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Special Report from the CDC

Increased unintentional drowning deaths in 2020 by age, race/ethnicity, sex, and location, United States [☆]

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ABSTRACT

Introduction: During the COVID-19 pandemic, one study in Australia showed an increase in drowning deaths in certain settings, while a study in China showed a decrease in drowning deaths. The impact of the COVID-19 pandemic on drowning deaths in the United States is unknown. **Objective:** To report on unintentional drowning deaths among U.S. persons aged ≤ 29 years by demographic characteristics and compare 2020 fatal drowning rates with rates from 2010 to 2019. **Methods:** Data from CDC WONDER were analyzed to calculate unintentional drowning death rates among persons aged ≤ 29 years by age group, sex, race/ethnicity, and location of drowning. These rates were compared to drowning death rates for the previous 10 years (2010–2019). **Results:** In 2020, 1.26 per 100,000 persons aged ≤ 29 years died from unintentional drowning, a 16.79% increase from 2019. Drowning death rates decreased 1.81% per year on average (95% CI: -3.02% , -0.59%) from 2010 to 2019. The largest increases in unintentional drowning deaths from 2019 to 2020 occurred among young adults aged 20 to 24 years (44.12%), Black or African American persons (23.73%), and males (19.55%). The location with the largest increase in drowning was natural water (26.44%). **Conclusion:** Drowning death rates among persons aged ≤ 29 years significantly increased from 2019 to 2020. Further research is needed to understand the impacts of the COVID-19 pandemic on drowning and identify how drowning prevention strategies can be adapted and strengthened. **Practical applications:** Drowning remains a leading cause of injury death among persons aged ≤ 29 years. However, drowning is preventable. Interventions such as learning basic swimming and water safety skills, and consistent use of lifejackets on boats and among weaker swimmers in natural water, have the potential to reduce drowning deaths. Developing strategies that ensure equitable access to these interventions may prevent future drowning.

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1. Introduction

Every year in the United States there are around 4,000 unintentional drowning deaths and another 8,000 nonfatal drownings that require treatment in an emergency department (CDC WISQARS). Drowning is one of the top three leading causes of unintentional injury death among persons aged ≤ 29 years (CDC WISQARS). More children aged 1–4 years die from drowning than from any other

cause, except birth defects (CDC WISQARS). Among individuals aged ≤ 29 years, American Indian or Alaska Native persons and Black or African American persons have the highest drowning rates (Clemens, Moreland, & Lee, 2021). Despite a steady decrease in drowning deaths among persons aged ≤ 29 years overall in the past two decades, racial and ethnic disparities in drowning deaths persist (Clemens et al., 2021). The most frequent locations where drowning occurs differ by age group (Clemens et al., 2021). Infants under the age of 1 year most often drown in bathtubs, children aged 1–4 years in swimming pools, and persons aged 15 years and older in natural water (Clemens et al., 2021; Denny et al., 2021).

The COVID-19 pandemic and the associated public health response had a sudden and dramatic impact on the behaviors and lifestyles of people in the United States (Chen et al., 2021; Giuntella, Hyde, Saccardo, & Sadoff, 2021) that may have impacted

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fatal and nonfatal injury rates. Several efforts have been made to assess the impacts of COVID-19 on general injury trends globally, with countries reporting both increases and decreases in injuries. For example, studies found significant increases in trauma patient admissions from May to June of 2020 in Italy and from March 2020 to February 2021 in the United States (Giudici et al., 2021; Moore et al., 2022) and significant increases in unintentional injury deaths from March to August 2020 in the United States (Faust et al., 2021). However, other studies found the number of injuries seen in some trauma centers significantly decreased while local COVID-19 stay-at-home orders were in place in the United States and England (Sherman et al., 2021; Sephton et al., 2021) and all-cause injury mortality significantly declined during the COVID-19 pandemic in Guangdong, China (Zheng et al., 2021).

