

Clinical risk assessment rating and all-cause mortality in secondary mental healthcare: the South London and Maudsley NHS Foundation Trust Biomedical Research Centre (SLAM BRC) Case Register

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Background. Mental disorders are widely recognized to be associated with increased risk of all-cause mortality. However, the extent to which highest-risk groups for mortality overlap with those viewed with highest concern by mental health services is less clear. The aim of the study was to investigate clinical risk assessment ratings for suicide, violence and self-neglect in relation to all-cause mortality among people receiving secondary mental healthcare.

Method. A total of 9234 subjects over the age of 15 years were identified from the South London and Maudsley Biomedical Research Centre Case Register who had received a second tier structured risk assessment in the course of their clinical care. A cohort analysis was carried out. Total scores for three risk assessment clusters (suicide, violence and self-neglect) were calculated and Cox regression models used to assess survival from first assessment.

Results. A total of 234 deaths had occurred over an average 9.4-month follow-up period. Mortality was relatively high for the cohort overall in relation to national norms [standardized mortality ratio 3.23, 95% confidence interval (CI) 2.83–3.67] but not in relation to other mental health service users with similar diagnoses. Only the score for the self-neglect cluster predicted mortality [hazard ratio (HR) per unit increase 1.14, 95% CI 1.04–1.24] with null findings for assessed risk of suicide or violence (HRs per unit increase 1.00 and 1.06 respectively).

Conclusions. Level of clinician-appraised risk of self-neglect, but not of suicide or violence, predicted all-cause mortality among people receiving specific assessment of risk in a secondary mental health service.

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Introduction

Psychosocial risk assessment is widely used in mental healthcare to identify targets for early intervention (Székely *et al.* 2007; Priest *et al.* 2008; Ajdacic-Gross *et al.* 2009). However, the risks of mental healthcare service users are often overlooked and many leave hospitals without adequate assessment (Kapur *et al.* 2002, 2008), resulting potentially in underestimated and unrecognized hazards. A full assessment of psychosocial stressors by healthcare professionals is

therefore strongly and routinely encouraged to improve patient care (Department of Health and Social Security, 1984; National Institute for Health and Clinical Excellence, 2004). A large number of characteristics of individuals and their environment are believed to be relevant for inclusion in such assessments, including symptoms of mental disorders (particularly depressive symptoms) (Priest *et al.* 2008; Häfner *et al.* 2010), and known risk factors for suicide (Kripalani *et al.* 2010), violence (Kavanaugh *et al.* 2009) and self-neglect (Campayo *et al.* 2009), as well as personal psychosocial problems (National Institute for Health and Clinical Excellence, 2004), physical disorders or adverse life-styles such as smoking in schizophrenia (Brown *et al.* 2000). Mental disorders such as depression, bipolar disorder and schizophrenia are

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associated with substantial and persisting excess mortality risk (Brown *et al.* 2000; Mykletun *et al.* 2009; Schoevers *et al.* 2009). But there is limited information on mortality as an outcome in relation to conventional risk assessments used routinely in mental healthcare or on the extent to which those patients most vulnerable to all-cause mortality overlap with the high-risk groups frequently targeted by mental health services for particularly close attention. The aim of the study was therefore to describe the level of mortality in people who received an enhanced risk assessment in a secondary mental healthcare setting, and to investigate associations between all-cause mortality and previous scores on this risk assessment schedule which included three major risk clusters (concerning suicide, violence and self-neglect).

Method

Study setting and mortality ascertainment

The analysis was carried out using a data resource containing anonymized electronic records of all secondary mental healthcare service users from the South London and Maudsley NHS Foundation Trust (SLAM) which are contained in the SLAM Biomedical Research Centre (SLAM BRC) Case Register. SLAM is the only provider of mental health services in its geographic catchment area of four boroughs: Lambeth, Southwark, Lewisham and Croydon. The four boroughs contain a very broad spectrum of living areas, their populations comparable overall with those of London as a whole in terms of age, gender, education and socio-economic status distributions (Stewart *et al.* 2009).

