	.322**	.543**	.654**	099**	126**	0.049	-0.051	1

Structural Equation Modeling

Structural equation models are often called causal models because the variables are arranged in a sequential structure where antecedent variables affect the consequent variables. Although called causal, the models are not sufficiently causal because the variables are still arranged by the researcher based on theory and a priori expectations. In this modeling technique, some variables are observed from data, whereas others are latent because they are created by the researcher. The latent variables are also called factors because they are created by a combination of observed variables by confirmatory factor analysis. An example of a latent variable could be neighborhood perception, which can be created from observed variables on people's perception on neighborhood, such as other people walking, police presence being effective, people being friendly, et cetera.

The Conceptual Model

An SE model usually begins with a conceptual model where the variables are arranged in a causal pathway based on theoretical understanding. The conceptual model for examining the empirical relationships is shown in Figure 18. Availability of alternative modes (shown in a dashed oval) is considered only in the model for transport walking but not recreational walking because it is not likely to have much of an effect on how much people walk for leisure. In the generic model, neighborhood socioeconomic characteristics and personal characteristics are the only exogenous variables. According to the construct, neighborhood characteristics affect actual crime events, so that neighborhoods with higher socioeconomic status experience fewer crime events. Places that experience more frequent crime are expected to increase the potential for victimization, which in turn is expected to increase fear of walking in the neighborhood. However, it is hypothesized that crime events alone, irrespective of victimization, would have a direct positive effect on fear of walking because people in crime-prone areas are aware of crime even if they have never been victimized.

Neighborhood socioeconomic characteristics are expected to directly affect perceptions about neighborhoods so that higher overall socioeconomic status of neighborhoods is positively associated with positive neighborhood perception. Individual's personal characteristics are also expected to affect neighborhood perception, but whether their effects are positive or negative would depend on specific characteristics. Similarly, it is hypothesized that personal characteristics would affect the likelihood of being victimized, but the nature of victimization would vary by individual characteristics.

Pedestrian safety, as determined by road infrastructure and traffic characteristics, is expected to positively affect both neighborhood perception and amount of walking. When neighborhood perception is positive, it is expected that people would have less fear of walking in the neighborhood. In contrast, crime events in the neighborhood and past victimization are likely to have a positive effect on fear of walking, meaning that both are likely to increase fear of walking. Finally, fear of walking is expected to decrease amount of walking. In

Figure 18. The conceptual framework for the SE model

the concept for transportation walking, it is expected that the availability of cars in household and overall dependency on cars in the neighborhood would reduce the amount of walking. 24, where their names, data sources, descriptions, means, and standard deviations are provided. As evident, most of the variables are created from the intercept survey responses, whereas five variables were generated from the ACS, and one was estimated from data from the police departments of the three municipalities.

