

One Texan dies from drowning every day!



A report on fatal unintentional drownings, Texas, 2006-2020

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August 2022



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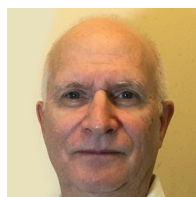
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Acknowledgements

We thank Elizabeth Boriack Nemec, MPH, CPST and Stewart Williams, BS, CPSTI for their assistance with this report.

A Message to the Community

Drowning is a public health crisis in Texas, across the U.S., and across the globe. As the only freestanding, comprehensive pediatric healthcare facility providing medical care to children in a 46-county Central Texas region and beyond, Dell Children's Medical Center treats many of the children who experience drowning. At Dell Children's and across all Ascension locations, we strive to provide the most expedient and up-to-date care, offering the best chances of survival to those who have experienced a drowning event. However, it is critical that we do all that we can within our community to prevent drowning from happening in the first place. This report provides critical information about fatal drownings that have occurred in Texas and offers guidelines for what all members of our community can do, at all points in the drowning timeline, to reduce drowning incidence and severity.

Christopher Born

Christopher Born, MBA, CPA
President
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A Letter to the Community

Drowning is fast, silent, and preventable. Drowning does not discriminate. Drowning happens to all ages, races, and genders. Drowning happens to people of every socioeconomic level, in all types of water, and even to people of all swimming abilities. Drowning is the single leading cause of unintentional injury death for children 1-4 years old and a leading cause for older children, teens, and adults. For every fatal pediatric drowning, there are an estimated eight times as many non-fatal drowning incidents. These drownings impact all Texans. Working together to prevent drowning, we can save the life of one Texan every day.

As the Executive Director of Colin's Hope, a Texas non-profit formed in 2008 after the tragic drowning of 4-year-old Colin Holst in a lifeguarded pool in Austin, I feel that understanding as much as possible about drownings in Texas is essential to our daily work. Colin's Hope exists with a single mission to educate parents, caregivers, and children to be safer around water so that we can prevent drownings. If we do not know what the drowning landscape is, then we are trying to solve a problem without vital pieces of information. We need accurate and timely data that show us who is drowning, where they are drowning, the circumstances surrounding each drowning incident, and trends that may be occurring across Texas and the United States. Then, we need to use this information to create programming and develop research so our prevention work can be as effective as possible in reducing the number of drowning events that occur in our state. We now see that there are racial disparities in drowning as well as differences across age and gender groups. This is such crucial information to know and be aware of because it can help us target programs and messages within our community.

Colin's Hope is a leader in the water safety field and promises to continue working tirelessly, year-round to raise the water safety awareness of all Texans. I am honored to have been a part of this collaboration and will use the data and information in this report here in Texas as well as in our work across the United States. We invite you to learn all you can from this report and apply it to your work and your lives. Together, we can prevent drowning.

We honor the Texas families who have lost a loved one to drowning and all those who have been impacted by a non-fatal drowning. We do this work for you and with the hope that no other Texas family is impacted by preventable drowning.

Alissa Magrum

Alissa Magrum
Executive Director
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Executive Summary

This report describes the magnitude and patterns of fatal unintentional drownings among Texans between 2006 and 2020. The intent of the report is to increase the awareness of drowning as a public health issue, use data to strengthen drowning prevention efforts, and encourage more drowning research in Texas. This report was written by members of the Central Texas Drowning Prevention Action Team and represents a collective effort by Colin's Hope and Dell Children's Trauma and Injury Research Center.



Key Findings: Fatal Unintentional Drownings, Texas, 2006-2020

- **5,401 Texans died from unintentional drowning during the 15-year time period.**
 - On average, one Texan lost their life to drowning every day.
 - **Compared to other states:**
 - Texas had the third highest number of total deaths due to unintentional drowning.
 - Texas had the 17th highest death rate, at 1.3 fatal drownings per 100,000 population.
 - **The unintentional drowning death rate recently increased.**
 - In 2020, Texas had a higher total number of fatal drownings and higher death rate due to drowning than all 14 prior years.
 - **Male Texans were at higher risk of drowning.**
 - The death rate for male Texans was three times as high as for female Texans.
 - **There were disparities in drowning risk based on race and ethnicity.**
 - Black Texans had a higher death rate compared to other races.
 - Racial disparities in drowning death rates were larger for children than adults.
 - Hispanic or Latino Texans had a lower death rate compared to Texans who are not Hispanic or Latino.
 - **Young children were most at risk of drowning.**
 - Texas children 1-4 years old had the highest death rate from drowning of all age groups.
 - Drowning was the leading cause of unintentional injury-related death for children 1-4 years old.
 - Drowning killed more children 1-4 years old than birth defects, cancer, homicide, or heart disease.
 - **Different types of water settings in Texas posed different levels of risk depending on age.**
 - Infants under 1 year old most often drowned while in bathtubs.
 - Children 1-4 and 5-14 years old most often drowned while in swimming pools.
 - Teenagers 15 years and older most often drowned while in natural waters.
 - Adults of all ages most often drowned while in natural waters.
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Recommendations

- Drowning prevention in Texas should be strengthened for all communities, all age groups, and all drowning settings.

- With Black Texans at greater risk than other races, Texas drowning prevention efforts should prioritize developing water competency and providing drowning prevention information and materials (e.g., life jackets) to this community.

- More research is needed to identify factors that contribute to racial disparities in drowning risk.

- With drowning as the leading cause of unintentional injury death for children 1-4 years old, young children should be a priority for drowning prevention.

- The higher drowning incidence for male Texans indicates a need to change perceptions of drowning risk and encourage more male involvement in water safety efforts.

- Drowning prevention efforts should be tailored toward age groups based on the location of highest drowning risk, with bathtubs a priority for infants, swimming pools a priority for toddlers and young children, and natural water a priority for teenagers and adults.

- Drowning prevention efforts should highlight that natural water poses the greatest risk of drowning overall, and that drownings happen while swimming, boating, and using other watercraft, such as paddlecraft (e.g., canoes, kayaks, and stand-up paddleboards).

- More research is needed in all aspects of drowning risk, prevention, and treatment; for instance, research should identify factors that contribute to drowning risk based on gender, age, race, and ethnicity so drowning prevention efforts can address the biggest barriers and most effectively lower drowning risk for all populations and in all settings.

- Continuing surveillance of fatal and non-fatal drownings in Texas is needed.

- Policy makers should work to effectively reduce the high burden of drowning in Texas, providing legislative and budgetary support to reduce drowning across the state.



