RESEARCH

Estimating prevalence of bereavement, its contribution to risk for binge drinking, and other high-risk health states in a state population survey, 2019 Georgia Behavioral Risk Factor Surveillance Survey

Toni P. Miles[1]*, Changle Li[2], M Mahmud Khan[2], Rana Bayakly[3], Deborah Carr[4]

*Correspondence:
Toni P. Miles[1*], Rosalynn Carter Institute for Caregivers, Atlanta GA.USA
Full list of author information is available at the end of the article

Abstract

Background: Binge drinking is a pattern of alcohol abuse. Its prevalence and associated risk factors are not well documented. Heavy drinking, on the other hand, has a well-studied association with bereavement . This report uses a cross-sectional, population-based survey to estimate prevalence of bingeing and its association with new bereavement. Bingeing is defined as 4 or more drinks (women) or 5 or more drinks (men) in a 2-to-4-hour setting. For the first time, the Georgia Behavioral Risk Factor Surveillance Survey (BRFSS) included a bereavement item, '*Have you experienced the death of a family member or close friend in the years 2018 or 2019*?'.

Methods: Georgia BRFSS is a complex sampling survey administered annually. It is designed to represent the 8.1 million persons in the U.S. state of Georgia aged 18 years and older. Alcohol consumption patterns are routinely measured in the common core. In 2019, the state added a new item probing for bereavement in the prior 24 months predating the pandemic of COVID-19. Imputation and weighting techniques were applied to yield population prevalence rates of new bereavement, bingeing, and their co-occurrence with other high-risk health states. Models, adjusted for age, gender, and race were used to estimate the risk for other unhealthy behaviors posed by the co-occurrence of bereavement and bingeing.

Results: In Georgia, bereavement is common (45.8 %), and alcohol consumption is common (48.8 %). Bereavement and alcohol use co-occurred among 1,796,817 persons (45 % of all drinkers). The subset of co-occurring bereavement and binging totaled 608,282 persons. Within this group, the highest rates of bereavement were associated with death of a friend / neighbor (30.7%) or 3 plus deaths (31.8%).

Conclusions: While bingeing is a known risk to public health, its co-occurrence with recent bereavement is a new observation. Public health surveillance systems need to monitor this co-occurrence to protect both individual and societal health. In a time of global bereavement, documenting its influence on binge drinking can support the work towards Sustainable Goal #3 – Good health and Well-Being.

Keywords: BRFSS, Binge Drinking, Population Survey, Bereavement, SDG#3. Mental Health

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Background

Bereavement is an established risk factor for morbidity and mortality which has received little attention in prevention research. It is defined as the fact of the death and is different from the concept of grief. Grief is an emotional response such as sorrow, sadness, or anger. Exposure to bereavement within one's social network is associated with a 2- to 5-fold increased mortality risk which can persist for as much as 10 years [1,2]. This exposure is also associated with increased rates of health care consumption [3,4]. Anecdotes describing the behaviors of bereaved people include references to changes in patterns of sleeping and eating. The detrimental version of these behaviors includes insomnia and overeating. The emergence of new, detrimental behaviors after exposure to bereavement may be a mechanism driving the downstream increases in health care consumption. The existing literature describing alcohol use behaviors shows conflicting patterns of protection and injury. Social drinking protections cognition [5]. Bingeing or heavy drinking increases illness and premature mortality risk [6,7]. This report examines the co-occurrence of bereavement and binge drinking to answer a single question. Is binge drinking significantly more common among persons with new bereavement?

Bereavement related health effects extend beyond biological relatives to encompass coworkers and others with strong social ties, i.e., fictive kin [8.9]. The strongest evidence for these effects comes from cohort studies. Longitudinal analyses of cohorts show bereavement is associated with a 2-fold increased risk of death in the 6 years following the event [1]. In these cohorts, rates of detrimental health behaviors - insomnia, smoking, and alcohol use – were also elevated among the bereaved [9-11]. These observations suggest bereavement has its pervasive and long-lasting effect through behavior change. Can this perspective be extended beyond families to the population level? There is evidence that the numbers of persons exposed to bereavement are increasing. Population growth has combined with later age at death to increase the annual number of deaths. In the United States, this annual growth in numbers of deaths has been observed each year between 1935 and 2010. In 2010, there were almost 2.5 million deaths. By 2018, this number had increased to 2.8 million [12]. Recent work has provided an estimate for numbers of bereaved linked to a single death from a single cause - COVID. With COVID, an estimated 9 persons are in the social network of the decedent [13]. Cohort studies, population growth, and cause of death analyses provide indirect

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evidence for greater numbers of persons with exposure to bereavement. Is there a parallel trend of emerging, detrimental health behavior over the same 75 years? Answering this question requires a dataset with bereavement exposure combined with health behaviors. Currently, no complex sampling survey connects bereavement and health behavior.

Complex sampling surveys routinely assess health behaviors. The Behavioral Risk Factor Surveillance Survey (BRFSS) has more than 30 years of population-level health behavior assessment. The types of behaviors BRFSS includes changes over time to meet current public health concerns. For example, alcohol use only became a regular part of BRFSS in the early 2000s [14]. Bereavement exposure not routinely assessed in BRFSS. Currently, exposure to bereavement is indirectly inferred from big data sources - population registries or complex sampling surveys of death certificates. [2, 3,15]. National mortality registries are a comprehensive listing of deaths. These sources have been used to link bereavement to health care consumption by family members [3]. The National Mortality Follow Back Survey (NMFS) is a complex sampling survey designed to validate death certificates and ascertain events surrounding decedent health prior to their death. NMFS data are derived from interviews with family members. Despite the sensitive nature of the topic, participation rates range from 90 to 95 % in the 3 cycles of NMFS – 1966, 1986, and 1993. NMFS does not have health behavior for the informant. The Health and Retirement Survey (HRS) is a longitudinal cohort [16]. Health outcomes – not behaviors – are the focus of HRS reports. HRS-based analyses have identified mediators and moderators of health care consumption after bereavement [1, 4, 9, 10]. The concept of mastery – global, health, and financial – is a composite attitude index that is linked to probability of health care encounters such as doctor visits and overnight hospital stays [10]. Timing of exposure to bereavement in HRS is not precisely characterized well enough to test hypotheses regarding behavior change. HRS captures all deaths occurring in childhood through the ones occurring between waves of interviews for adults aged 50 years and older. To ascertain changing health behaviors, the timing of exposure and behavior needs temporal standardization. Existing registry or NMFS data also has limited potential for mechanistic studies because each is missing informant health behaviors.

