



Research article

Midlife mortality in White non-Hispanic male veterans enrolled in Department of Veterans Affairs primary care, 2003–2014

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ABSTRACT

Background: After years of decline in mortality rates in the United States, there have been increases in mortality rates in White non-Hispanic Americans ages 45–54, due to increases in deaths from suicide, poisoning, and alcoholic liver disease.

Objectives: To determine whether White non-Hispanic middle age male Veterans enrolled in Department of Veterans Affairs (VA) primary care had increased mortality, as found in the general population.

Research design: Repeated cross-sectional analysis over 12 years to describe trends in death rates for men across 3 race/ethnicity groups (White non-Hispanic, Black non-Hispanic, Hispanic) and 2 age groups (45–54, 55–64) for the Veteran and general US male populations.

Subjects: 60 million patient-years for Veterans enrolled in VA primary care from 2003 to 2014 and 1.8 million who died during the study period.

Measures: All-cause and cause specific death rates for alcoholic liver disease, poisoning, and suicide.

Results: For White non-Hispanic male Veterans ages 55–64, the increase in all-cause mortality from 2003 to 2014 (+309 deaths/100,000) was accompanied by significant changes in deaths due to poisoning (+30/100,000), alcoholic liver disease (+23/100,000), and suicide (+17/100,000). For US men ages 55–64, all-cause mortality decreased slightly from 2003–2014 (-22 deaths/100,000). However, there were increases in death rates due to poisoning (+17/100,000), alcoholic liver disease (+14/100,000) and suicide (+11/100,000).

Conclusions: These disturbing findings for White non-Hispanic Veteran men ages 55–64 suggest the critical importance of suicide prevention programs as well as the importance of high quality integrated health care for both Veteran and non-Veteran men.

1. Introduction

After years of declining mortality rates across all age groups in the United States (US), Case and Deaton reported increasing mortality rates in White non-Hispanic Americans ages 45–54 [1]. This change was attributed to dramatic increases in deaths due to poisoning, suicide, and alcoholic liver disease. In Washington State during the years 2000–2013, male, White non-Hispanic Veterans ages 45–64 also experienced marked increases in these same cause specific death rates [2]. External causes of death, which include both accidental deaths as well as deaths due to suicide, were more common in Veterans who used Department of Veterans Affairs (VA) health care services versus those Veterans who did not [3]. They were also more common in Veterans with mental illness [4] and Veterans with service connected disabilities [5]. The purpose of this study

was to determine whether White non-Hispanic middle age male Veterans enrolled in VA primary care experienced similar increases in all-cause and select cause specific death rates observed in the general population. We also examined death rates in middle age Black non-Hispanic and Hispanic male Veterans, because Case and Deaton reported that in the US population, death rates did not increase for these 2 groups [1].

2. Methods

2.1. Data sources and study sample

We identified all Veterans enrolled in VA primary care panels from the Primary Care Management Module within the VA Corporate Data Warehouse (CDW) [6]. Date of death and underlying cause of death were

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obtained from the National Death Index for Veterans [7]. Our dataset comprised 60 million patient-years of Veterans who were empaneled in VA primary care from 2003 to 2014. Among the study population, 1.8 million died during the study period. Because most Veterans were men, the analysis focused on male Veterans, comprising approximately 55 million patient years. We also used the Centers for Disease Control Wonder underlying cause of death database to obtain all-cause and cause specific death rates for men ages 45–54 and 55–64 in the US population [8]. To assess midlife mortality, the analysis considered male patients in 2 age groups (45–54 and 55–64) and 3 race/ethnicity groups (White non-Hispanic, Black non-Hispanic, and Hispanic). The race/ethnicity groups were constructed by combining race (American Indian/Alaskan Native, Asian, Black, multiple-race, Native Hawaiian/Pacific Islander, White, and other/unknown) and ethnicity (Hispanic, non-Hispanic, and unknown) employing an algorithm that used self-reported race and ethnicity information from the VA Surveys of Healthcare Experiences of Patients, CDW, VA vital status file, and Department of Defense files [9]. The final sample included 5.8 million patient years for male VA primary care patients ages 45–54 and 12.6 million patient years for men ages 55–64.

2.2. Mortality rates

We calculated annual all-cause mortality rates as the number of deaths per 100,000 patients per year by age group and categories of race/ethnicity. Following the approach of Case and Deaton [1], we classified underlying cause of death according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD10). We then calculated annual cause specific mortality rates for 3 underlying causes of death, including alcoholic liver disease (K70, K73, K74), poisoning (X40–X45, Y10–Y15, Y45, Y47, Y49), and suicide (X60–X84, Y87.0).

2.3. Statistical analysis

We performed a repeated cross-sectional analysis over 12 years to describe time trends in mortality rates across 3 race/ethnicity groups for 2 age groups. In addition, we stratified the time trends based on the rurality of Veterans' county of residence, classified using groupings of Rural Urban Commuting Codes [10]. Finally, we assessed trends by

geographic locations using US Census regions (West, Midwest, South, and Northeast). This study was done for quality improvement purposes and was not reviewed by an institutional review board. The VA Office of Research Oversight granted us permission to submit this paper for publication.

