CBEM®

CHILDHOOD BEREAVEMENT ESTIMATION MODEL

TECHNICAL APPENDIX

The Childhood Bereavement Estimation Model® (CBEM) represents the most comprehensive effort towards quantifying the prevalence of childhood bereavement in the U.S. Addressing limitations of past estimations, the model extends prior research by establishing a theory-based tool incorporating inputs that are customizable geographically, temporally, and relationally. The model generates retrospective (current) and prospective (projected) estimations due to the death of a parent or sibling. Rather than gathering new data, the model combines reputable, existing population-level data sources to approximate the magnitude of childhood bereavement.

This Technical Appendix describes model enhancements for both standard report and key topic report releases starting in 2021.

CHILDHOOD BEREAVEMENT ESTIMATION MODEL

TECHNICAL APPENDIX

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2025 STANDARD REPORT RELEASE

2025 Overview

- There were no changes to the CBEM's quantitative framework in 2025.
- Mortality, natality, and population input data were updated.
    - 5-year cumulative data period updated to 2019-2023 from 2018-2022.
    - Snapshot results rely on data for 2023.

2025 Standard National and State Reports

- Incorporating 2023 data means four of the five years of data (i.e., 2020-2023) reflect direct and indirect impacts of the COVID-19 pandemic.
- Use of new data generally results in increases in the number and percentage of children who will be bereaved by age 19 and by age 25 for Projected and Current bereavement measures associated with the death of a parent or sibling compared to the 2024 report.
    - Using rounded values, the number and percentage of children that will be bereaved by age 18 increased in 44 out of 51 states, including Washington, D.C., remained the same in 10, and decreased in only one.
    - Using rounded values, the number and percentage of children that will be bereaved by age 25 increased in 44 out of 51 states, including Washington, D.C., remained the same in three, and decreased in four.
- The associated Snapshot estimates for 2023 show a slight decline in the national number of children newly bereaved from the death of a parent or sibling compared to the results for 2022.

What data are included to develop sibling-based and parent-based estimates by leading cause of death?

- The report includes CBEM analyses using a dataset from CDC WONDER of the total number of deaths by single year of age based on causes of death reported in CDC WONDER's *15 Leading Causes of Death* reporting option using data for 2019-2023.
- Judi's House/JAG Institute selected the top five leading causes of death for siblings, ages 0-17, and adults where the age range of the parents accounts for the age at birth and when the child would be 17.
    - The age ranges vary for the United States and individual states and are included in each report.

What does it mean if there are fewer than five reported leading causes of death in a state report?

- CDC WONDER's criteria result in mortality being reported as "Suppressed" when there are nine or fewer deaths associated with a submitted query to the database.
- This suppression criteria can result in fewer than five listed causes of death being reported.

What does the percentage of bereaved children value provided in the CBEM Leading Causes of Death section of the report represent?

- The percentage of bereaved children for a specific cause of death is calculated by dividing the number of children who will experience bereavement due to that cause by the number of all bereaved children.

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2025 KEY TOPIC: COUNTY-LEVEL

Why did Judi's House/JAG Institute conduct CBEM analyses to evaluate bereavement at the county level?

- Judi's House/JAG Institute conducted county-based CBEM analyses to draw attention to, and consideration of, how childhood bereavement rates vary within and across communities.
- This work also provides an update to the county-based bereavement estimates Judi's House/JAG Institute originally produced and released in 2020.

What changes were made to CBEM methods for the analyses?

- No changes were made to the CBEM's quantitative framework to produce this report.

What data were evaluated this report?

- The CBEM was used to produce the report's bereavement estimates using mortality and natality data retrieved from CDC WONDER databases for the aggregated 5-year period 2019-2023.
    - For mortality data:
        - County-specific bereavement estimates are supported with data specific to the county
        - Bereavement estimates reported for an *Aggregated Counties* group within a state are supported with data aggregated across all counties in the group (see below for how these counties were identified).
            - Mortality data were retrieved using WONDER's 2018-2023: *Underlying Cause of Death by Single-Race Categories* database using the *Five-Year Age Groups* reporting option for deaths from *All causes.*
                - NOTE: On July 12, 2024 WONDER stopped reporting the size of the population associated with deaths for queries using the Five-Year Age Groups reporting option for persons younger than 1 and persons age 1-4 when the data request included at least one county (e.g., mortality data for deaths from All causes in Denver County, CO or aggregated All cause mortality data for the State of Colorado and Denver County, CO).
                - WONDER staff reported making this change to bring its data reporting in WONDER into compliance with Census Bureau standards for reporting population estimates.
                - This change required use of the average number of deaths and average population in the age 0-4 population for the CBEM's as input data for the bereavement analyses.
    - For natality data:
        - Aggregated information the average age of mother's and father's age at a mother's first live birth for the years 2019-2023 were retrieved from WONDER's *Natality for 2016-2023 (expanded)* database for all counties in the United States.
            - Where county-specific information was available it was used.
            - For all other counties, and the *Aggregated Counties* group within a state, information from WONDER reported for *Unidentified Counties* in the state was used.

