

Data Resource Profile: The Korea National Hospital Discharge In-depth Injury Survey (KNHDIS)

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Introduction

Injuries constitute a major public health problem, killing more than 5 million people (9% of deaths) worldwide each year and causing many more cases of disability. In Korea, the death rate from injuries has dropped from 61.2 per100 000 in 2009 to 56.5 in 2019, with traffic accidents accounting for approximately 10% of deaths in aged 1- 29 group in 2019[1]. Injuries, both unintentional and intentional injuries are viewed as largely preventable events. Furthermore, injuries and their burden can be reduced with effective measures of prevention and treatment[2].

The WHO has suggested injury surveillance system to inform about injury prevention and treatment, and to improve recovery outcomes in 2001. Many countries such as the US, Canada, Australia, China applied the WHO's injury surveillance guidelines to assess the pattern and trend of injuries[3]. In 2005, the KDCA launched an injury surveillance system called the Korea National Hospital Discharge In-depth Injury Survey (KNHDIS) with hospital based data, patients' demographic data (age, sex, and geographic area), details on injury (intent, place, mechanism, nature of injury), and contextual data (date of admission and discharge, outcomes, payment information) in order to understand the scale of injuries, identify risk factors, and provide data supporting prevention policies and intervention strategies suggested by the WHO injury surveillance guidelines. It is an integrated system of data collection, analysis, interpretation and communication. In addition, the KNHDIS is a national probability survey and has been conducted annually since its inception.

The KNHDIS defines patients with injury-related discharges as S00-T98 (injury, poisoning and a few other consequences of external causes) of the International Classification of Diseases, Tenth Revision (ICD-10) [4], which was designated in addition to the main diagnosis or sub-diagnosis code.

Data resource area and population coverage

The KNHDIS is an ongoing probability survey and targets injured patients admitted to hospitals. The scope of the KNHDIS encompasses patients discharged from all acute general hospitals of 100 or more beds, except certain types including single specialized hospitals, nursing hospitals, geriatric hospitals, veterans' hospitals, military hospitals, and rehabilitation hospitals. In addition, cases of

32 patients who have only stayed in the emergency room, as well as those who had normal full-term
33 spontaneous delivery were excluded[5]. The KNHDIS data captured multiple admissions with no
34 distinction between the initial admission and the subsequent readmissions, except in the first surveyed
35 year which excluded multiple events.

36

37 **Data Collection Procedures**

38 Two data collection procedures are used for the KNHDIS. One is an automated system in which the
39 sampled hospitals extract the Korea Uniform Hospital Discharge DataSet (KUHDDS), gather data
40 from forms with information about the injury, and then transmit the data electronically to the data
41 system operated by the KDCA, known as the integrated disease health management system (the IS,
42 www.is.kdca.go.kr) [6].

43 The procedure that hospitals with the automated system go through involves the Electronic Medical
44 Record (EMR) system automatically extracting the KUHDDS, followed by the hospital's staff
45 surveying for the KUHDDS and the injury-related codes.

46 The other is a manual system in which sample selection and transcription of information from the
47 hospital records to abstract forms on the IS are performed by trained research staffs of the KDCA.

48 Approximately 68.6% of the sampled hospitals provide their data through the automated system; and
49 those hospitals accounted for 89.0% of the total data in 2018. The survey participation rate of sampled
50 hospitals tended to slightly decrease over time—from 98.0% in 2004 to 95.5% in 2018 (as of 2019,
51 Table 1)[7].

52

53 **Sampling Design**

54 The original sample was selected in 2005 from a pool of general hospitals listed in the national patient
55 survey. A two-stage stratified cluster sampling scheme was applied, and hospitals were stratified into
56 four strata based on the number of beds (100-299, 300-499, 500-999, and over 1000 beds) and on
57 their geographic locations (provinces referred to as “Si”, “Do”). However, 16 regional emergency
58 medical centers, four specialized emergency medical centers, and five specialized burn care hospitals
59 were mandatorily selected from 2007[8]. In the first stage of the scheme, individual hospitals were
60 selected as the primary sampling unit (PSU); and in the second stage, discharged cases from the
61 sampled hospitals were selected as the secondary sampling unit (SSU). The sample plan has had
62 updated the selection probabilities periodically based on previous survey results and the variance in
63 the number of hospitals. The sample size was 150 hospitals in the first surveyed year, and was

