



California Drowning Data Report



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Background

Water and California

With 39 million residents, California is the most populous and third largest state by land area in the United States.¹ California comprises the majority of the United States (U.S.)' western coast and ranks third in total ocean shoreline miles among all states.² Though most well-known for southern beaches with moderate climates and year-round sun, California's 1,110 miles of coastline includes a wide range of water temperatures, environmental conditions, and associated water safety risks due to its complex ocean current systems.^{3,4} In addition to vast and varied coastal water access, California also boasts over 2,000 miles of rivers, over 27,500 documented standing bodies of water (e.g., lakes, reservoirs, and ponds), and 454,000 acres of non-agricultural wetlands.⁵⁻⁷ Many of these natural water sources experience significant yearly variability in water quantity and quality due to California's inconsistent precipitation.⁸

Natural water in California has been essential to sustenance, travel, and recreation for thousands of years. California's Indigenous peoples have cultivated deeply insightful knowledge of and relationships to water through practices such as boating and navigation, sustainable water-based sustenance (e.g., salmon fishing and abalone harvesting), recreational play, and associated cultural, spiritual, and ceremonial caretaking of the land and water.⁹⁻¹⁴ Traditional Indigenous Ecological Knowledge is recognized as an important component of improving safety in and around California's water through maintaining ecosystem biodiversity, combating climate change, and cultivating a greater understanding of and respect for water.¹²

Examining the health impacts of water management strategies developed by Spanish, Mexican, and U.S. settlers reveals the consequences of systems that prioritize expansion over safety and sustainability. California's agricultural industry, which consumes roughly 40% of the state's water and produces over \$50 billion in annual revenue, is supported by a vast network of irrigation canals; these unregulated sources of water, however, pose a concerning risk of drowning for humans and animals.¹⁵⁻¹⁷ Additionally, large-scale re-routing of water and re-purposing

has led to increased flooding and property damage in regions of California such as Owens Valley, along with other adverse health outcomes.^{18,19} Thus, creating sustainable water usage and management systems that holistically incorporate input from land use partners is critical to water safety and accessibility at the state level.

Millions of residents and tourists also enjoy water-based recreational opportunities, including over four hundred surfing sites, and ample kayaking, boating, and water-based sightseeing locations; beaches alone experience over 150 million one-day visits a year.^{20,21} High exposure to recreational water activities comes with an increased need to prioritize drowning prevention in recreational spaces to ensure these opportunities are safe for all.

California is also renowned for its pools, with 1.3 million in-ground swimming pools across the state and roughly 15,000 pools added each year.²² An important driver of pool construction and use in much of the state is weather, as mild temperatures allow for the operation of year-round outdoor public and private pools. Given that many of California's pools are residential pools without trained staff, it is important that pool and safety guidelines and drowning prevention practices are developed, disseminated, and enforced through policy, education, and data analysis.

Water as a site of leisure has been an important selling point since the California booster campaigns of the early 1900s, which sought to present the state as the "ultimate symbol" of laid-back and luxurious "progress and modernity."^{23,24} Hollywood-based films, lifestyle magazines, and other forms of media have promoted the desirability and luxury of private, leisure-oriented pools, beaches, and coastlines in southern California since the 1930's. These images have captured national and international imaginations and cemented the role of the backyard pool in the "cultural tapestry" of California's state imagery.²⁵

Drowning prevention

California maintains statewide legislation, agency support, and a robust network of public and private partners committed to drowning prevention. Increased water safety infrastructure, including the passage of new laws, increased funding for prevention and education initiatives, and the development of multisectoral coalitions has greatly advanced the state's ability to address drowning in the last fifteen years.

California statewide laws establish safety standards for pools and personal flotation devices (PFDs). Senate Bill (SB) 552 (2024, Calif. Leg.) requires that all pools and hot tubs built after January 1st, 2007, must be equipped with at least two of seven approved drowning prevention safety features.²⁶ Additionally, isolation fencing is required for any pool associated with a licensed childcare setting.²⁷ Some counties have passed additional pool safety regulations at the municipal level.²⁸ However, none of these laws require regular inspections to ensure that private pools maintain legal safety standards after being built, nor do laws require inspections for private pools built before these laws were enacted.

In addition to pool safety laws, every child under 13 years old must wear an appropriate U.S. Coast Guard-approved life jacket while in a "moving

recreational vessel" in California.²⁹ Starting in 2026, statewide law will also prohibit the manufacture, sale, and distribution of wearable PFDs that are not approved by the United States Coast Guard.³⁰ Moreover, an adult trained in cardiopulmonary resuscitation (CPR) must be present when children are engaging in or around a school swimming pool.³¹ These laws represent important steps in ensuring water safety, but there are gaps in understanding how and if these laws are enforced, or their overall impact.

The Department of Boating and Waterways is the only state entity mandated to provide fundamental water safety education for all children in California.³² However, limited personnel and lack of state funding support mean the mandate cannot practically be enacted for all California schools.

One of California's most notable innovations to address the multisectoral nature of drowning prevention has been the development of coalitions and task forces that connect, mobilize, and amplify water safety organizations and initiatives at the local and state level. Coalition participants include public health institutions, first responders and medical experts, family and private foundations, childhood safety advocates, aquatics professionals, and community-centered water safety organizations.³³ At the local level, county-wide task forces address



Couple kayaking on unknown body of water.

drowning incident response and data collection, policy implementation, and drowning prevention interventions such as educational campaigns and swim lessons.^{34,35} Additionally, partnerships between lifeguards and hospitals/trauma response centers tackle ocean-based water safety and drowning prevention.³⁶

At the state level, the California Water Safety Coalition (CWSC) “connects, convenes, and coordinates California’s drowning prevention and water safety community to collaborate on effective solutions to prevent drowning.”³³ This includes hosting an annual summit, fostering the creation of working and project groups to support specific drowning prevention goals (e.g., reviewing and providing feedback on legislative reports), and producing the California Water Safety Strategy, which names eight priorities for drowning prevention in the state.³⁷ This strategy represents an unprecedented and important first step in designing a comprehensive drowning prevention strategy for California and will be a critical precursor to the CDPH’s construction of a state legislation-mandated California Water Safety Action Plan for Children that will launch in 2027.³⁸

Project description

This project seeks to better understand and strengthen drowning data collection and analysis to prevent further tragedies in and around water in California. Research was conducted in collaboration with the CDC Foundation, the CDPH, the CWSC, and various drowning prevention and aquatic safety partners across the state.

The following report includes:

1. A situational assessment of California’s existing data, driven by a questionnaire administered to partners across the state that evaluated existing resources, priorities, gaps, capacity and need
2. A detailed analysis of burden and circumstances of drowning based on existing data
3. Lessons and considerations for strengthening drowning data and engaging in drowning prevention across California based on research and evidence



Friends surfing in the morning.



Situational assessment

Introduction

In 2023, the California Water Safety Strategy (The Strategy) named enhancing drowning data as one of eight key priorities critical for advancing drowning prevention efforts statewide.³⁷ The Strategy lists linkage across institutional data sources, the standardization of data collection tools, and the creation of a statewide drowning registry as key points in transforming California's drowning data at the state level.

An evaluation of existing drowning data available at the state and local level confirms that California's current systems have major gaps in determining important circumstantial information. Some county-specific systems and initiatives provide best practices to potentially increase collection of circumstantial information. Additionally, county partners provide important insight into national and state-level systems. Designing systems that attend to local specificity and statewide known risk factors will be important in enhancing efficacy and fidelity. Burgeoning financial and legislative support from the California State Senate, the CDC Foundation, and drowning prevention coalitions demonstrates that dedicated staffing and legislative mandates allows for increased access and analysis across existing data sources.

Legislative support for drowning data

Despite the lack of formalized data sharing and access across the state, California's grassroots community organizing has resulted in information and strategy sharing and mobilization at the county and state level. Community advocates drove the passage of foundational capacity-building legislation and the strengthening of coalitions that advance data collection, sharing, and analysis.

A landmark turning point for drowning data in the state of California was the passage of Senate Bill (SB) 855 (2022, Calif. Leg.). SB 855 established the development of a four year "data collection pilot program" within California Department of Public

Health (CDPH) to "collect detailed data on childhood fatal and non-fatal drowning in California."³⁸ By January 1st, 2027, the pilot program will submit "recommendations on the structure and operation of an ongoing system for collecting child drowning data" along with a "standardized electronic form for counties to use in reporting drowning statistics."³⁸ The passage of bills such as SB 855 would not be possible without active and engaged multisectoral partners.

Since its 2024 inception, SB 855's Drowning Data Pilot Program has provided an essential foundation for establishing a statewide drowning registry system and has already provided personnel staff to conduct more robust, systemic drowning surveillance and analysis. Most surveyed partners evaluated in this section are also county and state partners included in SB 855's Drowning Data Pilot Program.

The Pilot Program is substantially supported by the California Water Safety Coalition (CWSC), which hosts a yearly summit featuring data sessions and maintains an ongoing data workgroup. This group is the largest statewide hub for such knowledge sharing and strategy development and has been a crucial site in shaping and analyzing data systems. CWSC members have provided essential insight, partnerships, and community feedback to each other and to the CDPH.

Statewide drowning data collection

CDPH provides consistent access to user-friendly analyses of basic drowning data, including deaths, emergency department (ED) visits, and hospitalizations. Beyond this, however, California's statewide data are decentralized by demographics, drowning circumstance (e.g., location), outcome (fatal/non-fatal), and response type (i.e., Emergency Medical Services [EMS] personnel on scene). Increasing access to existing statewide databases will allow for more detailed information on drowning circumstances, impact, and potential prevention measures.

Deaths, ED visits, and hospitalizations attributed to all injury mechanisms, including drowning, have been analyzed annually at the state level by CDPH since 1991. These data are made available to the public via the EpiCenter dashboard, an “interactive tool for viewing California data on injuries that resulted in death, hospitalization, or an ED visit.”³⁹ California’s EpiCenter data include basic demographic and residence location information for all cases, along with manner of death. However, the dashboard only includes fatal cases where drowning is an underlying cause of death (and not cases where drowning was a contributing cause of death) and lacks drowning location specification beyond International Classification of Disease codes, which can be further ascertained by recoding free response text information. Importantly, ED visits and hospitalizations include multiple causes of death on EpiCenter, leading to more comprehensive coverage for non-fatal incidents.

In addition to EpiCenter, CDPH has provided a yearly drowning data presentation at the annual CWSC Summit since 2021. These presentations allow for the dissemination of more detailed data to relevant sector representatives but are not available for public access after the Summit. With staffing support provided by SB 855 and the CDC Foundation, this year CDPH has released a public-facing Injury Data Brief: California Drowning Trends (2016–2023). This brief provides information about unintentional drowning trends to all water safety partners.⁴⁰

CDPH maintains a long-standing relationship with California’s Child Death Review Teams (CDRTs). CDRTs are multisectoral investigation teams dedicated to “sharing of confidential information between various agencies so that cases of child abuse-related fatalities would not be missed” and were originally created to address child abuse.⁴¹ The nationally standardized child death review case report form has a very detailed drowning module that provides robust information about drowning location, circumstance, and adult responsibility.

In Sacramento County, where every child death is reviewed and every CDRT form is comprehensively completed, this instrument is a valuable source of both locally specific and nationally comparable drowning data. However, national and state funding for the CDRT program has been reduced for many years, resulting in fewer counties maintaining active teams, even fewer reviewing all cases, and only a small number consistently submitting information to the national system.

CDPH is currently exploring many additional data sources, including the California Emergency Medical Services Information System, drowning data from California State Parks for both fatal and non-fatal incidents, boating-related drowning data maintained by the Department of Boating and Waterways, and data from the state’s new syndromic surveillance system (CalSyS).^{42–44} It is important to recognize that negotiating voluntary data agreements with other state agencies is a time-consuming process due to competing departmental priorities and preserving important data privacy protections.