Alcohol consumption and abuse is a well-studied health behavior. Binge drinking and its association with bereavement is a new area of study for population health [11, 17]. Bingeing is a global issue with rates that vary across nations, ranging from 12.6 % (Singapore) to 40.4 % (Mexico)

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[18, 19]. Binge drinking is part of a larger spectrum of excess alcohol use. According to the Centers for Disease Control and Prevention, in the U.S. excess alcohol use costs $28 billion in health care, $179 billion in workplace productivity, $13 billion in automobile accidents, and $25 billion in criminal justice. These reports indicate that reductions in detrimental consumption could have a large positive effect on a broad spectrum of outcomes – not just health [3, 20]. In the United States, annual cross-sectional surveys show increasing rates of bingeing between 2011 and 2017 from 16.7 % 18.0 % [21]. Rates also vary by state and region in the U.S., with rates highest in the Midwest region (20.0 %) and in small metropolitan areas (17.7 %) [22]. Between 2011 and 2014, the state of Georgia (southeastern region) had bingeing rates between 13.1 % and 16.6 %. Traditional studies of bingeing focus on age at first use and its contribution to subsequent heavy drinking [23,24]. While the prevalence of bingeing is well-documented, less is known about the individual, social, and contextual factors that initiate bingeing [25, 26]. The pervasiveness of binge drinking creates an ideal starting place for a study of health behavior change as a mechanism for bereavement-related injury.

Before the COVID-19 pandemic, the U.S. state of Georgia began field testing an item estimating the prevalence of new bereavement in the years 2018 and 2019 with the question *Have you experienced the death of a family member or friend in the years 2018 or 2019*? The prevalence of bereavement for that period was 45.8 % in a population of 8,164,018 adults aged 18 years and older [27]. Georgia BRFSS contains the necessary elements to study co-occurrence of binge drinking and bereavement. Its population-level design creates an opportunity to measure the scale of bereavement and behavior change.

Materials and methods

Design and setting of the study

The 2019 Georgia BRFSS field survey, administered by the Georgia Department of Public Health in the United States, is the data set used for this analysis. The BRFSS is a telephone interview of U.S. residents in all 50 states and is a primary source of information on major chronic health conditions, health-related risk behaviors, and the use of preventive services among adults. Alcohol-related items are part of the core set of questions asked by all states. States can also add items of local interest. Georgia added a bereavement module to the 2019 field survey [27]. The core interview takes an average of 17 minutes while the state-optional items add 5 to 10 minutes more. Using list-assisted,

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random digit dialing, persons randomly selected from the non-institutionalized adult population aged 18 years and older resident in Georgia for interviews. One interview is obtained from households drawn from within primary statistical units and include both landline and cellular phones. The common core contains uniform survey items asked in all states on health risk behaviors, chronic diseases, access to health care, and use of preventive services. Due to differential loss of responses to both individual core and state-added modules, 917 persons are missing from the group responding to the bereavement item in 2019 BRFSS.

The binge drinking rates are derived from weighted, imputed BRFSS data for the portion of persons reporting any alcohol use (n = 6,796). Each category of usage is mutually exclusive. For purposes of this presentation, only bingeing and social drinking rates are shown. To compare categories of age, crude rates are calculated using weighted data. These rates illustrate the differences in patterns of drinking between mutually exclusive age categories. The estimated numbers of state residents for each age subgroup are also shown. Crude rates are also used for the multivariate models. To compare gender and race groups, rates were age standardized. Since 1999, the 2000 U.S. standard population has been used by government agencies for calculating age-adjusted rates [21,22]. This is approach allows for comparison of rates across time without bias due to population aging. To facilitate comparison of 2019 BRFSS drinking rates with prior reports, the tables use the 2000 standard population to calculate age-standardized rates. For more details about the use of age-standardized rates https://seer.cancer.gov/stdpopulations/2000stdpop-use.html.

Measures

In BRFSS the standard format for health behavior items is structured to capture the 30-day period prior to the day of interview (physical activity, binge drinking, self-rated health, and physical or mental health).

Bereavement

Bereavement was assessed with an optional state-interest item in the 2019 Georgia BRFSS. Bereavement is defined by three items: ‘Have you experienced the death of a family member or close friend in the years 2018 or 2019?’. When the answer was yes, follow-up items included number of losses and the kinship category of the decedent. Number of losses was coded into four mutually exclusive categories: 0, 1, 2, and 3 or more losses. Relationship to the decedent has three mutually

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exclusive categories: family member only; friend or neighbor only; and both family and non-family member. These items were derived from the HRS [16].

Binge drinking was assessed with the question: 'Considering all types of alcoholic beverages, how many times, during the past 30 days did you have X (X=5 for men, X=4 for women) or more drinks on an occasion?'. We constructed a dichotomous indicator that equals one if a male reported five or more drinks on one occasion or a female reported four or more drinks on one occasion during the past month. The category of social drinking contains persons who say 'yes' to alcohol use but do not meet criteria for bingeing nor heavy drinking (> 7 drinks per week).

Alcohol screening & brief intervention (ASBI)

The Georgia BRFSS included an optional ASBI module. Only participants reporting a physician visit in the two years prior to survey were eligible for ASBI. The sample in the Alcohol Screening & Brief Intervention (ASBI) analysis are limited to a subset of 5,497 persons who reported a visit with a health care provider, regardless of drinking habit. The ASBI asks three questions: (1) At that checkup, were you asked in person or on a form if you drink alcohol. (2) Did the health care provider ask you in person or on a form how much you drink? (3) Did the health care provider specifically ask whether you drank (5 for men/ 4 for women) or more alcoholic drinks on an occasion? Response options for each item: Yes, no, do not know/Not sure, or refused.

Sexual orientation items

The GA BRFSS also has a test module with items on sexual orientation and gender identity. Sexual orientation defined by two questions. Which of the following best represents how you think of yourself, and do you consider yourself to be transgender? Response options: Gay, Straight or Bisexual or Something else. Response options for the transgender question are: Transgender male to female, Transgender female to male, transgender nonconforming. Appendix contains wording of questions used in the survey.

Statistical analyses

All statistical analyses were conducted using Stata [28]. In the unweighted sample, 4,289 respondents had complete information on all 15 items of interest as shown in Table 1. Chi Sq tests were used to detect statistical differences. There are several items with no missing responses (gender, age), low missing response rates (education / 0.48%, self-rated health / 0.33%) and intermediate missing rates (race / 2.37%, health behaviors / 6 to 11%). Sexual orientation and gender

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identity (SOGI) have the highest rates of missing responses (SOGI 25 %). When confronted with missing responses across multiple variables, we chose to apply multiple imputation techniques. The applied multiple imputation technique had an assumption of random missing [29, 30]. Multiple imputation allows researchers to use more available data, thus reducing biases due to missing responses [31]. The process began by creating 50 copies of the dataset to reduce the sampling error due to imputations. Next, we used the multiple imputation by chained equations (MICE) approach to impute missing data in multiple variables based on a set of univariate imputation models. These models were conditional models based on the type of variables. For example, the MICE allow use of logistic regression models to impute binary variables such as bereavement. Moreover, ordered logistic and multinomial logistic regression models can impute ordered categorical such as educational attainment and unordered categorical variables such as race.

