

Title:

Risk factors for of violent victimisation and injury from six years of the British Crime Survey.

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Abstract

Identifying factors that increase the likelihood of victimisation and injury reveals the considerable variability in risk across society and across violent incidents. Such practice allows the targeting of violence prevention resources to protect those at greatest risk of harm. In this study, three statistical models were developed to identify risk factors for violent victimisation, violent injury and assault-related treatment at an Emergency Department (ED). The cross-sectional sample included all respondents in successive sweeps of the British Crime Survey between 2002/03 and 2007/08 (n=261,510). Based on logistic regression, risk factors for violent victimisation included male gender, younger age, being divorced or separated, lower household income, living in an urban area and frequency of visiting a licensed premises. Among victims of violence, sustaining an injury was associated with weapon use and degree of alcohol intoxication. Among those injured in violence, weapon use, alcohol intoxication and being black increased risk of treatment at an ED. While sociodemographic factors can be used to predict incidence of victimisation, offence-specific factors offer greater predictive validity in predicting harm outcomes.

Keywords: *risk factor, violence, injury, prediction, harm, treatment, victim*

Interpersonal violence is one of the most pervasive and harmful problems faced by society. There were an estimated 520,000 homicides (2001) and 20 to 40 hospitalisations per violent death worldwide in 2000 (World Health Organization, 2002). In 2003/04, the cost of violence against individuals and households (£13.4bn; Home Office, 2005) was roughly equivalent to half the education budget for England and Wales. Therefore, the prediction and prevention of violence are high priorities for both researchers and governments. However, most research effort has sought to identify and predict offending behavior rather than identify those at increased risk of victimisation (Loeber, 1988; Farrington, 1998). In recent years, the victim perspective, strengthened by the introduction of national and local crime surveys, has emerged as an important topic for research, partly as a result of violence becoming a public health issue and a problem for individual patients in a range of healthcare settings.

In addition to preventing violence, public health approaches to violence have begun to focus on the evaluation and prevention of harm from violence. Therefore, the discipline aims to address the severity as well as the overall incidence of violence. This study, taking the narrow focus of physical injury as its indicator of harm, aims to first identify predictors of violent victimisation from a UK sample of respondents to a victimisation survey. It then aims to identify factors that influence likelihood of injury and emergency department treatment among victims of violence.

Predictors of violent victimisation

Data from the most recent British Crime Survey (BCS), collected in 2007/08, demonstrates that violent crime in England and Wales has fallen by 48% since the 1995 BCS was conducted (Kershaw et al., 2008). This finding is consistent with a study of assault injury treated in emergency departments (EDs; Sivarajasingam et al., 2007). In both data sets, younger respondents were at greater risk of violent victimisation compared to older respondents, with males being at greater risk of victimisation than females across all age groups. Furthermore, these findings are consistent with international accounts of violent

victimisation and medical records of assault injury (Faergemann et al., 2008; Wladis et al., 1999; World Health Organization, 2002).

Increased likelihood of violence is consistent across a number of social deprivation variables, such as unemployment and local physical disorder and lower household income (Nicholas et al., 2007), suggesting that social environment plays a large part in predicting victimisation. Living in a socially deprived area increases exposure to risky environments with high levels of offending. Consequently, these are areas that require levels of violence prevention disproportionate to less risky areas.

In addition to demographic variables, victim behaviour has been found to be associated with risk of victimisation. In the 2007/08 BCS (Kershaw et al., 2008), the frequency with which respondents visited venues licensed to sell alcohol was positively associated with increased likelihood of violent victimisation. The relationship between the NTE and victimisation is consistent with Routine Activities Theory (RAT; Cohen & Felson, 1979) which emphasises the convergence of potential victims with motivated offenders in the absence of suitable guardians – a phenomenon also observed in socially deprived areas. It is a versatile theory, suited to the analysis of violence in public situations. Given that alcohol is associated with increased offending, and alcohol myopia (Steele & Josephs, 1990) is likely to make individuals more susceptible to victimisation, it is anticipated that a positive relationship exists between alcohol intoxication and victimisation risk. Furthermore, as alcohol intoxication impairs physical coordination and communication skills (useful in deescalating potentially violent situations), it is possible that intoxication is further associated with *harm* from victimisation such as injury and need for medical treatment.