The variables used in the models are shown in Table

Table 24. Variable names, source, description, means and standard deviations

Variable	Source	Variable description	Mean	Std
Name		•		Dev
Af_Wkdy_D	Survey	Afraid to walk because of crime on weekdays at daytime (11-point scale: 0=not at all afraid, 10= extremely afraid)	1.74	2.62
Af_Wkdy_N	Survey	Afraid to walk because of crime on weekdays after dark (11-point scale: 0=not at all afraid, 10= extremely afraid)	3.64	3.34
Af_Wknd_D	Survey	Afraid to walk because of crime on weekends at daytime (11-point scale: 0=not at all afraid, 10= extremely afraid)	1.74	2.60
Af_Wknd_N	Survey	Afraid to walk because of crime on weekends after dark (11-point scale: 0=not at all afraid, 10= extremely afraid)	3.80	3.43
Age	Survey	Respondent age (1=18-24: 2=25-34: 3=35-44: 4=45-54: 5=55-64: 6=65+)	2.99	1.58
Cars	Survey	Number of cars in household (1=none, 2=1, 3=2, 4=3+ cars)	2.24	1.02
Crime	City	Violent crime in the area (see estimation method in text)	1.43	1.00
Fem_Age	Survey	Interaction between age and female	1.58	1.88
Female	Survey	Female (Female=1, Male and other=0)	0.52	0.50
Har_S	Survey	Whether respondent has been harassed by others while walking in the area (1=no, 2=only once, 3=more than once)	1.45	0.74
HH_Size	ACS	Average number of persons per household in neighborhood	2.57	0.55
NWhite	ACS	Share of non-white persons in neighborhood	0.57	0.29
Police	Survey	Perceived positive effect of police presence in neighborhood (11-point scale: 0=very negative, 10=very positive)	5.97	2.87
Poverty	ACS	Poverty rate in neighborhood	0.26	0.17
Ppl_Wk_D	Survey	Perceived frequency of other people walking in neighborhood in daytime (11-point scale: 0=never, 10=always)	7.92	2.47
Ppl_Wk_N	Survey	Perceived frequency of other people walking in neighborhood after dark (11-point scale: 0=never, 10=always)	5.24	2.90
Relax	Survey	Perceived propensity of people relaxing outside homes in neighborhood (1=no, 2=only at daytime, 3=at daytime and night)	2.01	0.75
SOV	ACS	Share of single occupancy driving trips for commuting in neighborhood	0.53	0.69
Transit	ACS	Share of public transit trips for commuting in neighborhood	0.41	1.01
Vict_FF	Survey	Whether respondent's friends or family member has been victim of crime while walking in the area (1=no, 2=only once, 3=more than once)	1.46	0.71
Vict_S	Survey	Whether respondent has been victim of crime while walking in the area (1=no, 2=only once, 3=more than once)	1.23	0.52
Wkdy_Ex_D	Survey	Time walking for exercise of recreation on weekdays in daytime ($1=0 \text{ min}$, $2=1-15 \text{ min}$, $3=15-29 \text{ min}$, $4=30-59 \text{ min}$, $5=60-89 \text{ min}$, $6=90+\text{ min}$.)	3.25	1.53
Wkdy_Tr_N	Survey	Time walking for transportation on weekdays after dark (1=0 min, 2=1-15 min, 3=15-29 min, 4=30-59 min, 5=60-89 min, 6=90+ min.)	2.40	1.44
Wknd_Ex_D	Survey	Time walking for exercise of recreation on weekdays in daytime $(1=0 \text{ min}, 2=1.15 \text{ min}, 3=15-29 \text{ min}, 4=30-59 \text{ min}, 5=60-89 \text{ min}, 6=90+ \text{ min}.)$	3.17	1.58
Wknd_Tr_N	Survey	Time walking for transportation on weekdays after dark (1=0 min, 2=1-15 min, 3=15-29 min, 4=30-59 min, 5=60-89 min, 6=90+ min.)	2.32	1.43

ACS: American Community Survey, 5-year summary, 2015

The SE Model on Walking for Recreation and Exercise

The unstandardized coefficients of an SE model examining the direct and indirect effects of neighborhood characteristics, personal characteristics, crime, victimization, neighborhood perception, and fear of walking on amount of walking for recreation and exercise are shown in Figure 19. By following convention, the observed variables are shown in rectangles and the latent variables are shown in ovals. Arrows with dashed lines show how each factor is formed by different indicator variables. Asterisks indicate the significance levels of the effects of variables.

The factor representing experience with crime (EXPERIENCE) is formed by responses to survey questions on how often the respondent has been a victim of crime, how often he/she has been harassed, and how often his/her friends and family members have been victims of crime. Because all three indicator variables positively and significantly affect the factor, the factor represents a higher degree of victimization. The factor on neighborhood perception (PERCEPTION) is formed by survey responses to questions on perception of people walking in the neighborhood in daytime, perception of people walking there after dark, perception of people sitting and relaxing in front of their homes, and perception of the effect of police presence. Because all four indicators enter the factor with positive signs, the factor represents a positive perception about the

neighborhood. Because AFRAID is a factor composed of two variables representing afraid to walk in daytime on weekdays and afraid to walk in daytime on weekends and both indicators enter the factor with positive sign, it reflects a higher degree of fear to walk. Similarly, since WALKEX is formed by walking for recreation and exercise on weekdays and weekends, it represents amount of walking for exercise and recreation generally.

According to the model, crime is affected by poverty, share of non-white persons, and average household size in neighborhood. Crime positively contributes to victimization experience, meaning that people in highercrime neighborhoods are more likely to be victimized. Victimization then positively affects fear of walking. The model shows that crime also has a direct effect on fear of crime beyond its indirect effect through victimization. The factor PERCEPTION affects the factor AFRAID negatively, indicating that when perception about the neighborhood is positive, fear of crime for walking is lower. Finally, as expected, the model shows that fear of crime negatively affects the amount of walking.

Two other findings from the models are important. First, people in neighborhoods with a larger share of non-white population are more likely to perceive that people sit and relax outside their homes. This may be a cultural phenomenon. The second important finding is that people in such neighborhoods have a less positive perception of the effect of police presence than other neighborhoods.

