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Comparison of Syndromic Surveillance and Hospital Discharge Data for Unintentional Drowning in Metropolitan Houston, Texas, USA

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Abstract

Background: Syndromic surveillance, which provides real-time data, may provide timely drowning surveillance compared to hospital discharge data where release of data may be delayed. We compared data on hospital visits for unintentional drowning identified in hospital discharge and syndromic surveillance datasets for accuracy and completeness.

Methods: We compared data for hospital visits for unintentional drowning identified in the Texas Health Care Information Collection hospital discharge and syndromic surveillance datasets

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for metropolitan Houston, Texas, USA from 2019-2021. Hospital visits included emergency department-only visits and hospital admissions. We compared time-series visualization of hospital visits between datasets. Injury burden, demographics, and inter-county distribution of drowning patients were compared using Pearson correlation coefficient for continuous data and Pearson Chi-square Goodness-of-Fit test for categorical data.

Results: We identified 860 hospital discharge visits and 929 syndromic surveillance visits (quarterly median (Interquartile Range): 64.0 (26.8, 117.5); 54.5 (28.0, 132.3) respectively) for unintentional drowning. Time-series visualization showed high correlation between syndromic surveillance and hospital discharge visits (correlation coefficient: 0.93 (95% CI:0.77-0.98)). There were small differences by race, ethnicity, and county for all ages and for pediatrics and large differences by sex for all ages in the number of unintentional drowning hospital visits identified within the datasets.

Conclusions: Regional unintentional drowning burden and trends are highly correlated between syndromic surveillance and hospital discharge data. Small differences by race, ethnicity, and county and large differences by sex in the number of unintentional drowning hospital visits were identified between datasets. Syndromic surveillance is useful for real-time surveillance of unintentional drowning.

Background

Drowning is the third leading cause of death by unintentional injury in the world[1, 2] and one of the top ten causes of child death in every global region.[2] In the United States (US), it is the leading cause of unintentional injury death in children aged 1-4 years.[3] Between 2019-2021, there was an average of 4,400 fatalities from drowning annually in the US.[4] There were an estimated 7,985 US emergency department (ED) visits in 2021 for non-fatal, unintentional (including undetermined) drowning for persons of all ages.[5]

There are multiple ways to monitor drowning burden, each with important strengths and limitations which influence the type of public health interventions. Fatal drowning surveillance at the county level can be studied using National Vital Statistics System (NVSS) fatality data which uses death certificate information.[4]

Fatal and non-fatal drowning surveillance may be performed by Web-based Injury Statistics Query and Reporting System (WISQARS),[5] or analysis of hospital and ED discharge data such as Healthcare Cost and Utilization Project databases (NIS, KID, NEDS).[6] It is challenging to monitor non-fatal drowning burden through WISQARS because its data source (National Electronic Injury Surveillance System) only provides national injury estimates based on representative data.

Regional level non-fatal drowning surveillance is challenging because there is no single source of data. Data sources, such as emergency medical services, hospital, and clinic records, are disparate, lack standardization of variables and have a high frequency of missing data.

Hospital discharge datasets have several advantages. They capture demographic, encounter, and clinical information such as diagnoses and clinical procedures using standardized data

templates and dictionaries. The information is considered reliable in estimating injury burden because of the use of standardized coding viz., International Classification of Diseases 10th Revision, Clinical Modification [ICD-10-CM]. However, hospital discharge datasets also have disadvantages. They are subject to coding errors, do not include urgent care and clinic visit information, and are not timely. Often, data are released more than one year after conclusion of the data period, thus making real-time injury surveillance challenging. Moreover, these datasets lack enough detail to inform local injury prevention measures. Patterns and causes of drowning vary geographically[7, 8] and are influenced by the local environment.[9–12] Therefore, timely local surveillance is necessary to develop countermeasures tailored to individual communities.[13–15]

Syndromic surveillance is a novel tool to inform local surveillance efforts and public health responses.[16] By capturing information directly from ED chief complaints, discharge diagnosis and ICD-10 codes, syndromic surveillance systems provide a near real-time data stream to monitor community disease patterns. While these systems were originally designed to detect infectious disease outbreaks and bioterrorism-related events,[16–19] they have been expanded to all-hazards analysis.[20] Previous studies have reported on the use of syndromic surveillance in heat waves and cold weather,[21, 22] bites,[23, 24] mass gatherings,[25] mental health,[26] and firearm and traffic injuries.[27, 28]

The use of syndromic surveillance as a tool for drowning surveillance or in drowning prevention is still early[29, 30] and not well understood. Furthermore, how syndromic surveillance data differs from hospital discharge data in terms of drowning burden, demographics, and trends at a regional level is unexplored. We compared unintentional drowning burden and demographic characteristics of drowning victims between syndromic surveillance and hospital discharge data in a large metropolitan area.

