Epidemiology of Injuries in the Philippines: An Analysis of Secondary Data

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ABSTRACT

Background. Injury surveillance is viewed as an important component of injury prevention. Several data systems in the Philippines exist but have not been analyzed together. Analyzing these readily available data can guide policy making.

Objective. This report aimed to describe the epidemiology of injuries in the Philippines using secondary datasets.

Method. Death data of 2013 from the Philippines Statistics Authority and injury surveillance data of 2014 from the Department of Health were obtained and recoded. Summary statistics were generated.

Results. Injured persons mainly come from the young age group. There were a higher number of males compared to females. Provincial variations in death rates for specific injury types existed. There did not seem to be an obvious pattern in injury occurrence according to month and time of day. High numbers of injuries were reported during daytime but admission and death rates peak at night. Injuries were shown to be an anatomically heterogeneous group with dominance in superficial injuries, head trauma, and hand fractures.

Conclusion. Analysis of secondary datasets revealed the epidemiology of injuries in the Philippines. Results have implications in health policy and injury prevention.

Key Words: epidemiology, Philippines, secondary data analysis, surveillance, wounds and injuries

INTRODUCTION

Injury is defined as "physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy." Different classification methods can be used for injuries. It could be classified according to the cause (mechanical, radiant, thermal, electrical, or chemical) or according to anatomy (e.g. head, chest, abdominal). A variation of the cause would describe the situation surrounding the injury (e.g. interpersonal, war, force of nature, road injury).[1] Each of these classification systems can be useful in injury prevention and treatment. Information on injuries should be collected for public health purposes through surveillance.

Injury surveillance is viewed as an important component of a country's injury prevention efforts. The systematic and continuous collection of injury data allows empirical evidence to be considered whenever a country develops programs or policies.[1] Towards this end, the Philippines established multiple systems in place to capture data on injuries. The Philippine Statistics Authority (PSA) compiles data on registered deaths and stores these data in electronic

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format. The Philippine National Police (PNP) has its own reporting system although it is limited to injuries with criminal or legal implications. Finally, the Department of Health (DOH) has the Online National Electronic Injury Surveillance System (ONEISS).[2]

These systems operate independently and are not linked. Analyses of the data for deaths and police reports are not publicized in academic journals. The ONEISS regularly publishes quarterly reports describing the patterns of injuries and provides useful information on injury patterns in the country.[3] However, the system used to describe the injuries in terms of symptoms or manifestations is not ideal. The categorization uses broad criteria and does not provide much anatomical detail. A better description of injuries will help guide hospitals in terms of resource management and capacity building.

Describing the epidemiology of injuries is important in the context of creating a safer environment. The lack of high quality epidemiology data interferes with the development of targeted injury prevention programs.[4] For example, geographic data is useful for road injury prevention as it would identify injury hot spots which could serve as targets for stricter law enforcement or road engineering interventions. Identifying the ages affected by a specific injury would help tailor the message to target audience since education materials that may be effective among adults might not be applicable for children.

The study provides an analysis of available injury data leading to an epidemiologic description of injuries in the Philippines as to person, place, and time including anatomical descriptions of injuries. We decided to limit the analysis of two datasets namely, PSA death registry and ONEISS, as these contain enough information for classification into health. The PNP data were limited only to crimes involving persons and were thus biased towards interpersonal causes of injury (e.g. injury inflicted by another person) and self-harm (i.e. suicide). The database also did not contain enough descriptive information for classification into appropriate internal and external causes of injuries that would facilitate synthesis with other injury databases. The results of this analysis will be useful to guide prevention programs and resource allocation.

METHODS

Overview of the data sources

The Philippine Statistics Authority database contains individual records of registered deaths in the country. The data are obtained from death certificates submitted by health care providers to local civil registries. Local offices encode the data; the national office then conducts validation and data cleaning before releasing for public use. The database contains all the information recorded in the death certificate; however, for our purpose, only demographic and cause of death data were requested. There is a lag in validation, hence, only 2013 data were available when we requested data in 2015.

