

## Original Article

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# The epidemiology of non-suicidal self-injury: lifetime prevalence, sociodemographic and clinical correlates, and treatment use in a nationally representative sample of adults in England

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## Abstract

**Background.** Although the clinical importance of non-suicidal self-injury (NSSI) has received increasing recognition, relatively little is known about its epidemiology. The objective of this study was to estimate the lifetime prevalence of NSSI in adults and its association with socio-demographic characteristics, psychiatric disorders, and lifetime treatment for NSSI.

**Methods.** A nationally representative face-to-face survey was conducted with 7192 adults aged  $\geq 18$  years in England. Respondents were interviewed about engagement in NSSI, psychiatric illness, suicidal thoughts and behavior, and treatment history for this behavior.

**Results.** The estimated lifetime prevalence rate of NSSI was 4.86%. Younger age, growing up without biological parents in the household, being unmarried, and impoverished backgrounds were associated with NSSI. The majority of respondents with lifetime NSSI (63.82%) had at least one current psychiatric disorder. Most psychiatric conditions were associated with greater odds of lifetime NSSI in multivariate models. NSSI was strongly associated with suicidal ideation and suicide attempts, respectively, even after accounting for psychiatric disorders and sociodemographic covariates. A substantial proportion of respondents with NSSI history (30.92%) have engaged in medically severe self-harm, as indexed by requiring medical attention for this behavior. The majority of respondents with NSSI (56.20%) had not received psychiatric care for this behavior.

**Conclusions.** NSSI is prevalent in the general population and associated with considerable psychiatric comorbidity. A high rate of unmet treatment needs is evident among those with this behavior. Those at the greatest lifetime risk for NSSI may also be particularly limited in their resources to cope with this behavior.

## Introduction

Non-suicidal self-injury (NSSI) has received increasing recognition in recent years as a clinically significant phenomenon, conceptually distinct from suicidal behavior. Indeed, these two clinical phenomena appear to differ notably in their neurobiology, response to treatment, and long-term trajectory (Brent, 2011; Mars et al., 2014). Furthermore, there is emerging evidence that NSSI is an even stronger predictor of prospective suicide attempts than is a past history of attempts (Ribeiro et al., 2016). Reflecting this growing appreciation of the empirical and clinical importance of NSSI, it was recently included in *DSM-5* as a disorder warranting further consideration (American Psychiatric Association, 2013).

To advance the current understanding of NSSI, basic epidemiological data on its prevalence, sociodemographic and diagnostic correlates, and its associations with treatment use are needed. Although several prior studies have examined the prevalence of this behavior in specific demographic or regional subpopulations (Taliaferro, Muehlenkamp, Borowsky, McMorris, & Kugler, 2012; Whitlock, Eckenrode, & Silverman, 2006), nationally representative studies are necessary to arrive at generalizable estimates of its prevalence. To date, there have been relatively few population-based studies that have assessed this behavior in adults (e.g. Briere & Gil, 1998; Keel, Jean Forney, Buchman-Schmitt, Kennedy, & Joiner, 2018; Klonsky, 2011). Nationally representative studies are even rarer; these include studies of German adults (Plener et al., 2016), Danish young adults (Christoffersen, Møhl, DePanfilis, & Vammen, 2015), and Belgian college students (Kiekens et al., 2018). Lifetime prevalence rates for NSSI ranged from 2.7% among Danish young adults (Christoffersen et al., 2015) to 5.9% among American adults (Klonsky, 2011).

Although these studies are important for characterizing the prevalence and functions of NSSI, several essential questions about its epidemiology remain unaddressed. In particular, there remains a need for large-scale, epidemiological studies that permit fine-grained analyses for determining associations between NSSI with clinical phenomena occurring at relatively low

base rates in the general population, such as certain psychiatric disorders (Klonsky, 2011). One nationally representative study has been conducted in this area, albeit with the sample limited to college students (Kiekens et al., 2018). Additionally, accurate epidemiological estimates of medical and mental health service utilization for NSSI are particularly needed for their potential to inform mental health policy. Indeed, to date, no epidemiological studies have been conducted to characterize patterns of treatment use specifically for NSSI.

The current study is uniquely able to address these needs by employing a substantially larger sample ( $n = 7403$ ) than in prior epidemiological studies in this area (i.e. the largest sample from epidemiological studies of adults to date featured 4718 participants; Christoffersen et al., 2015). It provides data on the lifetime prevalence of NSSI and its treatment in a nationally representative sample of adults residing in England, drawn from the Adult Psychiatric Morbidity Survey (APMS) 2007 (McManus, Meltzer, Brugha, & Bebbington, 2009). It is also the first epidemiological study to present (i) fine-grained data on sociodemographic and psychiatric correlates of NSSI, (ii) evaluations of NSSI in relation to suicidal ideation and suicide attempts, and (iii) correlates of medical and psychiatric treatment use specifically for NSSI.

