HHS Public Access

Author manuscript

*Inj Prev*. Author manuscript; available in PMC 2019 December 01.

Published in final edited form as:

*Inj Prev*. 2019 December ; 25(6): 521–528. doi:10.1136/injuryprev-2018-042933.

# Non-fatal self-inflicted versus undetermined intent injuries: patient characteristics and incidence of subsequent self-inflicted injuries

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## Abstract

**Background—**Non-fatal self-inflicted (SI) injuries may be underidentified in administrative medical data sources.

**Objective—**Compare patients with SI versus undetermined intent (UI) injuries according to patient characteristics, incidence of subsequent SI injury and risk factors for subsequent SI injury.

**Methods—**Truven Health MarketScan was used to identify patients' (aged 10–64) first SI or UI injury in 2015 (index injury). Patient characteristics and subsequent SI within 1 year were assessed. A logistic regression model examined factors associated with subsequent SI.

**Results—**Among analysed patients (n=44 806; 36% SI, 64% UI), a higher proportion of patients with SI index injury were female, had preceding comorbidities (eg, depression), Medicaid (vs commercial insurance), treatment in an ambulance or hospital and cut/pierce or poisoning injuries compared with patients with UI index injury. Just 1% of patients with UI had subsequent SI≤1 year vs 16% of patients with SI. Among patients with UI index injury, incidence of and risk factors for subsequent SI injury were similar across assessed age groups (10–24 years, 25–44 years, 45–64 years). Severe injuries (eg, treated in emergency department), cut/pierce or poisoning injuries, mental health and substance use disorder comorbidities and Medicaid (among adult patients) were risk factors for subsequent SI among patients with UI index injuries.



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**Contributors** CP conceived of the study, led the study design and interpretation of results, assisted with data analysis, drafted and edited the manuscript for important intellectual content and approved the final manuscript as submitted. LX assisted with the study design and interpretation of results, led data analysis, edited the manuscript for important intellectual content and approved the final manuscript as submitted. RWL assisted with the study design and interpretation of results, edited the manuscript for important intellectual content and approved the final manuscript as submitted. DMS assisted with the study design and interpretation of results, edited the manuscript for important intellectual content and approved the final manuscript as submitted. MFB assisted with the study design and interpretation of results, edited the manuscript for important intellectual content and approved the final manuscript as submitted.

**Competing interests** None declared.

**Patient consent** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** Data available from authors on request.

**Conclusions—**Regardless of circumstances that influence clinicians' SI vs UI coding decisions, information on incidence of and risk factors for subsequent SI can help to inform clinical treatment decisions when SI injury is suspected as well as provide evidence to support the development and implementation of self-harm prevention activities.

## INTRODUCTION

Population surveillance and analysis of non-fatal self-inflicted (SI; inclusive of suicidal and non-suicidal intent) injuries using administrative medical data sources rely on clinicians' accurate identification and coding of self-harm injuries. Comprehensive information on SI injury at the individual and population levels is important because people who self-injure are at substantially greater risk of suicide.[1–5] Clinicians might document an injury as undetermined intent (UI) in place of SI, unintentional or assault injuries, although previous research has suggested there may be significant undercoding of SI, in particular, as UI.[6–8] Patient reticence to reveal intentions, legal and other ramifications of classifying injuries as non-accidental, and other issues might inhibit clinicians' endorsement of SI in patients' medical records.[9–11]

Several previous studies have examined appropriate SI intent classification among suicide deaths[12–19] but few studies have directly examined intent classification among non-fatal injuries by comparing characteristics and health outcomes among patients with SI-coded vs UI-coded injuries.[6] Such investigations can generate information to support clinical decision making when self-harm is suspected, identify risk factors for subsequent self-harm among patients with UI injuries as well as inform SI injury research methods. This study aimed to compare characteristics of patients with SI versus UI injuries and incidence of and risk factors for subsequent SI injuries among a large convenience sample of US patients with Medicaid or commercial insurance to test the hypothesis that SI is frequently undercoded as UI.

## METHODS

### Data

This study's methods follow the approach of a previous analysis of repeat SI among youth patients.[20] We used Truven Health MarketScan data on US patients aged 10–64 years with Medicaid or commercial insurance and identified the first date of a medical claim (inpatient or outpatient) with an SI or UI diagnosis in 2015 (or index injury). It was not possible to ensure that the index injury was patients' first-ever SI or UI injury. MarketScan reports paid insurance claims and encounters from participating large employers, managed care organisations, hospitals, electronic medical record providers and Medicare and Medicaid contributors.[21] Insurance coverage status dictates each patient's MarksetScan enrolment timeline. Enrolment could stop, for example, due to a job change (eg, employer-based insurance), a move to a different US state (eg, Medicaid state-based programme) or enrolee mortality; there is no information about why a person's MarketScan enrolment ends and typically researchers restrict analysis to enrolees with a particular enrolment period.

