

Arizona Drowning Data Report

CDC Foundation



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Executive summary

Drowning remains a significant public health concern in Arizona and was the leading cause of death among children aged 1 to 4 years in the United States from 2018 to 2023.[1] Maricopa County, Arizona reported a 79% increase in drowning death rates among children aged 0 to 4 years from 2015 to 2016 and a 100% increase from 2019 to 2020.[2,3]

This report examines the burden and circumstances of drowning in Arizona and evaluates the data systems currently used to monitor drowning incidents. To better characterize the full burden of drowning, expanded inclusion criteria for drowning deaths were developed and used throughout the report. From 2016 to 2023, Arizona residents experienced 2,122 unintentional drowning-related emergency department visits and 456 unintentional drowning-related hospitalizations. From 2009 to 2023, there were an additional 1,589 unintentional drowning deaths. Children aged 1 to 4 years experienced the highest drowning rates across all outcomes, while males and American Indian or Alaska Native residents experienced disproportionately high fatal drowning rates. Pools and home-based water settings accounted for most fatalities, and Child Fatality Review data identified lack of supervision, inability to swim, and lack of personal flotation device use as common contributing factors.

Findings indicate that drowning-related data are fragmented across agencies, vary in completeness, and often lack critical circumstantial information needed to guide prevention. Strengthening data sharing, surveillance infrastructure, and collection of risk factor information would improve Arizona's ability to identify high-risk populations, tailor prevention strategies, and reduce drowning-related injuries and deaths statewide.



Introduction

In 2024, Arizona's estimated population was 7,621,703, a figure that has grown on average by 1.4% per year over the last decade.[4] The state's landscape is defined by extreme climatic contrasts, such as vast desert regions with intense heat and minimal rainfall in the south and west versus cooler, higher-elevation areas with seasonal freezing in the north.[5,6] These extreme conditions produce extensive networks of desert washes and vast floodplains that can rapidly fill with water during storms.[7] Consequently, Arizona experiences frequent and unpredictable flash flooding, particularly during the monsoon season (mid-June through the end of September), creating significant and often underestimated drowning hazards across the state.[6]

The state boasts approximately 90,373 miles of river which include several major rivers, such as the Colorado, Salt, Gila, and Verde rivers.[8,9] Arizona offers a variety of recreational aquatic activities for residents and visitors, such as rafting the Grand Canyon, water skiing and boating on Lake Powell and Lake Havasu, kayaking the expansive river system, paddleboarding, and fishing. Some corridors of the Colorado and Salt Rivers are also used for recreational activities such as boating, swimming, and tubing, and have dedicated marine law enforcement.[9]

The state is also home to Native American communities who experienced the highest rate of unintentional fatal drowning among all race and ethnicity groups in the United States from 1999 to 2019 (2.5 per 100,000).[10] These communities comprise various Indigenous tribes across Arizona, many of whom have historical connections to natural bodies of water and rely heavily on these waters for cultural practices and a source of food and water. For example, the Navajo Nation has a connection with Antelope Canyon and Lake Powell; the Salt River Pima-Maricopa Tribe has a connection to the Salt and Gila Rivers; and the Cocopah Indian Tribe has roots along the Colorado River.[11-13]

When accounting for population, Arizona is among the states with the most residential pools per capita in the United States (U.S.), with an estimated 505,000 residential pools and approximately 13 persons per pool (ranked fourth and first among all states, respectively).[14] In Arizona's five most urbanized counties (i.e., those with the most housing units), there are a total of 490,635 residential and non-residential pools (Figure 1).[15-20] The total pool count per county includes both residential and non-residential pools from individual county assessor datasets while the number for total pools in the state are derived by a private dataset that only reflects residential pools. Currently, there is no available statewide estimate for total pools (both residential and non-residential).

Drowning prevention landscape

Given the variety of natural water in Arizona and the high prevalence of swimming pools, drowning is an ongoing concern in the state. However, there had been no reports specific to drowning surveillance released in three decades, until the Arizona Department of Health Services (ADHS) released a drowning report in 2019.

The 2019 ADHS report analyzed drowning-related hospitalizations in Arizona from 2016 to 2019 and found that 58% of 1,286 total cases statewide involved a young child aged 0 to 4 years.[2] In Maricopa County, the most commonly reported bodies of water for non-fatal drowning among young children were swimming pools (n=401) and bathtubs (n=57). According to the report, the drowning death rate for young children aged 0 to 4 years in Maricopa County was 5.9 per 100,000 in 2016, a 79% increase from the previous year. A 2021 report update showed a death rate for the same age group of 6.6 per 100,000, a 100% increase from the previous year in Maricopa County.[3] The ADHS annual reports represent a limited body of drowning-focused publications in Arizona, and provide limited insight into drowning-related deaths among adults aged 18 and older.

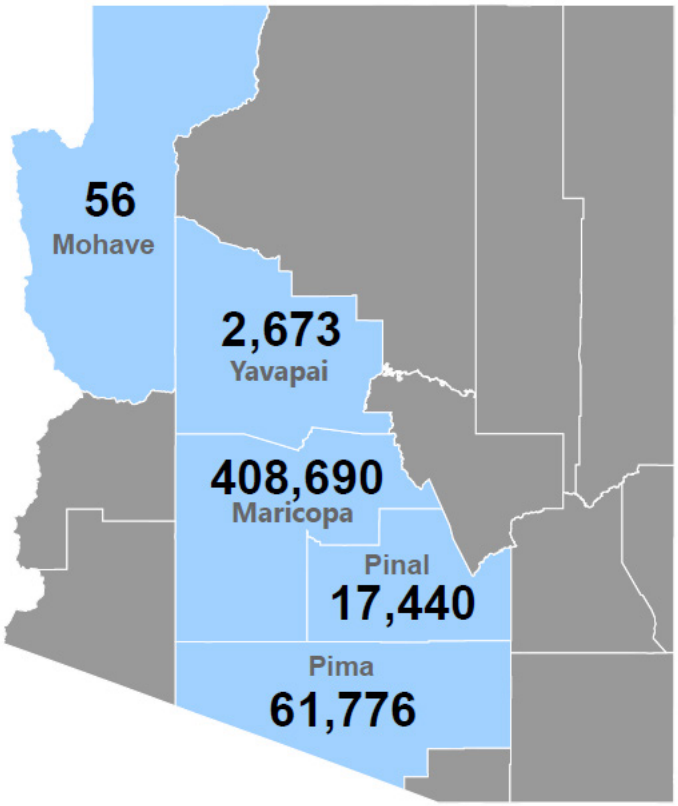
Presently, the drowning prevention community in Arizona includes the U.S. National Park Service, the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department (AZGFD), the ADHS, local law enforcement agencies, local fire departments,

Phoenix Children's Hospital, and community organizations such as the Drowning Prevention Coalition of Arizona, Safe Kids Arizona, Salt River Project, United Phoenix Firefighters Charities, and Children's Safety Zone.

Together, these organizations have successfully implemented initiatives and programs aimed at reducing drowning risk, including helping families acquire adequate pool fencing for their home pools, delivering swimming lessons to families, providing life jackets and water safety kits, conducting outreach and education, collecting data on drowning incidents, and establishing a platform for people who have been impacted by drowning to share their experiences. While a network of dedicated individuals and organizations with a substantial reach currently exists, improved understanding of the burden and associated risk factors of drowning continues to be a priority for the drowning prevention community. This is evident through the creation of a private data collection platform *Children's Safety Zone*, which compiles data on drowning incidents that occurred from 2005 to present.[21]

The most recent amendment to Arizona state drowning prevention legislation occurred on May 6, 2025, when Arizona Governor Katie Hobbs signed House Bill 2019 into law (reflected in Arizona Revised Statute § 15-249.19). The statute directs the Arizona Department of Education to compile and disseminate a list of all free or low-cost water safety resources (e.g., swimming lessons) on a publicly accessible webpage. The statute also directs all Arizona school districts and charter schools to provide this information to parents and guardians at time of student enrollment. This law went into effect during the 2025–2026 school year.[22]

Figure 1. Pool counts by top five counties with most housing units.*



* Pool counts current as of 2024.



Situational assessment

Objective

Most systems that capture drowning-related data are compartmentalized and lack reach beyond the agencies and organizations that collect the data. The most comprehensive datasets are maintained within government entities, with state agencies having access to more robust data than local jurisdictions. State agencies routinely gather data from local jurisdictions (as part of their data collection network) through formal channels, and local jurisdictions can access data that they provide to the state. These transactions are made possible by established data-sharing agreements and formal data reporting systems. These data sharing agreements dictate the data flow for the state's syndromic surveillance system, hospital discharge data, vital statistics data, emergency medical services (EMS) data, and incident reporting from local law enforcement agencies to the Arizona Game and Fish Department (AZGFD). However, data sharing between agencies and within departments is less streamlined. Data collected by these agencies are not housed in a centralized system, limiting data sharing with other local and state government agencies. Formal requests across agencies and departments may be required to obtain data, and it is not obligatory for those requests to be fulfilled.

Law enforcement data collection in Arizona is complicated by overlapping jurisdictions and multiagency responses, particularly along the Colorado River corridor from Yuma to Page, where incidents may occur near state boundaries, tribal lands, or federally managed areas. Popular recreational destinations such as Lake Havasu and Lake Mead often require coordination among local, county, state, federal, and neighboring state agencies. For example, a drowning incident in Lake Havasu City may involve the Lake Havasu City Police Department, the Mohave County Sheriff's Office, AZGFD, the U.S. Fish and Wildlife Service, and the San Bernardino County (California) Sheriff's Office. Medical transport decisions may further complicate case tracking, as patients are often transported to facilities in Arizona or Nevada based on factors such as proximity, weather conditions, bed availability, and family considerations. As a result, identifying the lead investigative agency and establishing appropriate data sharing channels with Arizona Department of Health Services (ADHS) can be challenging.

Although third-party EMS providers would generally report these incidents to the National Emergency Medical Services Information System (NEMSIS), access to this data source is restricted to ADHS personnel who work directly within the system. Additionally, Arizona Prehospital Information and EMS Registry System (AZ-PIERS) is authorized for use only for specific quality improvement and assurance purposes. Expanding its use to support drowning surveillance would require further internal consideration and approval to ensure compliance with statutory parameters.

Private organizations, such as local coalitions, private data collectors, and specific programs within care facilities, operate under a strict need-to-know system or rely solely on publicly available information. One such example is the Injury Prevention Program at Phoenix Children's Hospital, which receives data on non-fatal drowning incidents only after a referral comes from hospital staff outside of the program. This workflow limits the reach of the program to serve all persons who are at risk of experiencing a drowning event or having a repeat incident.

A situational assessment was conducted to understand the type of data that are collected and used in Arizona to describe the burden and circumstances of drowning including information about who collects and uses this data, if and how data are shared, the available variables, challenges to collecting and reporting data, and information about drowning prevention programs in Arizona.

Methods

The CDC Foundation developed and administered a questionnaire on drowning data collection and use to select organizations engaged in drowning prevention work. The purpose of the questionnaire was to: 1) identify the types of data currently collected on drowning events; 2) examine how these data are being used; and 3) assess capacity for improving drowning surveillance efforts. Four organizations (i.e., ADHS, Child Crisis Arizona, Phoenix Children's Hospital, and the Drowning Prevention Coalition of Arizona) submitted responses providing insight into existing prevention efforts, involved stakeholders, and how these activities are resourced. The information provided through the questionnaire is summarized below.

Results

Questionnaire respondents identified data sources used for drowning surveillance. Some individual entries provided insight from multiple organizations and drew from more than one data source. All information reported in the questionnaire was based on the respondents' knowledge of the data source.