The bereavement results for this Key Topic are reported for specific counties and, in many states, for a group of counties identified as "Aggregated Counties". What criteria were used to determine the composition of the "Aggregated Counties" group?

- The need to aggregate data for a group of counties in a state reflects there being many counties with relatively small populations among the 3,142 counties in the United States. Mortality data for these counties is often reported as *Suppressed* by WONDER.
- To balance the desire for as many county-specific estimates as possible with the realities of data suppression in

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WONDER the following population-based screening criteria were used to determine which counties received specific bereavement estimates:

- All counties with an aggregated population of 80,000 or more among those age 0-59 for the years 2019-2023.
- At least 80% of the state's aggregated population age 0-59 for the years 2019-2023 would be addressed with county-specific bereavement estimates.
    - In some states this required including counties with an aggregated population age 0-59 for the years 2019-2023 that was less than 80,000.
    - In these states, the additional counties were identified by sorting by population and then continuing to add counties with the largest populations until the 80% threshold was reached.
        - Mortality data were retrieved using WONDER's 2018-2023: Underlying Cause of Death by Single-Race Categories database using the Five-Year Age Groups reporting option for deaths from All causes.
    - Applying these criteria 1,750 of the 3,142 US counties have specific bereavement estimates. These counties account for 96% of the aggregated US population age 0-59 for the years 2019-2023.

What does it mean if a county is part of the "Aggregated Counties" group?

- For counties that are part of the *Aggregated Counties* group the reported bereavement results are reflective of the underlying data for the whole group so can't be disaggregated to specific counties within the group.
    - Most directly, this means there is no specific estimate for the number of bereaved children within any county in the *Aggregated County* group. This is reflected in the data within the CBEM Dashboard and addressed directly within the Dashboard's *Notes* field.

Data caveats to the income-group based bereavement analyses

- Results for Washington D.C. are not presented as it does not have any associated counties.
    - Bereavement estimates based on data for 2019-2023 are provided in the 2025 Standard reports.
- The state-level analysis of bereavement by income group for Connecticut has several data-related caveats because of the state's organization into both counties and planning regions.
    - The relationship between counties and planning regions in Connecticut is detailed in a Federal Register notice titled **Change to County-Equivalents in the State of Connecticut** (see https://www.federalregister.gov/documents/2022/06/06/2022-12063/change-to-county-equivalents-in-the-state-of-connecticut).
        - As the notice's *Summary* section states, "This notice provides information about the State of Connecticut's (hereafter Connecticut or the State) formal request to the Census Bureau to adopt the State's nine planning regions as county-equivalent geographic units for purposes of collecting, tabulating, and disseminating statistical data, replacing the eight counties which ceased to function as governmental and administrative entities in 1960."
        - Figure 1 in the notice presents a map with Connecticut's county and planning region borders
            - We used this map to develop the following relationship between Connecticut's counties and planning regions:

County	Planning Region
Litchfield	Northwest Hills
Hartford	Capitol
Tolland	Capitol
Windham	Northeastern Connecticut
Fairfield	Western Connecticut and Greater Bridgeport
New Haven	South Central Connecticut
Middlesex	Lower Connecticut River Valley
New London	Southeastern Connecticut

    - CDC WONDER's mortality database provides data on deaths by age group and by county in Connecticut for the years 2019-2023, but associated population data is only available for the years 2019-2021. As a result, only mortality and population data from 2019-2021 was used for the county-level bereavement analyses for

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Connecticut (Note there is no mortality data in WONDER for the planning regions in Connecticut).

- Kalawao County, HI is not accounted for in the bereavement analyses for Hawaii. During the 2019-2023 period there were no reported deaths in the 0-59 age group in this county.