## Patient sample

This study's analysis sample comprised patients with 12 months enrolment before and after the index injury (ie, spanning different parts of 2014–2016 per patient depending on the 2015 index injury date) (figure 1). The analysis sample construction implicitly excluded patients who died within 12 months following their index injury. A recent systematic review of studies worldwide over the preceding 30 years reported the average 1 year incidence of fatal SI injuries (ie, suicide) was 2% (n=40 studies) among all-ages patients initially treated for non-fatal SI injuries in hospital settings.[22]

Non-fatal SI and UI injuries were defined by standard International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) external cause codes (E-codes) E950–959 (SI injury)[23] and E980–89 (UI injury)[23] and by ICD-10-CM codes proposed by the Centers for Disease Control and Prevention[24] to classify SI and UI injuries. Not all claims for injury treatment included E-codes to identify injury intent; an estimated 91% of inpatient injury records and 93% of emergencydepartment (ED) injury records include E-codes.[25] We excluded patients who were already inpatients on 1 January and patients with an index injury date before 30 January in a non-ED or urgent care facility (UCF; a non-hospital medical clinic with extended hours) setting who were treated for the same injury mechanism (eg, cut/pierce) in the previous 30 days (timeline selected a priori), with the assumption that such treatment might have been follow-up from a previous injury.

## Subsequent self-inflicted injury definition

Subsequent SI among patients with UI index injury included SI injuries diagnosed in any clinical setting on any date after the index injury. To increase the likelihood that an SI diagnosis after SI index injury was a new event and not follow-up care, a different definition was required to identify subsequent SI among patients with SI index injury: (1) a medical claim for UCF or ED services for SI injury on any date after the index injury date (because emergency treatment was presumed to represent a new injury) or (2) a medical claim for treatment in any non-emergency (ie, non-ED, non-UCF) clinical setting occurring≥30 days after the index injury date.

## Analysis

First, we used $\chi^2$ tests to assess whether there were significant differences between patients with SI and UI index injury in terms of demographics (eg, sex), prevalence of previously diagnosed comorbidities (separately reported for those affecting≥10% of patients; identified by the Agency for Healthcare Research and Quality's Elixhauser Comorbidity Index[26] diagnosis codes), clinical treatment setting (eg, ambulance; emergency and inpatient treatment were treated as a proxy for injury severity) on the day of the index injury (patients could have more than one such setting) and index injury mechanism (cut/pierce, poisoning, other) by patient age group (10–24, 25–44 and 45–64 years—because US population rates of self-harm vary by age, peaking among adolescents and young adults.[27][28] Second, we compared incidence of subsequent SI injury within 1 year by age group among patients with index SI versus UI injuries, index injury mechanism and whether patients were treated for their index injury in an ED or as a hospital inpatient. Third, we used a logistic regression model to assess whether risk factors for subsequent SI injury within 1 year were the same or

different for patients with SI and UI index injury by age group. We used SAS V.9.4 (Cary, North Carolina, USA) for analysis.

## RESULTS

### Patient and injury characteristics

Among 44 806 patients (20 334 with commercial insurance and 24 472 with Medicaid; figure 1) analysed, far more patients had UI index injuries (n=28 530) than SI injuries (n=16 276); figure 1 and table 1). Among all assessed age groups, patients with SI index injury had a statistically significantly ($p<0.05$) greater proportion of females compared with patients with UI index injury (eg, all ages: 68% of patients with SI injury were female vs 53% of patients with UI injury) (table 1). A significantly greater proportion of patients with SI index injury among all assessed age groups had previously diagnosed comorbidities (eg, all ages: 50% of patients with SI vs 31% of patients with UI) (table 1). The most prevalent comorbidities among patients with SI index injury included depression (eg, all ages: 36% of patients with SI vs 11% of patients with UI), psychosis (24% vs 8%), drug abuse (19% vs 9%), chronic pulmonary disease (17% vs 13%; asthma is included in this category), other neurological disorders (16% vs 9%), hypertension (15% vs 12%) and alcohol abuse (10% vs 4%) (table 1); each was diagnosed in a significantly greater proportion of patients with SI index injury compared with patients with UI index injury in all assessed age groups. A significantly higher proportion of patients age 25–64 with SI index injuries had Medicaid but a lower proportion of youth patients (age 10–24) with SI index injuries had Medicaid compared with patients with UI index injury (table 1).

A significantly smaller proportion of patients with SI index injury were initially treated in clinician offices (eg, all ages: 11% of patients with SI vs 26% of patients with UI), a UCF (<1% vs 9%) or an ED (43% vs 49%) for their index injury, and a significantly greater proportion of patients with SI index injury were initially treated in ambulances (37% vs 14%) or as inpatients (43% vs 6%) among all assessed age groups (table 1; patients could have been treated in multiple locations). A significantly higher proportion of patients with SI index injury had cut/pierce injury mechanism (eg, all ages: 14% vs 3%) or poisoning mechanism (eg, all ages: 58% vs 31%), and a significantly smaller proportion had other injury mechanisms (eg, all ages: 29% vs 66%) among all assessed age groups (table 1).

### Incidence of subsequent self-inflicted injury within one year of index injury

Nearly 16% (n=2553/16,276) of patients with SI index injury of all ages had subsequent SI compared with 1% (n=387/28 530) of patients with UI index injury (table 2). A substantially higher rate of subsequent SI among patients with SI vs UI index injury was observed across age groups, index injury mechanisms and also when analysis was restricted to patients treated in an ED or as an inpatient for the index injury (table 2). Among patients initially treated in any clinical setting for index injuries, the ratio of the proportion of patients with SI versus UI index injury with subsequent SI injury was between 4 times (ie, among 25–44 years old, poisoning index injury) and 44 times (ie, among 45–64 years old, cut/pierce index injury) higher by age group and index injury mechanism (table 2). Among only patients treated in an ED or as inpatients for index injuries, the ratio of the proportion of patients

with SI versus UI index injury with subsequent SI injury was between 3 times (ie, among 25–44 years old, poisoning index injury) and 29 times (ie, among 45–64 years old, other/multiple index injury) higher (table 2).