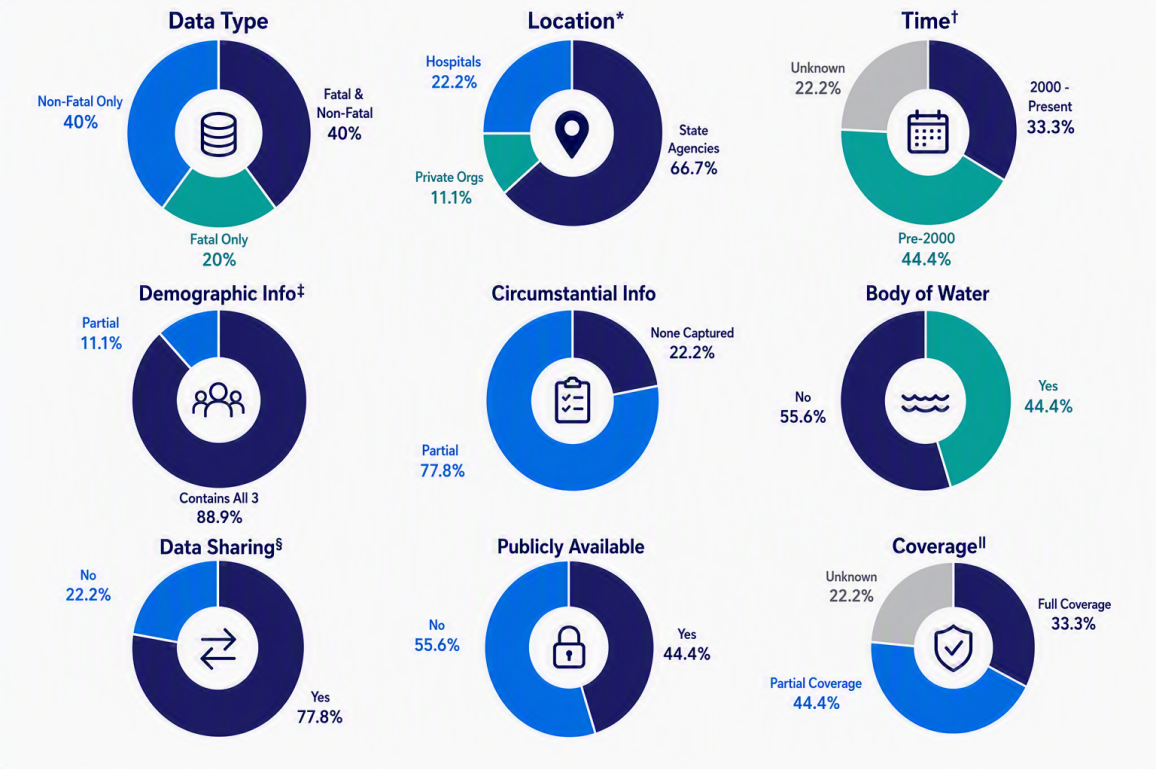
Among data sources identified by questionnaire respondents, key information, such as time of incident, fatal or non-fatal, location of where the data are stored, circumstantial information of the incident, and jurisdictional coverage varied widely across organizations. Other characteristics, such as demographic information, the body of water where the incident occurred, if the data are shared with other entities, and if the data are publicly available, were more consistently answered as a "Yes" or "No." Respondents reported that 44% of the data sources included data before 2000, 22% after 2000, and 22% did not specify the time period covered. Additionally, respondents reported that approximately 89% of the data sources contained the person's age, sex, and race and ethnicity.

Respondents shared that 78% of the data sources included information on some circumstances of drowning (e.g., activity at time of drowning, location of drowning, presence of structural barrier), but not necessarily all (Figure 2). The remaining 22% of the data sources contained no circumstantial data, and none of the data sources included complete circumstantial information. For example, 56% of the data sources did not report the type of water body in which the incident occurred and only 11% of data sources included information on environmental conditions, such as wind intensity and water temperature (data not shown). Only 33% of the data sources were reported to capture all cases or a high proportion of the cases in their jurisdiction (data not shown). The questionnaire did not collect the exact number of cases captured by each data source.



Colorado River near Lake Havasu in western Arizona.

Figure 2. Breakdown of data source characteristics.



* Refers to the type of organization where the data are stored.
† Refers to the time period covered by the source.
‡ Refers to including all, none, or a combination of Age, Sex, and/or Race and Ethnicity.
§ Refers to whether the data from the source are shared with other parties.
|| Refers to the proportion of cases within a given jurisdiction that were captured in the data source.

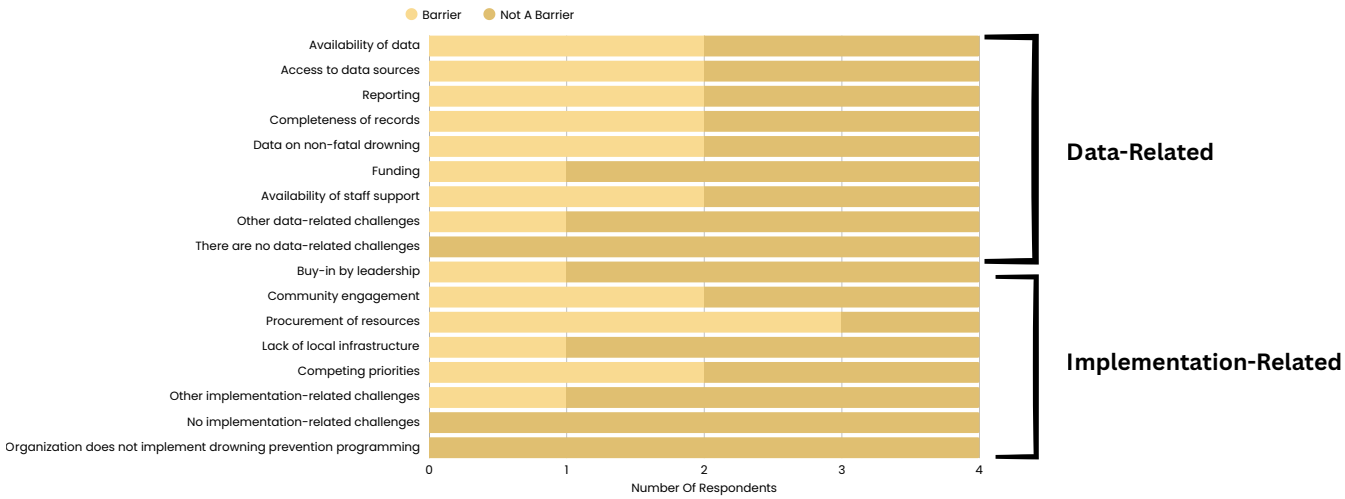
Respondents shared that partnerships with external organizations enabled them to provide their communities with a variety of services, including increasing community awareness of drowning prevention through in-person events, free workshops, and swimming lessons. Partnerships involving data collection, surveillance strengthening, and policy action were less frequently reported, with only one or no respondents engaging in any of these activities.

Respondents provided information on four drowning prevention programs, three of which were still active at the time of the questionnaire. Of the four total programs, three were reported to promote safety and increase awareness, two to improve surveillance efforts, and none to provide swimming lessons, water competency training, or policy action activities.

When assessing perceived challenges related to data systems and prevention programming implementation within counties or statewide, the most frequently reported challenge was procurement of resources for program implementation (3 out of 4 respondents). Of note, nearly all 17 challenges were reported by at least one respondent (Figure 3). No respondents indicated that there were no data- or implementation-related challenges.

Overall, respondents reported that access to hospitalization, emergency department (ED), and fire department data would be the most useful for their program. The most important opportunities for program improvement included receiving support to: implement strategies, improve data collection, provide technical tools, and coordinate among stakeholders. Priority data needs included improved information on the activity at time of drowning, supervision, presence of child-proofing mechanisms, and location of the incident.

Figure 3. Barriers reported by questionnaire respondents.



Details on data sources used for drowning surveillance as described in questionnaire responses, as well as other promising data sources found through alternative means, are presented below.

Hospital discharge data

The Hospital Discharge (HD) Database contains intake and final disposition data for patients seen at an ED or hospitalized, including International Classification of Disease-10th revision-Clinical Modification (ICD-10-CM) codes for discharge diagnoses. All ED facilities and hospitals licensed by ADHS enter data. By state law, all facilities must be licensed before operating, and all ED facilities and hospitals licensed by ADHS enter data into the system (Figure 4).

Vital statistics data

Vital statistics data were accessible through the Data Lakehouse maintained by ADHS (Figure 5). The Data Lakehouse is the agency's centralized database for vital records, hospital discharge, and population denominator data reported to ADHS. Data Lakehouse users can query or view the data directly through the platform or export data for analysis. Vital statistics data contain information pulled from death certificates that includes information regarding underlying and contributing causes of death. Direct access to these data is routinely available to authorized ADHS personnel.

Medical certifiers/examiners data

Figure 5 highlights a system of data linkage in Arizona in which medical certifiers, medical examiners, tribal law enforcement, hospitals, and funeral homes report death certificate data to ADHS through the Database Application for Vital Events (DAVE) system. Data extracted from the DAVE system are linked during the modeling step and further integrated to finalize the newly geocoded data before being output in the Data Lakehouse for analysis and use.



Figure 4. Hospital discharge data flow.

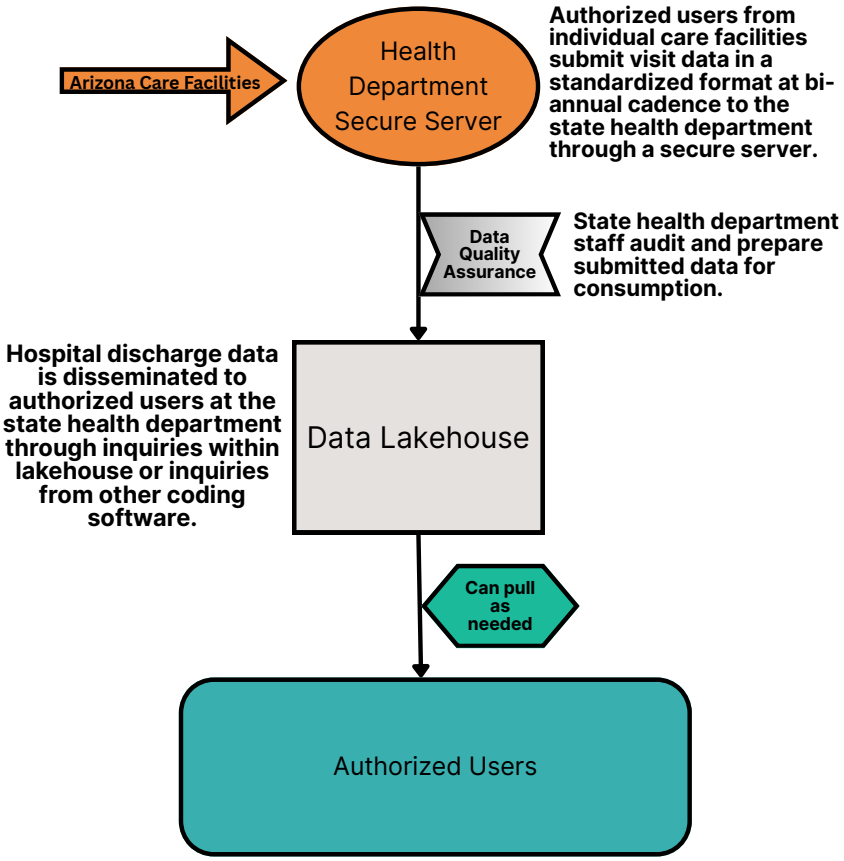
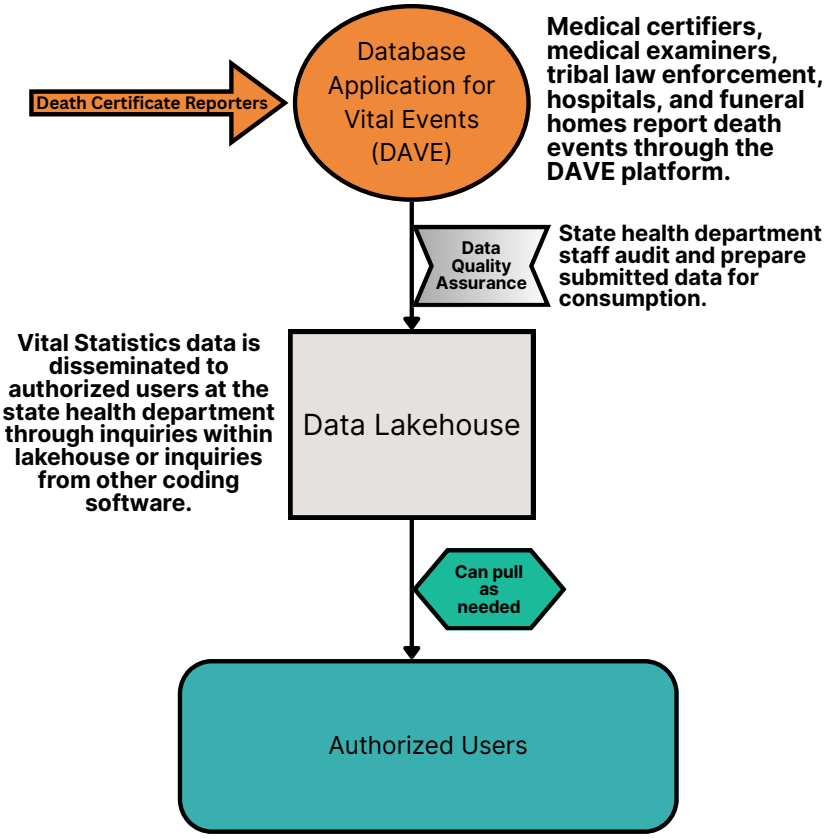


Figure 5. Vital statistics and medical certifiers/examiners data flow.



Child Fatality Review

Child Fatality Review (CFR) data include information on fatal drowning incidents among decedents aged 18 years or younger and contain circumstantial data related to the injuries, causes of death, and safety measures in the child's immediate environment. CFR data also provide insight into preceding circumstances, such as whether the child used a personal flotation device, was being supervised, or if the child knew how to swim. These data were made available through an ADHS epidemiologist who works with the state's CFR program and has direct access to the National Fatality Review-Case Reporting System (NFR-CRS). NFR-CRS is a nationwide database managed by the National Center for Fatality Review and Prevention that helps review teams collect and analyze information about child deaths (Figure 6). Although this system is rich in circumstantial data, such as information on the child's home environment and parental circumstances, it does not capture drowning incidents occurring after adolescence. CFR data contain indicators that are not available in ADHS death data.

