



One Death Is Too Many Together, We Can Do Better

Methodology, Data, Limitations, & Citations

Retrospective Methodology

The Phase 1 design called for the secondary analysis of vital statistics records (data related to the death of the individual), including:

1. Death data from participating state vital statistics records for the years 2014-2018.
2. Military service records of the deceased from the Defense Manpower Data Center (DMDC).

A. Two primary datasets were used for the analysis

1) State dataset: This dataset was obtained from the following states: Alabama, Florida, Maine, Massachusetts, Michigan, Minnesota, Montana, and Oregon for the period of years covering 2014-2018. The state dataset includes demographic information such as Social Security Number (SSN), gender, age, marital status, race, highest education level, state-reported veteran status (FSM status reported to the state but not verified by the DoD), date of death, manner of death, method, or cause of death (as an ICD-10 code), residential zip code or county, and in some cases death zip code or county.

2) DoD dataset: This dataset pertaining to the former service members was obtained from the Defense Manpower Data Center (DMDC), for the same period (i.e., 2014-2018). The DMDC data includes service information such as DoD verified former service member (yes or no), service component, the branch of service, character of service, date of separation, deployment details, active-duty details, and casualty details. The DoD dataset was comprised of data from the following data sources provided by DMDC:

- i. Active-Duty Military Personnel Master File – Provided an inventory of all individuals on active duty (excluding reservists on active duty for training) and their personnel information.
- ii. Active-Duty Military Personnel Transaction File – Contained an Active-Duty transaction record for every individual's entrance, separation, or reenlistment information throughout the DoD.

- iii. Reserve Components Common Personnel Data System Master File – Provided the DoD with a standardized and centralized database containing personnel information on all current and past members of the Reserve Components in the DoD Military services.
- iv. Reserve Components Common Personnel Data System Transaction File – Contained a Reserve Component transaction record for every individual's entrance, separation, or reenlistment information throughout the DoD.
- v. Active Service Registry – Contained activation events for Reserve and Guard components of the Uniformed Services. Activation events are defined by the DoD Manual 7730.54 to include, but not limited to, work normally assigned to active-duty members and training.
- vi. Contingency Tracking System – Contained military and DoD civilian deployment data such as OEF, OIF, etc.
- vii. Defense Casualty Analysis System – Contained data that could be used to understand trends in casualties as they relate to terrain, advances in medicine, the advent of better technology that has enhanced the safety of the war fighter, or the challenges brought about by new threats.

B. How the “state dataset” was curated:

- 1) The state data provided by each state that participated (Alabama, Florida, Maine, Massachusetts, Michigan, Minnesota, Montana, and Oregon) was used in this study for the years 2014-2018 (5 years). Note that Alabama only includes the years 2016-2018 (3 years). Data from Alabama for the years 2014-2015 were excluded because the Manner of Death was missing for those two years of data.
- 2) Demographic data (such as SSN, gender, age, marital status, race, highest education level, date of death, manner of death, method, or cause of death as an ICD-10 code, residential zip code or county, and in some cases death zip code or county) were cleaned, validated, and transformed into a common format to ensure consistency across the data for the eight states.

3) Residential location and death location (when provided) in some cases, was a zip code and in other cases could be a county name. These data fields were then translated to the county FIPS code, which is a five-digit Federal Information Processing Standards code that uniquely identifies counties and county-equivalents in the United States.

C. How the DoD dataset was curated:

1) In order to validate the curated state datasets, a list of valid formatted SSNs was provided to DMDC. DMDC then verified whether the SSNs provided were for a former service member and, if so, provided data sets, including the service history data. The service history data came from the data files which were defined above in “Official data source definition from the DMDC.”

CI. Both data sets (the state dataset and the DoD dataset) were further refined to exclude data that met the following criteria:

1) Only included records with a valid formatted SSN, so blank or invalid formatted SSNs were excluded.

i. Exclusion Rationale: DMDC required the SSN to verify whether the decedent is an FSM or not (FSM = Yes or No).

ii. In the 18-64 age group this exclusion accounted for about 2.5% of the total records.

2) Excluded “Unknown” former service members. These were caused when the SSN was a duplicate, meaning the SSN appeared more than once in the data set provided by the State data.

3) Exclusion Rationale: Since DMDC relied solely on SSNs for former service member validation, then duplicate SSNs in the data set (from the same state) were removed, and the record was flagged as an “Unknown” former service member.