Background

Worldwide, drowning is a public health problem, resulting in nearly 236,000 deaths in 2019 and ranking as the third leading cause of death due to unintentional injury.(1) Although drowning poses a greater risk in lower and middle income countries, drowning is a significant burden in the United States (U.S.), resulting in a yearly estimate of 3,960 fatal unintentional drowning deaths and 8,080 non-fatal drownings.(2) Drowning can happen at any age, but children 1-4 years old are most at risk. In the U.S., drowning is the leading cause of unintentional injury death for children 1-4 years old.(2)

Drownings are not always fatal, though. The Centers for Disease Control and Prevention (CDC) reports that for every one fatal drowning of a child under 15 years of age, there are eight more children who receive emergency department care for non-fatal drownings.(2) Non-fatal drownings can have devastating consequences, resulting in long-term neurological impairments.(3) Fatal and non-fatal drownings typically have long-term psychological impacts on families and survivors.(4) Additionally, the economic burden of drowning is high.(5), (6)

Drowning risk can vary widely between U.S. states due to the size of the state, the weather, and the availability of natural water sources, home pools, and public pools. Texas is the second most populous state in the U.S., with almost 30 million residents.(7) The weather in Texas averages from a low of 36° F in January to a high of 96° F in July and August, which allows for swimming and water sports most months of the year.(7) Because of the high outdoor temperatures, home pools are common, with one in 27,723 people having a home pool, making Texas the state with the sixth highest rate of home pools in the U.S.(8) Additionally, Texas is home to many sources of natural water. Texas has the sixth highest miles of coastline of any state.(9) Texas is also dotted with many lakes, ponds, and rivers and offers many opportunities for water-based recreation across the state. The large population of Texas could lead to a large total burden of drowning deaths. Additionally, the weather and availability of swimming pools and natural water in Texas may make the state more prone to a high drowning death rate.

The aim of this report is to provide a current understanding of the magnitude and patterns of unintentional drowning deaths among Texans over the 15-year period between 2006 and 2020. We believe the information in this report will increase awareness of drowning as a public health issue. With a better understanding of the scope of fatal unintentional drowning in Texas, we can strengthen drowning prevention efforts and encourage more drowning research.

Methods

This report uses mortality data from the CDC WONDER online database, which is a freely accessible website for querying public health data sets. We report the total number of deaths due to unintentional drowning and crude death rates (number of deaths per 100,000 population) for Texas residents from 2006-2020. For this report, unintentional drowning deaths are defined using the International Classification of Diseases, Tenth Revision codes V90 and V92 (drowning deaths related to watercraft) and W65-W74 (drowning deaths related to bathtub, swimming pool, natural water, and other or unspecified).

Data are presented by setting, gender, age group, race, and ethnicity. In addition, total number and frequency of drowning deaths, yearly average deaths, and death rates are presented for the drowning settings. To place drowning among other causes of death, the leading causes of death for Texas children, aged 1-4 years, for 2006-2020 are presented. To place death rates for Texas in context, calculations of the age-adjusted death rates (per 100,000 population) of all states are presented and ranked for the 15-year time period. We also compare drowning statistics for Texas to the U.S. as a whole.

CDC Wonder has rules to protect decedent confidentiality and standards for statistical reliability. Death counts based on fewer than 10 deaths are suppressed for confidentiality; death rates based on fewer than 20 deaths are suppressed for statistical unreliability. The number of decedents whose ages are not stated is suppressed. Because data suppression limited the data we could present for some years, we used a four-year period (2017-2020) to calculate the monthly average death counts. Additionally, death rates for fatal unintentional drownings by setting, by year are only presented for the three categories that had statistically reliable rates: natural water, swimming pools, and bathtubs. We compare death rates for those under and over the age of 18 years for White, Black or African-American (Black), Asian or Pacific Islander (Asian/PI) racial groups; death rates are not presented for American Indian or Alaska Native due to data suppression. Confidence intervals (95%) were calculated for death rates. Small confidence intervals suggest little variability around the rate, whereas large confidence intervals suggest less stability of the rate. Rates with confidence intervals that do not overlap are reported as significantly different from each other.

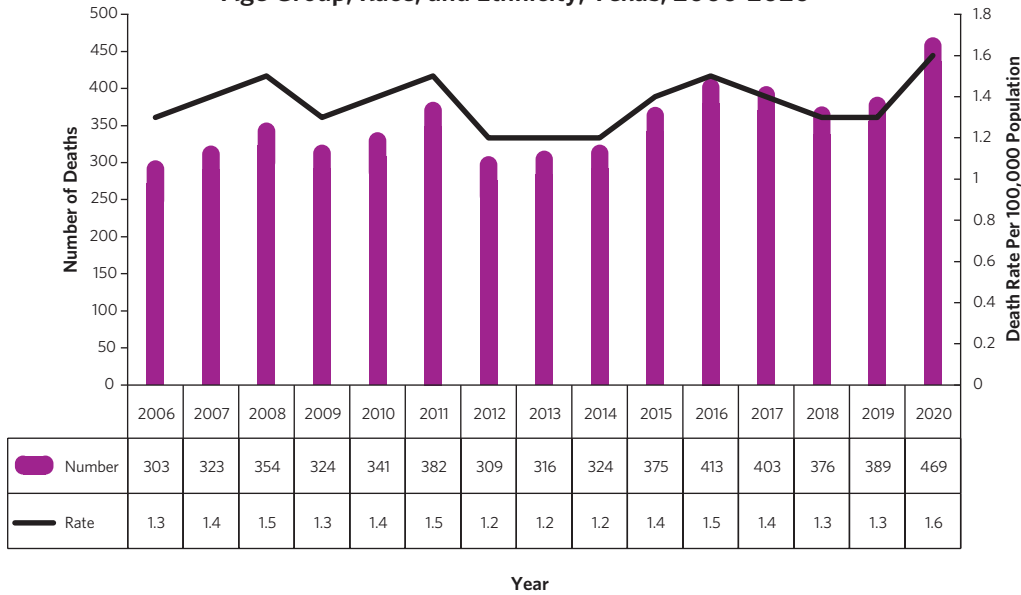
Results

Fatal Unintentional Drownings by Year

Over the 15-year period from 2006-2020, 5,401 Texans died from unintentional drowning, with an average of 360 deaths per year. On average, almost one Texan died from drowning every day.

The total number of Texans who died from unintentional drowning ranged from a low of 303 deaths in 2006 to a high of 469 in 2020 (Figure 1). The average yearly drowning death rate for the 15-year period was 1.4 (deaths per 100,000 population). The drowning death rate ranged from a low of 1.2 from 2012-2014 to a high of 1.6 in 2020.

Figure 1. Fatal Unintentional Drowning* Number and Rate by Gender, Age Group, Race, and Ethnicity, Texas, 2006-2020

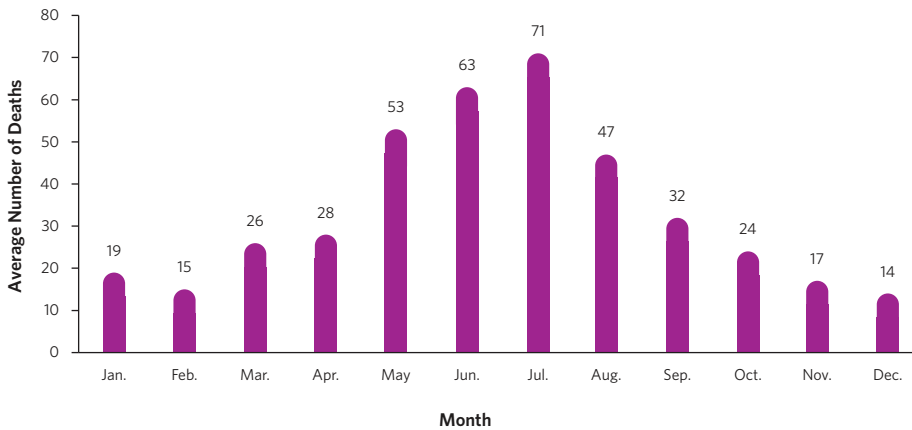


*International Classification of Diseases (ICD)-10 cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

Fatal Unintentional Drownings by Month

Fatal drownings varied by month, with the highest number of drowning deaths in the summer. Figure 2 shows the four-year average number of fatal drownings by month from 2017-2020. The monthly average number of fatal drownings ranged from a low of 14 in December to a high of 71 in July.

