Introduction

There are more than a billion people with physical or mental disability worldwide, comprising around 15% of the global population. [1] The recent World Report on Disability [1] highlights physical and sexual violence against people with disability as a major risk factor for ill health in this group. In the non-disabled population, violence contributes significantly to the global burden of injuries, physical and mental health problems, substance misuse and death. [2] The health impact of violence among the disabled is likely to be compounded by pre-existing morbidity and difficult social circumstances. The 2006 United Nations Convention on the Rights of Persons with Disabilities highlights the entitlement of this vulnerable group to ‘freedom from exploitation, violence and abuse’ and obliges member states to ‘take all appropriate measures’ to prevent violence and rehabilitative victims. In order to meet these obligations, we need to better understand the epidemiology of violence in this population.

Recent reports by the Equality and Human Rights Commission found evidence for high levels of violence against people with disability, but called for “definitive data...on the scale, severity and nature of disability harassment”. [3,4] A recent systematic review found that past-year violence was experienced by 24% of people with mental illness and 3% of people with non-specific impairment (with pooled adjusted odds ratios of 3.9 and 1.5 respectively compared with the non-disabled), but highlighted important gaps in the evidence base. [5] We identified three key unanswered questions of relevance to policy makers, which we address in this study. Firstly, we do not know who among the disabled is most at risk, and what type of violence they are most likely to suffer from [5]. Past evidence suggested that those with mental illness were at particularly high risk, but this was largely based on comparing clinical samples of people with severe mental illness to general population samples of people with self-defined
physical disability. Secondly, there is little evidence on the health impact of violence in this group, which may be magnified by chronic illness and poor psychosocial resources. [6] Finally, we do not know what proportion of violence in the population as a whole (and in those with disability) is explained by disability-associated risk. Policy makers need answers to these questions in order to design and target cost-effective interventions.

In the UK, there are 10 million people living with a limiting disability. [7] The government recently recommended the addition of disability measures to major national surveys, in order to estimate unmet needs in this population. The British Crime Survey (BCS), a large national victimization survey, introduced a measure of disability subtypes for the first time in 2009. This provided a timely opportunity to address the following hypotheses/questions: (1) Are people with disability at greater risk of violence (and violence subtypes) than those without disability, and do people with mental illness have a greater risk than those with physical/other disabilities? (2) Do disabled victims experience more severe health problems following violence than non-disabled victims? (3) What proportion of violence victimisation in the population as a whole (and in those with disability) is attributable to the independent effect of disability (4) What is the associated economic cost?

Methods

Analysis of data from the 2009/2010 British Crime Survey. [8].

Ethics Approval

In this study we analysed British Crime Survey (BCS) data collected on behalf of the Home Office, which is available to the academic community from the UK Data Archive (UKDA). A subset of this data (including data on domestic and sexual violence and on substance misuse) could only be accessed under Special License, to ensure participant confidentiality. We were granted Home Office approval to access BCS Special License data for the purposes of this study. We did not seek additional ethics committee approval for this secondary data analysis.

Setting, Participants and Study Design

The BCS is a nationally representative cross-sectional survey of crime victimisation in men and women aged 16 or over living in private residential households in England and Wales. The survey has a complex design, with clustering, stratification and unequal sampling probability. [9] The sample size is powered to estimate crime rates in each of 42 Police Force Areas (PFAs), with a minimum target of 1000 participants per PFA. Lay interviewers collected data in door-to-door visits. The main survey used face-to-face interviews, and included measures of non-domestic and domestic physical and sexual violence. Sexual assaults and domestic violence were also measured using a more sensitive self-completion questionnaire, but only in those aged 16–59. This questionnaire was omitted if participants refused to complete it or asked for interviewer help. Historically, around 80% of BCS participants completed this questionnaire, with non-completers being older and more socially deprived. [10] Also historically, less than a fifth of those who reported sexual or domestic violence in the self-completion questionnaire also reported these experiences in the face-to-face interview. [10].

We included participants who took part in the April/2009-March/2010 BCS survey (when disability subtypes were first measured). We excluded individuals with missing data on disability or on survey design. We performed two sets of analyses: (1) An analysis of data on all participants, using violence measures from face-to-face interviews only (‘main-interview analyses’) (2) An analysis of data on the subgroup of people aged 16–59 who answered the self-completion questionnaire, using both face-to-face and self-completion violence measures (‘self-completer analyses’). Therefore, the former included all participants across the age range, whilst the latter included a younger subgroup with more sensitive measures of sexual and domestic violence.