64 expanded to 200 hospitals by 2017[9]. The selected discharge cases were approximately 9% of the
 65 total discharge cases (approximately 10% until 2006), but did not exceed 6,000 cases per hospital.
 66 The selection process was done using the systematic sampling method. The number of cases selected
 67 for hospitals with uncomputerized KUHDDS was based on the number of beds as follows: a
 68 maximum of 300 cases for 100-199 beds, 420 cases for 200-299 beds, and 540 cases for hospitals
 69 with more than 300 beds. In regard to the 2010 survey population, the probability was doubled for
 70 children of ages 0 to 4 and for women of ages 25 to 35 due to high estimation errors in the previous
 71 survey results. Furthermore, the sample size will be increased to up to 250 hospitals in order to better
 72 estimate the representative statistics of each region.

73 The KNHDIS data captured multiple admissions with no distinction between the initial admission and
 74 the subsequent readmissions, except in the first surveyed year which excluded multiple events. Injury
 75 cases were account for approximately 13% - 15% of total discharges, including multiple events every
 76 year. In 2018, 302,593 hospitalizations were reviewed, from which 38,109 injury cases were
 77 identified and examined (Table 2).

78

79 **Estimation of Total Discharged Cases**

80 The survey was a complex sample survey, and appropriate weights were applied for the estimation.
 81 The number of injury cases was estimated using the estimation of the mid-year population of each
 82 year. Linear variance estimation was carried out using the Taylor series, with the selected procedure
 83 being SURVEYMEANS provided by SAS, using the latest version available for that report year (e.g.
 84 ver 9.4 in 2019) (SAS Institute Inc., Cary, NC, USA).

85 The weighting was calculated by multiplying the probability of the hospital selection (PSU) by the
 86 probability of the patient selection (SSU). The formula for estimating the total (\hat{Y}) is defined as
 87 follows:

$$\hat{Y} = \sum_{h=1}^H \frac{N_h}{n_h} \sum_{i=1}^{n_h} \frac{M_{hi}}{m_{hi}} \sum_{j=1}^{m_{hi}} y_{hij} = \sum_{h=1}^H \sum_{i=1}^{n_h} \sum_{j=1}^{m_{hi}} w_{hij} \cdot y_{hij}$$

88 where,

89 h: stratum h by hospital size (h=1,2, H=4)

90 i: i^{th} hospital in stratum h, $i=1, 2, \dots, n_h$

91 j: j^{th} patient of i^{th} hospital in stratum h, $j=1, 2, \dots, m_{hi}$

92 N_h is the number of target hospitals in stratum h.

93 n_h is the number of hospitals to be sampled in stratum h.

94 M_{hi} is total number of discharged patients of i^{th} hospital in stratum h.

95 m_{hi} is the number of sampled discharged patients in the i^{th} hospital in stratum h.

96 w_{hij} is the weighting of discharged patients to be sampled in hospital j of stratum h .

$$w_{hij} = \frac{N_h}{n_h} \times \frac{M_{hi}}{m_{hi}}$$

97 The variance of the estimated total number of discharged patients \hat{Y} is computed using the following

98 formula:
$$\hat{V}(\hat{Y}) = \sum_{h=1}^H \hat{V}_h(\hat{Y})$$

99 where,
$$\hat{V}_h(\hat{Y}) = \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} (y_{hi} - \bar{y}_{h..})^2, y_{hi} = \sum_{j=1}^{m_{hi}} w_{hij} \cdot y_{hij}, \bar{y}_{h..} = (\sum_{i=1}^{n_h} y_{hi}) / n_h$$