Methods

This is a cross-sectional study that compared data on hospital visits for unintentional drowning identified in hospital discharge and syndromic surveillance datasets for the 8-county metropolitan Houston region, Texas, USA from January 1, 2019, to December 31, 2021. Hospital visits, which included ED-only visits as well as hospital admissions, were selected based on the patient's county of residence being in one of the following Texas counties: Harris, Chambers, Liberty, Fort Bend, Brazoria, Galveston, Montgomery, or Waller. In 2020, the population in the region was 7,092,073. By age, children 0-17 years comprised 26.2% of the population. Persons of Hispanic ethnicity comprised 38.8% of the population; non-Hispanic White persons-33.9%; Black persons-18.5%; Asian persons 8.3%; and Native American or Pacific islander persons 1.1% of the population.[31] The City of Houston instituted syndromic surveillance in 2016 but it was not fully operational until 2018. Therefore, we began monitoring unintentional drowning injury trends from 2019 onwards.

Inpatient and outpatient (ED) hospital discharge data were obtained from the Texas Health Care Information Collection (THCIC) and combined to produce the hospital discharge dataset. The dataset includes patients who are treated in the ED or hospitalized from the

ED. THCIC collects data from hospitals and health maintenance organizations operating in Texas.[32] Except for a few small rural hospitals, all licensed hospitals in Texas submit inpatient and/or outpatient discharge data to the THCIC. There were 191 hospitals in the 8-county metropolitan Houston region that submitted data to the THCIC in 2021. Data are submitted quarterly and include patient demographics, admission date, admission source, length of stay, discharge status (alive/dead), transfer status, diagnosis (ICD-10CM) codes, procedure codes and billing data. All direct personal and demographic identifiers are excluded. Each hospital is responsible for data accuracy and completeness but data are subject to coding errors. After submission, data are audited and verified by THCIC for accuracy. A final encounter per patient is prepared. THCIC data cannot be linked with other data sources.[33] Mortality data in THCIC reflects only patients who died in the hospital. We selected unintentional drowning hospital visits with the ICD-10CM codes: W65-W74, V90, V92 and T75.1XXA, W16 (with 6th character=1 except 16.4 and 16.9 where 5th character=1), W22.041 from hospitals within the 8-county region between 2019-2021. THCIC data are available after a lag of one year.

We obtained National Syndromic Surveillance Program (NSSP) data from the City of Houston Health Department (HHD) Electronic Surveillance System Early Notification of Community-based Epidemics (ESSENCE) platform. The dataset includes patients who are treated in the ED or hospitalized from the ED. In 2021, the HHD-ESSENCE platform included data from 88 hospital emergency departments within the 8-county region. NSSP is a multi-lateral initiative across hospitals, healthcare facilities, regional and state health departments, and the Centers for Disease Control (CDC). It centralizes electronic patient encounter data, such as free-text chief concern, discharge diagnosis codes, and select demographic information (e.g., age, sex) from laboratories, EDs, urgent care centers, and inpatient centers for rapid analysis and secure transmission to participating agencies. Specifically, data are available within a platform called BioSense within 24 hours after a patient's initial presentation, where it can be used for near real-time public health surveillance. Diagnostic information is collected using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM), ICD-10-CM, and Systematized Nomenclature of Medicine codes.[20, 34]

Victims of unintentional drowning were identified in syndromic surveillance data from the chief complaint, discharge diagnosis and ICD-10-CM codes of hospital visits. The chief complaint and discharge diagnosis of hospital visits describe the purpose of the visit, the health care provider's assessment, or the triage notes. The CDC developed and uses the "unintentional drowning v1" definition in the NSSP.[29] This definition queries the patient's discharge diagnosis and chief complaint information and relevant ICD-10-CM codes (T75.1, V90, V92, W16 (with 6th character=1 except 16.4 and 16.9 where 5th character=1), W22.041, W65-W74, codes only included when 7th character =A or missing) to identify initial unintentional drowning encounters in ESSENCE. In addition to discharge diagnosis codes, the definition relies on the chief complaint inclusion (e.g., "drown", "underwater", "submerge" and respiratory symptoms related to contact with a body of water) and exclusion terms (e.g., "drown self", "attempt to drown", and "feel or sound like drowning") to further identify drowning-related ED and urgent care visits and decrease false positives.[29] We manually reviewed the chief complaint and discharge diagnosis and excluded hospital