Weighted crude and age-standardized prevalence rates were also calculated using multiple imputation process for sub-groups. Age-standardized rates were calculated using the 2000 U.S. population and formulas. The 2000 standard facilitates comparison with older studies of prevalence. Logistic regression models were adjusted for age and race to generate adjusted odds ratios.

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Results

Bereavement

Table 1: Variables used in this analysis, Complete and Missing responses, Variables, 2019 Georgia BRFSS, Unweighted Panel

Variable	Complete Response, N	Complete %	Missing Response, N	Missing %
Bereavement item*: Death of family and/ or friend, 2018 or 2019.	5,206	70.79	2,148	29.21
Demographics				
Gender	7,354	100.00	0	0
SOGI§	5,443	74.01	1,911	25.99
Age	7,354	100.00	0	0
Race /ethnicity	7,180	97.63	174	2.37
Social determinants				
Educational attainment	7,319	99.52	35	0.48
Metropolitan Statistical Area, residence	7,354	100.00	0	0
Employment status	7,202	97.93	152	2.07
Health Behaviors				
Physical activity in past month?	6,780	92.19	574	7.81
Smoking status	6,847	93.11	507	6.89
At least one drink of alcohol in past 30 days?	6,796	92.41	558	7.59
Binge drinking	6,540	88.93	814	11.07
Self-rated health	7,330	99.67	24	0.33
Physical Health not good, days in past month	6,802	92.49	552	7.51
Mental Health not good, days in past month	6,799	92.45	555	7.55
Alcohol Screening & Brief Intervention (ASBI)				
Asked about any alcohol use	5,497	74.75	1,857	25.25
Asked how much alcohol	5,466	74.33	1,888	25.67
Asked about binge drinking	5,056	68.75	2,298	31.73
Complete information, 15 variables	4,289	58.32	3,065	41.68

Note: 'Don't know', 'Refused' and 'Blank' equal missing. *New 2019 BRFSS item '*Have you experienced the death of a family member or close friend in the years 2018 or 2019*? * SOGI§: Sexual Orientation and Gender Identity. Module 29, two questions '*Which of the following best represents how you think of yourself? Do you consider yourself to be transgender?* Health behaviors reflect Healthy People 2020 target areas described in https://www.healthypeople.gov/2020/topics-objectives ; Accessed April 11, 2021. For all items see 2019 BRFSS Questionnaire https://www.cdc.gov/brfss/questionnaires/index.htm; Accessed May 14, 2021.

There were 4,289 persons with complete information on all variables included in the analyses. Among respondents to the bereavement module the distribution is as follows: 56.5% females, 91.9 % Cis-gender; 65.7% White non-Hispanic, and 20.8 % Black, non-Hispanic with a median age of 38 years. Tables 1 and 2 are focused on bereavement reporting in this survey and is organized by Demographics, Social Determinants, and Health Behaviors. The Alcohol Screening and Brief Intervention (ASBI) items were included in a state-optional module focused on health insurance and care utilization.

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Table 2: Percent Bereaved within subgroups. 2019 Georgia BRFSS, Weighted data with Multiple Imputation

	Estimated Population N = 8,164,018	
	Percent	**SE**
Percent reporting bereavement	**45.16**	**1.16**
Demographics		
Males	44.23	1.76
Females	46.03	1.52
SOGI[§]: CIS Gender	45.46	1.18
SOGI[§]: All other	41.31	4.97
18 – 24 years	36.76	5.65
25 – 34 years	37.42	4.77
35 – 44 years	42.90	3.33
45 – 54 years	**47.64**	**2.80**
55 – 64 years	**47.98**	**2.71**
65 + years	**50.18**	**2.41**
Black or African American only, NH	**56.07**	**2.42**
White only, NH	42.17	1.33
All other	33.81	3.42
Metropolitan Statistical County	44.72	1.36
Non-Metropolitan Statistical County	**47.02**	**1.85**
Graduated, College or Technical School	43.38	2.05
Attended College or Technical School	**47.62**	**2.18**
Graduated, High School	45.48	2.20
Did not graduate, High School	42.77	3.04
Employed	44.90	1.61
Unemployed	**48.23**	**5.73**
Retired	45.06	1.91
Unable to work	**52.16**	**3.33**
Homemaker or student	40.35	3.41
High risk states of Health Behaviors in past 30 days		
14 or more days / No physical activity	45.87	2.10
Current smoker / Yes	**53.61**	**3.29**
Binge drinking / Yes	46.12	3.25
SRH / Fair / Poor	**50.97**	**2.42**
14 or more days, Physical health not good	**52.56**	**2.69**
14 or more days/ Mental health not good	**54.91**	**2.92**

Note: **Bold = p>.05. Compared to state rate. Chi χ^2** New item '*Have you experienced the death of a family member or close friend in the years 2018 or 2019?* SE = Standard Error, SOGI[§], CIS Gender includes '*I think of myself as straight and not transgender.'* SOGI[§], all other includes Gay /Bisexual /Something else and transgender (male to female, female to male, gender nonconforming). NH[€] = non-Hispanic. SRH[¥] Self-rated health 5 categories: excellent, very good, good, fair, and poor. Health behaviors reflect Healthy People 2020 target areas described in https://www.healthypeople.gov/2020/topics-objectives ; accessed April 11, 2021. For wording of survey items see 2019 BRFSS Questionnaire https://www.cdc.gov/brfss/questionnaires/index.htm; accessed May 14, 2021.

Table 2 compares estimated bereavement rates and their standard errors. Estimates presented in Table 2 and all subsequent tables are derived from the sample of 4,289 participants with complete responses. The projected population of Georgia aged 18 years and older is 8,164,018 - consistent with the U.S. census bureau projections for the state. Planning for resources needed by the population can be estimated using these numbers. Proportion of demographic and geographic subgroups are also included in the table. The highest rates of bereavement are reported by persons self-identified as black or African American (57 %), and persons unable to work (52 %) or who are

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unemployed (48 %). Statistically significant rates of bereavement are also observed among persons living outside of the Atlanta Metropolitan Statistical Area (47 %), persons not completing college or technical school (47 %), and females (46 %). The final six rows in Table 2 show bereavement rates for high-risk categories of health behaviors - no physical activity, current smoking, binge drinking, and poor self-rated health. These rates and numbers can be useful for county governments administering services for persons with chronic illnesses and disabilities. For each of these high-risk health states, bereavement rates are significantly greater higher than the overall state rate of 45 %. *No physical activity* is the only exception to this trend. BRFSS also probes for physical and mental health. Bereavement rates for persons reporting 14 or more days of poor physical health or poor mental health have significantly greater rates of bereavement than all others.