100 The standard error is computed as the square root of the total variance, $\sqrt{\hat{V}(\hat{Y})}$.

101

102 **Data Validation and Quality**

103 The KCDC developed a quality management program, which involves first checking the data
104 transmitted into the IS. Data are subject to automatic quality control checks on submission the original
105 entry. Various errors—including omission of essential items, duplicate transmissions of the same data,
106 as well as errors in admission and discharge dates, code values for each item, the dates of the main
107 operations, and the date of the injury occurrence—were analyzed and returned. The second step is to
108 verify the items surveyed by the specialized quality control team within the KCDC and identify any
109 logical errors that may exist between the said items (the relationship between the patient's age and the
110 source of medical expenses, between the external code of injury and the information gathered from
111 the in-depth survey, between age and the location and activity leading to the injury, between age and
112 the diagnosis and the surgical code, between diagnoses relating to only one of the either genders and
113 the surgical code, etc.). Third, external experts review the cases of patients who were hospitalized for
114 more than 180 days, which are then excluded from the national statistic. However, information that is
115 related to disease and treatment, such as codes for diagnoses, procedures, and for the accuracy of the
116 original cause for injured patients as well as those of deceased neonatal patients, is provided as raw
117 data. Any errors or information requiring reconfirmation were corrected with the hospital.

118

119 **Data Collected**

120 **Patient and Clinical Information**

121 The types of data collected include the hospitals' information; the patients' demographic information
122 including age, gender, residence zip code, primary payer/insurance status; detailed clinical
123 information and injury-related codes such as the mechanism and location of the occurrence of the
124 injury based on the International Classification of External Causes of Injuries version 1.2[10], with 30

125 variables available in the core dataset(see Table 3).

126 Primary diagnosis and additional diagnosis were coded based on the ICD-10. Procedures were coded
127 as ICD-10 and ICD-9CM. ICD-10 was used between 2005 and 2014 then the Korean Standard
128 Classification of Diseases-7th edition (KCD-7)[11] by the Statistics Korea was applied form 2015,
129 which is the Korean version of ICD-10 including Korea specific diseases code. Primary procedure
130 defined as surgical operation and additional procedures included endoscopic polypectomy, Gamma
131 knife, extracorporeal shock wave lithotripsy and special examination for diagnosis purpose. For each
132 discharges record, up to 20 additional diagnostic and additional procedure codes were collected from
133 the second KNHDIS. Apart from data on diagnoses and procedures, the survey contains information
134 on dates of admission, each coded procedure, discharge and injury occurred, primary payer/insurance
135 status such as national health insurance, medical care (Medicaid, Medicare), car insurance industrial
136 accident compensation insurance, or uninsured.

137

138 **Injury Information**

139 The injury-related contents were developed based on the International Classification of External
140 Causes of Injuries (ICECI) recommended by the World Health Organization. Key data elements on
141 injury include intent of injury, place of occurrence, injury mechanism and activities undertaken when
142 injured (sports, leisure activities, work, treatment, and education). The discharges with diagnosis
143 coded as S00-T75 and T79 required to collect information external causes of injuries (V-Y code), and
144 all 10 variables in injury information dataset (Table 3). The external causes of injury were collected
145 up to 2 codes to understand consequence after original injury. Injuries were classified by the intention
146 of act into 4 categories: unintentional injuries, intentional injuries, violence-related injuries, and legal
147 intervention. Place of injury occurred was coded linked with external cause of injury as residence,
148 school and school area, commercial facilities, farms, medical facilities, cultural facilities such as
149 amusement park, public building, industrial or construction place and etc. Injury mechanism provides
150 information about method or instrument that caused the injury. The outcome of injury patient at the
151 time of discharge was evaluated with medical record and coded with Glasgow Outcome Score of 5(1
152 for dead, 2 for persistent vegetative state, 3 for severe disability, 4 for moderate disability, and 5 for
153 good recovery).

154 The following were surveyed for as needed: the means of transportation (pedestrians, bicycles,
155 motorcycles, cars, buses, and airplanes), suicide risk factors (conflict with family members, disease,
156 financial problems, death in the family, and abuse), and toxic substances. For cases with T78, T80-
157 T98, and Y40-Y98, only external causes of injuries were surveyed (E, V code with the ICD-9, V, W, X
158 code with the ICD-10). The item “nature of injury” was surveyed separately until 2005, after which it

159 was changed to be generated from the S00-T98 code of the primary diagnosis or additional diagnosis.
160 Each surveyed year estimated the injury discharge rates using the year estimate population by
161 demographic characteristics, intent, injury mechanism, and etc from 2004 to 2017 (Table 4).