Figure 2. Average Number of Fatal Unintentional Drownings* by Month, Texas, 2017-2020



*International Classification of Diseases (ICD)-10 cause of death codes V90, V92, W65-74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

Demographics of Fatal Unintentional Drownings

From 2006-2020, the death rate for male Texans was significantly higher than for female Texans (Table 1). Male Texans had a death rate more than three times as high as female Texans, with 77.1% male and 22.9% female.

Compared with other races, the highest total number of drownings were among White Texans, with 79.4% of the total fatal drownings (Table 1). Black Texans had a significantly higher drowning death rate than White or Asian/PI Texans, at 1.7 compared to 1.2-1.3.

Texans who were not Hispanic or Latino had the highest total number of drownings, with 73% compared to Hispanic or Latino Texans, with 26.5% (Table 1). Texans who were not Hispanic or Latino had a significantly higher death rate, at 1.6 compared to 0.9 for Hispanic or Latino Texans.

Fatal drownings occurred in every age group. Between 2006 and 2020, over 1,200 children under the age of 15 years fatally drowned (Table 1). Children 1-4 years old had a significantly higher drowning death rate than other age groups, at 3.4 compared to rates of 0.6-1.5. Children 5-14 years old had a significantly lower drowning death rate than other age groups, at 0.6 compared to rates of 1.1-3.4.

Table 1. Fatal Unintentional Drowning* Number and Rate by Gender, Age Group, Race, and Ethnicity, Texas, 2006-2020

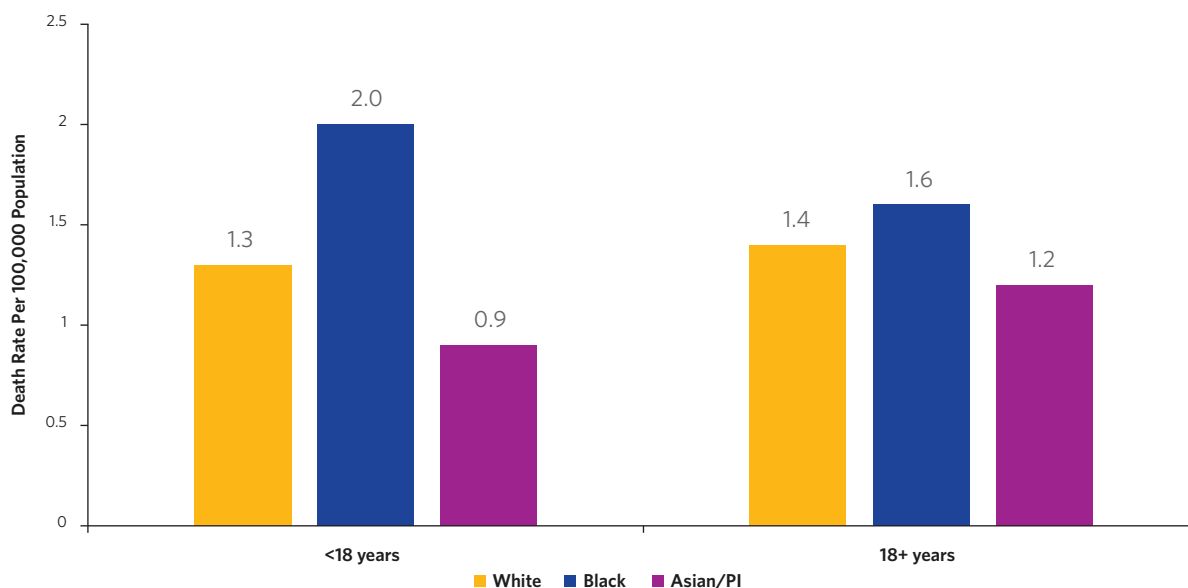
Variable	Number	Rate	95% CI
Gender			
Male	4,165	2.1	2.0-2.2
Female	1,236	0.6	0.6-0.7
Age Group (Years)			
< 1	67	1.1	0.9-1.5
1-4	798	3.4	3.2-3.6
5-14	370	0.6	0.6-0.7
15-24	838	1.5	1.4-1.6
25-34	752	1.3	1.2-1.4
35-44	660	1.2	1.1-1.3
45-54	655	1.3	1.2-1.4
55-64	586	1.4	1.3-1.5
65-74	368	1.4	1.3-1.5
75-84	230	1.7	1.5-1.9
85+	75	1.4	1.1-1.8
Race			
White	4,289	1.3	1.3-1.4
Black or African American	876	1.7	1.6-1.8
Asian or Pacific Islander	225	1.2	1.0-1.3
American Indian or Alaska Native	11	Unreliable [^]	Unreliable [^]
Ethnicity			
Not Hispanic or Latino	3,945	1.6	1.6-1.7
Hispanic or Latino	1,433	0.9	0.9-1.0

*Death rates are per 100,000 population. *International Classification of Disease (ICD)-10 underlying cause of death codes V90, V92, W65-W74. ^Death rates based on fewer than 20 deaths suppressed for unreliability. CI = confidence interval. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database. Demographic data that is unknown is not presented.*

Fatal Unintentional Drownings by Age Group and Race

Black Texans had significantly higher death rates than White or Asian/PI Texans (Table 1). Racial disparities in drowning death rates were larger for children than adults (Figure 3). Non-overlapping confidence intervals for Black children (1.8-2.3) compared with White children (1.2- 1.3) and Asian/PI children (0.7-1.2) as well as for Black adults (1.5-1.7) compared with White adults (1.3-1.4) and Asian/PI adults (1.1-1.4) show that drowning death rates are higher for Black Texans within both the 0-17-year-old age group and within the 18 and older age group.

Figure 3. Rate of Fatal Unintentional Drowning* by Age Group, by Race, Texas, 2006-2020



*International Classification of Diseases (ICD)-10 cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

Settings of Fatal Unintentional Drownings

Natural water, swimming pools, and bathtubs are potential unintentional drowning settings, as are less common “other” sources, like wells, feeding troughs, fountains, toilets, and pails of water. In addition, there is a risk of drowning related to boating (watercraft-related). Over the 15-year period, almost half of all drownings occurred in a natural setting, with 42.2% of fatal drownings occurring in natural water (e.g., lakes, ponds, or rivers) and an additional 6.5% of fatal drownings classified as watercraft-related (Table 2).