## Method

### Sample

The APMS 2007 was conducted with 7403 (unweighted) respondents aged 16 and older, using a multi-stage stratified probability sampling design. This sampling strategy was designed to yield a sample representative of the population of England residing in private households. Complete details regarding the sampling strategy and design, as well as weighting procedures, have been previously reported (McManus et al., 2009). Given the focus of the current study on NSSI in adults, only respondents aged  $\geq 18$  years and answered queries regarding NSSI were included in analyses (unweighted  $n = 7192$ ).

Respondent data were collected using a combination of face-to-face computer-assisted personal interviews (CAPIs) and computer-assisted self-completion interviews (CASIs). The CASI was used to supplement the CAPI in inquiring about personally sensitive experiences (e.g. NSSI and psychiatric illness). Respondents were informed beforehand that the interviewers would be blind to their responses on the CASI. The decision to adopt the CASI was based on prior findings that face-to-face inquiry of personally sensitive information can often lead to underreporting due to feelings of embarrassment and social desirability response biases (Tourangeau, Rips, & Rasinski, 2000; Tourangeau & Yan, 2007). Such computerized assessment techniques that ensure privacy in responding have been found to be effective in improving accuracy and result in greater reporting of personally sensitive information (Turner et al., 1998), as in the case of self-injurious behaviors (Evans, Hawton, Rodham, & Deeks, 2005; Nock et al., 2008; Safer, 1997).

## Measures

### Sociodemographic characteristics

The following eight sociodemographic characteristics were assessed: sex, race/ethnicity (White or racial/ethnic minority),<sup>†1</sup>

age (stratified into four groups: 18–29, 30–39, 40–49, and  $\geq 50$ ), highest educational qualification (Bachelor's degree; teaching, Higher National Diploma, or nursing; A Level; general certificate or secondary education; others; or none), number of biological parents who lived with the respondent throughout childhood (none, 1, or 2), marital status (married or cohabiting; widowed, separated, or divorced; or never married), gross annual household income, before tax and National Insurance deductions (stratified by quintiles:  $\leq \pounds 10\,574$ ;  $\pounds 10\,575$ – $\pounds 16\,194$ ;  $\pounds 16\,195$ – $\pounds 24\,699$ ;  $\pounds 24\,700$ – $\pounds 40\,383$ ; and  $\geq \pounds 40\,384$ ), and the Overall Index of Multiple Deprivation (stratified by quintiles). Annual household income was adjusted using McClements equivalence weights (McManus et al., 2009) to account for the number, age, and the relationships of adults and children living in the household. The Overall Index of Multiple Deprivation 2004 (Noble et al., 2004) is a composite index of local poverty widely used in England. Individual-level data in seven domains (i.e. living environment, barriers to housing and services, education, skills and training, income, health deprivation and disability, and crime and disorder) were aggregated for small areas of  $\sim 1500$  residents. Respondents' deprivation scores were determined by linking their household postcode address with the corresponding Super Output Area of residence (geographical regions developed after the 2001 UK census). Quintile groupings were based on the Index of Multiple Deprivation 2004 scores across all the Super Output Areas in England.

### Current psychiatric disorders

ICD-10 depression and anxiety disorders were ascertained using the Revised Clinical Interview Schedule (CIS-R; Lewis, Pelosi, Araya, and Dunn, 1992), a structured diagnostic interview, administered by trained lay interviewers (McManus et al., 2009). Disorders assessed with the CIS-R include the following: depression, generalized anxiety disorder (GAD), social phobia, specific phobia, panic disorder, agoraphobia, and obsessive-compulsive disorder (OCD). The CIS-R has previously been found to be reliable in direct comparisons between lay interviewers and psychiatrists (Lewis et al., 1992). Probable attention-deficit/hyperactivity disorder (ADHD) was evaluated using the Adult ADHD Self-Report scale (World Health Organization, 2003), with scores  $\geq 4$  indicating the probable presence of ADHD (Faraone & Biederman, 2005). This measure has been shown to have good sensitivity and specificity (McManus et al., 2009). For assessing probable post-traumatic stress disorder (PTSD), respondents were first queried about traumatic life events they had experienced since age 16. Those who had experienced a traumatic event were then asked to complete the Trauma Screening Questionnaire (TSQ; Brewin et al. 2002; Foa, Riggs, Dancu, & Rothbaum, 1993), with scores  $\geq 6$  indicating probable PTSD. The TSQ has been identified by the National Institute for Health and Clinical Excellence (NICE) as one of two screening measures with the greatest potential utility in primary care settings (National Institute for Health and Clinical Excellence, 2006), and was chosen specifically for use in the APMS because it has been previously employed in a large population-based study (Galea et al., 2007), and it has been well validated with different samples and different types of traumatic events (McManus et al., 2009). The TSQ has demonstrated high sensitivity and specificity (Brewin, 2005) when compared to the Clinician-administered PTSD Scale (Blake et al., 1995). The presence of probable eating disorders was evaluated with the SCOFF screening schedule (Morgan, Reid, & Lacey, 1999), with scores  $\geq 6$  indicating

<sup>†</sup>The notes appear after the main text.

probable eating disorders. This measure has exhibited good sensitivity and specificity when compared to clinical diagnoses (McManus et al., 2009). According to NICE guidelines, the SCOFF is the preferred screening measure for identifying probable eating disorder cases in community samples (National Collaborating Centre for Mental Health, 2004).