162

163 **Data Resource Use**

164 The KNHDIS provides a unique data source not currently available elsewhere in Korea and has been
165 widely used by various academic researchers and policy makers. Annual reports have been published
166 in the late part of their subsequent years since 2006 (target data of 2004)[12]. The KNHDIS has
167 provided the health statistics that were needed for the development of injury prevention-related
168 objectives for the Health Plan 2020 (HP2020), which is the national comprehensive health plan put
169 together by the Korean Ministry of Health and Welfare(KMOHW)[13]. The provided indicators were
170 the rates of admission to hospitals for causes relating to intentional or unintentional injuries, traffic
171 accidents. In support of the Presidential agenda goals, the KNHDIS has also provided seven indicators
172 relating to safety-related objectives for children under the age 14 since 2011[14]. These include rates
173 of admission caused by intentional/unintentional injuries, poisoning, sports/recreation injuries, traffic
174 accidents, and pedestrian traffic accidents. The data was also used to revise the Korea Classification
175 of Diseases (KCD) by Statistics Korea[15]. With over 100 publications as of July 2020, the KNHDIS
176 has been used to answer a variety of relevant research questions. The main research issues it addresses
177 include the effect of disease burden[16-18] and risk factors on hospitalization duration[18-21],
178 epidemiologic characteristic of injuries[22-25], and so on. A full list of publications involving the
179 KNHDIS data in domestic and international journals is available from the supplementary data section
180 at IJE online. The annual KNHDIS symposium provided KCDC have been held 14 times up to 2019,
181 with approximately 250 researchers attending each time. The comprehensive injury fact sheets were
182 published annually by collaborating with various agencies and KCDC since 2011, such as the fire
183 agency, the statistics agency, the Rural Development Administration, the National Medical Center, the
184 National Health Insurance Corporation, the Road Traffic Authority, and the School Safety and
185 Insurance Federation. Furthermore, the data has worked to increase awareness regarding the
186 importance of injury prevention, and a chapter about this has been placed in Korean language
187 textbooks of the 4th graders.

188

189 **Strengths and Weaknesses**

190 The KNHDIS is an ongoing survey that reflects Korea's national representative sample, is a valuable
191 source of understanding injury-related information, and improves policies made to prevent injuries. It

192 has the advantage of being able to grasp the trend of injuries in a time-sequential manner, and it
193 continually produces systematic national health and medical statistics related to injuries for the public
194 and the academic sector.

195 The KNHDIS covers not only patients with health insurance provided by the Korea National Health
196 Insurance Service, but also those who are covered by other types of insurance, such as industrial
197 accident insurance and car insurance. Furthermore, the contents of the survey are coded with ICD-10
198 and ICECI that makes international comparisons possible.

199 The KNHDIS has several limitations. The KNHDIS only surveys hospitals with more than 100 beds,
200 and as such additional surveys on hospitals with less than 100 beds are needed, as well as ones on
201 outpatient injuries. Also, the dataset cannot distinguish cases of readmission to multiple hospitals
202 because it does not collect personal linkable identification codes. In other words, all the data
203 surrounding one particular discharge case are from one hospital.

204

205 **Data Resources Access**

206 Data are available for all the years the survey was conducted. The annual reports are downloadable at
207 the KDCA website (<http://www.kdca.go.kr>) and the Korea Statistics website (<http://mdis.kostat.go.kr>).
208 A micro data is available as request by email (kcdcinjury@korea.kr) with an application
209 (<https://www.kdca.go.kr/board/board.es?mid=a20507030000&bid=0020>). Qualified applicants are
210 able to submit an application form summarizing the proposed research project that will be using the
211 KNHDIS. For successful applicants, data will be transferred by the KCDC injury data team. Further
212 information and enquires can be submitted to kcdcinjury@korea.kr.

213

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216 members, including the medical record review staffs, the Korean Medical Record Association, and the
217 expert committees that have provided technical support to the KNHDIS.

218

219 **Conflict of interest:** None declared.