### Risk factors for subsequent self-inflicted injury within one year of index injury

Controlling for patient and index injury characteristics, previously diagnosed comorbidities were significantly associated with subsequent SI injury within 1 year of index injury for both patients with SI and patients with UI of all age groups, although fewer comorbidities were associated with subsequent SI injury among both patients with SI and patients with UI index injury aged 45–64 compared with the younger assessed age groups (table 3). Younger patients with SI index injury (aged 10–24 and 25–44 years) with Medicaid were significantly less likely to have a subsequent SI injury while older patients with UI index injury (aged 25–44 and 45–64 years) with Medicaid were significantly more likely to have subsequent SI injury (table 3).

Among all patients with SI index injuries, initial treatment in a clinician office was significantly associated with subsequent SI injury, while patients treated as inpatients for an index SI injury were significantly less likely to have subsequent SI injury (table 3). In contrast, among all patients with UI index injures, initial clinical treatment in an ambulance or ED was significantly associated with subsequent SI injury (table 3). Relative to other mechanisms, cut/pierce and poisoning index injuries were significantly associated with subsequent SI among only patients with UI index injury (table 3).

## DISCUSSION

Among this patient sample, patients with SI index injury of all age groups were more often female, had previously diagnosed comorbidities and Medicaid (rather than commercial insurance). These differences are notable, but do not constitute definitive proof of dissimilarity between these patient groups—the possibility remains that these patient characteristics influenced whether an index injury was coded as SI or UI. This study's stronger evidence of dissimilarity between patient groups with SI and UI lies in the much higher observed incidence of subsequent SI among patients with index SI compared with UI injuries (all ages: 16% vs 1%). Among every assessed age group and every assessed index injury mechanism, patients with SI injuries had statistically significantly and substantially higher incidence of subsequent SI. This association held regardless of whether patients received ED or inpatient treatment for their index injury (ie, more severe injuries). However, this study did not directly address the possibility that SI index injury coding itself increased the likelihood that a subsequent injury was also coded as SI. Therefore, this study's results cannot refute, but do provide some evidence in contradiction to, the hypothesis that SI is frequently undercoded as UI.

Most meaningful for public health and clinical practice is perhaps this study's finding that some risk factors for subsequent SI were the same for patients regardless of whether they were identified as having an SI or UI index injury—specifically, both patients with SI and patients with UI index injury with previously diagnosed mental health or substance use disorder comorbidities were significantly more likely to have subsequent SI. Some physical

comorbidities also demonstrated associations with subsequent SI. Among children and youth (aged 10–24) with SI or UI injuries, chronic pulmonary disease (asthma is included in this category in the Elixhauser Comorbidity Index) was associated with subsequent SI, while hypertension among patients with SI aged 25–44 was associated with subsequent SI.

Adult patients with UI index aged 25–64 years with Medicaid were significantly more likely to have subsequent SI than patients with commercial insurance, while youth and younger adult patients with SI index aged 10–44 years with Medicaid were significantly less likely to have subsequent SI than patients with commercial insurance. Medicaid is typically an indicator that a patient comes from a low-income household or has a disability and also implies different provider reimbursement practices compared with commercial insurance payers. This study's finding of a significant association between some patients' Medicaid status and incidence of subsequent SI merits further investigation.

Patients with UI index with cut/pierce or poisoning injuries were significantly more likely to have subsequent SI than patients with other injury mechanisms. That clinical treatment for UI index injuries in an ambulance or ED was associated with subsequent SI could conceivably signal either misclassification of severe SI index injuries as UI (ie, such patients at elevated risk of what is actually repeat SI) or that the experience of severe non-SI injury creates an elevated risk of patients' future self-harm. Inpatient index injury treatment among patients with SI index injury was associated with significantly lower odds of subsequent SI. This could conceivably indicate that inpatient treatment—where patients may have the opportunity to receive more intensive psychiatric treatment compared with ED or physician office visits,[29] for example, mitigated the risk of subsequent SI. This result also merits further investigation.

We are aware of two previous studies with population-based data that directly compared patients with non-fatal SI and UI injury—one study examined ED visits among US youth[9] and the other examined ED visits among Canadian patients of all ages.[6] The distribution of patients' injury intention within our study sample—that is, more patients with UI injuries than SI injuries overall, with the exception of the youngest age group—is consistent with those studies. Our study sample's higher prevalence of females with SI injuries and distribution of injury mechanism by intent (eg, number of patients with SI poisoning vs other SI injury mechanisms) is also consistent with those studies. Our study reported broadly similar rates of subsequent SI among patients with SI and UI index injury compared with the Canadian study (16% and 1% vs 11% and 3%, respectively). Separately, a systematic review of studies worldwide over the preceding 30 years reported the average 1 year incidence of repeat non-fatal SI was 16% among all patients initially treated for SI injuries in hospital settings.[22] Like the present study, the previous Canadian study reported that patients with index SI cut/pierce injuries and patients with UI with cut/pierce and poisoning index injuries had the highest rates of ED visits for subsequent SI injuries.[6]

## Limitations

This study relied on administrative medical data, which implies a number of limitations. First, we limited our analysis to patients with injuries where external cause (including injury intent) was identified in the medical claim record and we proposed novel criteria to

differentiate unique SI injury events outside of emergency clinical settings (eg, SI diagnosis regarded as a new injury if diagnosis occurred≥30 days after index SI injury). Second, our use of administrative healthcare data did not facilitate investigation of a wide range of suicide circumstances or risk for repeated SI that have been studied previously, for example, relationship, job, financial and legal problems.[3031] Third, although MarketScan is one of the largest and most comprehensive data sources on population health in the USA, the inability to observe mortality using MarketScan data is a major limitation. Fourth, retrospective analysis of a large data source like MarketScan is a relatively efficient option for comparative outcomes research, but clinical validation of UI coding in smaller study samples can provide more detailed information about patients and circumstances related to UI-coded injuries.[8] In a similar manner, future analysis might investigate incidence of assault injuries among patients with previous UI injuries.

