Higher Psychological Distress is Associated with Unintentional Injuries in U.S. Adults

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Abstract

Background—Links between mental illness, self-inflicted injury, and interpersonal violence are well recognized, but the association between poor mental health and unintentional injuries is not well understood.

Methods—We used the 2010 National Health Interview Survey to assess the association between psychological distress and unintentional non-occupational injuries among U.S. adults. Psychological distress was measured by the Kessler Psychological Distress Scale, a symptom scale shown to identify community-dwelling persons with mental illness. Multivariable logistic regression was used to estimate adjusted odds ratios (AOR) and 95% confidence intervals.

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Results—Of the 26,776 individuals analyzed, 2.5% reported a medically-attended unintentional injury in the past three months. Those with moderate and severe psychological distress had 1.5 [1.2-1.8] and 2.0 [1.4 -2.8] times higher odds of injury, respectively, as compared to those with low distress levels, after adjusting for age, sex, race, marital status, education level, alcohol use, physical functional limitation, medical comorbidity, employment status, and health insurance status. Psychological distress was significantly associated with falls [AOR 1.4 (1.1-1.9)] and sprain/strain injuries [AOR 2.0 (1.5-2.8)], but not transportation-related injuries [AOR 1.2 (0.7-1.9)] or fractures [AOR 1.1 (0.8-1.6)].

Conclusion—Among community-dwelling U.S. adults, psychological distress is significantly associated with unintentional non-occupational injury, and the magnitude of association increases with severity of distress. The association between psychological distress and injury may be particularly strong for falls and sprain/strain injuries. These findings draw attention to a large group of at-risk individuals that may merit further targeted research, including longitudinal studies.

Keywords

mental health; wounds and injuries; risk factors; psychological distress

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Introduction

In 2010, there were 41 million emergency department visits for injuries in the United States, three-fourths of which were for unintentional injuries.[1] The total economic impact of unintentional injuries in 2011 was estimated at $753 billion.[2] Identifying those at high risk for injury is crucial if we are to effectively target injury prevention strategies. Evidence suggests that persons suffering symptoms of a mental illness—up to 25% of U.S. adults each year [3]-- may be at increased risk for injury.[4-17] Although links between mental health, self-inflicted injury, and interpersonal violence have long been recognized,[18,19] the relationship between mental health and unintentional injuries among community-dwelling adults has not been well studied. Symptoms of poor mental health can include impaired concentration, impulsivity, errors in perception and judgment, and psychomotor dysfunction, [20] all of which are potential mechanisms through which poor mental health could increase the risk of unintentional injuries. In addition to a number of methodological limitations, most studies examining the relationship between mental health and injury have not differentiated between intentional and unintentional injuries or examined the association between mental health and individual causes or types of injury.

The Kessler 6-item Psychological Distress Scale (K6) is a set of questions designed to identify individuals likely to have a diagnosed or undiagnosed mental illness with severe enough symptoms to cause moderate or serious functional impairment.[21] In validation studies, it has been found to discriminate well between adults meeting diagnostic criteria for a serious psychiatric condition and those who do not.[21-23] More recently, lower scores have been found to reliably identify adults in the general population with moderate, yet still clinically relevant, mental health symptoms in need of treatment.[24] No study to date has explored the association between psychological distress and non-occupational unintentional injuries in a large nationally-representative sample of U.S. adults. We analyzed data from

the 2010 National Health Interview Survey (NHIS) to determine whether higher levels of psychological distress were associated with a higher prevalence of non-occupational unintentional injury in the community-dwelling U.S. adult population. We also examined whether the strength of association between psychological distress and injury differed among the major causes and types of injury.

Methods

Data Source

The NHIS is a nationally-representative household survey that collects information on recent non-fatal injuries as well as demographic factors, illness, health behaviors, and disability in the United States. Each year, the NHIS is administered to approximately 35,000 households, collecting data on approximately 100,000 non-institutionalized civilian U.S. adults and children.[25] The NHIS uses a multi-stage area probability sampling design,[26] oversampling black, Hispanic, and Asian households. Trained interviewers visit households in randomly selected clusters and conduct Computer Assisted Personal Interviews (CAPI), collecting information from a household respondent on each family member residing at the address. From each household, one adult aged 18 years and over is then selected randomly to answer questions from the additional Sample Adult questionnaire. Our initial study sample consisted of the 27,157 adults who completed the Sample Adult questionnaire in 2010. The total household and overall Sample Adult response rates in 2010 were 79.5% and 60.8%, respectively.[25]

Measures

Exposure variable—The 6-item Kessler Psychological Distress Scale (K6) is embedded in the Sample Adult Questionnaire. Each of the six components begins *"How often in the past 30 days did you feel…"* and continues 1.*"so sad that nothing could cheer you up,"* 2. *"nervous,"* 3.*"restless or fidgety,"* 4. *"hopeless,"* 5. *"that everything was an effort?"or 6. "worthless,"* Possible responses include 0 ("none of the time"), 1 ("a little of the time"), 2 ("some of the time"), 3 ("most of the time"), and 4 ("all of the time"), and are summed to obtain a score between 0 and 24. Based on initial validation studies, a score of 13 was identified as the optimal cut-point for discriminating between those with and without a diagnosable psychiatric illness with significant functional impairment, with a total classification accuracy of 92%.[21-23] For our study, psychological distress was categorized as follows based on these and subsequent [24] validation studies: No or low distress (0-4 points), moderate distress (5-12 points), and severe distress (13 points). Additional analyses were conducted including a separate category "none" for those with a K6 score of zero, although this grouping was not the primary focus of our analysis due to lack of studies validating this use of this cutpoint. Participants with incomplete responses to Kessler scale questions were excluded from the analysis (Figure 1).