Measures (see Box1)

Disability was defined as any ‘long-standing physical or mental health conditions or disabilities that have lasted or are expected to last 12 months or more and which limit day to day activities’. Our main exposure was a three-level disability measure: (a) no disability (b) one or more disabilities, including disability due to mental illness (‘mental illness’) (c) one or more disabilities, excluding disability due to mental illness (‘non-mental disability’). The main outcome was being the victim of any actual or threatened violence in the past year (whether physical or sexual, domestic or non-domestic). Secondary outcomes were the following six violence subtypes: actual, threatened, physical, sexual, domestic and non-domestic violence. We adjusted for age, sex, social deprivation (at the individual, household and area levels) and substance misuse (see Box 1). [11] [2] Potential interaction terms were disability interacting with sex and age.

Statistical Analysis

We carried out design-based analyses (which took into account the complex survey design, including weighting, clustering and stratification) using the ‘svy’ suite commands in Stata, version 11.0 (Stata Corporation, East College Station, TX USA). We report weighted prevalence estimates with robust standard errors. Hypothesis tests were based on adjusted Pearson’s tests (for bivariate analyses), or adjusted Wald tests (for multivariate logistic regression analyses).

We estimated the crude prevalence and age/sex adjusted odds ratios for any violence victimisation for each of the six disability subtypes (compared to those without the given disability). To address our first question, we estimated crude and age/sex standardised prevalence of violence and its subtypes in those with no disability, mental illness and non-mental disability; using the whole study sample as the standard population. We estimated odds ratios (ORs) for violence and its subtypes (a) adjusted for age and sex (b) adjusted for the other covariates detailed in Box 1. We tested the final models for interaction between disability and sex and disability and age using the interaction effect Wald test. To address our second question, we estimated the prevalence and odds of physical and mental illness following violent offences experienced by those with and without disability (adjusting for age, sex and offence type; and for clustering of offences within individuals).

To address our third question, we used Greenland’s methodology [12,13] to estimate the proportion of violence that can be attributed to the independent effect of disability (the population attributable fraction or PAF), both in the general population and among people with disability. Greenland’s methodology is recommended for estimating adjusted attributable risk (where the effect of other factors is taken into account). [13] It employs a maximum likelihood approach based on the logistic model. We used the Greenland-based ‘punaf’ command in Stata (V12.0 SE), which estimates PAFs on the basis of parameter estimates from multivariate logistic regression models.

To estimate the burden of disability-related violence at the population level, we combined 2009 Office for National Statistics population figures [14] with our estimates of disability prevalence,
violence prevalence, and PAFs to estimate (a) the total number of people with disability who experienced violence (calculated as population total \( \times \) prevalence of disability \( \times \) prevalence of violence amongst those with disability; summed across 5 age-group strata to improve precision of estimates (b) the total number of people who experienced violence attributable to the independent effect of disability (calculated as (a) \( \times \) PAF amongst people with disability).

Finally, we estimated the financial cost of violence attributable to disability in England & Wales (E&W) in 2009. We used the best available estimates of the unit costs of crime; which were first developed by the Home Office research directorate in 2000 [15], and most recently updated in 2011 [16]. These unit costs are derived from estimates in the general population, and include costs to healthcare and criminal justice systems, lost economic output, and cost to victims from the physical and emotional impact of crime. [17]. For violent crime, incidents are grouped into 5 cost categories (serious wounding, other wounding, common assault, robbery and sexual assaults). In the BCS, participants who report being a victim of violence are asked detailed information about the number of incidents experienced and the nature of each incident (e.g. who it was perpetrated by, injuries sustained, etc.). Each incident is then coded into one of the above categories. This data is provided by the Home Office alongside population weights, and hence allows for estimation of the total number of incidents experienced in the population. We estimated (a) the total cost of crime among those with disability (calculated as number of incidents experienced by people with disability in the study sample \( \times \) population weights for these incidents \( \times \) unit costs) and (b) the cost attributable to the effect of disability (calculated as (a) \( \times \) our PAF estimate for main-module actual violence). These cost estimates did not include violence disclosed in the self-completion module, since there are no available up to date unit cost estimates for these experiences. [18,19] This follows the methodology used by the Home Office, where the published cost of crime only includes violence disclosed in the main module. [17].

