

Partners For Childhood Drowning Prevention: 2023-2024

WATER SAFETY FOR FAMILIES

Drowning can happen to any family. It is quick and it is silent.

Drowning is the single-leading cause of unexpected death of children ages 1 to 4 years old.



4-SIDED POOL FENCING

A fence that surrounds the pool: Specifically designed so that children cannot easily get over, under, or through it. A safe gate should be secured at all times.



American Academy of Pediatrics
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LIFE JACKETS

U.S Coast Guard Approved: Use for open bodies of water and at pools for young children and unskilled swimmers.



SWIM LESSONS

High quality, low-cost lessons are typically available through your city: Swim lessons can help reduce the risk of drowning for children. Some kids may be ready to start swim lessons after age 1.

For more information visit www.aap-oc.org/pcdp or scan the QR Code, save the PDF or screen shot it!

Funded in part by the California Department of Public Health Kids' Plate Program



SUPERVISION

Be watchful: Avoid distractions such as cell phone use and conversations with others. Assign a water watcher.



CPR & AED TRAINING

Rescue Immediately Onsite: All parents & guardians need current CPR AED training. Rescue breaths are vital – children and drowning victims are often oxygen starved.



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Funding Sources

- California Kids' Plates Program, California Department of Public Health Injury and Violence Prevention Branch
- Clinic in the Park, an American Academy of Pediatrics, Orange County Chapter (AAP-OC) fiscally sponsored project
- Melinda Hoag Smith Presbyterian Hospital Community Benefits
- The Picerne Family Foundation
- Private Donors



TABLE OF CONTENTS

Chapter 1: Introduction

Chapter 2: Childhood Drowning and the California Pool Safety Law

Chapter 3: Professional and Community Awareness, Education, and Engagement

Chapter 4: Foundations for Childhood Drowning Surveillance 2023

4.1: Child Drowning Surveillance

4.2: California Child Drowning Data

4.3: Child Drowning Data Collection Project

4.4: Recommendations for Surveillance

4.5: Surveillance Resources



Chapter 1: Introduction

Drowning is the leading cause of preventable morbidity and mortality among young children in the U.S., California, and Orange County.

Partners for Childhood Drowning Prevention is a project of the Injury and Violence Prevention Initiative of the American Academy of Pediatrics-Orange County (AAP-OC). We created a broad, multi-sectoral partnership of pediatric health care, social service, and education professionals; community-based organizations; public and academic institutions; parents; and policy advocates.

Partners for Childhood Drowning Prevention was designed with two linked components: 1) Prevention of Drowning: Professional and Community Awareness Education and Engagement; and 2) Foundations for Childhood Drowning Surveillance 2023.

Partners for Childhood Drowning Prevention was funded, in part, by the California Department of Public Health Kids' Plates Program, The Picerne Family Foundation, Melinda Hoag Smith Presbyterian Hospital Community Benefits, American Academy of Pediatrics-Orange County (AAP-OC), Clinic in the Park (a fiscally sponsored project of AAP-OC), and private donors.

A significant California legislative milestone was achieved in 2022. Under the leadership of California State Senator Josh Newman — and sponsored by the American Academy of Pediatrics-California and then joined by the California Alliance of YMCAs — Senate Bill 855 (Newman, Ch. 817, Stat. 2022: Childhood Drowning Data Collection Pilot Program) was chaptered into law. SB 855 requires the California Department of Public Health to produce a California Water Safety Action Plan for Children and a standardized electronic form for counties to use in reporting drowning statistics.

Acknowledgments

The continuous contributions and commitment of our multi-sectoral partners in advancing our knowledge, practices, and policies to prevent childhood drowning are exceptional.



Partners for Childhood Drowning Prevention Project Team & Advisors

- Phyllis Agran, MD, MPH, FAAP (AAP-OC, UCI Departments of Pediatrics and Emergency Medicine, Clinic in the Park)
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- Kathryn Tan, BS (AAP-OC)
- William Koon, California Water Safety Coalition
- Michael Hallinan, retired Police Commander (City of Irvine Police Department) and retired Police Lieutenant (UC Irvine Police Department)
- Tom Lankard (former Director, California Office of Traffic Safety; Manager, Caltrans Legislative Affairs, retired)



The evolution of this project required formulating a core multi-sectoral team of child health provider clinicians, research scientists, health educators, parents, policymakers, and social media and communication strategists with expertise in injury prevention — specifically, the prevention of drowning. Our communications and social media specialists translated evidence-based prevention strategies into public awareness and education campaigns.

We were fortunate to connect with Med Tac Global, a remarkable non-profit organization focused on advanced first-aid strategies.

We acknowledge those members of our team who contributed to Foundations for Childhood Drowning Surveillance (2010) and rejoined us. Their knowledge, experience, and history have been valuable to our project.

Partners

- American Academy of Pediatrics-California
- American Academy of Pediatrics-California Collaborative for Resident Advocacy
- California Department of Public Health, Injury and Violence Prevention Branch
- California State Senator Josh Newman
- California Water Safety Coalition
- Clinic in the Park, a fiscally sponsored project of the American Academy of Pediatrics-Orange County (AAP-OC)
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- Illumination Foundation
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- Med Tac Global
- Melinda Hoag Smith Center for Healthy Living
- Newport Mesa Unified School District
- Orange County Child Death Review Team
- Orange County Child Protective Services
- Orange County Fire Authority
- Orange County Public Health Nurses
- Orange County Department of Social Services



- Rady Children’s Hospital UC San Diego
- Riverside Public Health
- The Raise Foundation
- Rotary Club of Newport Mesa
- University of California Irvine
 - Center for Trauma and Injury Prevention Research
 - School of Medicine Departments of Pediatrics and Emergency Medicine
 - Sue and Bill Gross School of Nursing
 - School of Social Sciences
 - Police Department
- University of California San Diego, Herbert Wertheim School of Public Health & Human Longevity Science (Nancy Binkin, MD)
- University of California San Francisco, Fresno
- Valley Children’s Hospital Madera, CA
- Water Safety Council of Fresno County
- YMCA Orange County

Special appreciation is extended to our California Department of Public Health, Injury and Violence Prevention Branch: Kate Bernacki, MPH, Kids’ Plates Coordinator; Jeffrey Rosenhall, MA, Chief Unintentional Injury Program and Policy Section; Orion Stewart, PhD, Research Scientist; Renay Bradley, PhD, Chief Epidemiology and Surveillance Section; Elena Costa, Coordinator Essentials for Childhood; Stacy Alamo Mixson, MPH, Injury and Violence Prevention Branch Chief. Steve Wirtz, PhD, former Chief Unintentional Injury Program and Policy Section was instrumental in guiding our 2010 project and our current project.

We take this opportunity to remember two iconic public health and injury prevention leaders who are no longer with us. Roger Trent, PhD, a former Chief of the Epidemiology and Surveillance Section, Injury and Violence Prevention Branch, California Department of Public Health was instrumental in our data surveillance work in 2009. Mark Horton, MD, MPH, pediatrician was a former Orange County Director of Public Health, and the first CDPH Public Health Officer. His contributions to child health and injury prevention have been iconic.

As we remind ourselves every day: One More Drowning Is One Too Many!



Chapter 2: Childhood Drowning and the California Pool Safety Law

According to the Centers for Disease Control (CDC), in California, drowning is the leading cause of injury death among 1-4-year-olds and the second-leading cause of injury death among 5-9-year-olds. (Centers for Disease Control) WISQARS™ — Web-based Injury Statistics Query and Reporting System.¹

The California Department of Public Health (CDPH) EpiCenter online database reveals that drowning has been the leading cause of injury death among California residents 1-4 years of age for nearly 25 years.² On average, 33 children less than 5 years of age have died each year from drowning (2010-2021). Among children who survive drowning, a large number experience lifelong disabilities that range from minor to severe. The California Department of Developmental Services 2022 Client Development and Evaluation Report (CDER) documents a caseload of more than 700 persons who require lifelong services as a result of nonfatal drowning.³ This caseload represents a significant long-term cost to the state.

5 Leading Causes of Injury Deaths, Children 0-17 Years of Age: California Residents (2017-2021)

N = total # of fatalities for age group

Ages <1 N=398	Ages 1-4 N=626	Ages 5-9 N=348	Ages 10-14 N=661	Ages 15-17 N=1613
Suffocation (204)	Drowning (225)	MVT, Unspec. (79)	Suicide (187)	Suicide (435)
Homicide (81)	Homicide (96)	Drowning (55)	MVT, Unspec. (106)	Homicide (353)
MVT, Unspec. (24)	Pedestrian (73)	Homicide (50)	Homicide (76)	Poisoning (248)
Drowning (19)	MVT, Unspec. (61)	MVT Occupant (49)	Pedestrian (60)	MVT, Unspec. (210)
MVT Occupant (12)	Suffocation (38)	Pedestrian (28)	MVT Occupant (45)	MVT Occupant (111)

1. All injury categories are unintentional injuries except for homicide.
2. "MVT, Unspec." – Motor Vehicle Traffic, Unspecified
3. "MVT Occupant" – Motor Vehicle Occupant & Motor Vehicle Traffic Occupant
4. "Pedestrian" – Pedestrian, Traffic, & Nontraffic

Source: EpiCenter, CDPH

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The California Child Death Review Council was defunded in 2008 due to the Great Recession. Reporting to the California Department of Public Health is managed on a regional basis and dependent upon county child death review teams.

Data from child death review teams can provide a comprehensive review of child fatalities from all causes and recommendations for prevention.⁴ Inconsistent and incomplete data hamper the identification and monitoring of trends and risk factors and hinder prevention recommendations. The American Academy of Pediatrics strongly recommends that states establish systematic reporting on the circumstances of drowning.⁵ A robust statewide data collection and analysis system provides information to develop best practices, community interventions, and relevant public policies.

The California Legislature found a solution to the statewide drowning data collection gap. SB 855 (Newman, Ch. 817, Stat. 2022: Childhood Drowning Data Collection Pilot Project) was chaptered into law. This bill requires the State Department of Public Health in the California Health and Human Services Agency to establish, on or before January 1, 2024, and administer the Childhood Drowning Data Collection Pilot Program.⁶

Definitions

Standardized Definition of Drowning.

Using standardized definitions is the primary strategy to improve case reporting, data collection, understanding of the epidemiology of drowning, and public education and awareness communications.

The American Academy of Pediatrics Prevention of Drowning Policy and the Prevention of Drowning Technical Report classifies drowning according to the 2002 World Congress on Drowning, and the World Health Organization (WHO) revised the definition of drowning to “the process of experiencing respiratory impairment from submersion/immersion in liquid.” Drowning outcomes are as follows: death, no morbidity, or morbidity with outcomes as moderately disabled, severely disabled, vegetative state/coma, and brain death.⁵



Drowning Data Collection Codes

The International Statistical Classification of Diseases and Related Health Problems (ICD) is published by the World Health Organization (WHO). The 10th Revision (ICD-10) included changes in the classification of unintentional drowning with more detail on the body of water and the mechanism.⁷ ICD-10 codes are used for drowning surveillance by almost all countries and are reported to WHO.

This uniformity of reporting promotes international comparability in the collection, processing, classification, and presentation of mortality statistics and is commonly used for drowning surveillance. Child death review teams, hospitals, and other medical facilities use the ICD-10 CM system, based on medical diagnoses. Researchers also use the ICD-10 coding system. (The ICD-11 for Mortality and Morbidity Statistics Version was released 01/2023).

These codes have limited usefulness in understanding factors to guide the development of prevention strategies. This is especially problematic if the full code is not utilized or left as “unspecified” and/or if multiple causes of death are not coded.

Pool Barrier Definition

The International Swimming Pool and Spa Code (IPSC) | ICC Digital Codes definition of a pool barrier is as follows: A permanent fence, wall, building wall, or combination thereof that completely surrounds the pool or spa and obstructs access to the pool or spa. The term “permanent” means that the fence is not able to be removed, lifted, or relocated without the use of a tool.⁸ It is important to differentiate this barrier from other types of barriers and safety devices that may be included in data collection systems and legislation. The U.S. Consumer Product Safety Commission provides safety barrier guidelines for residential pools.⁹

ICD10 External cause of Accidental (non-transport) Injury: Drowning and Submersion Codes

- W65 Accidental drowning and submersion while in bathtub
- W66 Accidental drowning and submersions following fall into bathtub
- W67 Accidental drowning and submersion while in swimming pool
- W68 Drowning and submersion following fall into swimming pool
- W69 Accidental drowning and submersion while in natural water
- W70 Drowning and submersion following fall into natural water
- W73 Other specified cause of accidental non-transport drowning and submersion
- W74 Unspecified cause of accidental drowning and submersion



Intentional and undetermined codes

X71 Intentional self-harm by drowning and submersion

X92 Assault by drowning and submersion

Y21 Drowning and submersion, undetermined intent

T75.1 Effects of drowning and nonfatal submersion

There are other codes that are used for drowning that can be accessed. These are the codes that we used in our analysis.

California Pool Safety Laws

In 1984 Contra Costa County, California adopted a pool enclosure law in response to Nadina Riggsbee, an advocate parent who lost one child to drowning and her son is the oldest living survivor in California.¹⁰ This was the first of its kind in the U.S. Notably, Contra Costa County now follows California State law, which does not require a pool enclosure but offers it as an option.

The first California Pool Safety Act (Setencich, Chapter 925, Statutes of 1996) went into effect on January 1, 1997. According to this Act, new swimming pools constructed at private, single-family homes must be equipped with either a permanent fence, a pool cover meeting specified standards, exit alarms or self-closing self-latching devices on all doors providing access to the pool, or other means of protection equal to or greater than the other options. In 2006, the pool safety law was amended (Mullin, Chapter 478, Statutes of 2006) to include two additional safety features: removable mesh fencing and pool alarms that sound when a person enters the water. Additionally, the 2006 Act expanded the scope to include a building permit requirement for a pool remodel.¹¹

The California Pool Safety Act was updated in 2017. SB 442 (Newman, Chapter 670, Statutes of 2017).¹² This law requires, in part, newly constructed or remodeled swimming pools and spas at private single-family residences to incorporate at least two of seven instead of one specified drowning prevention safety feature. The specific codes related to each device are referred to in the law and in the California Building Codes.