Outcome variable—Our primary outcome was the first non-occupational, unintentional injury suffered by the single adult household member chosen at random to respond to the Sample Adult questionnaire (including the K6). Our analyses considered injuries for which medical consultation or treatment was sought occurring during the three-month period prior

to the survey. Because injury data were reported for the entire household (as part of the Family Core module) by a single individual—not necessarily the adult chosen to respond to the Sample Adult questionnaire—we used unique study person numbers assigned to each household member to combine injury data with the Sample Adult respondent's K6 and other data.

An injury was considered to have occurred to a Sample Adult respondent when they or the household respondent reported that, during the past three months, the Sample Adult respondent had an injury where any part of their body was hurt *and* that they talked to or saw a medical professional about the injury. If the Sample Adult was reported to have been injured more than once, we considered only the first injury, as subsequent injuries to the same individual could be related to the first injury. Injuries reported to have occurred while "*working at a paid job*" were excluded because exposure to workplace injury risks varies widely according to the specific nature of the work, the characteristics of which are not fully captured in the NHIS.[27] Respondents were asked open-ended questions about the nature and circumstances of the injury, and from these responses NHIS staff assigned each injury an ICD-9-CM External Cause of Injury codes (E-code). Although questions specifically addressing injury intent (i.e. self-inflicted, assault) are not asked, the NHIS staff were able to code an injury as being the result of an assault or self-inflicted injury based on the reported circumstances surrounding the injury. Because our primary outcome was unintentional injury, we excluded injuries with E-codes indicating injuries that were self-inflicted (E-950-959) or purposefully inflicted by others (E-960-969, E979, E999.1). We also excluded the small number of poisonings (Figure 1).

Other variables—We also analyzed variables included in the NHIS that characterized the population and might confound or modify the association between psychological distress and injury (Table 1). Secondary outcome measures included individual major causes and types of unintentional injury.

Statistical Analysis

All analyses were conducted with SAS Version 9.2, incorporating sample weights (*proc surveyfreq* and *proc surveylogistic*) to account for the complex sample design and non-response rates in the NHIS.[28] Variables that were related (Pearson's χ^2, p $\leq$ 0.05) to both our outcome (injury) and predictor (psychological distress level) were identified as potential confounders. Potential confounders were further evaluated using the Mantel-Haenszel odds ratio as described below. If after stratifying by a third variable, there was significant heterogeneity in the strata-specific odds ratios relating injury to psychological distress (Breslow-Day p $\leq$ 0.05), the third variable was identified as a possible effect modifier. Variables were identified as probable confounders if the Mantel-Haenszel summary odds ratio obtained from the stratified analyses differed from the unadjusted odds ratio by more than 10% and were retained in the final multivariable model if they remained significant at the p<0.05 level using manual backward stepwise logistic regression or had been identified as important confounders in the literature. Complete cases analyses were employed for the multivariable regression. We tested for interactions by individually adding the potential effect modifiers as interaction terms in the adjusted model. The adjusted model was also

used to examine the association between psychological distress and the most common individual causes and types of injuries. Because of the small numbers of some types of injury using three categories of psychological distress, moderate and severe distress were collapsed into a single category for this portion of the analysis. All percentages and odds ratios are reported using weighted data.

Results

Cohort and Subject Characteristics

Among the 26,776 individuals in our sample, 625 suffered at least one unintentional non-occupational injury in the past three months that resulted in medical consultation or care (Figure 1), corresponding to an annual weighted prevalence estimate of approximately 10%. The respondents ranged in age from 18 to 92 years, were predominantly female, white, employed, and had at least a high school education. Nineteen percent were current smokers, 27% were obese, and 46% had at least one chronic medical condition. Of the adults in our sample who completed all the K6 questions (99.1%), 21% had K6 scores of 5 points or higher, indicating at least moderate psychological distress (Table 1). Forty-four percent of the population reported no symptoms of psychological distress (data not shown). All of the subject characteristics varied significantly by level of psychological distress. With the exception of the household income variable (11% missing), the proportion of values missing was less than 4% for all variables and less than 1% for most variables (Table 1).

The most common injury cause was a fall (42%); followed by injuries related to transportation (13%); overuse or strenuous movement (12%); being struck by object or person (11%); being cut or pierced (7%); animal or insect bite (3%); associated with fire, burn, or scald (1%); machinery (1%); and other (8%). Sprain, strain, and twist injuries were the most common types of injury (31%), followed by fractures (23%), bruises (13%), cuts (13%), insect bites (3%), burns (2%), scrapes (2%), animal bite (0.5%), and other (10%). Approximately 8% of injuries resulted in overnight hospitalization, 47% in an emergency department visit, and 24% in use of an ambulance (data not shown).