We examined the frequency of missing data for all covariates included in the model. For variables with missing data in more than 5% of participants, we included a ‘value missing’ category in logistic regression analyses. To assess for participation bias in the self-completion measures, we compared the characteristics of those who completed this module with those who were unwilling or unable to do so.

We carried out additional analyses to separate out the effects of disability type, number of co-morbid disabilities and severity of functional limitation on violence risk (see supplementary material).

**Results**

**Participant Flow and Response Rates**

In 2009/10, 4,4638 people participated in the BCS, a response rate of 76% (with significantly lower participation in those aged under 35 and over 60, in men and in London). [9] 44398/44638 (99.5%) of BCS respondents were included in our analysis, after excluding those who had missing survey design data (n = 149). Violence data (n = 91). 28225/44398 (64%) were aged under 60, and hence eligible for the self-completion questionnaire. Of those, 22874/28225 (81%) completed that questionnaire, with significantly lower participation in older people, men, ethnic minorities, the socially deprived and those with disability (69% vs. 82% of those with and without disability respectively; p<0.001).

**Socio-demographics and Prevalence of Disability**

Sample socio-demographic characteristics are shown in table 1, and largely reflected the general population. 9037/44398 participants (16.2%) had at least one limiting disability; 7781 (15.9%) had one or more disabilities excluding mental illness (‘non-mental disability’) and 1256 (2.4%) had one or more disabilities including mental illness (‘mental illness’). Those with and without disabilities differed on most socio-demographic characteristics, with disabled people being significantly older (mean age 61 vs. 44, p<0.001), and more likely to be female and socially deprived (Table 1). Only household income had missing values for more than 1% of the sample (with missing values for 18% of the sample).

**Prevalence and Odds of Violence by Disability**

Prevalence and odds of any violence for each of the disability subtypes are shown in Figure S1 and Table S1. From the main interview analyses, the age/sex adjusted relative odds for victimisation were highest amongst those with mental illness (aOR 2.7; CI 2.2–3.4) and long-term physical illness (aOR 2.6, CI 1.9–3.7), followed by those with mobility problems (aOR 1.9, CI 1.6–2.3) and ‘other’ disability (aOR 2.0, CI 1.7–2.4). There was no association between violence victimisation and either sensory impairment (aOR 1.3, CI 0.9–2.0) or learning disability (aOR 0.8, CI 0.4–1.5), at the 5% significance level. We found similar associations in the self-completer analyses (see Figure S1 and Table S1).

Prevalence and odds of violence and its subtypes for those with no disability, non-mental disability or mental illness are shown in Figures 1 & 2 and Tables S2 & S3. Age and sex standardised prevalence of any past-year actual or threatened violence in those with no disability, non-mental disability and mental illness was 5.9, 9.3 and 13.2% respectively in the main interview analyses, and 9.9, 14.9 and 21.0% respectively in the self-completer analyses. A similar gradient was observed across all violence subtypes. For those with self-completion data who reported victimisation, a similar proportion of victims with and without disability reported physical violence (92% and 91% respectively) and sexual violence (15% and 14% respectively). Although both victims with and without disability reported non-domestic violence more often than domestic violence, domestic violence was reported by a greater proportion of disabled than non-disabled victims (44% vs. 31%; p for difference<0.01), whilst non-domestic violence was reported by a lower proportion of disabled than non-disabled victims (66% vs. 74%; p for difference<0.001).

For all violence subtypes, and in both sets of analyses, the age/sex adjusted OR was higher in those with disability compared to those without (at the 1% significance level), and higher in those with mental illness than those with non-mental disability (at the 5% significance level). Across violence subtypes, those with non-mental disability had nearly double the odds and those with mental illness had nearly triple the odds of violence compared with the non-disabled after adjusting for age and sex. Additional adjustment for a range of individual, household and area factors resulted in only minimal changes to the OR estimates, except for a sizeable reduction in the OR of domestic violence-particularly among those with mental illness.

There was no interaction between disability and age or sex on violence risk. Regardless of disability, men were more likely to be victims of both physical and non-domestic violence (53 & 58% of victims respectively; p<0.05), whilst women were more likely to be victims of sexual and domestic violence (83 & 71% of victims respectively; p<0.001). Across all violence types, around 80% of the violence was perpetrated by men, 10% by women and 10% by both men and women.
Only 15% of those who reported sexual violence and 25% of those who reported domestic violence in the self-completion questionnaire also reported these experienced in the main interview, with no differences in disclosure rates by disability.