In 2008, the Clinical Record Interactive Search (CRIS) was developed as a program which automatically anonymizes full clinical records from the source electronic notes system in SLAM, enabling researchers to search and retrieve anonymized records. A detailed protocol for the CRIS resource is available in open-access format (Stewart *et al.* 2009). It received ethical approval as an anonymized data resource for secondary analyses by Oxfordshire Research Ethics Committee C in 2008 (reference no. 08/H0606/71), and currently accesses data on over 180 000 service users in the four London boroughs (approximately 1.2 million residents) for which SLAM is the monopoly provider of secondary mental healthcare. Of these, approximately 35 000 are receiving active care from SLAM at a given time. A detailed diagnostic breakdown has been previously published for CRIS, the majority diagnostic groups being mood disorders [International Classification of Diseases, tenth revision (ICD-10) F30–39, 16.0%], schizophrenia/schizotypal/delusional

disorders (ICD-10 F20–29, 10.2%) and mental/behavioural disorders due to psychoactive substance use (ICD-10 F10–19, 9.7%).

Available CRIS data include date of death sourced monthly by SLAM from the National Health Service (NHS) Care Records Service. The analysis described here was based on a surveillance period from 1 January 2007 to 31 March 2010, the rationale being that the electronic clinical records coverage became complete across all SLAM services during 2006 and, at the time of the analysis, the last regular check on mortality had been accomplished in the beginning of April 2010.

Definition of the cohort

The cohort was composed of a defined group of patients who were active to SLAM at any point during the study period (1 January 2007 to 31 March 2010), aged 15 years and older, and were evaluated using a structured risk assessment (see below) during that period. More specific analyses focused on those for whom all items on at least one of the three risk factor clusters (suicide, violence and self-neglect) had been completed. The sampling process for this analysis is summarized in Fig. 1.

Structured risk assessment

In the source clinical records system, a compulsory target for all clinical teams is a 'brief risk assessment' on all active cases. This electronic form predominantly consists of free text fields concerning the presence or absence of any potential risk factors for adverse outcomes and allows clinical staff to record risk and any actions taken to address this. Where the staff member considers significant risk to be present, a 'structured risk assessment' is the next available option which is a structured assessment taking the form of present/absent tick-boxes enquiring about specific risk factors for suicide, violence or self-neglect. The complete schedule is listed in the Appendix. The analysis described here therefore adopted a pragmatic approach, accepting the fact that completion of these structured risk assessments is entirely dependent on staff behaviour but assuming that they would in general identify a subgroup of service users about whom there were relatively high levels of concern. A second underlying assumption was that higher numbers of items scored as positive within a risk cluster would represent a higher level of concern for that outcome. Binary responses (yes = 1, no = 0) for these tick-box items were therefore summed to create subscale scores. Internal consistency analyses of the generated scales yielded Cronbach α coefficients of 0.69 for suicide risk, 0.72 for

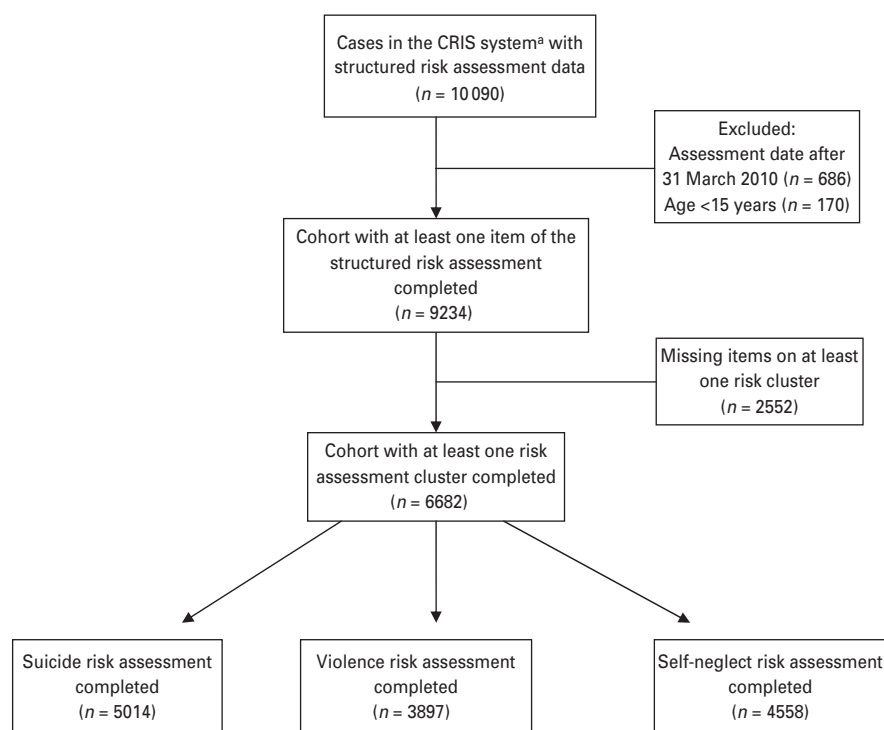


Fig. 1. Flowchart of the analysed sample. ^a Records retrieved from the Clinical Record Interactive Search (CRIS) system on 7 July 2010.