2024 STANDARD REPORT RELEASE

2024 Overview

- There were no changes to the CBEM's quantitative framework in 2024.
- Mortality, natality, and population input data updated.
    - 5-year cumulative data period updated to 2018-2022 from 2017-2021.
    - Snapshot results rely on data for 2022.

2024 Standard National and State Reports

- Incorporating 2022 data means three of the five years of data reflect direct and indirect impacts of the COVID-19 pandemic.
    - The new data results in increases in the number and percentage of children who will be bereaved by age 18 and by age 25 for bereavement measures associated with the death of a parent.

2024 KEY TOPIC: HOUSEHOLD INCOME

Why did Judi's House/JAG Institute conduct CBEM analyses to evaluate the relationship between income and bereavement?

- Judi's House/JAG Institute conducted income group-based CBEM analyses to draw attention to, and consideration of, how childhood bereavement rates vary within and across communities based on household income differences.
- These analyses build on earlier Judi's House/JAG Institute efforts to highlight differences in bereavement within population subgroups, such as our 2021 estimates quantifying bereavement within states for population subgroups defined by race or Hispanic/Latino origin, and our 2020 county-level bereavement estimates.

What changes were made to CBEM methods for the analyses?

- No changes were made to the CBEM's quantitative framework to produce this report.

The bereavement results for this Key Topic are reported for income groups. How were counties organized into these groups for the state-level analyses?

- The income groups are based on a Judi's House/JAG Institute evaluation of 2018-2022 data on median household incomes at the national, state, and county-levels from the Census Bureau's American Community Survey.
- Income-based groups were developed to support comparisons, subject to data availability, between locations where the median household income is roughly the same as a reference value and locations that have median household incomes slightly larger than or much larger than the reference value along with locations that have median household incomes slightly smaller than or much smaller than the reference value.
- This approach resulted in the following income-based groups:
    - Group 1: Median household income less than or equal to 75% of the reference value
    - Group 2: Median household income from 76% of up to, or equal to, 90% of the reference value
    - Group 3: Median household income from 91% of up to, or equal to, 110% of the reference value
    - Group 4: Median household income from 111% of up to, or equal to, 125% of the reference value
    - Group 5: Median household income equal to or exceeding 126% of the reference value
- For the state-level analyses, counties in the state were assigned to an income group by comparing the county's

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median household income to the associated median household income value for the state.

- Once grouped, aggregated birth and mortality data for the counties in an income group was developed or requested from respective CDC WONDER databases as described below.

What data were evaluated in this report?

- This report provides estimates of children and young adults that will be bereaved (Projected results) from the death of a parent or sibling by age 18 by income group.
- The CBEM was used to produce the bereavement estimates in the report using cumulative natality and mortality input data retrieved from CDC WONDER databases for the 5-year period 2018-2022.
    - These data were aggregated based on the counties in an income group within a state.
    - Information on the average age of mother's and father's age at a mother's first live birth was retrieved from WONDER's Natality for 2016-2022 (expanded) database consistent with the approach used for the 2024 Standard National and State reports for each state and the counties within a state.
        - Within an income group, available county information was aggregated using a weighted average approach.
        - If no information for a specific county was available for an income group, the value for *Unidentified Counties* within the state was used.
    - Mortality datawere retrieved using WONDER's *2018-2022: Underlying Cause of Death by Single Race Categories* database using the *5-Year Age Groups* reporting option for dealths from *All Causes*
        - NOTE: On July 12, 2024 WONDER stopped reporting the size of the population associated with deaths for queries using the *5-year Age Groups* reporting option for persons younger than 1 and persons age 0-4 when the data request included at least one county (e.g., mortality data for deaths from All Causes in Denver County, CO or aggregated All Cause mortality data for the State of Massachusetts and Denver County, CO.)
            - This change required use of the average number of deaths and average population in the age 0-4 population for the CBEM's county-based income group bereavement analyses.
            - For consistency, this approach was also used for state-level data.

What does it mean if results for an income group in a state are reported as "No Counties"?

- A reported "No Counties" result for an income group in a state-level analysis means no counties in the state had a median household income that fell within the bounds for that income group given the reference value of the state's median household income.

What does it mean if results for an income group in a state are reported as "Not Modeled"?