4) In the 18-64 age group, this exclusion accounted for about 0.001% of the total records.

3) Excluded ages 65 and above (which means we only included ages 18-64).

i. Exclusion Rationale: Excluded ages 65 and over due to limitations of the DoD data collected prior to 1971. Therefore, our data is limited to former service members who died between 2014-2018 and were not over 65 years old at the time of death.

ii. This exclusion represents about 57% of the total former service member records for all ages 18+.

4) Excluded former service member records where their only Uniform Service Organization Component was "Temporary" or "Unknown/Not Applicable."

i. Exclusion Rationale: Since we could not place the former service member into one of the Regular, Reserve, or Guard components, then we excluded those that were only "Temporary" or only "Unknown/Not Applicable." "Temporary" only component records are all from 1971-1974.

ii. In the 18-64 age group of former service members, this exclusion accounted for about 0.21% of the total former service member records in the 18-64 age group.

5) Exclude former service records where days since the date of separation from the military and date of death were less than 2 days.

i. Exclusion Rationale: The assumption here was that some of these could have been active-duty deaths, and we wanted to exclude those from our analysis.

ii. In the 18-64 age group of former service members, this exclusion accounted for about 2% of the total former service member records in the 18-64 age group.

E. **Self-Injury Mortality** Per Rockett et al. (2021), self-injury mortality (SIM) was defined as "a composite of all suicides (ICD-10 U03, X60-X84, Y 87.0) by any method, irrespective of decedent age; 80% of accidental ('unintentional' under CDC nomenclature) opioid and other drug intoxication deaths (X40-X45) and 90% of corresponding deaths of undetermined intent (Y10-15) amongst

persons ages 15 years and older” (p. 3). For this study, SIM only focused on the primary cause of death ICD field. For any given record with a SIM applicable ICD, the resulting value was either 1, 0.9, or 0.8, depending on the type of applicable SIM value. Using the quantity of deaths provided by UA, America’s Warrior Partnership characterized suicide (as determined by the medical examiner or coroner) totals from SIM associated accident and undetermined deaths to highlight the impact of SIM related accident and undetermined on the former service member community.

F. Populations: Wherever rates were used for comparison purposes, such rates were derived for each year using the American Community Survey (ACS) 5-year population estimates of the respective categories. The annual rate for a category was derived per 100,000 population using the following formula:

Rate = Death Counts x 100,000/Population Estimate

Undercounting Statement

Death certificate data originated from coroners and medical examiners and is aggregated centrally within each state. Data from the states were then sent to the CDC to fuel data analysis and reporting engines such as the National Death Index (NDI), National Violent Death Reporting System (NVDRS), and others. At no point within this flow was the FSM status of decedents verified. Consequently, data in state and federal systems were off by whatever error rates resulted from the initial entries.

Data errors, particularly undercounting, can result in trends continuing without detection and populations that are potentially at risk not meeting warning level thresholds to invoke preventative measures. Beyond prevention efforts, errors in reporting also result in inaccurate research that utilizes the corresponding data, which can again influence policies and practices.

Ensuring accurate data from states is a mandatory step in all-cause mortality analysis; otherwise, the adage of garbage-in, garbage-out will inevitably hold true.

Statistical Analysis

The following analysis was applied based on research questions:

A. For any analysis that needed to assess group differences (e.g., civilians vs. FSM) on a categorical variable (e.g., age group) or effect of a categorical variable (e.g., discharge status) on suicide count, a univariate analysis of variance was conducted. Similarly, to assess the effect of more than one categorical variable and the interaction effect on suicide count, a multivariate analysis of variance was conducted.

B. For any count analysis in which there were both categorical and scale variables (e.g., gender and years of service on suicide count), binomial logistic regression was conducted.

C. For any count analysis in which there were only scale variables (e.g., years of service on suicide count), binomial regression was conducted.

D. For any rate analysis, depending on the complexity of analysis and/or research question, either odds ratio analysis or negative binomial regression analysis was applied.

E. Odds ratio formula for FSM to civilian suicide rate: $\text{FSM odds (which is FSM count/population) / civilian odds (which is civilian count/population)}$. The same formula can be modified for other odds calculation.