visits where the chief complaint or discharge diagnosis did not indicate drowning.[29] Most unintentional drowning hospital visits are captured by the above definition along with manual review.[29] We excluded undetermined drowning encounters (Y21) and urgent care clinic visits. Syndromic surveillance data are subject to variation in coding, reporting, and availability of visit-level data between facilities or over time. In our study, through a data use agreement with the HHD, we obtained aggregate regional data by demographics, year, facility type (ED, urgent care clinic), ICD-10 codes, chief complaint, and discharge diagnosis. We were unable to analyze hospital visits by individual facility, facility size or location.

Data Analysis

We compared the NSSP (syndromic surveillance) and THCIC (hospital discharge) data for unintentional drowning hospital visits in the 8-county metropolitan Houston region for quarterly burden, demographics (sex, race, Hispanic ethnicity, and age (all ages, pediatric 0-17 years)) and for inter-county distribution. Race was categorized as Black, White, Native American or Alaska Native, Asian or Pacific Islander, Other, and not recorded. “Other race” included patients not specified in the previous categories. The primary outcome was strength of association between NSSP data and THCIC data. Time-series visualization of injury burden was performed for both datasets. Injury burden, demographics, and inter-county distribution for unintentional drowning were compared using a) Pearson Correlation Coefficient for continuous data; and b) Pearson Chi-Square Goodness-of-Fit test with Cohen’s ω ($\sqrt{X^2/N}$) and the standardized residual $((\# \text{observed} - \# \text{expected})/\sqrt{\# \text{expected}})$ for categorical data. We used observed (hospital discharge data) and expected (syndromic surveillance data) percentages to calculate reported statistics (standardized residual values, chi-square p-values and Cohen’s ω). Effect size compares the extent of the difference between groups. Generally, a small effect size for Cohen’s ω is 0.1, 0.3 for median effect and 0.5 for large effect size.[35] We utilized STROBE guidelines for observational studies.[36] This study was approved by the Institutional Review Board of Baylor College of Medicine (protocol-H-49897).

Patient and public involvement

Patient and public input were not sought since data were retrospective. They did not participate in study design or recruitment. We developed research questions based on existing gaps in drowning surveillance. The study results (injury burden and trends) will be disseminated to the community after publication.

Results

We identified 860 hospital discharge visits and 929 syndromic surveillance visits (quarterly median (IQR): 64.0 (26.8, 117.5); 54.5 (28.0, 132.3)) respectively for unintentional drowning between 2019-2021. Comparison of quarterly mean and quarterly median number of hospital visits between datasets revealed a close correlation between datasets for both age cohorts (All ages: Pearson Coefficient: 0.93 (95% CI: 0.77-0.98); Pediatric: Pearson Coefficient: 0.95 (95% CI: 0.84-0.99)) (Table 1, Figure 1).

There were small and small-to-medium differences in the number of unintentional drowning hospital visits by quarter between the two datasets (All ages: Cohen's $\omega = 0.11$; Pediatric: Cohen's $\omega = 0.20$) (Table 2).

Comparison of the number of unintentional drowning hospital visits between datasets by race categories for both age cohorts revealed small differences (All ages: Cohen's $\omega = 0.16$; Pediatric: Cohen's $\omega = 0.18$) (Table 3).

Similarly, comparison of the number of unintentional drowning hospital visits between datasets by Hispanic ethnicity for both age cohorts revealed small differences (All ages: Cohen's $\omega = 0.20$; Pediatric: Cohen's $\omega = 0.17$) (Table 4).

Comparison of the number of unintentional drowning hospital visits by sex between the two datasets revealed a large difference in the cohort comprising all ages (Cohen's $\omega = 1.00$) but a small difference in the pediatric group (Cohen's $\omega = 0.04$) (Table 5).

Finally, we observed small differences in the number of unintentional drowning hospital visits by county between both datasets for all ages (Cohen's $\omega = 0.17$) and for the pediatric group (Cohen's $\omega = 0.17$) (Supplemental Table 1).