As noted above, RAT suggests that the absence of appropriate guardians increases the potential for crime. Guardians come in a range of forms, but are most recognisable as police officers. There is little evidence to suggest that police force strength (i.e. number of officers per head of population) has an impact on crime prevention (Bayley, 1994). We theorise that, in responding to crime, police force strength will be associated with reduced likelihood of serious harm from violence, but not actual risk of victimisation.

Harm from violence: Injury and ED treatment

Identifying factors that affect the likelihood of violent injury can benefit interventions to reduce physical and emotional harm as well as expenditure on medical resources and lost productivity. Previous studies have used medical data to identify factors associated with increasing severity of violent injury (Brennan et al., 2006). However, these data only sample victims of violence that come to the attention of medical services. Victimization surveys such as the British Crime Survey offer an opportunity to identify social and demographic factors that influence victim outcomes ranging in severity from no injury to serious injury.

Victimization surveys and injury

The relationship between violence and injury is, as yet, under-researched. While limited in the depth of medical information that they extract, victimization surveys represent the most effective tool currently available for identifying risk factors for violent injury. While emergency department records offer an objective indicator of the numbers of victims of serious violence in an area, they fail to distinguish between those who and do not receive medical treatment following assault. Identifying those at greatest risk of harm can facilitate the prevention of violent injury. Nonetheless, surveys frequently under-report victimization compared to more sophisticated measures of violence such as the Conflict Tactics Scales (Straus, 1979). It is anticipated that the use of three simple questions relating to the presence of victimization, injury and treatment in an ED will increase the accuracy of the estimates within these analyses.

This study aims, for the first time, to develop estimates for risk of violent victimization and harm from a large, representative sample of adults in England and Wales. In addition, by juxtaposing the three analyses, the study aims to reveal trends in risk factors across increasing levels of physical harm from violence. Based on the literature above, it was hypothesised that male gender, younger age, single marital status, lower income and

frequency of visiting licensed premises would be associated with increased risk of victimisation and harm. Furthermore, it was hypothesised that the use of a weapon, victim intoxication, lower police force strength, assault in the NTE and assault by more than one assailant would increase risk of injury and ED treatment among victims of violence.

Method

Sample

BCS data sets for the years 2002/03, 2003/04, 2004/05, 2005/06, 2006/07 and 2007/08 were extracted from the Economic and Social Data Service (ESDS) archive. A sample of six successive BCS sweeps was utilised because this would yield a sufficient number of victims of violence that received treatment in an ED for robust analysis to be conducted and for reliable conclusions to be drawn. The data files were inspected to confirm consistency in question type, data coding and response rates. The combined data set consisted of 261,510 sets of responses, detailing 4,325 violent victimisations. To avoid disproportionate influence of factors influencing repeat victimisation, only first reported incidents of violent victimisation were included in the analysis. This sample represents approximately 0.5% of the population of England and Wales eligible for inclusion in the BCS. The inclusion criteria for survey respondents were that they were aged 16 years or over and lived in a household, as opposed, for example, to being homeless or living in a communal establishment, such as a prison or a hospital. Further details of BCS sampling procedures can be found in Bolling et al. (2002). Predictor variables are described in Table 1.

The BCS is a cross-sectional survey of a representative sample of the adult population in England and Wales about their experiences of crime in the previous twelve months. The survey aims to “estimate the extent of crime against individuals and their private property” (Budd & Mattinson, 2000, p. 3). It is therefore an important tool for measuring crime since it identifies many crimes that are not reported to the police and therefore do not appear in official police records (Brand & Price, 2000). This results in a more accurate picture of crime

and public perceptions of crime than police records and provides a useful indicator of the proportion of total violence incidents that result in injury and medical treatment.

