Crime victimization and the implications for individual health and wellbeing: A Sheffield case study

Abstract

Public health and criminology have developed largely independently of one another at the research and policy levels so that the links between crime victimization and health status are not well understood. Although it is not difficult to support the idea of crime as a threat to the health of individuals and the wider community, the difficulty lies in quantifying the impact of crime on public health, while controlling other variables, including gender and ethnicity. We report the results of a study, the goals of which were to: develop an understanding conceptually of the relationships between different types of crime (violent and non-violent) and health; explore the impact of victimization on quality of life and physical and psychological wellbeing; investigate the role of social and demographic factors in shaping any relationships.

The study is based on 840 responses from a postal survey administered to 4,100 households in Sheffield, England, located primarily in deprived areas where overall crime rates were high. Non-violent crimes were more frequently reported than violent crimes and in general, inner city neighbourhoods were associated with higher violent crime rates. Out of 392 victims of crime, 27% of individuals detailed physical injuries resulting directly from a crime event and 31% had taken some medical steps to treat a crime-related injury. 86% experienced at least one psychological or behavioural change, including stress, sleeping difficulties, loss of confidence, and depression. Logistic regression models estimated victimization risk based on various social and demographic variables. Violent crimes were consistently linked with higher odds of seeking medical treatment and a higher likelihood of experiencing psychological ill health effects or

behavioural changes. In comparison, victims of non-violent or property crimes were not significantly associated with mental health or behavioural/lifestyle effects.

Keywords: Crime; victimization; public health; wellbeing; violence; social model of health; deprivation; UK

1. Introduction

What society deems to be a criminal act has traditionally been the exclusive burden of the criminal justice system, dealt with primarily through the police, courts, and penal system. Although the criminal justice system has served us well in terms of prosecuting criminal acts and enforcing public safety, its resources become significantly overburdened when asked to concentrate more on crime prevention and the provision of additional services for treating and supporting the victims of crime (McManus and Mullett, 2001).

The health sector is unavoidably drawn into dealing with many of the consequences of crime, especially violent crime. Violence is one of the leading causes of death worldwide for people aged 15-34 years (McManus and Mullett, 2001). By definition, violent crime impacts directly on health, while the health effects of non-violent crime may be more indirect or psychological (Khalifeh et al., 2015). The economic cost of dealing with the consequences of crime translates into billions of US dollars in annual healthcare expenditures worldwide, and billions more in terms of work absenteeism, law enforcement, and lost productivity (Blau and Blau, 1982). However, identifying crime as a public health issue remains a relatively new idea, despite the close proximity of both sectors.

Research and policy making in the area of public health adopt a broad, interdisciplinary perspective focusing on population health as the outcome of many factors affecting the lives of individuals, families, and communities in different ways and via many pathways (Amick et al., 1995). The *social model of health* articulates these factors within a multidimensional definition of health that includes human well-being, human development, and quality of life, whilst emphasizing a community approach to promoting public health where the goal is to provide the maximum benefit for the largest number of people (Fineberg et al., 1994, Hanson et al., 2010).

The primary goal of this study is to explore and to better understand the impacts of crime on individual health and wellbeing drawing on the social model of health. Specific objectives are to develop an understanding of the conceptual foundation underlying the links between crime (violent and non-violent) and health status, to explore the effect of the victimization experience on quality of life and physical and psychological wellbeing, and to investigate the role of social and demographic factors in the health-crime relationship. The study is interdisciplinary in nature, integrating concepts and methodology from the fields of criminology, public health, and geography.

2. Research background

The research challenge here is to analyze and quantify the impact of crime on public health within a framework that draws on the social model of health. Figure 1 illustrates our conceptual model linking crime and health. Crime levels are one element of the social environment within which people live their lives. High crime levels combined with material deprivation seriously damage that environment especially if associated with low levels of social cohesion. Social cohesion is, in fact, reflective of the sense of injustice, discontent, and distrust in a community – the greater the level of distrust among individual members, the less cohesive a society becomes (Kawachi and Berkman, 2000). According to social disorganization theory (Sampson and Groves, 1989), a breakdown in social cohesion can lead to crime, which contributes further to conditions that may lead to poor health.

Deprivation has long been associated with poor health, including increased risk of early death and higher rates of illness from certain diseases (Merton, 1957). For example, socioeconomic deprivation has been associated with higher rates of admission to hospital (Struthers et al., 2000)

and higher case fatality from heart failure (MacIntyre et al., 2000). Feelings of deprivation originate from comparisons to perceived social norms, which tend to change over time and place. *Absolute deprivation* entails deprivation characteristics that apply to all people with fewest opportunities (the lowest income, the least education, the lowest social status). In contrast, *relative deprivation* refers to feelings or measures of economic, political, or social inequality (Merton, 1957). It is the discrepancy that exists between what a group expects to obtain and what it actually has, or the discontent people feel when compared to others who are more advantaged (Bayertz, 1999).

Relative deprivation is not only associated with public health inequalities, but may also generate high levels of crime, originating from dissatisfaction and unhappiness that can lead to protest behaviour and rebellion (Runciman, 1966). The greater the scale of status inconsistency, the more pressure exists to close the gap and more strenuous efforts made to succeed by fair means or foul (Elbogen and Johnson, 2009). Such "social ingredients" can lead to scenarios that cultivate higher crime rates in neighbourhoods. One reason why greater income inequality or relative deprivation is related to higher crime rates is its tendency to increase social divisions, thereby decreasing social cohesion (Kennedy et al., 1998, Baily, 1984, Messner, 1989).

High crime levels affect how people live and work, and at a group level may affect behavior and attitudes within communities (see for example, Jeffrey, 1971). Some high crime areas have high rates of temporary or permanent disability or even death. Others have high rates of various psychological disorders and self-limited mobility (Alpert et al., 1997, Andrews et al., 2003). In general, victims of crime have a poorer perception of their physical health, more chronic limitations on physical functioning, and more chronic medical conditions (Kirkland and Mason, 1992, Miller et al., 1993, Ullman and Siegel, 1996). The difficulty lies in quantifying the impact of

crime on health and disentangling its effects from other confounding variables, such as gender, ethnicity, and employment status (Amick et al., 1995, Cornaglia et al., 2014).

Only a few studies have documented the long-term physical and psychological deterioration of those who suffer stress, fear of crime, repeat victimization, and poverty (Benzeval et al., 1995, Fischbach et al., 1997, Freeman and Smith, 2014, Gowman, 1999, Kilpatrick et al., 1997). McManus (2000) suggested that people living in disadvantaged circumstances and high crime neighbourhoods are more at risk to disability and illness. Some studies have suggested that reducing income inequality would enhance social cohesiveness, which could lead to lower crime rates and better population health (Kaplan et al., 1996, Lynch et al., 1998, Wilkinson, 1996). This further highlights the knowledge gap that exists and the challenges of pinpointing the contribution that crime victimization makes to people's health status.

This study is based on the hypothesis that high crime rate areas are associated with poor health in the resident population. However, it is acknowledged that feedback loops exist in the cause-effect relationships between crime and health, as represented in Figure 1 by dashed arrows. Our figure emphasizes that identifying and quantifying such causal relationships are complicated by various confounding effects at both the ecological and individual levels. Drawing on the social model of health, at the individual level social and demographic factors, including age, income, education, and ethnicity are important. At the ecological level, we are attaching importance in this study to controlling for deprivation.

3. Methodology

The Sheffield Study of Crime and Health was a cross-sectional study of about 4,100 households residing within seven neighbourhoods of the City of Sheffield. The survey was conducted during March to May 2006. The approach included the distribution of a self-completion questionnaire by post. The principal aim of the survey was to gather data on crime experiences and the health and quality of life of individuals living within these neighbourhoods.