- A "Not Modeled" result for an income group in a state-level analysis is shown when there was a county or group of counties whose median household income(s) fell within the bounds for that income group, but the population of persons age 0-60 over the years 2018-2022 associated with that income group satisfied both of the following exclusion criteria:
    - The cumulative population in the income group was less than 150,000.
    - The cumulative population in the income group was less than 2% of the equivalent state population.
        - NOTE: Because of the use of 5-year age groups for retrieving population data from WONDER, the population age 0-60 reflects the total reported population age 0-59 plus 1/5 of the reported population age 60-64.
    - These criteria, also applied in our 2021 report on bereavement by race and Hispanic/Latino origin, exclude consideration of locations where WONDER suppresses much of the mortality data for privacy concerns and where any results would have to be considered uncertain/unstable because of the small associated populations.

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Data caveats to the income group-based bereavement analyses

- The state-level analysis of bereavement by income group for Connecticut has several data-related caveats because of the state's organization into both counties and planning regions.
    - The relationship between counties and planning regions in Connecticut is detailed in a Federal Register notice titled **Change to County-Equivalents in the State of Connecticut** (see https://www.federalregister.gov/documents/2022/06/06/2022-12063/change-to-county-equivalents-in-the-state-of-connecticut).
        - As the notice's *Summary* section states, "this notice provides information about the State of Connecticut's (hereafter Connecticut or the State) formal request to the Census Bureau to adopt the State's nine planning regions as county-equivalent geographic units for purposes of collecting, tabulating, and disseminating statistical data, replacing the eight counties which ceased to function as governmental and administrative entities in 1960."
        - Figure 1 in the notice presents a map with Connecticut's county and planning region borders.
            - We used this map to develop the following relationship between Connecticut's counties and planning regions.

County	Planning Region
Litchfield	Northwest Hills
Hartford	Capitol
Tolland	Capitol
Windham	Northeastern Connecticut
Fairfield	Western Connecticut and Greater Bridgeport
New Haven	South Central Connecticut
Middlesex	Lower Connecticut River Valley
New London	South Eastern Connecticut

    - CDC WONDER's mortality database provides data on deaths by age group and by county in Connecticut for the years 2018-2022, but associated population data is only available for the years 2018-2021. As a result, only mortality and population data from 2018-2021 were used for the analysis of bereavement by income group in Connecticut (Note there is no mortality data in WONDER for the planning regions in Connecticut).
    - The American Community Survey provides estimates of median household income for the period 2018-2022 by planning region in Connecticut. The relationship between counties and planning regions presented above was used to assign the Connecticut counties a median household income and to then assign those counties to an income group.
- The Census Bureau's American Community Survey does not report a median household income value for Loving County, TX for the period 2018-2022 as the county's population did not satisfy minimum size requirements for reporting this value.

2024 SPECIAL REPORT: SNAPSHOT ESTIMATES OF CHILDREN NEWLY BEREAVED BY A PARENT'S ACCIDENTAL DRUG OVERDOSE OR DEATH FROM ANY CAUSE OVER TIME

Why did Judi's House/JAG Institute conduct these analyses?

- Judi's House/JAG Institute conducted CBEM Snapshot analyses to examine the impact of parental deaths from Accidental Drug Overdoses and death from All Causes on childhood bereavement within each state and for the country over the period 2002-2022.
    - The estimates of the number of children younger than 18 newly bereaved in a year from a parent's death from an accidental drug overdose or death from any cause highlight changes in the absolute and relative importance of parental accidental drug overdose deaths as a source of childhood bereavement over time.
    - See www.judishouse.org/download/data-table-cbem-Snapshot-2002-2022-child-bereavement-due-to-parent-accidental-overdose to access these data.

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What changes were made to CBEM methods or input variables for the analyses?

- No adjustments were made to the CBEM's quantitative framework to produce this report.
- Relevant details regarding input variables specific to each set of analyses are provided in the section below.

What data are included in this report?