California’s Department of Developmental Services (DDS) maintains detailed information about individuals with long-term disabilities caused by non-fatal drowning incidents. Both diagnostic (e.g., type and severity of disability) and evaluation (e.g., impact on life skills and functionality) data are collected about these individuals and summarized information is published in the department’s annual Client Development Evaluation Report.⁴⁵ Future analysis of record-level data on the long-term health effects of non-fatal drowning utilizing information maintained by DDS is imperative for advancing water safety and drowning prevention efforts.

Media monitoring: A burgeoning system

California maintains limited media monitoring drowning databases via two organizations: the National Oceanic and Atmospheric Administration (NOAA), which provides media and mapping data for weather-related drowning across the state, and the Water Safety Council of Fresno County, which collects data for all media-reported fatal drowning within the county.

NOAA houses the National Centers for Environmental Information, which maintains a Storm Events database that records “the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce” along with “rare, unusual, weather phenomena” and “significant meteorological events.”⁴⁶ In addition to recording storm and flood-related drowning, NOAA also provides extensive environment-related circumstantial information for drowning incidents involving high surf, storm surge/tide[s], rip currents, and coastal flooding. CDPH plans to explore the utility of NOAA data in the next fiscal year; however, the total number of deaths captured by this system is small and thus reduces analysis priority at the state level. There are two NOAA offices that operate in California that monitor the northern and southern regions of the state and submit data into this system.

The Water Safety Council of Fresno County (the Council) manually monitors Google for media reports of drowning incidents by searching for keywords into Google Alert.⁴⁷ New incidents are filed in a private spreadsheet that tracks incident dates, victim demographic data, and narrative comments about the incident when available. Photo, reporting, and community comment data are used to generate the approximate GPS location of each incident. The Fresno County Sheriff’s Office, which is responsible for cataloguing and investigating fatal drowning, informally reviews the spreadsheet at the end of each year to confirm media reporting alignment with internal fatality records. If media reporting

and internal records align, spreadsheet results are posted on the Council’s website along with mapping information.

The Council’s system demonstrates that media monitoring for drowning is possible at the county level but is contingent upon sustainable staffing, dedicated time and human resourcing, and inter-agency cooperation. The Council’s system is currently maintained by an individual champion who volunteers their time and expertise to monitor drowning; there is no legislative or fiscal structure that supports media monitoring. Additionally, Council data management cannot directly access any record-level Sheriff’s Office data and is dependent on voluntary data sharing. While longstanding individual and community-level relationships with the Sheriff’s Office allow for some engagement between official death records and media monitoring, lifeguards and other aquatics agencies have been more difficult to contact regarding data on drowning incidents.



Santa Barbara, California coastline.

Localized circumstantial data

A cross-sectional analysis of ten California counties demonstrates the breadth of data collection at the local level. Counties were identified for inclusion based on diversity of geography, ranking within the top 10 drowning rates or counts in the last five years, and ongoing engagement in water safety and drowning prevention. Some entities collect only minimal data, but other agencies have created innovative, gold-star systems for monitoring drowning. One of California’s biggest strengths is the design, implementation, and evaluation of localized first responder instruments for drowning incidents that capture circumstance and outcome data.

Emergency Medical Systems

Two exemplary drowning incident forms for EMS providers are the Submersion Incident Reporting Form (SIRF), created by Riverside County’s Department of Public Health, and the Childhood Immersion System (CIS) electronic Patient Care Record module used in Orange County. While

EMS drowning incident response data collected by other counties only includes basic demographic information and incident time/date/address, both the SIRF and the CIS forms include more extensive drowning-specific questions for EMS officers to answer on-scene. These forms have allowed for more detailed analysis of drowning circumstances (e.g., lack of supervision) and identifying drowning hotspots for specific age groups.⁴⁸⁻⁴⁹

Orange and Riverside counties also use digitized reporting system infrastructure to ensure thorough and efficient completion of these more expansive data categories. In both counties, EMS officers cannot log their response to a drowning incident without completing drowning circumstance information questions asked in their supplemental forms, which auto populate if “drowning/submersion” is selected in the standardized reporting form. By making submission of the standard EMS response form predicated on answering drowning module questions, these counties have created a data infrastructure that facilitates information capture on-site. One area of improvement is automating

Table 1. Drowning-specific variables included in the Submersion Incident Reporting Form (SIRF) and Childhood Immersion System (CIS) forms.

Both CIS and SIRF		CIS	SIRF
• Barriers to water access	• Flotation device		• Last seen (activity)
• Barrier breach information	• Languages spoken by parents		• Type of clothing
• Swim lesson history			• Supervisor activity
• Immersion site (i.e., victim home, neighbor, friend, hotel)			• Water clarity/depth
• Type of incident dwelling (i.e., single family residence, apartment/condominium)			• Toys/objects in water
• Last seen (location and time)			• Estimated time submerged
• Rescue attempt			• Child Protective Services referral
• Rescue equipment			• Transported off-site or dead on arrival
• CPR administration			• Alcohol or drug use evident
• Supervisor/caretaker relationship to child			

hospitalization outcomes and discharge records for cases recorded by these forms. Riverside Department of Public Health representatives manually contact hospitals for updated outcome and discharge data for every case filed using the SIRF form, providing valuable, but human resource-dependent, follow-up information that better captures each drowning incident in its entirety. Automatically connecting hospitalization and discharge data to EMS cases and their corresponding SIRF forms would increase the efficacy and scalability of creating a standardized drowning form at the state level. This is both possible and feasible, as this process exists for statewide instruments such as the Cardiac Arrest Registry to Enhance Survival.⁵⁰

Beach lifeguard data

California is well known for its world-leading coastal and open water lifeguard systems. These first responders have substantially reduced the number and severity of aquatic distress incidents through the design and analysis of detailed, hyper-localized data collection systems. Huntington Beach, for example, regularly monitors an extensive set of beach-specific environmental conditions that impact safety in and around water, such as complex details about specific tide and current formations in high-risk areas. All lifeguard intervention actions are recorded in real time, and shift changes, staffing assignments, and personnel feedback are all regularly monitored, analyzed, and incorporated into operational decision-making processes.

In addition to providing important preventative and response information that enhance water safety, these data are crucial for ensuring adequate lifeguard staffing and appropriate resources are available. Encouraging the development and sustainability of locally specific systems that also integrate standardized drowning risk and prevention data into a robust, statewide structure would build interagency communication, allow for deeper understanding of California's vast and nuanced waterscape, and support lifeguard first responders to ensure our coasts remain safe for all.

Third-party vendors that manage information technology and data infrastructure needs for California's first responder drowning data systems are essential for high-level data collection and analysis, demonstrating the importance of the business sector in generating robust drowning data. One transformer of the ocean lifeguarding space is Watchtower, a lifeguard-founded "next generation digital command center for first responders."⁵¹ Watchtower provides incident data and auditing, computer assisted design and resource management, geographic information systems and trend analysis, internal and public communication tools, application programming interfaces and advanced integrations, and operations/asset management.

The presence of platforms with subject matter expertise in drowning response and prevention makes the development and expansion of California's beach lifeguarding data systems significantly more feasible by creating the data infrastructure to capture local knowledge and specificity while comparing outcomes and trends across the state. Individual company contracts with the United Kingdom, the United States Lifeguard Association, and other regional and national entities demonstrate that California-based vendors have the technology to link and expand systems at the state level and can provide clear price points, design models, and contract experience. These platforms demonstrate that data siloing can be overcome with flexible and comprehensive infrastructure to conduct drowning analysis and prevention at many different scales.



Burden and circumstances of drowning in California

Introduction

The following section outlines the burden and circumstances of drowning in California based on available data. The section begins with an overview of data analysis methods, followed by a review of fatal and non-fatal counts and rates over the period of study. Following this is an analysis of circumstantial variables including location, race, age, sex, region of California, and temporality. The section concludes with a preliminary review of circumstantial drowning data ascertained via analysis of Child Death Review Team (CDRT) data entered in the National Center for Fatality Review and Prevention (NCFRP) database.

Important conclusions include a recent rise of fatal drowning incidents across all age groups, continuing disparities in drowning across several demographics including race and sex, differences in drowning location and outcome by region, and confirmed need for strong supervision and safe access to water for children.

Methods

International Classification of Disease 10th revision (ICD-10) codes were used to identify drowning deaths and ICD-10 Clinical Modification (ICD-10-CM) codes were used to identify drowning-related emergency department visits and hospitalizations; Table 2 shows specific ICD-10 and ICD-10-CM codes. To better understand the full burden of drowning, expanded inclusion criteria for drowning deaths and hospitalizations were developed and used throughout this report. The following sources and inclusion criteria were used for all figures and statistics in this portion of the report unless explicitly stated otherwise.

Deaths from Civil Registration and Vital Statistics data from 2009–2023 were identified as unintentional drowning if there was an unintentional drowning ICD-10 code in either the underlying cause of death or multiple causes of death fields. This differs from the approach typically used for identifying fatal drowning, which only utilizes the underlying cause of death field. The expanded

criteria captured 22.4% more unintentional drowning deaths compared to the traditional approach from 2009–2023. Intentional drowning and drowning deaths of undetermined intent were also identified.

Emergency Department (ED) visits were identified from the California Department of Healthcare Access and Information (HCAI) ED data, and hospitalizations were identified from HCAI's Patient Discharge Data (PDD). ED and hospitalization data were limited to ED visits that did not result in hospitalization or death and hospitalizations that did not result in death. Traditionally, hospitalizations are only considered drowning-related if the primary diagnosis is an injury and there is a drowning ICD-10-CM code in a subsequent field while ED visits are considered drowning-related if there is a drowning ICD-10-CM code anywhere in the record.⁵² For this report, 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. ED and hospital data were limited to 2016–2023 due to coding changes of ICD-10-CM codes from the 9th to 10th revision. Intentional and undetermined intent for drowning-related ED visits and hospitalizations were also identified. Counts for both ED and hospitalization visits align with those provided by the California Department of Public Health (CDPH) via EpiCenter, as the same inclusion criteria is used for this site.

Rates were calculated as the number of drowning deaths, ED visits, or hospitalizations per 100,000 state residents overall and by year, sex, age group, race/ethnicity, and region using population estimates from the U.S. Census Bureau (vintage 2023 estimates for 2020 to 2023, vintage 2020 estimates for 2010 to 2019, and intercensal 2010 estimates for 2009 from: <https://www2.census.gov/programs-surveys/popest/datasets/>). Rates were age adjusted to the 2000 U.S. standard population using the direct method.⁵³ The number of drowning deaths, ED visits, and hospitalizations were also calculated for incidents that occurred in California among non-residents of California. Unless otherwise noted, the focus of this report is on unintentional drowning among state residents.

Table 2. 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 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.

Non-fatal (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.

Results

Drowning by the numbers: An overview

Between 2009 and 2023, 9,757 drowning deaths were recorded in California's Civil Registration and Vital Statistics data, an average of twelve fatal drowning incidents each week.^a From 2016–2023, drowning represented 2.6% of all injury-related deaths. For every fatal drowning in California, approximately three people were treated for non-fatal drowning at the ED or hospital between 2016–2023. Of these, 11,889 visited an ED and 3,262 were admitted to a hospital for non-fatal drowning. California residents comprised around 90% of all cases, with comparable percentages across deaths, ED visits, and hospitalizations.