State Level Death Records

With the failure of the local approach to obtain enough death records from local partners, OpDD moved in year 1 to state-level requests, expanding the ask to request all state death records for 2014-2018 at the same time. Obtaining these records at the state level proved both very difficult and time-consuming. Ultimately, OpDD was only able to obtain useable data from eight states (Alabama, Florida, Massachusetts, Minnesota, Montana, Michigan, Maine, and Oregon).

State Bureaucratic Obstacles/Delays.

A. Requesting data from states, procuring it, and then managing and analyzing the data was intricate and time-consuming for a complex number of factors discussed below. As was the case at the local level, each state data-sharing request/application (ultimately to every state) had to undergo review and approval from the research compliance, information technology, and legal teams, and often involved lengthy negotiations. Even with making good faith

efforts in each case, applications often were stopped by these legal concerns. For example, in one open records state, where getting the data should have been simple, the mandatory legal terminology, which required UA's acceptance to download the data, was unacceptable to UA (requiring UA to waive its "Sovereign Authority," which it cannot do as a state agency). Requests by UA to negotiate the terms were refused, so OpDD could not obtain the necessary data. Even when states approved the data request, bureaucratic issues created serious burdens and slowed things down. One such state requires that every individual who would access their data had to be listed, from the PI down to research assistants, and each had to sign the agreement; further, whenever anyone was dropped or added to the project (which frequently happened as key personnel changed and research assistants changed), the data sharing agreement had to be revised and re-signed by all parties.

1. As noted above, most states denied our data requests. Reasons for not participating included: a) not able to participate because of legal restrictions in providing critical data elements needed for OpDD (such as SSNs or other personal identifiers); b) not being able to share data with either UA and/or with OpDD partners; c) having excessive service fee charges for the data request (small fee amounts, typically under \$1,000, were paid by OpDD, but higher fees were outside of the project budget – one state requested \$16,000 for a single data pull because they charged per record); d) required the request go through their Institutional Review Board (IRB) for human subjects research approval; e) the states' focus shifted to regulating critical issues from the COVID-19 pandemic which consequently put our death data requests on indefinite hold, and f) various unspecified reasons.

2. State personnel changes. Changes in and departures of personnel handling data requests from the state side caused unexpected disruptions in addition to the already limited staffing on the data team. In numerous instances, the state personnel with whom a data request was begun left the agency holding the data or moved to other roles/responsibilities. Each time this occurred, requests were delayed while new people needed to become familiar with our request and how to handle it.

3. Lack of standardization of death record elements between states. From a data curation and analysis perspective, this factor took up an enormous

amount of project time. OpDD had to decide on the elements common across most states, then curate the data from the format as received to the common format to allow for combined analyses. This was a painstaking process. More details regarding this are discussed in Retrospective Methodology.

Federal Level and Partner Organization Records/Analyses

At the federal level, efforts to develop data sharing agreements and obtain data from the DoD and the VA were protracted, time-consuming, and, ultimately, only fully executed with the DoD.

The DoD has been a willing partner for OpDD from the beginning via the Defense Suicide Prevention Office (DSPO). In Year 1, negotiations were begun regarding developing an MOU and data sharing agreement. Initially, this centered around OpDD getting access to the National Death Index (NDI), housed within the National Center for Health Statistics (NCHS). After several months of negotiation, it was determined that providing OpDD access to state death records via the DOD's NDI agreement terms was not possible. Therefore, it was decided OpDD would pursue the state records independently while negotiating an agreement to get military service validation and associated service records for those deceased individuals in our data from the states. After further discussion/negotiation, it was determined that the data we needed was held by the Defense Manpower Data Center (DMDC) and that the DSPO would sponsor our data request to them. While simple in concept, developing and executing the agreement with the DoD took nearly two years to be finalized. Once executed, each step took time. For example, every data request made to DoD had to be reviewed and approved by their IRB Office and the Defense Human Resources Activity (DHRA) office for Human Research Protection Program (HRPP). One major issue that contributed to other limitations of the full roll-out of OpDD as designed was that in order to be able to validate whether a deceased individual had served in the military and, if yes, provide OpDD the service history details requested, DoD required that we provide them with the SSN, name, gender, and Date of Birth (DOB) for each individual in our data. Without those elements, DMDC could not pull data on a given individual. Needing the SSN became one of the biggest challenges to obtaining data from the states, many of whom could not provide SSNs either by law/regulations or out of concerns about data confidentiality and liability issues.