- The report provides national point-in-time "Snapshot" CBEM analyses using a dataset developed from information retrieved from CDC WONDER mortality and birth databases.
- Mortality data for Accidental Drug Overdose Deaths were retrieved using selection options in WONDER's *Underlying Cause of Death* databases by selecting *Drug/Alcohol Induced Causes* as the cause of death and *Drug Poisonings (overdose) Unintentional (X40-X44)* as the specific cause of death.
- Mortality data for deaths from All Causes were retrieved using the default selection options in WONDER's *Underlying Cause of Death* databases (i.e., **All** is selected as the cause of death).
- Information on the average age of mother and father at mother's first live birth were retrieved from WONDER's birth databases.
    - The main caveat to this information is WONDER's birth databases do not have information on father's age at a mother's first live birth before 2016. As a result, the information on father's age used for the 2017 estimates was also incorporated to develop childhood bereavement estimates for the prior years (i.e., 2012, 2007, and 2002).

2023 STANDARD REPORT RELEASE

2023 Overview

- There were no changes to the CBEM's quantitative framework in 2023.
- Mortality, natality, and population input data were updated.
    - 5-year cumulative data period updated to 2017-2021 from 2016-2020.
    - Input for sibling weight (i.e. average number of siblings per child) updated to 1.438 from 1.442 based on updated survey results from 2021 released by the U.S. Census Bureau.

2023 Standard National and State Reports

- Incorporating 2021 data means impacts from the first two years of the COVID-19 pandemic are captured.
    - The new data results in significant increases in the number and percentage of children who will be bereaved by age 18 and by age 25 for bereavement measures associated with the death of a parent.

2023 KEY TOPIC: PANDEMIC IMPACT

Why did Judi's House/JAG Institute conduct additional CBEM analyses by cause of death in 2023?

- Judi's House/JAG Institute conducted CBEM analyses by the causes of death addressed in the 2022 COVID-19 Pandemic Impact Report, while adding details for deaths by suicide, to provide additional details for childhood bereavement impacts associated with the COVID-19 pandemic.

What changes were made to CBEM methods or input variables for the analyses?

- No adjustments were made to the CBEM's quantitative framework to produce this report.
- Relevant details regarding input variables specific to each set of analyses are provided in the sections below.

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What data are included in the COVID-19 Pandemic Impact Report?

- The report's national point-in-time "Snapshot" CBEM analyses use a CDC WONDER dataset for data on total deaths from select causes by single year of age for each year from 2017 through 2021.
    - Retrieving mortality data for 2017-2021 from CDC WONDER requires accessing two datasets for each cause of death. Details for each cause of death are provided in the following bullets.
- Data on the number of Accidental Drug Overdose deaths by single year of age were retrieved from CDC WONDER based on the following category within the *Underlying Cause of Death* reporting section:
    - Drug/Alcohol Induced Causes: Drug Poisonings (overdose) Unintentional
- Data on the number of Homicide by Gunshot deaths by single year of age were retrieved from CDC WONDER using the following reporting options within the database's *Select Cause of Death* reporting section:
    - ICD codes reported by Injury Intent and Mechanism:
        - *Homicide* selected within the *Injury Intent* subsection
        - *Firearm* selected within the *Injury Mechanism & All Other Leading Causes* subsection
- Data on the number of *COVID-19* deaths by single year of age for 2020 and 2021 were retrieved from CDC WONDER using the following reporting options within the database's *Underlying Cause of Death* reporting section:
    - ICD-10 code = U07.1 (COVID-19)
- Data on the number of *Suicide* deaths by single year of age were retrieved from CDC WONDER using the following reporting options within the database's *Underlying Cause of Death* reporting section:
    - Injury Intent: Suicide
- In this report, the range of parent ages for children younger than 18 is 27-46. For youths younger than 25, which have results in the associated data table, the range of parent ages is 27-53.

2022 STANDARD REPORT RELEASE

2022 Overview

- There were no changes to the CBEM's quantitative framework in 2022.
- Mortality, natality, and population input data were updated.
    - 5-year cumulative data period was updated to 2016-2020 from 2015-2019.

2022 Standard National and State Reports

- Incorporating 2020 data means impacts from the first year of the COVID-19 pandemic are captured.
    - The new data results in significant increases in the number and percentage of children who will be bereaved by 18 and by age 25 for bereavement measures associated with the death of a parent.

2022 KEY TOPIC: CAUSE OF DEATH

Why did Judi's House/JAG Institute conduct CBEM analyses by cause of death?

- Judi's House/JAG Institute conducted CBEM analyses by cause of death to:
    - Highlight the common causes of death that precipitate grief in childhood to inform best practices and approaches to care (Leading Cause of Death Report).
    - Examine the impact of the COVID-19 pandemic on childhood bereavement to help inform development of adequate programming that can meet the increased demand for support services (COVID-19 Pandemic Impact Report).
    - Provide additional detail to complement our 2022 state and national-level bereavement analyses.
    - More fully incorporate the detail available in publicly available vital statistics.