violence risk and 0.64 for self-neglect risk which were felt to be sufficiently high to support scalability. The only item omitted from the source instrument in this analysis was family history of suicide because of high levels of missing data (94.4%) in cases for whom all other suicide-related risk items had been completed. Only data from the first structured risk assessment (regardless of how many clusters or items had been completed) during the observation period were considered for these analyses. By definition, all patients receiving a structured risk assessment would be under active care management in SLAM at that time.

Covariates

ICD diagnosis is another compulsory field in the source clinical records system and was treated as a covariate, categorized into the most common groupings: organic disorders (F00–F09), serious mental illness (F20–F31), depressive disorders (F32) and others. Where there were multiple diagnoses, the code closest to the risk assessment date was chosen. Demographic covariates comprised gender, religion, ethnicity, employment status and marital status, retrieved using CRIS from structured fields in the source dataset. Age was calculated from year and month of birth subtracted from the date of the first structured risk assessment during the study period. Area-level deprivation scores in 2007 were available through an

anonymized link created in CRIS between lower super output area residence code and summary data for that area from 2001 UK Census output. The index of multiple deprivation is derived from seven domains: income, employment, health, education, housing and services, crime, and environment (Office for National Statistics, 2007).

Statistical analysis

The samples receiving structured risk assessments were first described and age- and gender-standardized mortality ratios (SMRs) calculated for the entire cohort and then for the subgroups with complete data on risk assessment scales for suicide, violence or self-neglect. SMRs were calculated based on expected number of deaths from age- and gender-specific mortality rates for the England and Wales population in 2008 (Office for National Statistics, 2009). For each analysis and in each age \times gender cell, expected annual mortality rates were multiplied by the person-year follow-up in the respective observed cell, to account for the varying rates of observation from the date of the structured risk assessment. The end of follow-up for all analyses was defined as either the date of death or 31 March 2010 (censoring point). Therefore, the duration of follow-up began at the first assessment during the study period and finished at death or the end of the surveillance period.

Table 1. Standardized mortality ratios for analysed groups compared with England and Wales norms for 2008

Case subgroup	Total ^a	Male ^b	Female ^b
Total sample with any completed item (<i>n</i> = 9234, 234 deaths)	3.23 (2.83–3.67)	3.61 (3.02–4.28)	2.83 (2.30–3.44)
Cases with 1+ missing items on all subscales (<i>n</i> = 2552, 67 deaths)	3.15 (2.69–3.66)	3.72 (3.00–4.56)	2.64 (2.08–3.31)
Cases with at least one cluster subscale completed (<i>n</i> = 6682, 167 deaths)	3.09 (2.63–3.59)	3.45 (2.78–4.23)	2.73 (2.15–3.42)
Suicide risk assessment completed (<i>n</i> = 5014, 113 deaths)	3.38 (2.79–4.06)	4.18 (3.23–5.33)	2.68 (1.98–3.56)
Violence risk assessment completed (<i>n</i> = 3897, 102 deaths)	3.12 (2.55–3.79)	3.28 (2.51–4.44)	2.83 (2.11–3.72)
Self-neglect risk assessment completed (<i>n</i> = 4558, 111 deaths)	3.01 (2.48–3.63)	3.11 (2.36–4.03)	2.92 (2.19–3.80)

Data are given as standardized mortality ratio (95% confidence interval).

^a Age- and gender-standardized mortality ratio.

^b Age-standardized mortality ratio.

For descriptive purposes, SMRs were also calculated for all cases with serious mental illness diagnoses (ICD F20–31) during the observation period against the same reference population and compared between those who did and did not receive a structured risk assessment.

Next, subscale scores with ranges of 0–14, 0–14 and 0–11 were generated for risk of suicide, violence and self-neglect, respectively. Cox regression models were used to investigate associations with mortality, entering either total score for each risk assessment cluster or (for descriptive purposes) tertile groups as primary independent variables in separate models. Proportional hazards assumptions were checked as standard for Cox procedures and no serious violation was found. Age, gender, religion, employment, deprivation score, marital status, ethnic group, and primary psychiatric diagnosis were entered as potential confounders, and exploratory secondary analyses were stratified by diagnosis and by age group to investigate effect modification, with formal statistical testing of interaction terms. Stata/SE 8.0 software for Windows (Stata Corp., USA) was used.