Alcohol consumption

Binge drinking

Table 3: Crude and age-standardized rates per 100, Binge and Social, by Age, Gender Identity, Sexual Orientation, Self-reported Race, Ethnicity. 2019 Georgia (GA) BRFSS, Weighted population with Imputation. (Georgia Population, N = 8,164,018)

	All Drinkers N= 3,988,766	**Binge** N = 1,344,265			**Social** N = 2,551,500		
Age (Years)		**Rates**	CI Lower	CI Upper	**Rates**	CI Lower	CI Upper
18-20	163,860	**55.61**	**35.65**	**75.66**	44.20	24.20	63.99
21-24	356,944	46.49	34.79	58.58	48.58	36.75	60.42
25-34	878,634	43.69	36.49	50.89	54.94	47.79	62.09
34-44	745,217	36.08	29.25	42.90	63.04	56.15	69.92
45-54	746,216	28.32	22.42	34.22	69.86	63.86	75.85
55-64	579,245	25.75	20.07	31.43	70.26	64.30	76.23
65 +	518,650	14.12	10.34	17.90	**81.96**	**77.97**	**85.95**
Respondent Gender Identity / Sexual Orientation, Age-standardized							
Male	2,165,993	**27.40**	**27.34**	**27.46**	45.82	45.74	45.90
Female	1,822,773	20.82	20.77	20.88	50.76	50.67	50.85
Straight	3,673,708	24.48	24.43	24.52	48.09	48.02	48.15
LGBTQ /Other	315,058	25.63	25.45	25.82	47.71	47.42	48.01
Respondent Race, Age Standardized							
Black, NH	1,179,384	21.50	21.43	21.57	**50.80**	**50.68**	**50.92**
White, NH	2,238,967	**25.85**	**25.79**	**25.91**	46.85	46.77	46.93
All other	570,415	**27.72**	**27.58**	**27.85**	45.03	44.84	45.23

Note: **Bold numbers, p<.05**; SOGI and Race reported as standardized rates to the 2000 US Population. Rate per 100 persons. CI = 95 % Confidence Interval Lower and Upper Limits. Self-identified race. NH = Non-Hispanic Ethnicity. Definitions: Binge drinking: '*Considering all types of alcohol beverages, how many times during the past 30 days did you have X drinks* (x = 5 for men; x = 4 for women). Social drinking: Less than 7 drinks in a week'. Rate per 100 persons. CI = 95 % confidence interval with lower and upper limits. Heavy drinking (> 7 drinks a week) not shown in the table, N = 484,290.

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Table 3 shows the numbers and rates of binge drinking and social drinking among the estimated 4 million persons who reported any alcohol consumption. Estimates of social drinking (< 7 per week) are included for comparison with bingeing rates. The first 7 rows labeled Age, presents crude rates of consumption for each age category. Age is a significantly associated with pattern of consumption. The youngest participants – age 18 to 20 years – have the highest rate of bingeing (55.6 %). Rates are significantly lower in subsequent age groups to a low of 14.12 % among persons aged 65 and older. The legal age for drinking is 21 years in Georgia. Despite that legal barrier, there are 163,860 individuals who drink and are younger than the legal limit. The remaining demographic categories – gender identity, sexual orientation, and self-reported race – show rates of bingeing and social drinking using age-standardized rates. Males (27.4 %) have significantly greater rates than females (20.8 %) and LGBTQ (25.6 %) are significantly greater than straight (24.5 %). Among race and ethnicity categories Blacks (21.5%) are significantly lower than Whites (25.8 %) and All Other (27.7 %).

Alcohol and bereavement

Table 4. Age-standardized rates per 100 Binge and Social drinking by response categories to bereavement items - Numbers of deaths reported and Relationship to Decedent.
2019 Georgia BRFSS, Weighted, Imputed, Total Population aged 18 and older = 8, 164,018.

	All Drinkers 3,988,766	**Binge** 1,344265	**CL_{Lower}**	**CL_{Upper}**	**Social** 2,551,500	**CL_{Lower}**	**CL_{Upper}**
Number of deaths reported							
None¥	2,191,949	23.60	23.54	23.65	48.93	48.84	49.01
One	837,801	23.83	23.74	23.92	48.65	48.52	48.78
Two	481,214	21.38	21.27	21.50	**50.46**	**50.28**	**50.64**
Three Plus	477,802	**31.80**	**31.66**	**31.94**	41.01	40.85	41.17
Relationship to Decedent							
Family only	852,589	19.81	19.73	19.89	**52.14**	**52.01**	**52.28**
Friend / neighbor	372,431	**30.70**	**30.54**	**30.85**	42.19	42.19	42.01

Note: **Bold numbers, p<.05; ¥ Ref = No bereavement;** Rate standardized to the 2000 US Population. Rate per 100 persons. CI = 95 % Confidence Interval Lower and Upper Limits. Relationship categories are mutually exclusive. Binge drinking: 'Considering all types of alcohol beverages, how many times during the past 30 days did you have X drinks (x = 5 for men; x = 4 for women). Social drinking: Less than 7 drinks in a week'. Heavy drinking (> 7 drinks a week) not shown in the table, N = 484,290.

Among the population of 4 million persons who drink, Table 4 data presents estimates of the co-occurrence of binge or social drinking (columns) and intensity of bereavement (rows). Heavy drinking is not shown. Persons without bereavement have a binge drinking rate of 23.6 % and a social drinking rate of 48.9 %. The rates of bingeing among persons reporting one death is not significantly different than those without a death (23.8 %). Persons reporting three deaths have significantly higher rates of bingeing (31.8 %). Table 4 also shows rates of bingeing within mutually exclusive categories

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of kinship – family only versus friend or neighbor. The friend / neighbor category is termed *fictive kin* by social scientists. Fictive kin deaths are associated with significantly higher rates of bingeing (30.7 %) compared to family deaths (19.8 %).