The drowning prevention features are:

- An enclosure that meets the requirements of Section 115923 and isolates the swimming pool or spa from the private single-family home.
- Removable mesh fencing that meets the American Society for Testing and Materials (ASTM) Specifications F2286 standards in conjunction with a self-closing and self-latching gate that can accommodate a key lockable device.
- An approved safety pool cover, as defined in subdivision (d) of Section 115921.
- Exit alarms on the private single-family home's doors that provide direct access to the swimming pool or spa. The exit alarm may cause either an alarm noise or a verbal warning, such as a repeating notification that "the door to the pool is open."
- A self-closing, self-latching device with a release mechanism placed no lower than 54 inches above the floor on the private single-family home's doors providing direct access to the swimming pool or spa.
- An alarm that, when placed in a swimming pool or spa, will sound upon detection of accidental or unauthorized entrance into the water. The alarm shall meet and be independently certified to the ASTM Standard F2208 "Standard Safety Specification for Residential Pool Alarms," which includes surface motion, pressure, sonar, laser, and infrared type alarms. A swimming protection alarm feature designed for individual use, including an alarm attached to a child that sounds when the child exceeds a certain distance or becomes submerged in water, is not a qualifying drowning prevention safety feature.
- Other means of protection, if the degree of protection afforded is equal to or greater than that afforded by any of the features set forth above and has been independently verified by an approved testing laboratory as meeting standards for those features established by the ASTM or the American Society of Mechanical Engineers (ASME).



Chapter 3: Professional and Community Awareness, Education, and Engagement

The AAP-OC Chapter expanded its Injury and Violence Prevention Initiative with a team of California experts, contributing to our goals of professional and public awareness, education, and community outreach regarding drowning prevention and drowning data collection and surveillance. In 2021-2023, we increased the scope and capacity of our drowning prevention actions.

Educational Materials

“Water Safety For Families” educational infographics, videos, and educational collateral materials in English and Spanish highlight critical prevention and intervention strategies. The information is largely based on the American Academy of Pediatrics Prevention of Drowning Policy Statement and the Technical Report.¹³ Our partners provided feedback and reviewed the product. We revised it accordingly and will review and update the key messages as we learn about the need from our professional and community partners.

The infographic was produced as a PDF with embedded QR codes linking to video narratives covering U.S. Coast Guard-approved life jackets and a video explaining the critical interventions presented in the infographic.

The infographic is posted on our website; used in webinars and other educational presentations; displayed and distributed at community events at our “water safety station” in hard copy and displayed as a large poster and retractable banner; distributed to our pediatricians and community partners; and used in social media and newsletters. This is our basic teaching tool for our multi-sectoral partners, presenting the critical strategies to prevent drowning.

English Video Link: <https://vimeo.com/823821517>

Spanish Video Link: <https://vimeo.com/829583202>



<h3>WATER SAFETY FOR FAMILIES</h3> <p>Drowning can happen to any family. It is quick and it is silent. Drowning is the single-leading cause of unexpected death of children ages 1 to 4 years old.</p>  <p>4-SIDED POOL FENCING A fence that surrounds the pool. Specifically designed so that children cannot easily get over, under, or through it. A safe gate should be secured at all times.</p> <p><small>American Academy of Pediatrics Orange County Chapter © 2023 American Academy of Pediatrics Orange County Chapter. All Rights Reserved. Images are part of the Childproof Your Home program.</small></p>	 <p>LIFE JACKETS U.S Coast Guard Approved: Use for open bodies of water and at pools for young children and unskilled swimmers.</p>  <p>SWIM LESSONS High quality, low-cost lessons are typically available through your city. Swim lessons can help reduce the risk of drowning for children. Some kids may be ready to start swim lessons after age 1.</p> <p><small>More information at www.aap-oc.org/pcdp</small></p>	 <p>SUPERVISION Be watchful: Avoid distractions such as cell phone use and conversations with others. Assign a water watcher.</p>  <p>CPR & AED TRAINING Rescue Immediately Onsite: All parents & guardians need current CPR AED training. Rescue breaths are vital – children and drowning victims are often oxygen starved.</p> <p><small>Scan the QR code for the Water Safety for Families video</small></p>	<h3>SEGURIDAD EN EL AGUA PARA FAMILIAS</h3> <p>El ahogamiento puede afectar a cualquier familia. Es rápido y silencioso. El ahogamiento es la causa principal más inesperada de muertes entre niños de 1 a 4 años.</p>  <p>CERCADO DE PISCINA DE 4 LADOS Una cerca alrededor de la piscina. Diseñado específicamente para que los niños no puedan pasar fácilmente por encima, por debajo o a través de él. Una Cerca segura debe de estar cerrada todo el tiempo.</p> <p><small>American Academy of Pediatrics Orange County Chapter © 2023 American Academy of Pediatrics Orange County Chapter. All Rights Reserved. Images are part of the Childproof Your Home program.</small></p>	 <p>CHALECOS SALVAVIDAS Aprobado por la Guardia Costera de Estados Unidos. Se debe de usar en lugares de actividad acuática, ya sea para grandes o albercas para niños pequeños, o nadadores inexpertos.</p>  <p>LECCIONES DE NATACIÓN Lecciones de alta calidad y costos bajos son típicamente disponibles en su ciudad. Estas lecciones pueden ayudar a reducir el riesgo de ahogamiento para niños. Algunos Niños pueden estar listos para aprender después de 1 año.</p> <p><small>Escanee el código QR para ver el video en Español</small></p>	 <p>SUPERVISIÓN Estar Atento. Evite distracciones, como teléfonos celulares, conversaciones con otras personas y asigne a una persona para supervisar las áreas acuáticas.</p>  <p>REANIMACION CARDIO PULMONAR Y USO DE DESFIBRILADOR Rescate inmediato y en el sitio de Inmersión. Todos los padres y guardianes deben de recibir entrenamiento de Reanimación Cardio Pulmonar. Reparación de boca a boca son vitales - los niños que son víctimas de ahogamiento regularmente les falta mucho oxígeno.</p> <p><small>Más información en www.aap-oc.org/pcdp</small></p>
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Websites

Childhood Drowning Prevention for AAP-OC Chapter (www.aap-oc.org/pcdp)
 Clinic in the Park (www.clinicinthepark.org/resources/water-safety-resources)

Social Media Public Education and Awareness Campaigns

AAP-OC Chapter

- Facebook @AAPOCChapter4
- Instagram @ocaap
- Twitter @OCAAP

Clinic in the Park

- Facebook @clinicinthepark
- Instagram @clinicinthepark

Newsletters & Other Media

AAP-OC Chapter

Clinic in the Park

Drowning Prevention Newsletter. Two special edition drowning prevention newsletters were published in [May 2022](#) and [May 2023](#).

Homeowners Associations

Realtors

Rotary Clubs



Presentations and Webinars

2022

- April 26, 2022: Orange County Drowning Prevention Task Force
- May 31, 2022: Drowning Prevention for Populations with Special Needs
- July 7, 2022: Virtual "Drowning Prevention: Strategies That Make A Difference!"
- September 7, 2022: Virtual "California Resident Advocacy Collaborative"
- September 23-25, 2022: AAP-OC Chapter 38th Annual Current Advances in Pediatrics Conference

2023

- March 9, 2023: The Role of Public Health Nurses: Training on Drowning Prevention
- April 4, 2023: Children and Family Services Public Health Nurses Symposium
- May 23, 2023: Clinic in the Park Collaborator Meeting Drowning Prevention Presentation
- June 7, 2023: University Methodist Church Presentation on Water Safety for Families

15 Community Events 2021-2023

- Education and Distribution of Water Safety Materials and U.S. Coast Guard Approved Life Jackets
- 500 U.S. Coast Guard-approved life jackets fitted and distributed in largely low-income communities.
- YMCA Pilot Project: Water Safety For Families Education and U.S. Coast Guard approved life jacket loaner program at aquatics facilities.

2022

- April 30, 2022: Fullerton YMCA Healthy Kids Day
- May 21, 2022: Irvine Water Safety Challenge
- June 24, 2022: Irvine Swim Day
- June 30, 2022: CDPH Drowning Prevention
- July 30, 2022: Illumination Foundation Carnival
- August 20, 2022: Newport Mesa Unified School District, Melinda Hoag Smith Center for Healthy Living & IKEA
- August 27, 2022: Dia de Los Niños
- October 27, 2022: Melinda Hoag Smith Center for Healthy Living
- December 14, 2022: Melinda Hoag Smith Center for Healthy Living Christmas Shop



2023

- April 29, 2023: Fullerton YMCA Healthy Kids Day
- May 20, 2023: SuperKids Health Expo at the Boys and Girls Club Santa Ana
- June 4, 2023: Saint Joaquin Church, Costa Mesa
- June 7, 2023: Hoag Faith Community Nurses: Water Safety For Families Education, Methodist Church, Irvine
- June 30, 2023: Be the First Responder Summer Kick-Off, Ocean Institute (Med Tac Global)
- July 15, 2023: Illumination Foundation Carnival for Kids
- August 5, 2023: Back to School Resource Fair with Melinda Hoag Smith Center for Healthy Living and Newport Mesa Unified School District

We leveraged resources with partner organizations to expand our scope and outreach among health professionals, policymakers, and communities.

Recommendations for AAP-OC Partners for Childhood Drowning Prevention Initiative

Collaboration and Public Education

- Maintain collaboration with multisectoral partners.
- Continue multi-media public awareness, education, and community engagement.

Leverage Resources

- Foster and enhance national, local, and state partnerships and collaborations.

Professional Training and Capacity Building

- Provide drowning prevention educational tools to health care professionals and educators for train-the-trainer and parent education programs.
- Collaborate on a regional basis with other health professional organizations on drowning prevention education and interventions.
- Train health care providers on key data elements to better understand circumstances and the prevention of childhood drowning.

Advocacy for Policy Change

- California's Pool Safety Law has not had the intended effect of decreasing the annual rates of child drowning among California residents.



Chapter 4: Foundations for Childhood Drowning Surveillance 2023

4.1 Child Drowning Surveillance

Foundations for Childhood Drowning Surveillance 2023 builds on Foundations for Drowning Surveillance Data Report and the Drowning of 1-4-Year-Old Children In Swimming Pools and Spas, Surveillance Handbook (2010), to improve the quality and consistency of multi-agency drowning surveillance in California.^{14,15}

Foundations for Child Drowning Surveillance 2023 is designed to: 1) review current sources of data on childhood drowning; 2) review California’s publicly available data on pediatric drowning and identify gaps in understanding the circumstances of the incident; 3) create an easy-to-use hospital-based child data collection tool and update our Flowchart: Outcomes and Sources of Data for Drowning Incidents; and 4) provide recommendations for enhanced surveillance that informs prevention.

The California Department of Public Health Injury and Violence Prevention Branch (CDPH-IVPB) will begin implementation of the Childhood Drowning Data Collection Pilot Program on January 1, 2024. (Newman, Ch. 817, Stat. 2022: Childhood Drowning Data Collection Pilot Program).⁶

Table 1: Current Databases for Childhood Drowning Surveillance includes national, state, and county data sources and systems relevant to child drowning.



Current Databases for Childhood Drowning Surveillance

Background

As background for the data surveillance component of this project, we reviewed existing national, state and county data sources/systems that include information related to pool and spa drownings of children. We examined only those data systems that are relevant for child drowning incidents in California. We then created a table that indicates the title of the system, data sources for fatal and nonfatal incidents, and strengths and limitations of the system specific to drowning surveillance. (Additional information on each data system can be found on the websites which are hyperlinked in the table.)

NOTE: This table is not intended to be a comprehensive list of all National, State and local systems.

DATA SYSTEMS	FATAL DATA SOURCES & CODES	NONFATAL DATA SOURCES & CODES	STRENGTHS	LIMITATIONS
National	Fatal	Nonfatal	Strengths	Limitations
CDC WISQARS (Web-based Injury Statistics Query and Reporting System) www.cdc.gov/injury/wisqars/index.html	<ul style="list-style-type: none"> National Vital Statistics System (NVSS) includes state and county level death data Filed in state vital-statistics offices and includes causes of death reported by attending physicians, medical examiners and coroners Uses ICD-10 codes 	<ul style="list-style-type: none"> Uses U.S. Consumer Product Safety Commission (CPSC) NEISS data (see CPSC data system below) 	<ul style="list-style-type: none"> WISQARS: Most complete database identifying leading causes of death in the U.S. by state and county Excellent for trend analysis ICD-10 specific codes provide body of water location 	<ul style="list-style-type: none"> ICD-10 Codes insufficient for detailed incident circumstances Death data represents small proportion of all drowning cases Data subject to error due to inconsistent reporting
U.S. Consumer Product Safety Commission (CPSC) NEISS (National Electronic Injury	<ul style="list-style-type: none"> Fatal cases reported directly to CPSC staff 	<ul style="list-style-type: none"> Statistically valid injury surveillance system Probability sample of 96 U.S. emergency departments (ED) 	<ul style="list-style-type: none"> Produces annual report on Pool or spa drownings of children < 15 years using consistent data collection form 	<ul style="list-style-type: none"> Limited details related to barrier and safety devices Inconsistent documentation in emergency department medical records