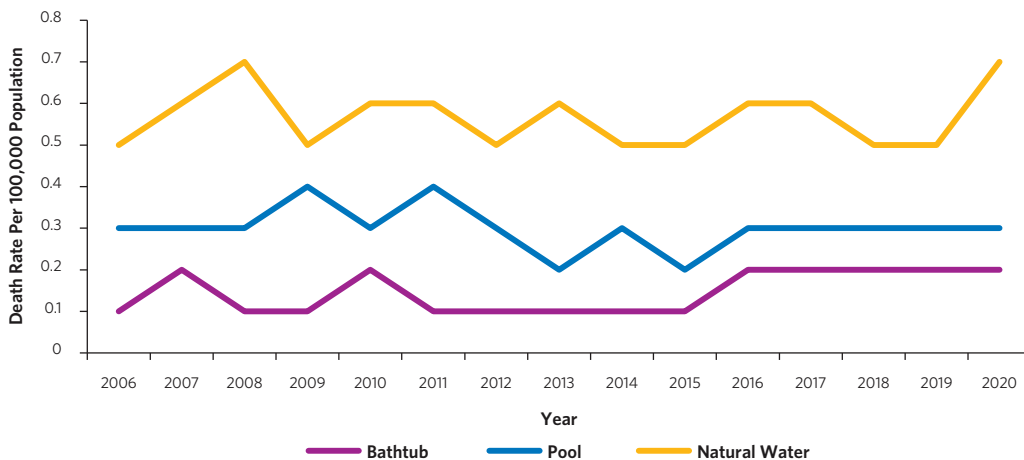
Table 2. Number, Percent Total, and Yearly Average of Fatal Unintentional Drownings* by Setting, Texas, 2006-2020

Setting	Underlying Cause of Death Code	Number	Yearly Average	Percent Total
Bathtub	W65-W66	583	39	10.8%
Swimming Pool	W67-W68	1,157	77	21.4%
Natural Water	W69-W70	2,278	152	42.2%
Other or Unspecified	W73-W74	1,032	69	19.1%
Watercraft-Related	V90, V92	351	23	6.5%

*International Classification of Disease (ICD)-10 underlying cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

Death rates in each setting have varied over the years (Figure 4). Between 2016 and 2020, death rates for bathtub or swimming pool drownings have remained constant. However, there was a recent increase in the drowning death rate occurring in natural waters from 2019 to 2020, with 2020 matching the prior high rate of 0.7 from 2008.

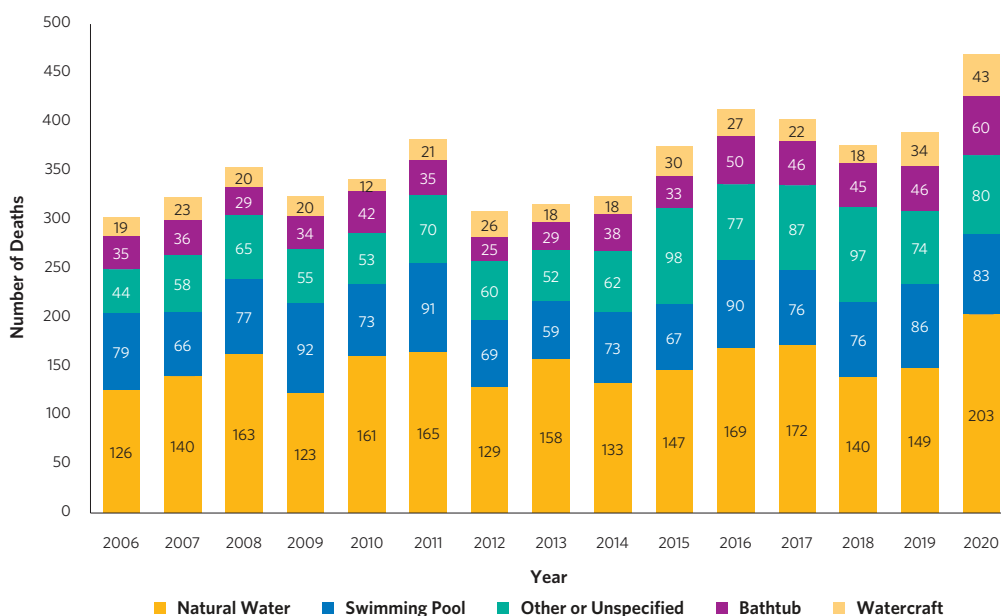
Figure 4. Rate of Fatal Unintentional Drowning* by Setting, by Year, Texas, 2006-2020



*International Classification of Diseases (ICD)-10 cause of death codes W65-W70. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

The number of drowning deaths for each setting varied by year (Figure 5). Drowning deaths in natural water ranged from a low of 123 in 2009 to a high of 203 in 2020. Drowning deaths in swimming pools ranged from a low of 59 in 2013 to a high of 92 in 2009. Drowning deaths in bathtubs ranged from a low of 25 in 2012 to a high of 60 in 2020. Watercraft-related drowning deaths ranged from a low of 12 in 2010 to a high of 43 in 2020. Drowning deaths that occurred in other or unspecified settings ranged from a low of 44 in 2006 to a high of 98 in 2015. Three settings (natural water, bathtub, and watercraft-related) had the highest number of fatal unintentional drowning deaths in 2020 compared with prior years.

Figure 5. Number of Fatal Unintentional Drownings* by Setting, by Year, Texas, 2006-2020



*International Classification of Diseases (ICD)-10 cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

The setting that was the greatest drowning hazard varied by age group (Table 3). Children under 1 year of age typically drowned while in bathtubs. Children aged 1-4 and 5-14 years commonly drowned while in a swimming pool. Those aged 15 years and older typically drowned while in natural waters.

Table 3. Percent of Total Fatal Unintentional Drownings* within Each Age Group Occurring in Location of Greatest Hazard, Texas, 2006-2020

Age Group (Years)	Location	Percent Total
<1	Bathtub	64.2%
1-4	Swimming Pool	51.5%
5-14	Swimming Pool	39.5%
15-24	Natural Water	60.8%
25-34	Natural Water	55.8%
35-44	Natural Water	51.8%
45-54	Natural Water	44.1%
55+	Natural Water	35.8%

*International Classification of Disease (ICD)-10 underlying cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

Leading Cause of Death for 1-4 Year Olds

From 2006-2020, there were 6,638 deaths (of any cause) among Texas children aged 1-4 years. The leading cause of death was from unintentional injuries, followed by birth defects, cancer, assaults (homicide), and heart disease (Table 4). Of the 2,329 unintentional injury deaths in Texas, the leading mechanism was drowning (798 deaths), followed by motor vehicle traffic (650 deaths). Drowning killed more Texan children aged 1-4 years than birth defects, cancer, homicide, or heart disease.

Table 4. Leading Causes of Death, Children Aged 1-4 Years, Texas, 2006-2020

Cause of Death	Number of Deaths
Unintentional Injuries	2,329
Birth Defects	687
Cancer	571
Assaults (Homicide)	551
Heart Disease	248

Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database



Fatal Drownings by State

From 2006-2020, of all U.S. states, Texas had the third highest total number of unintentional drowning fatalities (5,401), behind California (6,433) and Florida (6,348) (Appendix A). Texas ranked 17th among the states in terms of age-adjusted death rate, alongside five other states with the same rate.