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What changes were made to CBEM methods or input variables for the analyses?

- No adjustments were made to the CBEM's quantitative framework to produce the *Key Topic* reports.
- Relevant details regarding input variables specific to each set of analyses are provided in the sections below.

What data are included in the Leading Cause of Death Report?

- The report includes national CBEM analyses using a dataset from CDC WONDER of the total number of deaths by single year of age by 15 Leading Causes of Death for 2016-2020.
    - Causes of death were specified using the reporting options within the ICD 10 113 Cause List in CDC WONDER's *Select Cause of Death* reporting option.
        - This reporting option provides consistency in underlying mortality codes with results in the *Standard National and State* reports produced using CDC WONDER's *15 Leading Causes* reporting option.
- From the CDC WONDER's 15 Leading Causes of Death category, Judi's House/JAG Institute selected the top five leading causes of death for adults aged 27-53 for bereavement due to parent death loss analyses and for children aged 0-24 for bereavement due to sibling death loss analyses, respectively.

What data are included in the COVID-19 Pandemic Impact Report?

- The report provides national point-in-time "Snapshot" CBEM analyses using a dataset from CDC WONDER of the total number of deaths by single year of age by select causes of death for each year in the period 2016-2020.
- Judi's House/JAG Institute analyzed trends across 2015-2020 mortality data to identify three leading causes of death among the most impacted by the COVID-19 pandemic to include in this report:
    - Accidental drug overdose
    - Homicide by gunshot
    - COVID-19
- Data on the number of *Accidental Drug Overdose* deaths by single year of age were retrieved from CDC WONDER based on the following category within the *Select Cause of Death* reporting section:
    - Drug/Alcohol Induced Causes: Drug poisonings (overdose) Unintentional
- Data on the number of *Homicide by Gunshot* deaths by single year of age were retrieved from CDC WONDER using the following reporting options within the database's *Select Cause of Death* reporting section:
    - ICD codes reported by *Injury Intent and Mechanism*
    - *Homicide* selected within the *Injury Intent* subsection
    - *Firearm* selected within the *Injury Mechanism & All Other Leading Causes* subsection
- Data on the number of *COVID-19* deaths by single year of age for 2020 and 2021 to August 10, 2022 were retrieved from the following sources:
    - 2020 COVID-19 deaths – data from CDC WONDER's *Underlying Cause of Death 1999-2020* database using the following ICD-10 code within the database's Select Cause of Death reporting section:
        - U07.1 (COVID-19)
    - 2021 to August 2022 COVID-19 deaths – provisional data on the number of COVID-19 deaths by age and sex as of August 10, 2022 were retrieved from the National Center for Health Statistics (NCHS, see https://data.cdc.gov/NCHS/Provisional-COVID-19-Death-Counts-by-Age-in-Years-/3apk-4u4f/data).
        - The NCHS data was aggregated to counts of COVID-19 deaths by single year of age
            - 2020 deaths for COVID-19 from CDC WONDER were subtracted, by year of age, from the totals from the NCHS provisional data.
            - The result are estimates, by single year of age, for COVID-19 deaths for 2021 to August 10,2022.
    - U.S. Census Bureau data on the 2020 U.S. resident population by single year of age available through CDC WONDER is used as the estimate for 2021 U.S. resident population.

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2021 STANDARD REPORT RELEASE

Why was the CBEM enhanced in 2021?

- Judi's House/JAG Institute enhanced the CBEM to:
    - Improve the accuracy of results.
    - Make better use of publicly available vital statistics.

What was enhanced in 2021?