220

221 Table 1. The number of sampled hospitals, their rates of participation, and number of surveyed cases in the
 222 KNHDIS

Target year	Number of Target population hospitals					Number of Sample hospitals (A)					Number of Participated hospitals (B) (A/B, %)				
	sum	100-299	300-499	500-999	≥1000	sum	100-299	300-499	500-999	≥1000	Sum	100-299	300-499	500-999	≥1000
2004	512	334	84	84	10	150	70	27	43	10	147 (98.0)	67 (95.7)	27 (100.0)	43 (100.0)	10 (100.0)
2005	512	334	84	84	10	150	70	27	43	10	147 (98.0)	68 (97.1)	27 (100.0)	42 (97.7)	10 (100.0)
2006	512	334	84	84	10	150	70	27	43	10	144 (96.0)	65 (92.9)	26 (96.3)	43 (100.0)	10 (100.0)
2007	561	408	75	71	7	170	102	19	42	7	165 (97.1)	100 (98.0)	18 (94.7)	40 (95.2)	7 (100.0)
2008	561	408	75	71	7	170	102	19	42	7	170 (100.0)	102 (100.0)	19 (100.0)	42 (100.0)	7 (100.0)
2009	561	408	75	71	7	170	102	19	42	7	170 (100.0)	102 (100.0)	19 (100.0)	42 (100.0)	7 (100.0)
2010	561	408	75	69	9	170	103	18	40	9	166 (97.6)	101 (98.1)	18 (100.0)	39 (97.5)	8 (88.9)
2011	561	408	75	69	9	170	103	17	41	9	166 (97.6)	101 (98.1)	17 (100.0)	41 (100.0)	7 (77.8)
2012	561	408	75	69	9	170	103	17	41	9	166 (97.6)	101 (98.1)	17 (100.0)	40 (97.6)	8 (88.9)
2013	561	408	75	69	9	170	103	17	41	9	164 (96.5)	99 (96.1)	17 (100.0)	41 (100.0)	7 (77.8)
2014	561	408	75	69	9	170	103	17	41	9	164 (96.5)	98 (95.1)	17 (100.0)	41 (100.0)	8 (88.9)
2015	561	408	75	69	9	170	102	18	41	9	165 (97.1)	99 (97.1)	18 (100.0)	40 (97.6)	8 (88.9)
2016	561	408	75	69	9	170	101	18	42	9	161 (94.7)	95 (94.1)	17 (94.4)	41 (97.6)	8 (88.9)
2017	572	414	64	77	17	200	95	31	57	17	188 (94.0)	91 (95.8)	28 (90.3)	55 (96.5)	14 (82.4)
2018	572	414	64	77	17	200	95	31	57	17	191 (95.5)	91 (95.8)	30 (96.8)	55 (96.5)	15 (88.2)

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224

225

226 Table 2. The KNHDIS databases between 2004 and 2008

Target year	No. of hospitals participated	No. of discharged cases	No. of injury related cases
2004	147	175,100	26,791
2005	147	161,997	24,818
2006	144	170,008	25,511
2007	169	179,094	27,291
2008	170	190,074	28,031
2009	170	198,586	29,030
2010	166	220,838	31,654
2011	166	225,105	31,425
2012	167	235,526	32,758
2013	163	214,605	30,589
2014	165	224,061	31,389
2015	165	227,615	31,784
2016	162	235,579	30,829
2017	188	291,786	37,752
2018	191	302,593	38,109

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229 Table 3. The KNHDIS Data elements (as of Jun 2020)