Discussion:

We observed that unintentional drowning burden and trends were highly correlated between syndromic surveillance and hospital discharge data. There were small differences by race, ethnicity, and county for all ages and for the pediatric group in the number of unintentional drowning hospital visits identified within the datasets. We observed large differences by sex in the entire cohort and small differences by sex for the pediatric group in the number of unintentional drowning hospital visits identified within the datasets. The few, small differences between the datasets suggest that, at a regional level, syndromic surveillance may be novel and useful for conducting real-time surveillance for unintentional drowning.

The time series curves during the 3-year period, 2019-2021 between the two datasets were closely correlated. They revealed that the peak in unintentional drownings in 2020 was lower than the preceding and following years. This coincided with the outbreak of the coronavirus-19 pandemic with resultant social distancing, quarantines, and closure of many public spaces. This is corroborated with national data, where decreases in unintentional drownings were observed during 2020 with subsequent increases in unintentional drownings when stay-at-home orders were lifted.[37, 38] The same trend, seen in both data sources, indicates that syndromic surveillance will likely show similar trends over time as hospital discharge data.

Unintentional drowning hospital visits were fewer in 2019 for syndromic surveillance data compared to hospital discharge data because fewer hospitals participated in syndromic surveillance as it was novel. In subsequent years, the presence of drowning keywords and ICD-10 codes in the drowning definition may explain the higher number of hospital visits identified in syndromic surveillance data compared to hospital discharge data. The large difference in the number of hospital visits for drowning by sex between datasets in the entire

cohort could be explained by a higher proportion of hospital visits with unrecorded sex in the hospital discharge dataset. In our study, there was a high proportion of pediatric hospital visits. Children are more likely than adults to be medically evaluated after drowning. This is because children commonly drown in swimming pools with shorter submersion times compared to adults who often drown in more hazardous natural water settings that are associated with higher fatality.[39] Differences in the number of hospital visits for drowning between datasets may be due to variations in reporting by county or duplicate hospital visits arising from inter-facility transfer.

We observed that the number of hospital visits in syndromic surveillance data were higher than in hospital discharge data even though fewer hospitals participate in syndromic surveillance compared to the number of hospitals that submit hospital discharge data. This may be because syndromic surveillance utilizes key words and ICD-10 codes to identify patients of drowning whereas THCIC only uses ICD-10 codes to identify these patients.

The syndromic surveillance criteria to identify patients of drowning are different from the World Health Organization's (WHO) definition of drowning. This reflects differences in the objectives and emphasis between each description. The WHO defines drowning as "the process of experiencing respiratory impairment from submersion or immersion in a liquid." [40] The syndromic surveillance criteria to identify drowning are crafted for public health surveillance purposes. Therefore, while it captures hospital visits by patients who were submerged in water and include expected respiratory symptoms (e.g., choking), it cannot determine whether the airway was truly "submerged" and there was associated respiratory impairment. Notably, some patients in both the THCIC and syndromic surveillance datasets may not meet the WHO definition of drowning because they may include submerged patients without respiratory symptoms who require ED evaluation.

Syndromic surveillance has limitations. First, it may underestimate or overestimate unintentional drowning syndromic surveillance visits because of variations in coding, reporting, and availability of visit-level data between facilities or over time. Further, linking hospital discharge data with other datasets, including syndromic surveillance systems is prohibited.[33] This can limit data accuracy. Second, syndromic surveillance data cannot reliably determine the intent of drowning because of variability in ICD-10-CM coding. Not all syndromic surveillance visits possess ICD-10-CM codes, and even when included, not all codes characterize an intent. Other syndromic surveillance visits are described based on their chief complaint or discharge diagnosis which may lack intent. As one example, the ICD-10-CM code T75.1 has been used both for intentional and unintentional drowning, making this a poor differentiator for drowning intent. Hospital discharge data may be more useful than syndromic surveillance data in identifying intent because they rely on ICD-10 codes and not on the subjective text in chief complaint or discharge diagnosis narratives that are present in syndromic surveillance data. Third, duplicate hospital visits are possible in both datasets arising from inter-facility transfer. Unfortunately, data from both datasets are provided in aggregate, devoid of personal identifiers and data use agreements preclude linkage of syndromic surveillance data and hospital discharge data with other datasets.[33] Finally, syndromic surveillance data lacks consistent information on patient disposition and

cannot reliably differentiate between fatal and non-fatal drowning. This drawback could be mitigated if syndromic surveillance data are used together with medical examiner data.