Table 1 Description of predictor variables and correlations with outcome variables

	Percentage of total sample	Number of cases
Male	44.93	117,509
Age		
16-19	3.47	9,071
20-24	4.84	12,644
25-34	14.67	38,325
35-44	19.12	49,954
45-54	15.72	41,061
55-64	16.71	43,653
65-74	13.52	35,334
75+	11.95	31,211
Marital status		
Single	25.40	66,317
Married	48.61	126,958
Separated	3.30	8,606
Divorced	10.51	27,430
Widowed	12.18	31,811
Education qualifications		
No qualifications	33.50	83,469
GCSE	17.21	42,876
A-Level	23.17	57,694
University	26.11	65,040
Household income		
<£10,000	21.03	54,481
£10,000-£19,999	17.25	44,989

£20,000-£29,999	13.18	34,376
£30,000-£39,999	10.07	26,256
£40,000-£49,999	7.43	19,385
£50,000	9.69	25,247
Unknown income	21.35	55,659
Ethnicity		
White	93.92	232,498
Mixed	0.54	2,422
Asian	2.72	10,414
Black	1.71	485
Other ethnicity	1.10	218
Living in an urban area	61.89	161,668
Visits to a bar or pub in past month		
No visits	48.62	127,026
Less than once a week	28.09	73,344
Once to twice a week	16.21	42,334
About three times a week	3.98	10,413
Almost every day	3.10	8,087
Constable strength	Mean = 190.50, S.D. 52.08, Range 127-321	
Officer strength	Mean = 248.4, S.D. 68.19, Range 170- 432.	
Sweep		
2002/03	13.95	36,340
2003/04	14.50	37,898
2004/05	17.25	45,078
2005/06	18.28	261,238
2006/07	18.05	47,148
2007/08	17.97	46,935
If assaulted		

Assaulted near home	57.05	2,467
Weapon used	15.69	645
Any alcoholic drinks consumed prior to incident?		
None	68.23	1,338
One or two	18.16	483
More than two	13.61	394
Location of incident		
Home	30.67	1,323
Work	8.18	353
Night time economy	18.64	804
Sport	1.72	74
Transport	3.85	166
Public	14.51	626
Elsewhere	22.44	968
Number of assailants		
One	62.73	2,592
Two	12.90	533
Three	7.58	313
Four or more	16.80	694

^a Approximately equivalent to US Standard Assessment Tests (SATs)

^b Approximately equivalent to US High School Diploma

^c Income in UK pounds sterling

Measures

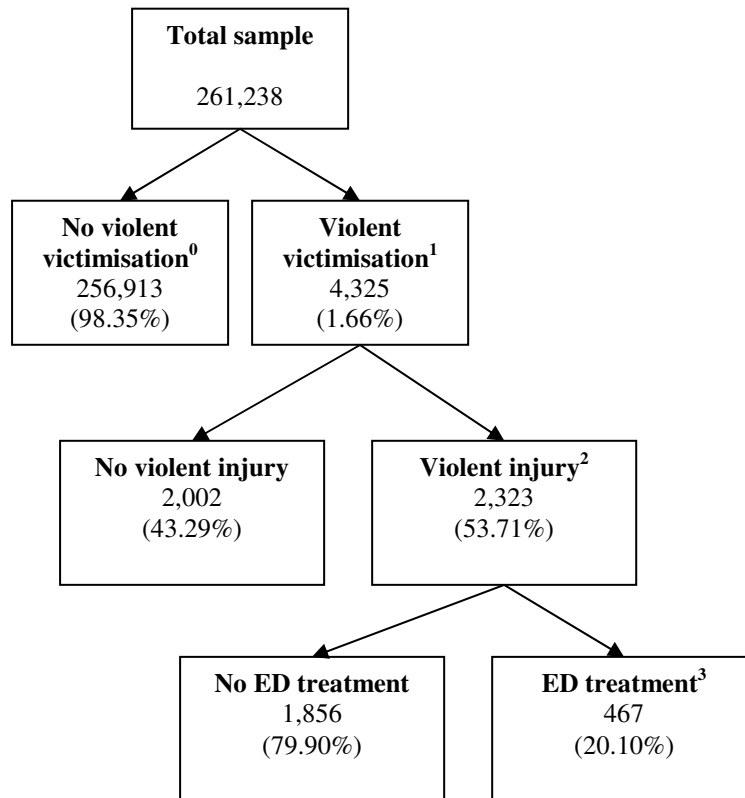
The three main outcome measures employed in these analyses, referring to and differentiating between all violent victimisation, victimisation with injury and victimisation that resulted in ED treatment, were the questions: “Has anyone, including people you know well, deliberately hit you with their fists or with a weapon of any sort or kicked you or used force or violence in any other way?”, “You mentioned earlier that force or violence was used.