Multivariable Analysis

The reporting of an injury was more than twice as common among those with severe psychological distress as among those with no or low distress (Table 2). Of note, only 1.5% of those with the lowest possible score (zero) on the K6 reported an injury (data not shown). After controlling for sex, age, race, marital status, education level, level of alcohol use, physical functional limitation, the presence of one or more chronic diseases, employment, and health insurance status, moderate psychological distress was associated with 50% greater odds of injury compared to having no or low distress (reference group), and those with severe distress had twice the odds of injury, compared to those with no or low distress (Table 2). When a smoking by psychological distress interaction term was added to the multivariable model, the interaction between psychological distress and smoking status was statistically significant (p=0.02). When the interaction was accounted for, the dose-response relationship between level of psychological distress and the odds of injury (Table 2A) increased in the never/former smoker group, and decreased in the current smoker group

compared to the respective adjusted odds ratios in the analysis without the interaction term (Table 2). Although the odds of injury were higher in current smokers regardless of psychological distress level compared to the reference category (never/former smokers with low/no distress, Table 2A), the differences in odds ratios comparing current to never/former smokers in each level of psychological distress were not statistically significant (data not shown).

Small numbers of events prevented analyses of individual causes and types of injury using three levels of psychological distress. Combining those with moderate or severe psychological distress (Kessler score 5), however, we found this group to have significantly higher odds of injuries from falls and overuse or strenuous movements, compared to those with no or low distress (Table 3). The association with transport-related injuries was weaker and not statistically significant. Moderate to severe psychological distress was also associated with significantly higher odds of sprain, strain, or twist injuries, but although the odds of fracture in this group was 20% higher than in those with no or low distress, the association was not statistically significant (Table 3).

Discussion

We found that higher levels of psychological distress were associated with increased odds of non-occupational unintentional non-fatal injury and that the odds increased with increasing levels of distress. This association was independent of level of alcohol use, medical comorbidity, physical functional limitation, and relevant demographic factors; however, the association was attenuated by smoking status. Our main results are consistent with previous studies [4,6-8,15,16] that have suggested depression as a risk factor for injury and also with a group of studies suggesting that those with a diagnosed mental illness have a higher rate of trauma hospitalization than the general population.[5,9,10,13,14] By using the Kessler Psychological Distress Scale (K6), we were able to capture a range of psychological symptoms that have been shown to be highly predictive of mental illness, either diagnosed or undiagnosed. Moreover, by using the three exposure categories, we were able to detect a gradation in the association between increasing severity of psychological symptoms and unintentional injuries overall.

Two previous studies have utilized the K6 in looking at risk factors for workplace injuries. Of these, one found a non-significant 34% higher adjusted odds of injury[11] among U.S. workers with severe psychological distress, and the other found twice the odds of injury[12] among Australian workers with severe distress. Neither study, however, examined the association between psychological distress and off-the-job injuries, which account for more than 4 in 5 injuries.[27,29]

Our findings suggest that the association between psychological distress and injury may be stronger in certain types of unintentional injury than in others. Unlike Sprince et al.,[30] who did not find a significant association between depression and falls among Iowa farmers, we found psychological distress to be associated with significantly higher odds of falls in the general population. We also saw particularly strong associations with overuse/strenuous movement and sprain, strain, and twist injuries. The association seen with these relatively

more minor injuries may represent an increased vulnerability to injury due to psychological or psycho-motor symptoms but may also reflect differences in pain perception[31] or healthcare-seeking behavior patterns, given that this analysis included only injuries for which medical attention was sought.

We found that higher levels of psychological distress were associated with significantly higher odds of injury in non-smokers and this association was attenuated in current smokers, although the odds ratios for smokers were not significantly different from those for non-smokers reporting an equivalent level of distress. This finding was unexpected and may be related to the modest number of injuries reported in smokers in our sample. Smoking has been identified previously as a possible risk factor for injury.[32,33] Tobacco smoking is also strongly associated with poor mental health status[34,35] and has been described as a form of self-medication for mental distress symptoms.[36]

Our study has several strengths. Because of the size and richness of the NHIS, we were able to identify and adjust for important confounders not controlled for in many previous studies. The NHIS sampling methodology ensures that our study sample represents the non-institutionalized civilian population of U.S. adults, including those living in rural, suburban, and urban areas. We thus avoid the selection bias inherent to hospitalized samples and the limited generalisability of rural samples with a high proportion of agricultural injuries. [4,6,30,15] Also, unlike hospital-based studies, the NHIS provides information on a random sample of the more than 90% of injuries that do not result in hospitalization and yet contribute substantially to injury morbidity and healthcare costs. Finally, we were able to focus on unintentional injury and examine the strength of association between psychological distress and the most common causes and types of unintentional injury, although small numbers of injuries in certain groups prevented analyses across the three psychological distress levels for all individual causes and types of injury.

The major limitation of this study is that we were unable to establish causality. Because of the cross-sectional design, we could not determine whether the injury pre-dated or may even have contributed to psychological distress symptoms in some individuals. Those with high K6 scores, however, have been shown to have a high likelihood of needing mental health services due to a longstanding mental health condition.[21-24] Furthermore, three longitudinal studies [6,7,16] and one cross-sectional study with retrospective reporting of pre-injury depression diagnosis[15] support a causal role for depression and other psychological symptoms as risk factors for injury. One study[7] suggested a bi-directional causal relationship, between depression and injury. Such a bi-directional relationship certainly could have contributed to the association we observed.