## CONCLUSION

Results suggest that patients with SI-coded injuries are different from patients with UI-coded injuries in terms of demographics, comorbidities, healthcare payer type and initial injury treatment settings, and such differences persist across age groups. Patients with SI-coded injuries had a substantially higher rate of subsequent SI compared with patients with UI-coded injuries, but some risk factors for subsequent SI were similar for both patients with SI and patients with UI. Specifically, patients with mental health and substance use disorder comorbidities appear most at risk for subsequent SI injury. When intent is undetermined, patients with severe injuries (eg, treated in ED), cut/pierce or poisoning injuries, mental health and substance use disorder comorbidities, and adult Medicaid patients may be most at risk for subsequent SI.

Clinicians can be better supported to identify, treat and code SI in patients' medical records. More effective strategies are needed to prevent SI, and ultimately, to prevent suicide—a risk among those who self-injure, with or without suicidal intent.[32] The Centers for Disease Control and Prevention's technical package to prevent suicide helps states and communities identify strategies with the best available evidence, including identifying and supporting people at-risk, teaching coping and problem-solving skills, promoting connectedness, creating protective environments and strengthening access and delivery of suicide care.[33]

## Acknowledgments

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

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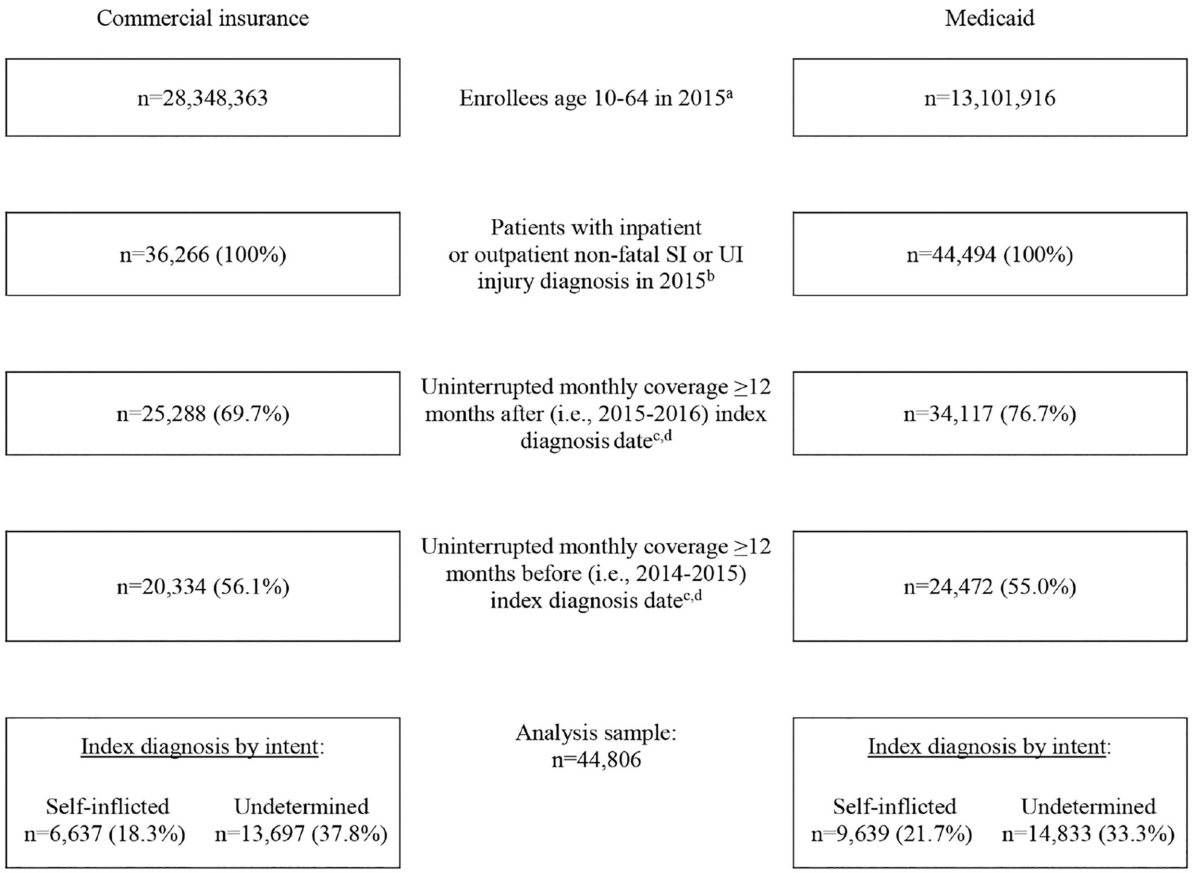
**What is already known on the subject**

- Non-fatal self-inflicted (SI) injuries may be undercoded by clinicians for a variety of reasons. Presumably some undetermined intent (UI) injuries are actually SI, but few studies have directly compared characteristics and health outcomes of patients with non-fatal SI and UI injury.