Syndromic surveillance

Syndromic surveillance data were accessible through the National Syndromic Surveillance Program BioSense (Electronic Surveillance System for the Early Notification of Community-based Epidemics or ESSENCE) platform. The ESSENCE platform captures chief complaint data collected at medical facility intake in near real-time, includes both ICD-10-CM codes and text-based narratives (Figure 7). While the ESSENCE platform has the potential to serve as a useful, near real-time surveillance tool, reporting is voluntary; as such, only ninety percent of all licensed facilities in Arizona report to the system. With its current capabilities, cases can be traced to specific facilities and, subsequently, to certain municipalities or communities. However, this level of analysis is more feasible in metropolitan areas of the state, where most participating facilities are located. Direct access to these data was made available for the project through ADHS.

Figure 6. Child Fatality Review data flow.

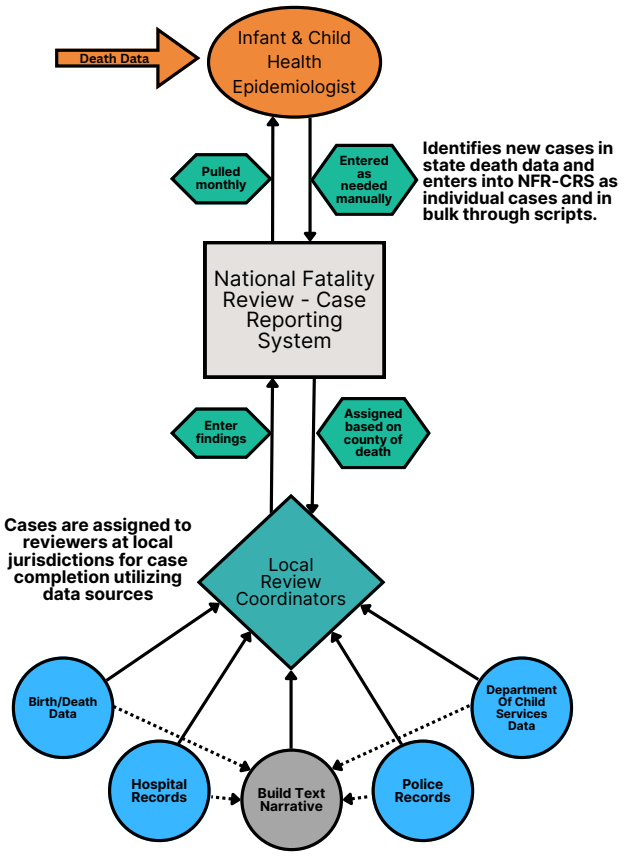
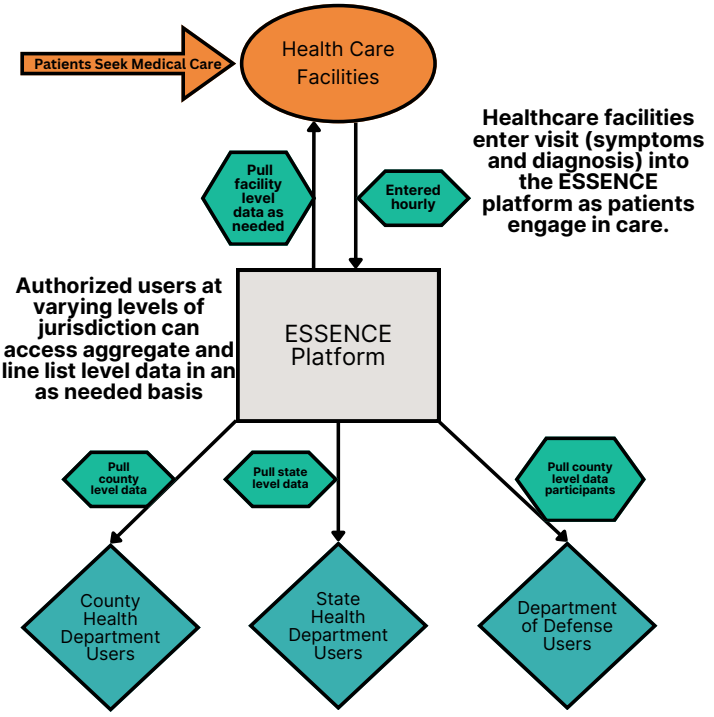


Figure 7. Syndromic surveillance (ESSENCE) data flow.



AZ-PIERS data

AZ-PIERS is a key data source that originates from emergency personnel and captures circumstances present at the scene of drowning incidents. These data are more likely to describe contributing factors at the time of incidents compared to HD and vital statistics data. Currently, these data are not accessible, but future opportunities to analyze AZ-PIERS data are possible if data sharing agreements are established. Data from AZ-PIERS would complement the ESSENCE platform's surveillance capabilities by adding circumstantial context that could enhance understanding of how to prevent future drowning. Additionally, data from AZ-PIERS could fill an existing gap by providing information about incidents that did not result in transport to an ED or hospital, including cases in which individuals are pronounced dead at the scene or who refuse transport.

Children's Safety Zone

Children's Safety Zone (managed by Swift Office Solutions) is a publicly available data source created and maintained by a private organization. Information on drowning incidents reported by fire departments serving local Arizona jurisdictions is aggregated and made available for public use. Most of these data are collected from the Phoenix and Tucson metropolitan areas, reflecting only a portion of drowning incidents across the state. Other drowning fatalities, particularly in more rural areas, are identified and included from news media sources. This data source serves as the only known multi-source public-facing registry.

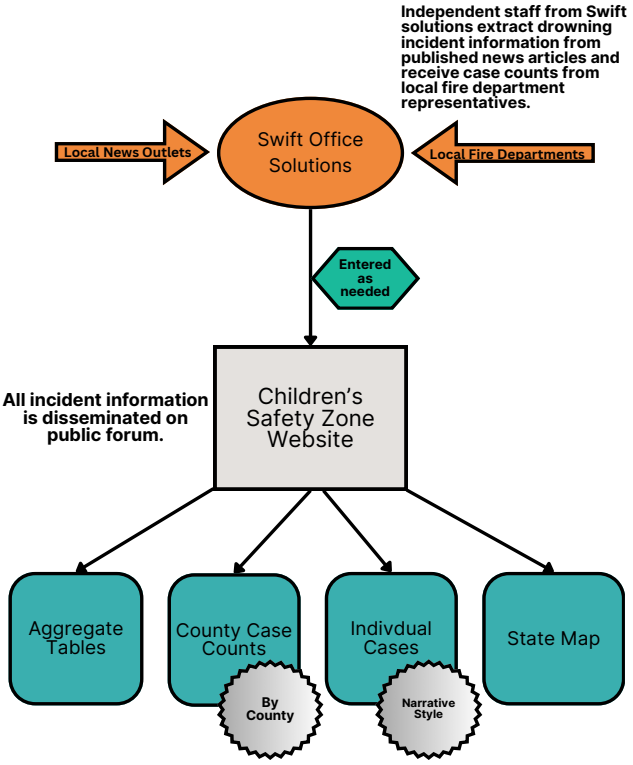
Arizona Game and Fish Department data

Arizona Game and Fish Department (AZGFD) maintains another key data source that originates from emergency personnel and captures circumstances present at the scene of drowning incidents. These data are more likely to describe contributing factors at the time of incidents compared to HD and vital statistics data. Currently, these data are not accessible, but future opportunities to analyze AZGFD data are possible if data sharing agreements are established. Data from AZGFD would add circumstantial context that could enhance understanding of how to prevent future drowning incidents.

Data on exposure to water

Drowning risk can be further assessed by examining an individual's exposure to hazards using county assessor data and navigational data. However, current estimates vary on the number of pools (residential and non-residential) across the state by governmental and private data sources, making it difficult to ascertain exposure. Further exploration of residential pool data would provide a more comprehensive assessment of population exposure to drowning hazards. Additionally, boating navigation data could be used to cross-reference drowning incidents with popular boating routes, time of day, and seasons of the year. It may also be possible to link these data with weather and water level data to better characterize risk.

Figure 8. Children's Safety Zone data flow.





Burden and circumstances

Objective

This section examines emergency department (ED) visits, hospitalizations, and deaths related to drowning captured across various data sources. The analysis describes patterns of drowning events by demographic characteristics (i.e., age, sex, and race and ethnicity), geography, seasonality, and the bodies of water where drowning events occurred. Using an expanded case inclusion criteria and standardized rate calculations, this analysis aims to provide a comprehensive descriptive assessment of drowning outcomes and circumstances in Arizona to inform surveillance and prevention efforts.

Methods

Appendix A shows the International Classification of Disease-10th revision (ICD-10) codes used to identify drowning deaths and the ICD-10-Clinical Modification (ICD-10-CM) codes used to identify drowning-related ED visits and hospitalizations. Traditionally, deaths are identified as unintentional drowning if one of the unintentional drowning ICD-10 codes is listed as the underlying cause of death. To better characterize the full burden of drowning, expanded inclusion criteria for drowning deaths were developed and used throughout this report. For instance, deaths captured in Vital Records from 2009 to 2023 were identified as unintentional drowning if an unintentional drowning ICD-10 code was recorded in either the underlying cause of death or multiple causes of death fields. In short, if an unintentional drowning ICD-10 code was present in any field in the record, that record would be included as an unintentional drowning. Using the expanded criteria captured 15% more unintentional drowning deaths from 2009 to 2023 compared to the traditional approach.

ED visits and hospitalizations were drawn from Hospital Discharge Data for the period 2016 to 2023. ED visits were limited to cases that did not result in hospitalization or death, and hospitalizations were limited to cases that did not result in death, ensuring mutually exclusive outcome categories.

Traditionally, hospitalizations are considered drowning-related only if a) the primary diagnosis is an injury and b) there is a drowning ICD-10-CM code in a subsequent field. ED visits, on the other hand, are considered drowning-related if there is a drowning ICD-10-CM code anywhere in the record.[23] For this report, expanded criteria were applied. Both ED visits and hospitalizations were identified as unintentional drowning if there was an ICD-10-CM code related to unintentional drowning anywhere in the record. The expanded hospitalization inclusion criteria captured 113% more unintentional drowning hospitalization cases compared with the traditional approach.

ED and hospital data were limited to 2016 onward due to the transition from International Classification of Disease-9th revision-Clinical Modification (ICD-9-CM) to ICD-10-CM coding at the end of 2015. Intentional and undetermined intent drowning-related ED visits, hospitalizations, and deaths were also identified. ED, hospitalization, and death data were extracted from the Arizona Department of Health Services (ADHS) Data Lakehouse.

Rates were calculated as the number of drowning ED visits, hospitalizations, or deaths, per 100,000 state residents, overall and by year, sex, age group, race and ethnicity, and region. Population estimates were obtained from the ADHS population denominators for the years 2009 through 2023 from: https://pub.azdhs.gov/health-stats/menu/info/pop/index.php. Rates were age-adjusted to the 2000 U.S. standard population using the direct method.[24] The number of drowning ED visits, hospitalizations, and deaths, was also calculated for incidents that occurred in Arizona among non-residents. Unless otherwise noted, this report focuses on unintentional drowning among Arizona residents.

Overall results

Between 2016 and 2023, there were 2,122 ED visits and 456 hospitalizations related to unintentional drowning among Arizona residents. Additionally, between 2009 and 2023, there were 1,589 deaths related to unintentional drowning recorded among Arizona residents (Table 1). The selection of these timeframes—2016 to 2023 for ED visits and hospitalizations and 2009 to 2023 for fatalities—was based on the collective availability of data across state health departments that participated in the CDC Foundation drowning prevention project.

Between 2016 and 2023, for every one ED visit or hospitalization, there were 0.4 and 2.1 fatalities, respectively. Additionally, for every one hospitalization recorded, there were over four ED visits between 2016 and 2023. In addition to the 1,589 unintentional drowning fatalities, fewer than 200 intentional and undetermined drowning fatalities occurred between 2009 and 2023, accounting for 11% of all drowning fatalities among Arizona residents (Table 1). Resident cases accounted for 85% of all drowning related ED visits, hospitalizations, and fatalities combined. The frequency of intentional or undetermined intent for non-resident drowning-related ED visits and hospitalizations was less than 6 cases and, as such, these cases were excluded from the table. All rates mentioned in this section and sections thereafter are among Arizona residents and are age-adjusted.

Demographics

Average annual counts and rates per 100,000 residents for unintentional drowning cases by outcome, demographic characteristics, and county of residence are shown in Table 2. Overall, there were 4.13 ED visits per 100,000 residents and 0.84 hospitalizations per 100,000 residents between 2016 and 2023. Between 2009 and 2023, there were 1.51 fatalities per 100,000 residents (data not shown). Males experienced higher rates than females across all outcomes. Children aged 1 to 4 years experienced the highest rates across all outcomes among all age groups. Non-Hispanic White and non-Hispanic Black or African American residents experienced the highest non-fatal rates among all racial and ethnic groups while American Indian or Alaska Native residents experienced the highest fatal rates. Demographic data are further described in the following subsections.