Most drowning deaths among California state residents (7,384; 82.1%) were unintentional, though an intentional drowning led or contributed to 1,146 fatalities of state residents.^b As many early cases do not specify primary intent, only 398 of these intentional drowning cases were definitively classified as suicides (4.4% of all state resident drowning fatalities) and 45 drowning fatalities were due to homicide (<0.1%).^c Most suicide cases were clustered in the Bay Area, which had 115 self-harm drowning fatalities related to a fall. This may be driven by the presence of bridges over the water such as Golden Gate Bridge, a known "suicide magnet" that averaged roughly 30 suicides per year from 2005 until the installation of a suicide deterrent net in January 2024.⁵⁴⁻⁵⁵

The majority of drowning hospitalizations (70.8%) and ED visits (66.6%) for state residents were also unintentional. However, intent of drowning was more difficult to ascertain in ED and hospitalization settings; 26.2% and 29.2% of total drowning incidents respectively were marked "undetermined" compared

to only 4.6% of deaths for all state residents. The CDPH's injury surveillance case definitions only rely on underlying cause of death; inclusion criteria also changed slightly in 2016 when the state injury dashboard was updated. Therefore, drowning fatality counts from both systems are lower than those reported throughout this section. California's Legacy EpiCenter, which contains the state's standard injury surveillance data prior to 2016, reports 3,198 drowning fatalities between 2009–2015 for state residents across all intents and mechanisms. California's current public-facing injury data dashboard, EpiCenter, reports 4,284 drowning fatalities between 2016–2023 for state residents across all intents and mechanisms.

Among unintentional fatalities where drowning was a contributing cause, common underlying causes of unintentional deaths included motor vehicle crashes (350 cases) and boating/water transport-related fatalities (263 cases). Among drowning deaths where boating or water transport-related injury was listed as the underlying cause, 74.5% of watercrafts were unspecified (196 cases); however, 19.7% involved a canoe or kayak (54 cases).

Intent was labeled "undetermined" for many cases where drowning was a contributing cause of death, particularly for instances where primary cause of death was a chronic health condition. When "undetermined" and "unintentional" manner of death were combined, 257 drowning fatalities were attributed to cardiac or circulatory-related health issues; of these cardiac-related cases, 60.1% or 156 cases were attributed to ischemic heart disease. Additionally, 50 drowning fatalities reported epilepsy as the primary cause of death when aggregating across unintentional and undetermined intent. This aligns with previous research across California, the United States, Canada, and Australia, which has identified epilepsy as a significant risk factor for drowning.⁵⁶⁻⁵⁹

^a Deaths were identified from the California Comprehensive Master Death File. Hospitalizations were identified from the California Department of Health Care Access and Information (HCAI) Patient Discharge Data (PDD). Emergency Department visits were identified from HCAI Emergency Department data. Deaths, ED Visits, and Hospitalizations are mutually exclusive. All data analysis conducted using expanded CDC Foundation criteria for inclusion of primary and secondary sources (see Methods section).

^b For earlier data (majority 2009–2015), some cases where drowning was a secondary cause of death did have an intent assigned for primary cause of death, even though the drowning itself was marked as intentional. For the sake of this analysis, all cases where drowning itself was intentional were included even if primary intent was not specified.

^c For comparison, the three top injury mechanisms for fatal suicides between 2009–22 were via firearm (11, 218), suffocation (10,278), and poisoning (4,358). From EpiCenter (CDPH, 2025).

Major demographic takeaways

Identifying populations that are disproportionately impacted by drowning and better understanding potential causes of these disparities is an essential component of preventing future drowning incidents. The following segment of this report reviews trends and distributions for fatal and non-fatal drowning incidents in California across several demographic variables. The analysis begins with a review of differences in incidence and outcome across sex, age, and race/ethnicity (Table 3), followed by an exploration of location, region, and temporal trends. All analysis is limited to state residents only.

Table 3. Emergency department (ED) visits (2016–2023), hospitalizations (2016–2023), and fatalities (2009–2023) average counts and rates per 100,000 residents in California across sex, age, and race/ethnicity.^a

Variable		ED visits		Hospitalizations		Fatalities	
		Annual average count	Rate per 100,000 residents*	Annual average count	Rate per 100,000 residents*	Annual average count	Rate per 100,000 residents*
Sex	Male	547.00	3.00	177.25	0.97	359.67	1.85
	Female	387.50	2.22	92.75	0.53	132.60	0.66
Age	<1 year	42.25	9.33	11.12	2.46	3.27	0.69
	1-4 years	372.75	19.63	114.00	6.00	46.60	2.38
	5-9 years	87.50	3.44	27.25	1.07	11.27	0.44
	10-14 years	59.38	2.28	13.38	0.51	6.67	0.26
	15-19 years	52.75	1.95	11.38	0.42	20.13	0.73
	20-24 years	53.00	1.79	8.25	0.28	31.60	1.09
	25-34 years	87.50	1.87	18.25	0.39	63.80	1.21
	35-44 years	65.38	1.30	13.88	0.28	58.00	1.14
	45-54 years	48.25	0.97	16.12	0.33	67.47	1.33
	55-64 years	33.12	0.69	13.62	0.28	68.73	1.47
	65-74 years	21.12	0.59	12.25	0.34	55.20	1.69
	75+ years	11.62	0.45	10.50	0.40	59.53	2.34
Race/ethnicity	American Indian or Alaska Native	3.00	2.06	0.75	0.54	5.07	3.09
	Asian	66.75	1.40	27.00	0.55	61.73	1.10
	Black or African American	54.50	2.95	20.88	1.15	40.00	1.82
	Native Hawaiian or other Pacific Islander	2.00	1.48	0.88	0.65	0.47	0.36
	White	400.50	3.90	107.38	0.99	247.67	1.53
	Hispanic or Latino ^d	326.50	1.94	81.50	0.50	132.80	0.92
	Multiracial	5.88	0.37	3.50	0.18	2.40	0.25
	Unknown	75.50	**	28.12	**	1.80	**
	Other	**	**	**	**	**	**

Variable		Emergency Department		Hospital		Fatal	
		Annual average count	Rate per 100,000 residents*	Annual average count	Rate per 100,000 residents*	Annual average count	Rate per 100,000 residents*
Residence region	Superior California	88.50	2.98	20.00	0.66	61.53	1.91
	Northern Coast	26.62	3.16	6.00	0.66	22.47	2.31
	San Francisco Bay Area	129.50	2.09	32.75	0.53	82.33	1.12
	Northern San Joaquin Valley	59.88	3.18	11.25	0.60	42.07	2.27
	Central Coast	46.62	2.16	11.12	0.50	29.73	1.29
	Southern San Joaquin Valley	80.88	2.99	15.25	0.57	41.40	1.68
	Inland Empire	141.12	3.20	39.00	0.89	50.27	1.14
	Los Angeles County	172.25	1.93	59.88	0.67	88.27	0.87
	Orange County	86.12	3.07	30.25	1.04	34.87	1.08
	San Diego & Imperial Counties	99.50	3.02	41.62	1.26	37.40	1.06

*Rates per 100,000 residents for Sex, Race/Ethnicity, and Residency Region are adjusted for age; Rates for age groups are age-specific.

**Suppressed due to low numbers.

Sex

California's fatal drowning rates by sex have remained stable over time at a ratio of approximately one female death for every three male deaths (1:3).^e Both groups had the highest rate of fatal drowning across the study in 2023, which reflects overall trends in fatality throughout the state (see Temporal Trends section). Interestingly, the recent increase in male deaths appears to be driven by those aged 45–54, 55–64, and 65–74 years, which indicates the need for more research regarding drowning risk in middle-aged and older males. Conversely, female fatality rates were not clustered in a particular age range. Both males and females have exhibited clear decreases in drowning-related ED visits and hospitalizations rates in recent years, with 2023 marking the lowest unintentional ED visit rate of all time for females and the second lowest for males. This also reflects overall trends throughout the state (see Temporal Trends

section).^f The most prevalent trend in drowning circumstance by sex was watercraft-related fatalities, of which roughly 91.6% were male. This is a well-reported phenomenon that is often attributed to sex-based differences in risk-taking behavior and discrimination against women in boating and sailing spaces.⁶⁰⁻⁶⁵

Age

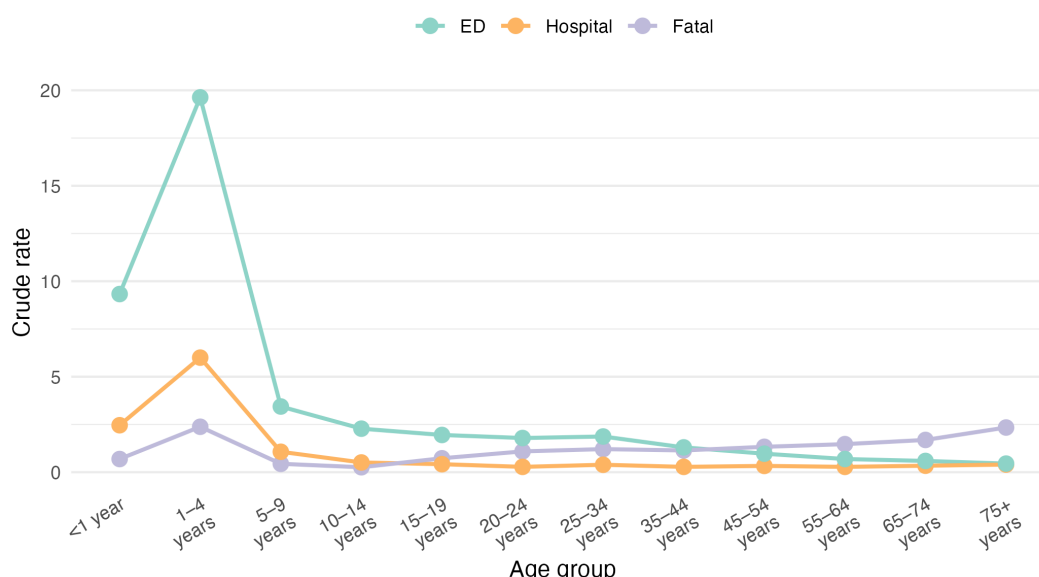
The age distribution of fatal drowning in California generally mirrors that of national and international trends. California continues to report high drowning numbers and age-adjusted rates for children aged 1–4 years (2.38 fatal drowning per 100,000 people) and adults 75 years and older (2.34 per 100,000). In terms of total fatalities, those aged 55–64 years had the highest number of deaths (n = 1,031), followed by those aged 45–54 (n = 1,012) and 25–34 years (n = 957).

^d All race/ethnicity categories except for "Hispanic or Latino" are "non-Hispanic or Latino."

^e Data for sex not shown in report, available upon request.

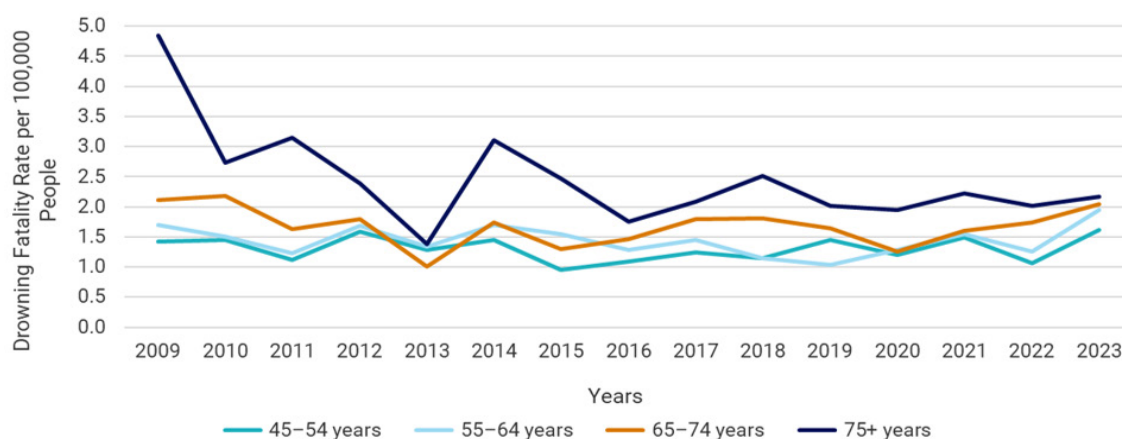
^f In 2023, rate of fatal drowning for male residents in California rose to 2.16 per 100,000, compared to 1.76 per 100,000 in 2022. Females rose to 0.80 per 100,000 compared to 0.72 per 100,000 in 2022.