Data from the VA

The VA was also willing to discuss participation from the beginning. They assigned a senior VA researcher to be the VA PI and point of contact in developing any agreements. This PI, however, was not able to actively collaborate due to multiple other obligations. After about three quarters of Year 1, the initial PI withdrew and recommended a different researcher (Dr. John McCarthy), who agreed to take over as OpDD PI for the VA. Dr. McCarthy, although also overextended, continued to work with OpDD to get IRB clearance and to lay the groundwork for a data-sharing MOU. The sticking point between OpDD and the VA was the VA cannot—by their own regulations protecting Veteran privacy and confidentiality—share identifiable data with outside agencies under normal procedures. The VA proposed that rather than providing OPDD with VA healthcare utilization records to be linked with the other OpDD data, that OpDD create a linked data set to them as the final point of data linkage and then let the VA analyze the data and report the result to OpDD. This obstacle remains unresolved, and no agreement has been executed with the VA.

Rate Data:

OpDD Suicide Rate per 100K 18-64 Male and Female	2014	2015	2016	2017	2018
MN	37	40	42	46	48
FL	39	41	43	44	44
AL			43	45	47
ME	41	44	48	50	53
MA	33	35	37	40	41
MI	39	42	45	49	51
MT	67	70	74	79	79
OR	52	55	58	61	63

VA Suicide Rate per 100K 18-74 Male and Female	2014	2015	2016	2017	2018
MN	26	23	29	30	29
FL	33	37	35	35	38
AL			34	35	38
ME	38	43	27	44	41
MA	17	19	21	20	21
MI	30	30	28	32	35
MT	50	51	50	60	62
OR	40	42	42	49	49

OpDD SIM (ie. Overdose) Rate per 100K 18-64 yr Male and Female	2014	2015	2016	2017	2018
MN	18	19	20	22	23
FL	27	28	29	30	30
AL			68	71	73
ME	28	30	33	35	37
MA	71	75	81	86	89
MI	32	34	37	39	41
MT	12	12	13	14	14
OR	20	21	22	23	24

5 yr ACS Census Validated State Veteran Population 18-64 Male and Female	2014	2015	2016	2017	2018
MN	182,303	168,172	157,344	146,295	138,077
FL	758,548	724,272	694,218	673,228	670,282
AL			195,004	186,899	181,436
ME	65,265	61,098	55,782	52,763	50,145
MA	170,290	160,121	148,771	139,625	135,103
MI	335,805	313,654	289,436	270,317	257,558
MT	49,932	48,094	45,224	42,411	42,537
OR	162,582	153,606	146,316	138,725	135,344

Predictors of SIM Among FSM in OpDD

A logistic regression analysis is presented here to see what variables are

associated with a higher risk of SIM among the FSM in the OpDD Phase 1 data. Independent variables included gender, race, marital status, demotion, most recent component, and most recent branch, and the number of years of service. The initial sample of FSM was 62,446. Due to missing variables, the effective sample size was reduced to 60,228, out of which 7,306 had SIM. The analysis controlled for state differences.

Gender was a binary male or female. Race was grouped into three categories, Black (African American), White, and Others (which includes Hispanics). There was a good number of White FSMs whose Hispanic origins were unknown. Thus, White may contain both Hispanic and Non-Hispanic White. Marital status was dichotomized into living with a partner (married or domestic partnership) or without a partner (divorced, separated, never married, or widowed). Demotion was yes or no. Component included guard, regular, and reserve. Two cases of Temporary were excluded. Branch included Air Force, Army, Coast Guard, Marine Corps, and Navy. Years of service is self-explanatory.

Demographics for Regression Analysis

Variables	% or Mean (std)	Available	Missing
Race		61,681	767
Black/African American	13.8%		
White ¹	83.5%		
Others²	2.8%		
Gender		62,448	0
Male	92.5		
Female	7.5%		
Education ³		34,674	27,774
No HS diploma/GED	8.0%		
HS Diploma	54.6%		
Some college/Associate Degree	27.2%		
College degree or higher	10.2%		
Marital Status		61,623	825
Living without a partner ⁴	64.2%		
Living with a partner ⁵	35.8%		
Demotion		62,448	0
No	87.1%		
Yes	12.9%		
Types of Discharge ⁶		44,829	17,619
Honorable/General	87.8%		
Dishonorable/Bad Conduct	0.3%		
Other than honorable	11.9%		