The presence of alcohol dependence was measured using a two-stage process, with respondents first completing the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, and Grant, 1993). Those scoring  $\geq 10$  were then interviewed with the community version of the Severity of Alcohol Dependence Questionnaire (SADQ-C; Stockwell, Sitharthan, McGrath, and Lang, 1994) with scores  $\geq 4$  indicating probable alcohol dependence. The Diagnostic Interview Schedule (Robins, Helzer, Croughan, & Ratcliff, 1981) was used to assess the presence of drug dependence in respondents who reported past-year use of eight drug types.

#### *Lifetime NSSI and treatment*

Lifetime occurrence of NSSI was first assessed in the CAPI with the question: 'Have you ever deliberately harmed yourself in any way but not with the intention of killing yourself?' Respondents with a positive history of NSSI on the CAPI were asked follow-up questions about NSSI methods (i.e. cutting, burning, swallowing hazardous objects, and other methods), as well as medical treatment (i.e. for physical injury from NSSI) and mental health treatment, respectively, specifically for NSSI. The query about lifetime occurrence of NSSI was repeated later in the interview with the CASI, this section first prefaced with a note that some questions from earlier in the interview would be repeated. An endorsement of lifetime occurrence of NSSI on either the CAPI or CASI was coded as a positive lifetime history of NSSI.

#### *Lifetime suicidal ideation and behavior*

As with NSSI, lifetime suicidal ideation ('Have you ever wished that you were dead?' and 'Have you ever thought of taking your life, even if you would not really do it?') and suicide attempts ('Have you ever made an attempt to take your life, by taking an overdose of tablets or in some other way?') were initially assessed with the CAPI. Queries about the lifetime occurrence of active suicidal ideation and suicide attempts were repeated subsequently in the interview with the CASI. Endorsement of relevant items on either the CAPI or CASI was coded as a positive history of suicidal ideation and suicide attempts, respectively.

#### *Statistical analyses*

Cross-tabulations were calculated to estimate the lifetime prevalence of NSSI, and medical and psychiatric treatment for NSSI for each relevant sociodemographic and psychiatric correlate. Similarly, cross-tabulations were used to produce lifetime prevalence estimates of suicidal ideation and suicide attempts, respectively, among respondents with lifetime NSSI. Frequency counts for NSSI methods were based on the subset of participants who endorsed a lifetime history of NSSI on the CAPI.

Bivariate logistic regression analyses with NSSI as the criterion variable were conducted to determine its associations with sociodemographic correlate and psychiatric disorders. For psychiatric disorders, a multivariate logistic regression analysis was also conducted with all disorders included in the model and adjusting for all eight sociodemographic factors examined at the bivariate level.

Bivariate and multivariate logistic regression analyses were conducted with suicidal ideation and suicide attempts,

respectively, as the criterion variable and NSSI as the predictor of interest. In multivariate analyses, all sociodemographic factors<sup>2</sup> and psychiatric disorders were included as covariates, as well as suicidal ideation in the case of suicide attempts as the outcome variable. For analyses with suicidal ideation as the criterion variable, respondents were excluded if they had a lifetime history of suicide attempts, so as to yield analyses of 'pure' suicidal ideation (i.e. cleanly evaluating the strength of the association between NSSI and suicidal ideation unconfounded by its association with suicide attempts; Klonsky & May, 2014; Liu, Case, & Spirito, 2014; Walsh, Sheehan, & Liu, 2021).

Analyses for lifetime medical treatment and mental health treatment for NSSI as criterion variables were conducted with the subset of participants who endorsed a lifetime history of NSSI on the CAPI. For these NSSI treatment utilization analyses, sex, age,<sup>3</sup> and the number of psychiatric disorders were evaluated separately and simultaneously as predictors in bivariate and multivariate logistic regression models, respectively.

For all regression analyses, results were presented as odds ratios (ORs) with 95% confidence intervals (CIs). All analyses were conducted in SPSS 23.0, using weighting procedures to accommodate the complex sampling frame of the survey and to generate nationally representative estimates.

## **Results**

### *NSSI prevalence and characteristics*

The lifetime prevalence of NSSI was 4.86% (s.e. = 0.28%; unweighted  $n = 325$ ). The most frequent method specifically endorsed was cutting (60.13%, s.e. = 3.92%), followed by burning (13.11%, s.e. = 2.81%) and swallowing hazardous objects (11.19%, s.e. = 2.30%). Other methods of NSSI were endorsed by 28.82% (s.e. = 3.40%) of respondents with lifetime NSSI.