Figure 1. Rate of unintentional drowning fatalities (2009–2023), emergency department (ED) visits (2016–2023), and hospitalizations (2016–2023) per 100,000 people in California by age group.^a



Between 2020 and 2023, fatal drowning rates rose sharply among adults aged 45 to 74 years, with the 45–54 and 55–64 age groups both recording their highest rates in 2023. In contrast, other age groups experienced either slight increases or maintained similar rates from 2009–2023. This further underscores that drowning seems to be a growing problem in California (Figure 2).

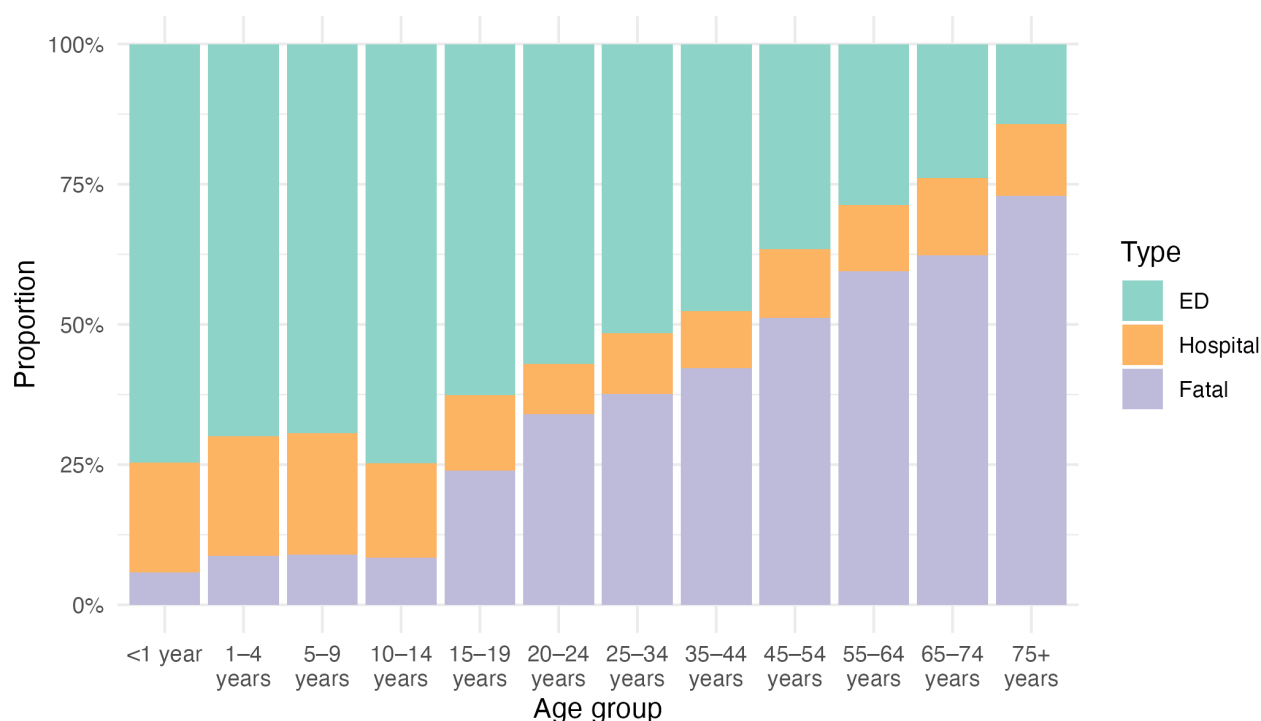
Figure 2. Rate of fatal unintentional drowning among persons aged 45–75+ in California (2009–2023).⁹



The distribution of drowning outcomes among California residents differs greatly by age (Figure 3). Though the overall ratio of fatal to non-fatal drowning across the state is 1:3, children aged 0–14 years experienced a much higher proportion of non-fatal cases. This pattern reverses with increasing age, with more than 50% of drowning incidents for all adults aged 55 years and older resulting in death. Several factors may contribute to these differences. Children and young adults are more likely to drown in settings where others are nearby and can call 911; for example, many child drowning incidents occur during relatively short lapses in supervision in pools or bathtubs where rescue is more feasible. Additionally, older adults may have pre-existing medical conditions that increase the likelihood that a drowning incident will be fatal.

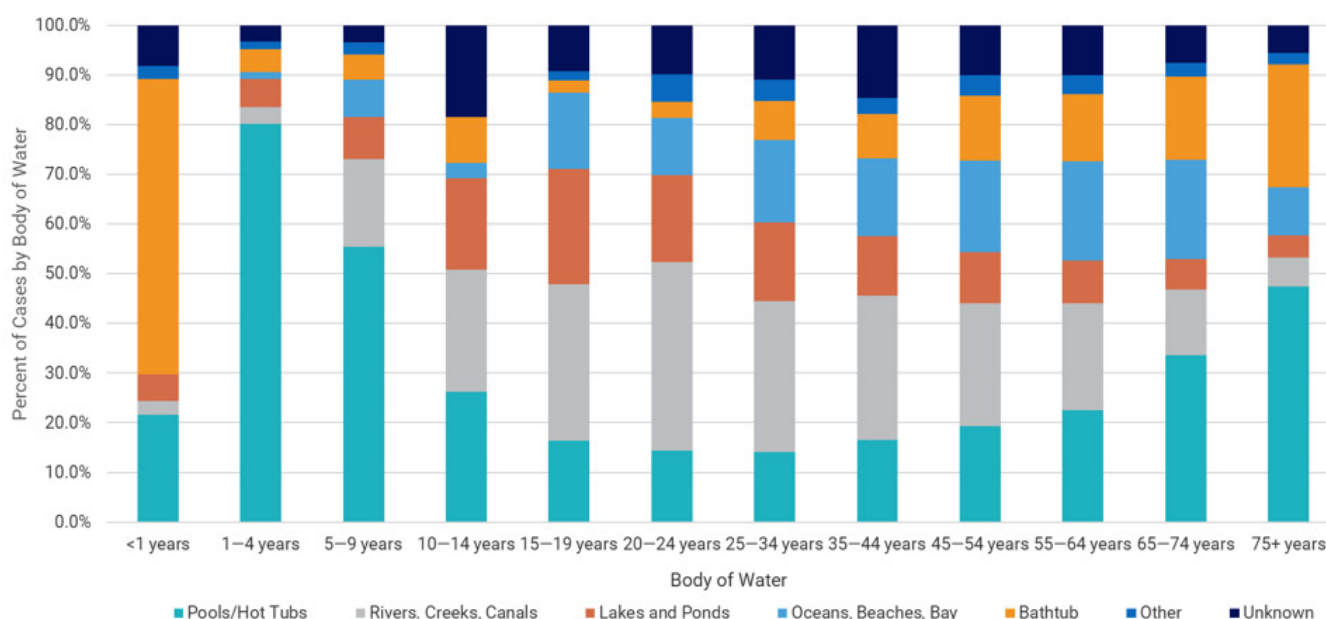
⁹ Deaths were identified from the California Comprehensive Master Death File. All data analysis conducted using expanded CDC Foundation criteria for inclusion of primary and secondary sources (see Methods section).

Figure 3. Proportion of emergency department (ED) visits, hospitalizations, and fatal drowning incidents by age group.^a



Locations of fatal drowning incidents in California differ greatly across the age span (Figure 4). Location was determined by free text response options present in ICD-10 codes from 2014–2023, which were recoded and aggregated based on body of water: pools/hot tubs, rivers/creeks/canals, lakes/ponds, oceans/beaches/bays, bathtubs, “Other,” and “Unknown.”

Figure 4. Fatal drowning location by age in California, 2014–2023.⁹



A breakdown of key findings by age group and location is as follows:

- Infants (ages 0–1 years): This age group primarily drowned in bathtubs (59.5% of cases).
- Ages 1–4: Toddlers overwhelmingly drowned in pools (80.1% of cases).
- Ages 5–9: Pool fatalities remained the most common (55.5%), followed by rivers, creeks, and canals (17.7%) for this age group.
- Ages 10–24: River, creek, canal, lake, and pond drowning fatalities increased between people aged 10 and 24, accounting for 53.8% of cases among those aged 10–14, 55.1% among those aged 15–19 years and peaking at 55.6% among those aged 20–24 years.
- Ages 20–44: Most fatal drowning incident locations were split between pools, lakes/rivers, and oceans/beaches/bays for these age ranges.
- Ages 45–74: Drowning fatalities in ocean, beach, and bay settings increased compared to other age groups. These ages accounted for 52.7% of all deaths in these locations, with those ages 55–64 years contributing 19.2% of all deaths in this location category, and 20.0%

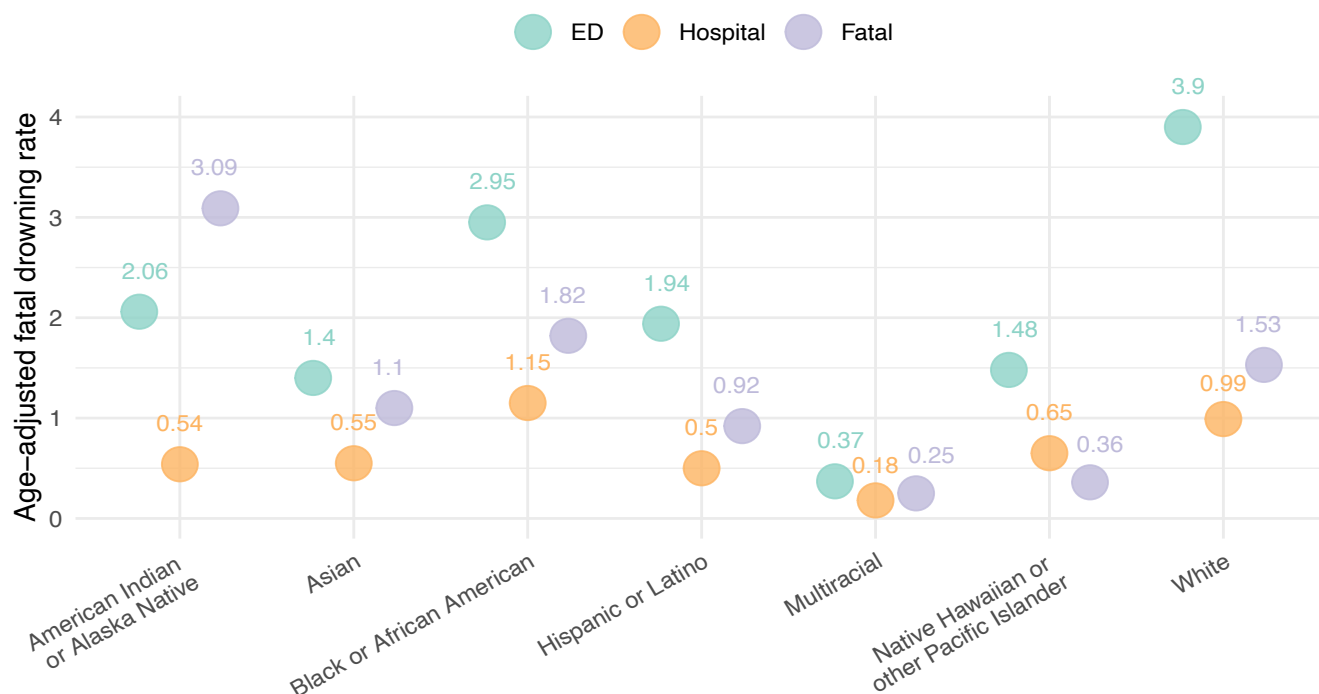
of deaths in this age range. Bathtub deaths, which dropped sharply after infants aged 0–1 years, rose with increasing age after ages 15–19 years and accounted for 16.8% of drowning fatalities for adults aged 65–74.

- Ages 75 and older: This group, previously identified as an at-risk population, had the highest rate of drowning (2.34 deaths per 100,000 residents) between 2009–2023. They also experienced the second highest number of pool drowning deaths (256 cases) behind children aged 1–4 years (351 cases); no other age group surpassed 200 cases during this period. Of note, adults 75 years and older had the highest number of fatal drowning incidents in bathtubs (134 cases).