Table 1. Drowning-related emergency department (ED) visits, hospitalizations, and fatalities by intent and Arizona residency.*

	ED visits (2016–2023)		Hospitalizations (2016–2023)		Fatalities (2009–2023)		Total
Intent	**State residents**	**Non-state residents**	**State residents**	**Non-state residents**	**State residents**	**Non-state residents**	
All intents	2,188	398	495	71	1,778	316	5,246
Unintentional	2,122	†	456	71	1,589	302	4,929
Intentional	52	†	26	‡	116	†	203
Undetermined	14	†	13	‡	73	†	114

* 76% of Emergency Department and Hospitalization cases (combined) had no value reported for the ACCIDENT_STATE variable. Cases with a missing value for the ACCIDENT_STATE variable were assumed to have been injured in Arizona.
† Case count is suppressed to prevent disclosure of identifiable information. Additional suppression may be applied to prevent back calculation of a suppressed value.
‡ Zero cases

Table 2. Average frequency counts and rates of drowning outcomes by demographics and region, Arizona residents.

Variable		Emergency department visits (2016–2023)			Hospitalizations (2016–2023)			Fatalities (2009–2023)		
		Total count	Annual average count	Rate per 100,000*	Total count	Annual average count	Rate per 100,000*	Total count	Annual average count	Rate per 100,000*
Sex	Male	1,171	146.38	4.48	277	34.63	1.02	1,132	75.47	2.18
	Female	951	118.88	3.76	179	22.38	0.66	457	30.47	0.85
Age	<1 year	146	18.25	21.82	23	2.88	3.44	24	1.60	1.87
	1–4 years	1,144	143.00	41.23	202	25.25	7.28	272	18.13	5.11
	5–9 years	187	23.38	5.13	31	3.88	0.85	43	2.87	0.63
	10–14 years	73	9.13	1.94	21	2.63	0.56	18	1.20	0.26
	15–19 years	112	14.00	2.95	14	1.75	0.37	68	4.53	0.97
	20–24 years	52	6.50	1.31	20	2.50	0.51	97	6.47	1.35
	25–34 years	110	13.75	1.40	22	2.75	0.28	167	11.13	1.19
	35–44 years	107	13.38	1.52	20	2.50	0.28	164	10.93	1.27
	45–54 years	81	10.13	1.19	24	3.00	0.35	182	12.13	1.43
	55–64 years	53	6.63	0.77	31	3.88	0.45	185	12.33	1.52
	65–74 years	35	4.38	0.60	26	3.25	0.44	169	11.27	1.75
	75+ years	22	2.75	0.51	22	2.75	0.51	200	13.33	2.78
Race and ethnicity[†]	American Indian or Alaska Native	58	7.25	2.39	12	1.50	0.50	114	7.60	2.59
	Black or African American	131	16.38	4.21	39	4.88	1.30	100	6.67	2.08
	Asian or Pacific Islander	40	5.00	2.17	12	1.50	0.67	49	3.27	1.55
	White	1,227	153.38	5.53	283	35.38	1.14	927	61.80	1.49
	Hispanic or Latino	630	78.75	2.89	97	12.13	0.48	340	22.67	1.07
	Multiracial	‡	‡	‡	‡	‡	‡	18	1.20	§
	Unknown	36	4.50	§	13	1.63	§	40	2.67	§
	Other	‡	‡	‡	‡	‡	‡	‖	0.07	§
County of residence	Apache	8	1.00	1.53	‡	‡	‡	33	2.20	3.18
	Cochise	25	3.13	2.95	6	0.75	0.69	18	1.20	0.84
	Coconino	37	4.63	3.68	‖	0.25	0.22	17	1.13	0.87
	Gila	8	1.00	2.01	‖	0.38	0.71	25	1.67	2.78

* Rates per 100,000 residents for Sex, Race and Ethnicity, and Residency Region are adjusted for age and reflect resident unintentional cases; Rates for age groups are age-specific crude rates; The Annual Intercensal Estimates of the Resident Population for Selected Age Groups by Sex for Arizona: April 1, 2010 to April 1, 2020 (SC-EST2020INT-AGESEX-04) from the U.S. Census Bureau, Population Division were used to calculate rates for cases that occurred in 2010.

[†] American Indian or Alaska Native, Black or African American, Asian or Pacific Islander, and White are all non-Hispanic and are mutually exclusive race/ethnicity groups.

‡ Zero cases.

§ No population estimates were available for age-adjusted rate calculation.

‖ Case count is suppressed to prevent disclosure of identifiable information. Additional suppression may be applied to prevent back calculation of a suppressed value.

Table 2. Average frequency counts and rates of drowning outcomes by demographics and region, Arizona residents.

Variable		Emergency department visits (2016–2023)			Hospitalizations (2016–2023)			Fatalities (2009–2023)		
		Total count	Annual average count	Rate per 100,000*	Total count	Annual average count	Rate per 100,000*	Total count	Annual average count	Rate per 100,000*
County of residence	Graham	16	2.00	5.04	||	0.38	0.90	22	1.47	3.76
	Greenlee	||	0.38	3.72	‡	‡	‡	||	0.07	0.67
	La Paz	||	0.63	4.71	||	0.13	0.31	20	1.33	9.00
	Maricopa	1,412	176.50	4.33	314	39.25	0.93	974	64.93	1.53
	Mohave	107	13.38	8.72	9	1.13	0.52	58	3.87	2.11
	Navajo	18	2.25	2.13	6	0.75	0.73	34	2.27	2.17
	Pima	213	26.63	3.07	54	6.75	0.76	169	11.27	1.06
	Pinal	127	15.88	4.24	32	4.00	0.99	82	5.47	1.34
	Santa Cruz	12	1.50	3.05	||	0.50	0.98	6	0.40	0.70
	Yavapai	39	4.88	3.25	8	1.00	0.52	54	3.60	1.56
	Yuma	80	10.00	4.59	10	1.25	0.66	55	3.67	1.78
	Unknown	12	1.50	§	||	0.50	§	||	0.27	§

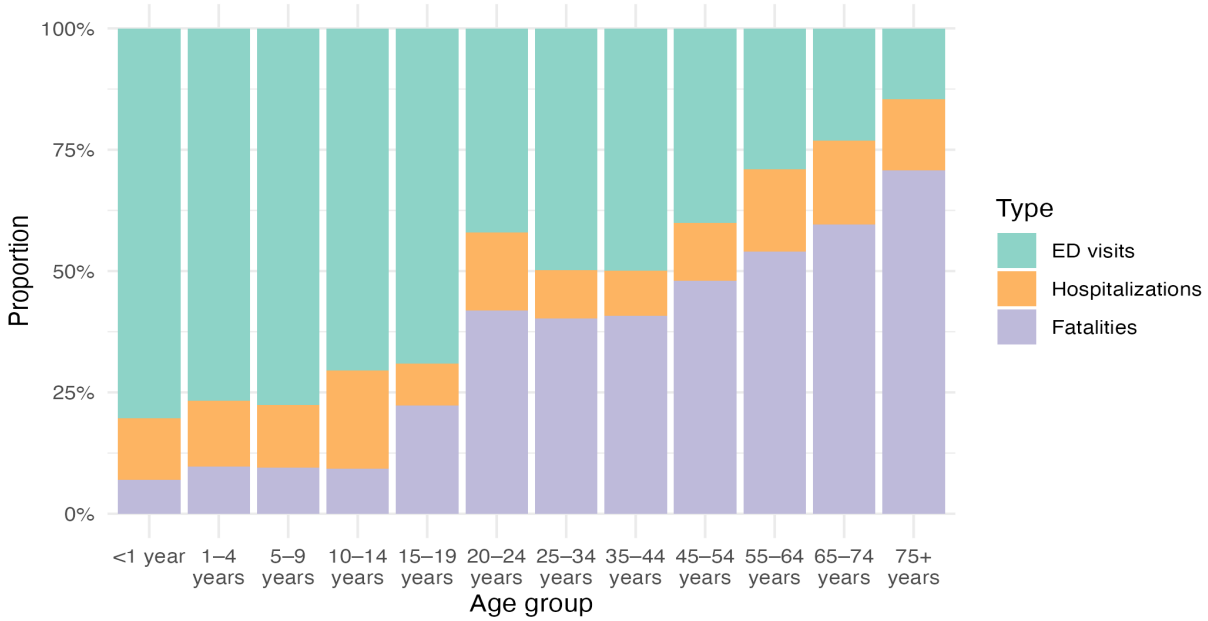
* Rates per 100,000 residents for Sex, Race and Ethnicity, and Residency Region are adjusted for age and reflect resident unintentional cases; Rates for age groups are age-specific crude rates; The Annual Intercensal Estimates of the Resident Population for Selected Age Groups by Sex for Arizona: April 1, 2010 to April 1, 2020 (SC-EST2020INT-AGESEX-04) from the U.S. Census Bureau, Population Division were used to calculate rates for cases that occurred in 2010.
† American Indian or Alaska Native, Black or African American, Asian or Pacific Islander, and White are all non-Hispanic and are mutually exclusive race/ethnicity groups.
‡ Zero cases.
§ No population estimates were available for age-adjusted rate calculation.
|| Case count is suppressed to prevent disclosure of identifiable information. Additional suppression may be applied to prevent back calculation of a suppressed value.

Age

Children aged 1 to 4 years had an average annual case count of 143 and the highest rate of ED visits for drowning at 41.23 per 100,000, a substantially higher rate than the next highest group, infants aged less than 1 year (21.82 per 100,000) (Table 2). Similarly, children aged 1 to 4 years had the highest rate of hospitalizations (7.28 per 100,000), followed by infants less than 1 year (3.44 per 100,000). Young children aged 1 to 4 years had the highest average annual number of fatal drowning incidents (n=18.13) and the highest rate (5.11 per 100,000), followed by persons aged 75 years and older, with an average annual drowning case count of 13.33 and a rate of 2.78 per 100,000. Adolescents aged 10 to 14 years had the lowest fatal drowning rate at 0.26 per 100,000.

Figure 9 shows the proportion of unintentional drowning incidents by age group for ED visits, hospitalizations, and deaths. As age increased, the proportion of fatalities increased, while the proportion of non-fatal outcomes decreased. Fatal drowning accounted for approximately 7% of drowning cases among infants under 1 year of age, compared to about 71% of cases among adults aged 75 years and older. Conversely, ED visits accounted for approximately 80% of drowning cases among children under 1 year of age, compared to about 15% among adults aged 75 years and older. For additional age group-time series analyses, please see Appendix B.

Figure 9. Proportions of unintentional drowning outcome type (emergency department (ED) visit, hospitalization, fatality) by age group, Arizona residents, 2009–2023.*



* Proportions represent emergency department (ED) visits and hospitalizations from 2016 to 2023 and fatalities from 2009 to 2023.

Sex

Unintentional drowning frequency and age-adjusted rates per 100,000 were higher for males than females for all outcomes (Table 2). Drowning-related ED and hospitalization counts were consistently higher among males than females every year from 2016 to 2023 (Figures 10 and 11) with an average of 23.1% and 54.7% more ED and hospitalization cases, respectively. The fatal drowning rate among males was 2.6 times higher than among females (2.18 compared with 0.85 per 100,000) (Table 2).

Race and ethnicity

Figure 12 shows age-adjusted rates by race and ethnicity and outcome. ED rates were highest for non-Hispanic White and non-Hispanic Black populations (5.53 and 4.21 per 100,000, respectively) while rates for other races and ethnicities were between 2.17 and 2.89 per 100,000. Non-Hispanic Black and non-Hispanic White populations also had the highest hospitalization rates (1.30 and 1.14 per 100,000, respectively) while other race and ethnicities had rates less than 1 per 100,000. Fatal drowning rates were highest among non-Hispanic American Indian or Alaska Native (2.59 per 100,000), non-Hispanic Black (2.08 per 100,000), and non-Hispanic Asian or Pacific Islander (1.55 per 100,000) populations.



Navajo sisters riding on horses in Monument Valley, Arizona.

Figure 10. Unintentional drowning-related emergency department (ED) visits by year and sex, Arizona residents, 2016–2023.