Figure 19. Unstandardized coefficients of observed and latent variables in a structural equations model examining the effect of crime on walking for exercise or recreation at daytime.

The SE Model on Walking for Transportation

Figure 20 shows the standardized coefficients of the SE model examining the causal pathways connecting crime and walking for transportation. This model is different from the SE model on walking for exercise and recreation in three important ways. First, the factor ALTERNAT has been added to account for alternatives to walking with the reasoning that the amount of walking for transport would be less when alternative modes (especially cars) are available and driving is more prevalent in the neighborhood. It is composed of number of cars in the respondents' household, share of commuting trips in neighborhoods made by single-occupancy vehicles (SOV), and share of commuting trips by mass transit. As expected, share of commuting trips by SOV in neighborhood and number of cars in household enter the factor with a positive sign, whereas share of transit trips enter the factor with a negative sign. Because the factor basically represents a greater prevalence of automobiles, it was expected to have a negative impact on walking for transportation.

The second major difference between this SE model and the SE model on walking for recreation and exercise is that the factor WALKTR is composed of two variables on walking after dark instead of walking in daytime, whereas WALKEX was composed of two variables walking in daytime. The two variables representing walking after dark were used in this model based on Lagrange Multiplier (LM) tests, which showed that the two variables provide better overall model fit than the variables on walking in daytime (whereas the daytime walking variables showed better results for recreational walking). The reason for daytime walking fitting better in the recreational walking model and nighttime walking fitting better in the transportation walking model could be that not many people in the area contemplate walking for recreation or exercise after dark, whereas people are so accustomed to walking for transportation in daytime that they mostly experience fear of walking after dark.

The third important characteristic of this model is that the variable on share of SOV trips for commuting has a strong negative effect on neighborhood crime. It is likely that the variable serves as a proxy for high household income (although survey data was collected on household income, the variable was not included because of a large number of missing responses).

The overall results of the model on transportation walking are as good as the model for recreational walking. Like in the previous model, it shows that violent crime affects transportation walking also, but this effect applies to walking after dark instead of walking in daytime.

Figure 20. Unstandardized coefficients of observed and latent variables in a structural equations model examining the effect of crime on walking for transportation after dark

Recommendations for Addressing Crime

The SE models showed that violent crime increases fear of crime and victimization, which in turn affects people's decisions on walking for recreation/exercise and transportation. Thus by addressing crime, people's willingness to walk can be potentially increased. A question was included in the survey to inquire what type of strategies would make people feel safer. Their responses are shown in Table 25. It shows that better lighting is preferred by most respondents, followed by clean and well-maintained neighborhoods and security cameras, respectively. It is also worth noting that the respondents from Newark saw merit in the strategies more than the respondents from the other two municipalities. This may be the result of higher crime and greater fear of crime in that city relative to the other two places.

Improvement	Bloomfield	Newark	Verona	Total
Better lighting	45.8	45.9	38.1	45.1
Increased police presence	15.3	42.1	8.5	33.3
Clean, well-maintained neighborhood with trees and plantings	27.1	49.2	11.0	40.9
Neighborhood watch program	15.3	30.0	3.4	24.4
Community events	25.4	35.0	18.6	31.5
Crackdown on crime	8.5	34.8	1.7	26.2
More people and businesses open on the street	20.3	32.1	15.3	28.0
Security cameras	24.6	39.8	13.6	34.1

Table 25. Recommendations for feeling safer

Note: Percentages do not add to 100% because multiple strategies could be selected

Conclusion

This study examined how violent crime affects walking for recreation/exercise and transportation by using crime data and a survey of people in Newark, Bloomfield, and Verona. It used basic comparisons of variables for the three places and finally examined the relationship between crime and walking by aggregated data for all three municipalities. The correlation analysis showed how the variables are related, but it also showed the limitations of the analysis in understanding the effects of crime on walking. In contrast, the logically constructed SE models showed that crime increases victimization and fear of crime and these two variables in turn adversely affect walking for both recreation and transportation. From a policy perspective, the most important finding of this study is that violent crime decreases the amount of walking for both recreation and transportation in the study area. By addressing crime through effective measures, the local authorities not only can make places safer and more livable, but can also make its residents healthier by inducing walking. According to the intercept survey results, better street lighting, better maintenance of public areas, and installation of security cameras, respectively, are the most sought-after solutions to address fear of crime in the study area.

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