Results

The cohort

A total of 9234 eligible cases were identified as having any item completed on the structured risk assessment with 234 deaths and a median follow-up period of 9.4 months from the first structured risk assessment. Of these, 6682 had complete assessments for at least one cluster of risk factors: 5014 for suicide risk, 3897 for violence risk and 4558 for self-neglect risk. Among the 6682 with at least one cluster completed, the average age at first assessment during the study period was 45.2 years (s.d. = 17.9 years) and there were more men (55.0%) than women. Prevalences of the five most common diagnoses among the sample were 30.7%, 13.0%, 7.8%, 6.8% and 5.9% for schizophrenia,

depressive disorders, bipolar disorders, substance-use disorders and dementia, respectively.

SMRs for case groups

SMRs for the cohorts are summarized in Table 1. Mortality in all subgroups was significantly higher than expected from national norms, these associations being stronger for men than women. They were not substantially different between those with and without full data on risk assessment subscales and also did not differ substantially between those receiving assessments for individual subscales. In the wider case register, restricting the sample to people with an ICD diagnosis of serious mental illness (F20–F31), those who had not received a structured risk assessment during the observation period had an SMR of 4.11 [95% confidence interval (CI) 3.74–4.52, *n* = 6566], compared with an SMR of 3.38 (95% CI 2.57–4.36, *n* = 3340) in those with these diagnoses who did receive a structured risk assessment.

Predictors of mortality in cases receiving structured risk assessments

The distributions of covariates are summarized in the second column of Table 2, with the remainder of the table summarizing associations with mortality. In age-adjusted analyses for cases with at least one risk assessment cluster completed (*n* = 6682), higher mortality hazard was significantly associated with male gender, married/cohabitating (compared with single) status, and an organic (compared with other) primary diagnosis. Risk was lower in the African/Caribbean/other black (compared with British/other white) ethnic group. No significant associations were found with employment status or area-level deprivation score. After adjusting for all covariates, only the self-neglect risk scale was positively associated with mortality, whether entered as a continuous variable or in tertile groups (*p* of test for trend across tertiles = 0.008).

Table 2. Predictors of mortality in cases with complete data on at least one risk cluster ($n=6682$)

Exposure		Mortality, %	Adjusted hazard ratio ^a (95% CI)	<i>p</i>
Age, years			1.07 (1.06–1.08)	<0.001
Mean	45.2			
s.d.	17.9			
Gender, <i>n</i>				
Female	3004	2.50	Reference	
Male	3678	2.50	1.51 (1.10–2.06)	0.010
Religion, <i>n</i>				
No affiliation	1835	3.10	Reference	
Any affiliation	1716	2.45	0.79 (0.53–1.18)	0.248
Not known	3131	2.17	0.89 (0.62–1.28)	0.538
Employment status, <i>n</i>				
Unemployed	2876	1.29	Reference	
Employed	297	0.34	0.35 (0.05–2.52)	0.295
Retired/students	750	8.13	0.91 (0.54–1.53)	0.725
Other/unknown	2756	2.46	1.12 (0.72–1.75)	0.608
Deprivation score ^b , <i>n</i>				
1st tertile (1.5–28.0)	2174	2.62	Reference	
2nd tertile (28.1–37.4)	2156	2.74	1.09 (0.76–1.57)	0.641
3rd tertile (37.5–65.2)	2167	2.17	0.93 (0.63–1.37)	0.720
Marital status, <i>n</i>				
Single	4273	1.43	Reference	
Married/cohabitating	896	5.80	1.73 (1.18–2.55)	0.005
Divorced/separated/widowed	1117	4.66	0.83 (0.55–1.23)	0.349
Not disclosed/not known	396	0.51	0.30 (0.07–1.25)	0.098
Ethnic group, <i>n</i>				
British/other white	3589	3.82	Reference	
Asian	170	1.76	0.76 (0.24–2.40)	0.641
Indian/Bangladesh/Pakistani	131	0.76	0.24 (0.03–1.73)	0.157
African/Caribbean/other black	2206	1.04	0.56 (0.35–0.88)	0.012
Mixed/unknown/others	586	0.51	0.36 (0.11–1.12)	0.079
Primary psychiatric diagnosis, <i>n</i>				
Others	1993	1.10	Reference	
Organic (ICD-10 F00–F09)	482	13.90	1.85 (1.08–3.16)	0.025
Serious mental illness (ICD-10 F20–F31)	3340	1.77	1.16 (0.71–1.89)	0.564
Depressive disorders (ICD-10 F32–F33)	867	2.19	1.00 (0.54–1.85)	0.991
Suicide risk scale score ^c			0.99 (0.92–1.07)	0.810
Mean	3.6			
s.d.	2.7			
1st tertile (score 0–1), <i>n</i>	1262	3.25	Reference	
2nd tertile (score 2–4), <i>n</i>	2106	2.66	0.93 (0.61–1.41)	0.723
3rd tertile (score 5–14), <i>n</i>	1646	2.19	1.03 (0.64–1.65)	0.914
Violence risk scale score ^d			1.01 (0.96–1.12)	0.334
Mean	3.9			
s.d.	3.2			
1st tertile (score 0–2), <i>n</i>	1587	3.47	Reference	
2nd tertile (score 3–4), <i>n</i>	946	1.59	0.68 (0.38–1.21)	0.187
3rd tertile (score 5–14), <i>n</i>	1364	2.35	1.34 (0.83–2.21)	0.224
Self-neglect risk scale score ^e			1.14 (1.04–1.24)	0.005
Mean	2.2			
s.d.	2.1			
1st tertile (score 0), <i>n</i>	1117	0.81	Reference	
2nd tertile (score 1–2), <i>n</i>	1728	1.27	1.45 (0.66–3.15)	0.354
3rd tertile (score 3–11), <i>n</i>	1713	4.67	2.57 (1.26–5.25)	0.009