Studies investigating the impact of the COVID-19 public health response on drowning mortality are limited. One study conducted in Guangdong, China found drowning deaths had decreased by 35% during the COVID-19 pandemic (January–June 2020) compared to the same timeframe in the prior year (Zheng et al., 2021). Another study examined unintentional coastal drowning fatalities in Australia and found the risk of drowning was 1.75 times higher during the COVID-19 restriction period (March – June 2020) compared to the previous 15 years on average (Lawes, Strasiotto, Daw, & Peden, 2021). Specifically, drowning while boating or using personal watercraft had the largest increase (88%; Lawes et al., 2021). Increases in drowning during rock fishing (60%) and unpowered watercraft activities (33%) were also reported. However, drowning related to swimming/wading (–50%) and snorkeling/diving (–67%) significantly decreased during the COVID-19 restriction period (Lawes et al., 2021).

Determining rates of drowning deaths during the COVID-19 pandemic may inform future public health strategies to prevent drowning, specifically during infrastructure disruption, and improve access to interventions for persons at the highest risk. The objective of this study is to describe drowning death rates among persons aged ≤ 29 years in 2020 and to compare these rates to those in the previous decade (2010–2019) by demographic characteristics and drowning locations.

2. Methods

Mortality data from the National Vital Statistics System (NVSS) were accessed through the Centers for Disease Control and Prevention's Wide-ranging Online Data for Epidemiologic Research (CDC WONDER) and analyzed to describe unintentional drowning deaths among persons aged ≤ 29 years from 2010 to 2020 in the United States. Through a collaboration with the National Center for Health Statistics and state and local jurisdictions, NVSS includes records of all deaths in the United States. Crude drowning death rates per 100,000 population and 95% confidence intervals from 2010 to 2020 were calculated by demographic characteristics and drowning locations. Rates were analyzed overall and by 5-year age groups (<1, 1–4, 5–9, 10–14, 15–19, 20–24, 25–29), sex (female, male), race/ethnicity (Non-Hispanic American Indian or Alaska Native [AI/AN], Non-Hispanic Asian or Pacific Islander [A/PI], Non-Hispanic Black or African American [Black], Non-Hispanic White [White], and Hispanic or Latino all races [Hispanic]), and location of drowning (bathtub, pool, natural water, watercraft, other/unspecified). Where data on ethnicity was not stated, deaths were included in the total count but were not included in the race/ethnicity counts. *International Classification of Diseases*, Tenth Revision (ICD-10) codes (W65–W74, V90, V92) were used to identify drowning-related deaths and to describe the location of drowning deaths (bathtub: W65, W66; pool W67, W68; natural water: W69, W70; other/unspecified: W73, W74;

watercraft: V90, V92). Location of drowning deaths were further analyzed by sex, age group, and race and ethnicity.

The annual percent change (APC), corresponding 95% confidence intervals (CI), and significant changes in trends in crude drowning rates from 2010 to 2019 were analyzed using JoinPoint software (version 4.9.0.1). Trends were analyzed overall among persons aged ≤ 29 years and by age group, sex, race/ethnicity, and drowning location. The percent change from 2019 to 2020 and corresponding 95% CIs were calculated and compared to the APC from 2010 to 2019 overall and by demographic characteristics and location of drowning to describe deviations from the previously identified trends (Ingram et al., 2018).

3. Results

In 2020, 1,589 persons aged ≤ 29 years died from unintentional drowning (Table 1). From 2010 to 2019 unintentional drowning death rates decreased by 1.81% per year (95% CI: –3.02%, –0.59%) (Fig. 1). However, from 2019 to 2020, the rate of unintentional drowning deaths increased by 16.79% (95% CI: 8.35%, 25.24%) among persons aged ≤ 29 years. Rates of unintentional drowning were 3.48 times higher among males compared to females in 2020. Rates increased by 19.55% (95% CI: 9.73%, 29.37%) among males from 2019 to 2020 and decreased 2.38% per year (95% CI: –3.53%, –1.22%) from 2010 to 2019.