Comparing Texas Statistics to the U.S. as a Whole

Appendix B shows fatal unintentional drowning statistics for the United States as a whole in comparison with Texas. Over the 15-year period, 59,581 Americans died from unintentional drowning, of which 9.1% were Texans. Texas appears to have similar drowning death rates compared to the United States from 2006-2020 (1.4 versus 1.3) and for 2020 (1.6 versus 1.4). Drowning death rates were significantly higher in Texas compared to the U.S. for two races: White (1.3 versus 1.2) and Black (1.7 versus 1.4). Drowning death rates were higher for Asian/PI in Texas compared to the U.S. (1.3 versus 1.0), but overlapping confidence intervals indicate they may not be significantly different. Due to a statistically unreliable death rate, it is unknown how American Indian or Alaska Native rates in Texas compare to the U.S. as a whole. In the U.S., drowning death rates for American Indians or Alaska Natives were significantly higher than for all other races. Although the drowning death rate for Hispanic or Latino were the same in Texas as for the U.S. as a whole, rates for Texans who are not Hispanic or Latino Americans were higher than those who are not Hispanic or Latino across the U.S. as a whole. Texas had a significantly higher drowning death rate for children 1-4 years of age compared to the U.S. as a whole (3.4 versus 2.7). For all other age groups, drowning death rates were similar between Texas and the U.S. as a whole. Somewhat similar percentages of total fatal unintentional drownings occurred in each water setting in Texas compared to the U.S. as a whole.

Discussion

We initiated this investigation to gain a current understanding of the magnitude and patterns of unintentional drowning deaths among Texans over a 15-year period. Drownings are a public health problem in the state resulting, on average, in the deaths of 360 Texans annually - about one Texan lost to drowning every day. Between 2006 and 2020, over 5,000 Texans have drowned. In Texas, for children 1-4 years old, drowning was the leading cause of unintentional injury death and caused more deaths than birth defects, cancer, homicide, or heart disease.

Drownings happened year-round in Texas and peaked in the summer. Drowning settings posed different risks depending on age, with infants drowning most often in bathtubs, children 1 - 14 years old drowning most often in swimming pools, and teenagers and adults 15 years and older drowning most often in natural water. For all age groups combined, natural water posed the greatest risk of all settings. Overall, the greatest drowning risk was for Texans who fell into one of these groups: male, 1-4 years old, or Black.

Drowning death rates for male Texans, which are about three times higher than drowning death rates for female Texans, parallel differences that are found in the U.S. as a whole (Appendix B). Research on children's and teenagers' drowning death rates in the U.S. between 2007 and 2016 shows that gender differences exist by age and setting. In swimming pools, 0-14 year old boys drown two times more often and 15-19 year old boys drown four times more often than girls, respectively; in natural water, 0-14 year old boys drown three times more often and 15-19 year old boys drown 15 times more often than girls.⁽¹⁰⁾ Together, our data and U.S. data suggest a need to target drowning prevention efforts toward males, particularly teenage boys, with a focus on water safety around natural water, like rivers, lakes, and oceans. Additionally, research should focus on different behaviors and perceptions of risk that might drive the higher drowning death rate for males.

Similar to data for the U.S., as a whole, drowning death rates for children 1-4 years old are higher than for all other age groups. Confidence intervals show that the death rate for 1- to 4-year olds in Texas (3.4) is significantly higher than within the U.S. (2.7) (Appendix B). A recent robust technical report from the American Academy of Pediatrics provides information and research regarding drowning, including information that home pools are a common place for toddlers and young children to drown due to the chance of the pool being accessed without supervision.⁽¹¹⁾ Potentially, the prevalence of home pools in Texas increases the risk for the 1- to 4-year-old age group. With drownings for 1- to 4-year olds causing more deaths than birth defects, this age group needs extra prevention outreach and research. Drowning death rates for children 5-14 years old are the lowest of any age group and the same between Texas and the U.S. as a whole (0.6). This does not mean that these children should be exempted in prevention efforts. Additionally, there may be subsets of the population, such as racial groups, for whom drowning risk remains high for 5- to 14-year olds. Future research should take a closer look at interactions between age and race.

Black Texans have significantly higher drowning death rates than White or Asian/PI Texans. Potentially, the disparities in drowning risk may be related to differences in swimming competency. Research highlights that swimming ability for children 4-17 years old is predicted by race, with lower swimming ability among Black children.⁽¹²⁾ Lower swimming ability persists into adulthood as well, with research showing twice as many Black college students reporting that they cannot swim (56.2%) compared with White college students (26.8%).⁽¹³⁾ Additionally, research has shown that fear of drowning was higher among Black than White participants.⁽¹⁴⁾ Extensive research is needed to identify factors that lead to differences in swimming abilities and drowning risk and to understand what has led racial disparities in drowning risk to increase in the last few years.⁽¹⁵⁾ Outreach and research should

address structural drivers of racial differences in drowning rates, swimming ability, access to swimming and water safety instruction, and fears related to swimming or drowning.

Our findings highlight how programming and research addressing disparities in drowning risk should not combine under-represented racial or ethnic groups together. This report shows that drowning risk is higher for Black Texans compared with White or Asian/PI Texans, but lower for Hispanic or Latino Texans than not Hispanic or Latino Texans. Additionally, due to a low American Indian or Alaska Native population in Texas, we were unable to report the drowning death rate in Texas for American Indians or Alaska Natives. Appendix B shows that the drowning death rate for American Indians or Alaska Natives in the U.S. as a whole is higher than for all other races. It is not clear whether the rate might be somewhat consistent across many states, including Texas, or whether a few states amplify the U.S. death rate for this group. Appendix A shows that the drowning death rate in Alaska is three times higher than in Texas and at least twice as high as any other state besides Hawaii. Potentially, a high American Indian or Alaska Native population in Alaska accounts for the high overall death rate for the U.S. More data is needed to better understand drowning risk for American Indians or Alaska Natives in Texas.

Though yearly drowning death rates fluctuated during the 15-year period, we observed the highest drowning death rate and number of deaths in 2020 compared to all previous years. Potentially the increase in drownings was related to unintended consequences of the COVID-19 pandemic. Research shows that families in the U.S. made a number of changes to swimming routines during the pandemic, such as swimming in different locations and changing how often they swam. Many caregivers delayed swimming lessons for toddlers and swam with them less often, potentially making toddlers less familiar with being in or around water and less conscious of water safety rules, which could increase risk when they are around bodies of water.(16)

Potential changes in swimming routines and drowning during the pandemic highlight the need for improvements in how we quantify drowning risk. Research suggests that fewer people swam, but that the people who did swim swam more often.(16) Those who swam less reduced their drowning risk during that time, but those who swam more increased their drowning risk. These changes could be assessed if drowning risk was estimated based on exposure. Research has estimated that drowning morbidity and mortality is four times higher than traffic fatalities when estimated by population-based exposure, but is 200 times higher when adjusted for person-time exposure.(17) Future research should explore drowning risk using estimates of exposure, taking into consideration that risk varies by demographics such as age, race, and gender and interactively by location and age.