### *Sociodemographic correlates*

Sociodemographic composition by NSSI history is presented in Table 1. No differences in sex, race/ethnicity, or educational attainment were observed for lifetime NSSI (Table 2). Compared to the oldest age group (50 years and older), there was a pattern of increasing lifetime OR values of NSSI with younger age groups (ORs = 4.45–8.47), this difference in OR values being most pronounced for those aged 18–29 years (OR = 8.47, 95% CI = 5.74–12.50). OR values of NSSI were significantly greater for respondents who lived with one or no biological parents throughout childhood (ORs = 2.17–2.43). Respondents who never married were also at greater risk for NSSI when compared to currently married or cohabiting respondents (OR = 2.60, 95% CI = 1.97–3.43). Respondents at the bottom quintile for household income had the greatest OR values of NSSI when compared to those in the top quintile (OR = 2.96, 95% CI = 1.96–4.46). Similarly, those in the bottom quintile for overall Index of Multiple Deprivation had greater odds of lifetime NSSI when compared to those in the top quintile (OR = 2.04, 95% CI = 1.37–3.03).

### *Psychiatric correlates*

Among respondents with a lifetime history of NSSI, the majority (63.82%, s.e. = 3.24%) had at least one psychiatric disorder at the time of assessment. The prevalence of NSSI for each psychiatric

**Table 1.** Sociodemographic characteristics by the lifetime history of NSSI (unweighted  $n = 7192$ )

Sociodemographic characteristics	Lifetime history of NSSI, % (S.E.)	No lifetime history of NSSI, % (S.E.)
<i>Sex</i>		
Female	52.92 (3.38)	51.51 (0.69)
Male	47.08 (3.38)	48.49 (0.69)
<i>Race/ethnicity</i>		
Racial/ethnic minority	7.17 (1.79)	9.57 (0.60)
White	92.83 (1.79)	90.43 (0.60)
<i>Age (y)</i>		
18–29	41.56 (3.34)	17.90 (0.63)
30–39	23.37 (2.74)	18.72 (0.52)
40–49	22.83 (2.50)	18.74 (0.52)
≥50	12.24 (1.85)	44.65 (0.69)
<i>Education</i>		
Bachelor's degree	21.27 (2.56)	21.33 (0.61)
Teaching, Higher National Diploma, or nursing	7.05 (1.60)	7.65 (0.33)
A level	17.44 (2.47)	15.39 (0.51)
General certificate or secondary education	28.35 (2.67)	25.63 (0.61)
Other qualifications	3.12 (1.01)	3.50 (0.24)
No qualifications	22.77 (2.29)	26.49 (0.62)
<i>Lived with biological parents throughout childhood</i>		
None	5.12 (1.33)	2.93 (0.22)
One	28.49 (2.76)	14.58 (0.51)
Both	66.39 (2.88)	82.49 (0.54)
<i>Marital status</i>		
Never married	37.63 (3.17)	18.99 (0.63)
Widowed, separated, or divorced	12.05 (1.59)	15.05 (0.39)
Married or cohabiting	50.32 (3.09)	65.96 (0.64)
<i>Household income<sup>a</sup></i>		
Top quintile (≥£40 384)	14.27 (2.28)	22.92 (0.73)
Second quintile (£24 700–40 383)	18.19 (2.75)	21.04 (0.57)
Third quintile (£16 195–24 699)	19.61 (2.75)	20.32 (0.57)
Fourth quintile (£10 575–16 194)	14.82 (2.14)	17.75 (0.57)
Bottom quintile (≤£10 574)	33.11 (3.08)	17.97 (0.67)
<i>Overall Index of Multiple Deprivation</i>		
Top quintile	15.47 (2.43)	19.28 (1.00)
Second quintile	13.85 (2.29)	22.70 (1.00)
Third quintile	19.05 (2.66)	20.12 (0.90)
Fourth quintile	20.40 (2.76)	18.81 (0.86)
Bottom quintile	31.22 (3.15)	19.09 (0.98)

<sup>a</sup>Family income was weighted using McClements equivalence scores.

disorder is displayed in Table 3, with 13.84% (S.E. = 0.96%) of respondents with at least one psychiatric disorder endorsing a history of NSSI. For individual psychiatric disorders, prevalence rates of NSSI ranged from 12.97% (S.E. = 3.77%) in the case of respondents with panic disorder to 34.95% (S.E. = 5.77%) in the case of those with agoraphobia.

Also presented in Table 3 is the association between psychiatric disorders and NSSI, with bivariate ORs, as well as multivariate ORs adjusting for all eight sociodemographic characteristics previously examined at the bivariate level. At the bivariate level, having any psychiatric condition was associated with greater odds of NSSI (OR = 6.94, 95% CI = 5.23–9.20), with the odds of NSSI increasing with a number of disorders (OR = 2.09, 95% CI = 1.91–2.29). When examined individually in bivariate analyses, all 12 psychiatric disorders were also significantly associated with greater odds of NSSI. After adjustments were made for psychiatric comorbidity and sociodemographic variables, the ORs were uniformly reduced for all psychiatric disorders, but remained significant, with the exceptions being OCD and most anxiety disorders. Among the psychiatric disorders that retained significant associations with NSSI in the multivariate model, ORs ranged from 1.94 in the case of GAD to 3.63 in the case of drug dependence.