**Health Impact of Violent Incidents by Disability**

Health impact was reported for a total of 2477 violent incidents, which were experienced by 2100 people who reported violence in the main module questionnaire (table 2). There were no differences between those with and without disability in the mean number of incidents experienced (1.5), or in the proportion of incidents resulting in physical injury (28.0%) or requiring medical attention (10.3%). Those with disability were more likely to report that the incident led to anxiety, depression or panic attacks, and that they were emotionally affected ‘very much or quite a lot’ rather than ‘just a little’ by the incident (at the 1% significance level). These adverse mental health effects were commoner in those with pre-existing mental illness than those with other disability types (at the 5% significance level).

**Population Attributable Fraction and Population Estimates**

PAFs and related population estimates are shown in table 3. Using ‘main interview’ findings, which relate to people aged 16 and above, we estimated that the proportion of violence which could be attributed to the independent effect of disability was 7.5% (CI 5.7–9.3%) in the general population and 48.8% (CI 41.1–55.4%) among those with disability. Using ONS mid-2009 population figures for England and Wales we estimated that in that year the independent effect of disability resulted in an estimated additional 184,000 people with disability experiencing any actual or threatened violence, including 116,000 disabled victims of actual violence, at an excess cost of £1.51 billion pounds (table S4).

Estimates from the subgroup of people with self-completion data, which only relate to people aged 16–59, are summarised in Table S3. Compared to ‘main interview’ estimates, the PAFs are lower (reflecting the lower prevalence of disability in this younger subgroup), but the estimated number of victims are higher (reflecting the higher prevalence of violence when both self-completion and main interview measures are taken into account).

**Additional Analyses**

Results from our additional analyses suggested that differences between the groups we defined as having disability with and without mental illness were due to the effect of mental illness itself, rather than to the differences between these groups in the number of co-morbid disabilities or the severity of functional limitation (see File S1).

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**Table 1. Sample socio-demographic and disability characteristics.**

| Socio-demographic characteristics* | Non-disabled (N = 35361) % (n) | Disabled (N = 9037) % (n) |
|-----------------------------------|-------------------------------|---------------------------|
| Mean age (sd)**                   | 43.6 (sd 0.44)                | 61.0 (sd 0.52)            |
| Female**                          | 50.3 (19187)                  | 56.0 (5225)               |
| White**                           | 88.1 (32498)                  | 92.7 (8604)               |
| Married/cohabiting**             | 63.7 (20914)                  | 56.2 (3921)               |
| Living alone**                   | 11.7 (8054)                   | 29.0 (4132)               |
| Has degree/diploma**             | 36.6 (12670)                  | 18.9 (1697)               |
| Employed**                       | 66.9 (22394)                  | 20.9 (1591)               |
| Renting social housing**         | 12.0 (4510)                   | 30.4 (2908)               |
| Living in urban area             | 79.0 (26051)                  | 79.3 (6800)               |
| Living in an inner city**        | 10.0 (2665)                   | 12.0 (868)                |
| Living in area in lowest deprivation quintile** | 18.2 (5986) | 28.2 (2454) |

**Disability characteristics** Not applicable

Mobility impairment 52.0 (4930) 4.4 (1392)
Sensory impairment 9.3 (815)
Long-term physical illness 2.7 (170)
Learning disability 14.5 (1256)
Mental health condition 51.0 (4563)
Other 26.0 (2236)
One or more disability excluding mental illness 85.5 (7781)
One or more disability including mental illness 14.5 (1256)
Severe functional disability 28.4 (2692)
Two or more disabilities 34.5 (3202)

*None of these variables had missing values for >1% of the sample.
**p for difference <0.001.
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Discussion

Using a large general population sample, we found that people aged 16 and over with one or more disabilities including mental illness had relative odds of 3.0 (2.3–3.8) and those with one or more disabilities excluding mental illness had relative odds of 1.8 (1.5–2.2) of being a victim of past-year violence compared with the non-disabled after adjusting for socio-demographic and behavioural factors (with similar relative odds across violence subtypes). Compared with non-disabled victims, victims with disability were more likely to experience mental health problems following violent incidents, especially those with pre-existing mental illness. We estimated that around 8% of violence in the general population and half of violence among those with disability could be attributed to the independent effects of disability, and that this resulted in an estimated additional 116,000 people with disability experiencing actual violence in England and Wales in 2009, at an excess cost of £1.51 billion.