3.1 Survey design

The survey was administered at the Super Output Area (SOA) level, which is a geographic hierarchy designed to improve the reporting of small area statistics in the UK and are not subjected to regular boundary change. This study was conducted at the lower layer SOA level, which has a minimum population of 1,000 (and average of 1,500) and a minimum resident household of 400 (an average of 630). The 2001 SOAs were maintained using 2004 Census data with boundaries aligning and no notable changes. Out of 339 lower layer SOAs in Sheffield, four SOAs were selected based on varying victimization rates (cases per 1,000 population for 1998-2000), but similar high levels of deprivation and low socioeconomic status according to the 2004 Indices of Multiple Deprivation (IMD 2004). This effectively enabled the 'health response' to crime to be observed, while controlling for area level deprivation. Deprivation status was assessed by combining five standardized scores of five IMD 2004 domains (income, employment, education, barriers to housing and services, and living environment) based on a multi-criteria evaluation (MCE) approach. SOAs were selected based on having similar upper quartile MCE index scores, corresponding to areas of high deprivation, and from each quartile of ranked victimization rates. SOAs were also selected to be scattered geographically and not clustered in the same local area.

A total of 800 households were randomly sampled from each SOA. The final sample size for each SOA was ultimately determined by availability of funds and survey resources. With an average of 800 out of 1,150 households per SOA sampled, an expected 10-15% response rate would result in a target of 80-120 responses per SOA. This is sufficient when assuming that a 15% margin of error and an average population size of 1,150 households per SOA would require a minimum sample size of 42 households at a 95% confidence level (DeVaus, 2002).

Sampled SOAs were chosen that had similar base population sizes, ranging from 1,380 to 1,500 according to 2004 population statistics (Table 1). 800 households were sampled from each SOA, resulting in a percentage of households sampled as follows: SOA1 (63%), SOA2 (65%), SOA3 (36%), and SOA4 (58%). Two SOAs were located in the Arbourthorne ward, whereas other SOAs were in the Central/Manor and Burngreave electoral wards (Fig. 2). These areas were associated with relatively high deprivation status and British Crime Survey victimization rates, and located close to either the city centre or industrial areas. A second group of three SOAs was selected based on medium to low deprivation status and generally low levels of crime as comparative sample areas. A reduced sample of 300 households was selected from each of these SOAs, since the focus is primarily on high crime and deprivation areas, where the probability of victimization is highest.

3.2 Postal questionnaire

The postal questionnaire was designed and piloted and in the first section, respondents were asked about previous crime experiences in the past five years, whether any incidents were reported to police, and whether medical steps were taken to treat injuries or ill health effects. The survey questionnaire is available from the first author upon request. The second section addressed both victims of crime and respondents who had never experienced victimization.

Location-based information about the neighbourhood of residence was collected by postal code area and also information about environmental and physical characteristics.

The last section of the questionnaire collected key demographic information about the respondent, including gender, age, marital and family status, country of birth, ethnic origin, and disability status. Household deprivation status was assessed according to education level completed, employment status, and annual household income.

The response rate was 20.5% with a total of 840 responses received out of 4,100 distributed questionnaires (Table 1). Postal questionnaire survey responses were compiled in a SPSS (Statistical Package for the Social Sciences) database that was subsequently used for computing univariate descriptive statistics and fitting logistic regression models. The response rate was rather better than that usually achieved by postal questionnaire surveys, especially when considering that no follow-up mail-out was conducted due to time and cost limitations (DeVaus, 2002).

4. Results & discussion

4.1 Personal experiences of crime and effects on health

Table 1 reports characteristics of the sample SOAs, the victimization rates in the sample data, as well as victimization rates recorded by the British Crime Survey (BCS) for a comparable five-year period from 1998-2003. Sample SOAs (SOAs 1 to 4) differ in terms of rates of violent and non-violent crimes (Table 2). Compared with SOAs 5 to 7 (comparison SOAs), the difference between violent/non-violent crime categories was not overall significant ($\chi 2 = 1.38$, $p = 0.24$). In general, non-violent crimes were more frequently reported than violent crimes, which was consistent with other sources of crime statistics, such as the BCS and official police records (Lynn and Elliot, 2000).

Vehicle-related theft and vandalism/damage to property were, by far, the most frequently reported non-violent crimes in Sheffield. SOAs 1 and 2 reported the most cases of violent crime, including threatening/abusive behaviour and robbery/mugging in the street. These areas are located in the inner city and are quite densely populated and economically challenged. These areas are associated with the highest crime rates recorded in the survey and have high multiple deprivation scores. On average, most comparison SOAs reported significantly lower rates of violent crime when compared to the four sample SOAs with higher deprivation. The exception was SOA 6 (Woodhouse), which had the highest violent and non-violent victimization rates of any area. This may be due to the higher population density in this busy suburban area located in southeastern Sheffield, which has a variety of commercial industrial businesses and housing estates that offer potential targets and opportunities for crime.

The difference between SOAs was not as evident when comparing reported non-violent crime experiences. Nevertheless, less deprived comparison SOAs reported higher non-violent crime rates compared to the sample set of SOAs. SOA5 in the suburban Darnall ward reported a much higher rate of burglary/break-in (23%) than any other surveyed area. These findings suggest that Sheffield's inner city neighbourhoods experience more violent crime (e.g. violent assault) with direct implications for health, while non-violent crime is more common in its suburbs.

In many cases, victims expressed worry about going to the police and being forced to go to court to give evidence. Some respondents cited a preference to consult their G.P. or neighbours/family/friends before reporting the crime to police due to the nature of their experience. As shown in Table 3, the two most common medical steps taken after becoming a victim of crime were visiting their doctor or G.P. (16%) and taking medication for anxiety (14%). Taking medication for sleeping problems (9%) and attending counselling (7%) were additional

treatments frequently taken by victims to cope with their crime experiences. The difference between sample and comparison SOAs in terms fo medical steps taken after crime experiences was significant at the 1% level ($\chi 2 = 19.28$, $p < 0.01$). Note that crime-related injuries may vary widely in degrees of severity and consulting a medical doctor does not necessarily entail the use of emergency services. Furthermore, a time lag may occur between injury and manifestation of ill health symptoms. Victims may not always connect a certain health problem to an earlier crime experience.

Out of 392 respondents with victimization experiences, 104 individuals detailed physical injuries resulting directly from a crime event. Bruising and pain were cited as the most common physical injuries experienced, while broken or fractured limbs, cuts, black eyes, scarring, and loss of teeth were also frequently reported. In total, 120 respondents (31% of victims) had taken some medical steps to treat a crime-related injury, while the remaining 69% of victims cited no physical injury or need to obtain medical assistance. Paralysis and permanent disability occurred in the most severe cases. Two respondents were victims of hit and run incidents, reporting a severe decline in quality of life due to permanent disability, which affected mobility. Some respondents cited predisposing health conditions, such as diabetes and heart conditions, that were exacerbated by a crime experience due for example, to increased stress and anxiety from a home burglary experience. Several respondents had experienced post-traumatic stress disorder (PTSD) and subsequent diagnosis and treatment by their G.P., including counselling, prescription medication, and antidepressants as their main modes of treatment and coping with a crime experience.

Our survey also elicited information about the impact of crime on quality of life and overall wellbeing by assessing lifestyle changes adopted after a crime experience, which are often made to reduce risk of future victimization (Table 4). Differences between sample and comparison SOAs

were not found to be significant ($\chi 2 = 9.49$, $p = 0.39$). The lifestyle change most frequently cited by victims (28%) was avoidance of certain places that were either known or perceived to be high risk areas. Many respondents indicated a fear of public spaces and poorly lit parts of estates. Street lighting was cited as an important factor to many respondents when choosing a travel route or determining whether to avoid passing through an area, particularly at night. A further 25% of victims indicated installation of security lights or house alarms, which were actions taken to increase the safety of homes and interpreted as a manifestation of their fear of crime. Other commonly cited lifestyle or behavioural changes included fitting new locks, avoiding going out after dark, and avoiding going out alone.