CI, Confidence interval; s.d., standard deviation; ICD, International Classification of Diseases.

^a Per unit increase for continuous variables or compared with reference group for categorical variables; age-adjusted for demographic factors, deprivation score, and primary diagnosis as exposures; for risk scale scores and tertile groups as exposures: adjusted for age, gender, religion, employment, deprivation score, marital status, ethnic group and primary psychiatric diagnosis group.

^b Test for trend through categories, $p=0.746$.

^c Test for trend through categories, $p=0.353$.

^d Test for trend through categories, $p=0.377$.

^e Test for trend through categories, $p=0.008$.

Calculated SMRs for the lowest, middle and highest tertile groups on the self-neglect scale were 2.05 (95% CI 0.94–3.89, $n=1117$), 2.50 (95% CI 1.55–3.82, $n=1728$) and 3.39 (95% CI 2.69–4.22, $n=1713$), respectively. Associations of suicide and violence risk scale scores with mortality were close to the null in both unadjusted and adjusted analyses. Further exploratory analysis of individual items from these two scales did not reveal any specific associations with mortality (data not shown). Removal of the item referring to difficulties managing physical health from the self-neglect risk subscale resulted in similar associations of interest [fully adjusted hazard ratios by recalculated tertile groups: group 1, reference; group 2, 1.86 (95% CI 0.88–3.94); group 3, 2.57 (95% CI 1.24–5.34)].

Further stratification by diagnostic group of the self-neglect association with mortality revealed the following hazard ratios (for self-neglect entered as a continuous independent variable after adjustment for all other covariates): 1.10 (95% CI 0.95–1.27) in organic disorders (F00–F09), 1.17 (95% CI 1.01–1.36) in serious mental illness (F20–F31), 0.89 (95% CI 0.63–1.25) in depressive disorder (F32) and 1.13 (95% CI 0.90–1.42) in other disorders. There was no evidence of modification by age for the suicide and violence risk subscale scores (data not shown); stratified hazard ratios for the association between self-neglect score and mortality were 1.25 (95% CI 1.01–1.55) for 15- to 44-year-olds, 1.14 (95% CI 0.93–1.39) for 45- to 64-year-olds and 1.09 (95% CI 0.97–1.23) for 65+ -year-olds, although there was no statistically significant interaction (p for interaction = 0.200).

Discussion

Main findings

In a large database derived from secondary mental healthcare electronic clinical records, 9234 service users had received a comprehensive structured risk assessment. Both these cases and the subgroups with complete data on specific risk assessment clusters had higher all-cause mortality compared with national norms although, within those with serious mental illness, mortality was lower in the subgroup for whom a structured risk assessment was completed compared with those without such an assessment. Considering the risk clusters themselves, a higher number of items conferring risk of self-neglect was associated with higher mortality but no such associations were found for those scoring higher on suicide or violence risk. The association between risk of self-neglect and mortality was highest for people with serious mental illness diagnoses.