Subjects	Items	Contents
	Hospital information	<ul style="list-style-type: none"> • Hospital identification code • Number of bed in hospital • Hospital address
	The KUHDDS	
	Demographics	<ul style="list-style-type: none"> • Gender • Age at admission • Date of birth • Zip code
	Admission information	<ul style="list-style-type: none"> • Expected source of payments • Admission date • Discharge date • Admission route (e.g. emergency, outpatient)
	Medical information	<ul style="list-style-type: none"> • Primary diagnosis KCD-10th(KCD-7th) code • Additional diagnosis KCD-10th(KCD-7th) code (up to 20¹) • External cause of injury (up to 2²) • Primary procedure ICD-9-CM • Date of procedure • Additional procedure code (up to 20¹) • Discharge method • Underlying cause of death • Discharge disposition (e.g. home, other health care facility, expired) • Treatment result (e.g. improved, ceased)
Injured patients		
S00-T75, T79 (ICD-10)	Injury information	<ul style="list-style-type: none"> • Intent • Place of occurrence • Activity when injured • Mechanism of injury • Date of injury occurrence • Nature of injury (e.g. superficial injury, open wound, fracture; generated from ICD code T00-07, T20-632) • Mode of transport • Proximal Risk factors for intentional self-harm (e.g. conflict with families, physical illness, financial problem) • Poisonous substance • Glasgow Outcome Scale • External causes of injuries (V-Y code)
T78, T80-T98, Y40-Y98(ICD-10)	Injury information	<ul style="list-style-type: none"> • External causes of injuries (V-Y code)

230 KUHDDS: Korea Uniformed Hospital Discharge DataSet

231 KCD-9th : Korean Standard Classification of Diseases, KCD

232 ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification

233 ¹ surveyed up to 5 in 2004, ² surveyed up to 1 in 2004

Table 4. Estimated injury discharge rates*, 2004-2017

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	9,081	9,477	9,490	10,091	10,518	11,131	11,979	12,488	13,093	13,184	13,505	13,800	14,218	14,199
Non-injuries	7,722	8,007	7,995	8,551	8,891	9,464	10,136	10,663	11,164	11,222	11,499	11,732	12,162	12,042
Injuries	1,359	1,470	1,495	1,541	1,628	1,667	1,843	1,825	1,929	1,962	2,006	2,068	2,056	2,157
Intent	1,627	1,713	1,575	1,787	1,837	1,872	2,057	2,019	2,119	2,118	2,121	2,169	2,087	2,160
Non-intentional	1,505	159	1,622	1,669	1,721	1,762	1,947	1,913	2,021	2,006	2,015	2,070	2,007	2,082
Intentional	111	113	115	105	111	106	105	101	91	92	90	82	74	71
Unknown	10	10	15	12	3	4	5	5	6	20	16	17	6	5
Age group														
0-14	880	868	835	862	912	872	918	918	963	921	964	901	804	795
15-24	1,373	1,468	1,495	1,574	1,560	1,573	1,655	1,634	1,697	1,608	1,672	1,747	1,623	1,567
25-34	1,620	1,697	1,741	1,833	1,863	1,844	1,959	1,929	1,911	1,836	1,811	1,745	1,656	1,639
35-44	1,824	1,875	1,970	1,900	1,880	1,939	2,004	1,903	1,938	1,947	1,805	1,817	1,743	1,685
45-54	2,111	2,280	2,315	2,335	2,333	2,463	2,648	2,588	2,626	2,632	2,525	2,564	2,313	2,326
55-64	2,570	2,705	2,666	2,643	2,613	2,755	2,904	2,894	3,083	3,070	3,044	3,137	3,064	3,263
65-74	3,072	3,174	3,378	3,201	3,434	3,446	3,967	3,686	3,941	3,941	4,000	3,830	3,896	4,094
75+	3,958	4,188	4,451	4,226	4,641	4,481	5,242	5,057	5,644	5,485	5,786	6,101	6,272	6,666
Injury mechanism														
Traffic accident	669	690	714	746	743	745	772	734	771	729	731	738	670	660
Fall	463	491	518	504	532	558	654	668	703	748	736	783	792	873
Stuck by/against	164	173	246	243	242	239	268	263	274	248	251	252	231	256
Stabbing	86	141	87	72	77	68	74	67	69	75	62	68	77	81
Poisoning	47	47	61	52	55	58	58	55	57	57	59	53	50	45
Fire/Flame ¹	35	323	35	46	54	61	59	52	56	56	67	58	51	31
Others	163	152	90	124	134	143	172	180	189	205	215	217	216	214

* Discharge rate: discharge rate per 100,000 population applied population estimate of the surveyed year.

¹Estimates with relative standard error of less than 5.