As shown in Table 4, residents in the inner city and higher deprivation SOAs (SOAs 1 to 4) were more likely to adopt a behaviour or lifestyle change after victimization compared to those residing in suburban or lower deprivation communities. In particular, avoidance measures (e.g. of going out alone to certain areas or after dark) were frequently cited by residents in inner city areas. In all, 83% of previous victims indicated that they had adopted one or more behavioural or lifestyle changes, likely due to a heightened sense of victimization risk after a crime event, even though the respondent's neighbourhood or living environment may not have physically changed. Fear of crime is a primary driver behind voluntarily adopting changes in daily lifestyle and routines, aimed at reducing the likelihood of repeat victimization.

Results from this survey consistently found that psychological impacts of crime were more prevalent and widespread than physical health effects (Table 5). These included feelings of stress that were cited most frequently, along with sleeping difficulties, loss of confidence, and depression. However, such reported symptoms are often difficult to measure (in terms of severity), diagnose, or treat. Such symptoms may also provide further evidence of PTSD or

emotional effects resulting from a traumatic experience, which can often have serious and long-lasting consequences (Andrews et al. 2003). Insomnia, depression, restlessness, and alienation are symptoms that are often related to PTSD and manifested over time. In comparison to psychological symptoms, behavioural changes reported by survey respondents after a crime experience were less common (Table 5). These included work absenteeism (13%) and changes in appetite (13%), which were cited most frequently. The use of substances, including starting or increasing smoking or alcohol consumption, and dependence on prescription medication, were least reported. Nevertheless, in general, most victims (86%) cited experiencing at least one psychological or behavioural change directly resulting from a crime experience. Confidence intervals at the 95% significance level showed that female respondents and those living alone generally reported more psychological and behavioural ill health effects compared to male respondents and those living with someone else.

4.2 Demographic characteristics and victimization

Survey data and victimization experiences were analyzed according to the individual characteristics of respondents, including gender, age group, ethnicity, family status, and disability status. Results indicated that a high proportion of women respondents report psychological impacts of crime, such as feelings of stress, sleeping difficulties, lack of confidence, and depression compared to male respondents (Table 5). The only exception was panic attacks, which were more prevalent in males. Males also cited more behavioural changes in appetite, work absenteeism, and increased use of substances (alcohol consumption and prescription medication), while there was no difference between sexes in terms of increased smoking habits. This indicates that male victims tend to resort to more behavioural measures for responding to a crime experience, such as increased use or reliance on substances and changes in lifestyle. Results point

to gender differences in terms of coping mechanisms adopted by men and women when responding to being victimized.

Survey results indicated that similar types of ill health effects (both physical and psychological) were reported by all age groups to varying degrees (Table 5). Feelings of stress were prevalent within all age groups, but the survey did not uphold the stereotypical perception that elderly people suffer the most from victimization. Rather, respondents over 75 years of age cited fewer ill health effects from crime experiences compared to younger age groups. Over 30% of the 19-40 and 41-60 age groups cited feelings of stress, whereas less than a quarter of 61-75 and over 75 age groups experienced stress as a result of crime. The age groups 19-40 and 41-60 experienced the most ill health effects in comparison to other age categories with a large proportion (over 20%) citing sleeping difficulties, loss of confidence, and depression as a result of victimization. We disregard the under 18 years age group as it contained only 8 respondents.

The effect of family status (i.e. living alone or with others) was examined (Table 5). Survey results were consistent with the commonly held perception that those living alone experience more anxieties and behavioural changes compared to those living with a companion. They reported more symptoms of stress, panic attacks, depression, sleeping difficulties, and substance abuse (alcohol, smoking, prescription medication). Experiencing lack of confidence was also higher in respondents living alone than those living with someone else. This suggests that loneliness can potentially exacerbate psychological and behavioural ill health effects in the aftermath of a crime experience, especially since people living alone may be more conscious of their physical/mental health and feel more vulnerable.

About 15% of survey respondents indicated that they were disabled or had some form of disability or handicap. A crosstab analysis (Table 5) revealed that many disabled respondents experience stress (54%), lack of confidence (42%), and depression (39%). These results suggest that disabled persons may be more likely to be adversely affected by a crime experience, especially since they may be more vulnerable and sensitive to fear of crime. Many may be already living with predisposing health conditions that affect mobility and the ability to recover from a traumatic victimization experience. Respondents indicated a fear of not being able to fend for themselves in the event of their homes being broken into and a general feeling of helplessness due to a handicap or disability. This contributed to a general lack of confidence or feelings of depression, thus leading to an increased perception of vulnerability and susceptibility to the risk of victimization.

Respondents from ethnic minority backgrounds reported significantly more ill health effects as a result of crime (Table 6). The majority of survey respondents were White-British (724 respondents), while only 116 respondents (14%) belonged to ethnic minority groups (Asian-Pakistani or Bangladeshi, Black-African or Caribbean, and Mixed). Categories with less than 10 respondents sampled are not included in Table 6 (Asian-Indian, Asian-other, Black-other, Chinese, and 'other' subgroups). Out of those who had previously been victimized, more instances of stress and lack of self-confidence were cited across all ethnic minority groups compared to the White-British majority group. Asian-Pakistani or Bangladeshi respondents indicated more cases of depression (69%) and work absenteeism (23%) than any other ethnic minority group. More of both the Black-African or Caribbean and Mixed ethnic minority groups cited feelings of stress, while Black-African or Caribbean respondents mentioned changes in appetite (31%) more frequently than any other subgroup. In general, Asian-Pakistani or Bangladeshi respondents

reported significantly more ill health effects (psychological and behavioural) due to crime than compared to White-British respondents when considering 95% confidence intervals.

However, it is important to note that the small sample size of each ethnic minority group makes it difficult to generalize survey results. Many residents (especially recent immigrants) may not know English or have varying levels of literacy, which would impact the likelihood of responding to the postal questionnaire survey. Some respondents suggested that some ethnic groups (particularly of Asian origin) may be especially reluctant to report crime experiences and would be least likely to report victimization to the police. It was still nevertheless evident that ill health effects from crime differed significantly between groups of different ethnic origins. Changes in lifestyle and behaviour adopted to cope with a crime event may be influenced by one's cultural background and/or upbringing. These results emphasize the importance of taking into account cultural differences when developing crime prevention or victim treatment programs.

4.3 Logistic regression models of the health impacts of crime

A logistic regression model was fitted to the data from the questionnaire survey where the dependent variable is whether the individual had been a victim of crime (1) or not (0). Various social and demographic variables were used as predictors (independent variables). The aim was to identify the individual characteristics most strongly associated with victimization in the sample. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set, reliably distinguished between victims and non-victims in the sample (chi square = 137.98, $p < .000$ with df = 49). Table 7 reports the results and the odds of victimization against the various social and demographic characteristics. Gender, family status, ethnicity, country of birth, and income, often perceived as being related to the risk of becoming a victim of crime were not significant. In contrast, marital status, education, and employment status were all

significant predictors of victimization in our sample. Reference groups for the logistic regression models were selected based on normative categories relevant to the crime and health relationship, such as comparing victimization risk with the elderly age groups (>75 years), people who are either separated or divorced, and highly educated individuals. In general, the selection of reference categories does not matter as long as interpretation of results is consistent (Vittinghoff et al., 2006). Our results indicated that age was not a statistically significant determinant for victimization, while full-time employment and students were associated with a lower risk, possibly due to having more regularly scheduled daily routines and activities that decrease odds of victimization. Separated or divorced individuals were most at risk to victimization in this study, a plausible explanation being that single individuals tend to be more vigilant, taking more preventative measures against crime than individuals who used to be married and are now adjusting to living alone. Higher educated individuals were also more prone to victimization, which could be related to higher income status and material wealth that present opportunities for crime.