Overall, prevalence and risk estimates are consistent with studies from other countries. [5] In the USA, one national and one statewide household survey found that women with disability had four-fold the odds of being a victim of sexual assault than non-disabled women. [20,21] Both studies found no association between disability and physical assaults, but this may be due to limited study power. In our much larger study, we found a clear association between disability and both physical and sexual assaults. In Taiwan, national data on sexual assaults found that people with disability were more likely to experience sexual assaults than those without, particularly those with learning disabilities.

Figure 1. Prevalence and odds of violence subtypes in people aged 16 and above, by disability (interview measures of violence only).

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difficulty and chronic psychosis. [22] This is consistent with our finding of high risk among those with mental illness. However, we failed to find an association between violence and either learning disability or sensory impairment. This may be due to limited power (only 170 people with learning disability participated in this study). It could also be due to participation bias; the survey was designed for the general population, and people with significant intellectual impairment or communication problems may have found it difficult to participate in the lengthy and detailed study interview.

We found that the relative odds of violence outside and within the home were equally high, with the former being more prevalent. However, the prevalence of domestic violence may have been underestimated due to response or disclosure bias. Disabled victims were less likely to complete the sensitive self-reported measure of domestic violence than non-disabled victims, and it is possible that non-completers were at higher risk. Disclosure of domestic violence may be particularly difficult for disabled victims, as they may be dependent on perpetrators, and fear increased violence or independence loss and institutionalization following disclosure. [23] Nonetheless, this study suggests that interventions for both non-domestic and domestic violence are required in this population. We found that social deprivation and substance misuse did not account for the excess risk of non-domestic violence, but did account for some of the excess domestic violence risk (especially amongst those with mental illness), suggesting that these factors could be appropriate intervention targets for addressing domestic violence risk.

Past evidence suggested that those with mental illness were at particularly high risk, but this was largely based on comparisons between studies with widely differing settings and measures. [5] Our study is one of the few to directly compare risks for those with...
self-defined mental illness versus other disability types in a community sample. We found that those with mental illness had significantly higher risks of violence victimisation, and were more likely to suffer mental ill health following violence, than those with other disabilities. This may be explained by a high concentration of intersecting risk factors at the personal, interpersonal, community and societal levels among those with mental illness [2] [24]. These include high rates of exposure to childhood violence (e.g. parental domestic violence and childhood abuse), which predisposes to mental illness and personality difficulties, which in turn put people at risk of low self-esteem, interpersonal conflict, substance misuse and violence perpetration. [25] This constella-

### Table 2. Impact of violent offences on health, by disability.

|                  | n/N of incidents¹ | %   | OR (CI) adjusted for age, sex and offence type |
|------------------|-------------------|-----|---------------------------------------------|
| **Injury**       |                   |     |                                             |
| Non-disabled     | 531/1951          | 28.4|                                             |
| Non-mental disability | 78/330        | 23.2|                                             |
| Mental illness   | 72/196            | 32.0|                                             |
| Total            | 681/2477          | 28.0|                                             |
| p for difference |                   |     | 0.15                                        |
| **Medical attention** |               |     |                                             |
| Non-disabled     | 173/1951          | 10.3|                                             |
| Non-mental disability | 34/330        | 10.5|                                             |
| Mental illness   | 25/196            | 9.6 |                                             |
| Total            | 232/2477          | 10.3|                                             |
| p for difference |                   |     | 0.96                                        |
| **Emotionally affected ‘quite a lot’ or ‘very much’** | | | |
| Non-disabled     | 425/1878          | 19.8| 1                                           |
| Non-mental disability | 111/319      | 32.6| 1.8 (1.3–2.5)                               |
| Mental illness   | 90/188            | 44.5| 2.5 (1.6–3.9)                               |
| Total            | 626/2385          | 22.4|                                             |
| p for difference |                   |     | <0.001                                      |
| **Anxiety, depression or panic attacks** | | | |
| Non-disabled     | 240/1879          | 10.6| 1                                           |
| Non-mental disability | 63/319        | 16.3| 1.5 (0.95–2.2)                              |
| Mental illness   | 92/188            | 42.2| 4.9 (3.2–7.6)                               |
| Total            | 395/2386          | 12.8|                                             |
| p for difference |                   |     | <0.001                                      |

¹These incidents were experienced by 1653 people without disability, 290 people with non-mental disability and 157 people with mental illness.