Although the NHIS questionnaire has been refined over many years and interviewers receive extensive training, our data are subject to the limitations of self and proxy reported information, including incomplete knowledge of injuries or injury circumstances, under-reporting and recall of more minor injuries,[37] and potentially differences in recall according to presence or severity of psychological symptoms. Additionally, we have no information about fatal injuries, although these represent less than 1% of medically-attended injuries.[38]

Our findings add to the evidence characterizing the relationship between poor mental health and unintentional injury, suggesting that even moderate mental health symptoms among community-dwelling adults are associated with increased prevalence of injuries serious enough to seek medical attention. This association appears to be strongest for falls and sprain/strain injuries, both of which contribute substantially to disability and both healthcare and societal cost.[2] Those seeking medical care for unintentional injuries may be more likely to have unrecognized mental health needs that may have either contributed to or resulted from their injuries. Brief alcohol and substance abuse screening, intervention, and referral programs have been used successfully in trauma centers nationwide to prevent recurrent traumatic injury.[39] Longitudinal research is needed to clarify causal relationships and identify mediators of the association between psychological distress and unintentional injury and also to evaluate the potential of mental health screening and intervention as an injury prevention strategy.

Acknowledgments

References

1. [Accessed September 4, 2013] National Hospital Ambulatory Medical Care Survey: 2010 Emergency Department Summary Tables. Available at http://www.cdc.gov/nchs/data/ahcd/nhamcs_emergency/2010_ed_web_tables.pdf

2. National Safety Council. [Accessed September 4, 2013] Injury Facts 2013 Edition. Available at http://www.mhi.org/downloads/industrygroups/ease/technicalpapers/2013-National-Safety-Council-Injury-Facts.pdf

3. National Institute of Mental Health Statistics. [Accessed 3/5, 2012] Available at: http://www.nimh.nih.gov/statistics/index.shtml

4. Nordstrom DL, Zwerling C, Stromquist AM, et al. Epidemiology of unintentional adult injury in a rural population. J Trauma. 2001; 51:758–766. [PubMed: 11586172]

5. Cameron C, Purdie D, Kliewer E, et al. Differences in prevalence of pre-existing morbidity between injured and non-injured populations. Bull World Health Organ. 2005; 83:345–352. [PubMed: 15976875]

6. Tiesman HM, Peek Asa C, Whitten P, et al. Depressive symptoms as a risk factor for unintentional injury: a cohort study in a rural county. Inj Prev. 2006; 12:172–177. [PubMed: 16751447]

7. Patten S, Lavorato D, Eliasziw M. Major Depression and Injury Risk. Can J Psychiat. 2010; 55:313–318.

8. Mussolino M. Depression and hip fracture risk: the NHANES I epidemiologic follow-up study. Public Health Rep. 2005; 120:71–75. [PubMed: 15736334]

9. Poole GV, Lewis JL, Devidas M, et al. Psychopathologic risk factors for intentional and nonintentional injury. J Traum. 1997; 42:711–715.

10. Wan JJ, Morabito DJ, Khaw L, et al. Mental illness as an independent risk factor for unintentional injury and injury recidivism. J Traum. 2006 Dec.61:1299–1304.

11. Kim J. Psychological distress and occupational injury: findings from the National Health Interview Survey 2000-2003. J Prev Med Public Health. 2008; 41:200–207. [PubMed: 18515998]

12. Holden L, Scuffham P, Hilton M, et al. Psychological distress is associated with a range of high-priority health conditions affecting working Australians. Aust N Z J Pub Heal. 2010; 34:304–310.

13. O'Donnell M, Creamer M, Elliott P, et al. Prior trauma and psychiatric history as risk factors for intentional and unintentional injury in Australia. J Traum. 2009; 66:470–476.

14. McGinty E. Injury risk and severity in a sample of Maryland residents with serious mental illness. Inj Prev. 2013; 19:32–37. [PubMed: 22661205]

15. Fragar L, Inder KJ, Kelly BJ, et al. Unintentional Injury, Psychological Distress and Depressive Symptoms: Is There an Association for Rural Australians? J Rural Health. 2013; 29:12–19. [PubMed: 23289650]

16. Chen G, Smith GA, Deng S, et al. Psychological symptoms and nonfatal unintentional injuries among Chinese adolescents: A prospective study. J Adolescent Health. 2005; 37:460–466.

17. Rowe R, Maughan B, Goodman R. Childhood psychiatric disorder and unintentional injury: Findings from a national cohort study. J Pediatr Psychol. 2004; 29:119–130. [PubMed: 15096533]

18. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. Brit J Psychiat. 1997; 170:205–228.

19. Bayard Burfield L, Sundquist J, Johansson SE. Self-reported long-standing psychiatric illness as a predictor of premature all-cause mortality and violent death: a 14-year follow-up study of native Swedes and foreign-born migrants. Soc Psych Psych Epid. 1998; 33:491–496.

20. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. Fourth. Washington, DC: American Psychiatric Association; 1994.

21. Kessler R, Barker P, Colpe L, et al. Screening for serious mental illness in the general population. Arch Gen Psychiatry. 2003; 60:184–189. [PubMed: 12578436]

22. Pratt LA, Dey AN, Cohen AJ. Characteristics of adults with serious psychological distress as measured by the K6 scale: United States, 2001-04. Adv Data. 2007 Mar 30.(382):1–18. [PubMed: 17432488]

23. Kessler RC, Green JG, Gruber MJ, et al. Screening for serious mental illness in the general population with the K6 screening scale: Results from the WHO World Mental Health (WMH) survey initiative. Int J Method Psych. 2010; 19:4–22.

24. Prochaska J, Sung H, Max W, et al. Validity study of the K6 scale as a measure of moderate mental distress based on mental health treatment need and utilization. Int J Method Psych. 2012; 21:88–97.

25. About the National Health Interview Survey. Centers for Disease Control and Prevention; Available at: http://www.cdc.gov/nchs/nhis/about_nhis.htm [Accessed 5/28, 2012]

26. National Health Interview Survey (NHIS) Public Use Data Release: NHIS Survey Description. Division of Health Interview Statistics, National Center for Health Statistics; Hyattsville, MD: 2011. Available at: ftp://ftp.cdc.gov/pub/health_statistics/nchs/dataset_documentation/nhis/2010/srvydesc.pdf [Accessed 5/29, 2012]

27. Smith GS, Wellman HM, Sorock GS, et al. Injuries at work in the US adult population: contributions to the total injury burden. Am J Public Health. 2005; 95:1213–9. [PubMed: 15983273]

28. [Accessed 12/1, 2012] Variance Estimation Other Analytic Issues, NHIS 2006-2011. Available at: http://www.cdc.gov/nchs/data/nhis/2006var.pdf

29. Chen, LH.; Warner, M.; Fingerhut, L.; Makuc, D. Vital Health Stat. Vol. 10. National Center for Health Statistics; 2009. Injury episodes and Circumstances: National Health Interview Survey, 1997-2007.

30. Sprince N, Zwerling C, Lynch C, et al. Risk factors for falls among Iowa farmers: a case-control study nested in the Agricultural Health Study. Am J Ind Med. 2003; 44:265–272. [PubMed: 12929146]

31. Adler G, Gattaz WF. Pain perception threshold in major depression. Biol Psychiat. 1993; 34:687–689. [PubMed: 8292672]

32. Sacks JJ, Nelson DE. Smoking and injuries: an overview. Prev Med. 1994; 23:515–20. [PubMed: 7971880]

33. Leistikow BN, Martin DC, Samuels SJ. Injury death excesses in smokers: a 1990-95 United States national cohort study. Inj Prev. 2000; 6:277–80. [PubMed: 11144627]

34. Leung J, Gartner C, Hall W, et al. A longitudinal study of the bi-directional relationship between tobacco smoking and psychological distress in a community sample of young Australian women. Psychol Med. 2012; 42:1273–1282. [PubMed: 22011372]

35. Sung H, Prochaska J, Ong M, et al. Cigarette smoking and serious psychological distress: a population-based study of California adults. Nicotine Tob Res. 2011; 13:1183–1192. [PubMed: 21849411]

36. Winterer G. Why do patients with schizophrenia smoke? Curr Opin Psychiatr. 2010; 23:112–119.

37. Warner M, Schenker N, Heinen MA, et al. The effects of recall on reporting injury and poisoning episodes in the National Health Interview Survey. Inj Prev. 2005; 11:282–287. [PubMed: 16203836]

38. Centers for Disease Control and Prevention. [Accessed September 4, 2013] FastStats. Available at http://www.cdc.gov/nchs/fastats/injury.htm

39. Dicker RA, Mah J, Lopez D, et al. Screening for mental illness in a trauma center: rooting out a risk factor for unintentional injury. J Traum. 2011; 70:1337–1344.

What is already known on this subject

- Both depression and having a mental illness diagnosis have been associated with increased injury rates in certain populations.

- The association between degree of psychological distress and unintentional off-the-job injuries in adults has not been studied in a representative national sample.

What this study adds

- Among community-dwelling U.S. adults, unintentional non-occupational injury is significantly associated with psychological distress, and the magnitude of association increases with severity of distress.

- The association between psychological distress and injury is particularly strong for certain injury causes (falls and overuse or strenuous movements) and injury types (sprains and strains).