Strengths and limitations

Strengths of the study include a large sample observed longitudinally from a case register database. SLAM is Europe's largest provider of secondary mental healthcare serving four boroughs of southeast London with relatively high levels of deprivation overall as areas containing inner urban environments, but containing considerable population heterogeneity. Suboptimal mortality tracing would have led to underestimated associations; however, previous analyses from this case register have confirmed substantially raised mortality in wider case groups consistent with findings from other samples (Chang *et al.* 2010), suggesting that mortality under-ascertainment is unlikely to have been a problem. The large sample was advantageous for detecting the associations of interest, although there was less scope for adequately powered subgroup analyses. Considering the positive associations with self-neglect risk score but apparently absent associations with suicide or violence risk scores, we do not believe that different levels of statistical power are likely to be responsible as the score distribution was lowest (i.e. closest to zero) for self-neglect compared with the other two and the tertile group comparisons were carried out in order to ensure that exposure status was scaled equivalently between the three exposures.

More consideration has to be given to the structured risk assessment as a measure of exposure status, which has advantages and disadvantages. A disadvantage was that the assessment schedule was not formally evaluated as a measurement in terms of constructs such as inter-rater or test-retest reliability, although scaling properties were satisfactory. Furthermore, it should be borne in mind that observational data on variability over time cannot be used to infer reliability because repetition of such a scale is likely to be influenced by change in the underlying perceived risk. Instead, it is a list of items that we feel would be considered as uncontroversial risk indicators in standard clinical practice. In this respect it has advantages of being a pragmatic and 'naturalistic' reflection of clinician-perceived risk. Its application in clinical settings is also clearly unsystematic but, again, likely to be naturalistic and generalizable given the size of SLAM and the heterogeneity of its services. It also has the advantage of being an instrument included in the source records system purely to aid clinical record keeping with no administrative pressure regarding its completion or not. We therefore feel it is reasonable to assume that cases for whom a structured risk assessment is completed are likely to be relatively concerning to clinical teams regarding risk and that the same applies to those with higher scores on each of the three subscales.

Confounding is also a potential consideration. We found little evidence of confounding by socioeconomic status insofar as this was quantified. A key area for further research concerns the role of physical co-morbidity which is potentially complex. Disability caused by a physical disorder may give rise to self-neglect and therefore the disorder itself may be a confounding factor if it is also independently associated with mortality risk. On the other hand, self-neglect due to mental disorder may give rise to worse physical health, which may therefore be on the causal pathway between self-neglect and mortality. No change in the associations of interest between self-neglect and mortality was found when the item most strongly related to physical health was omitted from the self-neglect scale; however, further analyses of these interrelationships is required, and this should be supplemented by investigations of specific causes of death to clarify the extent to which clinician-appraised self-neglect shows specificity as an exposure.

Risk assessments and adverse outcomes

Early identification of risk is emphasized in many national psychosocial assessment programmes (Priest *et al.* 2008), and has been proposed as an important strategy in secondary prevention (Häfner *et al.* 2010; Kavanaugh *et al.* 2009), with a full assessment of psychosocial stressors by healthcare professionals recommended in many areas of policy (Department of Health and Social Security, 1984; National Institute for Health and Clinical Excellence, 2004). Suggested risk markers for inclusion in a psychosocial assessment include: mental illness symptoms (particularly depressive symptoms) (Häfner *et al.* 2010; Priest *et al.* 2008), suicide-related factors (Kripalani *et al.* 2010), violence (Kavanaugh *et al.* 2009), self-neglect (Campayo *et al.* 2009), personal psychosocial problems (National Institute for Health and Clinical Excellence, 2004) and adverse life-styles such as smoking in schizophrenia (Brown *et al.* 2000). A considerable body of research has investigated whether risk assessment can effectively prevent specific adverse outcomes. For example, lack of a suicide risk assessment has been found to be associated with further repetition of self-harm (Kapur *et al.* 2002; Miret *et al.* 2009; Bergen *et al.* 2010) and increased hazard of completed suicide (Hickey *et al.* 2001) in general hospital settings. Risk evaluation for self-neglect, on the other hand, has been found to be associated with higher rather than lower mortality (Gill, 2009). Most self-neglect research has focused on older populations with diverse exposure definitions (Pavlou & Lach, 2006), although some articles have highlighted the importance of self-neglect screening in working-age adults, particularly in the context of

substance abuse (Thibault & Maly, 1993). Furthermore, early detection of self-neglect has been cited as an important strategy for preventing deterioration in prodromal stages of schizophrenia (Häfner *et al.* 2010). Our findings support the importance of this construct as at least one factor mediating the well-recognized association between serious mental illness and reduced life expectancy (discussed further below).