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### Table 3. Population attributable fraction for violence related to the independent effect of disability, and estimated number of victims arising from PAF in England and Wales in 2009¹.

|                  | PAF in whole population | PAF in those with disability | n all victims/N whole population (millions)² | n disabled victims/N disabled population (millions)³ | n disabled victims attributable to disability (thousands)⁴ |
|------------------|-------------------------|-----------------------------|---------------------------------------------|-----------------------------------------------------|--------------------------------------------------------|
| **Main interview analyses** | | | | | |
| Any violence     | 7.5 (5.7–9.3)           | 48.8 (41.1–55.4)            | 2.44/44.55                                  | 0.378/7.22                                          | 184.0                                                  |
| Actual violence  | 7.8 (5.4–10.1)          | 51.8 (41.5–60.4)            | 1.49/44.55                                  | 0.224/7.22                                          | 115.9                                                  |
| **Self-completer analyses** | | | | | |
| Any violence     | 4.8 (3.3–6.3)           | 41.2 (32.4–48.9)            | 3.22/32.26                                  | 0.375/2.66                                          | 154.9                                                  |
| Actual violence  | 6.2 (4.2–8.1)           | 43.1 (33.3–51.4)            | 2.17/32.26                                  | 0.236/2.66                                          | 134.2                                                  |

¹Based on ONS mid-2009 population figures.
²Based on (1) and our estimates of violence prevalence in the whole population.
³Based on (1) and our estimates of prevalence of disability and prevalence of violence among the disabled.
⁴Based on (3) and our PAF estimates among those with disability.

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tion of problems increases the risk of victimization, and decreases the likelihood of exiting a cycle of violence. Our findings suggest that those with mental illness would be a suitable group for targeted intervention. The factors that put them at risk may start early and require broad and complex interventions. Future research should identify which subgroups of people with mental disorder are at greatest risk of victimization. One cohort study found that people with both common mental disorders (anxiety, depression) and severe mental illness (schizophrenia) were at increased risk of physical and sexual assaults. [26] Among people with severe mental illness, risk is highest for those with a history of childhood abuse, co-morbid substance misuse and social disadvantage (such as homelessness and poor social support) [27,28,29,30,31].

We estimated population attributable fractions (PAFs), as this “provides a bridge by which results of epidemiologic studies can be made relevant to public health policy”. [32] By estimating this measure, we would classically be making the assumption that disability ‘causes’ violence, and that there are interventions that can eliminate disability and the violence risks associated with it. [32] We acknowledge that the causal pathway between exposure to disability and violent victimization is poorly understood and is likely to involve a complex interplay of variables relating to victim, perpetrator and environment. However, in our analyses, we sought to estimate the proportion of violence attributable to disability that is not explained by factors shared with the general population (and measured in our study). Factors unique to those with disability may include decreased ability to understand danger, to escape from a perpetrator on whom they are dependent and to communicate experiences to health and legal authorities. [33–34]

Whilst disability-related risk accounted for a relatively small proportion of violence in the general population, the estimated number of victims with disability arising from this excess risk, and associated economic costs, are sizeable. Although we used the best available costing measures from the general population, these may not account for differences in demography, baseline health and response to violence in the disabled. A significant proportion of violent crime cost arises from its physical and emotional impact on victims. [17] As we showed in this study, the psychological impact is greater among people with disability, so we are likely to have underestimated the true cost.

Strengths of this study include the large, nationally representative sample with detailed measures of disability, violence and covariates, which allowed us to generate robust estimates of violence prevalence, risk and population impact. The study has several limitations. The target population only included people living in private residential households, so findings cannot be generalized to people with disability living in residential or supported accommodation. Findings cannot be generalized to those who have significant communication or cognitive problems (of a severity that would preclude their participation in the BCS). The survey did not use a sensitive measure of sexual and domestic violence in those aged 60 and above, hence underestimating these violence subtypes in this age group. Although it is difficult to establish temporal relationships in cross-sectional surveys, those with disability had a minimum illness duration of 1 year, and the main outcome was past-year violence, so-apart from measurement errors- disability would have preceded violence. Reporting bias is possible, but its likely direction is unclear. People with mental illness or other disabilities may over-report violence since it has a greater impact on them. Conversely, they may under-report violence as they may worry more about the consequences of disclosure. Past evidence suggests that people with mental illness tend to reliably report victimisation experiences. [35].