#### Associations with suicidal ideation and behavior

The majority of respondents with the lifetime history of NSSI had also experienced suicidal ideation at some point in their lifetime (82.09%, S.E. = 2.54%). Just under half (49.29%, S.E. = 3.34%) of respondents who had engaged in NSSI in their lifetime also had a suicide attempt history. In bivariate analyses, NSSI was significantly associated with 'pure' suicidal ideation (OR = 13.00, 95% CI = 8.61–19.64) and suicide attempts (OR = 25.33, 95% CI = 19.05–33.67). In multivariate analyses, effect sizes were reduced but remained large for NSSI in relation to these outcomes (OR<sub>pure suicidal ideation</sub> = 8.71, 95% CI = 5.33–14.24; OR<sub>suicide attempts</sub> = 6.32, 95% CI = 4.29–9.29).

#### Medical and mental health treatment for NSSI

Regarding treatment use specifically for NSSI, 30.92% (S.E. = 3.55%) of respondents with lifetime NSSI had received medical attention and 43.80% (S.E. = 3.90%) had received mental health services for this behavior.<sup>4</sup> As detailed in Table 4, when sex, age, and the number of psychiatric disorders were evaluated at the bivariate level as predictors of lifetime medical treatment for NSSI among respondents with a history of this behavior, no significant associations were observed. Therefore, a multivariate analysis predicting medical treatment used for NSSI was not conducted. In the case of psychiatric care for NSSI among respondents who have engaged in this behavior, both female sex and number of psychiatric disorders were associated with greater odds of psychiatric treatment in bivariate analyses. When considered together with age in a multivariate model, both predictors remained significantly associated with psychiatric care (OR<sub>female sex</sub> = 1.82, 95% CI = 1.07–3.09; OR<sub>number of psychiatric disorders</sub> = 1.15, 95% CI = 1.03–1.29).

#### Discussion

In addition to providing a nationally representative estimate of the lifetime prevalence of NSSI, the current study presented the first



**Table 2.** Sociodemographic correlates of non-suicidal self-injury (unweighted  $n = 7192$ )

Sociodemographic characteristics	Lifetime NSSI		
	% (S.E.) <sup>a</sup>	Odds ratio (95% CI)	$p$
<i>Sex</i>			
Female	4.99 (0.41)	1.06 (0.80–1.39)	0.69
Male	4.73 (0.44)	1.00	
<i>Race/ethnicity</i>			
Racial/ethnic minority	3.68 (0.94)	0.73 (0.43–1.23)	0.24
White	4.98 (0.29)	1.00	
<i>Age (y)</i>			
18–29	10.60 (1.07)	8.47 (5.74–12.50)	<0.001
30–39	6.00 (0.75)	4.56 (3.04–6.84)	<0.001
40–49	5.86 (0.66)	4.45 (3.05–6.48)	<0.001
≥50	1.38 (0.21)	1.00	
<i>Education</i>			
Bachelor's degree	4.84 (0.64)	1.00	
Teaching, Higher National Diploma, or nursing	4.48 (1.04)	0.92 (0.54–1.59)	0.77
A level	5.46 (0.82)	1.14 (0.73–1.76)	0.56
General certificate or secondary education	5.34 (0.60)	1.11 (0.77–1.59)	0.57
Other qualifications	4.34 (1.38)	0.89 (0.43–1.85)	0.76
No qualifications	4.20 (0.46)	0.86 (0.61–1.22)	0.40
<i>Lived with biological parents throughout childhood</i>			
None	8.21 (2.11)	2.17 (1.24–3.81)	<0.01
One	9.09 (1.05)	2.43 (1.83–3.22)	<0.001
Both	3.96 (0.26)	1.00	
<i>Marital status</i>			
Never married	9.19 (0.93)	2.60 (1.97–3.43)	<0.001
Widowed, separated, or divorced	3.93 (0.51)	1.05 (0.76–1.45)	0.77
Married or cohabiting	3.75 (0.31)	1.00	
<i>Household income<sup>b</sup></i>			
Top quintile (≥£40 384)	3.12 (0.52)	1.00	
Second quintile (£24 700–40 383)	4.28 (0.67)	1.39 (0.85–2.26)	0.19
Third quintile (£16 195–24 699)	4.76 (0.73)	1.55 (1.00–2.40)	<0.05
Fourth quintile (£10 575–16 194)	4.14 (0.64)	1.34 (0.85–2.12)	0.21
Bottom quintile (≤£10 574)	8.70 (0.94)	2.96 (1.96–4.46)	<0.001
<i>Overall Index of Multiple Deprivation</i>			
Top quintile	3.94 (0.61)	1.00	
Second quintile	3.02 (0.47)	0.76 (0.46–1.25)	0.28
Third quintile	4.61 (0.66)	1.18 (0.78–1.79)	0.44