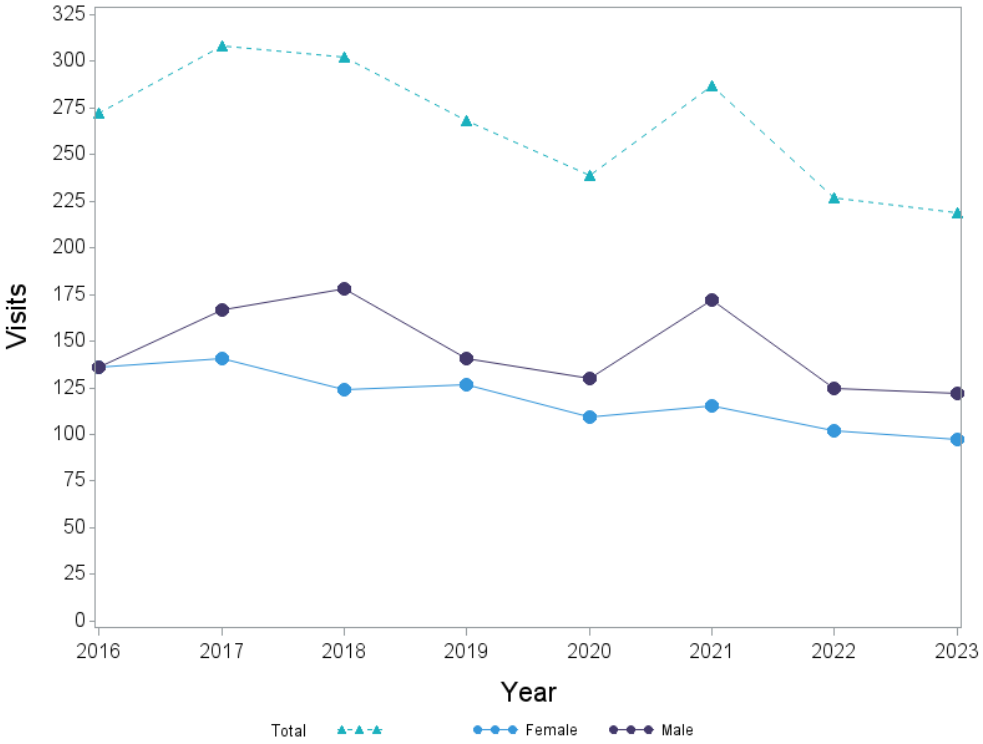


Figure 11. Unintentional drowning-related hospitalizations by year and sex, Arizona residents, 2016–2023.

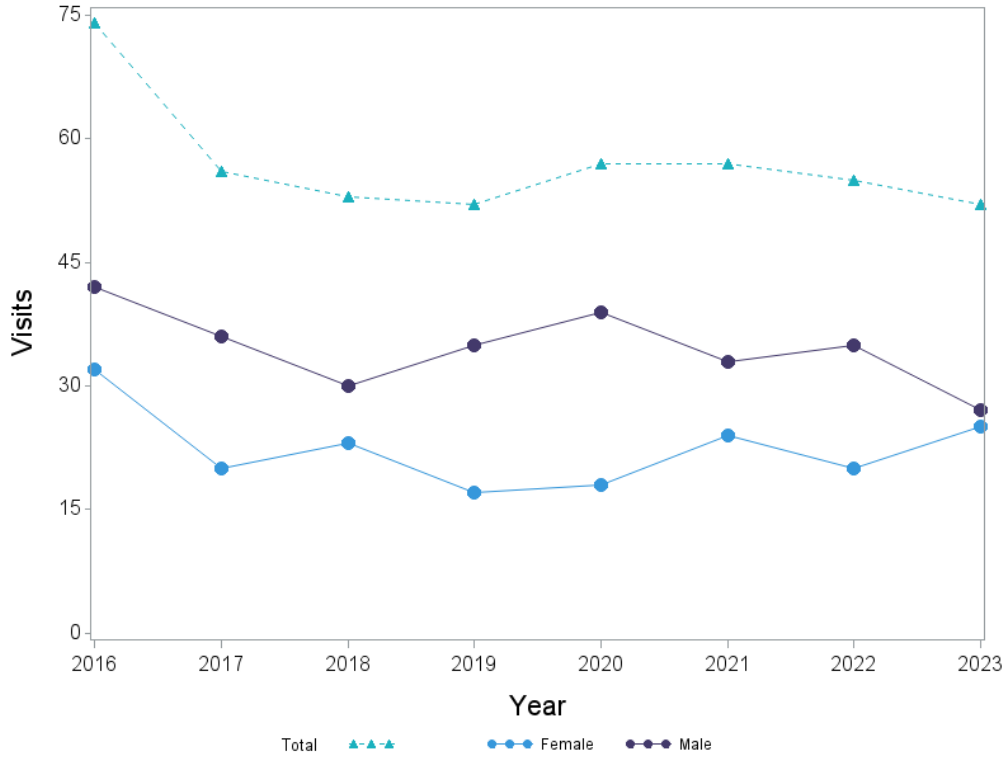
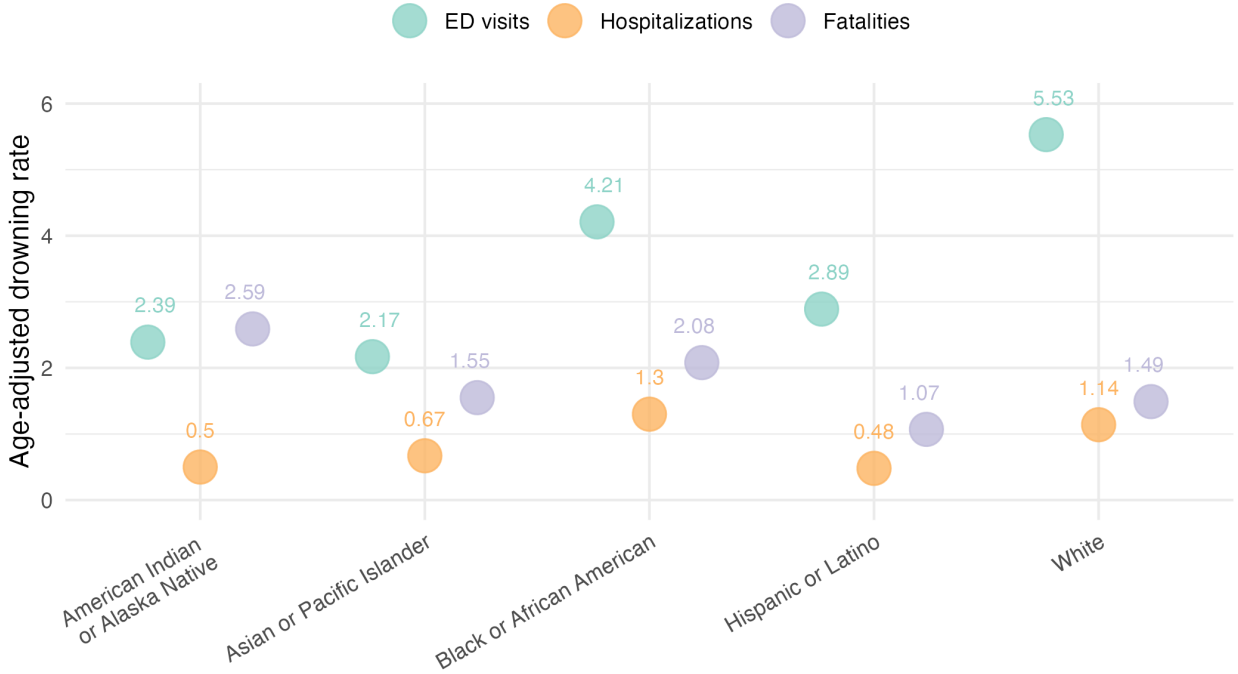


Figure 12. Age-adjusted rates of unintentional drowning outcome type (emergency department (ED) visit, hospitalization, fatality) by race and ethnicity, Arizona residents, 2016–2023.*†



* Age-adjusted rates per 100,000 population
† American Indian or Alaska Native, Black or African American, Asian or Pacific Islander, and White are all non-Hispanic and are mutually exclusive race/ethnicity. groups.

County of residence

Regional age-adjusted rates per 100,000 residents are shown below in Figures 13–15 for drowning-related ED visits, hospitalizations, and fatalities, respectively. The rates represented in these figures reflect the individual's county of residence, and not the county where the drowning incident occurred or the location of the facility at which the incident received care. Mohave and Pinal counties had the highest ED visit and hospitalization rates at 8.72 and 0.99 per 100,000, respectively, while La Paz County had the highest fatal drowning rate (9.00 per 100,000). Residents of La Paz County have relatively easy access to natural bodies of water being situated just south of Alamo Lake and Lake Havasu, a popular recreational site in the area, with the Colorado River bordering on the west.

For the purposes of this analysis, urban counties were defined according to the ADHS Data Definitions from: https://pub.azdhs.gov/health-stats/menu/info/sources.php. Classification of urban counties included Maricopa, Pinal, Pima, and Yuma counties, while the remaining counties (Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Navajo, Santa Cruz, and Yavapai) were classified as rural.

Although case frequency for all outcomes was relatively higher in more urban counties (especially in Maricopa County, which represented 62% of all fatal cases [n=974]), their larger population sizes can result in lower mortality rates. Conversely, a relatively small number of deaths in rural counties may produce elevated mortality rates due to smaller population denominators. When considering frequency of fatal drowning incidents, rural counties recorded relatively lower fatalities ($n \leq 60$) than urban counties. Rural counties also consistently reported lower counts of ED visits and hospitalizations than urban counties. However, their corresponding rates showed substantially greater variability. Some rural counties reported near zero rates, reflecting very few or no observed cases, while others exhibited some of the highest rates in the state. This wide range suggests that rate estimates in less populated counties are highly

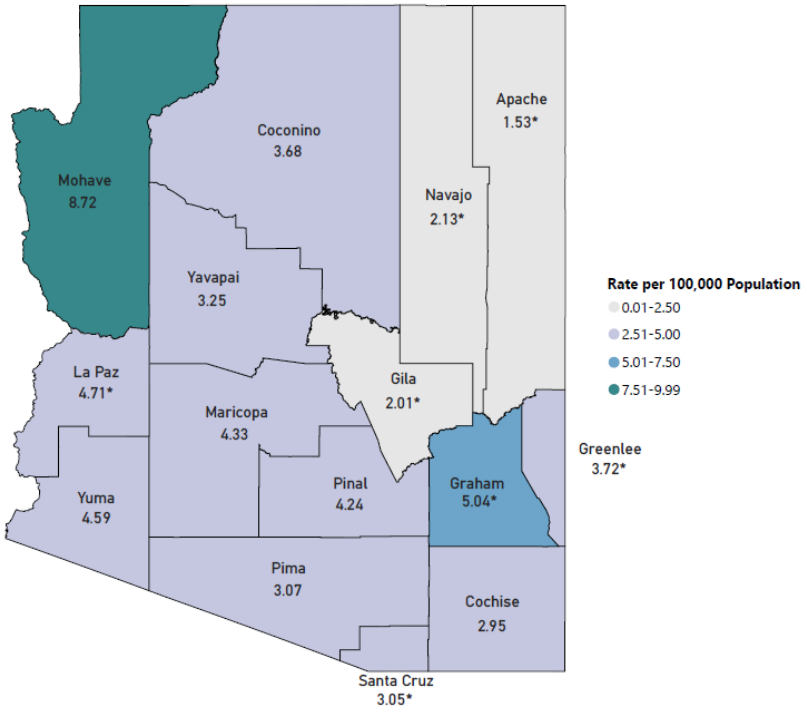
sensitive to small changes in case counts and, therefore, should be interpreted with caution.

Overall, urban counties demonstrated more stable and moderate rate patterns across ED visits, hospitalizations, and fatalities whereas rural counties displayed a broader and less consistent distribution. This contrast highlights the influence of population size on rate stability, with smaller populations producing more extreme and fluctuating rates despite relatively low absolute case counts.

Type of water and seasonality

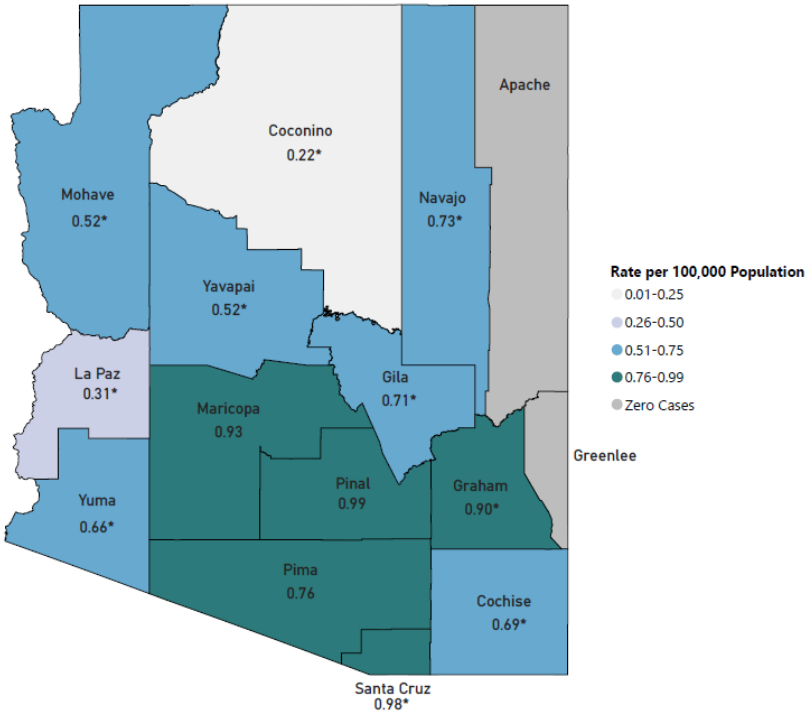
Drowning-related fatalities in Arizona occurred in various types of water. Most fatal drowning incidents occurred in pools (32.3%) and common home environments, such as bathtubs and showers (29.1%) (Table 3). Among natural bodies of water, lakes accounted for the highest proportion of drowning-related fatalities (11.1%), while canals, rivers, washes (or natural drainage channels), and other types of water accounted for approximately 20% of the fatalities. Pools and home-based types of water consistently accounted for the highest proportions of fatal drowning per year from 2009 to 2023 (Figure 16). Pools accounted for an average of 34% of drowning-related fatalities from 2009 to 2019. This proportion increased to 44% in 2020 before declining consistently in subsequent years. In contrast, home-based water settings accounted for an average of 26% of drowning-related fatalities from 2009 to 2019 and then experienced a steady increase over time. By 2021, the proportion of drowning-related fatalities occurring in home-based water settings had surpassed that of pools and continued to rise thereafter (Figure 16).