Race and ethnicity

California’s drowning rates, circumstances, and data availability are significantly impacted by the state’s extremely heterogenous population (Figure 5). Disparities in drowning across racial and ethnic groups are an important area of continued study and exploration so that effective interventions can be designed for populations at high risk.

Figure 5. Age-adjusted emergency department (ED) visits (2016–2023), hospitalizations (2016–2023), and fatal (2009–2023) drowning rates by race/ethnicity in California.^a



The populations with the highest fatal unintentional drowning rates during the time of study were American Indian or Alaska Native (AI/AN) Californians (3.09 deaths per 100,000) and Black or African American (1.82 per 100,000) Californians, in line with well-reported national trends (Figure 5).⁶⁶ Previous research has identified historical and contemporary discrimination against Black communities^h that has reduced safe access to water and aquatic spaces and contributed to increases in drowning.⁶⁷⁻⁷⁵ Many Indigenous populations whose ancestral lands extend throughout California have similarly been denied safe and culturally informed water access opportunities through governmental and private seizure of coastlines, building of dams, and destruction of watersheds.⁷⁶⁻⁷⁹

Black or African American persons also maintain the highest hospitalization rate and the second highest ED visit rate due to drowning incidents among all ethnic groups. In contrast, very few ED visits ($n = 24$) and hospitalizations ($n < 10$) have been recorded for those identifying as AI/AN. These numbers are not proportional to the expected ratio of non-fatal to fatal drowning.

A possible reason for this unusual discrepancy is the exclusion of many tribal health facilities that treat urgent injuries from California's data collection system. California's non-fatal injury surveillance data is limited to cases treated at state-licensed EDs and hospitals. Tribal health programs designated as primary health clinics in California are exempt from this state licensing process.⁸⁰ This means that California's 34 tribal health programs, which operate 66 ambulatory clinics, and ten urban health programs are not necessarily submitting data into the system used for state non-fatal injury surveillance unless an individual in the program is referred to a secondary hospital for "inpatient or emergency needs."⁸¹

In 2019 alone, California's tribal health programs maintained 88,227 active users and cumulatively treated at least 184,699 individuals. It is likely that a large proportion of these users are not consistently represented in state ED and hospitalization data, including patients that were treated and/or admitted for non-fatal drowning incidents. Providing comprehensive and accurate data for AI/AN populations is a crucial component of any future drowning prevention work in California; this process will involve deeper understanding of and comportment to existing tribal data agreements and must respect tribal data sovereignty.

Broader considerations of multi-ethnic and multiracial identity are also likely impacting data analysis. Forty-five percent of those identifying as AI/AN on the 2020 California Census also identify as one or more race, bringing a total of 630,000 California residents identifying as AI/AN alone to 1.4 million who identify as AI/AN alone or in combination.⁸² Therefore, more nuanced and inclusive guidance is needed to generate accurate numbers of drowning among AI/AN populations in California. States with high levels of "alone and in combination" indigenous residents, such as Hawaii, have successfully demonstrated alternative best practices that generate more accurate drowning numbers for similar populations.⁸³ This is particularly important given that California has seen a roughly 74% increase in AI/AN persons from 2010–2020.⁸²

Of note, 474,391 persons in the "AI/AN alone" category also identified as Hispanic or Latino in the 2020 Census.⁸² Current data sorting practices override this overlap and re-sort all cases of those who are Hispanic or Latino into a separate racial category. This means that over 75% of those whose default categorization would be AI/AN in California are re-calculated as Hispanic or Latino within current data analysis practice. This may contribute to under-counting AI/AN populations within California.

^h California's history of racial segregation in aquatics includes Los Angeles laws restricting pool access to one day a week for Black (and Mexican) Americans. While these laws were overturned at the city level in 1931 thanks to the advocacy of Los Angeles NAACP founder Betty Hill, racial segregation laws for private pools were not federally overturned until 1973. In response to discrimination and segregation, Black Californians also built Californian leisure sites that included beachfront resorts and other recreational aquatic opportunities. These sites were also subject to intimidation, violence, harassment, and state seizure of land; one well-known example is Bruce's Beach, which was fraudulently appropriated from the Bruce family in 1924 and returned by the Los Angeles County Board of Supervisors in July 2022 after almost 100 years of community campaigning and advocacy.

Though Hispanic or Latino populations in California maintain low rates of fatal and non-fatal drowning, counts are high; Hispanic or Latino persons comprise the second highest number of combined fatal and non-fatal drowning of any group in the state. Moreover, the drowning fatality rate for Hispanic or Latino persons increased from 0.78 per 100,000 people in 2018 to 1.06 in 2023. Therefore, drowning prevention and water safety interventions and campaigns should ensure that these communities are consistently engaged and informed.

Asian and Asian American Californians have maintained relatively low rates and numbers for drowning fatalities, ED visits, and hospitalizations across the period of study. However, these rates differ significantly based on location. Asian and Asian American communities are highly clustered in the Los Angeles and Bay Area regions of California.⁸⁴⁻⁸⁵ In an analysis of fatal drowning in the top five counties based on number of Asian residents, the three included Northern California counties (Santa Clara, San Mateo, and San Francisco) saw percentages of drowning that were lower than expected based on population distribution. In contrast, in Orange County, Asian persons accounted for approximately 18.9% of drowning deaths, roughly consistent with their share of the population. In Los Angeles, Asian persons make up roughly 16% of the population but accounted for 19.2% of drowning incidents.

It is difficult to ascertain more information about these differences without further data disaggregation. California maintains the largest number of Asian persons of any state, with over twenty-five distinct ethnic groups that have vast differences in language, socio-economic status, culture, and history.⁸⁶⁻⁹⁰ A large body of research has demonstrated that many different health risks and outcomes differ significantly between Asian ethnic groups when data is disaggregated.⁹¹⁻⁹³ High



Multi-generational family enjoying a meal together.

risk subgroups are then further invisibilized by the homogenization of Asian and Asian American data. Therefore, health advocates have pushed for better disaggregation of Asian and Asian American data and subsequently tailored health interventions.

One clear example of this disaggregation's impact on understanding drowning rates among specific subgroups is California's disaggregation of Asian and Native Hawaiian or Other Pacific Islander data, which has been required at the state level since 2019. Overall rates of hospitalization and emergency department visits for Pacific Islander persons are higher than for Asian persons, demonstrating clear differences in burden between these two populations. Important next steps for Asian American data disaggregation include ethnicity-specific analysis and prevention efforts for California's 20+ Asian ethnic groups, as previous research has demonstrated the importance of ethnicity-specific drowning research and interventions in Asian American communities.^j

ⁱ Health risks include, but are not limited to, income level, immigration status, poverty, educational achievement, language needs, tobacco use, and incarceration rates, and outcomes include COVID-19 contraction, chronic cardiovascular conditions, cervical cancer, suicidal ideation, diabetes, and obesity.

^j Quan et al. have demonstrated the need and efficacy of ethnicity-specific research and interventions for Vietnamese American communities that would not necessarily apply to other Asian American ethnic groups in the United States (94).

Lastly, though higher numbers of ED admissions align with expectations for White non-Hispanic persons, length of hospitalization stay (LOS) is the inverse of expected in drowning incidents across racial and ethnic groups. Previous studies have demonstrated that Black and Hispanic persons often have longer LOS times than white persons, leading to a variety of disparities in recovery.⁸³⁻⁸⁷ However, White non-Hispanic and Asian/Pacific Islander persons maintained longer LOS metrics after a non-fatal drowning incident than Black and Hispanic persons across many different measurements (median, mean, and percent of 4+ day stays).^k

These statistics mirror that of overall ED trends throughout the state, as 55% of all people treated at an ED from 2009–2019 were white despite white persons only comprising 38.9% of the entire population.⁹⁵ Though more research is needed to understand this discrepancy, one possible explanation is that White persons have much higher percentages of health insurance than any other

ethnic group in California, which might offset high costs of ED visits and ambulance transports.^{96,97} Given that Black persons have the highest rate of hospitalizations across ethnic groups, this is slightly disingenuous to statistical spread and may indicate differences in pre-mature discharge or other differences in insurance coverage.⁹⁷⁻¹⁰³ Other factors to consider include age distribution and co-morbidities.

These trends in fatal unintentional drowning rates have consistently differed between racial and ethnic groups over time, though fatal drowning among all ethnic groups has trended upwards in the last few years. ED visits and hospitalizations have decreased over time for all racial and ethnic groups with sample sizes large enough to calculate rates. Findings continue to demonstrate that drowning risks and outcomes are shaped by a multitude of factors, including disparities in access to water and medical services and inclusion into data sources.



Agricultural workers in the Salinas Valley, California.

^k From 2016-2023, California residents who identified as Asian/PI, and white had a median stay of 2 days for hospitalizations attributed to drowning. Black, Hispanic, Other, and Multiracial had a median length of stay of 1 day. Means are ranked as follows: Black = 3.6 days, White =4.2 days, Hispanic =4.4 days, Asian/PI =4.5 days. For drowning cases with a hospitalization length of stay greater or equal to 4 days, White non-Hispanic cases made up 26% of the total caseload, followed by Asian/PI (24%), Hispanic (23%), and Black/African American (22%).

Location

In addition to standard ICD-10 code responses, free text responses for fatal injury location that mention specific bodies of water can be re-coded to gain more specificity and insight. Of the four categories included in ICD-10 codes (pools, bathtubs, natural water source, and “Other”), natural bodies of water have consistently been the most common location for fatal drowning. Free text responses for location became available in 2014 and allow for further specificity across multiple ICD-10 categories. For cases with free text location entry, natural bodies of water were re-coded into ocean, river, lake, pond, creek, beach, bay, canal, and other. Pools were also separated into pools and hot tubs. Free text response locations from 2014–2023 are visualized in the figure below.

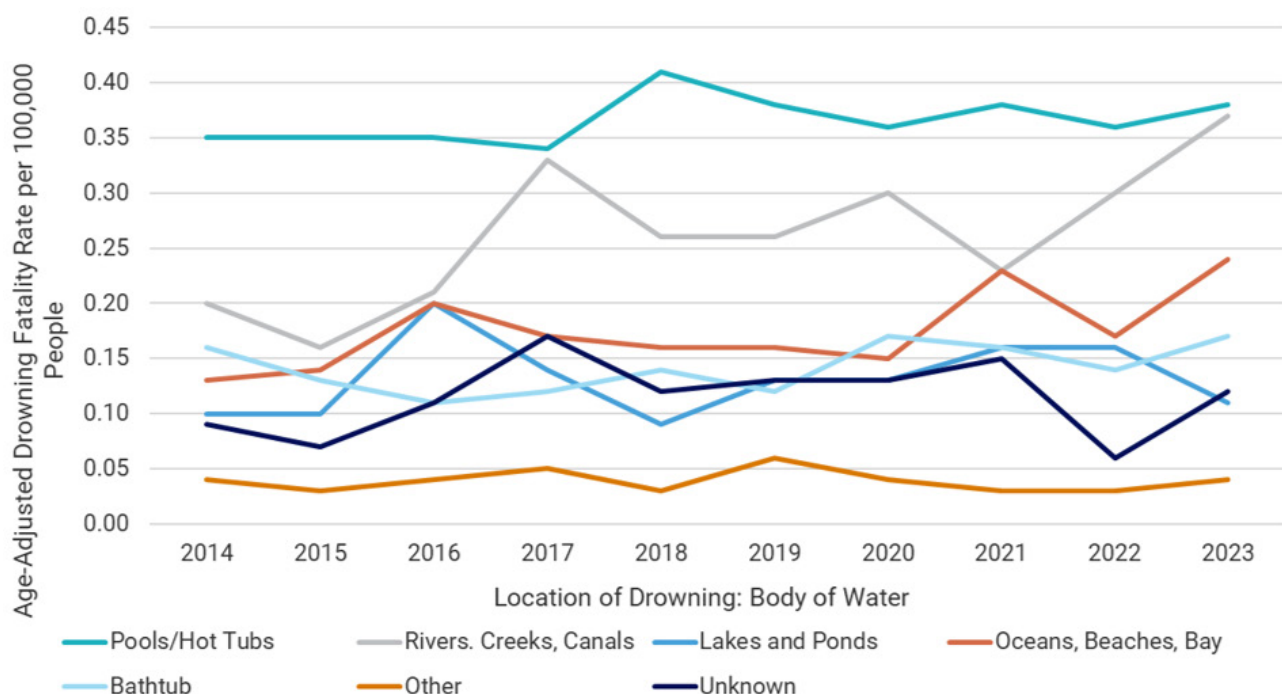
Across all years of study, pools and hot tubs accounted for both the highest rate and greatest number of deaths. Rivers, creeks, and canals rank second across all metrics and experienced an increase in 2020. This may be in part due to the COVID-19 pandemic lockdown, which closed many community pools and reduced safety of engaging in

recreational swimming opportunities at supervised settings. During this time, many people spent more time swimming and boating in natural water locations. However, this does not entirely explain why the highest number of fatal river drowning occurred in 2023; one possible factor might be the increased snowfall that year, which led to higher levels of river water and potentially more dangerous conditions throughout the state’s vast river network.¹⁰⁴

On the other end of the spectrum, “Other” was the least common location for unintentional fatal drowning incidents in California. The “Other” category included natural bodies of water such as sloughs, wetlands, and waterways, and manmade settings such as flood control channels, ditches, gutters, buckets, and wells.