Unintentional drowning death rates were highest among children aged 1–4 years (2.73 per 100,000 population). Rates did not significantly change from 2010 to 2019 (APC –0.03%; 95% CI: –1.56%, 1.06%) or from 2019 to 2020 (APC 12.88%; 95% CI: –2.72%, 28.48%) for this age group (Fig. 2). However, rates increased by 44.12% (95% CI: 19.76%, 68.48%) from 2019 to 2020 among persons aged 20 to 24 years and by 28.55% (95% CI: 7.61%, 49.49%) among persons aged 25 to 29 years. From 2010 to 2019, unintentional drowning rates decreased by 3.79% per year (95% CI: –5.69%, –1.84%) among persons aged 20 to 24 years and by 2.12% per year (95% CI: –3.83%, –0.38%) among persons aged 25 to 29 years.

In 2020, for individuals aged ≤ 29 years, Black persons had unintentional drowning rates 1.82 times higher than White persons, while AI/AN persons had rates 1.77 times higher than White persons. From 2010 to 2019 the rate of unintentional drowning among Black persons aged ≤ 29 years did not significantly change (APC –1.10%; 95% CI: –2.74%, 0.57%) (Fig. 3). However, from 2019 to 2020 the rate increased by 23.73% (95% CI: 5.35%, 42.10%). Rates of unintentional drowning decreased by 2.29% per year (95% CI: –3.68%, –0.88%) among White persons aged ≤ 29 years from 2010 to 2019 and increased by 15.67% (95% CI: 3.48%, 27.87%) from 2019 to 2020.

The most common location for unintentional drowning deaths among persons aged ≤ 29 years in 2020 was natural water (47.95%) followed by swimming pools (24.17%). The location varied by age group. The age group with the highest drowning rate in bathtubs was infants aged < 1 year (0.67 per 100,000), in swimming pools was children aged 1–4 years (1.62 per 100,000), and in natural water was persons aged ≥ 15 years (0.86 per 100,000 persons aged 15–19 years; 0.90 per 100,000 persons aged 20–24 years; 0.83 per 100,000 persons aged 25–29 years). From 2010 to 2019 the rate of unintentional drowning among persons aged ≤ 29 years in natural water decreased by 2.72% per year (95% CI: –3.70%, –1.72%) and from 2019 to 2020 increased by 26.44% (95% CI: 12.96%, 39.93%) (Fig. 4). Drowning deaths in locations other than natural water among persons aged ≤ 29 years did not significantly change from 2010 to 2019 or from 2019 to 2020 except for other/unspecified location of drowning deaths which decreased 4.53% per year (95% CI: –7.65, –1.30) from 2010 to

Table 1
Unintentional drowning deaths and location of drowning by sex, age, and race/ethnicity among persons aged ≤29 years, National Vital Statistics System, United States 2020.