(Continued)

**Table 2.** (Continued.)

Sociodemographic characteristics	Lifetime NSSI		
	% (S.E.) <sup>a</sup>	Odds ratio (95% CI)	$p$
Fourth quintile	5.25 (0.73)	1.35 (0.88–2.08)	0.17
Bottom quintile	7.71 (0.83)	2.04 (1.37–3.03)	<0.001

<sup>a</sup>Weighted prevalence of non-suicidal self-injury is presented for each sociodemographic characteristic.<sup>b</sup>Family income was weighted using McClements equivalence scores.

epidemiological assessment to date of this behavior in relation to sociodemographic and clinical characteristics, as well as mental health treatment utilization for NSSI, and it thus offers the most comprehensive epidemiological assessment of this behavior. The lifetime prevalence rate of NSSI was 4.86%, which is generally consistent with that reported in earlier studies with non-clinical adult samples (5.5%; Swannell, Martin, Page, Hasking, & St John, 2014) as was the finding that cutting was the most common form of this behavior (Klonsky, 2011). Furthermore, that NSSI occurred at a rate in the current study that falls within the range of prior epidemiological work with adults from different countries (2.7% among Danish young adults to 5.9% among American adults; Christoffersen et al., 2015; Klonsky, 2011), is preliminarily suggestive of the possibility that at least in its prevalence, NSSI may generalize across national populations. Given the few nationally representative studies conducted to date, however, more such studies are required before firm conclusions can be drawn regarding consistency in cross-national prevalence.

Among sociodemographic characteristics, younger age, in particular, was associated with elevated odds of NSSI. Interestingly, however, the lifetime prevalence of this behavior appeared to decrease with age, a finding also reported in two prior population-based studies of NSSI (Briere & Gil, 1998; Klonsky, 2011). This counterintuitive trend may be explained in part by the potential increase in NSSI among younger age groups, especially adolescents (Jacobson & Gould, 2007; Rodham & Hawton, 2009). This trend may also be partly accounted for by underreporting in older adults, due to either a greater sense of stigma or forgetting NSSI that may have occurred much earlier in life (Griffiths, Christensen, & Jorm, 2008). In support of this latter possibility, rates of mental illness based on prospectively collected data have been found to be considerably higher than in retrospective data with the same individuals (Moffitt et al., 2010; Wells & Horwood, 2004). Higher odds of NSSI was also noted among respondents who did not grow up with both parents in the household, and among those from socioeconomically impoverished households and neighborhoods, as indexed by household income and Overall Index of Multiple Deprivation. This pattern is important insofar as it indicates that those at greater risk for NSSI may also be exposed to chronically lower social support during childhood and greater socioeconomic adversity during adulthood. That is, such individuals may be at elevated risk from chronic exposure to stress in their environments, but may also be particularly limited in their resources for coping with this stress. This pattern suggests the need for greater investment of efforts to reduce potential unmet treatment needs and underlying barriers, particularly in the case of young adults, a population in which higher rates of NSSI indicate a greater need for care but

**Table 3.** Associations between psychiatric disorders and non-suicidal self-injury (unweighted  $n = 7192$ ).

	% (s.e.) <sup>a</sup>	Bivariate analyses		Multivariate analysis <sup>b</sup>	
		Odds ratio (95% CI)	$p$	Odds ratio (95% CI)	$p$
<i>Psychiatric disorder</i>					
Any psychiatric disorder	13.84 (0.96)	6.94 (5.23–9.20)	<0.001	–	–
Number of psychiatric disorders	–	2.09 (1.91–2.29)	<0.001	–	–
Depression	26.83 (3.18)	8.41 (5.87–12.04)	<0.001	2.00 (1.05–3.81)	0.03
<i>Anxiety disorders</i>					
Generalized anxiety disorder	20.86 (2.41)	6.14 (4.46–8.46)	<0.001	1.94 (1.22–3.10)	<0.01
Social phobia	32.64 (5.67)	10.10 (6.00–17.00)	<0.001	0.68 (0.26–1.74)	0.42
Specific phobia	23.40 (5.75)	6.19 (3.24–11.84)	<0.001	0.55 (0.17–1.84)	0.33
Panic disorder	12.97 (3.77)	2.98 (1.51–5.86)	<0.01	0.75 (0.29–1.93)	0.54
Agoraphobia	34.95 (5.77)	11.37 (6.68–19.37)	<0.001	2.52 (0.97–6.55)	0.06
Post-traumatic stress disorder	25.78 (3.68)	7.84 (5.14–11.95)	<0.001	2.34 (1.33–4.11)	<0.01
Obsessive compulsive disorder	29.28 (5.94)	8.58 (4.72–15.60)	<0.001	1.61 (0.68–3.81)	0.28
Eating disorders	19.97 (2.17)	6.21 (4.55–8.48)	<0.001	3.00 (2.02–4.45)	<0.001
Attention-deficit/hyperactivity disorder	17.93 (1.74)	5.59 (4.22–7.39)	<0.001	2.66 (1.77–4.00)	<0.001
<i>Substance use disorders</i>					
Alcohol dependence	17.91 (2.12)	5.15 (3.73–7.13)	<0.001	2.66 (1.71–4.14)	<0.001
Drug dependence	23.82 (3.28)	7.10 (4.84–10.43)	<0.001	3.63 (2.16–6.09)	<0.001

<sup>a</sup>Weighted prevalence of non-suicidal self-injury is presented for each psychiatric disorder.