- Further research is needed to clarify causal relationships and to evaluate the potential of mental health screening and intervention as an injury prevention strategy.
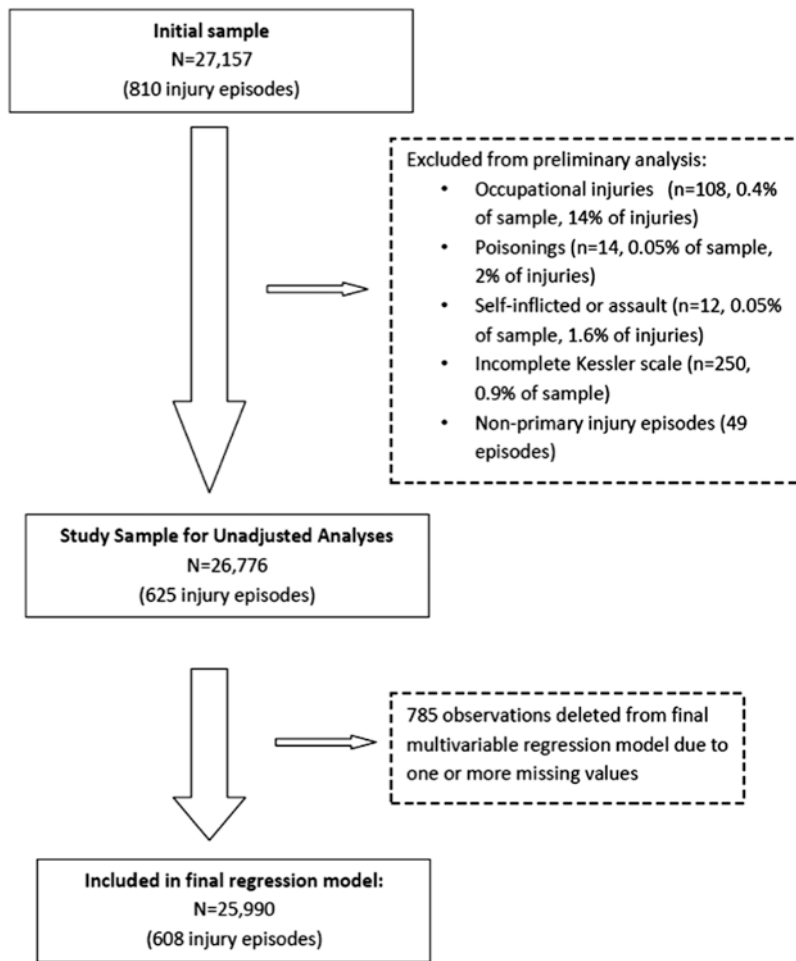
Figure 1.
Study sample flow diagram.

Table 1

Description of Study Population

Study Sample Characteristics	All N=26,776 n (weighted %)	By Psychological Distress Level[a] n (weighted %)			
		No or low N=21,190 (79%)	Moderate N=4,576 (17%)	Severe N=1,010 (4%)	p-value[b]
Sex (missing=0)					
Male	11,803 (44%)	9,685 (46%)	1,748 (38%)	370 (37%)	<0.0001
Female	14,973 (56%)	11,505 (54%)	2,828 (62%)	640 (63%)	
Age (missing=0)					
18-34	7,680 (29%)	6,041 (28%)	1,406 (31%)	233 (24%)	<0.0001
35-49	7,158 (25%)	5,613 (25%)	1,255 (26%)	290 (27%)	
50-64	6,588 (25%)	5,103 (25%)	1,133	352 (36%)	
65-92	5,350 (21%)	4,433 (22%)	(25%)	135 (13%)	
Race (missing=0)					
White non-Hispanic	15,335 (71%)	12,262 (71%)	2,522 (69%)	551 (69%)	<0.0001
Black non-Hispanic	4,443 (13%)	3,345 (12%)	897 (15%)	201 (15%)	
Hispanic	5,100 (12%)	3,982 (12%)	905(13%)	213 (13%)	
Other non-Hispanic	1,898 (5%)	1,601 (5%)	252 (4%)	45 (3%)	
Education (missing=116)					
Less than high school	4,569 (14%)	3,277 (13%)	983 (18%)	309 (27%)	<0.0001
High school grad/GED[c]	7,069 (27%)	5,443 (26%)	1,324 (29%)	302 (32%)	
Some college/vocational	7,932 (31%)	6,211 (30%)	1,430 (32%)	291 (29%)	
College grad or higher	7,090 (29%)	6,170 (31%)	817 (20%)	103 (11%)	
Household income as % of federal poverty level					
<200%	9,294 (31%)	6,520 (27%)	2,148 (43%)	626 (59%)	<0.0001
200% to 400%	6,845 (26%)	5,530 (26%)	1,121 (26%)	194 (20%)	
>400%	7,664 (31%)	6,650 (34%)	897 (22%)	117 (13%)	
Unknown	2,973 (12%)	2,490 (12%)	410 (9%)	73 (8%)	
Employment[d] (missing=54)					