Location Characteristic	Total		Bathhtub		Natural Water		Pool		Watercraft		Other/Unspecified	
	Deaths	Rate ^a (95% CI)	Deaths	Rate ^a (95% CI)	Deaths	Rate ^a (95% CI)	Deaths	Rate ^a (95% CI)	Deaths	Rate ^a (95% CI)	Deaths	Rate ^a (95% CI)
Total	1589	1.26 (1.20, 1.32)	135	0.11 (0.09, 0.13)	762	0.60 (0.56, 0.65)	384	0.30 (0.27, 0.34)	97	0.08 (0.06, 0.09)	211	0.17 (0.14, 0.19)
Sex												
Female	343	0.56 (0.50, 0.62)	78	0.13 (0.10, 0.16)	99	0.16 (0.13, 0.20)	110	0.18 (0.15, 0.21)	20	0.03 (0.02, 0.05)	36	0.06 (0.04, 0.08)
Male	1246	1.93 (1.83, 2.04)	57	0.09 (0.07, 0.11)	663	1.03 (0.95, 1.11)	274	0.43 (0.38, 0.48)	77	0.12 (0.09, 0.15)	175	0.27 (0.23, 0.31)
Age Group (years)												
<1 year	34	0.91 (0.63, 1.27)	25	0.67 (0.43, 0.99)	-	-	-	-	-	-	-	-
1–4 years	425	2.73 (2.47, 2.99)	34	0.22 (0.15, 0.31)	88	0.57 (0.45, 0.70)	252	1.62 (1.42, 1.82)	-	-	49	0.31 (0.23, 0.42)
5–9 years	117	0.58 (0.47, 0.68)	-	-	50	0.25 (0.18, 0.33)	45	0.22 (0.16, 0.30)	-	-	13	-
10–14 years	91	0.44 (0.35, 0.54)	-	-	55	0.27 (0.20, 0.34)	13	-	-	-	-	-
15–19 years	265	1.26 (1.11, 1.42)	-	-	180	0.86 (0.73, 0.98)	23	0.11 (0.07, 0.16)	16	-	37	0.18 (0.12, 0.24)
20–24 years	328	1.52 (1.35, 1.68)	27	0.13 (0.08, 0.18)	195	0.90 (0.78, 1.03)	22	0.10 (0.06, 0.15)	31	0.14 (0.10, 0.20)	53	0.25 (0.18, 0.32)
25–29 years	329	1.42 (1.26, 1.57)	27	0.12 (0.08, 0.17)	193	0.83 (0.71, 0.95)	27	0.12 (0.08, 0.17)	37	0.16 (0.11, 0.20)	45	0.19 (0.14, 0.26)
Race/Ethnicity^b												
AI/AN	24	1.97 (1.26, 2.92)	-	-	13	-	-	-	-	-	-	-
A/PI	90	1.10 (0.89, 1.35)	-	-	50	0.61 (0.45, 0.81)	19	-	-	-	15	-
Black/African American	389	2.02 (1.82, 2.22)	30	0.16 (0.11, 0.22)	213	1.11 (0.96, 1.25)	79	0.41 (0.32, 0.51)	22	0.11 (0.07, 0.17)	45	0.23 (0.17, 0.31)
Hispanic	344	1.13 (1.01, 1.25)	25	0.08 (0.05, 0.12)	165	0.54 (0.46, 0.62)	79	0.26 (0.20, 0.32)	20	0.07 (0.04, 0.10)	55	0.18 (0.14, 0.23)
White	741	1.11 (1.03, 1.19)	76	0.11 (0.09, 0.14)	320	0.48 (0.43, 0.53)	204	0.30 (0.26, 0.35)	49	0.07 (0.05, 0.10)	92	0.14 (0.11, 0.17)

Abbreviations: AI/AN (American Indian/Alaska Native), A/PI (Asian/Pacific Islander), CI (confidence interval).

^a Deaths per 100,000 population.

^b Persons identified as Hispanic could be any race, persons identified as AI/AN, A/PI, Black, and White were all non-Hispanic; where ethnicity was not stated, persons were excluded from the race/ethnicity counts.

-Death counts of <10 are suppressed for confidentiality and rates based off of <20 deaths are suppressed because they are considered unreliable.

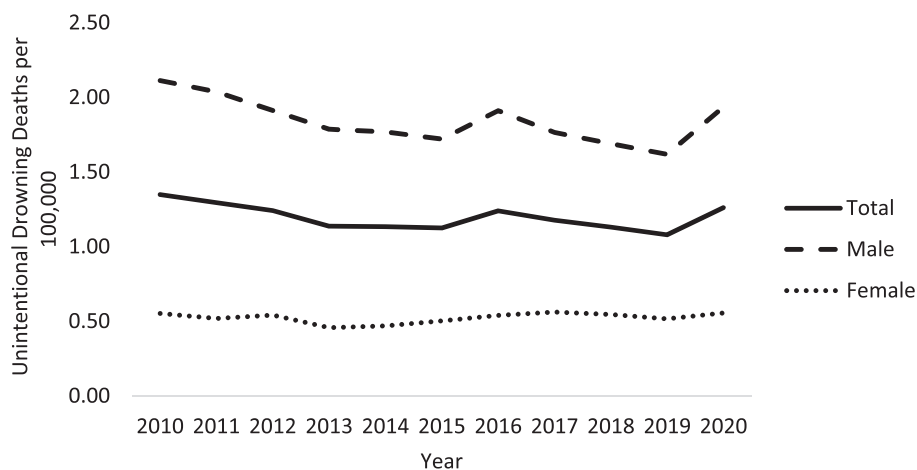


Fig. 1. Rates of unintentional drowning deaths per 100,000 persons ≤29 years overall and by sex, National Vital Statistics System, United States 2010–2020.