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1 **Data Resource Profile: The Korea National Hospital Discharge In-depth**
 2 **Injury Survey (KNHDIS)**

3 Table 1. The number of sampled hospitals, their rates of participation, and number of surveyed cases in the
 4 KNHDIS

Target year	Number of Target population hospitals					Number of Sample hospitals (A)					Number of Participated hospitals (B) (A/B, %)				
	sum	100-299	300-499	500-999	≥1000	sum	100-299	300-499	500-999	≥1000	Sum	100-299	300-499	500-999	≥1000
2004	512	334	84	84	10	150	70	27	43	10	147 (98.0)	67 (95.7)	27 (100.0)	43 (100.0)	10 (100.0)
2005	512	334	84	84	10	150	70	27	43	10	147 (98.0)	68 (97.1)	27 (100.0)	42 (97.7)	10 (100.0)
2006	512	334	84	84	10	150	70	27	43	10	144 (96.0)	65 (92.9)	26 (96.3)	43 (100.0)	10 (100.0)
2007	561	408	75	71	7	170	102	19	42	7	165 (97.1)	100 (98.0)	18 (94.7)	40 (95.2)	7 (100.0)
2008	561	408	75	71	7	170	102	19	42	7	170 (100.0)	102 (100.0)	19 (100.0)	42 (100.0)	7 (100.0)
2009	561	408	75	71	7	170	102	19	42	7	170 (100.0)	102 (100.0)	19 (100.0)	42 (100.0)	7 (100.0)
2010	561	408	75	69	9	170	103	18	40	9	166 (97.6)	101 (98.1)	18 (100.0)	39 (97.5)	8 (88.9)
2011	561	408	75	69	9	170	103	17	41	9	166 (97.6)	101 (98.1)	17 (100.0)	41 (100.0)	7 (77.8)
2012	561	408	75	69	9	170	103	17	41	9	166 (97.6)	101 (98.1)	17 (100.0)	40 (97.6)	8 (88.9)
2013	561	408	75	69	9	170	103	17	41	9	164 (96.5)	99 (96.1)	17 (100.0)	41 (100.0)	7 (77.8)
2014	561	408	75	69	9	170	103	17	41	9	164 (96.5)	98 (95.1)	17 (100.0)	41 (100.0)	8 (88.9)
2015	561	408	75	69	9	170	102	18	41	9	165 (97.1)	99 (97.1)	18 (100.0)	40 (97.6)	8 (88.9)
2016	561	408	75	69	9	170	101	18	42	9	161 (94.7)	95 (94.1)	17 (94.4)	41 (97.6)	8 (88.9)
2017	572	414	64	77	17	200	95	31	57	17	188 (94.0)	91 (95.8)	28 (90.3)	55 (96.5)	14 (82.4)
2018	572	414	64	77	17	200	95	31	57	17	191 (95.5)	91 (95.8)	30 (96.8)	55 (96.5)	15 (88.2)

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8 Table 2. The KNHDIS databases between 2004 and 2008

Target year	No. of hospitals participated	No. of discharged cases	No. of injury related cases
2004	147	175,100	26,791
2005	147	161,997	24,818
2006	144	170,008	25,511
2007	169	179,094	27,291
2008	170	190,074	28,031
2009	170	198,586	29,030
2010	166	220,838	31,654
2011	166	225,105	31,425
2012	167	235,526	32,758
2013	163	214,605	30,589
2014	165	224,061	31,389
2015	165	227,615	31,784
2016	162	235,579	30,829
2017	188	291,786	37,752
2018	191	302,593	38,109

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11 Table 3. The KNHDIS Data elements (as of Jun 2020)