Our research highlights the need for clinicians to be aware of the elevated risks of domestic and non-domestic violence among patients with all disability types; and of the increased risk of mental health problems among disabled victims. Although people with mental illness are the most vulnerable to violent victimisation, mental health professionals often fail to screen for recent abuse, and violence is rarely detected or acted upon. [36] A recent review on domestic violence interventions for people with disability found that disabled victims had difficulty accessing generic services. Specialist services were rarely available and had a poor evidence base—although there were some promising approaches, including safety training and peer support. [34] In the non-disabled population, there is good evidence that there are effective interventions for both primary violence prevention (e.g. parent training, life skills training for children and adolescents) and secondary violence prevention (e.g. screening tools, education programs for health professionals, advocacy support programs). [37–39] Future research should evaluate the effectiveness of these interventions among people with disability; as well developing interventions to address risk factors specific to this group (e.g. caregiver stress, communication barriers to disclosure). From a policy perspective, our findings strengthen the economic and public health arguments for interventions in this group, and suggest the need for greater integration between health and victim support services.

People with disability, a predominantly elderly and disadvantaged group, are at increased risk of violence both within and outside the home. The significant public health and economic burden calls for an urgent assessment of the causes of this violence, and national policies on violence prevention in this vulnerable group.

Supporting Information

Figure S1 Adjusted odds of any violence victimisation, by disability subtype.

Table S1 Prevalence and odds of any violence victimisation, by disability subtype.

Table S2 Prevalence and odds of violence victimisation subtypes in people aged 16–59, by disability (‘self-completer analyses’).

Table S3 Prevalence and odds of violence victimisation subtypes in people aged 16–59, by disability (‘main-interview analyses’).

Table S4 Estimates of number of victimisation incidents and associated cost, by disability.

File S1 Supplementary Information-additional analyses.

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Author Contributions
Conceived and designed the experiments: HK. Analyzed the data: HK LH DO PM SJ. Wrote the paper: HK LH DO PM SJ.