A logistic regression analysis was conducted to predict whether medical treatment was required (1) or not (0) after victimization events (Table 8). The model was fitted to a sub-sample of 392 individuals. This analysis effectively differentiated between health impacts of violent crimes when compared to categories of non-violent crime at the individual level. Violent crime experiences, including threatening/abusive behaviour, violent assault, and robbery/mugging in the street were significantly related to higher odds of seeking medical treatment. As expected, violent assault was the most significant predictor of seeking medical treatment. The odds ratio indicates that violent assault victims are much more likely to seek medical treatment than respondents who did not experience violent assault (Exp(B) = 16.88).

In contrast, non-violent crime categories commonly associated with property theft or damage, such as burglary/break-in, vehicle-related theft, vandalism/damage to property, and other forms of theft were not significantly associated with seeking medical treatment. Interestingly, only theft of credit card had a significant relationship ($p = 0.008$) with 80% lower odds of seeking medical treatment when having a credit card stolen than those who do not (Odds ratio = 0.20), indicating an opposite effect when compared to violent categories of crime. This suggests that credit card theft or fraudulent types of crime are not usually associated with physical trauma – if any health impacts exist, these are either not immediately apparent or manifest themselves in a different way (e.g. psychological). Effects of financial theft or fraud on mental health and wellbeing may be a complex yet interesting relationship to examine in future studies.

Table 8 also shows results of a logistic regression model assessing the relationship between mental health and behavioural indicators with previous victims' crime experiences. Various psychological and behavioural effects of crime were recoded into a single dichotomous dependent variable, indicating whether a victim had experienced psychological and/or behavioural changes after a crime event (1) or not (0). The model was statistically significant and reliably distinguished between violent and non-violent crime categories and their differing impacts on psychological health. Crimes of a violent nature were consistently linked with higher odds (two to three times) of reporting some form of psychological/behavioural change than victims of other types of crime.

Although the analysis confirmed psychological/behavioural impacts of different types of crime, the nature of how and to what extent psychological health and wellbeing are affected was difficult to assess. To address this limitation, eleven logistic regression models were tested, each assessing various psychological health and behavioural responses with respect to specific types of crime (Table 9). Results of this analysis showed a strong association of psychological ill health effects

with violent crime experiences, especially violent assault and threatening/abusive behaviour, in comparison to non-violent or property crimes. Previous victims of violent assault had significantly greater odds ($p < 0.01$) of reporting all types of psychological effects and behavioural changes assessed by the survey, including being 11 times more likely to start or increase smoking habits. Victims of threatening/abusive behaviour also had greater odds of experiencing detrimental mental health impacts – namely psychological effects, including feelings of stress, panic attacks, depression, and lack of confidence. Behavioural changes were not significantly associated, except for sleeping difficulties, alcohol consumption, and work absenteeism.

An important finding is that victims of non-violent or property crimes are not significantly associated with mental health or behavioural/lifestyle impacts. Depression and sleeping difficulties tested significant for victims of burglary/break-in and vandalism/damage to property, whereas vehicle-related theft and credit card theft were not significantly related to any psychological health impacts. It can be concluded that psychological/behavioural impacts of violent crime are significant and potentially far-ranging compared to non-violent crime experiences. Such health impacts are not necessarily physical in nature and may not be visible or immediately apparent at the time of victimization. Psychological ill health may potentially have wide-ranging and long-term impacts on wellbeing, physical health, and life span (e.g. from increased smoking and alcohol consumption).

Many of the psychological and behavioural impacts reported by victims may be closely related to each other. For example, both reduced attendance at work and depression may significantly affect victims of crime, and originate from similar roots and causal factors. Collectively, such symptoms may be reminiscent of signs of post-traumatic stress disorder (PTSD), which may not immediately manifest itself. Such responses may differ widely, since psychological responses vary

with an individual's conditions and own abilities to cope, as well as the severity of the crime experience itself. Knowledge and information about the severity of psychological/behavioural responses may provide valuable information for designing effective programs and services for treating victims of crime and their families.

5. Discussion

The Sheffield Study of Crime and Health survey was conducted to explore how crime affects the health and quality of life of residents in different neighbourhoods based on a social model of health. The study involved a postal questionnaire survey, which provided further insight into the links between crime and health at the individual level. The survey proved to be an effective way of determining the types of crimes experienced by residents in seven sampled neighbourhoods, which were selected based on varying victimization rates and deprivation status. This enabled us to study how crime experiences affect the health and overall quality of life of victims and non-victims, while controlling for area level deprivation.

The value of the Sheffield study is fourfold. First, the study designed a questionnaire survey instrument that effectively gathered data about the impact of crime on personal health. The manifestation of physical and psychological symptoms as a result of direct crime experiences was examined. Second, a postal questionnaire survey generated valuable data about the extent to which crime affects health at the individual level. Third, findings from this study served to evaluate commonly held perceptions and assumptions about victims and non-victims. Finally, logistic regression analysis provided useful insights into more subtle patterns in the relationship between crime and health, and how these relationships differ between groups of varying demographic, social, and economic status.

Ill health effects as a result of crime experiences at the individual level were explored, determining the types of psychological symptoms and behavioural changes often experienced by victims. Psychological symptoms, such as feelings of stress, sleeping difficulties, lack of confidence, and depression were frequently cited. Victims also made significant lifestyle changes as a result of their crime experiences, such as avoidance of certain places, avoidance of going out after dark, and avoidance of going out alone. Many respondents installed security measures around the home as precautions, including fitting security lights/alarms and fitting new locks. Such practices were adopted after becoming more vigilant and aware of the risks of victimization.

The survey identified clear gender and ethnic dimensions to the ill health effects of crime. For example, women, people from ethnic minority backgrounds, and disabled persons tend to suffer disproportionately more ill health effects and may be identified as more vulnerable to victimization. Our findings support previous studies that have identified gender differences in responses to victimization experiences, such as females being more likely to respond emotionally than males, including worrying more and perceiving greater vulnerability to victimization (Sutton and Farall, 2005, Hale, 1996). Contrary to the stereotype, in this survey, older people did not suffer more ill health impacts from crime when compared to other age groups.

A logistic regression approach was adopted to explore links between health and crime at the individual level. Model results suggested that violent crime experiences (e.g. violent assault, threatening/abusive behaviour, robbery) were significantly linked with the need to seek medical treatment, such as hospital visits, taking medication for anxiety, pain, or sleeping problems, or visiting a doctor/G.P./counsellor – indicating manifestations of detrimental impacts on physical health. Similarly, there were greater odds of detrimental psychological health impacts (e.g. feelings of stress, panic attacks, depression, and lack of confidence), supporting previous findings

that victims may suffer depression and mental disorder problems that may subsequently require attention of mental health services (Weaver and Clum, 1995). Studies have also shown that victims of crime are likely to suffer from Post-Traumatic Stress Disorder, which can lead to further mental and physical health complications, including chronic disease, hypertension, and heart disease, which may be related to depression, anxiety, and alcohol or drug abuse that may result from a crime experience (Littleton and Henderson, 2009, Nishith et al., 2001, Maser and Cloninger, 1990). Clearly, violent crimes can have far-ranging direct and indirect impacts on the health of victims. In comparison, victims of non-violent or property crimes in our study were not significantly associated with mental health or behavioural/lifestyle impacts.

In summary, this study explored and attained a better understanding of the complex links between health and victimization experience at the individual level underpinned by the social model of health. Few studies have explored the relationship between crime and its impacts on physical and psychological health and wellbeing (Khalifeh et al., 2015, Freeman & Smitth, 2014). This study provides a conceptual model of such links with empirical survey results supporting the notion that ill health effects of crime extend beyond physical injury and may be manifested in psychological symptoms and behavioural changes. It is likely that doctors and medical staff may often be the personnel many victims consult first for crime-related injuries, even before they are reported to police authorities. Hence, medical personnel may be well-placed to be the 'first port of call' for victims of violent crime, rather than police or emergency services. This was especially true for treatment of physical injuries for victims who felt embarrassed or afraid to report to the police.