Our study has important public health implications. Drowning surveillance has currently focused mainly on fatal drowning using NVSS data. The delay in obtaining non-fatal drowning data can negatively impact real-time drowning surveillance. Our results, which demonstrate a close correlation between hospital discharge and syndromic surveillance drowning injury burden and trends, suggest that syndromic surveillance data could provide an accurate and viable approach to real-time regional drowning surveillance. This can be enhanced by encouraging greater participation by health facilities in ESSENCE. Syndromic surveillance also provides information on the aquatic setting which can assist in the planning of local drowning countermeasures. Drowning surveillance and prevention could be further enhanced by combining syndromic surveillance and medical examiner data.

Our study has limitations. First, the results are for one region in the US and may not be generalizable to other areas, especially where there are different bodies of water or in regions which do not use NSSP. Second, because of incomplete patient disposition information, we were unable to characterize fatal and non-fatal unintentional drowning. This could be improved by including medical examiner data on fatal drownings to syndromic surveillance data to describe the epidemiology of drowning.

Conclusions:

Regional unintentional drowning burden and trends are highly correlated between syndromic surveillance and hospital discharge datasets. There are small differences in the number of hospital visits for drowning by race, ethnicity, and county and a larger difference in the number of hospital visits by sex between datasets. Given its timeliness and completeness, syndromic surveillance may be valuable when conducting real-time unintentional drowning surveillance at the regional setting. Future research should evaluate syndromic surveillance in unintentional drowning prevention.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Availability of data and material:

Data will be available upon conclusion of the grant period on October 1, 2026 after completing a data use agreement.

Abbreviations:

CDC	Centers for Disease Control and Prevention
ED	Emergency Department
ESSENCE	Electronic Surveillance System Early Notification of Community-based Epidemics
HHD	Houston Health Department
NSSP	National Syndromic Surveillance Program
NVSS	National Vital Statistics System
THCIC	Texas Health Care Information Collection
WISQARS	Web-based Injury Statistics Query and Reporting System

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What is already known on this topic

Syndromic surveillance has been used to monitor the burden and temporal trends of several injuries but it is only beginning to be used for drowning.

What this study adds

Regional unintentional drowning burden and trends are highly correlated between syndromic surveillance and hospital discharge data with minor differences in the number of hospital visits between datasets.

How this study might affect research, practice, or policy

Given its timeliness, syndromic surveillance may be a valuable tool to conduct real-time surveillance of unintentional drowning at the regional level.