The Online National Electronic Injury surveillance system is managed by the Epidemiology Bureau of the Department of Health. In 2014, 116 hospitals all-over the country participated in the surveillance system, albeit, with varying degrees of compliance. The system collects demographic and health data of injury patients consulting in surveillance hospitals. The latest form is available at the Department of Health website. Data are collected at the Emergency room and might be updated depending on the course of the patient and results of further testing. Data are collected via pen-and-paper forms and then encoded separately. The encoded data are forwarded directly to the national system where the Epidemiology Bureau can conduct cleaning and analysis on a quarterly basis.

Method

Data on deaths from the Philippine Statistics Authority, and injuries from the Online National Electronic Injury surveillance system were requested. The PSA was able to provide 2013 data for deaths classified as injuries using the ICD codes V00 to Y99. The ONEISS was able to provide data for injuries which occurred and were reported in 2014. The databases were cleaned and re-coded in Excel. For ONEISS, injuries described were classified according to the Global Burden of Disease Injury criteria. If a person had multiple injuries, the person was counted under the injury category that was deemed most severe. The severity is based on the disability weight assigned to that injury type. The disability weights used were requested from the Institute of Health Metrics of the University of Washington.

Causes of injury can be classified into external and internal causes. External causes refer to the circumstances surrounding the death such as while driving a car or fall from a height. Internal causes are the physical manifestation of the injury on the body. Both external and internal causes were derived from ONEISS; however, the number of deaths analyzed was much lower and covered only hospitals participating in the surveillance. The internal causes were re-classified to GBD internal categories. Two analysts reviewed the ONEISS diagnoses and physical examination columns for the classification. If multiple injuries were present, the patient was classified under the injury with the highest GBD disability weight. Only external causes could be extracted from the PSA data and were classified according to the GBD external categories.

The datasets were cleaned using Microsoft Excel and Stata 12. Descriptive statistics such as mean and frequency distribution were generated for different indicators of person, place, and time. Death rates were also computed.

Ethical considerations

The analysis was part of a bigger study to determine the socioeconomic burden of injuries in the Philippines. The protocol for the analysis was approved by the UP Manila Research Ethics Board. In compliance with the Privacy Act, the use of the secondary data falls under analysis of data for public health reasons. Permissions to use the data were obtained from the agencies who own the datasets. Only de-identified datasets were used in the analysis.

RESULTS

A. Person

In 2013, The Philippine Statistics Authority reported 40,072 deaths due to violence and injuries. This translated to a reported death rate of 40.7 deaths per 100,000 persons due to injuries. Majority (78%) were males and the age-sex pyramid showed that a good proportion of deaths occurred among the young to middle age males. Mean age at death was 38.44 years old. Mean age at death of males was lower at 37.42 years (SD: 18.55) compared to females at 42.03 years (SD: 26.75). Only 36.1% were attended deaths or deaths seen by a health professional. (Figure 1A).

The 2014 ONEISS reported 44,839 injuries with 4,570 cases of admissions. There were 200 recorded deaths. Majority (70.42%) were males. The average age was 28.01 years (SD: 18.53). Age-sex pyramid shows that most injured persons were males in the young adult age group. (Figure 1B).

B. Place

Top provinces contributing to deaths due to injuries overall and for selected injury categories (road traffic, intentional causes, and falls) were determined using the PSA data. Top provinces in terms of deaths per population were also identified. Although Metro Manila and Cebu registered the highest number of deaths, the two areas were not among the top places with the highest death rates relative to the population. Four of the provinces with top death rates for injuries were found in Luzon while the top provinces for intentional causes were mostly found in Mindanao. No obvious pattern is found for deaths and death rates due to falls. (Table 1).

C. Time

There did not seem to be an obvious seasonal pattern in terms of occurrence of injuries with an almost equal distribution in number with small peaks in April, July, and December. June registered the lowest number of injuries. There also did not seem to be any pattern in terms of which days injuries occurred more frequently. The highest number, however, occurred on Sundays (16.69%) and the lowest on