Exposure-based risk estimates might be able to highlight that, although overall watercraft-related drowning death rates are low, when risk is assessed based on time spent in a watercraft-related activity, drowning risk may rank higher than expected. During 2020, there was an increase in recreational boating in Texas and across the nation.(18) It is likely that higher watercraft exposure was associated with the increase in watercraft-related fatal drownings that we observed in 2020. Efforts are underway to strengthen boating-related injury surveillance in the U.S.(19) Drownings determined to be watercraft-related can include a wide range of vessels, ranging from ferry boats to row boats, including motorboat passengers and people pulled on tubes or riding wakeboards, and including individuals riding jet skis or using paddlecraft, such as canoes, kayaks, and stand-up paddleboards. Research and intervention efforts should acknowledge the wide range of vessels and situations that are considered watercraft-related.

In this report, we only focused on drowning deaths among Texas residents, regardless where the drowning occurred. We do not know how many drowning deaths of non-Texas residents occurred in Texas. Additionally, our definition of unintentional drowning was broad, including watercraft-related drownings; other researchers may restrict their definition to include only bathtub, swimming pool, natural water, and other or unspecified drownings.

For this report, we only summarized drownings that were fatal; we did not include or analyze data on non-fatal drownings. The CDC estimates that for every one fatal drowning by a child under the age of 15 years, there are eight children who receive emergency department care for non-fatal drowning.(2) There were 1,235 Texas children under 15 years old who fatally drowned between 2006-2020; thus, we estimate that nearly 10,000 more children received emergency department care for non-fatal drownings during this 15-year period. Additionally, although fatal to non-fatal ratios are harder to estimate for teenagers and adults, thousands of Texans likely received emergency department care for a non-fatal drowning incident between 2006-2020. For patients who fully recover, drowning incidents can have long-lasting psychological ramifications.(4) Many patients do not fully recover, however, resulting in long-term neurological complications.(3) Continuing surveillance efforts for fatal and non-fatal drownings in Texas are needed to learn more about the magnitude, circumstances, and morbidity associated with non-fatal drowning cases.

Drowning prevention efforts in Texas are making an impact. Many local and state governmental agencies work to prevent drowning in Texas. For instance, the Texas Department of State Health Services collects and reports on data on fatal and non-fatal drownings. These are reportable conditions in Texas, meaning they must be reported by physicians, hospitals, medical examiners, and justices of the peace.(20), (21) The Texas Department of Parks and Wildlife collects data on boating-related





injuries (including drowning) and promotes drowning prevention.(22) The Texas Department of Family and Protective Services obtains information on child fatal drowning and provides water safety tips for parents.(23) Additionally, at the state level, the Governor's EMS and Trauma Advisory Council's Injury Prevention Committee and the Texas State Child Death Review Team have written and approved policy statements on child drowning and water safety.(24), (25)

A number of non-profit organizations, like Colin's Hope, YMCA, Safe Kids, and Live Like Cati work to increase awareness of drowning across the state. Texans are also involved in the development of the U.S. National Water Safety Plan.(26) In 2020, Dell Children's Medical Center in Austin, Texas launched a Drowning Prevention and Water Safety Program to develop community interventions and conduct scientific research to understand and reduce drowning risk. Organizations like the Central Texas Drowning Prevention Action Team have brought together stakeholders from across the community to work together to promote water safety.

Drowning prevention efforts in Texas are having a positive impact on policy. Several drowning prevention and water safety bills were filed during the recent (87th) Texas regular legislative session. Two bills were approved and signed into law: 1) the Je'Sani Smith Act, related to the use of lifeguards and informational signs to improve safety on public beaches, and 2) the Judah Brown Drowning Prevention Act, which states that a property owners' association may not prohibit or restrict a property owner from installing a swimming pool enclosure that conforms to applicable state or local safety requirements.(27), (29)

Researchers from around the world continue to publish the results of their drowning prevention work.(30) For instance, in 2021 there were 174 drowning-related articles, published in over 100 journals, which focused on 37 countries.(31) Texans are contributing to drowning prevention research. For instance, our research at Dell Children's Medical Center has shown that people are not very knowledgeable about drowning risk and life-saving information (e.g., how to identify if someone is drowning). A survey of caregivers of toddlers showed that fewer than half knew that it was true that *in the U.S., drowning is the leading cause of death due to injury for toddlers or that it was false that if a child is drowning, you usually hear them splashing or calling for help.*(32) A lack of knowledge about water safety and drowning could mean that people are not adequately protecting themselves and those they care for from the risk of drowning when they are around water. Our research also shows that lower water safety knowledge by caregivers is predictive of less attentive swimming pool supervision behavior of toddlers.(32) These findings highlight how important it is to ensure that information about drowning risk and water safety is made more widely available.

Moving Forward

Drowning is preventable. Yet, in 2020, unintentional fatal drownings in Texas were the highest they had been in 15 years. We need to redouble prevention efforts. As a community, we can work to follow, and encourage all community members to follow, the layers of protection to prevent drowning (Table 5). Below are actions that community stakeholders can take at different timepoints in the drowning timeline (Figure 6).(33)

The community needs to PREPARE to reduce drownings before they happen.

	<ul style="list-style-type: none">• Educate the community about the risks of drowning, making sure we are reaching communities that are most at-risk of drowning.• Educate parents at earlier timepoints, (e.g., start water safety training during prenatal preparation and include thorough information about bath safety for infants).
Community Outreach	<ul style="list-style-type: none">• Ensure that all children have access to affordable, convenient swim lessons.• Include open water training in swim lessons for all ages.• Ensure that adults with little or no swimming capability also have access to swim lessons, that adult swim lesson curriculum is specific to this community, and that there are efforts to reduce barriers to access (e.g., women whose customs prevent them from swimming with men present).
Research	<ul style="list-style-type: none">• Assess what types of messaging and programming are most effective at educating the community, changing perceptions about drowning risk, and changing behaviors to reduce drowning risk.• Identify factors that increase drowning risk for the community as a whole and for particular settings and populations.
Policy	<ul style="list-style-type: none">• Develop policies and regulations that reduce drowning risk when around water or due to unauthorized access to water (e.g., isolation fencing, lifejacket requirements for watercraft).

We need more layers of protection in place to PREVENT drowning when in or around bodies of water.

Community Outreach	<ul style="list-style-type: none">• Educate caregivers on drowning prevention.
Research	<ul style="list-style-type: none">• Assess behavioral factors that can reduce submersion incidence when in/around bodies of water, such as supervision of children by caregivers or a Water Watcher, flotation device use, and gathering towels and clothes before placing an infant in a bath.• Assess the effectiveness of water safety barriers and technology that could prevent children from accessing pools and alert pool owners to pool access or submersions during planned and unplanned swim times.• Assess drowning risks particular to bodies of water in Texas and develop recommendations for reducing drowning risk around specific locations or water settings.• Continue to improve monitoring and reporting of fatal and non-fatal drowning incidents in Texas.
Policy	<ul style="list-style-type: none">• Provide budgetary support to reduce drowning (e.g., creating signage about drowning risks, supervision expectations, and CPR instructions).• Create legislation and regulations that encourage barriers, like fencing, and other protective technology, like alarms and drowning detection systems.

When someone is drowning, we need to REACT with prompt and effective action.