2019 and did not significantly change from 2019 to 2020 (APC 24.09%; 95% CI: -0.89, 49.07).

4. Discussion

Drowning deaths among persons aged ≤29 years in the United States increased by almost 17% in 2020. The largest increases were

among young adults aged 20 to 29 years, Black or African American persons, males, and in natural water settings. During the initial months of the COVID-19 pandemic (spring 2020), drowning prevention organizations in the United States were concerned that stay-at-home orders would contribute to increased drowning deaths among young children who were spending more time around the home with distracted supervision ([Stop Drowning](#)

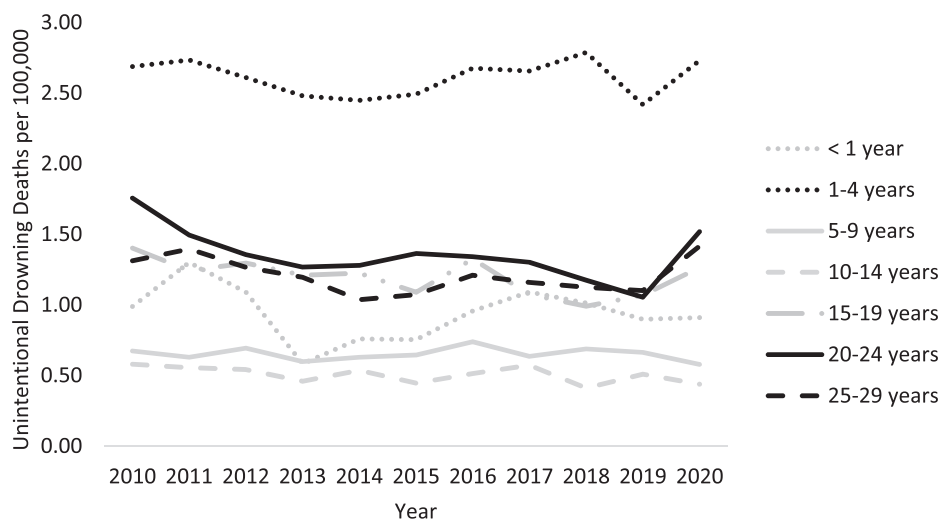
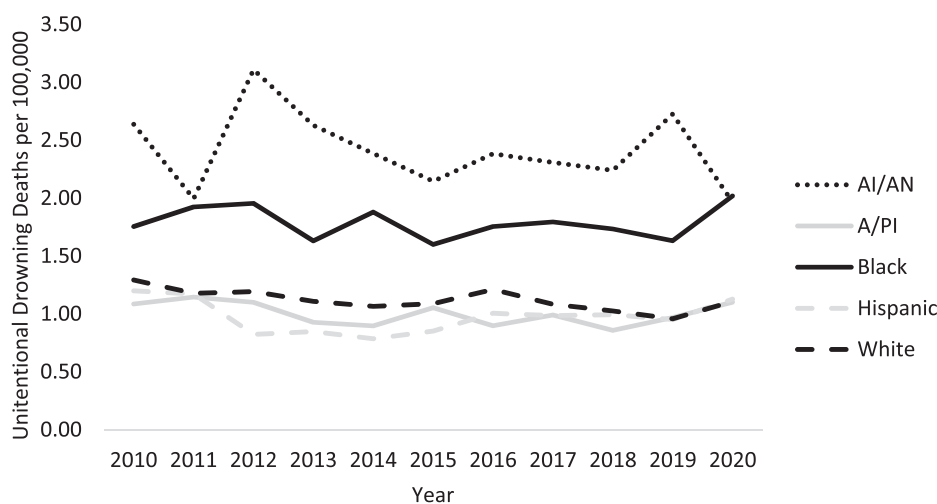


Fig. 2. Rates of unintentional drowning deaths per 100,000 persons ≤29 years by age group, National Vital Statistics System, United States 2010–2020.