**What this study adds**

- Analysis of a large US nationwide convenience sample of medical claims data indicated a higher proportion of patients with non-fatal SI injuries were female and had previously diagnosed comorbidities compared to patients with UI injury.
- Nearly 16% of patients with SI index injury had a subsequent SI injury within 1 year compared to just 1% of patients with UI index injury.
- Among patients with UI index injury, incidence of and risk factors for subsequent SI injury were relatively consistent across age groups (10–24 years, 25–44 years, 45–64 years). Severe injuries (eg, treated in emergency department), cut/pierce or poisoning injuries, mental health and substance use disorder comorbidities, and Medicaid (among adult patients) were risk factors for subsequent SI among patients with UI index injuries.
- Mental health and substance use disorder comorbidities were risk factors for subsequent SI regardless of whether patients had index SI or UI injuries.




Notes.
[a] Age 10-64 in 2015 identified by year of birth for Medicaid enrollees. Patient age reported for each service date for patients with commercial insurance.
[b] Non-fatal self-inflicted injury defined by ICD-9-CM codes E950-959 (SI) and E980-9 (UI) and ICD-10-CM codes for SI and UI injuries proposed by the Centers for Disease Control and Prevention.[26]
[c] Index SI injury diagnosis date (date, month, year) defined as the first inpatient or outpatient diagnosis of non-fatal SI injury in calendar year 2015.
[d] Enrollment identified in months in the source dataset (e.g., a patient with an index SI injury diagnosis on any date in September 2015 [i.e., calendar month 9] was included in the analysis sample if the patient was enrolled continuously through 2016 month 9 and including 2014 month 9).

**Figure 1.**
Sample selection of patients with non-fatal SI or UI injury diagnosis, USA, MarketScan, 2015. SI, self-inflicted injury; UI, undetermined intent injury.

**Table 1**

Characteristics of patients and index injuries, non-fatal SI or UI index injury diagnosis, USA, MarketScan, 2015

| | Age 10–24 years (n=21 461) | | Age 25–44 years (n=11 568) | | Age 45–64 years (n=11 777) | | All ages (n=44 806) | |
|---|---|---|---|---|---|---|---|---|
| **Measure** | **SI (n=9361)** | **ui (n=12 100)** | **SI (n=3907)** | **UI (n=7661)** | **SI (n=3008)** | **UI (n=8769)** | **SI (n=16 276)** | **UI (n=28 530)** |
| n (%) | | | | | | | | |
| **Patient** | | | | | | | | |
| Female | 6580 (70) * | 5577 (46) | 2629 (67) * | 4631 (60) | 1922 (64) * | 4981 (57) | 11 131 (68) * | 15 189 (53) |
| Comorbidities † | | | | | | | | |
| Any | 3675 (39) * | 2391 (20) | 2705 (69) * | 3333 (44) | 1811 (60) * | 3125 (36) | 8191 (50) * | 8849 (31) |
| Depression | 2660 (28) * | 560 (5) | 1914 (49) * | 1292 (17) | 1283 (43) * | 1301 (15) | 5857 (36) * | 3153 (11) |
| Psychoses | 1357 (14) * | 353 (3) | 1472 (38) * | 926 (12) | 1072 (36) * | 958 (1 1) | 3901 (24) * | 2237 (8) |
| Drug abuse | 912 (10) * | 429 (4) | 1372 (35) * | 1300 (17) | 824 (27) * | 852 (10) | 3108 (19) * | 2581 (9) |
| COPD | 931 (10) | 1117 (9) | 910 (23) * | 1149 (15) | 934 (31) * | 1470 (17) | 2775 (17) * | 3736 (13) |
| Other neurological | 762 (8) * | 438 (4) | 976 (25) * | 959 (13) | 815 (27) * | 1050 (12) | 2553 (16) * | 2447 (9) |
| Hypertension | 221 (2) * | 171 (1) | 998 (26) * | 1122 (15) | 1261 (42) * | 2166 (25) | 2480 (15) * | 3459 (12) |
| Alcohol abuse | 321 (3) * | 119 (1) | 707 (18) * | 430 (6) | 639 (21) * | 541 (6) | 1667 (10) * | 1090 (4) |
| Other | 1126 (12) * | 1061 (9) | 2544 (65) * | 2880 (38) | 2905 (97) * | 5454 (62) | 6575 (40) * | 9395 (33) |
| Payer type | | | | | | | | |
| Commercial | 4441 (47) * | 5322 (44) | 1031 (26) * | 3093 (40) | 1165 (39) * | 5282 (60) | 6637 (41) * | 13 697 (48) |
| Medicaid | 4920 (53) * | 6778 (56) | 2876 (74) * | 4568 (60) | 1843 (61) * | 3487 (40) | 9639 (59) * | 14 833 (52) |
| Index injury | | | | | | | | |
| Treatment setting ‡ | | | | | | | | |
| Clinician office | 1149 (12) * | 2801 (23) | 357 (9) * | 1717 (22) | 362 (12) * | 2861 (33) | 1868 (1 1) * | 7379 (26) |
| Ambulance | 3112 (33) * | 1213 (10) | 1629 (42) * | 1405 (18) | 1200 (40) * | 1274 (15) | 5941 (37) * | 3892 (14) |
| Urgent care facility | 50 (1) * | 1788 (15) | 16 (0) * | 451 (6) | 8 (0) * | 363 (4) | 74 (0) * | 2602 (9) |
| Emergency department | 4210 (45) * | 6180 (51) | 1693 (43) * | 4277 (56) | 1 108 (37) * | 3464 (40) | 7011 (43) * | 13 921 (49) |
| Inpatient | 3972 (42) * | 618 (5) | 1680 (43) * | 473 (6) | 1335 (44) * | 652 (7) | 6987 (43) * | 1743 (6) |