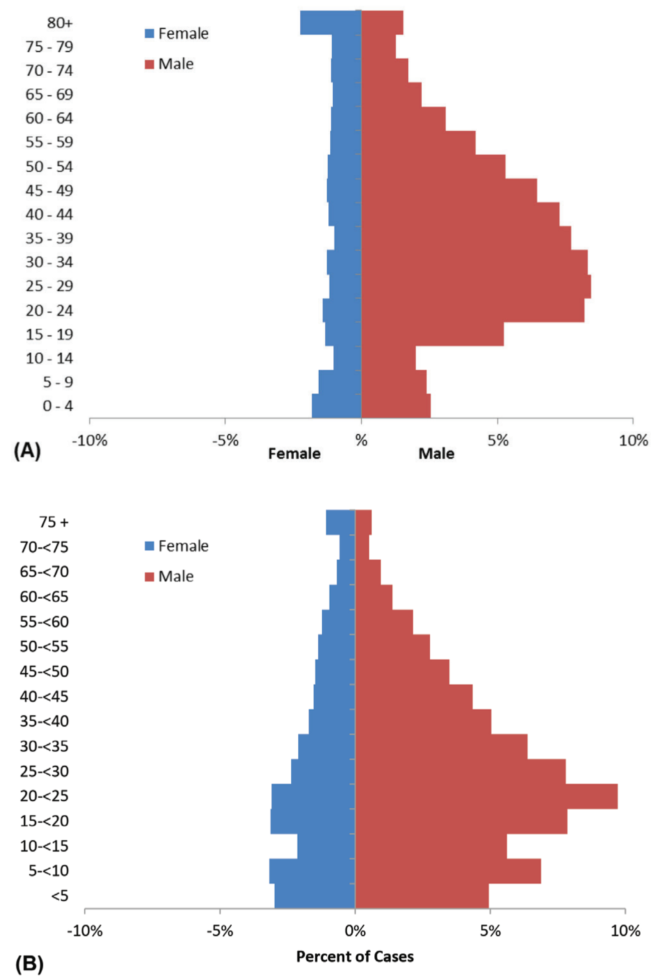

Figure 1. Age-sex distribution of (A) Registered deaths due to violence and injuries 2013 (n = 40,072) and (B) Injured individuals in ONEISS 2014 (n = 44,839, 1 missing information not included in figure).

Table 1. Top provinces in terms of absolute number of registered deaths and death rates for 2013

Overall injuries	Road traffic	Firearms, sharp objects and intentional causes	Falls
A. Absolute number of registered deaths			
Metro Manila	Metro Manila	Metro Manila	Metro Manila
Leyte	Pangasinan	Cebu	Cebu
Cebu	Davao Del Sur*	Cavite	Negros Occidental
Cavite	Isabela	Negros Occidental	Bohol
Iloilo	Nueva Ecija	Zamboanga del Sur	Batangas
B. Death rates (Death per population)			
Leyte	Nueva Vizcaya	Compostela Valley	Batanes
Batanes	Davao del Norte	Bukidnon	Mountain Province
Bohol	Isabela	Zamboanga del Sur^	Bohol
Misamis Occidental	Cagayan	Abra	Cagayan
Eastern Samar	La Union	Misamis Occidental	Misamis Occidental

** - including Davao City, ^ - including Zamboanga City*

Fridays (12.37%). Majority of injuries reported in ONEISS occurred during the time between 8 AM to 7:59 PM. The highest number occurred from 4 PM to 7: 59PM. The lowest number occurred during 12 AM to 3:59 AM. However, the death and admission rates were highest at night with highest death rate occurring at 12 AM to 3:59 PM and highest admission rate at 8 PM to 11:59 PM.

D. External causes of injury

External causes of death from PSA were analyzed according to sex. Due to the high number of unclassifiable and other causes of deaths, multiple imputation models were used to classify these deaths according to existing categories. Model inputs included age, sex, and region. From the baseline and imputed data, the common external causes of death for males were road and transport injury, injury due to firearms, and injury due to sharps/machinery. For women, the most common causes were road and transport injury, injury due to forces of nature, injury due to other unintentional causes, and fall injury. The year 2013 was the year a supertyphoon hit the Philippines which could explain the high number of deaths due to forces of nature. (Figure 2).

The ONEISS data was not analyzed according to sex and was not categorized by GBD categories for external causes due to lack of ICD codes. The ONEISS classification was retained and it was found to be similar to PSA death data with road injuries as the main contributor followed by falls, sharp objects, and mauling. (Figure 3).