It is important to recognize that drowning locations differ by region, age, and sex across the state. Exploring the relationship between location and race/ethnicity is a critical step for future data analysis work.

Figure 6. Location of unintentional drowning fatalities for California residents over time (2014–2023).⁹



Region

The U.S. Census and the California Complete Count Office have grouped California's 58 counties into 10 regions based on "hard-to-count populations, like-mindedness of the counties, capacity of community-based organizations within the counties, and state Census staff workload capabilities."¹⁰⁵ The following section explores regions where geography appears to influence drowning locations. Differences in drowning rates across regions appear to primarily be driven by geographic and resulting cultural differences in water engagement and access, along with differences in population size.

Los Angeles County's high absolute numbers are reflective of its large population; Los Angeles County's population fluctuated between 9.8–10 million residents from 2009–2023, while the second most populous region, San Diego and Imperial Counties, had less than one-third of Los Angeles' residency numbers. Conversely, the sparsely populated Northern Coast had the highest fatal drowning rate for adults 25–54 and a relatively high rate for ages 1–4, but some of the lowest total population and drowning death numbers. This indicates that it is important to consider both total numbers of drowning and rates of drowning to better prioritize interventions.

A note on rates versus numbers

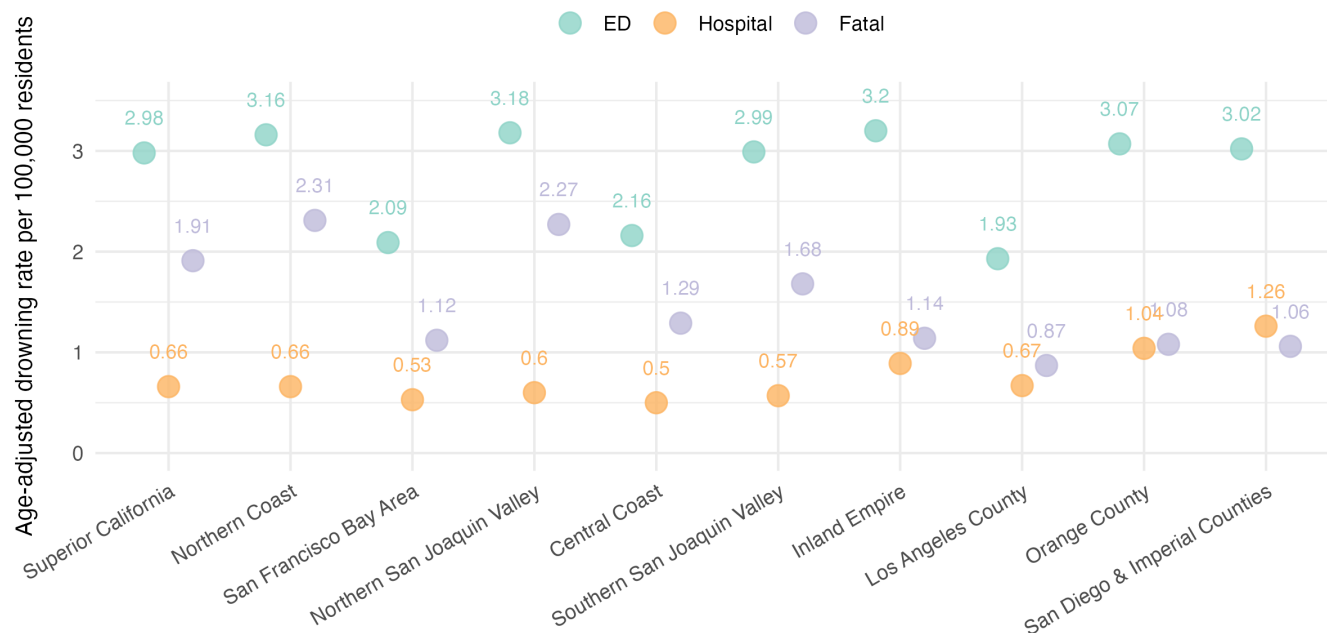
Los Angeles County maintains the highest number of drowning-related fatalities, ED visits, and hospitalizations, but ranks lowest for fatality and ED rates and just above the median for hospitalization

Table 4. Unintentional drowning emergency department (ED) visits (2016–2023), hospitalizations (2016–2023), and fatality (2009–2023) counts and age-adjusted rates per 100,000 residents in California by census region.^a

California Census region	Deaths	Death rate	ED visits	ED visit rate	Hospitalizations	Hospitalization rate
Superior California	923	1.91	708	2.98	160	0.66
Northern Coast	337	2.31*	213	3.16	48	0.66
San Francisco Bay Area	1,235	1.12	1,036	2.09	262	0.53
Northern San Joaquin Valley	631	2.27	479	3.18	90	0.60
Central Coast	446	1.29	373	2.16	89	0.50
Southern San Joaquin Valley	621	1.68	647	2.99	122	0.57
Inland Empire	754	1.14	1,129	3.20*	312	0.89
Los Angeles County	1,324*	0.87	1,382*	1.93	479*	0.67
Orange County	523	1.08	689	3.07	242	1.04
San Diego & Imperial Counties	561	1.06	796	3.02	333	1.26*

Highest count/rate marked by () and orange box.

Figure 7. Age-adjusted rates of unintentional drowning emergency department (ED) visits (2016–2023), hospitalizations (2016–2023), and fatalities (2009–2023) per 100,000 California residents by Census region.^a



The final portion of this section highlights regions of California where geography appears to play a role in the location of drowning fatalities. Recognizing the expansiveness of California’s regional geography is important to consider in designing comprehensive drowning surveillance systems and conducting drowning prevention. A breakdown of fatal drowning rates in each Census region by age can be found in Appendix 1. A table of the top three fatal drowning locations in each Census region can be found in Appendix 2.

North Coast

The North Coast maintains a vast coastline where beaches are often unmonitored, possibly contributing to the 19.4% of drowning fatalities in the region that occurred in the ocean. Though counts and proportions are slightly lower than the San Joaquin Valley and Superior Regions, the North Coast still experiences a relatively high percentage of river, creek, and canal drowning deaths (32.6%), perhaps due to the presence of six different rivers that span the region.¹⁰⁶⁻¹⁰⁸

San Joaquin Valley (Northern and Southern Regions)

After the North Coast, the Northern and Southern San Joaquin Valley regions have consistently reported some of the highest drowning fatality rates across the state, both by year and in aggregate. The Southern San Joaquin Valley area has the highest drowning death rates for ages 0–4 years at 3.49 per 100,000 people. The Northern San Joaquin region also reports exceptionally high fatal drowning rates for adults 20 and older, with rates well above the state average for many of these adult age groups. Adult fatal drowning rates in the Southern Joaquin River Valley, on the other hand, are more in line with others in the state.

Fatal drowning locations for both regions are strongly influenced by an expansive set of river, lake, and canal systems, with these locations making up 34.5% of all drowning incidents in the Northern region and 37.4% in the Southern San Joaquin River Valley region. The Northern San Joaquin Valley region is home to the titular San

Joaquin River, which flows from the Sierra Nevada mountains and has three major tributaries that extend throughout the region. The river then connects to the Sacramento, Mokelumne, and Calaveras rivers at the Sacramento-San Joaquin Delta (Delta), which is the largest estuary on the West Coast.^{109,110} Similarly, drowning in the Southern San Joaquin Valley is likely influenced by extensive access to the Kern and Fresno Rivers. Though drowning death data provide limited information about the circumstances of these incidents, the Department of Boating and Waterways has consistently identified the Delta as a leading site for boating incidents over the last ten years.¹¹¹⁻¹¹⁴

Superior California

Many of the rivers in the San Joaquin region extend throughout the northernmost part of the state, where rivers, creeks, and canals are also the most common locations for drowning fatalities in the region (37.6%). This region is also home to the massive Lake Shasta dam and reservoir, which may be a potential hotspot for further drowning data analysis and prevention.¹¹⁵

Southern California

Though oceans, beaches, and bays make up a sizable percentage of drowning death locations for Southern California coastal regions (Los Angeles [16.6%], Orange County [19.3%], and San Diego [22.7%]), Southern California saw much higher prevalence of drowning fatalities that occurred in pools across both coastal and inland regions from 2009–2023. Pools made up the highest percentage of deaths for Los Angeles (42.0%), Orange County (43.5%), the Inland Empire (45.3%), and San Diego/Imperial Counties (28.0%). These findings are in line with previous studies demonstrating higher numbers and rates of pool deaths in Southern California.⁵⁹ As of now, it is difficult to ascertain which of these fatalities occurred at private and residential pools versus public pools.

Interestingly, the second highest rate (3.2 per 100,000) and number (1,129) of ED visits (after Los Angeles County) were found in the Inland

Empire. Hospitalization rates were led by Orange County (1.04 per 100,000) and San Diego and Imperial Counties (1.26 per 100,000), with all other regions averaging less than one hospitalization per 100,000 residents. San Diego and Imperial Counties also had the highest total number of drowning hospitalizations outside of Los Angeles.

Though location data for non-fatal drowning incidents are not currently available, fatal trends indicate high percentages of bathtub drowning incidents in Orange (17.3%) and San Diego & Imperial Counties (17.6%). If non-fatal patterns are relatively consistent with fatal trends, this high proportion of bathtub drowning incidents may contribute to the increases in ED visits and hospitalizations. Unlike beaches and public pools, lifeguards and other first responders are not normally present in residential settings; moreover, many bathtub deaths occur in older adults who are at high risk for complications after a drowning incident. Therefore, the likelihood of needing emergency department and/or hospitalization services may be higher for non-fatal incidents as well.