Abbreviations: AI/AN (American Indian/Alaska Native), A/PI (Asian/Pacific Islander)
 Persons identified as Hispanic could be any race, persons identified as AI/AN, A/PI, Black, and White were non-Hispanic

Fig. 3. Rates of unintentional drowning deaths per 100,000 persons ≤29 years by race/ethnicity, National Vital Statistics System, United States 2010–2020.

Now, 2022). During January–April 2020, a 100% increase in drowning deaths among children 1–4 years of age was reported in Florida compared to the same months of the previous year (Safe Kids, Safe States, & YMCA, 2020). Although children aged 1–4 years continued to have the highest drowning rates of all age groups, our study revealed that there were no significant increases in unintentional drowning deaths in this age group in 2020 compared with earlier years. Despite this, children 1–4 years of age remain a critical group for prioritizing drowning prevention strategies, as drowning was the leading cause of death in this age group in 2020 (CDC WISQARS).

Drowning death rates among young adults aged 20–24 years (+44%) and 25–29 years (+29%) increased significantly. The majority of deaths among these age groups occurred in natural water. A study of injury mortality during the COVID-19 pandemic in China identified lockdowns and associated avoidance of outdoor activities as drivers of a 35% decrease in drowning deaths (Zheng

et al., 2021). However, our findings indicate that lockdowns and other COVID-19 related restrictions in the United States may have resulted in modified activities that increased exposure to natural water and drowning risk. People in the United States may have spent more time outdoors participating in activities where they could maintain social distancing, such as swimming and boating in natural water. Powerboat sales reached a 13-year high in 2020 in the United States, increasing 12% over the previous year (National Marine Manufacturers Association, 2020). Similar increases in boating-related drowning and boating sales contributed to increased drowning in Australia in 2020 (Lawes et al., 2021). In one study, young adults in Canada identified outdoor activities, including spending time at the beach, as an important coping mechanism during the COVID-19 pandemic (Ferguson et al., 2021). Further, COVID-19 related precautions might have resulted in decreased access to safety measures during participation in natural water recreation activities. Several lifejacket loaner

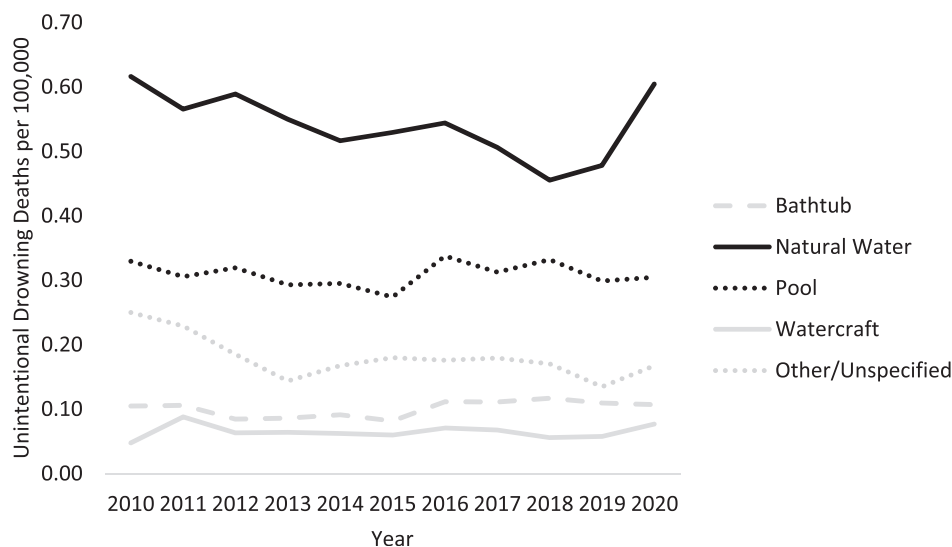


Fig. 4. Rates of unintentional drowning deaths per 100,000 persons ≤29 years by location, National Vital Statistics System, United States 2010–2020.