<p>Surveillance System) Collects data on consumer product-related injuries occurring in the U.S.</p> <p>https://www.cpsc.gov/Research-Statistics/NEISS-Injury-Data</p>		<ul style="list-style-type: none"> • Abstracts pertinent data from ED record; transcribes data into NEISS coding form 	<ul style="list-style-type: none"> • PCPSC Pool or Spa: Nonfatal Drowning Injuries and Reported Drowning, 2022 Report • Fatal data includes demographics and information related to location, type, scenario, and time between incident and death • NEISS provides estimates of nonfatal drowning injuries for U.S. • Includes some information on location of the incident • For some incidents, follow-back investigations conducted through telephone and on-site interviews with patient or patient’s relative 	
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<p>NEMSIS (National Emergency Medical Services Information System)</p> <p>https://nemsis.org</p>	<ul style="list-style-type: none"> • NEMSIS: National system used to collect, store, and share EMS data from the U.S. States and Territories. • NEMSIS is program of NHTSA’s Office of EMS 	<ul style="list-style-type: none"> • Collaborative system to improve prehospital patient care through standardization, aggregation, and utilization of point of care EMS data at local, state, and national levels • Potential to provide detailed information on circumstances of drowning incidents 	<ul style="list-style-type: none"> • Focus: Improving patient care may impact detailed drowning scene investigation • Voluntary submission by State and Territory EMS officials 	
<p>National Center for Fatality Review & Prevention (NCFRP)</p> <p>https://ncfrp.org</p>	<ul style="list-style-type: none"> • National Fatality Review-Case Reporting Systems (NFR-CRS): Web-based standardized case report tool (https://ncfrp.org/wp-content/uploads/CDR_CRS_v6-0.pdf) • More than 1,350 state and local Child Death Review Teams (CDRT) • Includes all 50 states, District of Columbia, Guam, and Navajo Nation 		<p>Produced Accidental Drowning Deaths 2004-2017 report (https://ncfrp.org/center-resources/quick-looks/accidental-drowning-deaths)</p> <ul style="list-style-type: none"> • Provides demographic, water source, location, supervision, barriers, and layers of protection information – data fields in the V6 Case Report Form 	<ul style="list-style-type: none"> • Variability between states on reporting requirements and case selection • Because not all states review all deaths, data may not be representative of all child deaths and cannot be used to calculate fatality rates • Data only as inclusive as the information that is brought to the CDRT by reporting entities • Reviews may be conducted years after a death,



	<p>ability to participate)</p> <ul style="list-style-type: none"> • Data Suppression Rule limits state and county reporting 		<ul style="list-style-type: none"> • Child Death Review Teams: Review data from reporting sources • Used for descriptive studies; analysis of associations between variables 	<p>resulting in loss of detail and potential for missing or unknown data</p> <ul style="list-style-type: none"> • Report represents only a small percentage of drowning cases • Case Report Form V.6 H3 section limited on circumstances of drowning events and changes in form over time • Not to be used for temporal trends, rates of geo-mapping
<p>NDCRP Drowning Scene Investigation https://ncfrp.org/cdr/drowning-case-registry</p>	<ul style="list-style-type: none"> • Participating CDRT's: Arizona Child Fatality Review Program; Connecticut Child Fatality Review Panel; Colorado Child Fatality Prevention System; Florida Child Abuse Death Review Program; Kansas State Child Death Review Board; Michigan Child Death Review Program; and Orange County, California CDR 		<ul style="list-style-type: none"> • NCDRC launched Drowning Death Scene Investigation and Child Death Review (CDR) Project in 2021 to support development of standardized drowning death scene investigation (DSI) form and enhanced data collection by existing CDR teams • Results pending 	<ul style="list-style-type: none"> • Results pending



State (California)	Fatal	Nonfatal	Strengths	Limitations
<p>California Department of Public Health EpiCenter California Injury Data Online</p> <p>https://skylab4.cdph.ca.gov/epicenter/</p>	<ul style="list-style-type: none"> • ICD-10 External Causes of Morbidity codes • Deaths identified from CDPH California Comprehensive Death File • Includes in-state deaths, and deaths of California residents that occurred in other states or jurisdictions 	<ul style="list-style-type: none"> • Uses ICD-10-CM codes (codes for diagnoses in health care settings) • Includes hospitalizations and ED encounters identified from California Department of Health Care Access (HCA) Patient Discharge Data (PDD) and ED data • Uses comprehensive definition of injury (principal diagnosis plus those with an external cause of injury code appearing in a diagnosis or external cause of morbidity field) • Data limited to CA residents treated in CA 	<ul style="list-style-type: none"> • Most versatile and comprehensive source of CA injury data • Provides information on extent of drowning for California residents • Enables rate calculations because population-based • Use of ICD-10 codes in fatal data allows for identification of pool cases • Expanded EpiCenter case definition for hospitalizations and ED encounters provides a more comprehensive count of drowning cases 	<ul style="list-style-type: none"> • Under-reporting of fatal cases that occur in CA because non-residents are not included in the database • Nonfatal hospital and ED data excludes non-resident drowning incidents in CA and does not include CA residents treated out of state • Subject to under-reporting of drowning in CA • Fatal injuries identified through ICD-10 codes in the underlying cause of death field only • Does not include deaths where an injury was an intermediate or contributory cause of death • Injuries only as accurate as medical coding, based on medical documentation used to populate the data • Possibility of double count of nonfatal injuries since some ED encounters may be included in hospital data • Expanded case definition for nonfatal drownings prohibits determination of the pool/spa cases



<p>California Department of Public Health Vital Statistics</p> <p>https://www.cdph.ca.gov/Programs/CHSI/Pages/Data-and-Statistics.aspx</p>	<ul style="list-style-type: none"> • Includes state and county level death data reported by attending physicians, medical examiners, and coroners • Uses ICD-10 codes • Captures all drowning fatalities regardless of whether or not it is the primary cause of death 		<ul style="list-style-type: none"> • Able to capture in-state fatal drownings and drownings of CA residents occurring in other states and jurisdictions • Includes non-residents who drown in CA • Source for EpiCenter fatal data • Data available for researchers with IRB (Institutional Review Board approval) 	<ul style="list-style-type: none"> • No official reports on drowning published by agency • Data may be subject to error because of reporting inconsistencies
<p>CCFSS (California Child Fatality Surveillance System)</p> <p>California has adopted the National Fatality Review – Case Reporting System (NFR-CRS)</p> <p>Formerly known as the Fatal Child Abuse and Neglect</p>	<ul style="list-style-type: none"> • Counties that have CRDTs are required to submit data into the CCFSS • Uses Case Report Form V.6 of the National Center for Fatality Review and Prevention 		<ul style="list-style-type: none"> • Uniform reporting of demographic information because uses standardized tool from NCFRP • CA law states each country may establish an interagency child death review team and then continues to provide further details about CDRT’s and state actions <p>https://law.justia.com/codes/california/2</p>	<ul style="list-style-type: none"> • Only 39 of 58 counties have submitted reports at least once • Number of cases submitted has declined since 2008 Decline could be explained by state budget cuts that led to a lack of funding for the program • Data Suppression rule prevents reporting for counties with less than 11 cases • Currently no State Child Death Review Team but loose network of



<p>Surveillance Project.</p> <p>https://www.pacesconnection.com/g/california-essentials-for-childhood-initiative/blog/new-resource-understanding-california-s-child-fatality-surveillance-system-ccfss-data</p>			<p>009/pen/11174.32-11174.35.html</p> <ul style="list-style-type: none"> • \$150 per case offered to counties that submit data into the CCFRSS • Name change promotes intent to capture all child fatalities 	<p>regional coordinators collaborates</p> <ul style="list-style-type: none"> • Despite the lack of funding for this program, the state published a report on these data in 2022. (Click here for the report.) • See section on NCFRP
<p>California Emergency Medical Services Information System (CEMSIS) Demonstration project for improving EMS data across CA</p> <p>https://emsa.ca.gov/cemsis/</p>	<ul style="list-style-type: none"> • Collects data from local EMS agencies in the state • Two systems – CEMSIS-trauma and CEMSIS-EMS • Requires the most current version of NEMSIS to be used to collect EMS data 	<ul style="list-style-type: none"> • Currently focuses on trauma and improving quality of EMS care • CEMSIS-EMS may be a source to provide further information on drowning cases 	<ul style="list-style-type: none"> • Full compliance and subsequent transmission to the state of data is inconsistent in California • Currently does not appear to have detailed information on drowning circumstances 	



Local	Fatal	Nonfatal	Strengths	Limitations
<p>Orange County EMS (OCEMS)</p> <p>https://www.ochealthinfo.com/about-hca/medical-health-services/emergency-medical-services</p>	<ul style="list-style-type: none"> Includes both fatal and nonfatal incidents occurring in OC Incorporated OCFA Immersion Incident questionnaire into electronic Patient Care Report (ePCR). Refer to OCFA 		<ul style="list-style-type: none"> Local county data Provides standardized data to CEMSIS which in turn provides it to NEMSIS Provides ePCR (electronic patient care report) data for OCFA Immersion System 	<ul style="list-style-type: none"> Focus on patient care vital but it may limit details regarding circumstances
<p>OCFA (Orange County Fire Authority)</p> <p>Orange County - OCEMS</p> <p>Drowning Reporting Process</p>	<ul style="list-style-type: none"> Includes both fatal and nonfatal incidents occurring in OC Data sources: OCEMS, OCFA, and Coroner In 2014 OCEMS built into the ePCR the set of custom questions that were previously captured through the OCFA Childhood Immersion System OCEMS sends data to OCFA who reviews and logs cases into an internal database and acts as a repository of the data 		<ul style="list-style-type: none"> Immersion incident questionnaire incorporated into electronic prehospital Electronic Patient Care Report (ePCR) thus requiring that it be completed before submission Real-time data collection Verified drowning cases indicate symptoms of respiratory distress Collects incidents occurring in the county that have engaged EMS Obtains significant detailed circumstance information Access to Coroner Reports OCFA staff dedicated to management and reports 	<ul style="list-style-type: none"> Possibility of missing cases that occur in unusual circumstances or those without EMS call or response Not linked to hospital data so limited information on nonfatal outcomes Incident data prohibits calculation of rates
<p>Riverside County Public Health</p> <p>Submersion Incident Report Form (SIRF)</p>	<ul style="list-style-type: none"> Includes both fatal and nonfatal incidents occurring in Riverside County based on fire department and EMS agencies electronic reporting. 		<ul style="list-style-type: none"> County-wide surveillance system Real-time data collection at incident site Within the ePCR, the SIRF form automatically opens and all questions must be answered before submission 	<ul style="list-style-type: none"> Time consuming to provide information to various reporting agencies Access to hospital data but no data linkages to obtain outcome information



	<ul style="list-style-type: none"> • Submersion Incident Report Form SIRF incorporated into Electronic Patient Care Report (ePCR) system that is used by all Riverside County-based Fire Department and EMS agencies 	<ul style="list-style-type: none"> • Form includes checkbox for CPS referral • Riverside Public Health receives daily email listing of all drowning cases in ePCR and maintains database • Hospital staff have access to SIRF • Riverside Public Health produces data briefs and monthly reports for monitoring • Incidents occurring at public or community sites referred to Environmental Health for on-site investigation 	<ul style="list-style-type: none"> • Currently data reports body of water but does not distinguish type of swimming pool such as community or residential • Data reports list outcomes as either fatal or survived without further detail • Incident data prohibits calculation of rates
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California County-Based Fatal and Nonfatal Surveillance Systems

We identified two county-based surveillance systems of fatal and nonfatal incidents that capture all drowning incidents at all locations: the Orange County Fire Authority and Riverside Public Health.

These are excellent systems that can be used as models as the CDPH-IVPB Childhood Drowning Data Collection Pilot Program develops recommendations on the structure and operation of an ongoing system for collecting child drowning data and creates a standardized electronic form for counties to use in reporting drowning statistics. These systems are described in Chapter 4.5 Surveillance Resources.



4.2 California Child Drowning Data

Drowning is the leading cause of unintentional injury-related death among children 1-4 years of age in the U.S. and California and the second leading cause of unintentional injury-related death among children 5-9 years of age.^{1,2} California is one of four states that address the prevention of residential pool drowning through state legislation.¹⁶ In California, drowning has remained the leading cause of injury death among 1-4-year-old children for three decades.

The first California Pool Safety Act went into effect on January 1, 1997. This Act has been updated and the current act is, Senate Bill 442 (Newman, Chapter 670, Statutes of 2017) Pool Safety Law.¹² Compared to previous versions, the current law, in part, increased the number of required safety features around residential pools from one to two. The home inspection process at the time of transfer of property to inform new homeowners of whether the home had the required safety features was expanded. The types of pool door alarms that meet the criteria expanded. The law covers pools and spas at private single-family residences. Two of the seven safety feature options must be selected: i) pool enclosure; ii) removable mesh fencing; iii) approved safety pool cover; iv) exit door alarms; v) self-closing, self-latching device on door; vi) alarm placed in the pool or spa; or vii) other means of protection greater or equal to the other 6 requirements. The intent of the 2017 California Pool Safety Act is to reduce child drownings at pools and spas.

Purpose of Analysis

The purpose of this preliminary data analysis is to 1) examine the annual rates of fatal drownings among California children 0-17 years and 1-4 years of age at all locations and 1-4 years of age at pools from 1999-2020; and 2) characterize 1-4-year-old drowning incidents.

Method

Data for this study was obtained from the EpiCenter California Injury Data Online website. This is a comprehensive source of injury data for California residents.



In 1999, EpiCenter started using the Tenth revision of the ICD (ICD-10) codes for fatalities. Rates were calculated for unintentional drowning from 1999-2020 using the Legacy Version of EpiCenter.² From their dropdown menu, we selected “unintentional-drowning/submersion.” We looked at drowning fatality rates at all locations for California children 0-17 years of age, 1-4 years of age at all locations, and at pool drownings for children 1-4 years of age. ICD-10 codes W67 and W68 were used to identify fatal pool drownings. The incidence rate and its 95% confidence interval were calculated for each year by using Poisson distribution approximation and presented as line charts.

The rates per population are based on the 2010 and 2020 Census Data, adjusted with population estimates each year between new census counts. This database is confined to California residents.

In 2016, EpiCenter was redesigned to include injury hospitalizations and emergency department visits.¹⁷ Injury hospitalizations and emergency department (ED) visits are identified from the California Department of Health Care Access and Information (HCAI) Patient Discharge Data (PDD) and ED Data, respectively. The PDD includes records of inpatient discharges from California-licensed hospitals, including general acute care, acute psychiatric, chemical dependency recovery, and psychiatric health facilities. The ED data include records of patient face-to-face encounters with providers at hospitals licensed to provide emergency medical services. If an ED encounter resulted in a same-hospital admission, the ED encounter would be combined with the PDD record and only appear as a hospitalization. More information can be found on the HCAI Data. On the EpiCenter interactive website, we selected drowning/submersion under the Injury Mechanism drop-down menu for deaths, hospitalizations, and ED visits. This included unintentional, intentional, and undetermined intent drownings.

(Because of the De-Identification Guidelines, we were only able to determine that less <4% of fatal cases were intent, unknown, or intentional. Less than 1% of hospitalized and ~0.3% of ED cases were classified as intentional.)