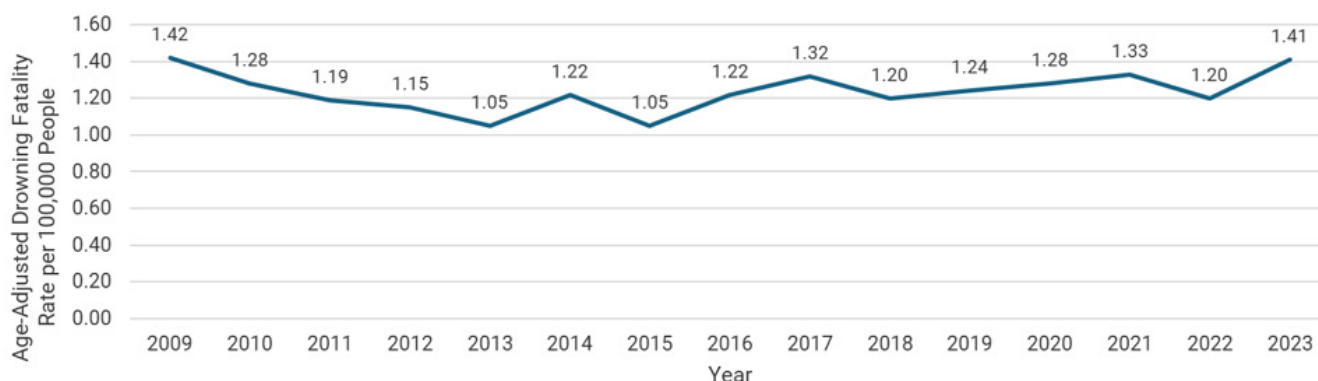
Coastal trends

As expected, several populated coastal areas of California reported high incidence of ocean, beach, and bay drowning fatalities. These settings accounted for the largest share of fatalities on the Central Coast (30.9% of all drowning deaths), a region known for its coastal beaches and marine access.¹¹⁶ Of drowning fatalities in the San Francisco Bay, 21.6% were listed as occurring in ocean, bay, or beach locations. The prevalence of coastal drowning fatalities in regions with large ocean presence underscores the importance of designing drowning prevention strategies around safe coastal access and supporting beach lifeguarding and lifesaving efforts.

Temporal trends

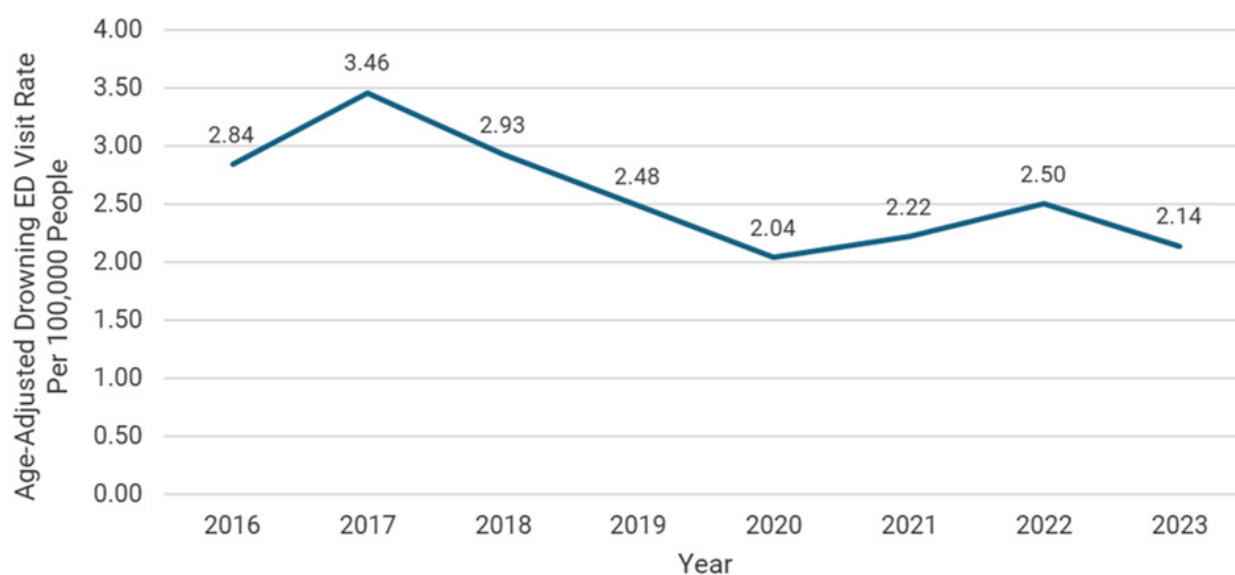
California's unintentional drowning death rates ranged from a low of 1.05 in 2015 to a high of 1.42 in 2009. A notable increase occurred between 2022 and 2023, when the rates rose from 1.20 to 1.41 drowning deaths per 100,000 people, the second highest overall rate within the period of analysis (Figure 8).

Figure 8. Age-adjusted unintentional fatal drowning rates per 100,000 California residents over time (2009–2023).⁹



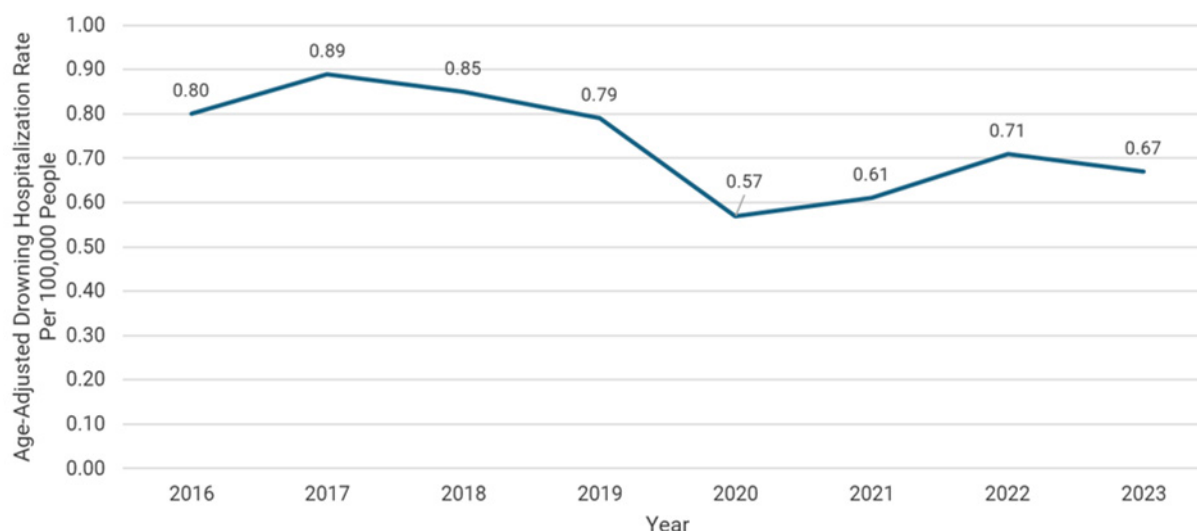
In contrast, ED visits and hospitalizations due to drowning have decreased from 2017–2020 and have remained relatively low since this time (Figures 9 and 10). The extreme decrease in rates observed in 2020 is likely due to the COVID-19 pandemic, but it is unclear if rates remained low due to fewer non-fatal drowning incidents or due to fewer people seeking care at the ED after a non-fatal drowning occurs.

Figure 9. Age-adjusted unintentional drowning-related emergency department (ED) visit rates per 100,000 California residents over time (2016–2023).¹



¹ Emergency Department visits were identified from HCAI Emergency Department data. All data analysis conducted using expanded CDC Foundation criteria for inclusion of primary and secondary sources (see Methods section).

Figure 10. Age-adjusted unintentional drowning-related hospitalization rates per 100,000 California residents over time (2016–2023).^m



Drowning is most frequently reported in California during summer. Over the study period, 2,869 fatalities occurred between June and August (40% of all drowning deaths); nearly twice that of any other season (Table 5). These patterns mirror those of other locations globally wherein seasonal weather conditions and resulting social infrastructure (e.g., summer breaks for school-aged children) impact water engagement. In California, warmer weather in the summer allows for increased access to and comfort at outdoor water sources; school breaks expand this access specifically for children.

The rise in drowning in 2023 seems to be due to increases in drowning during the winter months (January, November, December). This may have been driven by anomalously heavy wintertime precipitation, which reached the highest levels in two decades in Southern California in 2023.¹¹⁷

Table 5. Total unintentional drowning fatality counts and percentages in California by season (2009–2023).ⁿ

Season	Month	Total deaths
Summer	June–August	2,869 (40.6%)
Spring	March–May	1,570 (22.2%)
Fall	September–November	1,413 (20.0%)
Winter	December–February	1,213 (17.6%)

^m Hospitalizations were identified from the California Department of Health Care Access and Information (HCAI) Patient Discharge Data (PDD). Deaths, ED Visits, and Hospitalizations are mutually exclusive. All data analysis conducted using expanded CDC Foundation criteria for inclusion of primary and secondary sources (see Methods section).

ⁿ Deaths were identified from the California Comprehensive Master Death File. All data analysis conducted using expanded CDC Foundation criteria for inclusion of primary and secondary sources (see Methods section). A total of 7,065 cases had a date of death that could be included in seasonality analysis.

Child Death Review Teams (CDRT)

Some supplemental data in California can be analyzed to learn more about drowning circumstances for specific sub-populations. A clear example of this is California's CDRT data, which provide detailed information regarding child supervision, barriers present, and rescue attempts, along with some basic information regarding swim skill, presence of alcohol, and use of personal flotation devices (PFDs). CDRTs also ameliorate gaps in documented manner and cause of death currently found in basic fatality data across the state.

Thirty-one counties have submitted nearly 10,000 cases into the NCFRP's Child Death Review database from 2003–2024, which is referred to at the state level as the California Child Fatality Surveillance System (CCFSS), formerly known as the Fatal Child Abuse and Neglect Surveillance System (FCANS).⁴¹ Case inclusion, population coverage, and team composition are all decided at the county level, leading to some inconsistencies over time and location; for example, Sacramento County maintains a Child Abuse Prevention Center that reviews every single child death and enters all cases into the NCFRP/CCFSS database.¹¹⁸ On the other hand, counties such as Los Angeles no longer submit data into the system and only review select cases that are likely to drive systems change and policy reform.

The cases that are entered into this system provide a helpful cross-section in exploring drowning at the state level, as CDR and Vital Statistics data can be linked from 2016–2023. Of the 1,285 recorded child drowning fatalities (ages 1–19), roughly 30% were entered into the National CDR case registry ($n = 375$). An additional 10 cases were reported in the

CDR case registry but were identified as R-99 codes for "Ill-defined and unknown cause of mortality" in California's vital statistics death data between 2016–2023, increasing total case coverage. This is likely because these R-99 cases were homicides and thus required further investigation. Though homicides make up a relatively small proportion of all drowning, this phenomenon does highlight the added coverage provided by CDRTs in the event of a lengthier investigation.

The NCFRP/CCFSS database includes several preventative and response-focused drowning circumstance variables that address elements of safe access to water, safety in and around water, and rescue attempts. Though the sample sizes are often small for each variable, key findings from this dataset align with many best practices named by field experts in drowning prevention and water safety.



A parent and child enjoy time in the pool.

Water access

Key findings: In the 100 cases (7.8% of all known drowning fatalities among those aged 0–19 years in California) where barrier presence and functionality were reported, insufficient barriers between children and water contributed to 89% of deaths: 57 children did not have any barrier between them and the water, and of the 43 cases where children did have a barrier present between them and the water, 32 cases had some sort of barrier breach or malfunction.

Water safety

Key findings: Children did not have access to proactive water safety strategies, infrastructure, and skills to reduce drowning.

- Of the 80 cases where swimming ability was known (6.2% of all known cases aged among those 0–19 years in California from 2016–2023), 69 children did not know how to swim (86.3%).
- Of the 76 cases where PFD information was known and relevant (5.9% of all known child fatalities), 70 children were not wearing a PFD at the time of drowning (92.1%).
- Of the 80 cases where lifeguard presence was known and relevant (6.2% known fatalities), 77 children were in the water without a lifeguard (96.2%).

Supervision

Key findings: Crucial child supervision was absent or lacking in most drowning incidents where supervision information was reported.

- Of the 98 cases with reported information on supervision at the time of fatal drowning (7.6% of all known childhood fatality cases among those aged 0–19 years from 2016–2023):
 - 73 children did not have supervision at the time of drowning because the supervisor was either non-existent or absent (stepped away while supervising) (74.5% of all cases).
 - Of the 46 children who had either a present supervisor or a designated supervisor who stepped away at the time of drowning, 23 of those supervisors were impaired (50% of all supervisors)
 - 17 of those 23 impaired supervisors were considered “distracted” at the time of drowning (70.9% of impaired supervisors)

Rescue attempt

Key findings: Most childhood drowning fatalities reported in the NCFRP/CCFSS database include unsuccessful rescue attempt(s). This demonstrates a need for better rescue training and equipment, along with heightened emphasis on prevention to avoid the need for a rescue in the first place.