Community Outreach	<ul style="list-style-type: none">• Offer affordable and accessible CPR and water safety classes to community members, targeting parents, pool owners, and boat owners.• Emphasize the need for rescue breaths in CPR drowning response.
Research	<ul style="list-style-type: none">• Identify factors during rescue and response that improve outcomes, such as reducing submersion time.
Policy	<ul style="list-style-type: none">• Ensure that lifeguards and emergency personnel have the training and tools they need to rescue a drowning person safely and expediently and to provide the most effective initial treatment.• Create legislation and incentives that encourage training for pool and boat owners.

Following a drowning incident, we need to MITIGATE injury severity through prompt, informed actions by emergency personnel and clinical teams.

Community Outreach	<ul style="list-style-type: none">• Provide support for families impacted by a fatal or non-fatal drowning incident.
Research	<ul style="list-style-type: none">• Identify factors during initial and continued monitoring and treatment that improve mental and physical health outcomes.
Policy	<ul style="list-style-type: none">• Ensure that emergency personnel and clinical staff have the training and tools they need to offer the most effective monitoring and treatment following a submersion incident.

Figure 6. Drowning Timeline: Systematic Model of the Drowning Process

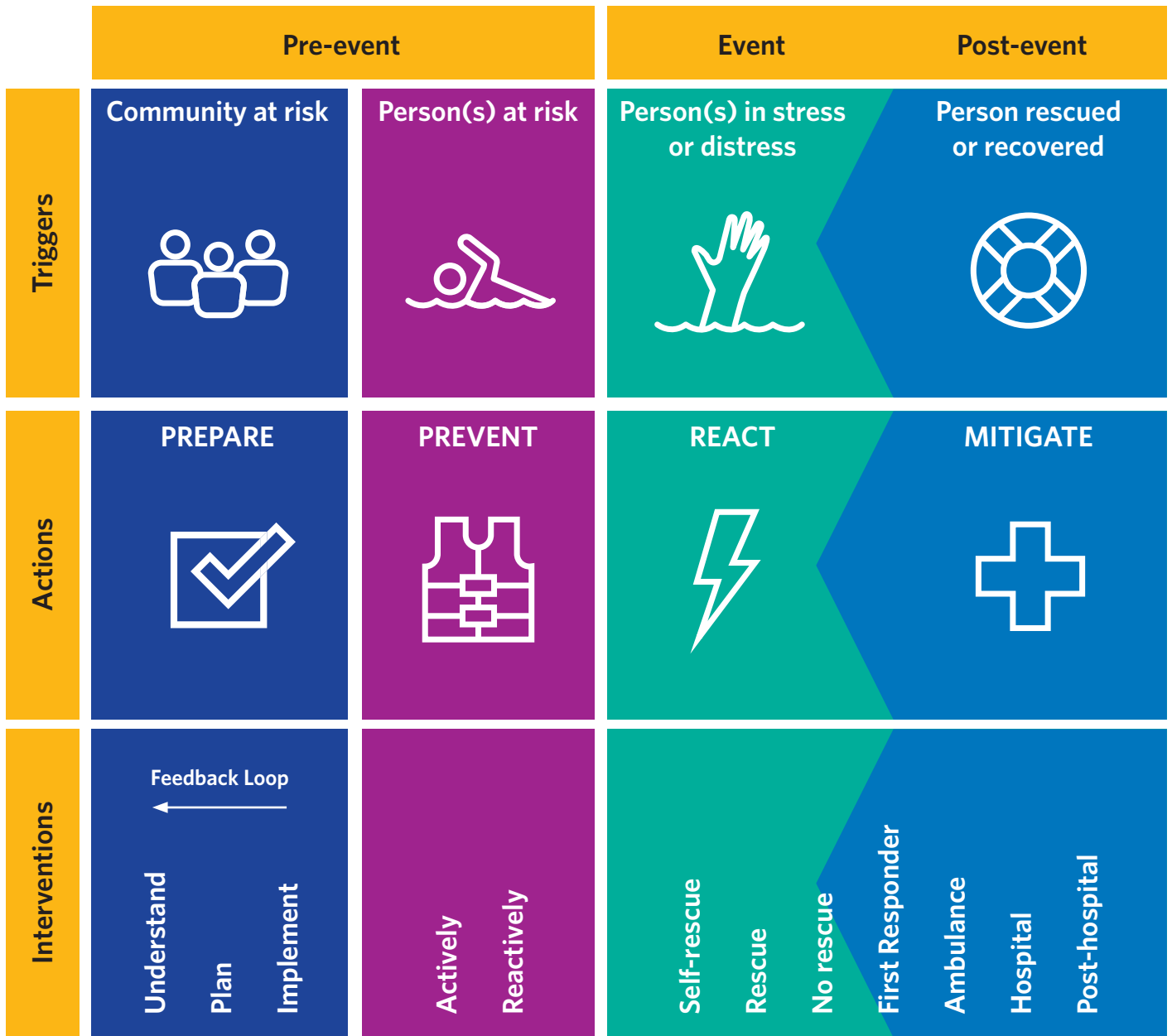


Figure design adapted from Szpilman D, et al. Drowning timeline: a new systematic model of the drowning process, Am J Emerg Med. 2016 Nov; 34(11): 2224-2226. Original design by Sociedad Espanola de Medicina de Urgencias e Emergencias.

Table 5. Suggestions For Actions Individuals Can Take to Add Layers of Protection to Prevent Drowning

Layers of Protection to Prevent Drowning			
Supervision to Prevent Drowning	Supervision during Non-Water Activities	Never leave children unattended near water (pools, tubs, lakes, rivers, canals, or oceans)	
		Be aware of other drowning hazards for very young children (buckets, ice chests, kiddie pools, washing machines, toilets)	
		Be aware of potential dangers in all environments (e.g., other homes, on vacation, at public pools)	
	Supervision during Planned Water Activities	Never leave children unattended in or near water	
		Keep infants and toddlers, and weak and non-swimmers, within arm's reach	
		Designate an undistracted adult "Water Watcher" in 15-minute intervals to maintain constant watch over all children in or near water	
		Do not use flotation devices as a substitute for supervision	
		Make sure you have towels, clothes, and everything you need before placing an infant in a bath	
			During transition points, like arriving at a pool, eating and bathroom breaks, and when preparing to leave, continue close supervision, especially if flotation devices are removed
	Skills to Prevent Drowning in Water	Water Competency Skills	If you are going to be in or around water, learn water competency and water safety skills
If you are going to be responsible for children in or around water, learn water competency and water safety skills			
Learn water competency skills that can apply to various aquatic environments, such as cold water and riptides			
Do not consider children to be "drown proof" because they've had swimming lessons; continue providing attentive supervision even as water competency improves			
Life Jackets as a Layer of Protection in Water	Life Jackets	When boating, paddling, and participating in water sports, ensure all adults and children wear U.S. Coast Guard approved life jackets or personal flotation devices (PFDs)	
		Use life jackets and PFDs as supplemental layer of protection when weak or non-swimmers are in or near water	
Addressing Emergencies to Prevent Drowning Related Injuries and Death	Resources and Skills	Learn CPR with rescue breaths and refresh skills annually	
		Take water safety and rescue courses	

Adapted from National Drowning Prevention Alliance (www.ndpa.org). Colin's Hope (www.colinshope.org) (34)

Table 6. Suggestions for Actions Pool Owners Can Take to Add Layers of Protection to Prevent Drowning