Were you bruised, scratched, cut or injured in any way” and “As a result of what happened, did you visit an Accident and Emergency department within 24 hours of the incident?”. Each response was coded by the interviewer as “Yes” or “No”. Among victims of violence, groups were divided into “no victimisation”, “victimised without injury or ED treatment”, “victimised with injury, but without ED treatment” and “victimised with injury and treated at an ED”. A decision tree in Figure 1 details the transitions between these outcomes.

Respondents can only occupy one condition of the model.

Indicators of police force strength for each of the financial years included in the sample were obtained from Home Office statistical bulletins (Cotton & Smith, 2003; Christopherson & Cotton, 2004; Bibi et al., 2005; Clegg & Kirwan, 2006; Bullock & Gunning, 2007; Bullock, 2008). Officer strength and constable strength for each police force were expressed in terms of number of officer or constables per 100,000 population, respectively.

Figure 1 Tree diagram of risk factor regression models.



Statistical Methods

The six data sets were combined using Stata v10 (Stata Corp, 2007) and a “sweep” variable which corresponded to the financial year of interview was added to the combined data set and resulting estimation models in order to control for changes in predictive factors over time. Firstly, variables that predicted violent victimisation were identified using the whole sample of respondents. Secondly, predictors of violent injury were identified from among the sample of respondents who reported violent victimisation and in the third stage predictors of ED treatment for violent injury were identified from among the sample of respondents who reported injury from violence. At each stage, a binary logit model was utilised to identify predictors of progress through the stages. These stages are represented by the estimation equation (1) below, where:

$$\text{logit Pr}(y>k \mid x, y \geq k) = \theta_k + x_k \beta \quad (1)$$

- 0= respondent was not a victim of violence
- 1= respondent was a victim of violence, but was not injured and did not receive ED treatment
- 2= respondent was a victim of violence, was injured but did not receive ED treatment
- 3= respondent was a victim of violence, was injured and received ED treatment

and where y is any of the possible outcomes (0,1,2 or 3) and k is (0,1 or 2). Model covariates, x_k , were allowed to vary between models as some offence-specific variables were only appropriate once the ‘hurdle’ of victimisation had been cleared.

Missing data. The issue of missing data in a data set can have a large, adverse effect on the generalisability of a model, particularly if the missing data are not independently distributed. It was found that 5.09% (n=13,316) of responses were dropped from the model by Stata’s default casewise deletion. Logistic regression using the missing data as a binary outcome variable revealed that age (OR 0.877), educational qualifications (OR 1.133), income (OR 1.064), type of area (OR 1.348), officer strength (OR 1.034) and constable strength (OR 0.958) were significantly related to this “missingness”. Despite these variables having some influence over the missingness of this response, it was decided, given the likely predictive importance of these variable and the small magnitude of missingness, that these were acceptable influences (Nicholas et al., 2007). Therefore, no variables were excluded on the grounds of excessive missingness.

Variable selection and model fitting. Sociodemographic variables recorded by BCS interviewers were used to identify predictors of violent victimisation. Offence specific variables were added to these sociodemographic variables to identify predictors of injury and ED treatment. Models were clustered according to 42* police force area to control for unequal inclusion probabilities across the sample and standard errors were estimated using the Huber/White procedure. To reduce the risk of Type I error, a Bonferroni Step Down (BSD) adjustment was applied to the alpha level of significance.

* Under BCS methodology, City of London Police and London Metropolitan Police are combined as one police force area.

Cross-validation. In order to determine the predictive power of the models, the data set was halved randomly to yield two data sets, the “training” and “test” sets. Models were developed using the “training set” and the effectiveness of this model was determined by its predictive power on the “test” data set. Outputs from the training and test models were compared to ensure that significant findings[†] were consistent across models and not the result of unequal inclusion probabilities across the sample. Receiver Operating Characteristic curves (ROC) were used to compare predictive powers.

