Psychological distress and risk of accidental death in the general population

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To the Editor -

While accidents are a major cause of disability and mortality worldwide, their aetiology is not well understood. Risk factors appear to include socioeconomic deprivation, lower cognition, and being male, older, and unmarried/living alone.[1-3] Investigators have also shown that severe mental illness is associated with an elevated risk of accidents, [2] however, these observations are exclusive to individuals with mental disorders serious enough to warrant hospitalisation[4] or referral to an outpatient clinic. To the best of our knowledge, there has been no examination of the link between lower levels of distress and subsequent risk of accidents. Strong *prima facie* reasons to anticipate such a relationship include the symptoms of fatigue, poor concentration, and sleep disturbance, that characterise even moderately distressed individuals, which may impact unfavourably on decision-making, risk perception, coordination, and response time, so precipitating accidents.

Described in detail elsewhere,[5] we used data from sixteen independent, geographically-representative surveys with mortality surveillance (the Health Survey for England [N=13] and the Scottish Health Surveys [N=3]). Combining these studies in the context of an individual-participant meta-analysis resulted in a total of 193,873 participants, 166,606 (86%) of whom had data on age, sex and psychological distress. Psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12) which contains items principally concerned with symptoms of depression and anxiety. The sensitivity (0.70) and specificity (0.80) against standardized psychiatric interview is acceptably high.[6] Study members also reported if they had even been diagnosed with a psychiatric disorder and if they had used prescribed psychotropic medications. Hazard ratios were computed using Cox proportional hazard models in which we accounted for between study variation using a shared frailty parameter. We used fractional polynomials to estimate the best-fitting dose-response curve.

In analyses of baseline data, we found that a higher prevalence of both self-reported psychiatric morbidity and psychotropic medications was apparent in the more psychologically distressed study members (supplemental figure 1). For instance, in people in the most distressed group (GHQ-12 score 12), 31% reported using psychotropic medications, whereas in the least distress group (GHQ-12 score 0) it was 2%.

A mean duration of 9.5 years of follow-up of 166,606 people (91,528 women) gave rise to 340 deaths ascribed to all accidents combined. In figure 1 we show that, following multivariable adjustment, an increase in the rate of accidental deaths occurred at a distress scores of above 3. After excluding study members with either self-declared psychiatric morbidity or use of psychotropic medications (111,848 people; 218 accidental deaths), hazard ratios became elevated at the lowest level of distress symptoms. A test for trend indicated a dose-response effect across the full range of distress scores (p-value for trend ≤ 0.001), with a one-standard-deviation-increase in psychological distress associated with an increase in risk of accidents after multiple adjustment (1.17; 1.04, 1.33). In supplemental table 1 we present the risk of accidents according to standard categorisation of psychological distress ('asymptomatic', 'sub-clinical symptomatic', 'symptomatic', 'highly symptomatic').

In this, the first population-based study in the context of psychological distress symptoms and accidental death, we found that accident rates were raised even in people with low levels of distress. That we were also able to show that known risk factors for accidents – gender (male vs. female: 1.80; 1.45, 2.23), older (per year increase in age: 1.05; 1.05, 1.06), unmarried/living alone (1.97; 1.58, 2.45), and of lower social status (manual vs. non-manual social class: 1.48; 1.18, 1.85) – were replicated herein (HRs are age-and sex-adjusted) gives us some confidence in our novel results for psychological distress (supplemental table 2). With this association being stepwise and seemingly robust to the adjustment of a series of confounding factors, implicates other, as yet unknown, mechanisms in this relationship.

References

(1) Batty GD, Gale CR, Tynelius P, Deary IJ, Rasmussen F. IQ in early adulthood, socioeconomic position, and unintentional injury mortality by middle age: a cohort study of more than 1 million Swedish men. *Am J Epidemiol* 2009; 169(5):606-615.

(2) Crump C, Sundquist K, Winkleby MA, Sundquist J. Mental disorders and risk of accidental death. *Br J Psychiatry* 2013; 203(3):297-302.

(3) McCartney G, Russ TC, Walsh D, Lewsey J, Smith M, Smith GD et al. Explaining the excess mortality in Scotland compared with England: pooling of 18 cohort studies. *J Epidemiol Community Health* 2015; 69(1):20-27.

(4) Hiroeh U, Appleby L, Mortensen PB, Dunn G. Death by homicide, suicide, and other unnatural causes in people with mental illness: a population-based study. *Lancet* 2001; 358(9299):2110-2112.

(5) Russ TC, Stamatakis E, Hamer M, Starr JM, Kivimaki M, Batty GD. Association between psychological distress and mortality: individual participant pooled analysis of 10 prospective cohort studies. *BMJ* 2012; 345:e4933.