Study Sample Characteristics	All N=26,776 n (weighted %)	By Psychological Distress Level[a] n (weighted %)			p-value[b]
		No or low N=21,190 (79%)	Moderate N=4,576 (17%)	Severe N=1,010 (4%)	
Employed	15,442 (59%)	12,855 (62%)	2,277 (51%)	310 (31%)	<0.0001
Not employed	11,280 (41%)	8,290 (38%)	2,294 (49%)	696 (69%)	
Marital Status (missing=47)					
Married	11,880 (44%)	9,919 (47%)	1,668 (36%)	293(30%)	
Divorced, widowed, or separated	6,934 (26%)	5,169 (25%)	1,368 (30%)	397(39%)	<0.0001
Single or living with partner	7,915 (30%)	6,062 (28%)	1,534 (34%)	319 (31%)	
Alcohol use[e] (missing=487)					
Former/non-drinker	9949 (35%)	7746 (34%)	1754 (37%)	449 (46%)	
Infrequent/light	11,299 (44%)	9069 (44%)	1871 (42%)	359 (35%)	<0.0001
Moderate	3724 (16%)	3053 (16%)	578 (14%)	93 (95%)	
Heavy	1317 (5%)	941 (5%)	291 (7%)	85 (9%)	
Smoking Status (missing=153)					
Never or former	21,538 (80%)	17,632 (83%)	3,295 (71%)	611 (58%)	<0.0001
Current smoker	5,085 (20%)	3,447 (17%)	1,249 (29%)	389 (42%)	
Obesity (missing=927)					
Obese (Body mass index ≥ 30)	7,318 (27%)	5,456 (26%)	1,479 (33%)	383 (37%)	<0.0001
Functional Impairment[f] (missing=63)					
Physical functional impairment	9,036 (35%)	6,189(30%)	2,348 (52%)	499 (50%)	<0.0001
Chronic conditions[g] (missing=39)	12,304 (47%)	9,117 (44%)	2,489 (55%)	698 (69%)	<0.0001
No health insurance coverage (missing=71)	5,040 (17%)	3,760 (15%)	1,017 (21%)	263 (25%)	<0.0001

[a] Psychological distress categories based on Kessler 6-item scale (maximum 24 points): No or low: 0-4 points; Moderate: 5-12 points; Severe: 13 points.

[b] Pearson's chi-square test

[c] General Educational Development test which, when passed, certifies U.S. or Canadian high school-level academic skills

[d] Employment defined as ''working for pay in the previous week.''

[e] Former/non-drinker = <12 drinks in lifetime or 12+ drinks in lifetime but none in past year; Infrequent/light = 12+ drinks in lifetime and 1 drink in past year and 1 drink in past year but 3 drinks per week in past year; moderate = 12+ drinks in lifetime and 4-14 drinks per week (male) OR 4-7 drinks per week (female) in past year; heavy = 12+ drinks in lifetime and >14 drinks per week (male) OR >7 drinks per week (female) in past year on average

[f] Difficulty performing activities without assistance due to a physical health condition.

[g] Ever told by a healthcare provider that you had any one of following: arthritis, hypertension, heart disease, emphysema, diabetes

Table 2

Associations between Study Variables and Unintentional Non-occupational Injury Prevalence

Study Variable	Any Injury[a] N (weighted %)	Unadjusted OR (95% CI)	Adjusted OR[b] (95% CI)
	N=625 (2.5%)		
Psychological Distress Level[c]			
No or low (0-4 points)	415 (2.1%)	1.0	1.0
Moderate (5-12 points)	161 (3.7%)	1.8 (1.5, 2.2)	**1.5 (1.2, 1.8)**
Severe (13 points)	49 (5.3%)	2.6 (1.9, 3.6)	**2.0 (1.4, 2.8)**
Sex			
Male	264 (2.4%)	1.0	1.0
Female	361 (2.6%)	1.1 (0.9, 1.3)	1.0 (0.9, 1.2)
Age			
18-34	143 (1.9%)	1.0	1.0
35-49	134 (2.0%)	1.1 (0.8, 1.4)	0.9 (0.7, 1.2)
50-64	186 (3.1%)	1.6 (1.3, 2.1)	1.0 (0.8, 1.3)
65+	162 (3.3%)	1.7 (1.3, 2.2)	0.8 (0.5, 1.1)
Race			
Hispanic	70 (1.5%)	1.0	1.0
White non-Hispanic	426 (2.8%)	1.9 (1.4, 2.4)	**1.4 (1.0, 1.8)**
Black non-Hispanic	93 (2.1%)	1.4 (1.0, 2.0)	1.1 (0.8, 1.6)
Other non-Hispanic	36 (1.9%)	1.2 (0.8, 1.9)	1.2 (0.7, 1.8)
Education			
Less than high school	92 (2.3%)	1.0	1.0
High school grad/GED[d]	151 (2.3%)	1.0 (0.8, 1.4)	1.1 (0.8, 1.4)
Some college/vocational	205 (2.7%)	1.2 (0.9, 1.6)	**1.3 (1.0, 1.7)**
College grad or higher	174 (2.6%)	1.1 (0.9, 1.5)	**1.4 (1.1, 1.9)**
Household income as % of federal poverty level			
Less than 200%	219 (2.7%)	1.0	[e]
Between 200% and 400%	147 (2.3%)	0.8 (0.7, 1.1)	
Greater than 400%	197 (2.6%)	1.0 (0.8, 1.2)	
Unknown	62 (2.1%)	0.8 (0.5, 1.1)	
Employment[f]			
Employed currently	287 (2.0%)	1.0	1.0
Not employed	338 (3.3%)	1.6 (1.4, 2.0)	**1.4 (1.1, 1.7)**
Marital Status			
Married	226 (2.0%)	1.0	1.0
Divorced/widowed/separated	227 (3.6%)	1.8 (1.5, 2.2)	**1.6 (1.3, 2.0)**
Single or living with partner	172 (2.4%)	1.2 (1.0, 1.5)	**1.4 (1.1, 1.7)**
Alcohol Use[g]			