Results

Among all BCS respondents included in the analysis, 4,325 respondents (1.66%) reported some form of violent victimisation in the year preceding completion of the survey interview. Of these victims, 2,323 (53.71%) sustained some form of violent injury and among those injured from violence, 467 (20.10%) received treatment in an ED within 24 hours of being assaulted. Table 2 shows the results of three logistic regressions of social, demographic and offence-specific predictor variables on likelihood of violent victimisation, violent injury and treatment in an ED for violent injury.

Violent victimisation

Males were significantly more likely than females to have been a victim of violence. Likelihood of victimisation decreased with age. Compared to single respondents, being married was a protective factors against risk of victimisation. However, being divorced or separated were associated with increased risk of victimisation. Risk of victimisation was inversely related to income with income group of lowest risk being for those respondents who reported a household income exceeding £50,000 per annum. Living in an urban area was associated with increased risk of victimisation. The robustness of this finding is in some doubt as this covariate was only significant in the “training” set model, not the “test” model. However, the strength of the association observed in the full model supports its inclusion as a

[†] These model outputs are available upon request

significant risk factor. There was a dose-response relationship between victimisation and number of visits to a licensed premises in the month preceding completion of the survey. No effect of educational qualifications, ethnicity or police force area were observed.

Violent injury (Model 2)

Being married decreased the likelihood of injury for victims compared to single victims. Having GCSE or A-level qualifications was associated with a decreased likelihood of violent injury compared to those without qualifications. In terms of situational factors, the use of a weapon by an assailant and number of alcoholic drinks consumed by the respondent were associated with increased risk of injury. Assault by four or more assailants was associated with lower risk of injury than assault by one assailant. There was no difference in risk of injury across gender, age, income, ethnicity, area type (urban or rural), frequency of visits to licensed premises, police force strength, assault area or location among respondents who reported violent victimisation.

ED treatment (Model 3)

Among those injured in violence, respondents with GCSE qualifications were at decreased risk of receiving ED treatment compared to those with no qualifications. Black respondents were at increased risk of ED treatment compared to white respondents. In terms of situational factors, the use of a weapon by an assailant increased the likelihood of ED treatment, while number of drinks consumed by a respondent prior to assault was associated with increased risk of ED treatment, although the relationship was non-linear. No effect of gender, age, marital status, income, area type, frequency of visits to licensed premises, police force strength, assault area, location or number of assailants.

Variable	Any violence		Injury		ED treatment	
	OR	95% CI	OR	95% CI	OR	95% CI

(comparison)									
Male	1.361***	1.287	1.438	1.051	0.902	1.225	1.273	0.973	1.665
Age									
(Age >75)									
20-24	0.717***	0.622	0.828	1.069	0.793	1.441	1.167	0.725	1.878
25-34	0.529***	0.479	0.584	1.292	0.973	1.716	1.460	0.918	2.323
35-44	0.391***	0.352	0.434	1.029	0.757	1.400	1.221	0.768	1.941
45-54	0.304***	0.260	0.355	0.944	0.689	1.292	1.151	0.646	2.049
55-64	0.160***	0.135	0.189	0.702	0.472	1.043	1.374	0.628	3.004
65-74	0.089***	0.070	0.113	0.589	0.373	0.929	0.554	0.181	1.697
75+	0.049***	0.036	0.066	0.679	0.392	1.177	1.228	0.264	5.710
Marital status									
(Single)									
Married	0.583***	0.532	0.639	0.718***	0.589	0.874	1.210	0.838	1.746
Separated	1.602***	1.373	1.869	1.132	0.781	1.639	0.841	0.548	1.291
Divorced	1.431***	1.290	1.586	1.237	0.962	1.591	1.328	0.928	1.902
Widowed	0.805	0.672	0.964	0.937	0.567	1.549	1.130	0.476	2.685
Education qualifications									
(No qualifications)									
GCSE	0.820	0.696	0.968	0.575***	0.454	0.729	0.439***	0.281	0.685
A-Level	0.900	0.799	1.014	0.645***	0.529	0.787	0.705	0.492	1.010
University	0.964	0.867	1.072	0.880	0.723	1.071	0.799	0.594	1.076
Household income									
(<£10,000 p.a.)									
10-20k	0.822***	0.739	0.915	0.945	0.753	1.186	0.926	0.656	1.309
20-30k	0.741***	0.669	0.821	1.117	0.898	1.389	0.699	0.443	1.103
30-40k	0.686***	0.609	0.772	0.785	0.600	1.028	1.382	0.958	1.995
40-50k	0.715***	0.621	0.825	0.967	0.737	1.271	0.995	0.585	1.692
50k+	0.663***	0.587	0.748	0.821	0.610	1.106	1.510	0.932	2.448
Unknown income	0.755***	0.674	0.845	1.144	0.975	1.341	0.954	0.687	1.326