Medical doctors and personnel may find themselves well-positioned to either collaborate with police or to encourage patients to report their crime experiences. The health services sector may

have rare access to victims of crime, although issues of confidentiality may prevent information sharing and collaboration between agencies. Nevertheless, involvement of medical personnel and other social services may provide a more comprehensive and effective approach for supporting victims of crime, rather than focusing on medical/emergency response and physical recuperation alone. Implementing so-called 'joined up thinking' and partnership between multi-agency services may bring further benefits both in reducing the underreporting of crime and in responding effectively to the health damaging consequences of crime at both the individual and community levels (Dunleavy, 2010).

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Tables

Table 1. Summary of key characteristics of selected SOAs for the Sheffield Study of Crime and Health. SOAs 1 to 4 were sample areas, while SOAs 5 to 7 were comparative areas with lower overall deprivation status and victimization rates. Deprivation status was determined by a multi-criteria evaluation (MCE) of IMD 2004 data. Survey victimization rates are compared with official British Crime Survey victimization rates (1998-2003).

SOA label	Sheffield ward	British Crime Survey victimization rate (cases per 1,000 pop, 1998-2003)	Sample population (response rate, minus missing)	Survey victimization rate (%)	Survey victimization rate (cases per 1,000 pop)	Deprivation status (MCE index value)	White British survey respondents	Description/ characteristics
Sample SOAs:								
SOA 1	Arbourthorne	539.9	130 (16%)	52.3%	523.1	62.3	122 (94%)	High crime, high deprivation
SOA 2	Burngreave	385.3	142 (18%)	54.9%	549.3	62.0	81 (58%)	High-med crime, high deprivation
SOA 3	Arbourthorne	351.5	156 (20%)	43.6%	435.9	62.0	142 (91%)	Med-high crime, high deprivation
SOA 4	Central/Manor	318.8	146 (18%)	39.7%	397.3	62.0	133 (90%)	Med crime, high deprivation
Comparative SOAs:								

SOA 5	Darnall	266.2	60 (20%)	46.7%	466.7	48.1	54 (90%)	Med-low crime, high deprivation
SOA 6	Woodhouse	244.5	80 (27%)	47.5%	475.0	35.6	78 (98%)	Med-low crime, med deprivation
SOA 7	Crookes	185.2	126 (42%)	42.9%	428.6	9.3	114 (90%)	Low crime, low deprivation

633

Table 2. Percentage (%) of sample respondents who were victims of violent/non-violent crime categories for Sheffield SOAs. Violent crimes include threatening/abusive behaviour, violent assault, and robbery/mugging in the street. Non-violent crimes include burglary/break-in, vehicle-related theft, theft of credit card, other forms of theft, and vandalism/damage to property. 95% confidence intervals are in parentheses.

SOA label (ward)	Violent crime		Non-violent crime	
	Number of cases / responses received	Victimization rate (%)	Number of cases / responses received	Victimization rate (%)
Sample SOAs:				
SOA 1 (Arbourthorne)	40 / 130	30.8% (22.9-38.7)	85 / 130	65.4% (58.2-74.6)
SOA 2 (Burngreave)	48 / 142	33.8% (26.0-41.6)	106 / 142	74.6% (67.4-81.8)
SOA 3 (Arbourthorne)	24 / 156	15.4% (9.7-21.1)	86 / 156	55.1% (47.3-62.9)
SOA 4 (Central/Manor)	36 / 146	24.7% (17.7-31.7)	77 / 146	52.7% (44.6-60.8)
Subtotal cases	148		354	
Comparison SOAs:				
SOA 5 (Darnall)	11 / 60	18.3% (8.5-28.1)	30 / 60	50.0% (37.4-62.6)
SOA 6 (Woodhouse)	28 / 80	35.0% (24.6-45.4)	69 / 80	86.3% (78.8-93.8)
SOA 7 (Crookes)	21 / 126	16.7% (10.2-23.2)	78 / 126	61.9% (53.4-70.4)
Subtotal cases	60		177	

642 Table 3. Medical steps taken by victims after crime experiences in Sheffield SOAs. Note that
643 victims could select more than one medical step. 95% confidence intervals are in
644 parentheses.

645

	Medical steps taken after crime experiences							
SOA label (ward)	Had to go to hospital once	Took medication for anxiety	Took medication for pain	Took medication for sleeping problems	Had to go to hospital several times	Visited doctor/G.P.	Attended counselling	Other steps
Sample SOAs:								
SOA 1 (Arbourthorne)	3	8	5	8	0	11	4	1
SOA 2 (Burngreave)	12	11	1	10	0	15	12	11
SOA 3 (Arbourthorne)	1	8	6	6	0	17	4	0
SOA 4 (Central/Manor)	2	10	2	4	2	8	4	2
Subtotal cases	18	37	14	28	2	51	24	14
Comparison SOAs:								
SOA 5 (Darnall)	0	7	4	2	1	4	0	2
SOA 6 (Woodhouse)	2	10	4	2	4	4	2	6
SOA 7 (Crookes)	2	2	0	2	0	3	1	0
Subtotal cases	4	19	8	6	5	11	3	8
Total cases	22	56	22	34	7	62	27	22
% Total victims (392)	6% (3.6-8.4)	14% (10.6-17.4)	6% (3.6-8.4)	9% (6.2-11.8)	2% (0.6-3.4)	16% (12.4-19.6)	7% (4.5-9.5)	6% (3.6-8.4)

646

Table 4. Changes made in behaviour or lifestyle after becoming a victim of crime (% of victims citing the change made). Note that victims may indicate more than one behavior or lifestyle change. The top three SOAs in each category are highlighted and 95% confidence intervals are in parentheses.

	Behaviour or lifestyle changes after crime experiences										
SOA label (ward)	Avoid going out alone	Avoid certain areas	Only travel by certain means	Moved house/changed address	Fitted security lights/alarms	Avoid going out after dark	Fitted new locks	Changed phone number	Stay at home as much as possible	Planning to move house/area	Other steps
Sample SOAs:											
SOA 1 (Arbourthorne)	**23**	**20**	**7**	**10**	12	**22**	**18**	**3**	**9**	4	**14**
SOA 2 (Burngreave)	**10**	**25**	**10**	**4**	**19**	**14**	**16**	**3**	**14**	**14**	**15**
SOA 3 (Arbourthorne)	2	**20**	1	2	**14**	10	12	2	7	8	6
SOA 4 (Central/Manor)	**14**	16	3	**7**	**22**	**20**	12	**4**	7	**13**	10
Subtotal cases	47	81	21	23	67	66	58	12	37	39	45
Comparison SOAs:											
SOA 5 (Darnall)	6	2	0	1	6	6	2	**3**	4	2	0
SOA 6 (Woodhouse)	5	12	**6**	0	12	6	8	**4**	**8**	**10**	3
SOA 7 (Crookes)	2	15	5	**4**	13	1	**14**	0	2	2	**14**
Subtotal cases	13	29	11	5	31	13	23	7	14	14	17
Total cases	62	110	32	28	98	79	82	19	51	53	62
% Total victims (392)	16% (12.4-19.6)	28% (23.6-32.4)	8% (5.3-10.7)	7% (4.5-9.5)	25% (20.7-29.3)	20% (16.0-24.0)	21% (17.0-25.0)	5% (2.8-7.2)	13% (9.7-16.3)	14% (10.6-17.4)	16% (12.4-19.6)

Table 5. Ill health effects (psychological and behavioural) reported by all victims of crime following a victimization experience according to gender, age category, family status, and disability status. Respondents may select more than one ill health effect. Percentage of survey respondents (n = total respondents in subcategory) who reported experiencing the ill health effect. 95% confidence intervals are in parentheses.