Figure 13. Age-adjusted unintentional drowning emergency department (ED) visit rates among Arizona residents, by county, 2016–2023.



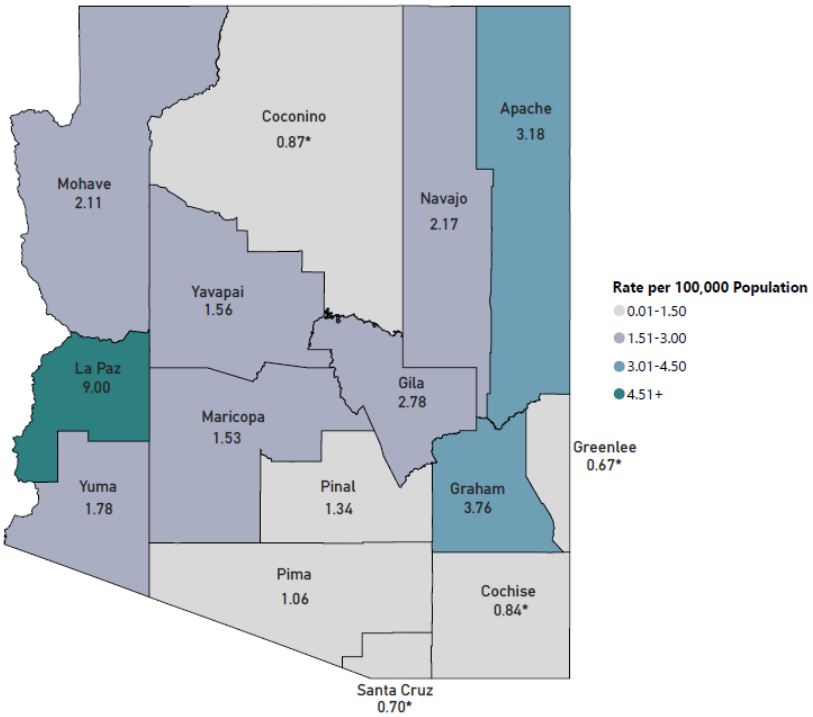
* Rates calculated with case counts less than 20 should be interpreted with caution as these rates may be unstable.

Figure 14. Age-adjusted unintentional drowning hospitalization rates among Arizona residents, by county, 2016–2023.



* Rates calculated with case counts less than 20 should be interpreted with caution as these rates may be unstable.

Figure 15. Age-adjusted unintentional drowning death rates among Arizona residents, by county, 2009–2023.



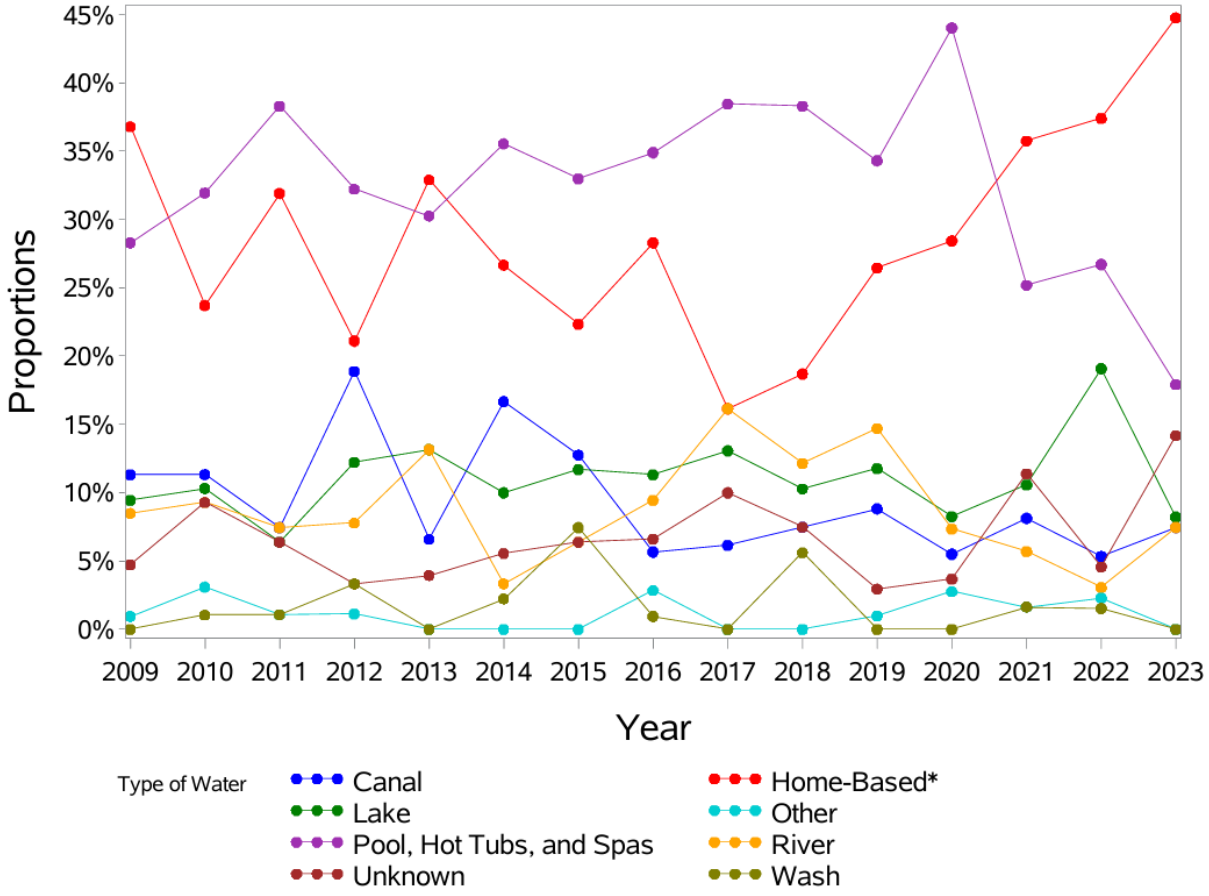
* Rates calculated with case counts less than 20 should be interpreted with caution as these rates may be unstable.

Table 3. Distribution of drowning-related fatalities by type of water, Arizona residents, 2009–2023.

Type of water	Count	Percent (%)
Pools, hot tubs, spas	513	32.3
Home-based*	463	29.1
Lake	177	11.1
Canal	143	9.0
River	139	8.7
Wash	25	1.6
Other	18	1.1
Unknown	111	7.0

* "Home-based" water types include shower, bathtub, and any incident locations described as "home".

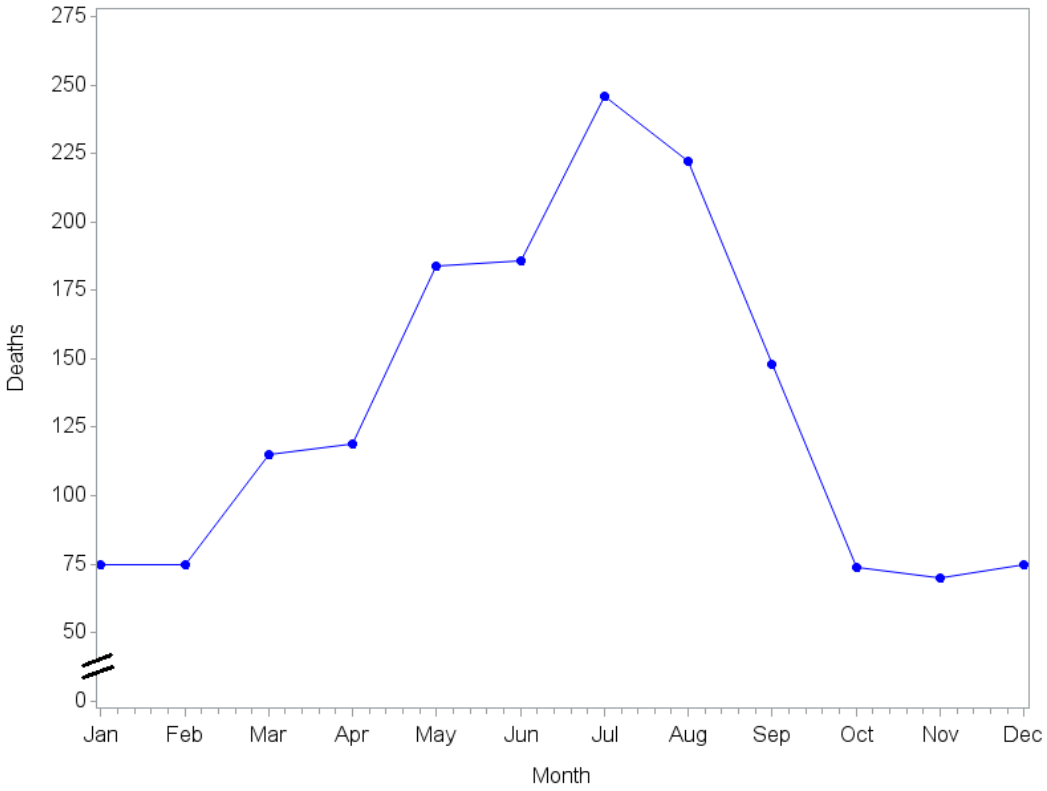
Figure 16. Proportions of unintentional drowning deaths by type of water and year, Arizona residents, 2009–2023.



* "Home-Based" water types include shower, bathtub, and any incident locations described as "home".

Approximately 50% of all drowning fatalities between 2009 and 2023 occurred in the warmer months (May through August) with total fatal drowning counts above 180 for each of those months (Figure 17). These frequencies coincided with high average monthly temperatures in Arizona. May is generally when average highs exceed 80°F, followed by an average peak of approximately 90°F in July, and then return to an average of below 80°F in September.[5]

Figure 17. Total unintentional drowning deaths by month, Arizona residents, 2009–2023.



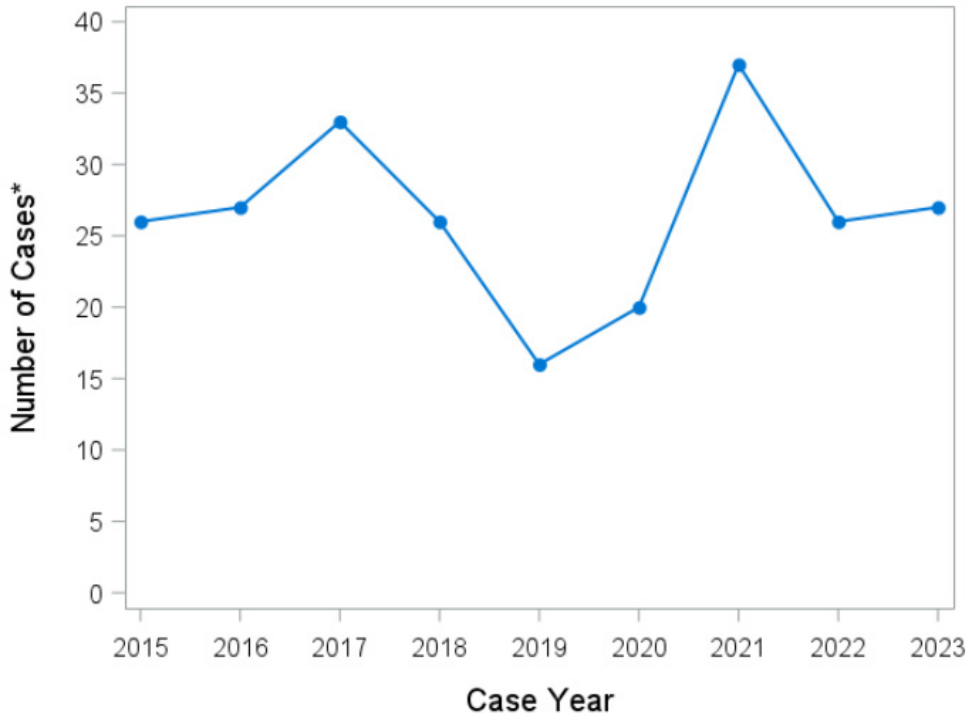
Child Fatality Review data

Child Fatality Review (CFR) data included 243 drowning-related fatalities among Arizona residents ages 18 years and younger from 2013 to 2023 (average of 22.09 fatalities per year), where the death occurred in Arizona. Male children accounted for 64.6% of the fatalities. A large proportion of fatalities involved children that were between 1 and 3 years old (64.3% of total cases). The majority of fatalities occurred in Maricopa County (68.3%), followed by Pima (8.2%) and Pinal (7.0%) counties (data not shown).