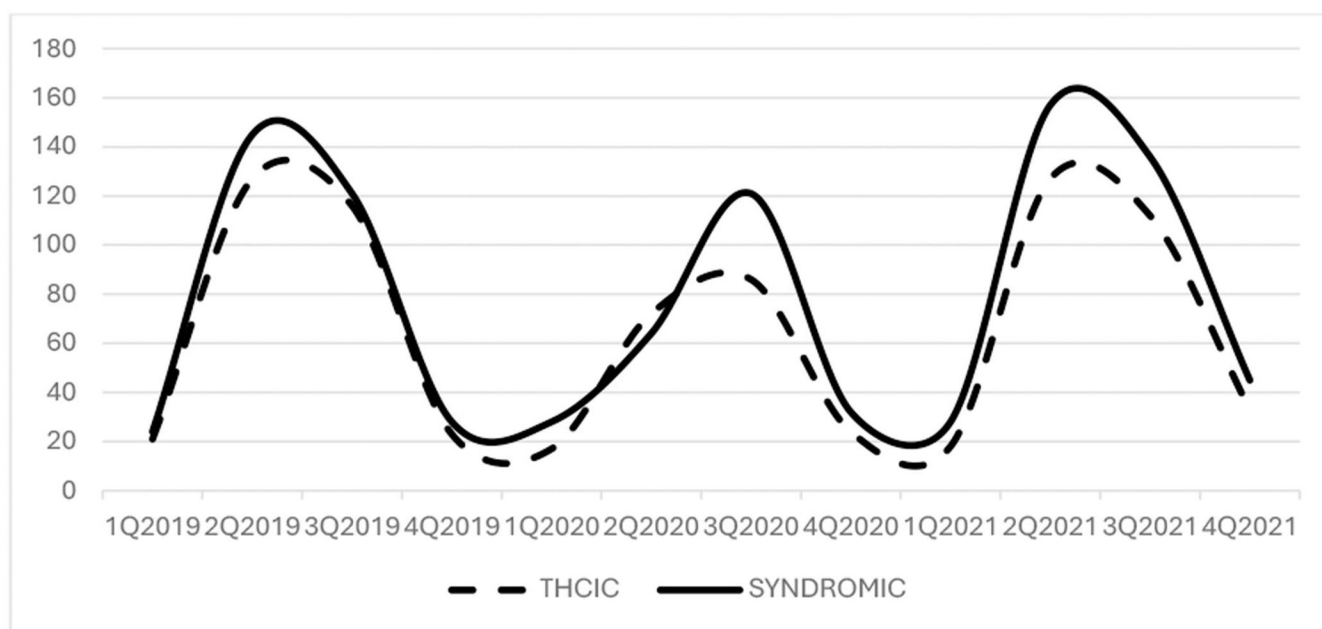


Figure 1. Time Series Graph Comparing Number of Unintentional Drowning Hospital Visits Identified in Syndromic Surveillance and Hospital Discharge Datasets (THCIC) (2019–2021) in Metropolitan Houston, Texas

Source for syndromic surveillance data: Houston Health Department Electronic Surveillance System Early Notification of Community-based Epidemics (HHD-ESSENCE); Source for hospital discharge data: Texas Health Care Information Collection (THCIC)

Table 1.

Number of Unintentional Drowning Hospital Visits Identified in Syndromic Surveillance and Hospital Discharge Datasets (2019-2021) in Metropolitan Houston, Texas

		Total N	Quarterly Mean ($\pm$ SD)	Quarterly Median (IQR)	Pearson Correlation (95% CI)
All Ages (n=1,789)	Syndromic Surveillance	929	77.4 ($\pm$ 53.6)	54.5 (28.0, 132.3)	0.93 (0.77 – 0.98)
	Hospital Discharge	860	71.7 ($\pm$ 49.9)	64.0 (26.8, 117.5)	
Pediatric (0-17 years) (n=1,605)	Syndromic Surveillance	777	64.8 ($\pm$ 45.8)	44.0 (23.8, 109.3)	0.95 (0.84 – 0.99)
	Hospital Discharge	828	69.0 ($\pm$ 47.7)	60.0 (26.8, 114.8)	

SD: Standard Deviation; CI: Confidence Interval; IQR: Interquartile Range

Source for syndromic surveillance data: Houston Health Department Electronic Surveillance System Early Notification of Community-based Epidemics (HHD-ESSENCE); Source for hospital discharge data: Texas Health Care Information Collection (THCIC)

Table 2.

Distribution of Unintentional Drowning Hospital Visits by Quarter Identified in Syndromic Surveillance and Hospital Discharge Datasets (2019- 2021) in Metropolitan Houston, Texas

	Year	Quarter	Syndromic Surveillance N (%)	Hospital Discharge N (%)	Standardized Residuals	Cohen's ω
All Ages (n=1,789)	2019	1Q	24 (2.6)	26 (3.0)	0.50	0.11 (small)
		2Q	145 (15.6)	154 (17.9)	1.16	
		3Q	121 (13.0)	131 (15.2)	1.24	
		4Q	28 (3.0)	32 (3.7)	0.85	
	2020	1Q	28 (3.0)	23 (2.7)	-0.38	
		2Q	64 (6.9)	96 (11.2)	3.26	
		3Q	121 (13.0)	98 (11.4)	-0.92	
		4Q	32 (3.4)	29 (3.4)	0.01	
	2021	1Q	28 (3.0)	19 (2.2)	-0.92	
		2Q	157 (16.9)	124 (14.4)	-1.26	
		3Q	136 (14.6)	98 (11.4)	-1.71	
		4Q	45 (4.8)	30 (3.5)	-1.19	
Pediatric (0-17 years) (n=1,605)	2019	1Q	20 (2.6)	26 (3.1)	0.96	0.20 (small-to-medium)
		2Q	133 (17.1)	148 (17.9)	0.54	
		3Q	107 (13.8)	128 (15.5)	1.29	
		4Q	26 (3.3)	32 (3.9)	0.89	
	2020	1Q	23 (3.0)	23 (2.8)	-0.37	
		2Q	52 (6.7)	88 (10.6)	4.37	
		3Q	95 (12.2)	93 (11.2)	-0.80	
		4Q	26 (3.3)	29 (3.5)	0.32	
	2021	1Q	21 (2.7)	19 (2.3)	-0.71	
		2Q	128 (16.5)	122 (14.7)	-1.25	
		3Q	110 (14.2)	91 (11.0)	-2.45	
		4Q	36 (4.6)	29 (3.5)	-1.47	

Source for syndromic surveillance data: Houston Health Department Electronic Surveillance System Early Notification of Community-based Epidemics (HHD-ESSENCE); Source for hospital discharge data: Texas Health Care Information Collection (THCIC)

Table 3.