We then characterized the 1-4-year-old age group for the years 2017-2021. Data elements reviewed included years of age, sex of child, race/ethnicity, location of incident, outcome (fatal, hospitalization, emergency department visit), disposition, and length of stay. Race/ethnicity is categorized as Hispanic, White, Asian, Black, Multiracial, and Pacific Islander.



The CDPH states that due to differences in how race/ethnicity is reported in the population and injury data, caution should be used when interpreting rates involving race/ethnicity.

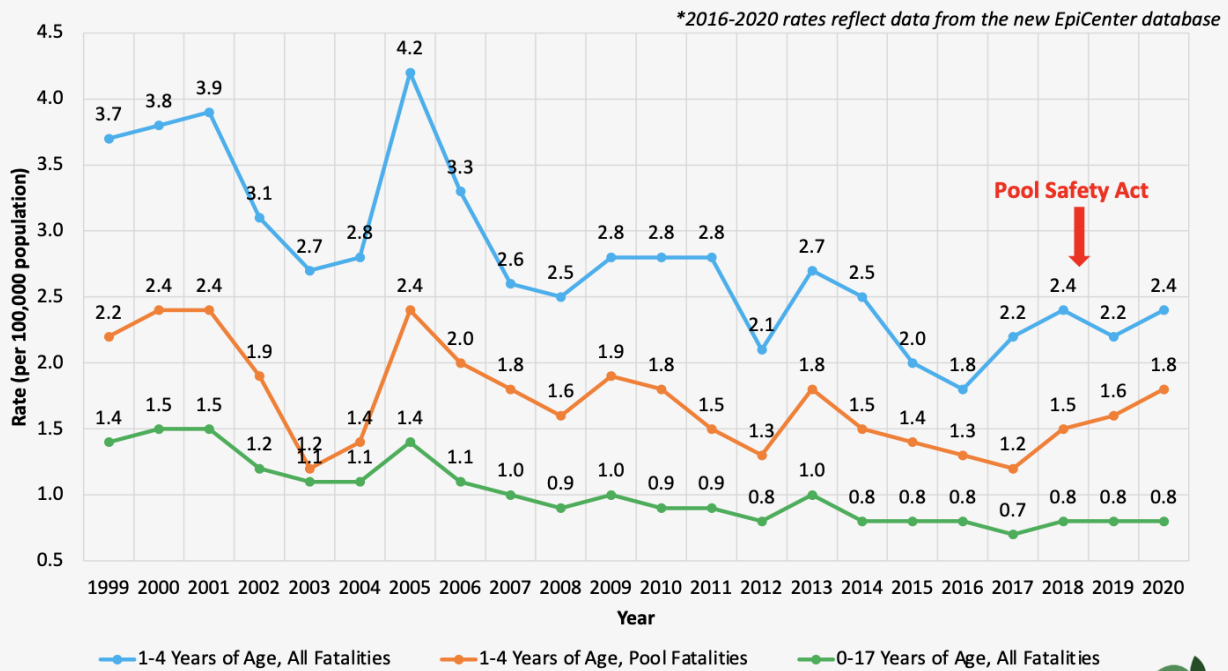
Consistent with California Health and Human Services De-Identification Guidelines, EpiCenter does not provide data for results with fewer than 11 cases.

Results

Drowning Rates: 1999-2020

Annual rates for drowning from 1999-2020 are presented in Figure 1 among the 0-17-year-old age group at all locations, the 1-4-year-old age group at all locations, and the 1-4-year-old age group at pools.

Figure 1 – Annual Unintentional Fatal Drowning Rates for Children 1-4 Years of Age vs. Children 0-17 Years of Age: California Residents (1999-2020)



Source: EpiCenter, CDPH

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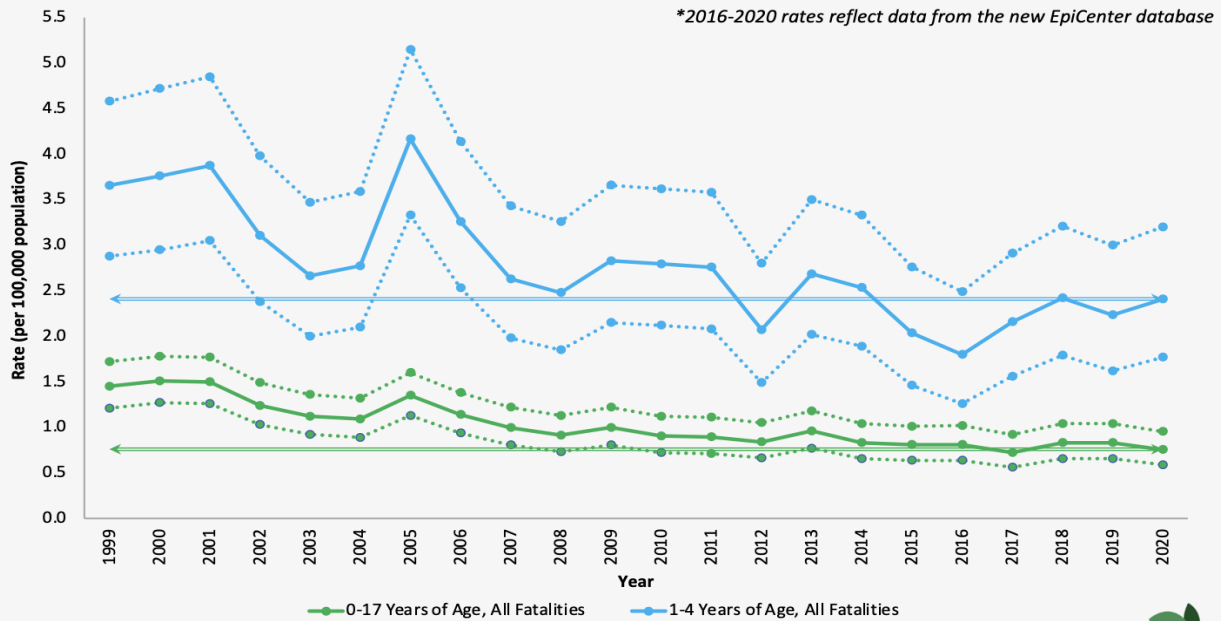
0-17 Year Age Group (Fatal: All Water Locations)

The drowning rate in this age group ranged from 1.51 (1.27 - 1.78) per 100,000 population in 2000 to 0.72 (0.56 - 0.92) per 100,000 in 2017. In 2020, the drowning rate in this age group was 0.76 (0.59 - 0.95) per 100,000 population which was less than the rates observed in 1999-2002, and 2005. However, the difference in drowning rate of the year 2020 with the rates observed in 2003-2004, and 2006-2019 was not statistically significant. (Figure 1.1).

1-4 Year Age Group (Fatal: All Water Locations)

The drowning rate in this age group ranged from 4.17 (3.33 - 5.15) per 100,000 population in 2005 to 1.8 (1.26 - 2.49) per 100,000 in 2016. In 2020, the drowning rate in this age group was 2.41(1.77 - 3.20) per 100,000 population which was less than the rates observed in 2005. However, the difference in drowning rate of the year 2020 with the rates observed in 1999-2004, and 2005-2019 was not statistically significant (Figure 1.1).

Figure 1.1 – Annual Rates for All Unintentional Fatal Drownings for Children 1-4 Years of Age vs. Children 0-17 Years of Age: California Residents (1999-2020)



Source: EpiCenter, CDPH

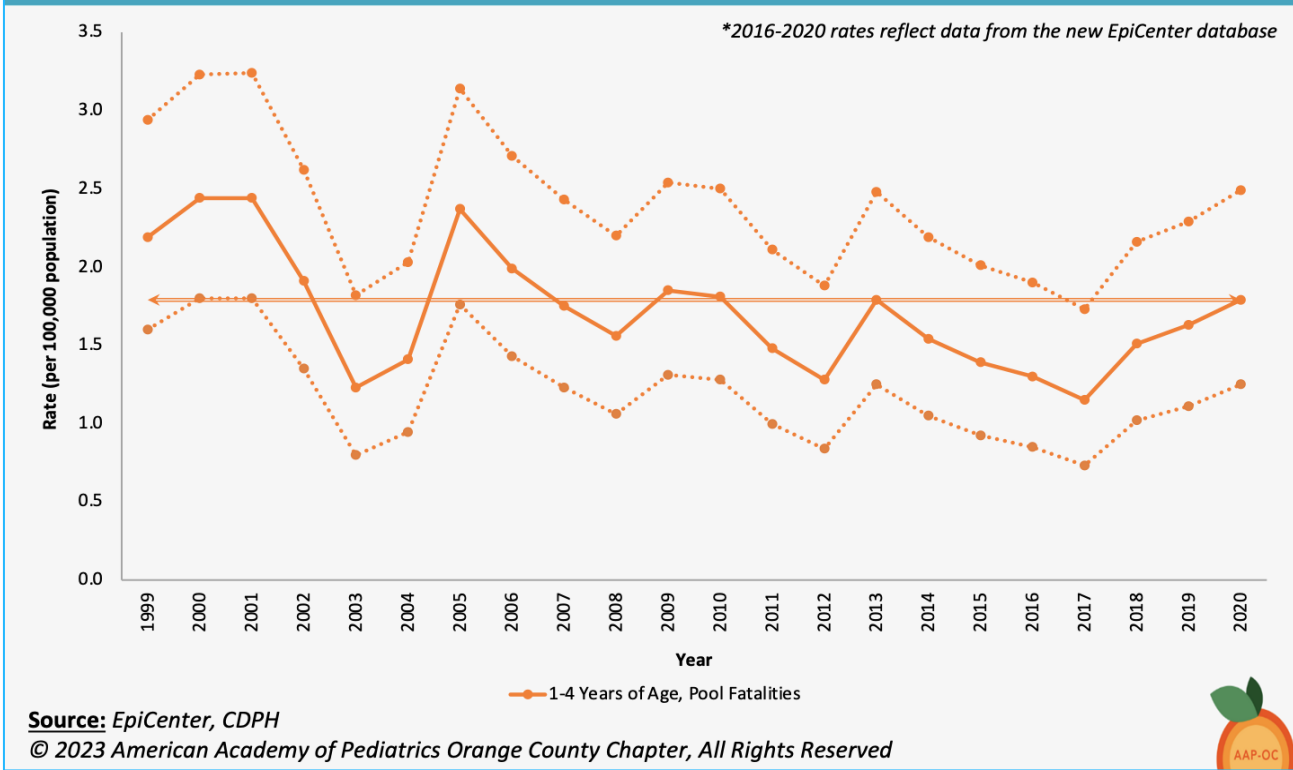
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1-4 Year Age Group (Fatal: Pool Location)

1-4 years age group, pool-drowning. The pool-drowning rate in this age group ranged from 2.44 (1.80 - 3.23) per 100,000 population in 2000-2001 to 1.15 (0.73 - 1.73) per 100,000 in 2017. In 2020, the pool-drowning rate in this age group was 1.79 (1.25 - 2.49) per 100,000 population. There was not a statistically significant difference in drowning rate of the year 2020 with the rates observed in 1999-2019 (Figure 1.2).

Figure 1.2 – Annual Rates for Unintentional Fatal Pool Drownings for Children 1-4 Years of Age: California Residents (1999-2020)



The dotted lines in Figure 1.1 and Figure 1.2 above represent the 95% Confidence Interval of the rate for the respective year (shown by a solid line in between the two dotted lines).

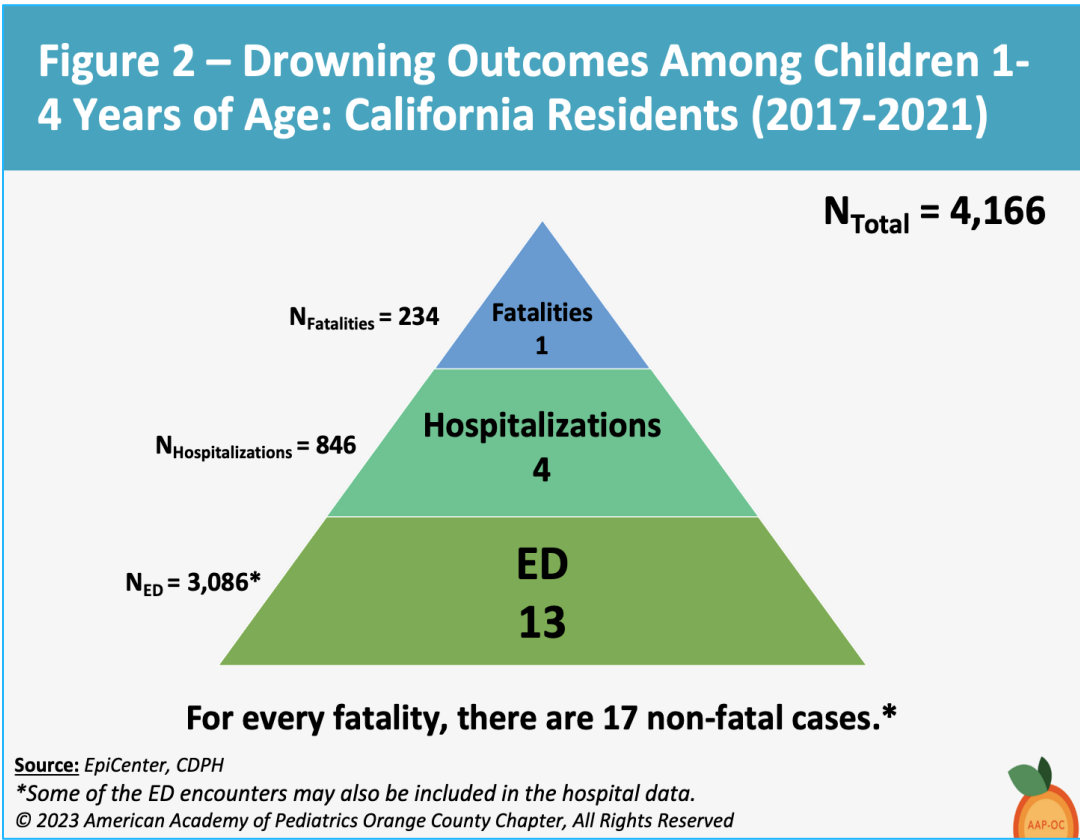
The horizontal line marks the observed rate in the last year of the study (2020).