| Measure | Age 10–24 years (n=21 461) | | Age 25–44 years (n=11 568) | | Age 45–64 years (n=11 777) | | All ages (n=44 806) | |
|---|---|---|---|---|---|---|---|---|
| | SI (n=9361) | ui (n=12 100) | SI (n=3907) | UI (n=7661) | SI (n=3008) | UI (n=8769) | SI (n=16 276) | UI (n=28 530) |
| Other[§] | 3505 (37)[*] | 5015 (41) | 1574 (40) | 3063 (40) | 1284 (43)[*] | 4243 (48) | 6363 (39)[*] | 12 321 (43) |
| Injury mechanism[¶] | | | | | | | | |
| Cut/pierce | 1680 (18)[*] | 369 (3) | 358 (9)[*] | 217 (3) | 178 (6)[*] | 225 (3) | 2216 (14)[*] | 811 (3) |
| Poisoning | 4984 (53)[*] | 2640 (22) | 2396 (61)[*] | 2713 (35) | 2030 (67)[*] | 3445 (39) | 9410 (58)[*] | 8798 (31) |
| Other[**] | 2697 (29)[*] | 9091 (75) | 1 153 (30)[*] | 4731 (62) | 800 (27)[*] | 5099 (58) | 4650 (29)[*] | 18 921 (66) |

All data are n patients (%).

[*] P<0.05 $\chi^2$ test of proportion comparing patient groups with SI and UI injuries.

[†] Comorbidities diagnosed in any clinical setting within one year preceding patients' 2015 index injury diagnosis. 'Other' includes comorbidities affecting <5% of total patients: obesity, hypertension, fluid and electrolyte disorders, weight loss, deficiency anaemias, diabetes, valvular disease, coagulopathy, rheumatoid arthritis, paralysis, congestive heart failure, liver disease, hypothyroidism, renal failure, chronic blood loss anaemia, lymphoma, peripheral vascular disease, solid tumour without metastasis, pulmonary circulation disease, metastatic cancer, AIDS.

[‡] Some patients were treated in multiple clinical settings on the index injury date (eg, ambulance and emergency department).

[§] Includes non-emergency department hospital outpatient, rural health clinic, federally qualified health centre, school, patient home and others.

[¶] Injury mechanism definitions: ICD-9-CM[23] and ICD-10-CM.[24]

[**] Includes multiple mechanisms.

COPD, chronic obstructive pulmonary disease; SI, self-inflicted; UI, undetermined intent.

**Table 2**

Incidence of subsequent non-fatal SI injury within 1 year of index SI or UI injury, USA, MarketScan, 2015

| | | | All Initial clinical treatment settings for Index Injury | | | Only patients with emergency department or Inpatient Initial treatment for Index Injury | | |
|---|---|---|---|---|---|---|---|---|
| **Age group** | **Index Injury mechanism†** | **Index Injury Intent** | **n patients** | **SI≤1 year of Index Injury, n (%) patients** | **Ratio of proportion of SI/UI with SI≤1 year of Index Injury** | **n patients** | **SI≤1 year of Index Injury, n (%) patients** | **Ratio of proportion of SI/UI with SI≤1 year of Index Injury** |
| All ages | Total | SI | 16 276 | 2553 (15.7) * | 11.2 | 13 998 | 2126 (15.2) * | 7.6 |
| | | UI | 28 530 | 387 (1.4) | | 15 664 | 313 (2.0) | |
| | Cut/pierce | SI | 2216 | 387 (17.5) * | 14.6 | 1932 | 337 (17.4) * | 10.9 |
| | | UI | 811 | 10 (1.2) | | 504 | 8 (1.6) | |
| | Poisoning | SI | 9410 | 1431 (15.2) * | 4.9 | 8459 | 1243 (14.7) * | 3.3 |
| | | UI | 8798 | 269 (3.1) | | 5203 | 229 (4.4) | |
| | Other‡ | SI | 4650 | 735 (15.8) * | 26.3 | 3607 | 546 (15.1) * | 18.9 |
| | | UI | 18 921 | 108 (0.6) | | 9957 | 76 (0.8) | |
| 10–24 | Total | SI | 9361 | 1411 (15.1) * | 13.7 | 8182 | 1207 (14.8) * | 9.3 |
| | | UI | 12 100 | 135 (1.1) | | 6798 | 109 (1.6) | |
| | Cut/pierce | SI | 1680 | 285 (17.0) * | 10.6 | 1446 | 243 (16.8) * | 9.9 |
| | | UI | 369 | 6 (1.6) | | 239 | 4 (1.7) | |
| | Poisoning | SI | 4984 | 716 (14.4) * | 5.1 | 4608 | 655 (14.2) * | 4.2 |
| | | UI | 2640 | 73 (2.8) | | 1864 | 64 (3.4) | |
| | Other†‡ | SI | 2697 | 410 (15.2) * | 25.3 | 2128 | 309 (14.5) * | 16.1 |
| | | UI | 9091 | 56 (0.6) | | 4695 | 41 (0.9) | |
| 25–44 | Total | SI | 3907 | 669 (17.1) * | 8.6 | 3373 | 570 (16.9) * | 6.0 |
| | | UI | 7661 | 156 (2.0) | | 4750 | 132 (2.8) | |
| | Cut/pierce | SI | 358 | 71 (19.8) * | 14.1 | 326 | 67 (20.6) * | 9.4 |
| | | UI | 217 | 3 (1.4) | | 137 | 3 (2.2) | |
| | Poisoning | SI | 2396 | 403 (16.8) * | 3.7 | 2140 | 350 (16.4) * | 2.7 |
| | | UI | 2713 | 124 (4.6) | | 1755 | 106 (6.0) | |