			Gender		Age					Family status	
Ill health effects	Percentage of total victims (n = 392)	Disabled (n = 133)	Female respondents (n = 494)	Male respondents (n = 346)	< 18 yrs (n = 8)	19-40 yrs (n = 228)	41-60 yrs (n = 324)	61-75 yrs (n = 176)	>75 yrs (n = 104)	Living alone (n = 304)	Living with someone else (n = 536)
Psychological effects:											
Stress	59.7% (54.8-64.6)	54.1% (45.6-62.6)	30.0% (26.0-34.0)	20.9% (17.3-24.5)	25.0% (5.0-55.0)	36.0% (29.8-42.2)	30.9% (25.9-35.9)	20.5% (14.5-26.5)	13.5% (6.9-20.1)	52.6% (47.0-58.2)	28.7% (24.9-32.5)
Sleeping difficulties	39.3% (34.5-44.1)	36.1% (27.9-44.3)	19.4% (15.9-22.9)	12.8% (9.9-15.7)	25.0% (5.0-55.0)	26.3% (20.6-32.0)	21.0% (16.6-25.4)	10.2% (5.7-14.7)	5.8% (1.3-10.3)	36.8% (31.4-42.2)	18.3% (15.0-21.6)
Lack of confidence	37.2% (32.4-42.0)	42.1% (33.7-50.5)	18.2% (14.8-21.6)	11.2% (8.4-14.0)	25.0% (5.0-55.0)	21.1% (15.8-26.4)	17.9% (13.7-22.1)	14.8% (9.5-20.1)	11.5% (5.4-17.6)	36.8% (31.4-42.2)	16.8% (13.6-20.0)
Depression	30.1% (25.6-34.6)	39.1% (30.8-47.4)	13.4% (10.4-16.4)	8.7% (6.2-11.2)	25.0% (5.0-55.0)	20.2% (15.0-25.4)	14.8% (10.9-18.7)	8.0% (4.0-12.0)	7.7% (2.6-12.8)	26.3% (21.3-31.3)	14.6% (11.6-17.6)
Panic attacks	24.5% (20.2-28.8)	33.1% (25.1-41.1)	13.4% (10.4-16.4)	15.0% (11.8-18.2)	25.0% (5.0-55.0)	12.3% (8.0-16.6)	13.0% (9.3-16.7)	9.1% (4.8-13.4)	7.7% (2.6-12.8)	22.4% (17.7-27.1)	11.6% (8.9-14.3)
Behavioural effects:											
Work absenteeism	13.3% (9.9-16.7)	9.0% (4.1-13.9)	5.3% (3.3-7.3)	6.9% (4.7-9.1)	25.0% (-5.0-55.0)	7.0% (3.7-10.3)	8.6% (5.5-11.7)	2.3% (0.1-4.5)	1.9% (-0.7-4.5)	11.8% (8.2-15.4)	6.3% (4.2-8.4)
Changes in appetite	12.8% (9.5-16.1)	18.0% (11.5-24.5)	5.3% (3.3-7.3)	7.5% (5.2-9.8)	0.0% (0.00)	10.5% (6.5-14.5)	6.8% (4.1-9.5)	1.1% (-0.4-2.6)	1.9% (-0.7-4.5)	11.8% (8.2-15.4)	6.0% (4.0-8.0)
Dependence on medication	10.7% (7.6-13.8)	18.0% (11.5-24.5)	4.0% (2.3-5.7)	5.8% (3.7-7.9)	0.0% (0.00)	5.3% (2.4-8.2)	6.2% (3.6-8.8)	4.5% (1.4-7.6)	1.9% (-0.7-4.5)	9.2% (5.9-12.5)	5.2% (3.3-8.0)
Alcohol consumption	10.2% (7.2-13.2)	6.0% (2.0-10.0)	4.0% (2.3-5.7)	5.2% (3.2-7.2)	25.0% (-5.0-55.0)	8.8% (5.1-12.5)	4.9% (2.5-7.3)	1.1% (-0.4-2.6)	0.0% (0.00)	7.9% (4.9-10.9)	5.2% (3.3-7.1)

Smoking	9.7%	6.0%	4.0%	4.0%	0.0%	7.9%	5.6%	1.1%	0.0%	10.5%	4.1%
	(6.8-12.6)	(2.06\-10.0)	(2.3-5.7)	(2.3-5.7)	(0.00)	(4.4-11.4)	(3.1-8.1)	(-0.4-2.6)	(0.00)	(7.1-13.9)	(03.3-7.1)
Other symptoms	8.7%	18.0%	3.6%	7.9%	0.0%	2.6%	3.7%	6.8%	3.8%	9.2%	3.7%
	(5.9-11.5)	(11.5-24.5)	(2.0-5.2)	(5.5-10.3)	(0.00)	(0.5-4.7)	(1.6-5.8)	(3.1-10.5)	(0.1-7.5)	(5.9-12.5)	(2.1-5.3)

661 Table 6. Ill health effects reported by respondents due to crime according to ethnic minority
662 groups. Respondents may select more than one ill health effect. Percentage of
663 survey respondents (n = total respondents in subcategory) who reported
664 experiencing the ill health effect. Categories with fewer than 10 respondents are
665 not shown. 95% confidence intervals are in parentheses.

666

Ill health effects	**White-British** (n = 724)	**White-Irish** (n = 14)	**Asian-Pakistani or Bangladeshi** (n = 26)	**Black-African or Caribbean** (n = 26)	**Mixed** (n = 12)
Psychological effects:					
Stress	27.1% (23.9-30.3)	57.1% (31.2-83.0)	57.7% (38.7-76.7)	46.2% (27.0-65.4)	50.0% (21.7-78.3)
Sleeping difficulties	18.0% (15.2-20.8)	57.1% (31.2-83.0)	46.2% (27.0-65.4)	15.4% (1.5-29.3)	33.3% (6.6-60.0)
Lack of confidence	16.6% (13.9-19.3)	57.1% (31.2-83.0)	46.2% (27.0-65.4)	15.4% (1.5-29.3)	33.3% (6.6-60.0)
Depression	13.0% (10.6-15.5)	28.6% (4.9-52.3)	69.2% (51.5-86.9)	15.4% (1.5-29.3)	0.0% (0.00)
Panic attacks	11.6% (9.3-13.9)	14.3% (-4.0-32.6)	34.6% (16.3-52.9)	15.4% (1.5-29.3)	0.0% (0.00)
Behavioural effects:					
Work absenteeism	6.1% (4.4-7.8)	14.3% (-4.0-32.6)	23.1% (6.9-39.3)	15.4% (1.5-29.3)	0.0% (0.00)
Changes in appetite	5.8% (4.1-7.5)	0.0% (0.00)	23.1% (6.9-39.3)	30.8% (13.1-48.5)	0.0% (0.00)
Dependence on medication	5.2% (3.6-6.8)	14.3% (-4.0-32.6)	11.5% (-0.8-23.8)	0.0% (0.00)	0.0% (0.00)
Alcohol consumption	4.7% (3.2-6.2)	14.3% (-4.0-32.6)	0.0% (0.00)	15.4% (1.5-29.3)	16.7% (-4.4-37.8)
Smoking	4.1% (2.6-5.6)	14.3% (-4.0-32.6)	0.0% (0.00)	15.4% (1.5-29.3)	16.7% (-4.4-37.8)
Other symptoms	3.9% (2.5-5.3)	14.3% (-4.0-32.6)	11.5% (-0.8-23.8)	0.0% (0.00)	0.0% (0.00)

667

668 Table 7. Summary of logistic regression identifying the main effects of social and
669 demographic variables on the odds of being victimized (n = 840 survey responses).
670 Non-significant variables and effects are not included.
671