Variables	% or Mean (std)	Available	Missing
Most recent component		62,448	0
Guard	8.6%		
Regular	50.3%		
Reserve	41.1%		
Most recent Branch		62,375	73
Air Force	13.5%		
Coast Guard	0.6%		
Marine Corps	11.5%		
Navy	23.0%		
Self-Inflicted Mortality		62,448	0
No	87.9%		
Yes	12.1%		
Suicide		62,448	0
No	94.0%		
Yes	6.0%		
Years of Service	5.5 (6.4 std)	61,838	610
Age at time of death (years)	55.9 (8.2 std)	62,448	0
Years between separation and death	31.4 (10.6std)	61,618	830

Notes:

1. White includes both Hispanic and non-Hispanic Whites as information on Hispanic Yes/No is missing in about 50% of state records.
2. "Others" includes all other races.
3. Education was not included in the multivariate analysis below because of the high amount of missing data.
4. Includes divorced, married but separated, never married, and widowed.
5. Includes married and domestic partnerships.
6. Discharge type was not included in the multivariate analysis below because of the high amount of missing data.

	B	OR	p
Gender (F vs. M)*	.026		.598
Race (White vs. Black)	.686	1.99	<.001
Race (Other vs. Black)	.725	1.75	<.001
Race (<i>White</i> vs. Other)	-.039		.592
Marital (With vs. without partner)	-.495	.61	<.001
Demotion (yes vs. no)	.446	1.56	<.001
Year of service	-.020	.98	<.001
Component (Guard vs. Reserve)	.207	1.23	<.001
Component (Guard vs. Regular)	.158	1.17	.001
Component (<i>Regular</i> vs. <i>Reserve</i>)	.049		.078
Branch (Coast Guard vs. Air Force)	.815	2.26	<.001
Branch (Coast Guard vs. Army)	.760	2.14	<.001
Branch (Coast Guard vs. Marine Corps)	.496	1.64	<.001
Branch (Coast Guard vs. Navy)	.727	2.07	<.001
Branch (Marine Corps vs. Air Force)	.318	1.38	<.001
Branch (Marine Corps vs. <i>Army</i>)	.264	1.30	<.001
Branch (Marine Corps vs. <i>Navy</i>)	.231	1.26	<.001
Branch (<i>Army</i> vs. Air Force)	.055		.184
Branch (Navy vs. Air Force)	.088	1.09	.051
Branch (<i>Navy</i> vs. <i>Army</i>)	-.033		.320

*Italicized items have p values above .001

Summary of SIM Risk Factors

A. Findings suggested that:

1. Gender was not associated with the odds of SIM (p=.598).
2. White FSM (OR=1.81, p<.001) and FSM of Other race/ethnicity (OR=1.75, p<.001) were more likely than Black FSM to have SIM. There was no significant difference between White and Others (p=.592).
3. Living with a partner was associated with lower odds of SIM (OR=.61, p<.001). The odds of SIM were about 40% lower.
4. FSM who had demotions were more likely to have SIM than those who did not (OR=1.56, p<.001). The odds were about 56% higher.
5. FSM, whose most recent component was guard were more likely to have SIM than those who were in regular (OR=1.23, p<.001) or reserve

component (OR=1.17, $p<.001$). There was no significant difference between regular and reserve components ($p=.077$).

6. Longer years of service were associated with lower odds of SIM (OR=.98, $p<.001$). One year longer was associated with a 2% reduction in the odds of SIM.

7. FSM who most recently served in Coast Guard were most likely to have SIM, followed by those who served in Marine Corps. Specifically,

i. FSM who most recently served in Coast Guard were more likely to have SIM than FSM who served in Air Force (OR=2.26, $p<.001$), Army (OR=2.14, $p<.001$), Marine Corps (OR=1.64, $p<.001$) or Navy (OR=2.07, $p<.001$).

ii. FSM who served in Marine Corps were more likely to have SIM than those who served in Air Force (OR=1.38, $p<.001$), Army (OR=1.30, $p<.001$), or Navy (OR=1.26, $p<.001$).

iii. There was no significant difference between Army and Air Force ($p=.184$), or between Army and Navy ($p=.320$). This contrast between Navy and Air Force was significant at 6%, with Navy FSM appearing more likely to have SIM (OR=1.09, $p=.051$).

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