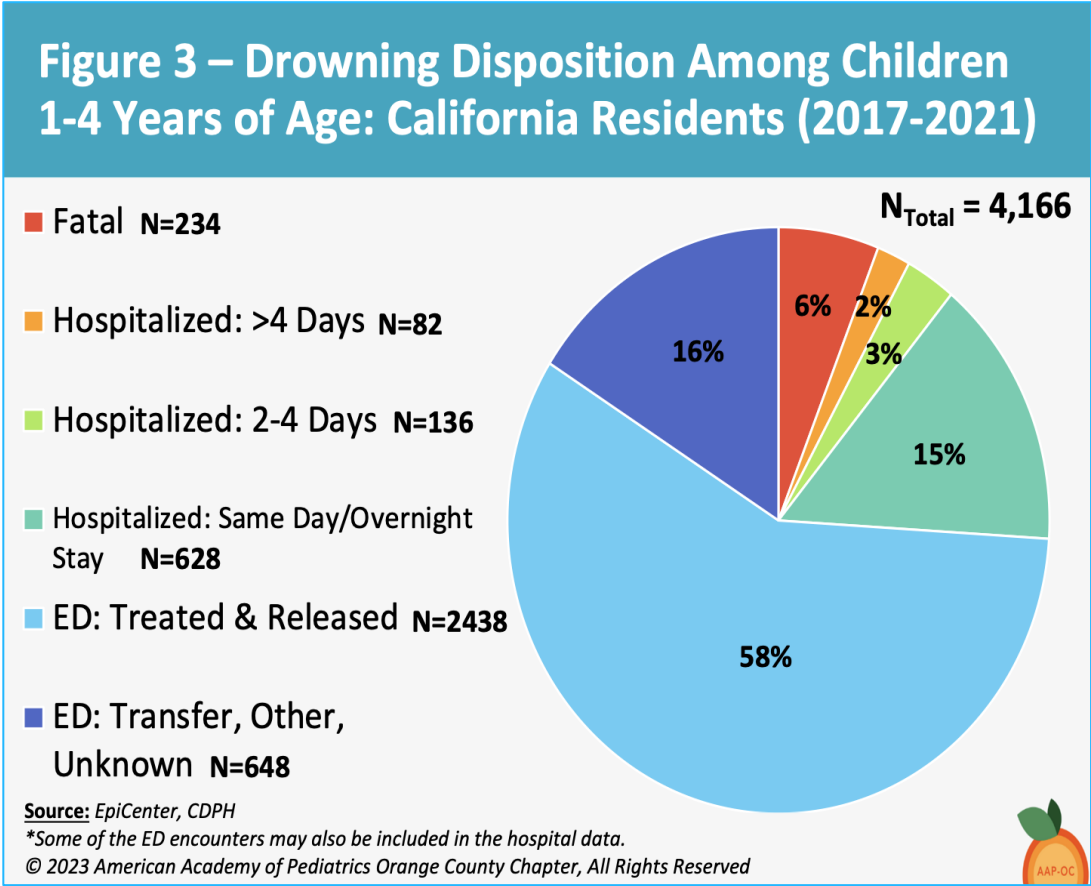
1-4 Year Age Group, 2017-2021 (Fatal, Hospital, ED incidents)

We then reviewed the data among California children 1-4 years of age for the 5-year period 2017-2021.

A comparison of the number of fatalities to hospitalizations to emergency department visits is demonstrated in Figure 2. Overall, there were 17 nonfatal incidents for each fatal incident. It should be noted that some emergency department (ED) encounters may also be included in the hospital data (Figure 2).



Drowning disposition among 4,166 California children 1-4 years of age reveals that 6% (234) were fatal. Disposition for the nonfatal cases reveals the following: 58% (2,438) treated and released from the emergency department; 15% (628) hospitalized and released within the day or overnight; 6% (136) hospitalized for 2-4 days; 2% (82) hospitalized for more than 4 days; 2% (82) hospitalized for more than 4 days; 16% (648) transferred or disposition unknown from the ED (Figure 3).



Drowning outcomes by age among the 4,166 children 1-4 years of age for the years 2017-2020 revealed 234 children fatalities; 846 hospitalized; and 3,086 ED treated.

The fatalities decreased with increasing age as follows: 36% among 1-year-olds; 32% among 2-year-olds; 20% among 3-year-olds; and 12% among 4-year-olds.

In contrast, hospitalizations and ED visits were highest among the 2-year-olds (Figure 4).

As demonstrated in Figure 5, while fatality rates were highest among the 1-year-olds, hospitalization, and ED visits were highest among the 2-year-olds. (Figure 5).

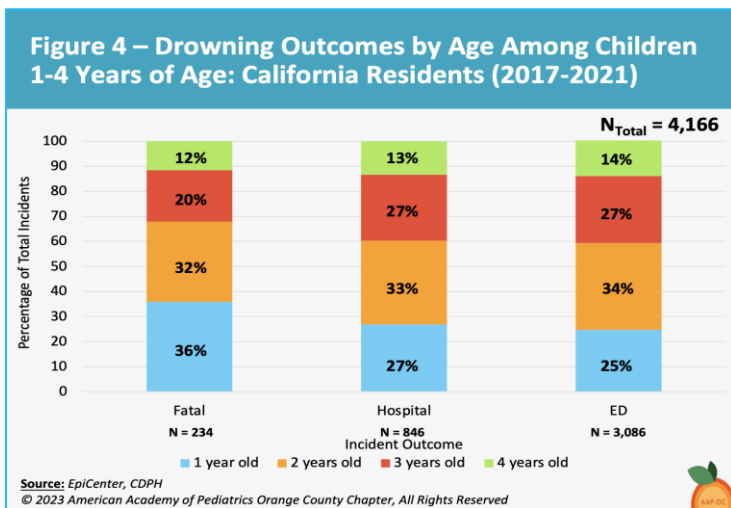


Figure 5 – Drowning Outcome Rates by Age Among Children 1-4 Years of Age: California Residents (2017-2021)

N_{Total} = 4,166

Age (years)	Fatalities		Hospitalizations		ED Visits	
	N	Rate	N	Rate	N	Rate
1	84	3.7	227	9.9	758	33.0
2	75	3.2	283	12.0	1061	44.9
3	48	2.0	223	9.2	820	33.8
4	27	1.1	113	4.6	447	18.1
Total	234	2.4	846	8.8	3086	32.3

Source: EpiCenter, CDPH
*All rates are per 100,000 population
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Rates by sex for 1-4-year-olds revealed that males had higher rates than females for all outcomes (N=4,166) as follows: male fatality rates were 3.2/100,000 population compared to female fatality rates, which were 1.7/100,000 population; male hospitalization rates were 10.5/100,000 population, while female fatality rates were 7.1/100,000 population; and male ED visit rates were 35.8/100,000 population compared to female ED visit rates which were 28.7/100,000 population (Figure 6).

Figure 6 – Drowning Outcome Rates by Sex Among Children 1-4 Years of Age: California Residents (2017-2021)

N_{Total} = 4,166

Sex	Fatalities		Hospitalizations		ED Visits	
	N	Rate	N	Rate	N	Rate
Male	154	3.2	506	10.5	1717	35.8
Female	80	1.7	340	7.1	1369	28.7
Total	234	2.4	846	8.8	3086	32.3

Source: EpiCenter, CDPH

*All rates are per 100,000 population

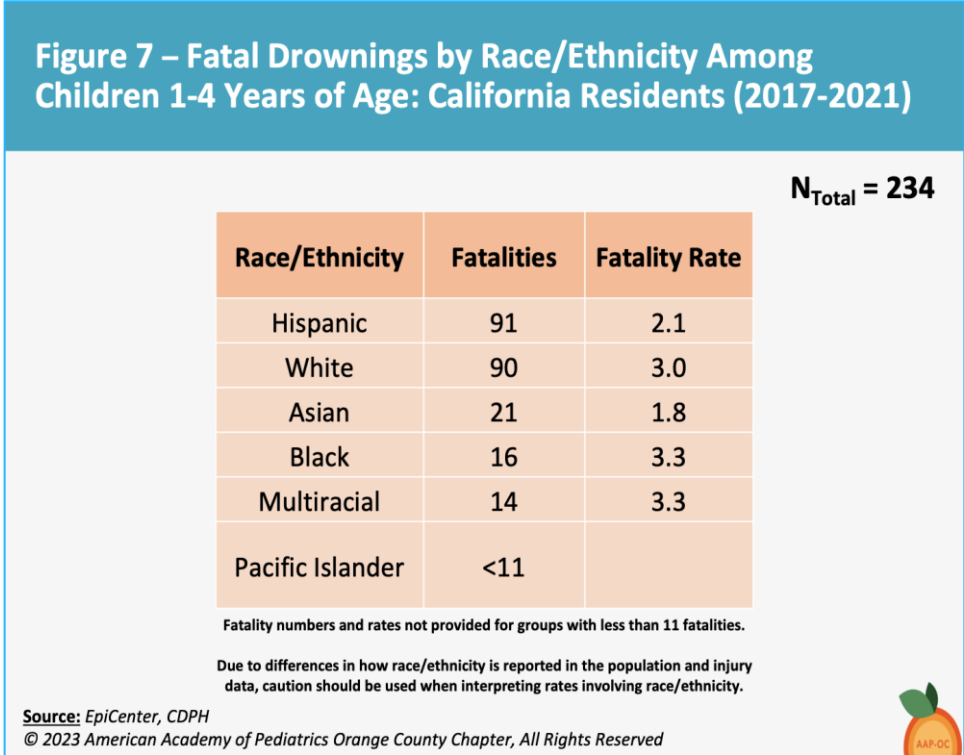
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Fatal drowning among children 1-4 years of age by race/ethnicity among California residents is to be interpreted with caution. Rates were highest among Black and Multiracial children followed by Whites (3.0/100,000 population), Hispanics (2.1/100,000 population), and lowest among Asians (1.8/100,000 population).

Rates are not provided for groups with less than 11 fatalities as noted in Figure 7.

A breakdown of hospital and ED data based on race/ethnicity is not included in our analysis because the CDPH modified this category in 2019.



The highest proportion of fatal, hospital, and ED-treated children occurred during the summer months of May to August with June and July showing the highest rates for fatal, hospitalization, and ED visits (Figure 8).

The weekend days Saturday and Sunday were the most frequent among all cases of fatal, hospital, and ED-treated children (Figure 9).

Figure 8 – Drowning Outcome Rates by Month Among Children 1-4 Years of Age: California Residents (2017-2021)

N_{Total} = 4,166

Month	Fatalities		Hospitalizations		ED Visits	
	N	Rate	N	Rate	N	Rate
January	<11		20	2.5	57	7.0
February	13	1.8	28	3.8	72	9.7
March	<11		31	3.8	105	12.9
April	24	3.1	70	8.9	224	28.5
May	28	3.4	97	11.9	286	35.2
June	38	4.8	172	21.9	664	84.5
July	43	5.3	168	20.7	754	92.9
August	29	3.6	118	14.5	448	55.2
September	17	2.2	57	7.3	242	30.8
October	<11		39	4.8	123	15.2
November	<11		25	3.2	68	8.7
December	11	1.4	21	2.6	43	5.3

Fatality numbers and rates not provided for groups with less than 11 fatalities.

Source: EpiCenter, CDPH
 *All rates are per 100,000 population
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Figure 9 – Drowning Outcome Rates by Day of Week Among Children 1-4 Years of Age: California Residents (2017-2021)

N_{Total} = 4,166

Day of Week	Fatalities		Hospitalizations		ED Visits	
	N	Rate	N	Rate	N	Rate
Sunday	37	2.7	183	13.4	669	48.9
Monday	24	1.8	105	7.7	368	26.9
Tuesday	34	2.5	98	7.2	316	23.1
Wednesday	30	2.2	79	5.8	338	24.7
Thursday	32	2.3	87	6.4	313	22.9
Friday	38	2.8	101	7.4	346	25.3
Saturday	39	2.9	193	14.2	736	54.0

Source: EpiCenter, CDPH
 *All rates are per 100,000 population
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EpiCenter divides California’s 58 counties into 7 regions. We then looked at the fatal, hospital, and ED-treated children 1-4 years of age by California regions. Fatality rates were highest for children in the Northern and Sierra region (6.2%). Hospitalizations (11.9%) and ED visits (43.2%) were more frequent in the Other Southern California region.

The largest number of fatal, hospital-treated, and ED-treated cases was in Southern California counties (Figure 10).

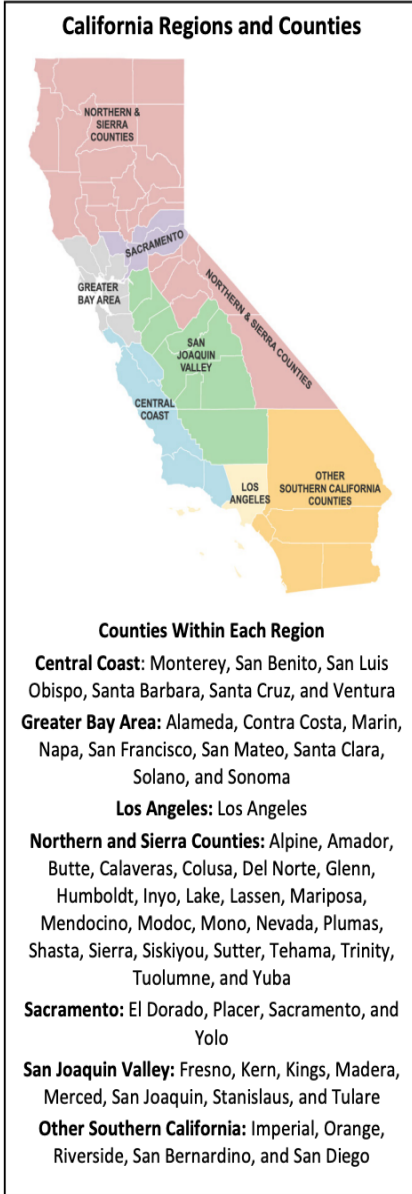


Figure 10 – Drowning Outcome Rates by Region of Residence Among Children 1-4 Years of Age: California Residents (2017-2021)

N_{Total} = 4,166

Region of Residence	Fatalities		Hospitalizations		ED Visits	
	N	Rate	N	Rate	N	Rate
Central Coast	<11		33	6.0	141	25.8
Greater Bay Area	24	1.4	96	5.7	378	22.4
Los Angeles	48	2.0	185	7.8	529	22.4
Northern and Sierra	19	6.2	30	9.8	117	38.0
Other Southern California*	65	2.3	341	11.9	1242	43.2
Sacramento Area	12	2.2	55	10.1	197	36.1
San Joaquin Valley	56	4.5	106	8.5	481	38.5

Fatality numbers and rates not provided for groups with less than 11 fatalities.