<sup>b</sup>Adjusted for sex, race/ethnicity, age, education, number of parents in household throughout childhood, marital status, family income, and Overall Index of Multiple Deprivation.

**Table 4.** Lifetime medical and psychiatric treatment for non-suicidal self-injury among respondents with a history of this behavior (unweighted  $n = 216$ )

Treatment type	% (s.e.) <sup>a</sup>	Bivariate analyses		Multivariate analysis	
		Odds ratio (95% CI)	$p$	Odds ratio (95% CI)	$p$
<i>Medical treatment for non-suicidal self-injury</i>					
Sex					
Female	30.01 (4.43)	0.92 (0.58–1.45)	0.71	–	–
Male	31.83 (5.39)	1.00	–	–	–
Age	–	0.99 (0.96–1.02)	0.50	–	–
Number of Psychiatric Disorders	–	1.07 (0.94–1.22)	0.32	–	–
<i>Psychiatric treatment for non-suicidal self-injury</i>					
Sex					
Female	50.70 (5.40)	1.76 (1.07–2.91)	0.03	1.82 (1.07–3.09)	0.03
Male	36.82 (5.59)	1.00	–	1.00	–
Age	–	0.98 (0.96–1.00)	0.07	0.98 (0.96–1.00)	0.07
Number of psychiatric disorders	–	1.16 (1.03–1.29)	0.01	1.15 (1.03–1.29)	0.01

<sup>a</sup>Weighted prevalence of treatment for non-suicidal self-injury among individuals who have engaged in this behavior is presented for each sex.

which may also be challenged by fewer financial resources in accumulated wealth than older adults to receive treatment.

Also worth mentioning is the *absence* of a significant sex difference in the lifetime prevalence of NSSI. Although this behavior has traditionally been viewed as more characteristic of females (Bresin & Schoenleber, 2015; Swannell et al., 2014) and recent

meta-analyses have found sex differences to exist in the prevalence of NSSI (Bresin & Schoenleber, 2015), including as a prospective predictor of this outcome (Fox et al., 2015), the current findings are consistent with those of previous population-based studies of NSSI (Briere & Gil, 1998; Klonsky, 2011). Several considerations may be relevant here for interpreting these findings in the

context of the broader literature. First, the perception that sex differences exist in NSSI may be in part a product of a confound, with commonly comorbid psychopathology also being more common among females (Swannell et al., 2014). Specifically, early studies on this topic often focused on clinical samples, in which a greater representation may be expected of certain disorders closely associated with NSSI (e.g. borderline personality disorder) and themselves more prevalent among females. If this is the case, one should be more likely to observe sex differences in clinical samples than in large community ones. This is precisely what was found in the recent meta-analysis of sex differences in NSSI prevalence (Bresin & Schoenleber, 2015). Furthermore, in a meta-analysis of the prevalence of NSSI (Swannell et al., 2014), no sex differences were observed after accounting for methodological considerations.

Second, it has been hypothesized (Bresin & Schoenleber, 2015) that greater sex differences in NSSI prevalence in clinical samples may in some measure be a function of males with this behavior being less likely than males with other mental health difficulties to receive treatment, and conversely, females with an NSSI history being more likely than females with other mental health problems to receive clinical care.<sup>5</sup> Although this hypothesis was not evaluated directly in the current study, the finding that females with NSSI were more likely than male counterparts to receive psychiatric treatment for this behavior is consistent with this possibility.

The current study also offers new insight into psychiatric correlates of NSSI. A notably high proportion of respondents with lifetime NSSI had at least one current psychiatric disorder (63.82%), and 13.84% of respondents with at least one psychiatric disorder had a history of NSSI, in contrast to an estimated lifetime NSSI prevalence rate of 4.86% in the general population. The pattern of findings in the multivariate analysis does not suggest any single Axis I disorder to be particularly characteristic of NSSI, as with the general exception of anxiety disorders and OCD, all disorders were associated with this behavior in multivariate analysis. Rather, when taken together with the finding of a positive dose-like association between the number of disorders and NSSI, along with prior observations that even a single incident of NSSI is tied to significant risk for negative mental health outcomes (Whitlock, 2010; Whitlock et al., 2006), these findings suggest that NSSI may to some degree be a broad marker of general severity of psychopathology. These findings are generally consistent with those of the one prior nationally representative study to evaluate diagnostic correlates (Kiekens et al., 2018), the main difference of note being that NSSI was significantly associated with all psychiatric disorders in the former study. The difference across studies with regards to the significance of associations with anxiety disorders may in part be due to the relevant analyses being conducted with NSSI disorder in the former study and with NSSI occurrence in the current one.