Alcohol, bereavement, and health behavior

Bingeing, bereavement, and health behavior

Table 5: Age-Standardized Bereavement Rates per 100, Binge and Social Drinkers, by Categories of Health-Related Behaviors and Screening by Physicians, 2019 Georgia BRFSS, Weighted, Imputed

	Georgia Population	**Binge Drinking**	**CI$_{Lower}$**	**CI $_{Upper}$**	**Social**	**CI $_{Lower}$**	**CI $_{Upper}$**
			Current smoker?				
Yes	513,774	**43.04**	**42.88**	**43.20**	29.92	29.77	30.07
No	3,474,992	21.52	21.48	21.56	**50.89**	**50.83**	**50.96**
			Self-rated health fair or poor				
Yes	594,897	**30.11**	**29.98**	**30.24**	42.22	42.08	42.37
No	3,393,869	23.31	23.27	23.36	**49.10**	**49.04**	**49.17**
			Mental Health not good for 14 or more days in the past 30 days				
Yes	629,842	**33.76**	**33.63**	**33.90**	38.27	38.11	38.43
No	3,358,924	22.50	22.46	22.55	**49.89**	**49.04**	**49.96**
			Physical Health not good for 14 or more days in the past 30 days				
Yes	374,243	**31.30**	**31.12**	**31.48**	41.58	41.39	41.77
No	3,614,523	23.86	23.81	23.90	**48.61**	**48.55**	**48.68**
			Alcohol screening & Brief Intervention (ASBI): Doctor asked about				
	Any use?						
Yes	2,672,093	23.69	23.64	23.74	**49.57**	**49.49**	**49.64**
No	1,316,673	**25.72**	**25.64**	**25.80**	46.16	40.06	46.27
	Quantity?						
Yes	2,488,729	22.97	22.92	23.02	**49.57**	**49.49**	**49.64**
No	1,500,037	**26.44**	**26.37**	**26.52**	46.16	40.06	46.27
	Bingeing?						
Yes	1,437,689	24.44	24.37	24.52	47.91	47.81	48.01
No	2,551,077	24.39	24.34	24.45	48.21	48.13	48.28

Note: Bold numbers, p<.05; Rate standardized to the 2000 US Population. Rate per 100. CI = 95 % Confidence Interval Lower and Upper Limits. Binge drinking: 'How many times during the past 30 days did you have X drinks (x = 5 for men; x = 4 for women). Social drinking: Less than 7 drinks in a week'**.** Behaviors source: https://www.healthypeople.gov/2020/topics-objectives.

Table 5 is organized so that the reader can compare bereavement rates for high- and low-risk states of health behavior for binge drinkers. These rates are age-standardized to remove biases attributable to age. Each health behavior category is shown as a yes or no – current smoking, fair / poor self-rated health, 14 days of not good mental health, and 14 days of not good physical health. All health behaviors shown in the table share a 30-day reference period. Persons with combined high-risk health states who also binge drink also have significantly higher rates of bereavement. Bereavement rate is greater in the category of combined smoking and binge drink (43.0 %) versus binge drinking but do not smoke (21.5 %). Bereavement rate is greater among those with a combination of bingeing and poor self-rated health (30.1 %); combined bingeing with poor mental

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health (33.7 %) or combined bingeing with poor physical health (31.3 %). These are cross-sectional associations – not causal. However, the consistent association of bingeing, poor health and loss suggests a potential mechanism linking health care utilization after bereavement. What do respondents say about being screened by a physician for alcohol use (Any use)? These reports show a paradoxical pattern. Table 5 hints that provider screening for bereavement may yield insights concerning binge drinking during a health care encounter. The question about *any* alcohol use includes queries about quantity and specifically bingeing. These data were included in Table 5 because other reports show that newly bereaved persons are more likely to visit their physician.

Social drinking and bereavement

While bereavement and its potential to co-occur with binge drinking is the focus on this report, the rates of bereavement among social drinkers throughout the report deserve comment. Social drinking is defined as less than 7 drinks in a week. The pattern of bereavement among social drinkers is distinctly different that of binge drinkers. This difference can be seen in Tables 3 through 5. Table 3 shows the subgroup rates of social drinking for the 2.5 million persons who define their pattern as social drinking (64 %). The rate of social drinking is significantly greater with each successively older age category reaching a maximum of 81.96 % among persons aged 65 years and older. Women (50.76 %) are significantly more likely to define their pattern as social when compared to men (45.82 %). Blacks (50.80 %) have the highest rates of social drinking when compared to Whites (46.8 %). In Table 4, social drinking is highest among persons reporting two deaths (50.5 %) and family deaths (52.0 %). In Table 5, the co-occurrence of social drinking and bereavement is complicated. High rates of bereavement were reported by persons who do not smoke (50.9 %) and those with better self-rated health (49.9 %). High bereavement rates co-occur with the reports of fewer days of poor physical (48.5 %) or poor mental health (49.0 %). It is notable that these bereavement rates are also greater than the population rate of 45 %. When thinking about the co-occurrence of social drinking and bereavement, it is important to keep in mind that alcohol use is not without risk. Social drinking and bereavement need its own analyses to evaluate these relationships.

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Table 6: Binge drinking, bereavement, and their combined effects, risky health behavior, 2019 Georgia BRFSS, Weighted with Imputation (N = 4,995,641).

	Model 1: Physical Inactivity		**Model 2:** Current Smoker		**Model 3:** Self-rated health, poor		**Model 4:** Physical Health, poor		**Model 5:** Mental Health, poor	
Groups	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
No Binge, No Bereaved	**Ref**		**Ref**		**Ref**		**Ref**		**Ref**	
Yes Binge, No Bereaved	0.79	0.54-1.16	**2.37**	**1.47-3.81**	0.81	0.52-1.28	0.79	0.49-1.28	**2.00**	**1.26-3.15**
Yes Binge, Yes Bereaved	1.03	0.69-1.54	**5.14**	**3.39-7.79**	1.00	0.66-1.54	0.93	0.56-1.56	**3.28**	**2.17-4.97**
Female	**Ref**		**Ref**		**Ref**		**Ref**		**Ref**	
Male	0.89	0.72-1.11	1.18	0.86-1.60	1.15	0.89-1.48	0.91	0.68-1.22	0.72	0.53-0.97
Black, NH	**Ref**		**Ref**		**Ref**		**Ref**		**Ref**	
White, NH	0.85	0.65-1.12	**1.70**	**1.13-2.56**	1.06	0.78-1.45	1.36	0.94-1.96	1.19	0.81-1.75
All other	0.82	0.55-1.22	0.94	0.50-1.76	1.43	0.93-2.21	1.17	0.69-1.99	1.17	0.70-1.96

Note: Bold, p<.01, AOR = adjusted Odds ratio. AOR uses rate standardized to the 2000 US Population. Categories of co-occurrence adjusted for gender and race. All health behaviors use *past 30 days* as time reference. *Poor* uses 14 or more days in the 30 days prior to interview. To illustrate the rationale for final adjustments to models, table also includes odds ratios for comparing men and women, as well as three levels of self-report race. Health behaviors: https://www.healthypeople.gov/2020/topics-objectives. Reference: 3,676,728 persons no binge drinking and not bereaved.

If you could ask one question and uncover multiple health risks, what would it be? Table 6 shows that new bereavement might be that question. In Table 6 each model estimates the adjusted odds ratio (AOR) for a singular high-risk health state – physical inactivity, smoking, poor overall health, poor physical health, and poor mental health. All models are adjusted for age and race / ethnicity. The three-group comparison shown at the top of the table can be viewed as the additional odds for health state added by bereavement. Persons who binge but are not bereavement are 2.37 times more likely to also smoke and have poor mental health. In comparison with persons who are also bereaved, the odds of being a current smoker doubles to 5.14 AOR. The risk for co-occurrence of poor mental health increases from AOR of 2.0 to 3.28.