- CBEM input variable: Father's age at first birth
    - As noted in the 2020 section, CBEM calculations assume each child has two adult caregivers (i.e., parents) and requires defining the two caregivers' ages at the time of the child's birth. Although these data link the caregivers' ages to specific genders, the parental bereavement calculations generated by the CBEM are not gender-specific.
    - *Fathers' age at first birth* was previously calculated using a published value for the average difference in age for fathers and mothers (Khandwala, Zhang, Lu, & Eisenberg, 2017). In 2021 Judi's House/JAG Institute replaced this assumption with more recent available data on parents' ages from the Center for Disease Control and Prevention's WONDER (Wide-ranging ONline Data for Epidemiologic Research, US DHHS, 2020) system to develop national and state-specific values for the average difference in fathers' and mothers' ages.
    - Judi's House/JAG Institute calculated the average difference in fathers' and mothers' ages at a mothers first live birth with the following information for years 2016-2019 from WONDER's *Natality*, 2016-2019 expanded dataset (US DHHS, 2020):
        - The number of births with an associated age range for the father.
        - The reported average mothers' age for each *Age of Father* category.
    - Calculations involved the following steps:
        - Fathers in each category were assigned an average age.
            - The midpoint was used for defined range categories (e.g., 22 years for the 20–24 years category).
            - Fathers are assumed to be 15 years old in the *Age Under 15* category.
            - Fathers are assumed to be 55 years old in the *Age 55+* category.
        - Weighted average ages for mothers and fathers across age categories were calculated using:
            - The total number of births across the *Age of Father* categories.
            - The assumed and reported average ages for fathers and mothers, respectively.
        - The average mothers' age was subtracted from the average fathers' age to produce the difference in parents ages.
    - Resulting parents' age differences overlap the previously used value of 2.30 years from Khandwala et al. (2017), with a range of 1.98 years (Wisconsin) to 2.78 years (Florida); the national average is 2.35 years.

How do these enhancements impact CBEM results?

- Moving to state-specific estimates of caregiver age has the following net impacts:
    - Estimates of bereavement due to parent death and bereavement due to sibling or parent death ***increase*** in locations where the updated data result in ***older*** first-time parents.
    - Estimates of bereavement due to parent death and bereavement due to sibling or parent death ***decrease*** in locations where the updated data result in ***younger*** first-time parents.

Concluding 2021 CBEM considerations

- As noted in the 2020 section:

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- CBEM results may vary year-to-year reflecting changes in data (e.g., first-time parents getting older, shifts in mortality rates).
    - Accordingly, some changes in the 2020 results compared to 2019 would be expected regardless of the model enhancements described above.
- Annual changes in the national and state results noting "1 in X children will be bereaved…" will, generally, occur less often than changes in the reported percentage of bereaved children.
    - The "X" value changes only when threshold percentage values are crossed because a given "X" value corresponds to a range of results for the percentage of bereaved children.
    - For example, when a report indicates that "1 in 11 children will be bereaved," this can encompass a range from roughly 8.7% to 9.5% of children who will be bereaved. Thus, even if we observe an increase in bereavement from 8.8% to 9.5% across time, the "1 in X" will remain "1 in 11".

2021 KEY TOPIC: RACE AND ETHNICITY

Why did Judi's House/JAG Institute conduct CBEM analyses by race and ethnicity?

- Judi's House/JAG Institute conducted CBEM analyses by race and ethnicity to:
    - Explore and quantify potential differences in childhood bereavement within and across the country and states according to the race or ethnicity of a child and their parents.
    - Provide additional detail to complement our 2021 state and national-level bereavement analyses.
    - More fully incorporate the detail available in publicly available vital statistics.

How were the reported race and ethnicity categories selected?

- CBEM results reflect the race and ethnicity categories available for the years 2015-2019 within the Center for Disease Control and Prevention's WONDER (Wide-ranging ONline Data for Epidemiologic Research, US DHHS, 2020) *1999-2019 Underlying Cause of Death by Bridged Race Categories* database.
    - The CDC WONDER database has the following reporting options for race and ethnicity, respectively:
        - Race
            - *American Indian or Alaska Native*
            - *Asian or Pacific Islander*
            - *Black or African American*
            - *White*
        - Ethnicity
            - *Hispanic or Latino*
            - *Not Hispanic or Latino*
            - *Not Stated*
- Aggregated mortality and population data were extracted for these race and ethnicity categories separately to serve as inputs to the CBEM. Because mortality data for the Not Stated ethnicity category are not reported with an associated population for deaths, this ethnic category was not included in analyses.

Why are results for certain race and ethnicity categories reported as "Not Reported"?

- To produce reliable, stable estimates, Judi's House/JAG Institute established the following criteria to determine when, based on the 5 years of WONDER data for 2015-2019, a race or ethnicity category population in a state would be excluded from the CBEM analysis:
    - An average annual population in the race or ethnicity category for those age 0-60 of less than 30,000.