Subjects	Items	Contents
	Hospital information	<ul style="list-style-type: none"> • Hospital identification code • Number of bed in hospital • Hospital address
	The KUHDDS	
	Demographics	<ul style="list-style-type: none"> • Gender • Age at admission • Date of birth • Zip code
	Admission information	<ul style="list-style-type: none"> • Expected source of payments • Admission date • Discharge date • Admission route (e.g. emergency, outpatient)
	Medical information	<ul style="list-style-type: none"> • Primary diagnosis KCD-10th(KCD-7th) code • Additional diagnosis KCD-10th(KCD-7th) code (up to 20¹) • External cause of injury (up to 2²) • Primary procedure ICD-9-CM • Date of procedure • Additional procedure code (up to 20¹) • Discharge method • Underlying cause of death • Discharge disposition (e.g. home, other health care facility, expired) • Treatment result (e.g. improved, ceased)
Injured patients		
S00-T75, T79 (ICD-10)	Injury information	<ul style="list-style-type: none"> • Intent • Place of occurrence • Activity when injured • Mechanism of injury • Date of injury occurrence • Nature of injury (e.g. superficial injury, open wound, fracture; generated from ICD code T00-07, T20-632) • Mode of transport • Proximal Risk factors for intentional self-harm (e.g. conflict with families, physical illness, financial problem) • Poisonous substance • Glasgow Outcome Scale • External causes of injuries (V-Y code)
T78, T80-T98, Y40-Y98(ICD-10)	Injury information	<ul style="list-style-type: none"> • External causes of injuries (V-Y code)

12 KUHDDS: Korea Uniformed Hospital Discharge DataSet

13 KCD-9th : Korean Standard Classification of Diseases, KCD

14 ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification

15 ¹ surveyed up to 5 in 2004, ² surveyed up to 1 in 2004

16 Table 4. Estimated injury discharge rates*, 2004-2017
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	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	9,081	9,477	9,490	10,091	10,518	11,131	11,979	12,488	13,093	13,184	13,505	13,800	14,218	14,199
Non-injuries	7,722	8,007	7,995	8,551	8,891	9,464	10,136	10,663	11,164	11,222	11,499	11,732	12,162	12,042
Injuries	1,359	1,470	1,495	1,541	1,628	1,667	1,843	1,825	1,929	1,962	2,006	2,068	2,056	2,157
Intent	1,627	1,713	1,575	1,787	1,837	1,872	2,057	2,019	2,119	2,118	2,121	2,169	2,087	2,160
Non-intentional	1,505	159	1,622	1,669	1,721	1,762	1,947	1,913	2,021	2,006	2,015	2,070	2,007	2,082
Intentional	111	113	115	105	111	106	105	101	91	92	90	82	74	71
Unknown	10	10	15	12	3	4	5	5	6	20	16	17	6	5
Age group														
0-14	880	868	835	862	912	872	918	918	963	921	964	901	804	795
15-24	1,373	1,468	1,495	1,574	1,560	1,573	1,655	1,634	1,697	1,608	1,672	1,747	1,623	1,567
25-34	1,620	1,697	1,741	1,833	1,863	1,844	1,959	1,929	1,911	1,836	1,811	1,745	1,656	1,639
35-44	1,824	1,875	1,970	1,900	1,880	1,939	2,004	1,903	1,938	1,947	1,805	1,817	1,743	1,685
45-54	2,111	2,280	2,315	2,335	2,333	2,463	2,648	2,588	2,626	2,632	2,525	2,564	2,313	2,326
55-64	2,570	2,705	2,666	2,643	2,613	2,755	2,904	2,894	3,083	3,070	3,044	3,137	3,064	3,263
65-74	3,072	3,174	34,378	3,201	3,434	3,446	3,967	3,686	3,941	3,941	4,000	3,830	3,896	4,094
75+	3,958	4,188	4,451	4,226	4,641	4,481	5,242	5,057	5,644	5,485	5,786	6,101	6,272	6,666
Injury mechanism														
Traffic accident	669	690	714	746	743	745	772	734	771	729	731	738	670	660
Fall	463	491	518	504	532	558	654	668	703	748	736	783	792	873
Stuck by/against	164	173	246	243	242	239	268	263	274	248	251	252	231	256
Stabbing	86	141	87	72	77	68	74	67	69	75	62	68	77	81
Poisoning	47	47	61	52	55	58	58	55	57	57	59	53	50	45
Fire/Flame ¹	35	323	35	46	54	61	59	52	56	56	67	58	51	31
Others	163	152	90	124	134	143	172	180	189	205	215	217	216	214

* Discharge rate: discharge rate per 100,000 population applied population estimate of the surveyed year.

¹Estimates with relative standard error of less than 5.

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