*Other Southern California includes the following counties: Imperial, Orange, Riverside, San Bernardino, and San Diego.

Source: EpiCenter, CDPH

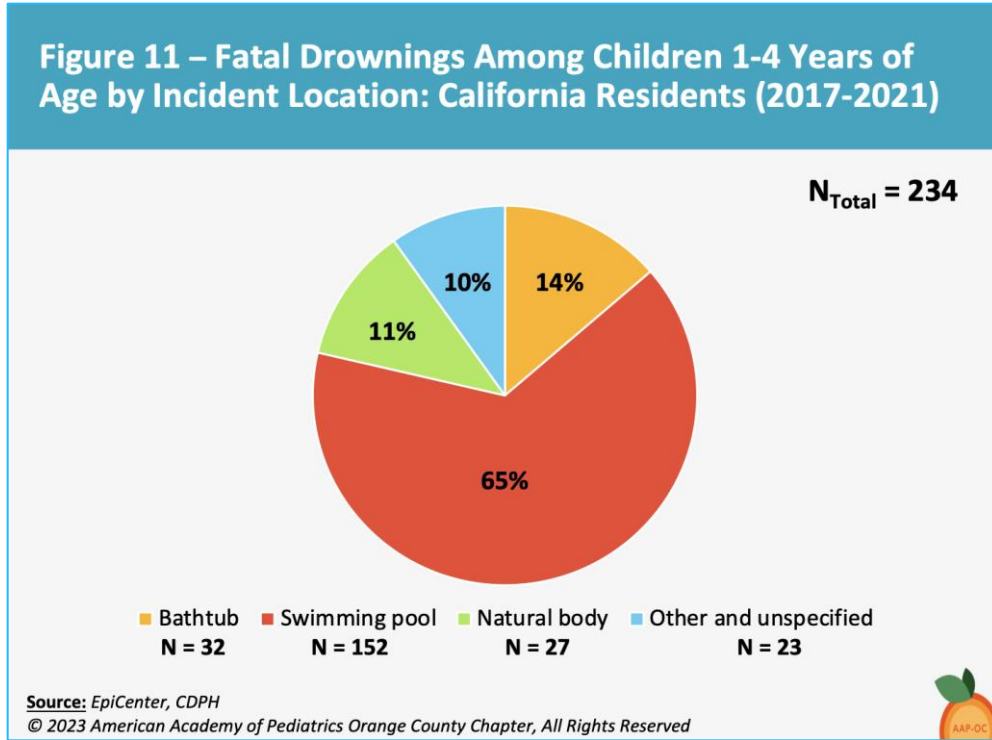
*All rates are per 100,000 population

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1-4 Year Age Group, 2017-2021 (Fatal, by Location)

Fatal drowning among the 234 children 1-4 years of age by incident location revealed the following: 65% (152) cases were at pools; 14% (32) were bathtubs; 11% (27) were at natural bodies of water; and 10% (23) were other/unspecified (Figure 11).



Conclusions

The California Department of Public Health EpiCenter online publicly available database is excellent for analyzing annual rates of fatal drowning incidents among California residents over time. The fatal drowning rate in all sources of water for 0-17 years age group in 2020 was less than the initial years covered in this report. However, we were not able to detect a significant decline in fatal drowning rate of this age group from 2006-2020.

Focusing on 1-4 years age group, we did not detect a steady decrease in the drowning rate in recent years. This was the case for pool drowning, as well as all sources of water.

Drowning remains the leading cause of death among California children 1-4 years of age.



Pools accounted for 65% of fatalities among this age group. For each fatality, there were 17 nonfatal drownings. Fatalities were highest among children 1 year of age and decreased with increased age, from 1-4 years of age. More than half (58%) of the children were treated and released from the emergency room. Males had higher rates than females for fatalities, hospitalization, and ED visits. The high-risk months for fatal and nonfatal drowning were May through August - the drowning season and highest on the weekends. The CDPH states that caution should be used in interpreting rates by race/ethnicity. Using national data, Clemens, et. al found persistent racial/ethnic disparities in fatal unintentional drowning rates among persons ≤ 29 years, indicating the need for interventions to reduce these disparities.¹⁸

Regional analysis of drowning fatality among children 1-4 years of age provides additional data. Southern California counties had the highest number of cases. As Koon, et al reported, regional-level variations in a large state such as California must be further evaluated for regional targeted solutions.¹⁹ We concur with this approach.

The current Pool Safety Act of 2017 which went into effect January 1, 2018, increased the number of safety features around a single-family residential pool from one to two.¹² We are not able to determine the impact of this law because the EpiCenter database does not differentiate the type of pool such as community or residential.

While not specific to California, the Consumer Product Safety Commission Pool or Spa Submersion 2023 Report revealed that nearly half (49%) of nonfatal emergency department treated children less than 5 years were at a residential pool. Among the fatalities, 84% were at a residential pool at the home of the victim, a family, friend, acquaintance, or neighbor. This study highlights the importance of surveillance systems that provide detail regarding the circumstances of the drowning incident.²⁰

Limitations

Using EpiCenter's publicly available data, this analysis is limited to California residents only. Children who visit California and our popular tourist attractions are not counted if they sustain a fatal or nonfatal drowning. The ratios of fatal to hospitalization to emergency department visits may include double counts as some ED encounters may also be included in the hospital data. We do not have exposure data. Additionally, we cannot determine the extent of unreported incidents.



Drowning is preventable but requires a multipronged approach with multiple layers of protection to allow for human error and lapses in supervision. Clearly, pools and young children must be addressed with specific targeted interventions. Our educational strategies with collateral education materials for health professionals and community stakeholders are presented in Chapter 3.

A robust integrated fatal and nonfatal systematic data collection system that includes key variables on the circumstances of the incident will advance our prevention interventions. Riverside Public Health and the Orange County Fire Authority are two California county models that accomplish this. Real-time data entry and timely data reports are essential to inform prevention strategies and policies. Chapter 4.4 provides our recommendations for enhanced surveillance systems.

Newman, Ch. 817, Stat. 2022: Childhood Drowning Data Collection Pilot Project moves us closer to the American Academy of Pediatrics recommendation that states establish systematic reporting.⁶ A statewide system that includes key data elements on the circumstances of drowning informs best practices, community interventions, and public policy enhancements. The ultimate goal is a reduction of child drowning.

UC Irvine IRB #1735



4.3 Child Drowning Data Collection Tool

Background

The California EpiCenter database on child drowning provides information on rates of childhood drowning over time, by victim demographics and location. However, it is limited in our understanding of modifiable risk factors and event circumstances that can further inform data-driven prevention strategies and policies.

Goal/Objectives

The goal was to improve the quality and quantity of data documented in hospital medical records by creating a data collection tool that can be used in the hospital setting for both fatal and nonfatal drowning cases of young children.

The specific objectives were to 1) determine key elements for a hospital-based easy-to-use drowning data collection tool; 2) develop the tool; and 3) use the tool for education and quality improvement by training health care providers on key data elements that inform on the drowning incident circumstances.

Methods

We reviewed the literature related to child drowning surveillance along with current data collection tools used at the national, state, and local levels as a guide to create a drowning data collection tool. These tools included the National Child Fatality Review and Prevention Case Report version 6 used by the California Child Fatality Surveillance System and the Death Surveillance Incident Form (DSI) created by the NCFRP new CDC Study.^{21,22}

We also reviewed the Orange County Fire Authority Immersion Incident Report and the Riverside Public Health Submersion Incident Report Form (SIRF) which are included in Chapter 4.5 Surveillance Resources. We reviewed our Drowning of 1-4-Year-Old Children in Swimming Pools and Spas 2010 Surveillance Handbook and accompanying report focused on enhancing child death review team of drowning incidents.^{14,15}

Our “Flowchart: Outcomes and Sources of Data for Drowning Incidents” provides an overview of portals for data entry of drowning victims. This flowchart informed on components of the child drowning data collection tool.



A team of experts in healthcare and drowning prevention reviewed the preliminary data collection tool and each of the four subsequent iterations. The review team was composed of 18 health professionals, including pediatricians, nurses, research scientists/epidemiologists, data analysts who oversee county-wide data collection systems, health educators, and members of the OC Child Death Review Team and the Riverside Public Health Child Death Review Team. Based on their recommendations the tool was further modified.

Results

The Child Drowning Data Collection Tool was created.

Using the tool, we led a training session with public health nurses and emergency responders who conduct home visits following a drowning or other significant incident. Participants reported that the tool was helpful in identifying key factors in the home and family environment for prevention.

Through our American Academy of Pediatrics-Orange County Partners for Child Drowning Prevention Initiative, we are implementing a pilot study to test the tool by retrospective review of a convenience sample of hospital records. The pilot study will provide insight into the extent of data documentation within the various components of the medical record. This will be designed as a quality-improvement activity and likely a tool modification will be indicated.

Conclusions

The Child Drowning Data Collection Tool compelled us to identify the key variables for hospital medical record documentation that can be used to 1) improve the quantity and quality of data with an easy-to-use tool; 2) train providers on key data elements to document; and 3) aid in local hospital-based surveillance of child drowning for quality improvement and data-informed prevention strategies.

Training public health nurses achieved a better understanding of modifiable risk factors and evidence-informed counseling for families. For example, a public health nurse advising parents that floaties are not protective but could even be harmful compared to the child wearing a U.S. Coast Guard-approved life jacket is a practice change. Another practice change is illustrating the protective value of an isolation fence around the backyard pool.

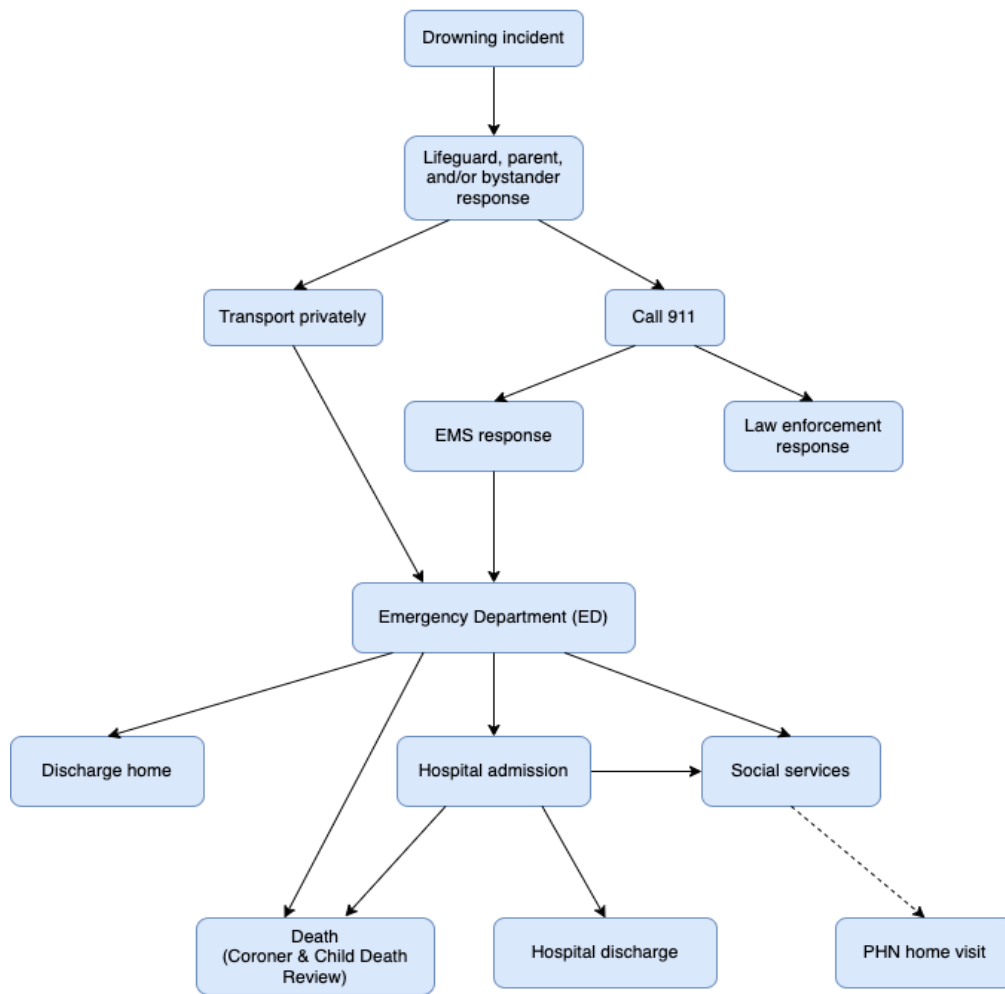


Training will continue in 2023-2024 with our pediatric residents through our partnership with the California Resident Advocacy Collaborative and with our health professional community.

The ultimate goal is prevention. The construction of a data collection tool moves toward standardization of critical data collection elements that can be used to improve our understanding of the circumstances of child drowning incidents. The tool can be used as a guide for child death review and hospital case review processes.

Child Drowning Surveillance (UCI Institutional Review Board #1940)

Flowchart: Outcomes and Sources of Data for Drowning Incidents



Providers can request a scene investigation and/or follow-up home visit at any time



Chapter 4.4. Recommendations For Surveillance

Why Surveillance?

Data-informed interventions and policies are critical to contribute to a reduction in childhood drowning. The American Academy of Pediatrics Prevention of Drowning Policy and Technical Report, the National Water Safety Action Plan, and the California Water Safety Coalition Strategy prioritize surveillance as a key strategy to identify risk factors and trends, as well as inform evidence-based harm reduction tactics.^{5,13,23,24}

We understand that it is not feasible for all of these recommendations to be implemented. However, if any of these recommendations are implemented, it will contribute to moving drowning surveillance and prevention forward. Each community can prioritize, and phase implementation based on urgency, feasibility, and resources.