| | | | All Initial clinical treatment settings for Index Injury | | | Only patients with emergency department or Inpatient Initial treatment for Index Injury | | |
|---|---|---|---|---|---|---|---|---|
| **Age group** | **Index Injury mechanism[†]** | **Index Injury Intent** | **n patients** | **SI≤1 year of Index Injury, n (%) patients** | **Ratio of proportion of SI/UI with SI≤1 year of Index Injury** | **n patients** | **SI≤1 year of Index Injury, n (%) patients** | **Ratio of proportion of SI/UI with SI≤1 year of Index Injury** |
| | Other[‡] | SI | 1153 | 195 (16.9) [*] | 28.2 | 907 | 153 (16.9) [*] | 21.1 |
| | | UI | 4731 | 29 (0.6) | | 2858 | 23 (0.8) | |
| 45–64 | Total | SI | 3008 | 473 (15.7) [*] | 14.3 | 2443 | 349 (14.3) [*] | 8.4 |
| | | UI | 8769 | 96 (1.1) | | 4116 | 72 (1.7) | |
| | Cut/pierce | SI | 178 | 31 (17.4) [*] | 43.5 | 160 | 27 (16.9) [*] | 21.1 |
| | | UI | 225 | 1 (0.4) | | 128 | 1 (0.8) | |
| | Poisoning | SI | 2030 | 312 (15.4) [*] | 7.3 | 1711 | 238 (13.9) [*] | 3.8 |
| | | UI | 3445 | 72 (2.1) | | 1584 | 59 (3.7) | |
| | Other[‡] | SI | 800 | 130 (16.3) [*] | 32.6 | 572 | 84 (14.7) [*] | 29.4 |
| | | UI | 5099 | 23 (0.5) | | 2404 | 12 (0.5) | |

All data are n patients (%).

[*] P<0.05 $\chi^2$ test of proportion comparing patient groups with SI and UI injuries.

[†] Injury mechanism definitions: ICD-9-CM[23] and ICD-10-CM.[24]

[‡] Includes multiple mechanisms.

SI, self-inflicted; UI, undetermined intent.

**Table 3**

Logistic regression analysis of risk factors associated with incidence of subsequent non-fatal SI injury within 1 year of index SI or UI injury, USA, MarketScan, 2015