These models are adjusted for age, gender, and race. The results of separate analyses comparing males and females; or three race ethnicity groupings are shown at the bottom of Table 6. For this illustrate, the models are only adjusted for age. Analyses show no added effect of bereavement comparing males and females. There is a persistent difference for race. For whites, there is a clear risk triad of bereavement, bingeing, and smoking. The important message of these models is that screening for bereavement could detect other high-risk health states but that its effectiveness as a screening tool have less sensitivity and specificity within subgroups.

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Discussion

The hypothesis guiding the aim of this investigation is that bereavement increases the likelihood of high-risk alcohol consumption. This inference is based on prior studies of bereavement-related behaviors. Our results provide additional support for this hypothesis. The inclusion of bereavement in an annual prevalence survey is new. However, a cross sectional survey like BRFSS cannot be used to establish a causal relationship. Its addition provides opportunity for surveillance. Surveillance is the rationale for conducting surveys like BRFSS. Emerging threats to the population health can be identified with surveillance. Monitoring patterns of alcohol use show a clear trend in binge drinking. By adding new bereavement, a potential trigger for bingeing is identified. Repeated measurement of new bereavement in future annual surveys is needed to provide evidence that co-occurrence is a trend requiring public health attention.

Gaps remain in our understanding of the association between new bereavement and binge drinking. Data in these analyses are subject to limitations that include recall bias, missing responses, and the extraordinary historical events occurring since the survey in 2019. There are traditional methods available to evaluate limitations like recall bias and missing responses. Sources of recall bias can be better understood with a targeted study of death certificates. The design of the National Mortality Follow Back Survey can be modified for this purpose. The bereavement item is new. All new BRFSS items are placed at the end of the interview session. The rate of missing responses is largely due to random dropouts at points prior to the bereavement item. Rates of bereavement in this report are calculated using multiple imputation combined with complex sampling weights. This approach was particularly valuable because there are no other points of reference. Repeated assessment of new bereavement in future surveys will give us additional rates for comparison. The bereavement item also needs to be included in BRFSS from other states to provide additional reference points. Work is underway to support a nationwide effort. The extraordinary historical event – a global pandemic of COVID19 -occurred after this survey was completed. It is reasonable to assume that the pandemic will have an outsized influence on rates of new bereavement as well as rates of binge drinking. Other than increased rates, the biases created by history will become evident over time. This is one more reason for repeated surveillance for new bereavement. Bereavement due to the pandemic, climate change related mortality, and war increases the salience of measuring bereavement in complex sampling surveys like BRFSS.

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Despite these limitations, this report shows the co-occurrence of bereavement and bingeing at a rate greater than would be expected by chance alone. New bereavement is a feature of the human condition. While increased in life expectancy is a welcomed public health achievement, the risk of bereavement increases across the life course. The deaths of parents and older relatives is happening with increasing intensity in countries where there are large number of older adults. The growth of an aging population and their associated deaths was our initial rationale for examining bereavement and its relationship to mortality [1], health care utilization [4], and insomnia [9]. We also examined health mastery and its contribution to resistance of negative health effects [10]. A rationale for the present study is the nagging question of mechanism. How does bereavement lead to negative health? In population-based work, mechanism requires greater precision in defining a time frame both the exposure (bereavement) and the behavior (alcohol consumption). The BRFSS items reference an intentional period for the exposure – 24 months before the interview and a period for health behaviors – the 30 days before the interview. To put it succinctly, do high-risk behaviors occur in the 30 days before interview? Is the prevalence of these behaviors significantly greater among the newly bereaved? There are hints that multiple high risk health behaviors are increased by bereavement. These additional high-risk behaviors include smoking plus poor physical and mental health. Bereavement care that includes attention to alcohol use may also have a positive impact on other negative health behaviors and influence multiple mechanisms driving individual-level morbidity and mortality after bereavement [32].

Alcohol use literature contains paradoxical reports of both protective and detrimental effects. This conflict between protective and detrimental effects complicates interpretation of the opposing age and gender trends for bingeing and social drinking observed in this report. Moderate or social drinking is defined as 7 or fewer drinks in a 7-day period. The oldest age category (65 years and older) and females have the highest rates of social drinking. These two groups also have the highest rates of new bereavement – 65 years and older (50%) and women (46%). Analyses of this paradox is out of the scope of this report. However, one paradox is the literature promoting moderate alcohol use as a protective effect for cognitive function among older adults [5]. This is directly opposite to the literature describing the fall risk associated with alcohol use [6]. Another paradox is the framing of alcohol use as both an exposure and an outcome for individual health. Several reports provide evidence that excess drinking increases risk of pre-mature mortality [7]. Young adults and males are

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at highest risk for this outcome. There is an emerging literature providing evidence that bereaved males of all ages are more vulnerable to hazardous drinking, dependence symptoms, and harmful use [11]. Our results suggest that screening for bereavement is likely to identify persons with harmful patterns of drinking – an improvement over screening for alcohol use alone.

The complexity of these contradictions is further muddied by variations in individual biology and cultural norms. Alcohol metabolism varies across individuals and populations [33]. This variability influences clinical and public health definitions of abuse and the manifestation of negative effects. There is a long history of cultural norms and expectations for bereavement related behavior that can initiate or exacerbate use of alcohol. In western cultures, funerary rites explicitly include alcohol consumption [34]. This expectation is present in cultures worldwide [35,36]. These paradoxes require evaluation and refinement to support the development of population-level interventions to diminish bereavement-related alcohol injury.

What has this report added to our public health perspective on bereavement and binge drinking? Where do gaps remain? There is extensive evidence for poor mental health after the death of friends and family [3, 8, 10]. The evidence that bereavement could act to increase risk of binge drinking is an advance in public health perspectives on mechanisms driving health behavior change. With this simple idea, future research can measure and target the co-occurrence of bereavement with detrimental alcohol use. This approach can be applied at multiple levels ranging from a global perspective to something very localized. The World Health Organization, Centers for Disease Control and Prevention, and the Georgia Department of Public Health already have existing strategies for reduction of bingeing. There are other alcohol control related policies being evaluated in 194 countries [17]. Sales restrictions were the most common policy implemented across geopolitical blocs. These policies are also consistent with the SAFER initiative – Strengthen restriction, Advance drink driving counter measures, facilitate access to screening, interventions, and treatment, enforce bans or comprehensive restrictions on alcohol sales and raise prices on alcohol through excise taxes or pricing policies (https://www.who.int/initiative/SAFER). Target 3.5 of Health-related Sustainable Development Goals (SDG) calls for nations to strengthen the prevention of harmful use of alcohol. On a country- or state-level, measuring alcohol outlet density and implementing unit pricing / alcohol taxes is a strategy. This approach demonstrated effectiveness after the global financial crises of 2008 in the United Kingdom [37]. Alcohol control policies increase its price or place limits on amounts for

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household purchase through a Minimum Unit Pricing policy were effective without being burdensome or resorting to extremes like prohibition [37]. Responding to widespread bereavement may be a path towards the goal of sustainable prevention in harmful use of alcohol [38]. Screening for new bereavement can serve to initiate action at all levels of health care.