programs (stations that provide the public with free use of lifejackets) were closed during 2020 due to concerns of surface transfer of the SARS-CoV-2 virus through shared lifejackets that could not be adequately disinfected between uses (Washington Department of Health). Additionally, several national parks and public beaches were closed for extended periods in Deerwester and Woodyard (2020), National Park Service (2020) which might have led people to recreate in unsupervised natural water locations instead.

The increase in unintentional drowning deaths among Black persons in 2020 is particularly concerning. A recent study identified persistent racial and ethnic disparities in drowning death rates in the United States and suggested that the disparities between non-Hispanic Black or African American persons and non-Hispanic White persons had increased from 2015 to 2019 (Clemens et al., 2021). The further increases in drowning death rates among Black persons in 2020, described in this report, emphasize the urgent need to identify factors that are driving disparities in drowning death rates (Clemens et al., 2021). For example, Black children report lower swimming ability than their White peers (Irwin, Irwin, Ryan, & Drayer, 2009). One effective strategy for preventing drowning is basic swimming and water safety skills training. However, availability of swimming lessons was impacted during the COVID-19 pandemic, with many jurisdictions closing public swimming pools due to local restrictions. The impacts of these closures are unlikely to have affected 2020 drowning numbers but delays in swimming lessons may potentially impact future drowning rates. Improving equitable access to basic swimming and water safety skills training for all populations, especially those at increased risk of drowning, may reduce future drowning deaths.

This study has limitations. First, changes in drowning death rates from 2019 to 2020 should be interpreted cautiously. Year to year estimates may vary for multiple reasons and the increase in drowning deaths from one year to the next could be due to outliers in the data and not suggestive of a significant change in trend (Ingram et al., 2018). Further, we cannot determine that increases in drowning death rates were related to the COVID-19 pandemic or the associated changes in infrastructure (e.g., closing of lifejacket loaner programs) that occurred. More recent years of mortality data are needed to determine if the increases in drowning death rates in 2020 were temporary or indicative of a new trend. Second, the location of drowning deaths coded as “unspecified” could not be determined and it is possible these deaths occurred in one of the other settings described in this report (swimming pools, natural water, watercraft, or bathtubs). Third, race/ethnicity is recorded

by next of kin or by observation on death certificates and may not be consistent with self-identified race/ethnicity. Persons self-identifying as American Indian or Alaska Native, Asian or Pacific Islander, or Hispanic in census data are sometimes reported as White or non-Hispanic in death data leading to potential underestimates in these racial and ethnic groups (CDC WONDER).

5. Conclusion

In 2020, children aged 1–4 years and Black and AI/AN persons aged ≤29 years had the highest fatal drowning rates. Drowning deaths were most common in natural water and swimming pools. Fatal drowning rates increased from 2019 to 2020 among persons aged ≤29 years. The largest increases occurred among persons aged 20–24 years, males, Black persons, and in drowning in natural water. Data describing risk factors and circumstances of drowning deaths and how they differ by race and ethnicity could help public health researchers adapt and strengthen drowning prevention interventions and decrease disparities in drowning deaths both before and during times of infrastructure disruption. CDC is working with partners to better understand the circumstances of drowning deaths and to improve access to effective interventions among persons at highest risk of drowning.

6. Practical applications

Drowning is preventable. Promising drowning prevention interventions include learning basic swimming and water safety skills, wearing lifejackets on boats or among weaker swimmers in natural water, close supervision of children in or near the water, and installing barriers to prevent unintended entry to water such as pool fences that completely surround swimming pools. Strategies that increase access to effective drowning prevention interventions among children and young adults at the highest risk, including during times of infrastructure disruptions such as those caused by the COVID-19 pandemic, could reduce drowning rates in the United States.

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Disclaimer

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