Additionally, lifetime prevalence rates for suicidal ideation and suicide attempts among respondents with NSSI were also particularly elevated (49.29–82.09%). That the effect size for NSSI in relation to 'pure' suicidal ideation and suicide attempts remained large even after accounting for the eight sociodemographic and 13 psychiatric covariates (and suicidal ideation in the case of suicide attempts as the outcome) is indicative of the robustness of these associations. Indeed, these findings are consistent with prior theoretical (Joiner, Ribeiro, & Silva, 2012) and empirical support (Ribeiro et al., 2016) for a strong association between NSSI and suicidality. In the same manner that anxiety often precedes depression when co-morbidity between the two conditions

exists (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003), NSSI has been conceptualized as more often to precede suicidal behavior than vice versa (Joiner et al., 2012; Whitlock et al., 2013). Empirically establishing the specificity in the temporal sequence of these often co-occurring phenomena in future research is of clinical importance.

As for receipt of clinical care for NSSI, a concerning proportion of respondents who had engaged in this behavior had experienced an injury of sufficient severity to warrant medical attention (30.92%). In light of sex differences in suicidal behavior, with females generally being more likely to attempt but males being more likely to die from their attempts (Nock et al., 2008) because they are more likely to adopt highly lethal means (Ajdacic-Gross et al., 2008), an unexpected finding was that no sex differences emerged in medical treatment for NSSI injuries. To the extent that medical treatment for NSSI is a reflection of medical severity of the behavior, this finding may be congruent with the view that, despite substantial overlap in their underlying risk factors, NSSI and suicidal behavior are nevertheless distinct clinical phenomena (Brent, 2011; Mars et al., 2014; Wichstrøm, 2009). That is, in contrast to the aforementioned sex difference in medically severe suicidal behavior, when males engage in NSSI, they are no more likely than their female counterparts to adopt more medically severe means.

Although a substantial proportion of respondents with NSSI received psychiatric treatment for this behavior, the majority did not. This indicates a high rate of unmet treatment need, especially when considered together with the analyses indicating NSSI is associated with considerable psychiatric comorbidity. In contrast to findings on medical treatment for NSSI, certain parallels exist between NSSI and suicide with regards to psychiatric treatment. Specifically, low overall treatment utilization and higher use among females observed for NSSI in the current study have also been found for suicide in others (Ahmedani et al., 2012; Bruffaerts et al., 2011).

Limitations of the current study should also be noted. Although the current study featured an older dataset, more recent publicly available data do not exist on a national scale similarly allowing for analyses of comorbid associations such as evaluated here. Additionally, there is no reason to expect the primary associations observed to differ as a function of time (e.g. most psychiatric conditions being associated with greater odds of lifetime NSSI). Second, and as touched upon above, the cross-sectional design of the current study precludes precise determinations of how NSSI is temporally related to psychiatric conditions, suicidal ideation and behaviors, and treatment use, particularly given that only lifetime, but not recent, NSSI was evaluated in association with these correlates and outcomes. Gathering such information in future research would be clinically informative. For example, if NSSI generally ceases following treatment for this behavior, greater effort should be devoted to reducing barriers to treatment. Alternatively, if NSSI persists after clinical care, such a finding would highlight the challenge of addressing NSSI. This latter possibility would be consistent with prior findings of modest empirical support for existing interventions for NSSI (Calati & Courtet, 2016; Ougrin, Tranah, Stahl, Moran, & Asarnow, 2015), and that for a sizeable proportion of individuals, NSSI may follow a particularly chronic course (Liu, 2017). Nonetheless, this study provides important new insight into the epidemiology of this phenomenon, which may serve as a basis for guiding future research.

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**Ethical standards.** The author asserts that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

## Notes

1 Although race/ethnicity data were collected at a much higher degree of resolution, the small number of unweighted cases of NSSI for several racial/ethnic groups necessitated collapsing this variable across racial/ethnic categories for meaningful analysis.

2 Given that several other sociodemographic characteristics are reflected in the Overall Index of Multiple Deprivation, a sensitivity analysis was conducted with this variable removed. This yielded results that were largely unchanged.

3 Whereas age was treated as a categorical predictor for lifetime NSSI occurrence, it served as a continuous predictor for treatment utilization analyses to accommodate the smaller  $n$  in these latter analyses.

4 Of note, when lifetime treatment utilization was examined among participants who endorsed a lifetime history of NSSI on the CASI, prevalence rates were very comparable, with 30.67% (s.e. = 3.84%) reporting receiving medical attention and 43.88% (s.e. = 4.04%) psychiatric treatment for NSSI.

5 Alternatively, it may be possible that both males and females with NSSI are more likely to receive treatment than are same-sex peers with other mental health difficulties, but that the same-sex difference is also greater in the case of females.

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