Conclusions

We found that bereavement increases the likelihood of binge drinking. While bingeing is a known risk to public health, its co-occurrence with recent bereavement is a new observation. Public health surveillance systems need to monitor this co-occurrence to protect both individual and societal health.

Abbreviations

BRFSS: Behavioral Risk Factor Surveillance Survey; NMFS: National Mortality Follow Back Survey; HRS: Health and Retirement Survey; ASBI: Alcohol Screening and Brief Intervention; SOGI: Sexual orientation and gender identity; MICE: Multiple imputation by chained equations; AO: Adjusted Odds Ratio; SDG: Sustainable Development Goals.

Declarations

Ethics approval and consent to participate: BRFSS is an annual surveillance survey of participants with cellphones and landlines. Consent to participate is inferred by response to survey questions.

Consent for publication: Not applicable.

Availability of data and materials: Data are de-identified and publicly available. [RRID:SCR_012974] This data can be found in the Centers for Disease Control and Prevention, https://www.cdc.gov/brfss/data_tools.htm. [RRID: SCR_012976].

Competing interests: All authors declare no competing interests.

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Author contributions: TM designed the study, developed the methodology, and wrote the manuscript. CL led the data analysis. RB, MK, and DC made important contributions to the revision of the manuscript. All authors read and approved the final manuscript.

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Authors' information: TM is the Pope Visiting Scholar, Rosalynn Carter Institute (RCI) for Caregivers [https://www.rosalynncarter.org/] and Professor Emerita, UGA College of Public Health. While a scholar-in-residence at RCI, TM is working on analyses connecting bereavement and caregivers. These results will be used by advocacy groups to inform public policy supporting caregiver health and wellbeing. During the pandemic and supported by the Centers for Medicare and Medicaid, TM disseminated created a guide for Best Practices in Bereavement Care to 4,000 nursing homes, personal care homes, and assisted living sites in Georgia. TM has also conducted recent interviews on this topic with Scott Tang on *Here & Now NPR*, Allison Gilbert of the New York Times, and Judith Graham of Kaiser Health News.

References

1. Allegra JC, Ezeamama A, Simpson C, Miles TP. 2015. Population-level impact of loss on survivor mortality risk. Qual Life Research. 2015; 24(12):2959-61.
2. Rostila M, Saarela JM. Time does not heal all wounds: Mortality following the death of a parent. J Marriage and Family. 2011; 73:236-49.
3. Fadlon I, Nielsen TH. Family health behaviors. Amer Econ Rev. 2019; 109(9):3162-91.
4. Miles TP, Allegra JC, Ezeamama A, Simpson C, Gerst-Emerson K, Elkins J. In a longevity society, loss and grief are emerging risk factors for health care use: findings from the Health and Retirement Survey cohort aged 50 to 70 years. Am J Hosp Palliat Care. 2016;33(1):41-6.
5. Zhang R, Shen L, Shen Y, Cordero J, Qi Y, Liang L, Li C. Association of Low to moderate alcohol drinking with cognitive functions from middle to older age among US adults. JAMA Netw Open. 2020; 3(6):e207922.
6. Osman A, Kankar N, Speechley M, Ali S, Montero-Odasso M. Fall risk increasing drugs and gait performance in community dwelling older adults: A systematic review. Ageing Res Rev. 2022; 77:101599.
7. Esser MB, Sherk A, Liu Y, Naimi TS, Stockwell T, Stahre M, et al. Deaths and Years of Potential Life Lost from Excessive Alcohol Use – United States, 2011 – 2015. MMWR Morb Mortal Wkly Rep. 2020; 69(39):1428-33.
8. Smith KP, Christakis NA. Social networks and health. Ann. Rev. Sociology. 2008; 34:405-29.

 doi:10.20944/preprints202301.0035.v2

9. Simpson C, Allegra JC, Ezeamama AE, Elkins J, Miles TP. The Impact of Mid-and Late-Life Loss on Insomnia: findings from the health and retirement study, 2010 cohort. Fam Community Health. 2014; 37(4): 317-26.
10. Ezeamama AE, Elkins J, Simpson C, Smith SL, Allegra JC, Miles TP. Indicators of resilience and healthcare outcomes: findings from the 2010 health and retirement survey. Qual Life Res. 2016; 25(4): 1007-15.
11. Pilling J, Thege BK, Demetrovics Z, Kopp MS. Alcohol use in the first three years of bereavement: a national representative survey. Subst Abuse Treat Prev Policy. 2012; 7:3.
12. Hoyert DL. 75 years of mortality in the United States, 1935 – 2010. NCHS data brief. 2012; 88:1-8. https://pubmed.ncbi.nlm.nih.gov/22617094/. Accessed May 18, 2022.
13. Vedery AM, Smith-Greenaway E, Margolis R, Daw J. Tracking the reach of COVID 19 kin loss with a bereavement multiplier applied to the U.S. PNAS. 2020; 117(30):17695-701.
14. Ceballos NA, Barbor TF. Editor's Corner: Binge drinking and the evolving language of alcohol research. J Stud Alcohol and Drugs. 2017; 78(4):488-90.
15. United States Department of Health and Human Services, Centers for Disease Control and Prevention, National Mortality Followback Survey, 1993. Inter-university Consortium for Political and Social Research [distributor], 2005. DOI: 10.3886/ICPSR02900.v1 Accessed March 27, 2022.
16. Health and Retirement Survey (HRS) Sample sizes and response rates. 2011. Accessed March 22, 2022. https://hrsonline.isr.umich.edu/sitedocs/sampleresponse.pdf.
17. Allen LN, Wigley S, Holmer H. Implementation of non-communicable disease policies from 2015 to 2020: A geopolitical analysis of 194 countries. Lancet: Glob Health. 2021; 9(11):e1528-e1538.
18. Lim W-Y, Subramaraniam M, Abdin E, He VY, Vaingankar J, Chong SA. Lifetime and twelve-month prevalence of heavy drinking in Singapore: Results from a representative cross-sectional study. BMC Public Health. 2013; 13:992.
19. Rivera-Rivera L, Series-Martinez M, Reynales-Shigematsu LM, Villalobos A, Jaen-Cortes CI, Natera-Rey G. Factors associated with binge drinking: National Health and Nutrition Survey 2020. Salud Publica Mex. 2021; 63(6):789-98.
20. Centers for Disease Control and Prevention. The cost of excessive alcohol use. (2019) https://www.cdc.gov/alcohol/onlinemedia/infographics/cost-excessive-alcohol-use.html, Accessed April 2022.