Ethnicity									
(compared to white)									
Mixed	1.091	0.787	1.513	1.240	0.590	2.605	0.646	0.203	2.061
Asian	0.783	0.639	0.958	0.907	0.570	1.443	1.410	0.661	3.012
Black	0.815	0.694	0.958	1.586	0.844	2.982	2.635***	1.660	4.182
Other ethnicity	0.940	0.751	1.178	1.207	0.765	1.904	1.222	0.445	3.353
Living in an urban area									
(Rural area)	1.130***	1.037	1.232	1.181	0.968	1.440	0.839	0.609	1.155
Visits to a premises licensed to sell alcohol in month preceding survey									
(No visits)									
Less than once a week	1.047	0.968	1.132	0.965	0.820	1.136	0.777	0.567	1.063
Once to twice a week	1.218***	1.124	1.319	0.966	0.802	1.164	0.843	0.580	1.225
About three times a week	1.521***	1.311	1.764	0.968	0.704	1.331	1.149	0.701	1.883
Almost every day	1.813***	1.594	2.062	0.747	0.604	0.924	0.887	0.519	1.517
Constable strength	1.003	1.000	1.006	0.996	0.985	1.006	0.997	0.983	1.012
Officer strength	0.996	0.992	1.001	1.005	0.990	1.020	1.005	0.985	1.025
Sweep									
(2002/03)									
2003/04	1.074	0.949	1.217	1.132	0.897	1.430	1.143	0.722	1.812
2004/05	1.084	0.970	1.211	1.047	0.803	1.363	1.051	0.728	1.517
2005/06	1.116	0.987	1.262	1.306	0.983	1.736	0.946	0.593	1.509
2006/07	1.141	1.018	1.280	1.081	0.843	1.384	1.166	0.743	1.831
2007/08	1.021	0.911	1.144	1.016	0.810	1.273	1.217	0.759	1.949
Assaulted near home				1.047	0.915	1.197	0.901	0.658	1.232
Weapon used				1.448***	1.161	1.807	2.833***	2.299	3.490
Any alcoholic drinks consumed prior to incident?									
(None)									

One or two		1.982***	1.539	2.554	2.015***	1.540	2.636
More than two		2.473***	1.983	3.084	1.946*	1.309	2.894
Location of incident							
(In a home)							
Work		0.919	0.687	1.228	1.056	0.597	1.866
Night time economy		0.911	0.709	1.171	1.003	0.694	1.449
Sport		0.863	0.544	1.369	1.174	0.391	3.530
Transport		0.672	0.472	0.958	0.513	0.238	1.108
Public		0.812	0.691	0.954	1.274	0.854	1.899
Elsewhere		0.961	0.768	1.202	1.171	0.803	1.706
Number of assailants							
(One)							
Two		0.736	0.592	0.916	1.136	0.746	1.731
Three		0.844	0.630	1.129	1.015	0.616	1.671
Four or more		0.713***	0.582	0.873	1.036	0.731	1.467
Observations	248194	3,781			2,027		
ROC	0.746	0.657			0.685		
Hosmer & Lemeshow χ^2	6.50(8), p=0.591	12.56(8), p=0.128			4.54(8), p=0.805		
Pseudo R²	0.079	0.057			0.076		

*BSD-adjusted p<0.05, **BSD-adjusted p<0.01, ***BSD-adjusted p<0.001.

Cross-validatory comparisons of the models obtained from the training data sets demonstrated that they were robust and not adversely affected by data inconsistencies, although small variation between models in estimating ED treatment suggests that these findings should be scrutinised carefully. Furthermore, comparison of ROC values indicates high levels of predictive ability for the models on both the “test” data set and the full data set (violent victimisation “training” ROC = 0.745, “test” ROC = 0.750, “full data set” ROC = 0.746; violent injury “training” ROC = 0.669, “test” ROC = 0.678 and “full data set” ROC = 0.657; and ED treatment “training” ROC = 0.745, “test” ROC = 0.696 and “full data set” 0.685).