| | Age 10–24 years (n=21 461) | | Age 25–44 years (n=11 568) | | Age 45–64 years (n=11 777) | | All ages (n=44 806) | |
|---|---|---|---|---|---|---|---|---|
| | SI (n=9361) | UI (n=12 100) | SI (n=3907) | UI (n=7661) | SI (n=3008) | UI (n=8769) | SI (n=16 276) | UI (n=28 530) |
| **Measure** | **aOR (95% CI)** | | | | | | | |
| **Patient** | | | | | | | | |
| Female | 1.32 (1.15 to 1.51) | 1.42 (0.99 to 2.04) | 0.93 (0.77 to 1.13) | 0.76 (0.54 to 1.06) | 0.86 (0.70 to 1.06) | 1.75 (1.11 to 2.76) | 1.09 (0.99 to 1.20) | 1.19 (0.96–1.47) |
| Comorbidities * | | | | | | | | |
| Depression | 1.59 (1.34 to 1.89) | 2.67 (1.54 to 4.61) | 1.34 (1.06 to 1.69) | 1.48 (1.02 to 2.17) | 1.30 (0.97 to 1.73) | 1.07 (0.66 to 1.75) | 1.48 (1.30 to 1.67) | 1.61 (1.23–2.10) |
| Psychoses | 1.99 (1.68 to 2.36) | 1.92 (1.08 to 3.42) | 2.35 (1.88 to 2.93) | 1.63 (1.11 to 2.40) | 1.30 (0.99 to 1.70) | 1.86 (1.13 to 3.07) | 1.92 (1.70 to 2.16) | 1.85 (1.41–2.43) |
| Drug abuse | 1.13 (0.91 to 1.39) | 2.50 (1.43 to 4.36) | 1.27 (1.04 to 1.57) | 1.62 (1.10 to 2.39) | 1.16 (0.90 to 1.51) | 1.49 (0.90 to 2.46) | 1.15(1.01 to 1.30) | 1.92 (1.47–2.51) |
| COPD | 1.23 (1.02 to 1.48) | 2.16 (1.33 to 3.50) | 1.22 (0.99 to 1.50) | 1.14 (0.77 to 1.68) | 1.19 (0.93 to 1.52) | 0.68 (0.42 to 1.10) | 1.19(1.06 to 1.34) | 1.13 (0.87–1.47) |
| Other neurological | 1.30 (1.06 to 1.60) | 1.23 (0.68 to 2.22) | 1.42 (1.15 to 1.73) | 0.89(0.61 to 1.30) | 1.22 (0.95 to 1.57) | 1.14 (0.70 to 1.88) | 1.29 (1.14 to 1.46) | 1.03 (0.79–1.35) |
| Hypertension | 1.31 (0.94 to 1.82) | 0.90 (0.37 to 2.15) | 1.51 (1.22 to 1.87) | 1.14(0.76 to 1.69) | 1.02 (0.77 to 1.34) | 1.02 (0.61 to 1.70) | 1.20 (1.04 to 1.39) | 1.06 (0.79–1.42) |
| Alcohol abuse | 1.24 (0.92 to 1.68) | 1.96 (0.98 to 3.95) | 1.41 (1.13 to 1.76) | 1.61 (1.05 to 2.48) | 1.63 (1.25 to 2.13) | 2.35(1.41 to 3.90) | 1.39 (1.20 to 1.60) | 1.90 (1.41–2.55) |
| Other | 1.44 (1.19 to 1.75) | 0.94 (0.52 to 1.71) | 1.34 (1.08 to 1.66) | 1.27 (0.87 to 1.85) | 1.04 (0.79 to 1.37) | 0.70 (0.42 to 1.16) | 1.27 (1.12 to 1.44) | 1.01 (0.77–1.33) |
| Medicaid | 0.61 (0.51 to 0.72) | 0.64 (0.40 to 1.02) | 0.44 (0.32 to 0.61) | 2.56 (1.26 to 5.21) | 0.73 (0.49 to 1.09) | 3.08 (1.45 to 6.51) | 0.60 (0.53 to 0.69) | 1.34 (0.97–1.84) |
| **Index injury** | | | | | | | | |
| Treatment setting † | | | | | | | | |
| Clinician office | 1.15(0.96 to 1.38) | 1.01 (0.56 to 1.83) | 1.70 (1.27 to 2.26) | 0.88 (0.45 to 1.73) | 1.66(1.21 to 2.27) | 0.32 (0.13 to 0.81) | 1.38 (1.20 to 1.58) | 0.71 (0.48–1.04) |
| Ambulance | 1.00 (0.88 to 1.13) | 1.52 (0.99 to 2.35) | 0.94 (0.78 to 1.13) | 1.57 (1.07 to 2.31) | 1.05 (0.84 to 1.30) | 2.53 (1.55 to 4.14) | 0.99 (0.90 to 1.08) | 1.86 (1.46–2.37) |
| UCF | 0.44 (0.16 to 1.25) | 0.24 (0.06 to 1.02) | 1.74 (0.48 to 6.27) | 2.77 (1.07 to 7.16) | 0.94(0.11 to 7.75) | 1.82 (0.52 to 6.37) | 0.68 (0.32 to 1.44) | 0.78 (0.40–1.50) |
| ED | 0.95 (0.79 to 1.15) | 1.78 (1.02 to 3.12) | 1.07 (0.81 to 1.42) | 1.65 (0.95 to 2.85) | 0.69(0.51 to 0.93) | 0.81 (0.45 to 1.46) | 0.89 (0.77 to 1.02) | 1.42 (1.03–1.96) |
| Inpatient | 0.72 (0.59 to 0.87) | 1.10 (0.50 to 2.40) | 0.82 (0.62 to 1.08) | 1.35 (0.67 to 2.70) | 0.53 (0.40 to 0.71) | 1.23 (0.62 to 2.42) | 0.69 (0.60 to 0.79) | 1.26 (0.84–1.91) |
| Injury mechanism ‡ | | | | | | | | |
| Cutting/piercing | 1.08 (0.91 to 1.28) | 1.89 (0.78 to 4.56) | 1.24 (0.90 to 1.71) | 2.04 (0.60 to 6.87) | 1.12 (0.72 to 1.74) | 1.30 (0.17 to 9.96) | 1.13 (0.98 to 1.30) | 2.14(1.11–4.15) |
| Poisoning | 0.94 (0.81 to 1.07) | 2.11 (1.40 to 3.19) | 1.04 (0.85 to 1.27) | 4.57 (2.82 to 7.39) | 1.03 (0.82 to 1.30) | 2.56 (1.49 to 4.37) | 0.99 (0.90 to 1.10) | 3.03 (2.33–3.95) |
| Other § | Reference | Reference | Reference | Reference | Reference | Reference | Reference | Reference |

[*] Comorbidities diagnosed in any clinical setting within 1 year preceding patients' 2015 index injury diagnosis. 'Other' includes comorbidities affecting <5% of patients: obesity, hypertension, fluid and electrolyte disorders, weight loss, deficiency anaemias, diabetes, valvular disease, coagulopathy, rheumatoid arthritis, paralysis, congestive heart failure, liver disease, hypothyroidism, renal failure, chronic blood loss anaemia, lymphoma, peripheral vascular disease, solid tumour without metastasis, pulmonary circulation disease, metastatic cancer, AIDS.

[†] Some patients were treated in multiple clinical settings on the index injury date (eg, ambulance and emergency department).

[‡] Injury mechanism definitions: ICD-9-CM[23] and ICD-10-CM.[24]

[§] Includes multiple mechanisms.

aOR, adjusted OR; COPD, chronic obstructive pulmonary disease; ED, emergency department; SI, non-fatal self-inflicted injury; UCF, urgent care facility; UI, non-fatal undetermined intent injury.