 doi:10.20944/preprints202301.0035.v2

21. Kanny D, Naimi TS, Liu Y, Brewer RD. Trends in Total Binge drinks per adult who reported binge drinking – United States, 2011 – 2017. MMWR Morb Mortal Wkly Rep. 2020; 69(2):30-4.
22. Bohm MK, Liu Y, Esser MB, Mesnick JB, Lu H, Pan Y, Greenlund KJ. Binge drinking among adults, by selected characteristic and state – United States, 2018. MMWR Morb Mortal Wkly Rep. 2021; 70(41):1441-6.
23. Aiken A, Clare PJ, Wadolowski M, Hutchinson D, Najman JM, Slade T, Bruno R, McBride N, Kypri K, Mattick RP. Age of Alcohol Initiation and Progression to Binge Drinking in Adolescence: A Prospective Cohort Study. Alcohol Clin Exp Res. 2018; 42(1):100-10
24. Sonthon P, Janma N, Saengow U. Association between age at first alcohol use and heavy episodic drinking: An analysis of Thailand's smoking and alcohol drinking behavior survey 2017. PLoS One. 2021; 16(11): e0259589.
25. Dom G, Samochowiec J, Evans-Lacko S, Wahlbeck K, Van Hal G, McDaid D. Impact of the 2008 Economic Crisis on Substance Use Patterns in the countries of the European Union. Int. J Environ Res Public Health. 2016; 13(1):122.
26. Feigelmann W, Cerel J, McIntosh JL, Brent D, Gutin N. Suicide exposures and bereavement among American Adults: Evidence from the 2016 General Social Survey. J Affective Disorders. 2018; 277:1-6.
27. Li C, Miles TP, Shen Y, Bayakly R, Ido M, Khan MM. A new measure of population health in a complex sampling survey: The 2019 Georgia Behavioral Risk Factor Surveillance Survey – Unweighted, weighted, and imputed weighted data. Research Square Preprint. (2021) Available at DOI: 10.21203/rs3.rs-793157/v1. Accessed May 8, 2022.
28. StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC.
29. White IR, Royston P, Wood AM. 2011. Multiple imputation using chained equations: issues and guidance for practice. Stat Med. 2011; 30(4): 377-99.
30. Kim JK, Brick MJ, Fuller WA, and Kalton G. On the basis of the multiple imputation variance estimator in survey sampling, J Royal Statistical Soc: Series B. 2006; 68: 509-21
31. Quartagno M, Carpenter JR, Goldstein H. 2019. Multiple imputation with survey weights: A multilevel approach. J Surv Stat Methodol. 2020; 8(5):965-89.

 doi:10.20944/preprints202301.0035.v2

32. Minian N, deRuiter WK, Lingam M, Corrin T, Dragonetti R, Manson H, et al. The effects of interventions targeting multiple health behaviors on smoking cessation outcomes: a rapid realist review protocol. 2018; 7(1):38.
33. Edenberg HJ, McClintock JN. Alcohol dehydrogenases, aldehyde dehydrogenases, and alcohol use disorders: a critical review. Alcohol Clin Exp Res. 2018; 42(12):2281-97.
34. Frisby H. Victorian funeral food customs. Victorian Rev. 2019; 45(2):221-6.
35. Ssebunnya J, Kituyi C, Nabanoba J, Nakku J, Bhana A, Kigozi F. Social acceptance of alcohol in Uganda. BMC Psychiatry. 2020; 20(1): 52.
36. Xing ZH, Her M, Xiong MK, Vue WH, Yang CT, Moua NH, et al. Exploring Hmong Americans' Attitudes towards Traditional Full-Service Funerals: The Hmong Cultural Integration Project. Hmong Studies Journal. 2020; 22:1 – 32.
37. O'Donnell A, Anderson P, Jane-Lopis E, Manthey J, Kaner E, Rohm J. Immediate impact of minimum unit pricing on alcohol purchases in Scotland: Controlled interrupted time series analyses for 2015 - 2018. BMJ. 2019; 366:15274.
38. Drooges M, Jensen D, Lindert J, Soboga-Nunes L, Ruden M, Guichardon M, et al. Health-related sustainable development goals: countdown on alcohol use, child overweight, and suicide mortality. Eur J Public Health. 2020; 30(Suppl_1): i10-i13.

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TABLES 1 through 6 are embedded within the text.

Results Section: Bereavement

Table 1: Variables used in this analysis, Complete and Missing responses, 2019 Georgia BRFSS, Unweighted Panel

Table 2: Percent Bereaved by subgroups of demography and high-risk health behaviors. 2019 Georgia BRFSS, Weighted data with Multiple Imputation

Results Section: Alcohol consumption

Table 3: Rates per 100, Two categories of alcohol use, by Age, Gender Identity, Sexual Orientation, Self-reported Race, Ethnicity. 2019 Georgia (GA) BRFSS, Weighted population with Imputation. Georgia Population reporting any drinking, N = 3,988,766

Table 4: Age-standardized rates per 100, Two categories of alcohol use, by response categories of bereavement items - Numbers of deaths reported and Relationship to Decedent. 2019 Georgia BRFSS, Weighted, Imputed, Total Population aged 18 and older.

Results Section: Alcohol, Bereavement and Health Behaviors

Table 5: Age-Standardized Bereavement Rates per 100, Two categories of alcohol use, by Categories of Health-Related Behaviors and Physician Screening, 2019 Georgia BRFSS, Weighted, Imputed.

Table 6: Binge drinking, bereavement, and their combined effects, risky health behavior, 2019 Georgia BRFSS, Weighted with Imputation, N = 4,995,641.

Appendix

Table: Gender, Sexual Orientation Questions of the BRFSS.

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APPENDIX: Gender, Sexual Orientation Questions of the BRFSS, by Year Sex Question (Demographics Section); **Sex Question (Screening Section) 2019**: Are you male or female?
SOGI Optional Module 2018-2019:

For male respondents
Which of the following best represents how you think of yourself?
1 = Gay
2 = Straight, that is, not gay
3 = Bisexual
4 = Something else
7 = I don't know the answer
9 = Refused Ask if Sex= 1.
For female respondents
Which of the following best represents how you think of yourself?
1 = Lesbian or Gay
2 = Straight, that is, not gay
3 = Bisexual
4 = Something else
7 = I don't know the answer
9 = Refused
Do you consider yourself to be transgender?
1 Yes, Transgender, male-to-female
2 Yes, Transgender, female-to-male
3 Yes, Transgender, gender nonconforming
4 No
Source: https://www.cdc.gov/brfss/data_documentation/pdf/BRFSS-SOGI-Stat-Brief-508.pdf .
Accessed March 24, 2022.