Discussion

A range of predictors of victimisation, violent injury and ED treatment for violent injury were identified through three separate regression models. The analyses took the form of hurdle-type models, with factors associated with transition through a tree model identified at three stages. The models answer a number of questions about the effect of a number of sociodemographic and situational factors on victimisation and risk of harm from violence. By reporting reliable effect estimations, the analyses provide valuable indicators of how to best reduce harm from violence. Although the analyses utilised data drawn from a sample of respondents in England and Wales, the findings have value for the prevention of harm at an international level.

As hypothesised, male gender and younger age were associated with increased risk of victimisation. This effect has been demonstrated across a range of cultures and groups (Faergemann et al., 2008; Nicholas et al., 2007). However, in support of findings by Brennan et al. (2006), male gender was not associated with injury or treatment outcome. Similarly, age had little effect on level of harm among victims. While the relationship between age and injury was approximately linear and inverse, wide confidence intervals indicate considerable variability in this relationship. Being married was associated with decreased risk of victimisation, while being separated or divorced were risk factors for victimisation. These findings could reflect the cross-sectional nature of the survey. For example, victimisation by a spouse in the twelve months preceding completion of the survey could have been a trigger for separation or divorce. It is not possible to determine the direction of the relationship between these two factors from these cross-sectional data. Having a GCSE qualification was a protective factor against injury and ED treatment. This is a new, robust finding and is the only sociodemographic finding that is associated with decreased risk across the two harm outcomes. That the effect of education on harm is not continued in a consistently linear way, coupled with the strength of this effect suggests that this finding reflects occupation more than educational achievements. This is supported by an approximately linear effect of income

on likelihood of victimisation. Combined, these findings suggests that having a GCSE qualification represents a substantial protective factor against victimisation – the magnitude of which exceeds the protective effect of further incremental increases in educational achievement.

Being black considerably was associated with a considerably heightened likelihood of ED treatment among those injured in violence. In fact, after the use of a weapon, being black was the strongest risk factor for ED treatment. This suggests that when victimised, black respondents suffer considerably more serious injuries. However, wide confidence intervals (which may also be a consequence of low numbers of black respondents) suggests large variability in this outcome among those injured in violence. Therefore, this finding could also reflect geographical factors which influence the likelihood of attendance at an ED. Within the survey sample, 82% of black respondents lived in an urban area, compared to 61% of white respondents. Lyons et al. (1995) have demonstrated that distance from an ED (commonly located in urban areas) influences likelihood of attendance. However, no effect of the interaction between ethnicity and area type was detected. Alternatively, black ethnic groups have been shown to be over-represented among victims of serious violence (House of Commons Home Affairs Committee, 2007), which may account for this effect of ethnicity on ED treatment. It is vital that work continues to redress these inequalities and to reduce the incidence of serious violence against black and other minority ethnic groups.

There was a dose-response relationship between violent victimisation and frequency of visiting premises licensed to sell alcohol, suggesting that this relationship was particularly robust. The relationship between licensed premises and victimisation is not a new finding – it is entirely consistent with RAT and the dose-response effect shown here simply provides further support for this already robust relationship. The interesting finding in this context is that injury and treatment outcome were not associated with this activity. In fact, the relationship between visiting a licensed premises and violent injury was found to be an inverse (although not statistically significant) one. However, alcohol dose was positively associated with injury and ED treatment likelihood, suggesting that intoxication contributes to

drinkers in the NTE being suitable victims by making them vulnerable to assault.

Furthermore, alcohol intoxication may result in worse harm outcomes following victimisation as victims may lack the physical coordination to protect themselves from violent blows or harmful falls. These findings offer support for the position that victim intoxication impacts more on risk of violent injury than the intoxication of an assailant (Shepherd et al., 2006).