Distribution of Unintentional Drowning Hospital Visits by Race Identified in Syndromic Surveillance and Hospital Discharge Datasets (2019- 2021) in Metropolitan Houston, Texas

	Race	Syndromic Surveillance N (%)	Hospital Discharge N (%)	Standardized Residuals	Cohen's ω
All Ages^a(n = 1,789)	White	540 (58.1)	489 (56.9)	-0.56	0.16 (small)
	Black or African American	190 (20.5)	145 (16.9)	-2.40	
	Native American or Alaska Native	1 (0.1)	1 (0.1)	0.15	
	Asian or Pacific Islander	40 (4.3)	33 (3.8)	-0.68	
	Other	153 (16.5)	191 (22.2)	4.07	
	Not Recorded	5 (0.5)	0 (0.0)	--	
Pediatric^a(0-17 years) (n = 1,605)	White	460 (59.2)	472 (57.1)	-0.84	0.18 (small)
	Black or African American	154 (19.8)	137 (16.6)	-2.11	
	Native American or Alaska Native	1 (0.1)	1 (0.1)	0.19	
	Asian or Pacific Islander	38 (4.9)	33 (4.0)	-1.19	
	Other	123 (15.8)	184 (22.2)	4.64	
	Not Recorded	1 (0.1)	0 (0.0)	--	

^a Chi-Square p-value significant at the 0.05 alpha level

Source for syndromic surveillance data: Houston Health Department Electronic Surveillance System Early Notification of Community-based Epidemics (HHD-ESSENCE); Source for hospital discharge data: Texas Health Care Information Collection (THCIC)

Table 4.

Distribution of Unintentional Drowning Hospital Visits by Ethnicity Identified in Syndromic Surveillance and Hospital Discharge Datasets (2019- 2021) in Metropolitan Houston, Texas

	Ethnicity	Syndromic Surveillance N (%)	Hospital Discharge N (%)	Standardized Residuals	Cohen's ω
All Ages^a(n = 1,789)	Hispanic	334 (36.0)	287 (33.4)	-1.27	0.20 (small-to-medium)
	Non-Hispanic	562 (60.5)	572 (66.5)	2.29	
	Not Recorded	33 (3.6)	1 (0.1)	-5.38	
Pediatric^a(0-17 years) (n = 1,605)	Hispanic	290 (37.3)	278 (33.6)	-1.76	0.17 (small)
	Non-Hispanic	470 (60.5)	549 (66.3)	2.15	
	Not Recorded	17 (2.2)	1 (0.1)	-4.03	

^aChi-Square p-value significant at the 0.05 alpha level

Source for syndromic surveillance data: Houston Health Department Electronic Surveillance System Early Notification of Community-based Epidemics (HHD-ESSENCE); Source for hospital discharge data: Texas Health Care Information Collection (THCIC)

Table 5.

Distribution of Unintentional Drowning Hospital Visits by Sex Identified in Syndromic Surveillance and Hospital Discharge Datasets (2019- 2021) in Metropolitan Houston, Texas

	Sex	Syndromic Surveillance N (%)	Hospital Discharge N (%)	Standardized Residuals	Cohen's ω
All Ages^a(n = 1,789)	Male	537 (57.8)	457 (53.1)	-1.80	1.00 (large)
	Female	391 (42.1)	375 (43.6)	0.68	
	Not Recorded	1 (0.1)	28 (3.3)	29.27	
Pediatric (0-17 years) (n = 1,605)	Male	441 (56.8)	452 (54.6)	-0.82	0.04 (small)
	Female	336 (43.2)	375 (45.3)	0.94	
	Not Recorded	0 (0.0)	1 (0.1)	--	

^aChi-Square p-value significant at the 0.05 alpha level.

Source for syndromic surveillance data: Houston Health Department Electronic Surveillance System Early Notification of Community-based Epidemics (HHD-ESSENCE); Source for hospital discharge data: Texas Health Care Information Collection (THCIC)