Risk prediction for all-cause mortality

An important issue to bear in mind in interpreting the findings of this study is that the outcome was all-cause mortality rather than the specific adverse outcomes that the risk scales are designed to predict. The objective of our analysis was not to investigate the degree to which suicide, violence or self-neglect can be individually predicted. Instead, we sought to build on findings (including those in this case register) of strong associations between mental disorders and mortality by investigating potential subgroups at particular risk. Taking serious mental illness as an example, the overall risk in the cohort receiving a structured risk assessment was not substantially different from those in whom a structured risk assessment was not completed. If anything, it was a little lower, suggesting that an increased visibility to services might have conferred some benefit. Consistent with this, no associations were found between number of risk factors for suicide or violence and risk of mortality which could possibly also be accounted for by the higher visibility to services if these result in improved general healthcare as an additional benefit – for example, the fact that suicide risk has been identified and scored on the measure may ameliorate any potential associations with mortality. Self-neglect, on the other hand, may be a more potent marker of risk because of the level of disengagement with services implied by this, although it may also reflect a particular symptom profile of the underlying mental disorder with independent effects on survival.

As described earlier, increasing research has highlighted associations between mental disorders and survival disadvantage. Disorders such as schizophrenia and bipolar disorder are associated with profound reductions in life expectancy (Chang *et al.* 2011), which if anything are worsening rather than improving (Hoang *et al.* 2011). The same is true of substance-use disorders in secondary care (Hayes *et al.* 2011) and depression in community samples (Mykletun *et al.* 2009), although anxiety symptoms may be protective (Mykletun *et al.* 2009). Given that much of the mortality excess is accounted for by natural causes (Mykletun *et al.* 2007; Hoang *et al.* 2011) and is present across a range of causes of death (Mykletun *et al.* 2007),

it seems reasonable to consider pathways which may be common to a variety of exposures in relation to a variety of outcomes. Self-neglect is one such potential underlying factor, although potentially as a component of a pathway rather than an explanation in itself (for example, potentially mediated through adverse risk behaviours, delayed presentation of disorders, lower access to healthcare and decreased responsiveness of health services amongst other processes). Considering mental disorder diagnosis as a covariate in our study, the results did not suggest that the observed association was accounted for by self-neglect in the context of dementia or other mood disorders. Instead, it appeared most strong in people with schizophrenia in whom self-neglect is more likely to have arisen as a consequence of the mental disorder rather than through physical co-morbidity. Supporting this, the hazard ratios were, if anything, stronger for younger compared with older cases. However, in interpreting the diagnosis-stratified findings, it should be borne in mind that the samples were not random selections of people with a given disorder but those in whom a structured risk assessment was deemed necessary. It is possible, for example, that clinician-rated self-neglect in depressive disorder characterizes a group with a different risk profile or healthcare experience from the same classification in schizophrenia. However, further research is required on this issue.

Other predictors of mortality in the analysed sample such as increased age and male gender were similar to what would be expected in a community sample. The lack of association with employment status and area-level deprivation score was unexpected but may reflect the relatively small numbers who were employed on the former measure, and the area- rather than individual-level measure of

socio-economic status in the latter case. Relatively low mortality in minority ethnic groups was also unexpected and requires further investigation, particularly since overall associations between mental disorder and mortality in these groups have been previously reported to be relatively high (Chang *et al.* 2010). It might possibly reflect different thresholds applied between groups for these risk assessments (i.e. if risk assessments are carried out at less severe levels of psychopathology if someone is from a minority ethnic group). The higher risk in married/cohabiting compared with single patients might reflect a similar threshold effect.