(continued on next page)

    - For a given race category: A population that represents less than 2.0% of the state's total age 0-60 population.
    - For a given ethnicity category: A population that represents less than 2.5% of the state's total age 0-60 population.
        - The criterion for ethnicity has a larger threshold value because there are fewer reporting options for ethnicity compared to race.
- Race and ethnicity categories that met both criteria were excluded from the state's CBEM analysis and listed as "Not Reported." The race and ethnic categories in the following states met both exclusion criteria:
    - American Indians or Alaska Natives in:
        - AR, CT, DE, DC, HI, IN, IA, KY, ME, MS, NE, NH, RI, SC, TN, VT, WV
    - Asians or Pacific Islanders in:
        - ME, MT, WV, WY
    - Blacks or African Americans in:
        - ID, MT
    - Hispanics or Latinos in:
        - ME, VT, WV

Why are results for certain Leading Causes of Death not reported in the CBEM race and ethnicity reports?

- CBEM Key Topic: Race and Ethnicity reports include data for the top five leading causes of death for each race and ethnicity category to provide important context to the childhood bereavement results.
- Top five leading causes of death data were not reported under the following conditions:
    - Data were suppressed by CDC WONDER and thus were not available to report.
    - CBEM results were not produced given considerations outlined above.

Were CBEM input variables adapted for the race and ethnicity analyses?

- CBEM methodology was not changed to produce bereavement results by race and ethnicity, but input variables were adjusted, where possible, to match the race and ethnicity categories and to accommodate data suppression issues at this level of analysis. Specifically:
    - Age-based populations and deaths.
        - To address data suppression issues encountered with youth death data, Judi's House/JAG Institute requested population and mortality data from CDC WONDER for two age groupings for each race and ethnicity category: ages 1-10 and ages 11-17.
        - Population and death data for these age groups were then evenly allocated to each of the single-year age groups in the category.
    - Father's age at first birth.
        - Judi's House/JAG Institute used the same calculation process described below for the 2021 CBEM reports to calculate the difference in father's and mother's age at first birth using national-level data where the fathers and mothers were of the same race or the same ethnic category. This process produced national estimates of the difference in father's and mother's age at first birth for the following race categories:
            - American Indian or Alaska Native
            - Asian
            - Black or African American
            - Native Hawaiian or Other Pacific Islander
            - White
        - For consistency with the race categories available in CDC WONDER's mortality database, we created a weighted average difference from the results for the Asian and Native Hawaiian or Other

Pacific Islander categories to use with the mortality data reported for the Asian or Pacific Islander category. This process was then repeated for the ethnic categories, producing results for the Hispanic or Latino and Not Hispanic or Latino categories.

- In contrast to the approach utilized for the 2021 CBEM reports where state-specific values were available, for the CBEM race and ethnicity analyses Judi's House/JAG Institute utilized national-level differences in mother's and father's age at first birth by race and ethnicity for national and state-level analyses given data suppression issues encountered at the state level.

Concluding 2021 CBEM Key Topic: Race and Ethnicity considerations

- Judi's House/JAG Institute anticipates that using age groupings to produce population and mortality input data by race and ethnicity categories for children age 1-17 has a small impact on bereavement results compared to using data specific to each single-year age group. Death of a child is a relatively rare event in the age 1-17 group (hence the suppression issues encountered). Without producing the actual data for each single-year age group for direct comparison it is not possible to conclude whether the use of the age group data increased or decreased sibling bereavement compared to using actual values for each single-year age group.
- Analyses are constrained to the race and ethnicity categories available in CDC WONDER for mortality and population data for the 5-year period of 2015-2019. There may be additional reporting options available for future analyses as there are additional race categories available in a second CDC WONDER mortality dataset (i.e., *2018-2019: Underlying Cause of Death by Single-Race Categories*). Judi's House/JAG Institute will continue exploring all reporting options.
- CBEM bereavement results by race and ethnicity assume each child has two adult caregivers (i.e., parents) and that both caregivers are of the same race or ethnicity as the child.

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judi's house JAG Institute
For Grieving Children and Families

Judi's House/JAG Institute is a research-based nonprofit in Aurora, CO devoted solely to supporting grieving children and families.

NEW YORK LIFE FOUNDATION

Judi's House/JAG Institute partnered with the New York Life Foundation to create the Childhood Bereavement Estimation Model.