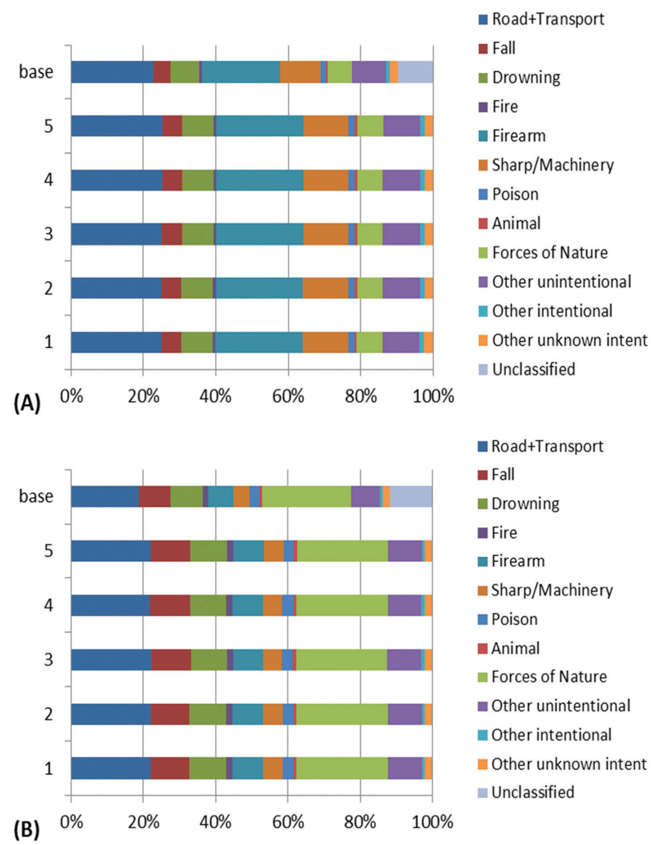

Figure 2. Distribution of deaths after multiple imputation of unclassified injuries (five imputation models) (A) Deaths among males (B) Deaths among females.

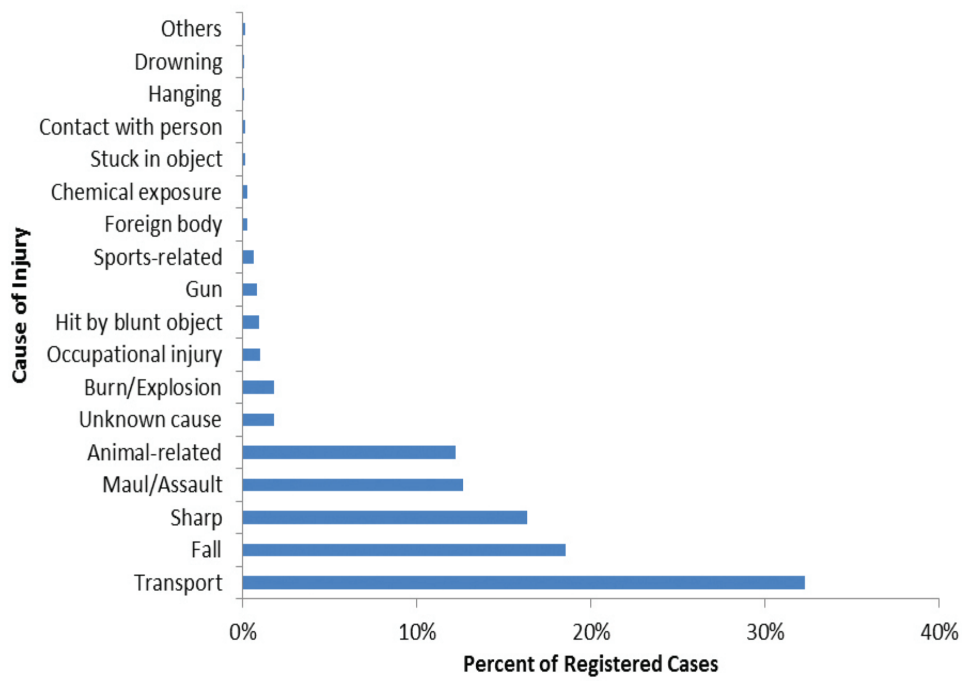

Figure 3. Distribution of ONEISS registered injuries according to cause (n = 44,840).