Recommendations

Standard Coding and Definitions

Uniformity of coding using the WHO (2002 World Congress on Drowning and the World Health Organization) definitions of drowning and outcomes, and ICD-10 (International Statistical Classification of Diseases and Related Health Problems), is essential. It was not clear from our review of existing surveillance systems that this was being done. Lack of clarity on definitions and subsequent coding hampers our understanding of drowning and comparisons across systems and communities. Specification is critical to ensure that we reduce “unknown” or “not specified” ICD-10 drowning codes.

Fatality Surveillance System

Utilize the National Child Report Form for fatal child drownings and train data collectors using the NCFRP Manual. Child Death Review Teams use the National Fatality Review-Case Reporting System web-based case reporting system. This system provides data collection tools, standardized data reports, and technical support and training for their web-based case reporting system. The Case Report Form special section on fatal drowning cases will likely be enhanced by the Drowning Death Scene Investigation and Child Death Review Project. Orange County was selected as a pilot site for this study.



In-depth case review by county child death reviews and a statewide death review process informs prevention recommendations.

Surveillance Systems Include Both Nonfatal and Fatal Drownings

Fatal and nonfatal drowning incidents provide critical information to identify modifiable risk factors and factors impacting medical outcomes. As we have demonstrated by our analysis of California Department of Public Health EpiCenter data, for each California child drowning fatality, there are 17 nonfatal incidents requiring medical attention. The number of fatal cases at the local level is too few or federal reporting requirements prohibit reporting of small numbers, and therefore, these data are not amenable to an analysis of risk factors. For prevention, we must look at the outcomes of death, no morbidity, or morbidity with level of severity. As stated in the American Academy of Pediatrics Policy Statement, the process of drowning is a continuum (drowning chain of survival) that can be interrupted by rescue at any point and impacts the outcome.

Integrated fatal and nonfatal drowning surveillance has been achieved with the Orange County Fire Authority Reporting system and the Riverside Public Health system. These two systems include all drownings occurring in their respective counties, irrespective of the residence of the victim. Moreover, both of these systems are real-time data collection and entry systems – essential for rapid response to prevention. These systems are described in Chapter 4.5.

Furthermore, a system that is managed by a public health department can have additional advantages. For example, Riverside Public Health has developed a special drowning prevention program that promotes a more comprehensive review of each case and better informs on prevention.

Standardized Data Variables for Data Collection

Based on our work, data collection tools should be characterized as follows: 1) contains essential key data variables to inform prevention; 2) are easy to use for data collection and medical record documentation using electronic systems; 3) include drop-down menus; and 4) training provided on the tool(s) used.



For pool drownings among young children, specification regarding the type of pool, such as a backyard single-family home or community pool is a key data variable. For community pools, further specifications regarding the location such as apartment complex, homeowner association, hotel or resort pool, or public pool provides information to understand modifiable risk factors. It is also critical that information regarding barriers and access be included. Because we have identified children with underlying medical and neurodevelopmental conditions as high risk for drowning, medical documentation as to underlying drowning risk factors is needed for individual and community safety measures. Moreover, supervisor characteristics and activities at the time of the incident assist our health care teams in developing a family and community safety plan to prevent further drowning incidents.

EMS-Initiated System Linked to Systems

Utilize the EMS-initiated system that includes all levels of care with data linkages. An example of an integrated system is California's Crash Medical Outcomes Data (CMOD) project.²⁵ This is modeled on the National Highway Traffic Safety Administration (NHTSA) and Crash Outcome Data Evaluation System (CODES). The CMOD project uses linked data from police traffic crash records (i.e., scene investigations) to medical data (from emergency departments, hospitals, and, in a future update, death files).

In the case of an EMS-initiated system, we recommend that data collection include the health care team (Emergency Medicine Team and all physicians, nurses, and social workers rendering patient and family care). Data should be linked between sources to provide a comprehensive understanding of case circumstances, medical management, social service consults, and referrals at discharge. Police reports are an important component of a linked system as are post-event public health nurse and social services referrals, home referrals, and environmental services scene assessments.

Social Worker Consult Requirement

We strongly recommend a hospital social worker consult on all child drowning cases. Social workers contribute to providing information on the circumstances of the event, precipitating factors contributing to the incident, additional social determinants that relate to child and family injury risk factors, and future safety plans. Social workers can refer to public health nurses and social service emergency responders through child protective services. Social workers can recommend that public entities conduct a further site investigation to ensure compliance with state and local building codes.



Professional Training and Capacity Building

Train health professionals (clinicians and clinician-scientists) on childhood drowning epidemiology surveillance and data collection, prevention, and evidence-based policies.

Develop a methodology for incorporating current electronic and emergent approaches and technology to data recording and documentation.

Utilize Emerging Technologies

Current and emerging technologies for data capture include but are not limited to text and word scanning, speech-to-text transcription, photographs, and aerial views of drowning sites, with zip code and census tract for GIS mapping. As new electronic data collection methods emerge, these should be incorporated into our training and data collection tools.

Resources to Support Institutionalized Robust Surveillance System

Ensure adequate resources for initiation, management, analysis, and dissemination of child drowning data with policy recommendations for prevention and monitoring of trends.

The California Department of Public Health Injury and Violence Prevention Branch will begin implementation of SB 855 Newman, Ch. 817, Stat. 2022: Childhood Drowning Data Collection Pilot Program.⁶ The anticipated outcomes will include recommendations on the structure and operation of an ongoing system for collecting child drowning data. Recommendations may include record linkage, real-time data entry, and data reports that could both confirm current evidence-based policy recommendations and result in more advanced strategies.



Chapter 4.5 Surveillance Resources

Orange County – OCEMS Drowning Reporting Process

Previously, the Orange County Fire Authority (OCFA) was utilizing a specialized module within their incident reporting system (OCFIRS) called the OCFA Childhood Immersion System to catalog and report on all drownings and near-drownings within the agency's jurisdiction. This was completed in a separate electronic system from the electronic prehospital care report (ePCR) ImageTrend Elite.

However, in 2014 the Orange County Emergency Medical Services (OCEMS) agency built into the ePCR the set of custom questions that were previously captured through the OCFA Childhood Immersion System. For any incident with a provider impression of "Drowning (Fatal or Non-Fatal)", the Immersion Incident field was then required to be completed by the implementation of a validation rule. This had the additional benefit of expanding the range of data captured to include the other EMS agencies within the county and not just from within the jurisdiction of the OCFA.

OCEMS then runs a monthly raw data report from the ImageTrend software and it is then sent to the OCFA where the calls are reviewed and any call that clearly lacks symptoms of respiratory distress as a result of immersion or submersion is separated out and the verified drowning incidents are then logged into an internal database at the OCFA which acts as the repository of this data, and combines drowning reports from OCFA, OCEMS, and the Coroner's office. Other agencies within the county have access to the data upon request.

Compared to the prior reporting process, the current system has definite advantages. Tying the immersion incident questionnaire to the ePCR and requiring its completion through validation rules ensures that these data points are collected nearly instantaneously after the call is completed.

Also, as noted above, this collection process now operates county-wide and not just within the areas served by the OCFA.



This system also has some disadvantages in terms of capturing data from all drowning incidents. The OCEMS reports occasionally miss drowning incidents that occur in more unusual water sources such as bathtubs, ponds, and fountains.

Additionally, because DOA drowning incidents often do not involve an EMS response, this data must be combined with the coroner’s data to produce complete drowning statistics, as well as provide the resulting outcome of drowning incidents once patients are left at the hospital.

Immersion Incident

COMPLETE FOR IMMERSION VICTIMS OF ALL AGES

Immersion: Site:
 [v] [list icon]

Immersion: Estimated Time Victim Last Seen:
 [clock icon]

Immersion: Victim wearing a flotation device?:

Immersion: PTA, did anyone attempt to resuscitate the victim?:

Immersion: Barriers present:
 [v] [list icon]


Immersion: Language of the parents:
 [v] [list icon]

Immersion-Caretaker:
 [v] [list icon]



Immersion Incident

Immersion-Caretaker location:



Immersion: Pool/Spa location:

Single family residence	Homeowner recreation center
Apartment/condominium	Hotel/motel
Other	Unknown

Immersion: Has the victim taken swimming lessons in the last year?:

Yes	No
Unknown	

Immersion-Residence:

Victim's	Victim's relative
Friends/neighbor	Other
Unknown	Not applicable

Immersion Incident

Immersion: Multiple barriers-List all:

Immersion: Location victim last seen:

In bathtub, not in baby seat	In bathtub in baby seat
Indoors, not in bathtub	Outdoors, not in water
Outdoors, in water	

Immersion: Victim Access:




Immersion: Multiple access factors:

Immersion: Flotation device notes:

Immersion: Did the rescuer have formal CPR training?:

Yes	No
Unknown	

Race:

Riverside County Submersion Incident Report Form (SIRF)

The Riverside County Department of Public Health developed the Submersion Incident Report Form (SIRF) Program in 2004 with funding from First 5 Riverside. A task force was created to examine the issue of drowning and strategies for decreasing the drowning rate. The task force determined that the priority would be to create and implement a more functional drowning data collection program that would provide details on how children were gaining access to water.

With input from first response agencies and law enforcement and referencing the successful drowning incident surveillance program in Maricopa County, Arizona, a comprehensive data collection form was developed for the SIRF Program. The intention was for first responders, whether fire personnel, paramedic units, or law enforcement, to complete the form after responding to any drowning incident in Riverside County.

Beginning in June 2004, emergency first responders filled out a paper form and submitted it to Public Health for data entry and analysis. In 2017, the submersion data collection points were incorporated into the Electronic Patient Care Record (EPCR) system that is used by all Riverside County-based Fire Departments and EMS agencies. Within the EPCR, the SIRF form is automatically populated if drowning is selected. Once drowning is selected, the SIRF report will automatically open, and all questions must be answered before the first responder can complete and submit the Electronic Patient Care Record. In addition to the SIRF data collection points, Public Health has access to the narrative completed by the first responder to gain additional details of the incident. Law enforcement agencies and hospitals currently use the paper form to notify Public Health. It is not uncommon to receive two or three SIRF forms per incident.

Public Health receives an email generated by Image Trend once a submersion incident has been entered by the first responder. The Public Health Program Coordinator reviews all Submersion Incident Report Forms and follows up with appropriate action. For example, fatal cases may include reports from one or more EMS agencies, an Emergency Department, and Law Enforcement. The coordinator combines the forms and may contact an agency to clarify and obtain additional details about the incident. The Riverside County Child Death Review Team is notified so the incident can be discussed by a sub-committee focused on drowning incidents and then discussed at the next monthly Child Death Review Team meeting.





SUBMERSION INCIDENT REPORT FORM (SIRF)

To be completed on all drowning incidents occurring in Riverside County

Fax completed form to: (951) 358-7175, Injury Prevention Services or scan and Email to emalone@ruhealth.org Questions - call (951) 358-7171 ask for Erin Malone.

<p style="text-align: center;">BASIC INCIDENT INFORMATION</p> <p>Date of Incident: _____ Time of Incident: _____ Your Agency's Incident Number: _____ Reporting Agency: _____ Street name: _____ Incident City: _____ Zip code: _____ Type of Dwelling: <input type="checkbox"/> House <input type="checkbox"/> Apartment <input type="checkbox"/> Condo <input type="checkbox"/> Hotel/Motel <input type="checkbox"/> N/A <input type="checkbox"/> Other: _____</p>	<p style="text-align: center;">A: ADULT SUPERVISION</p> <p>Supervisor(s) at time of incident: <input type="checkbox"/> Unknown <input type="checkbox"/> NA = adult <input type="checkbox"/> Mother <input type="checkbox"/> Father <input type="checkbox"/> Sibling <input type="checkbox"/> Grandparent <input type="checkbox"/> Babysitter/Childcare Provider <input type="checkbox"/> Pool party in progress at time of submersion <input type="checkbox"/> Other (specify): _____ Supervisor activity immediately prior to incident: _____ <input type="checkbox"/> Unknown Alcohol and/or drug use evident? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p>
<p style="text-align: center;">VICTIM INFORMATION</p> <p>Age of Victim: _____ Sex: <input type="checkbox"/> M <input type="checkbox"/> F Victim's Race/Ethnicity: <input type="checkbox"/> Unknown <input type="checkbox"/> American Indian <input type="checkbox"/> Asian <input type="checkbox"/> PI <input type="checkbox"/> Black <input type="checkbox"/> Hispanic <input type="checkbox"/> White <input type="checkbox"/> Multi racial <input type="checkbox"/> Other _____ Victim Last Seen: <input type="checkbox"/> Unknown <input type="checkbox"/> Swimming <input type="checkbox"/> Playing Outside <input type="checkbox"/> Playing Inside <input type="checkbox"/> Sleeping <input type="checkbox"/> Other: _____ Est. length of time submersed: _____ <input type="checkbox"/> Unknown Type of Clothing Worn by Victim: <input type="checkbox"/> Unknown <input type="checkbox"/> Swim suit <input type="checkbox"/> Day clothing <input type="checkbox"/> Pajamas <input type="checkbox"/> None Alcohol and/or drug use evident? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p style="text-align: center;">B: BARRIER INFORMATION</p> <p>Water Barriers Present Property fence present: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk <input type="checkbox"/> N/A Separate fence around pool <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk <input type="checkbox"/> N/A Self-closing/Self-latching gate <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk <input type="checkbox"/> N/A Other barriers/alarms present: <input type="checkbox"/> Unknown/unable to access <input type="checkbox"/> Sliding Door Alarm Other Barrier _____ Access to Pool by Victim: <input type="checkbox"/> Unknown <input type="checkbox"/> Direct Access by Adult <input type="checkbox"/> Direct Access by Child/no barriers or supervision <input type="checkbox"/> Child brought in to water area by other person <input type="checkbox"/> Pet door Explain how victim got through barrier(s): _____ _____</p>
<p style="text-align: center;">WATER SOURCE INFORMATION</p> <p>Site of Incident: <input type="checkbox"/> Unknown <input type="checkbox"/> Victim Residence <input type="checkbox"/> Relative Residence <input type="checkbox"/> Neighbor Residence <input type="checkbox"/> Friend Residence <input type="checkbox"/> Sitters/Daycare Provider <input type="checkbox"/> Hotel/Motel <input type="checkbox"/> Public (community, county, city) <input type="checkbox"/> Unknown <input type="checkbox"/> Other: _____ Water Clarity: <input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Unknown <input type="checkbox"/> Muddy <input type="checkbox"/> Green <input type="checkbox"/> Unknown Water Depth: <input type="checkbox"/> Under 18" <input type="checkbox"/> 18" – 48" <input type="checkbox"/> Over 4' <input type="checkbox"/> Unknown Water Type: <input type="checkbox"/> Unknown <input type="checkbox"/> Pool – in ground <input type="checkbox"/> Spa/Hot Tub <input type="checkbox"/> Bathtub <input type="checkbox"/> Pool – above ground <input type="checkbox"/> Toilet <input type="checkbox"/> Bucket <input type="checkbox"/> Child wading pool <input type="checkbox"/> Lake or pond <input type="checkbox"/> Stream/river <input type="checkbox"/> Canal/irrigation ditch <input type="checkbox"/> Other: _____ Toys or objects in water? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/> Unknown If yes, describe: _____</p>	<p style="text-align: center;">C: CLASSES/EMERGENCY PREPARATION</p> <p>Was rescue equipment near water? <input type="checkbox"/> NA <input type="checkbox"/> Shepherd's hook <input type="checkbox"/> life ring <input type="checkbox"/> other: _____ <input type="checkbox"/> None <input type="checkbox"/> Unknown/not assessed Who initially performed CPR? <input type="checkbox"/> supervisor <input type="checkbox"/> bystander <input type="checkbox"/> 9-1-1/ EMS personnel <input type="checkbox"/> NA/CPR not performed <input type="checkbox"/> Unknown <input type="checkbox"/> other: _____ Did victim ever take swim lessons or water safety classes? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown</p>
<p>Completed by: _____ Email Address: _____ Contact Phone: _____</p>	<p>Victim Transported to: _____ <input type="checkbox"/> DOA on Scene Narrative: _____ _____ _____ CPS Referral made: <input type="checkbox"/> YES <input type="checkbox"/> NO Date: _____ Reason: _____ _____ Environmental Health referral <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA EH is notified for all green/dirty pools or when submersion occurs at community pool setting (apartment, condo, hotel, park...).</p>