Predictor variables	Coefficient (B)	Odds ratio	95% Confidence Interval	Wald	Significance
Age category				29.21	***
< 18 yrs	22.34	5.03×10^9	(0.00,N/A)	0.00	ns
19-40 yrs	21.33	1.84×10^9	(0.00,N/A)	0.00	ns
41-60 yrs	20.81	1.09×10^9	(0.00,N/A)	0.00	ns
61-75 yrs	19.76	3.81×10^9	(0.00,N/A)	0.00	ns
> 75 yrs[1]	(--)	(--)	(--)	(--)	(--)
Marital status				11.76	**
Single	-1.03	0.36	(0.20, 0.65)	11.65	***
Widowed	-0.59	0.56	(0.28,1.09)	2.93	ns
Married or long term partner	-0.70	0.50	(0.26,0.96)	4.38	*
Separated or divorced[1]	(--)	(--)	(--)	(--)	(--)
Education completed				18.09	***
No formal qualifications	-0.77	0.46	(0.26,0.83)	6.54	*
Secondary	-1.09	0.34	(0.19,0.60)	13.64	***
A-levels or equivalent	-1.06	0.35	(0.17,0.71)	8.55	**
Further education certificate	-0.29	0.75	(0.43,1.31)	1.02	ns
Higher education[1]	(--)	(--)	(--)	(--)	(--)
Employment status				19.59	**
Full-time employment	1.55	4.71	(2.79,7.95)	6.22	*
Part-time employment	2.35	10.45	(5.97,18.41)	12.80	***
Self-employed	2.28	9.82	(5.45,17.55)	11.42	***
Temporary or contract employment	23.78	2.13×10^{10}	(0.00,N/A)	0.00	ns
Unemployed, seeking work	2.14	8.46	(4.40,16.43)	7.77	**
Unemployed, not seeking work	2.17	8.73	(5.08,15.10)	11.84	***
Student[1]	(--)	(--)	(--)	(--)	(--)

Not significant variables:

Gender (male, female)

Family status (living alone, living with someone else)

Ethnic origin (White-British, White-Irish, Asian-Pakistani or Bangladeshi, Black-African or Caribbean, Mixed)

Country of birth (England, Scotland, Wales, Northern Ireland, Rep. of Ireland, elsewhere)

Annual household income (<£5,000, £5,000-9,999, £10,000-19,999, £20,000-29,999, £30,000-39,999, £40,000-49,999, £50,000-59,999, >£60,000)

SOA of residence (SOA1 to SOA7)

(--) not applicable	* significantly different from reference category (p<0.05)
ns non-significant	** significantly different from reference category (p<0.01)
[1.] Reference category	*** significantly different from reference category (p<0.001)

672

673 Table 8. Two logistic regression model results of relationships between different types of
674 crime (nine independent variables) and the binary dependent variables: (a) sought
675 medical treatment, such as hospital visits, taking medication for anxiety, pain, or
676 sleeping problems, visiting a doctor/G.P., or receiving counselling (1) or not (0), and
677 (b) victim experienced a change in mental health and/or behaviour after a crime
678 experience (1) or not (0). Total sample includes 392 victims.

679

Binary dependent variable (Y/N)	**Seeking medical treatment**					**Experienced a change in mental health and/or behaviour**				
	Coefficient (B)	Odds ratio	95% Confidence Interval	Wald	Significance	Coefficient (B)	Odds ratio	95% Confidence Interval	Wald	Significance
Burglary/break-in	-0.05	0.95	(0.5-1.7)	0.03	ns	0.13	1.14	(0.70,1.84)	0.27	ns
Vehicle-related theft	-0.53	0.60	(0.3-1.0)	3.37	ns	0.47	1.61	(1.01,2.54)	4.04	*
Theft of credit card	-1.61	0.20	(0.1-0.7)	7.01	**	-0.01	1.00	(0.46,2.18)	0.00	ns
Other forms of theft	0.19	1.28	(0.6-2.4)	0.28	ns	0.18	1.20	(0.67,2.14)	0.37	ns
Vandalism/damage to property	0.25	1.28	(0.7,2.2)	0.77	ns	0.70	2.01	(1.26,3.22)	8.48	**
Threatening/abusive behaviour	1.55	4.71	(2.6-8.4)	27.32	***	0.93	2.53	(1.44,4.45)	10.45	***
Violent assault	2.83	16.88	(7.4-38.6)	45.30	***	0.89	2.42	(1.18,5.04)	5.69	*
Robbery/mugging in the street	1.73	5.62	(2.6-12.1)	19.74	***	1.18	3.26	(1.52,6.95)	9.32	**
Other	0.87	2.37	(0.7-8.1)	1.93	ns	1.64	5.16	(1.06,25.12)	4.12	*

ns non-significant

* significantly different from reference category ($p<0.05$)

** significantly different from reference category ($p<0.01$)

*** significantly different from reference category (p<0.001)

680

Table 9. Summary of eleven logistic regression models examining various psychological and behavioural effects (dependent variables) of different crimes (independent variables) experienced in the previous 5 years. Odds ratios are shown. Non-significant variables and effects are not included. 95% confidence intervals are in parentheses.

	Types of crime (independent variables)								
Ill health effects (dependent variables)	Burglary/break in	Vehicle-related theft	Theft of credit card	Other forms of theft	Vandalism/damage to property	Threatening/abusive behaviour	Violent assault	Robbery/mugging in the street	Other
Psychological:									
Feelings of stress (including anger)	1.07	0.69	1.89	1.56	1.46	3.08 ***	2.22 **	1.21	1.74
	(0.67,1.71)	(0.44, 1.08)	(0.84,4.22)	(0.87,2.80)	(0.93,2.31)	(1.77,5.37)	(1.08,4.55)	(0.61,2.40)	(0.50,6.04)
Panic attacks	1.09	0.67	1.22	1.71	1.17	4.90 ***	5.05 ***	4.56 ***	3.63 **
	(0.61,1.95)	(0.38, 1.18)	(0.48,3.11)	(0.88,3.31)	(0.67,2.06)	(2.75,8.73)	(2.52,8.73)	(2.16,9.63)	(1.07,12.33)
Depression	2.05 ***	1.10	0.64	1.43	2.07 ***	3.29 ***	5.27 ***	0.90	1.81
	(1.21,3.49)	(0.67, 1.82)	(0.24,1.71)	(0.76,2.66)	(1.25,3.40)	(1.92,5.62)	(2.65,10.47)	(0.39,2.03)	(0.53,6.17)
Lack of confidence	0.98	1.42	0.76	0.95	1.30	3.93 ***	4.59 ***	6.07 ***	0.27
	(0.58,1.65)	(0.88, 2.31)	(0.31,1.83)	(0.51,1.77)	(0.79,2.13)	(2.30,6.69)	(2.30,9.17)	(2.92,12.63)	(0.05,1.35)
Behavioural:									
Sleeping difficulties	1.58 *	1.03	0.65	0.67	1.69 **	3.05 ***	3.42 ***	1.04	1.88
	(0.98,2.56)	(0.65, 1.62)	(0.27,1.54)	(0.37,1.22)	(1.07,2.67)	(1.83,5.09)	(1.75,6.65)	(0.52,2.11)	(0.58,6.10)
Loss (or	0.67	0.79	1.50	0.53	1.55	1.77	5.29 ***	1.20	1.31