Table 2. Most Common Internal Causes of Injury based on ONEISS 2014

GBD category	Count	%	Cum %
A. All injuries			
Open wound(s)	28,107	62.70	62.70
Superficial injury of any part of the body	7,866	17.55	80.25
Fracture of hand (wrist & other distal part of hand)	1,786	3.98	84.23
Minor traumatic brain injury	1,036	2.31	86.54
Fracture of patella, tibia or fibula, or ankle	767	1.71	88.25
Fracture of clavicle, scapula, or humerus	733	1.64	89.89
Moderate-severe traumatic brain injury	693	1.55	91.43
Burn, no total body surface area reported	458	1.02	92.46
Injury to eyes	365	0.81	93.27
Fracture of radius and/or ulna	348	0.78	94.05
Normal on examination	348	0.78	94.82
Fracture of foot bones except ankle	261	0.58	95.40
Others	2,060	4.60	100.00
B. Admitted or Transferred Cases			
Open wound(s)	1,711	37.44	37.44
Minor traumatic brain injury	592	12.95	50.39
Moderate-severe traumatic brain injury	414	9.06	59.45
Superficial injury of any part of the body	401	8.77	68.23
Fracture of patella, tibia or fibula, or ankle	223	4.88	73.11
Fracture of hand (wrist & other distal part of hand)	204	4.46	77.57
Fracture of femur, other than femoral neck	155	3.39	80.96
Fracture of clavicle, scapula, or humerus	146	3.19	84.16
Internal hemorrhage in abdomen and pelvis	105	2.30	86.46
Burn, no total body surface area reported	72	1.58	88.03
Fracture of face bones	48	1.05	89.08
Normal on examination	44	0.96	90.04
Fracture of radius and/or ulna	43	0.94	90.98
Fracture of foot bones except ankle	42	0.92	91.90
Fracture of hip	41	0.90	92.80
Dislocation of shoulder	38	0.83	93.63
Fracture of sternum and/or ribs	38	0.83	94.46
Fracture of skull	31	0.68	95.14
Others	222	4.86	100.00
Open wound(s)	26,396	65.57	65.57
Superficial injury of any part of the body	7,465	18.54	84.11
Fracture of hand (wrist & other distal part of hand)	1,582	3.93	88.04
Fracture of clavicle, scapula, or humerus	587	1.46	89.5
Fracture of patella, tibia or fibula, or ankle	544	1.35	90.85
Minor traumatic brain injury	444	1.1	91.95
Burn, no total body surface area reported	386	0.96	92.91
Injury to eyes	340	0.84	93.76
Fracture of radius and/or ulna	305	0.76	94.51
Normal on examination	304	0.76	95.27
Others	1,905	4.73	100

E. Internal causes of injury

The five most common recorded injury categories were open wound(s), superficial injury of any part of the body, fracture of the hand, minor traumatic brain injury, and fracture of the patella, tibia or fibula, or ankle. If only admitted cases were considered, the most common injury categories were open wounds, minor traumatic brain injury, moderate-severe brain injury, superficial injury of any part of the body, and fracture of the patella, tibia or fibula, or ankle. (Table 2).

The highest number of deaths were classified under open wound(s), moderate-severe traumatic brain injury, and superficial injury of any part of the body. The highest case fatality rates; however, were for spinal cord lesion at neck level, asphyxiation and drowning, and severe chest injury. (Table 3).

DISCUSSION

Our secondary analysis showed that injured persons mainly come from the young age group. There were more males compared to females. Reported injuries peaked slightly on weekends and at night. Aside from superficial injuries and open wounds in various parts, the common injury types

Table 3. Deaths and Case Fatality Rates of According to Internal Cause of Injury based on ONEISS 2014