If the incident occurred at a public or community site, Public Health initiates a referral to the Riverside County Department of Environmental Health. An investigator is dispatched to conduct an onsite investigation with a routine inspection of the community water source and provides a follow-up report.

Depending on the violation, the water source may be required to close until a re-inspection is conducted by an investigator. Examples of some of the findings include gate not properly self-closing; missing or fading signage stating address of facility and capacity; missing or broken rescue equipment; and loose fence posts.

Public Health staff also reach out to non-EMS agencies to improve reporting. For example, the Department of Public Social Services is contacted to inquire if there are any previous contacts or issues within the household. Although law enforcement does not have access to the EPCR to document submersion incidents, their perspective is important. Public Health will often receive photographs of the scene from law enforcement. Ongoing outreach is done to encourage law enforcement to complete the paper SIRF report. There are also a few incidents each year who “self-transport” to the hospital. To address this issue, hospitals are contacted each year to review reporting procedures in an effort to capture accurate data.

Public Health uses the SIRF data in several ways. The Epidemiology and Program Evaluation Branch analyzes data and produces briefs. An updated data brief is expected to be released summer 2023. Public Health Administration includes water submersion data as one of the key indicators in a monthly dashboard report that monitors public health and administrative issues in a timely manner. Public Health uses the data for program development, grant writing, and evaluation. They also use it to educate the public about water safety issues unique to the County.

SIRF data is also available for use by participating agencies. The SIRF data is reviewed by the CQI (Continuous Quality Improvement) staff within EMS/Fire agencies. Hospital staff also have access to the EPCR system and can use the data to inform on patient care and treatment.



Source: Drowning of 1–4-Year-Old Children in Swimming Pools and Spas Surveillance Handbook, June 2010¹⁵

Appendix 1.

Issues and Questions to Consider When Conducting Child Drowning Case Review

Data Sources

- Agencies that collected information at the scene
- Case notes, pictures, and diagrams of scene

Child/Victim

- Age, Gender, Race/Ethnicity
- Home Address
- Date, time and place of death
- Medical History
- Activity and location of child when last seen
- Alone or playing with other children
- Length of time missing
- Type of clothing worn by victim when found
- Use of flotation device, type, Coast Guard-approved?
- Specifics on how child gained access to pool/spa
- Previous risk behaviors (opening doors, etc.)
- Swim ability, history of swim lessons

Supervisor/Supervision Information

- Intensity and level of supervision and by whom
- Primary person/s responsible for supervision of child
- Location of supervisor at time of incident
- Supervisor impaired, distracted and if so, how
- Supervisor drinking/using drugs
- Relationship to child, frequency of supervising child
- Language of supervisor/s
- Estimated time since child last seen by supervisor
- If child out of sight, where thought child was
- Issues related to multiple or child supervisors
- Supervisor knowledge of CPR
- Supervisor swim ability



Incident Information

- Date, Time and Address
- Site (i.e., child's home, child care, community pool, etc.)
- Type of dwelling (i.e., single family, apt, condo)
- Rental or HUD housing
- Length of time owner/leasee lived at address
- If not at child's home, reason child at location
- # of adults/children at location when incident occurred
- Alcohol and/or drug use evident at time of event
- Unusual or special event or circumstances
- Antecedent activities relevant to incident

Water Source Information

- Type of pool /spa (in-ground, inflatable, attached)
- Water clarity, temperature
- If spa, water obscured by jet bubbles
- Drain entrapment
- Pool use day of incident, by whom
- How often did the child use this pool/spa?
- Toys or other objects in water
- Other toys or objects near pool
- Year pool was built/remodeled
- History of code violations

Barrier / Access Information

- Property line fence, type, height, condition
- Direct access from house /garage to pool/spa?
- If fence between the house/garage and pool/spa, type, height, condition, partial or isolation
- Gates leading to pool/spa, type (self-closing, self-latching, open out,), position (open, closed), working condition
- If pool cover, type, in use
- Door/window alarms, type, functional, in use
- Other barriers/measures, condition and use
- Room from which child exited house
- Explain how victim got through barrier(s)/accessed pool



Family / Social History

- Household composition for child
- Language/s spoken
- Parents' marital status
- If divorced or separated, extent of parent contact with child
- History of maltreatment, prior or open CAR
- Parent/supervisor substance abuse/criminal history

Emergency Response, Treatment and Outcomes

- Rescue equipment/phone near pool/spa
- Who found child and where
- Delay in pulling child from pool or initiating CPR
- Estimated time of submersion
- 911 called
- CPR by whom, know CPR
- Transport by whom
- Course of treatment, where, and outcome
- Child Abuse Referral to CPS for this incident
- Follow-up actions taken by public agency, parents or pool owners after event?

Chapter 5. Guidelines for Scene Investigators (Police & Coroner/ME)

(Source: Drowning of 1–4-Year-Old Children in Swimming Pools and Spas Surveillance Handbook. June 2010)¹⁵

The Quick Reference Guide is from our 2010 Handbook. These were the definitions and standards as of 2010. The 2017 California Pool Safety Law and California Building Codes should be referenced for updates definitions and standards.

Law Enforcement and Coroners/Medical Examiners conduct scene investigations that contain key information for CDRTs. The scene investigation reports can provide essential insights and details into the circumstances surrounding the drowning death of a child when documented properly. This information is useful for public health professionals and others interested in preventing childhood drowning.



Descriptive documentation, photographs, and sketches of the scene as well as information obtained from witness interviews can provide important insights into the circumstances and risk factors for child drowning. A detailed narrative description of the incident can provide a clear understanding of the sequences of events before, during, and after the incident and the circumstances involved.

Specifically, the areas that are of interest that would advance knowledge of factors that contribute to child drowning and could guide interventions and measures to prevent child drownings are:

Circumstances (leading up to and at the time of the drowning)	
<p>Incident information</p> <ul style="list-style-type: none"> ■ Type of dwelling or facility ■ Site of incident (i.e., single family home, community pool, apartment pool) if home, whose; rental or HUD ■ Number of people at scene, presence of other children ■ Occasion (i.e., birthday party, neighborhood gathering, BBQ, etc.) ■ Drug and alcohol use and by whom 	<p>Body of Water</p> <ul style="list-style-type: none"> ■ Type (i.e., in-ground pool, spa, etc.) ■ If pool/spa, when built ■ Condition of water (i.e., murky, green) ■ Objects/toys in water ■ Take photos
<p>Barriers or other protective devices to prevent children from accessing water</p> <ul style="list-style-type: none"> ■ Fences (both property line and those around pool) ■ Description of each in terms of type, height, general condition, whether or not a child can go through, over or under ■ For pool fence, does it completely surround pool ■ Gates (self-closing/self-latching, open or closed) 	<p>Child</p> <ul style="list-style-type: none"> ■ Specifics on how child gained access to water ■ Where was and what was child doing prior to the incident ■ How long was child missing ■ Swim ability, history of swim lessons ■ Prior risk behaviors ■ Clothing ■ Use of flotation device



<ul style="list-style-type: none"> ■ Door alarms, locks, pool cover, other measures ■ Type, general condition, functionality and use ■ Take photos of the above. 	
<p>Supervision</p> <ul style="list-style-type: none"> ■ Degree and level of supervision ■ Who was supervising, age and what were they doing ■ Supervisor swim and CPR ability ■ Drug and alcohol use - will they submit to ■ Preliminary Alcohol Screening (PAS) 	<p>CPR</p> <ul style="list-style-type: none"> ■ By whom, how long, and their ability. ■ Response times of police and fire. ■ Delay time in calling 911 from time child was observed

Documenting the presence or absence of relevant information is important. If there is no documentation related to a particular item, a determination on whether or not this is a problem or risk factor cannot be made. For example, if water clarity was not documented for all cases, we cannot make a determination if this is an issue in the drowning of young children.

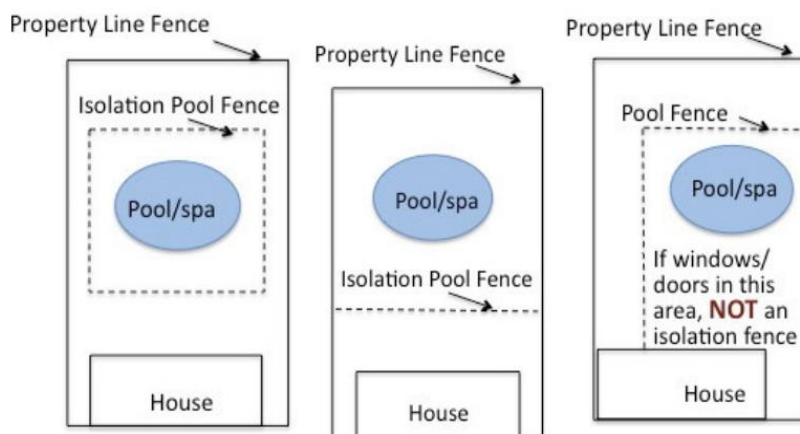
Two resources are available for observing and documenting drowning-related information: *Quick Reference Guide for Scene Investigators* (next page) and Appendix 1. *Issues and Questions to Consider When Conducting Review of Child Drowning Case*.



Quick Reference Guide for Scene Investigators

To facilitate incident comparison and data collection, please refer to this guide before completing the investigation report.

Property Line Fencing – In a home with a pool or spa, this type of fence is typically positioned along the property line in an effort to keep neighboring children and uninvited adults from accessing the pool/spa. Property line fencing is an important barrier, but it does *not* restrict access to the pool area from the home itself.



Isolation Fencing – This fencing is designed to restrict access from the house structure to the pool/spa area by completely separating the house from the pool/spa. Proper placement of Isolation Fencing allows access to the pool/spa **ONLY** through the gate(s) in that fence. There is no direct access from the house or garage to the pool through doors or windows.

Barrier Standards – Fences should be at least 4 feet high (CA code requires 60" for a new pool, but does allow for mesh fencing, which would probably be 48"), climb-resistant, and well-maintained. There should be **NO** openings in which a child can pass through or under the fence (4 inches or less between vertical members and/or at the base of the fence). Fences should have gates that are self-closing, self-latching, and open out from the pool/spa. All gates and alarms should be functional and in good working order.

(Note: You never want a self-locking gate on a residential pool, as the gate tends to be propped open during a pool party or activity, since not everyone has a key, and the self-locking gate may prevent quick rescue should it be necessary. Key-lockable is good, along with self-latching.)



Self-Closing / Self-Latching Gates – A properly installed gate will open outward from the pool/spa area. A self-closing gate will operate on hinges that allow the gate to completely close by itself. A self-latching gate means that the latch catches securely by itself. Latches should be child-resistant, with the release knob mounted at least 54” from grade.

Pool and Spa Safety Covers – Not all covers are designed for safety (some are for heating purposes only). A safety cover meets the American Society for Testing and Materials (ASTM) International voluntary standard F1346-9, which includes a requirement to hold a minimum of 485 pounds. They can be motor-driven (automatic) or manual.

Pool Safety Nets – These woven-rope-type structures prevent full access to the water. When installed, they secure to permanent connectors installed directly into the concrete decking of the pool area, hold a minimum of 485 pounds, and must have a maximum opening of 4” or less.

Door and Window Alarms – These are special alarms (battery or wired to home electrical system) on pool-access doors and windows that sound loudly throughout the house when a door or window is opened unexpectedly. They should have a temporary bypass switch located at least 54” from the ground, which allows an adult to pass through the door without activating the alarm. This switch should automatically reset after each use. An alarm connected to a home security system is NOT designed for drowning prevention.

Pool Alarms – Also known as water alarms, these either float in the water or are attached to the side of the pool, and sound when a child or other large object disturbs the water.

Floaties / Water Wings – Flotation devices such as inflatable arm bands, pool noodles, inflatable water rings, and rafts are NOT US Coast Guard-approved. These should not be used in place of US Coast Guard-approved life jackets.

California Pool Safety Law - California’s Swimming Pool Safety Act (Health and Safety Code Sections 115920- 115929) requires at least one approved safety barrier be in place for all pools and spas built after January 1, 1998, and for any pools being remodeled. (The 2017 Pool Safety Law requires two of the seven approved safety devices.)



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