(6) Aalto AM, Elovainio M, Kivimaki M, Uutela A, Pirkola S. The Beck Depression Inventory and General Health Questionnaire as measures of depression in the general population: a validation study using the Composite International Diagnostic Interview as the gold standard. *Psychiatry Res* 2012; 197(1-2):163-171.

Conflicts of Interest and Financial Disclosures

None to declare.

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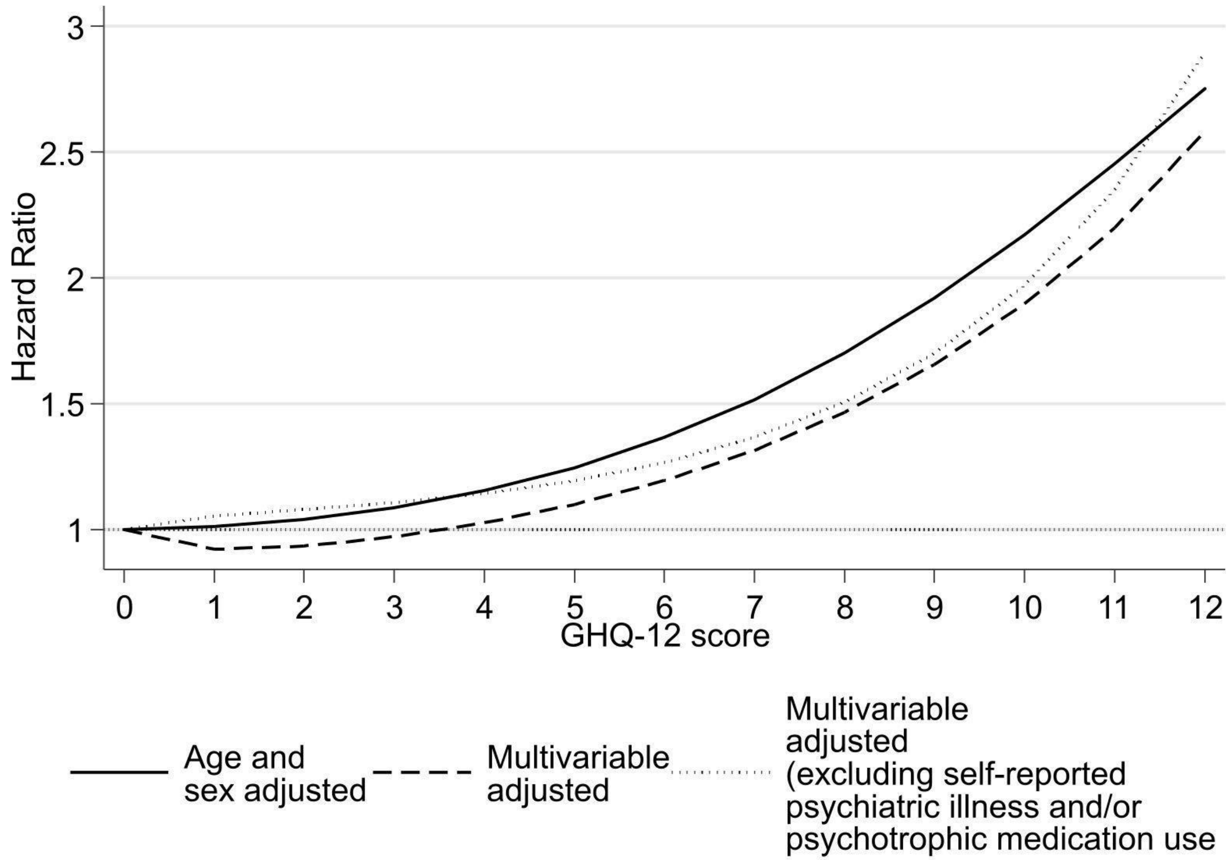
Figure 1. Dose-response association between psychological distress score and risk of accidental death: Individual-participant data from a meta-analysis of 16 general population-based cohort studies



Underlying unintentional external deaths were those deaths where the underlying cause of death was external (ICD-9 codes 800-999 and ICD-10 codes V00-Y98) and had no mention of the ICD codes indicating an intentional motivation (ICD-9 codes E950-E959 and E980-E989 or ICD-10 codes X60-X84 and Y10-Y34).

Multiple adjustment is adjustment for: age, sex, socioeconomic position (manual, non-manual occupation), frequency of alcohol consumption (never, former, occasional, monthly, 1-4 times per week, ≥ 5 times per week), smoking status (non-smoker, current smoker) and presence of a somatic longstanding illness (cancer, diabetes, other endocrine disorders, cardiovascular disease, hypertension, respiratory disease, and any other non-mental health condition).