In support of findings by Brennan et al. (2006), the use of a weapon by an assailant was associated with considerably increased risk of harm. While rare, - the predicted probability of any respondent in the sample being assaulted with a weapon was 0.00246 or 246 per 100,000 population – weapon use greatly increased the likelihood of serious injury being sustained by a victim. The predicted probability of ED treatment when injured with a weapon was 0.33, compared to 0.15 in other assaults[‡]. It should be noted that *post hoc* multinomial logit analyses did not reveal any variation in harm likelihood associated with particular weapon types[§].

Group violence may be particularly visible to guardians, providing an explanation for the protective effect of assault by four or more assailants. A weak protective effect of violence in public places was also noted in earlier models, but this effect failed to meet the threshold for significance following application of the BSD adjustment. Nevertheless, early intervention in assaults may be associated with decreased likelihood of harm (Sivarajasingam and Shepherd, 1999). This findings serves to highlight the importance of reliable and current intelligence about violence in an area. Anonymised ED data about the location and characteristics of violent injury represent a valuable source of information that can be used in the reduction of harm from violence.

Intuitively, it would follow that police force areas with greater numbers of police special constables and police officers per 100,000 population would be associated with decreased risk of violent victimisation, injury and ED treatment. However, as hypothesised

[‡] Predicted probability calculated using Stata 10 `prtab` function, holding all other regression covariates at their mean.

[§] Weapon types were: “Blunt object”, “Bottle/Glass”, “Knife or other stabbing instrument”, “Firearm” and “Other weapon”.

and in concurrence with existing literature (Bayley, 2004), no effect of police force strength was detected in the analyses. Of course, using number of officers expressed as a function of area population is a crude proxy measure of police force capability and activity and cannot reflect differing operational practices across police forces. For example, police force strength may simply reflect a needs-based response to crime in a police force area. Following this rationale, the null effect with narrow confidence intervals observed within here is exactly what would be expected. The role of police force strength in preventing victimisation needs to be evaluated in greater detail. The BCS, combined with police operational data presents a valuable opportunity for determining how best to allocate violence prevention resources.

As noted in the introduction, a limitation of this research is its reliance on accurate survey responses. Victimisation surveys have been shown to under-report the incidence of violent victimisation among samples compared to other, more focused measures. However, these measures have, in turn, been shown to over-report victimisation compared to scenario-based self-report measures (Hilton et al., 2003). The use of simple, “Yes/No” questions to identify the victimised, injured and treated respondents within the BCS sample limits the level of inaccurate responding by avoiding count-type question more commonly associated with inaccurate reporting, such as “How many times have you been assaulted in the past year?”. The limitations of self-report have been accepted here in exchange for the illuminating power of a large and nationally representative sample, which has facilitated the development of stable models of rare events without the risk of sampling bias.

While the models accounted for marked proportions of the reported violent victimisation and injury, unmeasured factors must also have played a part. Such factors are likely to include personality and behavioral characteristics such as history of aggression, impulsivity and risk-taking (Shepherd et al., 2002; Vaughn et al., 2006). While this position could be interpreted as *victim-blaming*, there is considerable evidence that psychological characteristics associated with high levels of risk-taking behaviour are *correlated* with history of victimisation. Emphasising these characteristics lays no more blame at the door of the victim than does our identification of demographic predictors of victimisation. Demonstrating

that some personal characteristics are associated with health-related outcomes can facilitate change in an individual's behaviour and is a cornerstone of much cognitive-behavioural treatment (Strecher et al., 2002).

This research has identified a number of sociodemographic factors that increase risk of victimisation among a UK sample. Using a large data set, reliable point estimates have been estimated, which can the allocation of resources to protect those at greatest risk. Furthermore, these analyses demonstrate the limited role that sociodemographic factors can play in predicting harm from violence. Factors such as age, gender and income offer little indication of harm outcome among victims of violence. However, the relationship between black ethnicity and risk of ED treatment for violent injury is a robust and worrying finding which deserves immediate scrutiny. Overall, situational factors such as weapon use and victim intoxication are far more successful than sociodemographic factors in determining harm likelihood. This offers support for the situational prevention of violent harm rather than the targeting of particular at-risk groups. Speedy response to violent incidents by emergency services and other guardians, combined with reliable information about violence locations and public awareness of increased vulnerability to violent injury once intoxicated is likely to play a considerable role in reducing the harm caused by violence.

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