Figure 18 depicts counts of fatal drowning incidents investigated by CFR between 2015 and 2023, ranging from a low of 16 cases in 2019 to a high of 37 cases in 2021.

Figure 19 depicts proportions of child fatalities by type of water based on CFR data. Two-thirds of all child fatalities were reported to have occurred in pools, hot tubs, or spas; 91.0% of which were on private property (Figure 20). Among fatalities that occurred in open water (n=38), lakes were the most common location (34.2%), followed by rivers (26.3%) and canals (21.1%) (Figure 21).

Figure 18. Drowning-related child fatalities per year, Arizona residents, 2015–2023.



* Case counts for 2013 and 2014 were omitted to prevent disclosure of identifiable information.

Figure 19. Distribution of child drowning-related fatalities by type of water, Arizona residents, 2013–2023.

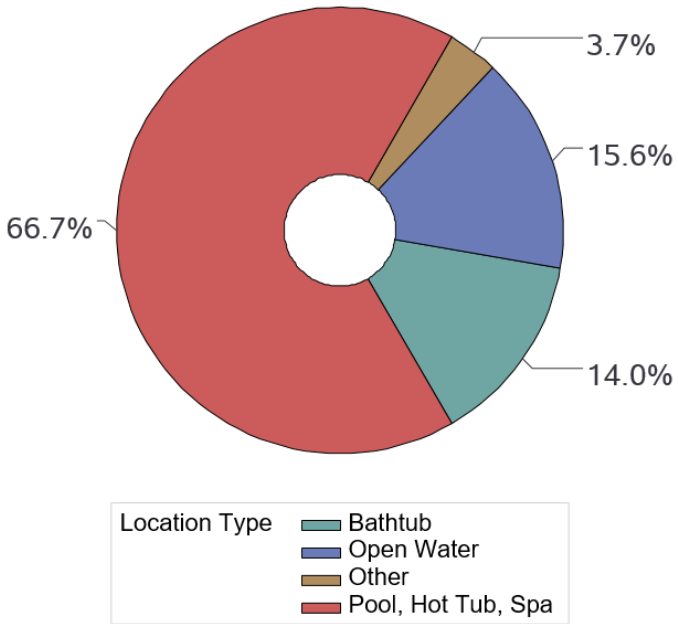


Figure 20. Distribution of child drowning-related fatalities that occurred in pools, hot tubs, and spas by ownership, Arizona residents, 2013–2023.

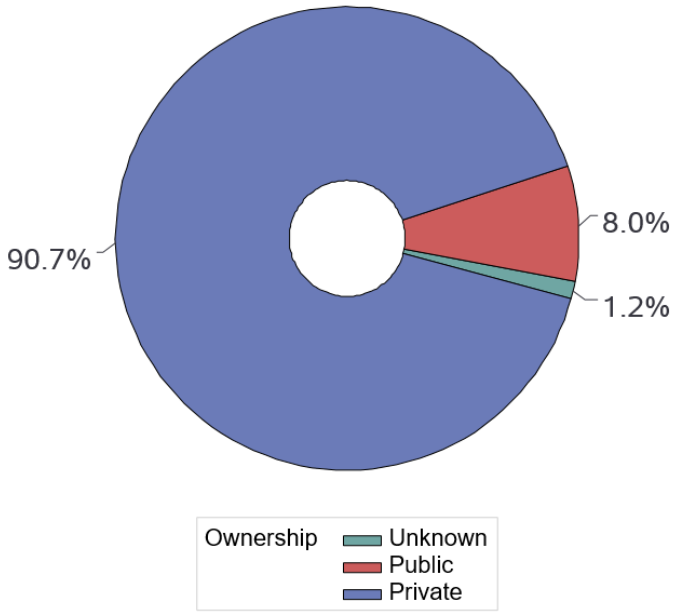
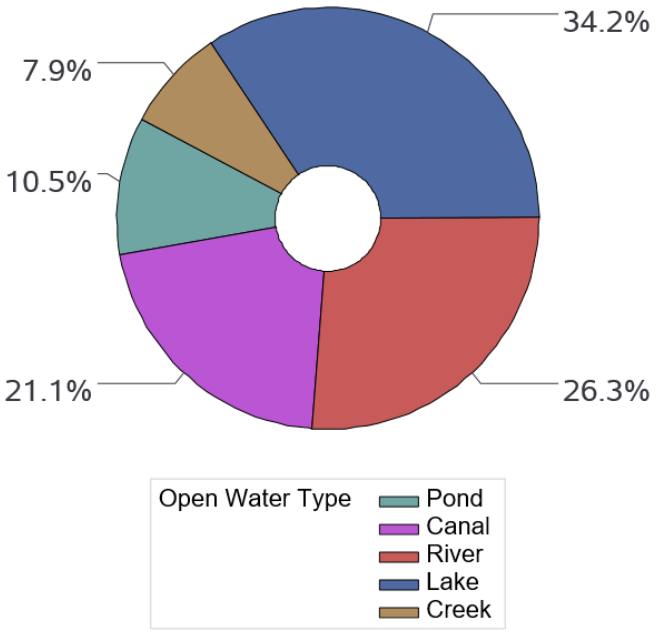


Figure 21. Distribution of child drowning-related fatalities by type of open water, Arizona residents, 2013–2023.



The CFR data also revealed commonly reported circumstances that contributed to these deaths. Inability to swim (63.4%), lack of personal flotation device (63.4%), and lack of supervision (48.2%) were the most reported circumstances of drowning fatalities among children (data not shown).

Among cases reporting an inability to swim, 81.8% occurred in Maricopa County, followed by Pima (6.5%) and Yuma (5.8%). Most cases in which inability to swim was listed (89.6%) involved children aged 1 to 4 years. Among cases reporting no personal flotation device use, 75.3% occurred in Maricopa County, followed by Pima (8.4%) and Yuma (5.2%). Children aged 1 to 4 years accounted for 79.2% of these cases. Among cases reporting a lack of supervision, 80.3% occurred in Maricopa County, followed by Pima (7.7%) and Yuma (6.0%). Children aged 1 to 4 years represented 82.1% of these cases.





Takeaways and considerations

Strengthening drowning data

Takeaway 1. Drowning-related data are currently fragmented across multiple agencies (e.g., hospitals, Emergency Medical Services, fire departments, law enforcement, park rangers, intra-agency groups). This may lead to duplicate counts when data are collated, but it would also provide rich accounts on the circumstances of each incident, which is critical for designing effective prevention strategies.

Consideration 1. A centralized reporting system with built-in de-duplication is needed to link and consolidate data across the response and care spectrum. For example, while the Arizona Department of Health Services is developing a drowning incident form for child fatalities, a broader system is required to capture all age groups and incident types. An additional option could include linking Arizona Game and Fish Department and local law enforcement investigation findings with emergency department visit, hospitalization, and/or death data for a more complete understanding of drowning circumstances.

Takeaway 2. Many existing data systems do not adequately cover all entities, incidents, or circumstances, resulting in gaps in both case counts and circumstantial information. The Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) platform, used for syndromic surveillance, currently receives data from approximately 93% of all healthcare facilities in Arizona on a voluntary basis, making it a promising source for future timely surveillance efforts. Administrative drowning data lack detailed exposure and circumstantial information, such as activity at the time of the incident, environmental conditions, supervision, or alcohol involvement. The absence of these contextual factors limits the ability to fully characterize risk patterns or identify specific prevention opportunities.

Consideration 2. Making drowning a mandatory reportable outcome (similar to certain infectious diseases) and implementing quality assurance measures will help address these gaps and establish a foundation for a dedicated drowning surveillance system. Regular training, especially amid staff turnover and high-work load at reporting facilities, is also critical to ensure data accuracy and completeness.

Takeaway 3. Current datasets often lack the details needed to fully understand exposure to water hazards.

Consideration 3. Integrating data from various sources could provide more context for drowning-related incidents. For example, county tax assessor data can provide counts of residential pools but may lack detailed information about fencing and locks. Health department inspections on public and semi-public pools usually note deficiencies in pool fencing, floatation devices, security locks, and drain covers, and can supplement data obtained from county tax assessors. In addition, city records may show unsafe building conditions, and consumer product data may be beneficial in describing risk in relation to household items such as toilets, buckets, and bathtubs.

Takeaway 4. Data systems are difficult to access and may be dispersed across multiple agencies.

Consideration 4. Establishing direct data-sharing channels through a task force to formalize interagency data exchange would provide a more comprehensive understanding of drowning risks and outcomes. A task force could also define roles and responsibilities, allocate resources, develop a coordinated action plan between agencies across government and community bodies, and could lead to a permanent initiative or service with a dedicated data network for drowning incidents.

Strengthening drowning prevention strategies

Takeaway 1. As the leading source of drowning-related incidents, pools require urgent attention in Arizona.

Consideration 1. Incorporating water safety education in public school curricula (e.g., offering swimming workshops, building a culture of safety), providing safety education for new parents at hospitals, promoting awareness of existing regulations, and strengthening oversight of residential pools could reduce drowning risk.

Takeaway 2. Many fatal child drowning incidents involve children who lack basic swimming skills.

Consideration 2. Expanding access to swimming lessons and establishing standardized skill benchmarks (e.g., floating, treading water, swimming set distances) are essential steps to improve water competency among children. Funding through subsidies, grants, and outreach programs can support these initiatives.

Takeaway 3. Drowning prevention resources are often concentrated in metropolitan areas such as Phoenix and Tucson, resulting in underserved rural communities with access to lakes, rivers, and canals.

Consideration 3. Enhanced coordination, additional funding, and/or the establishment of a centralized, state-level water safety office could support a more equitable distribution of resources. Additionally, since up to 50% of drowning fatalities occur during summer months, an opportunity exists to implement targeted marketing campaigns and allocate resources during these high-risk periods. Such as with pools, natural water settings found in rural Arizona can benefit from stricter monitoring of known drowning risk factors, such as alcohol use, vessel safety including life jacket use, and occupancy limits during peak periods. These risks can also be mitigated through enhanced awareness of existing regulations and oversight of natural water settings.



Backyard pool in Arizona.



Conclusions

Drowning-related injuries and fatalities have consistently been a hazard for Arizona residents, particularly for very young children and older adults. Although drowning happens frequently across all types of bodies of water, most drowning incidents occur at residential pools and bathtubs. Child Fatality Review data revealed that nearly half of the reviewed cases involved a lack of supervision. A lack of swimming ability or lack of personal flotation device use were contributing factors to nearly two-thirds of all reviewed cases. Most of these cases involved children aged 1 to 4 years and most occurred in Maricopa, Pima, and Yuma counties. Males were disproportionately impacted, experiencing a higher rate of drowning-related emergency department (ED) visits, hospitalizations, and fatalities than females. Non-Hispanic White individuals experienced the highest rate of ED visits, and non-Hispanic Black or African American individuals experienced the highest rate of hospitalizations. Age-adjusted fatal drowning rates were highest among non-Hispanic American Indian or Alaska Native individuals. The more populated counties account for most cases across all outcomes, with rates remaining relatively stable due to large population sizes. In contrast, rural counties, while contributing far fewer cases, had relatively high variability in rates, ranging from near zero to some of the highest observed values. This distribution underscores the influence of population size on rate stability, with smaller populations producing more extreme fluctuations despite low case counts.

Several limitations must be noted. First, the analyses presented in this report relied on International Classification of Disease 10th revision (ICD 10) and ICD-10-Clinical Modification (ICD 10 CM) drowning and submersion codes, which may have introduced misclassification bias, as some cases captured by these codes may not represent true drowning events. Conversely, non-fatal drowning incidents are likely underreported, particularly when individuals do not seek care or are treated outside of hospital or ED settings. Second, there are multiple data systems capturing information about drowning incidents in Arizona, each offering varying levels of detail but some missing critical data elements. For example, several areas of the state that contain natural bodies of water, such as Tonto National Forest, are managed by federal government agencies, but usually allow local emergency personnel to lead drowning incident response efforts. In these situations, documentation of the incident may be overseen by the government agency managing the area. However, the narratives or details described in these reports are for internal purposes only, which limits their use for surveillance, monitoring, or analysis. Third, data systems are largely disconnected, lacking a unified framework that ties together data collection and the broader drowning response continuum. Data-sharing protocols with law enforcement, community organizations, government agencies, and emergency personnel are yet to be established, limiting the ability to comprehensively assess drowning incidents across the state. Because of this fragmentation, those responsible for managing the data have had to rely on external ad hoc collaborations to create centralized access and improve coordination. Despite these efforts, limited staffing and resources, paired with drowning prevention often being underprioritized and underfunded, have hindered long-term progress.

Stakeholders have expressed interest in opportunities to improve access to hospitalization, ED, and fire department data as well as expand the information that is collected for drowning-related incidents (e.g., activity at time of drowning, presence of supervision, and the presence of adequate safety mechanisms at pools). Stakeholders also called for support in strategy implementation, data collection, technical tools, and coordination of prevention efforts.