GBD Category	Death	Total Cases	CFR
Open wound(s)	79	28,107	0.281
Moderate-severe traumatic brain injury	56	693	8.081
Superficial injury of any part of the body	19	7,866	0.242
Asphyxiation and drowning	11	39	28.210
Minor traumatic brain injury	6	1,036	0.579
Fracture of patella, tibia or fibula, or ankle	5	767	0.652
Fracture of skull	4	81	4.938
Fracture of hip	3	66	4.545
Fracture of femur, other than femoral neck	3	260	1.154
Fracture of sternum and/or fracture of one or more ribs	2	95	2.105
Internal hemorrhage in abdomen and pelvis	2	187	1.070
Burn, no total body surface area reported	2	458	0.439
Fracture of hand (wrist & other distal part of hand)	2	1,786	0.112
Spinal cord lesion at neck level	1	2	50.000
Severe chest injury	1	12	8.333
Burns, >=20% total burned surface area	1	28	3.571
Spinal cord lesion below neck level	1	33	3.030
Crush injury	1	98	1.020
Fracture of face bones	1	204	0.490
Injury to eyes	1	365	0.274
Fracture of clavicle, scapula, or humerus	1	733	0.136

CFR – case fatality rate

were head trauma, fractures of the hand, and fractures of the lower leg. Death data revealed provinces with high number of deaths and death rates due to injuries.

The Global Burden of Disease group which tracks injury and disease burden also noted that injuries disproportionately affected the young adult and the male population.[5] Most of the findings were also consistent with published local literature granted that some of these local studies were limited in scope to specific hospitals. A retrospective analysis of Trauma Service patients in the Philippine General Hospital from 2004 to 2007 also noted this trend.[6] Similar to our findings, top causes included vehicular collisions, intentional causes such as stab wounds and gunshot wounds, and falls. An older study on trauma deaths conducted in Tarlac Provincial Hospital from 1995 to 1997 also described a similar age-sex pattern.[7] They reported that vehicular collisions, burns, and falls as the top external causes of deaths.

To our knowledge, this is the first paper to analyze available Philippine secondary data on injuries. A notable difference in our analysis was the use of GBD categories as much as possible. An advantage of this system is that we can readily compare our data with other countries. More importantly, the system follows less anatomical categories compared to the system used in ONEISS. This system has some weaknesses though with some categories being overly broad. Our analysis showed that there was a high number of deaths arising from seemingly minor injuries such as open wounds. Although, it could also be a problem in categorization arising from limited data included in the ONEISS data.

Our analysis only covered registered deaths, while death registration coverage for the Philippines was estimated to be 77%.[8] Data included in the death certificate were also limited which prevented our use of the more specific GBD categories for external causes. For example, we used transport injuries only instead of further enumerating deaths of drivers of four-wheel vehicles and passengers of two-wheel vehicles. Secular events affected our death analysis with a high number of deaths due to forces of nature as a result of the supertyphoon affecting the Philippines that year. Death data from other years could be analyzed to verify findings. Due to the difference in the year of ONEISS and PSA data as well, a reanalysis once updated death data are available could be conducted to confirm similarities in patterns derived from the two datasets.

Despite limitations, the findings in our analysis do have implications in the formulation of health policies and programs. Clearly, age affects risk of injury. Injury prevention interventions such as education should be packaged appropriately that will be relatable to the target age group. The high burden among the young also suggests that injury prevention will likely be cost-effective as life years gains are higher due to the young age of potential injured persons.

The mapping showed provinces where injury death rates are high. These should be relayed to government officials in these areas to inform them of the situation. It is a given that while all health facilities should be prepared to handle trauma cases but improving health facilities in these areas should be prioritized due to the higher burden. High death areas should also be considered as initial roll out sites for injury prevention programs and emergency medical systems.

Injury patients were shown to be a heterogeneous group but certain causes dominate. These dominant types serve as low lying fruits for health programs. In this case, the immediate target should be transport injuries. Drowning and firearms injuries are also leading causes of death while falls contribute high morbidity. Targeting even just these injury types will greatly impact injury incidence. In addition, health facilities and workers should have the capacity to treat common forms of injury (e.g. head trauma and hand fractures). Further, mapping and sub-analysis of the epidemiology of these diseases should be conducted to further tailor policies and programs.

CONCLUSION

Analysis of secondary datasets revealed that most of injured individuals are young and male. There is no seasonality but more reported injuries occur on Sundays and during day time. Transport injuries and falls are the top causes of injuries in the Philippines. Results have implications in health policy and injury prevention. Mapping helped identified provinces with high injury rates. Injury categorization identified common injuries that should be considered in capacity building of healthcare providers. Strengthening data systems will likely yield better data and allow more precise policy recommendations.

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Statement of Authorship

All authors approved the final version submitted.

Author Disclosure

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