References
1. World Health Organisation (2013) World Report on Disability. Geneva: World Health Organisation.
2. Krug EG (2002) World Report on Violence and Health. Geneva: World Health Organisation.
3. Equality and Human Rights Commission (2011) Hidden in plain sight: inquiry into disability-related harassment. Manchester: EHRC.
4. Nocia A, Iganski P, Lague S (2011) Disabled people’s experiences and concerns about crime: analysis of the British Crime Survey. Manchester: Equality and Human Rights Commission.
5. Hughes K, Bellis MA, Jones L, Wood S, Bates G, et al. (2012) Prevalence and risk of violence against adults with disabilities: a systematic review and meta-analysis of observational studies. The Lancet 379: 1621–1629.
6. Hodgins S, Lincoln T, Mak T (2009) Experiences of victimisation and depression are associated with community functioning among men with schizophrenia. Social Psychiatry and Psychiatric Epidemiology 44: 446–457.
7. Department for Work and Pensions (2011) Family Resources Survey: United Kingdom 2009–2010. London: Department for Works and Pension.
8. Home Office Research Development and Statistics Directorate and BMRB (2010) Social Research, British Crime Survey, 2009–2010 [computer file]. Colchester, Essex: UK Data Archive [distributor] SN: 6627.
9. TNS-BMRB (2010) The British Crime Survey 2009–10 Technical Report. London: TNS-BMRB.
10. Walby S, Allen J (2004) Domestic violence, sexual assault and stalking: Findings from the British Crime Survey. London: Home Office.
11. Hall P, Isles J (2010) Violent and sexual crime. In: Flanery J, Kershaw C, Smith K, Chaplin R, Moon D, editors. Crime in England and Wales 2009/10. London: Home Office.
12. Greenland S, Drescher K (1993) Maximum Likelihood Estimation of the Attributable Fraction from Logistic Models. Biometrics 49: 863-872.
13. Berchou J (2001) A review of adjusted estimates of attributable risk. Statistical Methods in Medical Research 10: 193–216.
14. Office for National Statistics (2010) Population Estimates for UK, England and Wales, Scotland and Northern Ireland - mid 2009. ONS.
15. Brand S, Price R (2000) The economic and social costs of crime. London: Home Office.
16. Home Office (2011) Revisions made to the multipliers and unit costs of crime used in the Integrated Offender Management Value for Money Toolkit. London: Home Office.
17. Dubourg R, Hanefj (2005) Estimates of the economic and social costs of crime in England and Wales: Costs of crime against individuals and households, 2003/04. London: Home Office.
18. Walby S (2009) The cost of domestic violence: update 2009. Lancaster: Lancaster University.
19. Walby S (2004) The cost of domestic violence. London: Department of Trade and Industry.
20. Castel G, Martin SL, Smith JB, Gorka KK, Kupper LL (2008) National study of physical and sexual assault among women with disabilities. Injury Prevention 14: 87–90.
21. Martin SL, Ray N, Sotres-Alvarez D, Kupper LL, Moracco KE, et al. (2006) Physical and sexual assault of women with disabilities: Violence against Women 12: 823–837.
22. Lin LP, Yen CF, Kuo FY, Wu JL, Lin JD (2009) Sexual assault of people with disabilities: Results of a 2002–2007 national report in Taiwan. Research in Developmental Disabilities 30: 969–975.
23. Plummer S-B, Findley PA (2012) Women With Disabilities Experience With Physical and Sexual Abuse. Trauma, Violence and Abuse. 15–29.
24. Khalilfeh H, Dean K (2010) Gender and violence against people with severe mental illness. International review of psychiatry 22: 535–546.
25. Meade C, Kershaw T, Hanefj N, Sikkema K (2009) Long-Term Correlates of Childhood Abuse among Adults with Severe Mental Illness: Adult Victimization, Substance Abuse, and HIV Sexual Risk Behavior. AIDS and Behavior 13: 207–216.
26. Silver E, Arensmaa L, Langley J, Caspi A, Moffitt TE (2003) Mental disorder and violent victimization in a total birth cohort. American Journal of Public Health 95: 2015–2021.
27. Chapple B, Chant D, Nolan P, Cardy S, Whitford H, et al. (2004) Correlates of victimisation amongst people with psychosis. Social Psychiatry and Psychiatric Epidemiology 39: 836–840.
28. Dean K, Moran P, Faby T, Tyrer P, Leese M, et al. (2007) Predictors of violent victimization amongst those with psychosis. Acta Psychiatraca Scandinavica 116: 345–353.
29. Goodman LA, Salyers MP, Mueser KT, Rosenberg SD, Swartz M, et al. (2001) Recent victimization in women and men with severe mental illness: prevalence and correlates. Journal of Traumatic Stress 14: 615–632.
30. Hiday VA, Swartz MS, Swanson JW, Borum R, Wagner HR (1999) Criminal victimization of persons with severe mental illness. Psychiatric Services 50: 62–68.
31. Walsh E, Moran P, Scott C, McKenzie K, Burns T, et al. (2003) Prevalence of violent victimisation in severe mental illness. British Journal of Psychiatry 183: 233–238.
32. Steenland K, Armstrong B (2006) An Overview of Methods for Calculating the Burden of Disease Due to Specific Risk Factors. Epidemiology 17: 512–519.
33. Marge DK (2003) Call to action: ending crimes of violence against children and adults with disabilities; Marge DK, editor. Syracuse, NY: Upstate Medical University.
34. Lund EM (2011) Community-Based Services and Interventions for Adults With Disabilities Who Have Experienced Interspersional Violence: A Review of the Literature. Trauma Violence Abuse 12: 171–182.
35. Goodman LA, Thompson KM, Weinfurt K, Corl S, Acker P, et al. (1999) Reliability of reports of violent victimization and posttraumatic stress disorder among men and women with serious mental illness. Journal of Traumatic Stress 12: 587–599.
36. Howard L, Trevillion K, Khalilfeh H, Woodall A, Agnew-Davies R, et al. (2010) Domestic violence and severe psychiatric disorders: prevalence and interventions. Psychological Medicine 40: 881–893.
37. Organisation WH (2010) Violence prevention: the evidence (Overview). Geneva: World Health Organisation.
38. Ramsay J (2009) Advocacy interventions to reduce or eliminate violence and promote the physical and psychosocial well-being of women who experience intimate partner abuse. Cochrane Database of Systematic Reviews.
39. World Health Organisation (2009) Violence prevention: the evidence Reducing violence through victim identification, care and support programmes. Geneva: World Health Organisation.