Additional Layers of Protection to Prevent Drowning in Home Pools		
Supervision to Prevent Drowning	Supervision during Non-Water Activities	Never leave children unattended in or near the pool area If a child goes missing, check pools, bathrooms, and other water sources first
	Supervision during Planned Water Activities	Take small children out of the pool area if you have to run inside, even for a brief time
Physical Layers to Prevent Access to Pool or Spa Area	Property Line Perimeter Fencing	Install fencing around your property as a first line of defense for people outside your home
	Isolation Fencing	Install fencing that completely separates pool or spa area from house, other areas, and outside visitors
		Install self-closing, self-latching, and lockable gates with latches and locks out of the reach of children
		Use fencing with vertical bars no more than 4 inches apart
		Use fencing that is 60 inches in height or taller
	Monitor fencing regularly and immediately repair fencing, gates, and latches; fill in gaps under fencing; and move climbable objects away from fencing	
Pool and Spa Covers	Use only ASTM International approved covers; keep all children and pets off of safety covers	
Door and Window Locks	Use child-proof locks on doors and windows that open to the pool area	
Technology Monitoring Access to Pools or Submersion	Door and Window Alarms	Use alarms on doors and windows that open to the pool area
	Gate Alarms	Install alarms on gates that access the pool area
	Water Surface Alarms	Use alarms that detect motion on the water's surface
	Drowning Detection Technology	Adopt drowning detection technology, like wearable submersion alerts
Addressing Emergencies to Prevent Drowning-Related Injuries and Death	Resources and Skills	Keep rescue equipment nearby and a phone poolside for emergency use
		Post important information in pool area, such as CPR steps, first aid information, and home address
		Learn CPR with rescue breaths and refresh skills annually
		Take water safety and rescue courses

Adapted from National Drowning Prevention Alliance (www.ndpa.org). Colin's Hope (www.colinshope.org). (34)

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Suggested Citation

Johnson MB, Lawson KA, Magrum A, Zane, D. One Texan dies from drowning every day! A report on fatal unintentional drownings, Texas, 2006-2020. Central Texas Drowning Prevention Action Team, Dell Children's Trauma and Injury Research Center, and Colin's Hope, Austin, Texas. 2022 August. Retrieved from: https://www.dellchildrens.net/wp-content/uploads/sites/60/2022/08/texas_drowning_report.pdf

Appendix A. Fatal Unintentional Drowning* Number and Age Adjusted Rate by State, 2006-2020

State	Number	Age Adjusted Rate	State	Number	Age Adjusted Rate
Alaska	499	4.6	Vermont	123	1.3
Hawaii	648	3.0	Colorado	983	1.2
Louisiana	1,553	2.3	Indiana	1,130	1.2
Florida	6,348	2.1	North Carolina	1,764	1.2
Montana	306	2.0	California	6,433	1.1
Arkansas	825	1.9	Iowa	495	1.1
Mississippi	867	1.9	Kansas	497	1.1
Wyoming	159	1.9	Michigan	1,697	1.1
Oklahoma	1,050	1.8	New Hampshire	228	1.1
Oregon	1,059	1.8	Utah	490	1.1
Alabama	1,253	1.7	Wisconsin	953	1.1
Idaho	428	1.7	Minnesota	854	1.0
Maine	335	1.6	Rhode Island	150	1.0
South Carolina	1,188	1.6	Virginia	1,307	1.0
New Mexico	454	1.5	Illinois	1,772	0.9
Washington	1,625	1.5	Maryland	831	0.9
Texas	5,401	1.4	Nebraska	243	0.9
Arizona	1,449	1.4	Ohio	1,621	0.9
Georgia	2,044	1.4	Connecticut	469	0.8
Kentucky	882	1.4	Delaware	107	0.8
Tennessee	1,333	1.4	Pennsylvania	1,528	0.8
West Virginia	393	1.4	Massachusetts	780	0.7
Missouri	1,121	1.3	New Jersey	937	0.7
Nevada	565	1.3	New York	2,055	0.7
North Dakota	136	1.3	District of Columbia	52	0.6
South Dakota	161	1.3	Total	59,581	1.3

Note: The top five states with the highest total drowning fatalities are highlighted. Death rates are per 100,000 population. *International Classification of Disease (ICD)-10 underlying cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database.

Appendix B. Comparison of Fatal Unintentional Drowning* Statistics, Texas and United States

Time Period	Fatal Drowning Statistics	TX	CI [^]	U.S.	CI [^]
2006-2020	Total drownings deaths	5,401	n/a	59,581	n/a
	Drowning death rate	1.4	1.3-1.4	1.3	1.2-1.3
	Drowning death rate range	1.2-1.6	n/a	1.1-1.4	n/a
	Year with highest drowning death rate	2020	n/a	2020	n/a
2020	Drowning death rate	1.6	1.4-1.7	1.4	1.3-1.4

Unintentional Drowning Death Rate (95% CI), 2006-2020

Demographic	Demographic Characteristics	TX	CI [^]	U.S.	CI [^]
Gender	Male	2.1	2.1-2.2	2.0	1.9-2.0
	Female	0.6	0.6-0.6	0.5	0.5-0.5
Race	White	1.3	1.3-1.4	1.2	1.2-1.2
	Black or African American	1.7	1.6-1.8	1.4	1.4-1.4
	Asian or Pacific Islander	1.3	1.1-1.5	1.0	1.0-1.1
	American Indian or Alaska Native	<i>Unreliable</i>	n/a	1.7	1.6-1.9
Ethnicity	Hispanic or Latino	0.9	0.9-1.0	0.9	0.9-1.0
	Not Hispanic or Latino	1.6	1.6-1.7	1.3	1.3-1.3
Age Group (years)	< 1	1.1	0.9-1.5	1.0	0.9-1.1
	1-4	3.4	3.2-3.6	2.7	2.6-2.7
	5-14	0.6	0.6-0.7	0.6	0.6-0.6
	15-24	1.5	1.4-1.6	1.3	1.3-1.4
	25-34	1.3	1.2-1.4	1.2	1.1-1.2
	35-44	1.2	1.1-1.3	1.1	1.1-1.1
	45-54	1.3	1.2-1.4	1.3	1.2-1.3
	55-64	1.4	1.3-1.5	1.3	1.3-1.3
	65-74	1.4	1.3-1.5	1.4	1.3-1.4
	75-84	1.7	1.5-1.9	1.7	1.6-1.7
	85+	1.4	1.1-1.8	1.6	1.6-1.7

Percentage of Total Fatal Unintentional Drownings by Setting, 2006-2020

Setting	Bathtub	10.8%	n/a	11.9%	n/a
	Swimming pool	21.4%	n/a	17.8%	n/a
	Natural water	42.2%	n/a	44.8%	n/a
	Other or unspecified	19.1%	n/a	16.9%	n/a
	Watercraft-related	6.5%	n/a	8.6%	n/a

Death rates are 100,000 per population. All death rates are age-adjusted with the exception of the age groups. *International Classification of Disease (ICD)-10 underlying cause of death codes V90, V92, W65-W74. Source: CDC, National Center for Health Statistics. Underlying Cause of Death 1999-2020 on CDC WONDER online database. CI[^]=confidence interval



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