Supplemental Table 1. Hazard ratios (95% confidence intervals) for the relation of psychological distress severity with accidental death: Individual participant data meta-analysis of 16 general population-based cohort studies

	Number of people at risk	Number of accidental deaths[a]	Distress classifications (GHQ-12 score)				P-value for trend	1 standard deviation increase in distress score[b]
			Asymptomatic (0)	Sub-clinical symptomatic (1-3)	Symptomatic (4-6)	Highly symptomatic (7-12)		
Number of accidental deaths/Number at risk	166, 606	340	195/98757	81/42439	26/13481	38/11929		
Age- and sex-adjusted	166, 606	340	1.00 (ref.)	1.03 (0.79, 1.33)	1.11 (0.74, 1.67)	1.89 (1.33, 2.67)	0.004	1.20 (1.10, 1.31)
Age-, sex- & drinking frequency-adjusted	165, 060	339	1.00	1.02 (0.79, 1.32)	1.10 (0.73, 1.66)	1.80 (1.27, 2.57)	0.008	1.19 (1.08, 1.30)
Age-, sex- & smoking-adjusted	166, 041	337	1.00	0.99 (0.76, 1.29)	1.08 (0.72, 1.63)	1.78 (1.26, 2.53)	0.01	1.18 (1.08, 1.29)
Age-, sex- & social class-adjusted	157, 306	319	1.00	1.00 (0.76, 1.31)	1.08 (0.71, 1.66)	1.75 (1.21, 2.53)	0.017	1.18 (1.08, 1.30)
Age-, sex- & somatic illness-adjusted	166, 568	340	1.00	1.05 (0.81, 1.36)	1.14 (0.76, 1.73)	1.94 (1.37, 2.76)	0.002	1.21 (1.10, 1.32)
Age-, sex- & marital status	165, 716	329	1.00	1.01 (0.78, 1.32)	1.06 (0.70, 1.62)	1.84 (1.29, 2.61)	0.002	1.19 (1.08, 1.30)
Multivariable-adjusted[c]	155, 650	307	1.00	0.97 (0.74, 1.28)	1.02 (0.66, 1.59)	1.65 (1.14, 2.40)	0.047	1.16 (1.06, 1.28)
Multivariable-adjusted – with exclusions[d]	111, 848	218	1.00	1.06 (0.77, 1.46]	1.37 [0.85, 2.21)	1.56 (0.94, 2.58)	< 0.001	1.17 (1.04, 1.33)

[a] Underlying unintentional external deaths (ICD-9 codes 800-999 and ICD-10 codes V00-Y98 – all deaths where the underlying cause of death was external and had no mention of the ICD codes indicating an intentional motivation [ICD-9 codes E950-E959 and E980-E989 or ICD-10 codes X60-X84 and Y10-Y34]).
[b] Based on sex-specific standard deviations.
[c] Multivariable-adjusted effect estimates are adjusted for: age, sex, socioeconomic position (manual, non-manual occupation), marital status, frequency of alcohol consumption (never, former, occasional, monthly, 1-4 times per week, ≥ 5 times per week), smoking status (non-smoker, current smoker) and presence of a somatic longstanding illness (cancer, diabetes, other endocrine disorders, cardiovascular disease, hypertension, respiratory disease, and any other non-mental health condition).
[d] Excluding people with diagnosed mental illness and use of psychotropic medication

Supplemental Table 2. Relation of study covariates with accidental death: Individual participant data meta-analysis of 16 general population-based cohort studies

	Number of people at risk	Number of accidental deaths	Hazard Ratio (95% CI) [b]
Age (per year increase)	166, 606	340	1.05 (1.05, 1.06)
Sex (female is referent)	166, 607	341	1.80 (1.45, 2.23)
Drinking frequency	165, 060	339	
Never drank			1.28 (0.82, 2.00)
Ex-drinker			1.55 (0.99, 2.43)
Occasional (less than monthly)			1.03 (0.73, 1.45)
Monthly (1 to 2 times per month)			1.04 (0.72, 1.52)
1-4 times per week			1.00 (ref)
≥ 5 times per week			1.27 (0.96, 1.68)
Smoking Status	166, 041	337	
Non-smoker			1.00 (ref)
Current smoker			1.84 (1.45, 2.34)
Manual social class	157, 306	319	
No			1.00 (ref)
Yes			1.48 (1.18, 1.85)
Somatic illness	166, 568	340	
No			1.00 (ref)
Yes			0.90 (0.72, 1.12)
Marital status	165, 716	329	
Married/cohabiting			1.00 (ref)
Single, divorced or widowed			1.97 (1.58, 2.45)

All hazard ratios are adjusted for age and sex, except age which is sex-adjusted only, and sex which is age-adjusted only

Supplemental Figure 1. Baseline psychiatric morbidity and psychotropic medications according to psychological distress (N=166,593)