- Of the 110 cases where information about a rescue attempt was known and relevant (8.6% of all known child drowning fatalities from 2016–2023 among those aged 0–19 years), rescue attempts were conducted for 89 of them (80.1%).
- Most of these rescue attempts were conducted by parents/relatives (56.2%, n = 50), EMS (16.8%, n = 15), and bystanders/other adults (14.6%, n = 13).





Lessons and considerations

Understanding and strengthening data

Lesson 1. Drowning incident data are not centralized by circumstance, outcome (fatal/non-fatal), age, or location in California, nor are standards and guidance in place for reporting a drowning incident.

Basic drowning data in California fail to provide enough circumstantial information to understand causes of drowning and design tailored interventions, though expanded analysis categories used for drowning incidents in this report offer a more complete picture of the burden compared to previous California Department of Public Health (CDPH) efforts. More information is available for specific drowning circumstances, such as boating or a drowning incident that occurs in a state park, but these cases represent a relatively small fraction of state coverage. More detailed statewide tools, such as the Child Death Review form, are often incomplete and/or go unsubmitted due to lack of drowning-specific training and staffing. Some counties have incredibly detailed drowning data collection systems, but these data significantly vary at the county level.

Consideration 1. California needs to build a centralized, state-level database with both standard core inclusion variables, and options for location-specific and tailored variables that align with differences in prevention needs.

Crucial components to database building include staffing support for technical development, contract management, and adherence to the Health Insurance Portability and Accountability Act and data privacy standards. County systems such as on-site Emergency Medical Service responder modules can be expanded statewide to ensure mandatory

variable inclusion, and electronic platforms with strong database infrastructure can support more robust data processing and analysis from lifeguards. Core variables should reflect known risk factors for drowning. Housing this database within the CDPH would provide statewide support and technical expertise for data analysis and publication and create a centralized epidemiological hub across the state that builds upon existing statewide epidemiology databases and dashboards.

Lesson 2. Community-driven water safety coalitions are powerful sites for information-sharing, collective prevention efforts, and collaborative mobilization that need to be supported by staffing and infrastructure to remain sustainable.

At the state level, the California Water Safety Coalition has created significant momentum through cross-region networking, continued education, comprehensive partner engagement, and the development of a statewide Water Safety Strategy. At the county level, several councils run successful drowning prevention campaigns that include water safety education, advocacy for legislative policy change, swim lessons, data systems design and implementation, and data analysis. However, most of this work is driven by volunteers and water safety professionals employed by other entities (i.e., doctors, lifeguards) who cannot commit their full time and energy to maintaining these spaces.

Consideration 2. State legislature, private foundations, and government agencies can provide clear funding streams and infrastructure for multisectoral drowning prevention mobilization.

An important first step in this process is hiring paid staff to provide backbone support responsible for: 1) curating collaborative spaces for knowledge sharing and strategy development, 2) overseeing the building, maintenance, and analysis of data systems, and 3) providing technical assistance for data collection and intervention implementation.

Lesson 3. New legislation has been crucial in rapidly advancing and prioritizing data collection across the state.

Senate Bill (SB) 855 provided state funds to establish a Drowning Data Pilot Program, which thus far has been instrumental in expanding data exploration and analysis across the state. Providing staffing has allowed for the development of a drowning brief (which will be updated yearly moving forward), the ability to fund new and expanded data collection systems at the county level, the analysis of several new data sources, and the building of partnerships across the state.

Consideration 3. Establishing and executing a clear legislative and policy strategy for further systemic data collection and analysis is crucial for capitalizing upon current efforts and momentum.

As SB 855 only guarantees two years of funding, institutionalizing a drowning data analysis program, and, ideally, a drowning prevention program at the state level is an important first step to reducing drowning incidents across California. One important consideration is that many data sources are owned by local sources (i.e., many lifeguard agencies respond to different authorities), requiring individual data agreements to obtain large-scale data. Stronger legislation that provides one centralized authority with secure data access and analysis of mandates will reduce current inefficiencies and slowdowns.

Preventing drowning

Lesson 1. Children, particularly those aged 1–4 years, continue to be at high risk for both fatal and non-fatal drowning.

Data repeatedly confirms that children are at extremely high risk for drowning and make up the majority of California's overall drowning burden. In addition, drowning continues to be one of the leading overall causes of death for children aged 1–4 years across the state. Immediate action is needed, especially as numbers have risen over the past five years. Pools are a place of particular focus for children aged 1–4 years, with rivers and beaches also becoming higher risk sites as children age.

Consideration 1. California needs a comprehensive water safety, water competency, and drowning prevention strategy for children.

Reducing childhood drowning rates will require complex and multi-faceted strategies that include creating and enforcing stronger pool safety access and use guidelines (i.e., building, inspection, and maintenance), ensuring all children are supervised by qualified adults when in and around the water, ensuring flotation devices are effective and regulated by U.S. Coast Guard standards, providing both children and caregivers with water safety education and water competency skills, and conducting in-depth analyses of age-specific trends and risk factors. Creating and implementing a comprehensive California Water Safety Action Plan for children in California is an important step to addressing childhood drowning.

Lesson 2. Rivers, canals, and lakes are all bodies of water that must be targeted by drowning prevention efforts.

While children most commonly drown in pools, adolescents and young adults drown in natural bodies of water such as rivers and canals at a rate that continues to rise. These bodies of water are relatively understudied in drowning prevention literature and are often overlooked in broader conversations about aquatic safety at the state level.

Consideration 2. Identifying and addressing multi-faceted strategies to reduce river, lake, and canal drowning is a necessary component of statewide drowning prevention strategy.

There are many factors to consider in addressing river and canal drowning. Important first steps include: understanding complex environmental hazards in individual rivers and lakes, such as water patterns and impacts of seasonal rainfall on drowning risk; determining effective strategies for communicating risk and preventative action with adolescents and young adults; working with municipalities to increase lifeguarding and supervision; and understanding how local and regional culture and policy impacts interactions with rivers and canal (for example, recreational boating culture).

Lesson 3. California experiences significant variance in drowning patterns and circumstances across the state.

Distinct demographic patterns and trends emerged across California's vast array of geographies, communities, and cultures. Circumstantial variance

needs to be explored and addressed to identify and effectively tailor prevention strategies for those most at risk.

Consideration 3. Statewide drowning prevention must include sustainable, community-driven, and local partnerships.

Lifeguards in California have already demonstrated that detailed, locally focused research and prevention can decrease drowning and ensure resources are used efficiently in the process. Building and supporting local-level research and intervention initiatives that identify and engage populations who are most at risk will look extremely different across California. Currently, regions that maintain locally specific intervention hubs experience high labor costs that can be difficult to fund; therefore, providing state support and strong, flexible infrastructure is necessary for scale and sustainability.



Pacific Ocean at Big Sur, California.



Conclusion

Drowning is a significant public health concern within California that requires continued, urgent attention. Existing data demonstrate that both fatal and non-fatal drowning incidents are an immediate cause of concern for California residents, particularly young children and older adults. However, California is still missing circumstantial data that include information on why, how, and where people drown, and the data that do exist is often isolated in different state institutions and inconsistent at the local level. Collecting these data is crucial to designing and evaluating prevention strategies. Additionally, it is critical that prevention and data collection efforts address California's vast geographic and demographic heterogeneity.

California's state, local, and regional advocacy hubs, combined with strong multisectoral partnerships, position the state well for further advancement and engagement in drowning prevention. The state has taken important first steps in improving drowning data collection and designing prevention strategies through the formation of grassroots coalitions and the passage of trial-based data collection improvement. Moving forward, state and local governments must invest in sustainable, institutionalized, long-term commitment to drowning prevention and support community-based interventions to effectively reduce drowning in California.



Los Angeles, California at sunset.

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*Morris Reservoir and Dam in the San Gabriel Mountains in
Los Angeles County, California.*



Appendices

Appendix

Unintentional drowning fatality rates per 100,000 California residents by age group and census region (2009–2023).^a

	0–4 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
Superior California	3.09	0.67	0.65	1.70	1.96	2.18	1.77	2.09	2.17	2.11	2.46
Northern Coast	3.03	1.24*	**	1.09*	1.86*	2.97	2.83	2.98	2.59	2.36	2.34
San Francisco Bay Area	1.10	0.32	0.18*	0.65	1.22	1.08	0.94	1.20	1.55	1.95	2.55
Northern San Joaquin Valley	3.08	0.73*	0.76*	1.75	2.34	2.41	2.71	2.54	2.76	2.33	2.64
Central Coast	1.32	0.45*	0.31*	0.87	0.86	1.52	1.12	1.43	1.90	2.12	2.27
Southern San Joaquin Valley	3.49	0.72	0.36*	1.35	1.60	1.28	1.84	1.50	2.31	1.99	2.38
Inland Empire	3.10	0.48	0.12*	0.59	0.84	0.77	0.93	1.21	1.08	1.78	2.53
Los Angeles County	1.47	0.28	0.16*	0.36	0.62	0.79	0.80	0.89	0.96	1.20	2.51
Orange County	1.46	0.27*	0.20*	0.25*	0.70	1.16	0.87	1.05	1.15	1.96	3.44
San Diego & Imperial Counties	1.85	0.41*	**	0.49*	0.96	0.95	0.83	1.37	1.39	1.61	2.03

*Unstable rates (counts less than 20) should be interpreted with caution.

**Counts less than 5 were suppressed.

^a Deaths were identified from the California Comprehensive Master Death File. Hospitalizations were identified from the California Department of Health Care Access and Information (HCAI) Patient Discharge Data (PDD). Emergency Department visits were identified from HCAI Emergency Department data. Deaths, ED Visits, and Hospitalizations are mutually exclusive. All data analysis conducted using expanded CDC Foundation criteria for inclusion of primary and secondary sources (see Methods section).

Appendix 2

Top three locations for drowning unintentional drowning fatalities by California Census Region, counts and percent of deaths in region (2014–2023).^o

	Northern San Joaquin Valley	Orange County	San Diego & Imperial Counties	San Francisco Bay Area
1st	Rivers, creeks, canals (141, 34.5%)	Pools/hot tubs (151, 43.5%)	Pools/hot tubs (100, 28.0%)	Pools/hot tubs (185, 21.8%)
2nd	Pools/hot tubs (75, 18.3%)	Oceans, beaches, bay (67, 19.3%)	Oceans, beaches, bay (81, 22.7%)	Oceans, beaches, bay (183, 21.6%)
3rd	Unknown (52, 12.7%)	Bathtub (60, 17.3%)	Bathtub (63, 17.6%)	Rivers, creeks, canals (125, 14.7%)
4th (if one of top three is unknown)	Lakes and ponds (47, 11.5%)	N/A	N/A	N/A

	Inland Empire	Los Angeles County	Central Coast	Southern San Joaquin Valley
1st	Pools/hot tubs (229, 45.3%)	Pools/hot tubs (381, 42.0%)	Oceans, beaches, bay (92, 30.9%)	Rivers, creeks, canals (159, 37.4%)
2nd	Rivers, creeks, canals (84, 16.6%)	Oceans, beaches, bay (151, 16.6%)	Pools/hot tubs (76, 25.5%)	Pools/hot tubs (114, 26.8%)
3rd	Bathtub (67, 13.2%)	Bathtub (136, 15.0%)	Rivers, creeks, canals (45, 15.1%)	Lakes and ponds (59, 13.9%)

	Superior California	Northern Coast
1st	Rivers, creeks, canals (225, 37.6%)	Rivers, creeks, canals (74, 32.6%)
2nd	Pools/hot tubs (105, 17.6%)	Oceans, beaches, bay (44, 19.4%)
3rd	Lakes and ponds (91, 15.2%)	Pools/hot tubs (36, 15.9%)

^o Deaths were identified from the California Comprehensive Master Death File.

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