Study Variable	Any Injury[a] N (weighted %)	Unadjusted OR (95% CI)	Adjusted OR[b] (95% CI)
	N=625 (2.5%)		
Former/non-drinker	205 (2.3%)	1.0	1.0
Infrequent/light	259 (2.4%)	1.0 (0.9, 1.3)	**1.2 (1.0, 1.5)**
Moderate	108 (3.1%)	1.4 (1.1, 1.7)	**1.7 (1.3, 2.2)**
Heavy	39 (3.0%)	1.3 (0.9, 1.8)	**1.4 (1.0, 2.0)**
Smoking Status			
Never or former	488 (2.5%)	1.0	See table 2A
Current smoker	133 (2.7%)	1.1 (0.9, 1.4)	
Obesity			
Non-obese	412 (2.4%)	1.0	*e*
Obese (Body mass index 30)	193 (2.9%)	1.2 (1.0, 1.4)	
Physical Functional Limitation[h]			
None	273 (1.7%)	1.0	1.0
Any	351 (4.0%)	2.4 (2.1, 2.8)	**1.9 (1.5, 2.3)**
Chronic conditions[i]			
None	388 (1.7%)	1.0	1.0
Any	236 (3.5%)	2.1 (1.8, 2.5)	**1.5 (1.2, 1.8)**
Health insurance			
No coverage	78 (1.7%)	1.0	1.0
Any coverage	546 (2.7%)	1.6 (1.2, 2.1)	**1.4 (1.0, 1.9)**

[a]3-month prevalence, excluding occupational injuries, poisonings, and intentional injuries

[b]Model adjusted for psychological distress, sex, age, race, education level, employment status, marital status, alcohol use, physical functional limitation, chronic conditions, and health insurance coverage. Analyses accounted for sampling weights. Hosmer-Lemeshow Goodness-of-Fit test: p=0.61.

[c]Psychological distress categories based on Kessler 6-item scale (maximum 24 points): No or low: 0-4 points; Moderate: 5-12 points; Severe: 13 points.

[d]General Educational Development test which, when passed, certifies U.S. or Canadian high school-level academic skills

[e]Variable not included in final multivariable model

[f]Employment defined as "working for pay in the previous week."

[g]Former/non-drinker = <12 drinks in lifetime or 12+ drinks in lifetime but none in past year; Infrequent/light = 12+ drinks in lifetime and 1 drink in past year but 3 drinks per week in past year; moderate = 12+ drinks in lifetime and 4-14 drinks per week (male) OR 4-7 drinks per week (female) in past year; heavy = 12+ drinks in lifetime and >14 drinks per week (male) OR >7 drinks per week (female) in past year on average

[h]Difficulty performing activities without assistance due to a physical health condition.

[i]Ever told by a healthcare provider that you had any one of following: arthritis, hypertension, heart disease, emphysema, diabetes

Table 2A

Adjusted Odds Ratios for Injury by Smoking Status and Psychological Distress Accounting for Smoking by Psychological Distress Interaction

Smoking status	Psychological Distress[a]	Events[b]	Subjects	Adjusted OR[c] (95% CI)
		N (unweighted)		
Never or former	No or low	328	17,223	1.0 (ref)
	Moderate	117	3,231	1.6 (1.3, 2.1)
	Severe	32	591	2.5 (1.7, 3.8)
Current	No or low	80	3,354	1.2 (0.9, 1.6)
	Moderate	37	1,213	1.2 (0.8, 1.7)
	Severe	14	378	1.5 (0.8, 2.6)

[a]Psychological distress categories based on Kessler 6-item scale (maximum 24 points): No or low: 0-4 points; Moderate: 5-12 points; Severe: 13 points.

[b]Injury in three months prior to survey, excluding occupational injuries, poisonings, and intentional injuries

[c]Model adjusted for smoking, psychological distress, sex, age, race, education level, employment status, marital status, alcohol use, physical functional limitation, health insurance coverage, chronic conditions, and smoking*psychological distress interaction. (p=0.02 for interaction term) Analyses use weighted data.

Table 3

Association between Psychological Distress and Major Injury Causes and Types

	N (weighted %)	Unadjusted OR (95% C.I.) Moderate to severe distress[a] (vs. no or low)	Adjusted[b] OR (95% C.I.) Moderate to severe distress (vs. no or low)
Most Common Injury Causes			
Falls	267 (43%)	1.8 (1.4-2.4)	**1.4 (1.1-1.9)**
Overuse/strenuous movements	81 (15%)	2.0 (1.3-3.3)	**1.7 (1.1-2.9)**
Transportation	83 (12%)	1.6 (1.0-2.8)	1.2 (0.7-1.9)
Most Common Injury Types			
Sprains/strains/twists	190 (31%)	2.4 (1.8-3.3)	**2.0 (1.4-2.8)**
Fractures/broken bones	163 (23%)	1.5 (1.1-2.1)	1.2 (0.9-1.8)

[a]Psychological distress categories based on Kessler 6-item scale (maximum 24 points): No or low: 0-4 points; Moderate to severe: 5-24 points

[b]Model adjusted for sex, age, race, education level, employment status, marital status, alcohol use, physical functional limitation, chronic conditions, and health insurance coverage. Analyses use weighted data.