To improve drowning prevention efforts in Arizona, the state could benefit from a centralized data system where data can be linked and longitudinal, capturing information from the drowning incident event through the continuum of care (e.g., Emergency Medical Services to EDs, etc.). Detailed exposure data such as pool inspections, city zoning records, county tax assessor data, and law

enforcement records should be comprehensively explored and integrated to better assess risk factors. Re-classifying drowning as a mandatory reportable incident and enhancing quality assurance through ongoing training would increase the quantity of drowning-related incidents reported to the public health authority and would yield data that are complete and structured. A dedicated task force could facilitate data-sharing across departments to provide a clearer picture of drowning trends, formalize roles, and effectively allocate resources. Additionally, prevention efforts should focus on enforcing pool safety standards, educating children and parents about water risks, expanding access to swimming lessons, and ensuring resource equity across rural and urban regions, especially during the summer season when drowning peaks.

There are many opportunities to strengthen and build upon the drowning prevention and response system that currently exists in Arizona. If proposed strategies are realized, those individuals and organizations across the state that have already contributed so much to this issue, despite limited resources, can be empowered to achieve a system that Arizona residents and visitors can benefit from—one that delivers drowning prevention resources where they are needed, provides comprehensive real-time data, and can be sustained long-term.



Downtown Tucson, Arizona.

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Appendices

Appendix A

Table 1. International Classification of Disease 10th revision (ICD-10) and ICD-10-Clinical Modification (ICD-10-CM) codes used to identify drowning deaths (ICD-10) and emergency department (ED) visits and hospitalizations (ICD-10-CM).

Fatal

Unintentional drowning: Underlying cause of death = V90, V92, W65-W74 OR multiple cause of death = V90, V92, W65-W74 and the underlying cause of death ≠ X60-X99, Y00-Y34, Y87, U01-U03.

Intentional drowning: Underlying cause of death = X71, X92 OR underlying cause of death = X60-X99, Y00-Y09, Y87.0, Y87.1, U01-U03 and multiple cause of death = V90, V92, W65-W74, Y21, OR multiple cause of death = X71, X92 and underlying cause of death ≠ V90, V92, W65-W74, Y21.

Undetermined intent drowning: Underlying cause of death = Y21 OR underlying cause of death = Y10-Y34, Y87.2 and multiple cause of death = V90, V92, W65-W74, X71, X92 OR multiple cause of death = Y21 and underlying cause of death ≠ V90, V92, W65-W74, X71, X92.

T75.1: In the multiple cause of death field T75.1 is considered unintentional drowning if there are no intentional or undetermined injury codes present in the record: X60-X99, Y00-Y38, Y87, U01-U03. If intentional or undetermined injury codes are present in the record, T75.1 is coded as intentional or undetermined intent.

Nonfatal (ED visits and hospitalizations): All codes have a 7th character of A or missing.

Unintentional drowning: V90, V92, W16 with 6th character=1, W16.41, W16.91, W22.041, W65-W74 anywhere in the record.

Intentional drowning: X71, X92 and no other drowning codes present.

Undetermined intent drowning: Y21 and no other drowning codes present.

Primary diagnosis of injury (only traditional hospitalizations): S00-S99, T07-T34, T36-T50 with a 6th character of 1, 2, 3, or 4 except T36.9, T37.9, T39.9, T41.4, T42.7, T43.9, T45.9, T47.9, and T49.9 with fifth character of 1, 2, 3, or 4, T51-T76, T79, O9A.2-O9A.5, T84.04, M97.

T75.1: Considered unintentional drowning if there are no intentional or undetermined intent injuries anywhere in the record: X71-X83, X92-X99, Y00-Y09, Y21-Y33, Y38, R45.88, T14.191, T36–T50 with 6th character=2,3,4 except T36.9, T37.9, T39.9, T41.4, T42.7, T43.9, T45.9, T47.9, and T49.9 where fifth character=2,3,4, T51–T65 with 6th character=2,3,4 except T51.9, T52.9, T53.9, T54.9, T56.9, T57.9, T58.0, T58.1, T58.9, T59.9, T60.9, T61.0, T61.1, T61.9, T62.9, T63.9, T64, and T65.9 where the fifth character = 2,3,4, T71 with sixth character=2,3,4, T74, T76. If there are intentional or undetermined intent injuries in the record drowning was coded as intentional or undetermined intent.

Appendix B

Appendix B Tables 1 through 3 show age-specific counts and rates of unintentional drowning-related emergency department (ED) visits, hospitalizations, and fatalities from 2016 to 2023. ED visit rates were highest among children aged 1 to 4 years throughout the study period, with a rate of no less than 33.27 per 100,000 in 2022 and a max rate of 52.07 per 100,000 in 2017 (Appendix B Table 1). Rates for infants less than 1 year were second highest, ranging from 15.52 per 100,000 in 2019 to 26.10 per 100,000 in 2017. Rates among all other age groups were comparatively low.

Appendix B Table 1. Unintentional drowning-related emergency department (ED) visit counts and rates by age group, Arizona residents, 2016–2023.

	Age groups Count (Rate per 100,000)											
Year	**<1 year**	**1–4 years**	**5–9 years**	**10–14 years**	**15–19 years**	**20–24 years**	**25–34 years**	**35–44 years**	**45–54 years**	**55–64 years**	**65–74 years**	**75+ years**
2016	21 (24.27)	156 (45.45)	20 (4.34)	10 (2.18*)	13 (2.82*)	7 (1.43*)	15 (1.64*)	†	14 (1.66*)	6 (0.74*)	†	†
2017	23 (26.10)	184 (52.07)	27 (5.92)	11 (2.38*)	12 (2.56*)	†	18 (1.92*)	12 (1.41*)	6 (0.71*)	7 (0.84*)	†	†
2018	19 (22.01*)	168 (47.37)	32 (7.03)	9 (1.92*)	18 (3.82*)	†	17 (1.76*)	9 (1.04*)	13 (1.52*)	7 (0.82*)	†	†
2019	13 (15.52*)	139 (39.36)	28 (6.19)	12 (2.51*)	18 (3.79*)	13 (2.63*)	9 (0.91*)	19 (2.16*)	9 (1.06*)	†	†	†
2020	16 (19.81*)	115 (33.55)	17 (3.80*)	11 (2.34*)	11 (2.33*)	13 (2.66*)	14 (1.41*)	15 (1.70*)	9 (1.07*)	6 (0.69*)	8 (1.08*)	†
2021	20 (25.03)	149 (44.23)	22 (4.89)	6 (1.28*)	20 (4.22)	†	18 (1.78*)	23 (2.56)	8 (0.95*)	7 (0.80*)	7 (0.91*)	†
2022	18 (22.16*)	114 (33.27)	18 (3.93*)	8 (1.68*)	15 (3.12*)	6 (1.19*)	14 (1.36*)	12 (1.32*)	8 (0.93*)	8 (0.89*)	†	‡
2023	16 (19.39*)	119 (34.19)	23 (4.95)	6 (1.24*)	†	†	†	13 (1.40*)	14 (1.61*)	7 (0.77*)	†	6 (1.01*)

* Rates calculated with case counts less than 20 should be interpreted with caution as these rates may be unstable

† Case count (<6) is suppressed to prevent disclosure of identifiable information. Additional suppression may be applied to prevent back calculation of a suppressed value.

‡ Zero cases.

Appendix B

Hospitalization rates followed a similar age distribution compared to ED visits. Children aged 1 to 4 years consistently experienced the highest hospitalization rates, peaking at 9.90 per 100,000 in 2016, with a subtle decline for the remainder of the study period (Appendix B Table 2).

Fatal drowning rates displayed a contrasting pattern. While children aged 1 to 4 years experienced elevated fatality rates relative to other age groups, rates increased progressively after the age of 4 and were highest among adults aged 75 years and older (Appendix B Table 3). Deaths among children aged 1 to 4 years peaked in 2021 where there were 8.01 deaths per 100,000 population.



Ribbon Falls, North Kaibab Trail of the Grand Canyon National Park, Arizona.

Appendix B Table 2. Unintentional drowning-related hospitalization counts and rates by age group, Arizona residents, 2016–2023.

	Age groups Count (Rate per 100,000)											
Year	**<1 year**	**1–4 years**	**5–9 years**	**10–14 years**	**15–19 years**	**20–24 years**	**25–34 years**	**35–44 years**	**45–54 years**	**55–64 years**	**65–74 years**	**75+ years**
2016	*	34 (9.90)	6 (1.30†)	*	*	*	*	*	*	6 (0.74†)	*	‡
2017	7 (7.94†)	24 (6.79)	*	*	*	*	‡	*	6 (0.71†)	*	*	*
2018	*	29 (8.18)	*	*	*	*	*	‡	*	7 (0.82†)	*	‡
2019	*	21 (5.95)	*	*	*	*	*	*	*	*	*	*
2020	*	25 (7.29)	*	*	*	*	*	*	*	*	*	*
2021	*	26 (7.72)	*	*	*	*	7 (0.69†)	*	*	‡	*	*
2022	‡	24 (7.00)	*	*	*	*	*	*	*	*	6 (0.76†)	*
2023	*	19 (5.46†)	*	*	*	*	*	*	‡	*	*	*

* Case count (<6) is suppressed to prevent disclosure of identifiable information. Additional suppression may be applied to prevent back calculation of a suppressed value.
† Rates calculated with case counts less than 20 should be interpreted with caution as these rates may be unstable.
‡ Zero cases.

Appendix B

Appendix B Table 3. Unintentional drowning-related fatality counts and rates by age group, Arizona residents, 2009–2023.

	Age groups Count (Rate per 100,000)											
Year	**<1 year**	**1–4 years**	**5–9 years**	**10–14 years**	**15–19 years**	**20–24 years**	**25–34 years**	**35–44 years**	**45–54 years**	**55–64 years**	**65–74 years**	**75+ years**
2009	*	20 (4.92)	*	*	6 (1.32†)	9 (1.97†)	13 (1.35†)	8 (0.88†)	7 (0.82†)	12 (1.80†)	11 (2.52†)	13 (3.09†)
2010	*	21 (5.70)	*	*	*	6 (1.36†)	13 (1.52†)	8 (0.97†)	13 (1.54†)	7 (0.96†)	9 (1.81†)	10 (2.60†)
2011	*	19 (5.12†)	*	*	*	6 (1.35†)	*	14 (1.69†)	10 (1.18†)	9 (1.23†)	10 (1.99†)	9 (2.33†)
2012	*	12 (3.36†)	*	*	6 (1.28†)	8 (1.76†)	10 (1.16†)	9 (1.09†)	19 (2.27†)	8 (1.07†)	*	8 (1.99†)
2013	‡	19 (5.41†)	*	‡	*	*	8 (0.92†)	10 (1.20†)	13 (1.56†)	7 (0.92†)	*	9 (2.17†)
2014	*	13 (3.71†)	*	*	7 (1.54†)	*	*	14 (1.68†)	9 (1.07†)	14 (1.79†)	8 (1.35†)	9 (2.09†)
2015	*	14 (4.04†)	*	*	8 (0.44†)	6 (1.22†)	11 (1.22†)	8 (0.95†)	11 (1.31†)	11 (1.38†)	11 (1.76†)	14 (3.11†)
2016	*	20 (5.83)	*	‡	6 (1.30†)	7 (1.43†)	14 (1.53†)	8 (0.95†)	11 (1.30†)	12 (1.47†)	11 (1.68†)	15 (3.20†)
2017	*	19 (5.38†)	7 (1.53†)	*	7 (1.49†)	12 (2.46†)	17 (1.81†)	9 (1.06†)	11 (1.29†)	19 (2.27†)	12 (1.75†)	12 (2.44†)
2018	‡	22 (6.20)	*	*	*	6 (1.23†)	14 (1.45†)	15 (1.73†)	11 (1.29†)	8 (0.94†)	7 (0.99†)	16 (3.16†)
2019	*	8 (2.27†)	*	‡	*	*	13 (1.32†)	*	15 (1.76†)	18 (2.07†)	18 (2.74†)	13 (2.43†)
2020	‡	19 (5.54†)	*	‡	*	*	8 (0.81†)	13 (1.47†)	14 (1.67†)	16 (1.84†)	17 (2.29†)	16 (2.92†)
2021	*	27 (8.01)	*	*	8 (1.69†)	8 (1.61†)	10 (0.99†)	16 (1.78†)	11 (1.30†)	13 (1.48†)	9 (1.17†)	16 (2.78†)
2022	*	22 (6.42)	*	*	*	6 (1.19†)	10 (0.97†)	19 (2.08†)	18 (2.10†)	14 (1.57†)	20 (2.55)	17 (2.90†)
2023	*	17 (4.88†)	*	*	6 (1.23†)	6 (1.17†)	18 (1.72†)	11 (1.19†)	9 (1.03†)	17 (1.87†)	21 (1.63)	23 (3.87)

* Case count (<6) is suppressed to prevent disclosure of identifiable information. Additional suppression may be applied to prevent back calculation of a suppressed value.
† Rates calculated with case counts less than 20 should be interpreted with caution as these rates may be unstable.
‡ Zero cases.

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