increase) of appetite									
	(0.32,1.41)	(0.41, 1.51)	(0.53,4.25)	(0.20,1.40)	(0.80,3.01)	(0.89,3.54)	(2.58,10.87)	(0.45,3.21)	(0.26,6.46)
Alcohol consumption (started/increased)	1.39	1.75	2.16	2.94 **	0.83	0.29 **	8.54 ***	1.15	0.00
	(0.64,3.03)	(0.85, 3.60)	(0.85,5.51)	(1.28,6.80)	(0.38,1.82)	(0.11,0.80)	(3.63,20.12)	(0.36,3.69)	(0.00,N/A)
Smoking (started/increased)	0.86	1.19	0.29	2.12 *	1.25	1.08	11.48 ***	0.50	0.00
	(0.37,1.97)	(0.56, 2.51)	(0.06,1.43)	(0.87,5.16)	(0.57,2.71)	(0.47,2.44)	(5.10,25.83)	(0.11,2.38)	(0.00,N/A)
Dependence on prescription medication	1.37	0.99	1.40	1.70	1.37	0.95	8.68 ***	1.07	0.00
	(0.65,2.88)	(0.49, 2.00)	(0.49,4.02)	(0.73,3.96)	(0.66,2.82)	(0.43,2.14)	(3.97,18.97)	(0.34,3.42)	(0.00,N/A)
Reduced attendance at work	1.24	0.64	0.25 *	1.08	1.92 *	2.60 ***	6.98 ***	0.34	1.01
	(0.62,2.50)	(0.33, 1.27)	(0.05,1.24)	(0.47,2.48)	(0.98,3.77)	(1.31,5.15)	(3.28,14.87)	(0.07,1.53)	(0.20,5.18)
Other	4.05 ***	1.47	0.00	0.84	2.00 *	2.10	0.33	3.33 **	3.98 **
	(1.84,8.94)	(0.67, 3.20)	(0.00,N/A)	(0.29,2.40)	(0.89,4.50)	(0.85,5.15)	(0.07,1.62)	(1.16,9.57)	(1.00,15.84)

ns non-significant

* significantly different from reference category (p<0.1)

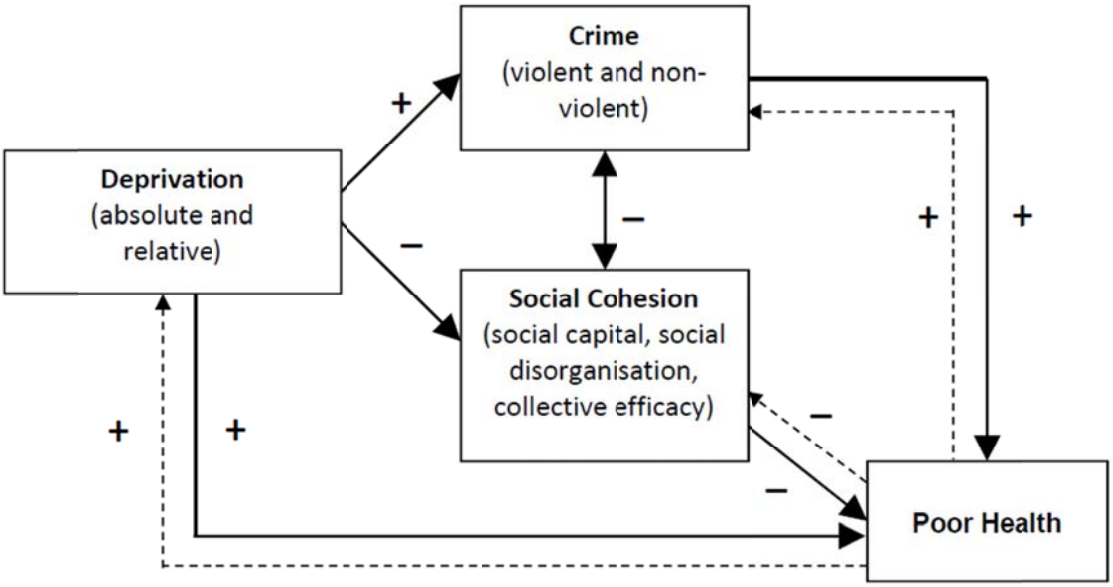
** significantly different from reference category (p<0.05)

*** significantly different from reference category (p<0.01)

687

688 **Figures**

689



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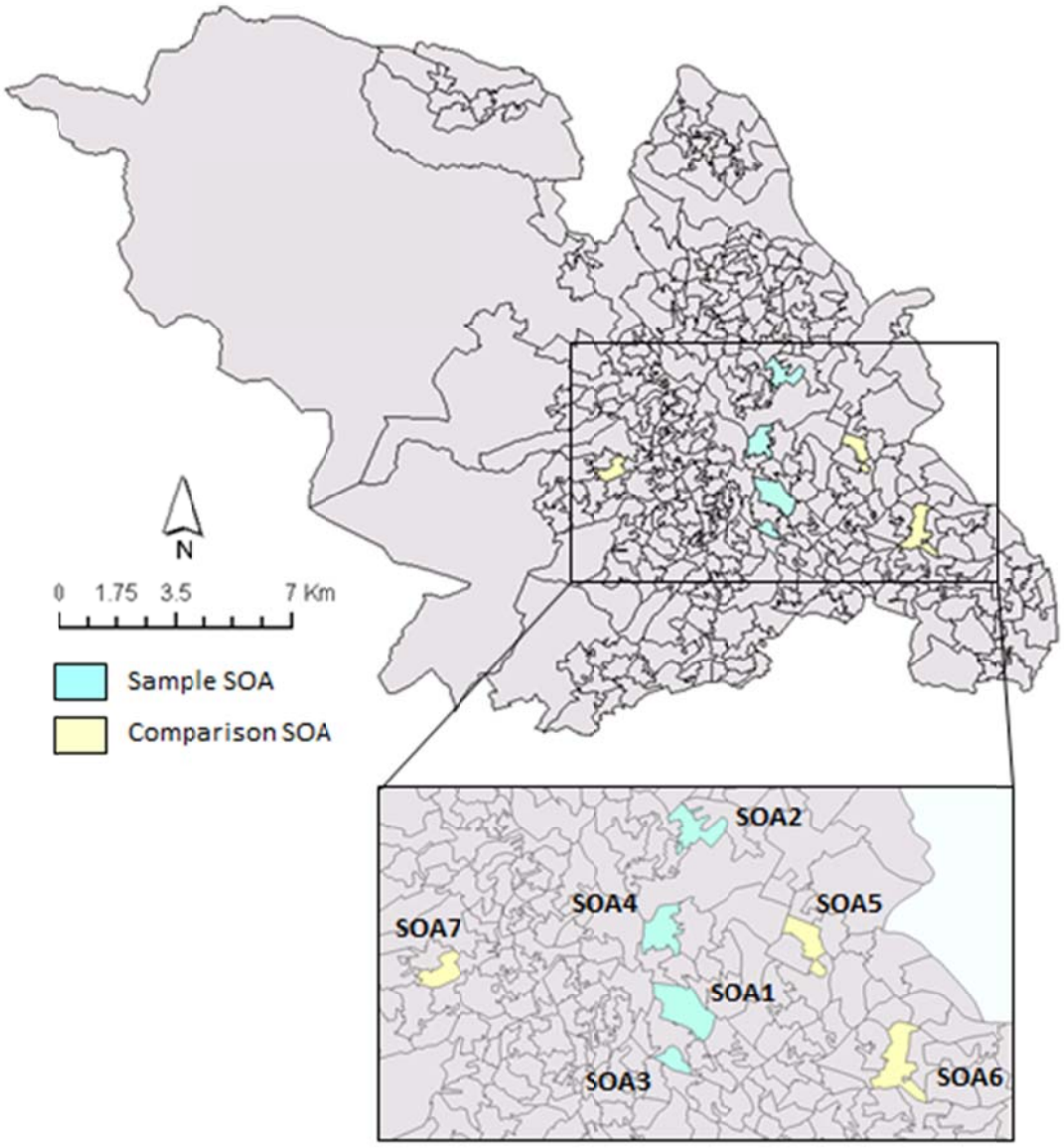
691

692 Fig. 1. Conceptual framework of the links between crime, deprivation, and health.

693



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695

696 Fig. 2. Map of primary and control Super Output Areas (SOAs) sampled for the Sheffield Study of

697 Crime and Health.

698