Clinical and policy implications

If mental health services were to reprioritize outcomes in favour of improving the overall life expectancy of people with mental disorders rather than preventing serious but relatively rare events such as suicide and violence, then our results suggest that there would need to be a refocusing of attention towards those identified as at risk of self-neglect, given the greater than 2.5-fold higher mortality between the highest and lowest tertile groups on this derived scale. As to further research into mechanisms underlying the association between self-neglect and mortality, as described earlier, a greater understanding is needed of levels of 'visibility' of people with serious mental illness to secondary care services (assuming that self-neglect may be less well recognized compared with risk of suicide or violence) and the potential impact that mental healthcare may and should exert towards improving general health and on indirect influences of mental disorders (e.g. through general health) on adverse outcomes.

Appendix. Proforma for the three risk assessment scales, and distribution of items in the sample

Items in the structured risk assessment	Proportion, %		
	Proportion missing ^a	With complete scale data ^b	Total sample ^c
Violence and aggression			
a. Has the patient a history of violence?	11.0	35.4	43.5
b. Does the patient misuse drugs/alcohol?	9.5	29.4	34.9
c. Is the patient experiencing delusions of persecution?	11.9	18.9	25.8
d. Has the patient made specific threats to harm others?	7.2	11.0	16.8
e. Has the patient expressed thoughts/fantasies of harm to others?	9.2	14.0	13.5
f. Does the patient have a history of antisocial behaviour?	13.8	26.4	29.6
g. Is the patient impulsive/display emotional lability?	9.8	34.5	41.5
h. Does the patient have a history of rootlessness/social restlessness?	19.3	41.9	40.9
i. Does the patient have a history of problems maintaining stability in employment/relationships?	14.4	23.8	22.2

Appendix (cont.)

Items in the structured risk assessment	Proportion, %		
	Proportion missing ^a	With complete scale data ^b	Total sample ^c
j. Does the patient have a history of non-compliance/disengaging with aftercare?	13.0	45.9	48.7
k. Has the patient recently been under significant stress?	12.1	36.4	42.4
l. Does the patient deny or minimize previous incidents of violence?	15.5	17.4	21.4
m. Is there evidence of violence within the patient's social network? (family/peers)	28.8	21.4	17.2
n. Have significant others expressed concern about the patient's risk?	10.3	34.4	38.5
Suicide			
a. Does the patient have a history of suicide attempts?	13.4	37.4	33.1
b. If so, did (s)he use a violent/perceived lethal method?	21.8	20.3	16.7
c. Has the patient made a plan to end his/her life?	7.9	18.8	23.4
d. Is the patient expressing suicidal ideation?	6.7	16.5	16.5
e. Is the patient expressing feeling of hopelessness?	8.4	27.0	25.9
f. Does the patient express high levels of subjective distress (from psychotic symptoms/situations)?	8.2	28.9	31.2
g. Does the patient express feelings of having no control over his/her life?	10.8	28.0	25.9
h. Does the patient misuse drugs/alcohol?	9.7	31.9	34.9
i. Does the patient display impulsivity?	9.9	35.7	37.0
j. Does the patient live alone?	6.3	36.8	36.3
k. Does the patient have poor physical health?	8.9	25.5	24.9
l. Has the patient recently suffered significant loss or threat of loss? (include perceived loss of status or role)	13.5	18.7	27.6
m. Has the patient recently disengaged with care or stopped medication?	12.0	7.6	7.6
n. Has the patient recently been discharged from hospital? (within 6 months)	5.7	16.4	16.8
Self-neglect			
a. Does the patient have a history of previous self-neglect?	15.9	38.7	40.6
b. Is the patient failing to eat or drink properly?	9.8	22.9	23.0
c. Does the patient have difficulty managing their physical health?	10.3	22.8	25.4
d. Is there a risk of the patient wandering?	10.4	12.4	14.4
e. Has the patient ever fallen?	27.2	16.8	11.8
f. Is the patient unable to look after his/her own hygiene?	7.9	21.6	23.8
g. Is there a threat of eviction?	17.4	11.2	8.0
h. Does the patient have significant debt due to regular difficulties, such as managing their finances?	26.9	11.9	12.0
i. Does the patient's accommodation inadequate to meet his/her need?	19.8	16.2	17.3
j. Does the patient deny problems perceived by others?	14.3	24.6	27.5
k. Does the patient have difficulty communicating his/her need?	6.9	16.6	19.1

^a Denominator $n = 9234$.

^b Denominator $n = 5014$ for suicide risk assessment, $n = 3897$ for violence risk assessment and $n = 4558$ for self-neglect risk assessment.

^c Denominator $n = 9234$.

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Declaration of Interest

None.

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