3. Results

Among White non-Hispanic male Veterans ages 45–54, the all-cause mortality rate decreased 405 deaths per 100,000 from 1012 in 2003 to 607 in 2014 (Figure 1, Table 1). Similar decreases in all-cause mortality were observed for male Black non-Hispanic Veterans (-435 deaths/100,000) and male Hispanic Veterans (-357/100,000). In the US male population, the all-cause death rate for White non-Hispanic males did not change over the 12 year period (+3 deaths/100,000). However, there were declines in death rates for Black non-Hispanic men (-403/100,000) and Hispanic men (-99/100,000). It is noteworthy that death rates for male Black non-Hispanic Veterans were lower than those for both male White non-Hispanic Veterans and Black non-Hispanic US men.

Among White non-Hispanic male Veterans ages 55–64, the all-cause mortality rate increased by 309 deaths per 100,000 male Veterans from 1331 in 2003 to 1640 in 2014 (Figure 2, Table 2). For Black non-Hispanic male Veterans, there was a slight decrease in the all-cause mortality rate (-75/100,000), and for Hispanic male Veterans there was a slight increase of 38 deaths/100,000. In the general US population, death rates decreased slightly for White non-Hispanic men (-22 deaths/100,000) but decreased markedly for Black non-Hispanic men (-347 deaths/100,000) and Hispanic men (-136 deaths/100,000). As was the case for the 45–54 group, death rates for Black non-Hispanic male Veterans were lower than those for Black non-Hispanic US men.

Figures 3 and 4 display death rates for alcoholic liver disease, poisoning, and suicide for White non-Hispanic men in the VA and US population. In the male Veteran 45–54 age group, deaths due to alcoholic liver disease decreased by more than half from 76/100,000 to 34/100,000 (Figure 3, Table 3). Deaths due to poisoning (+1/100,000) and suicide (+3/100,000) did not change appreciably. In the US male population, death rates due alcoholic liver disease remained stable (+2/100,000). However, death rates for poisoning increased 87% from 20 to 37/100,000 and death rates for suicide increased 34% from 29 to 39/

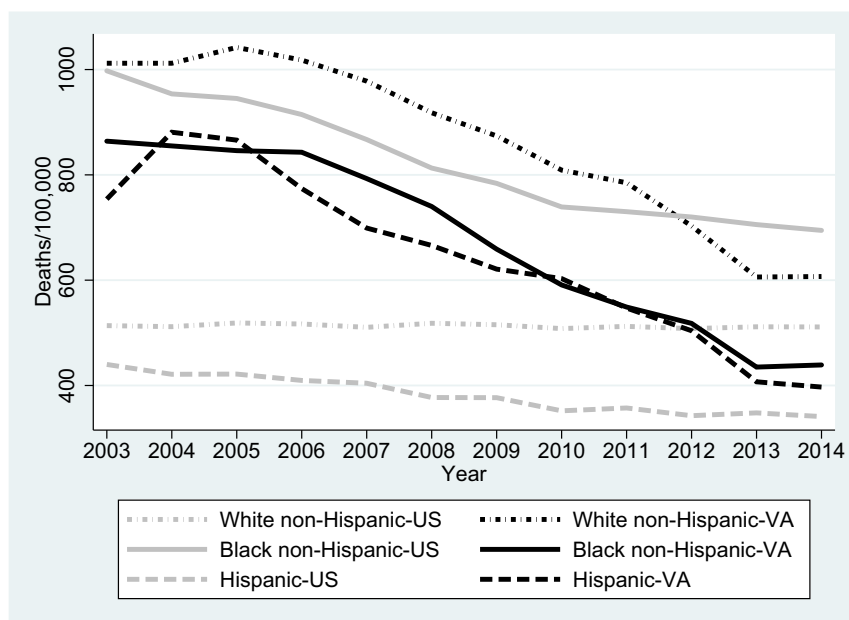


Figure 1. All-cause mortality by race/ethnicity among male Veterans, ages 45–54, 2003–2014. US United States VA Veterans Affairs.

Table 1. Annual all-cause death rates/100,000 for Unites States and Veteran male populations ages 45–54 by race.

Year	White non-Hispanic		Black non-Hispanic		Hispanic	
	US	VA	US	VA	US	VA
2003	514	1012	998	864	440	754
2004	512	1012	954	855	421	881
2005	519	1042	945	846	422	866
2006	517	1018	915	843	410	774
2007	510	978	767	793	404	699
2008	518	918	813	740	377	666
2009	515	874	784	659	377	621
2010	508	809	739	591	352	603
2011	512	785	730	549	357	547
2012	508	703	720	518	343	504
2013	512	606	706	435	348	407
2014	511	607	695	439	341	397

US United States VA Veterans Affairs.

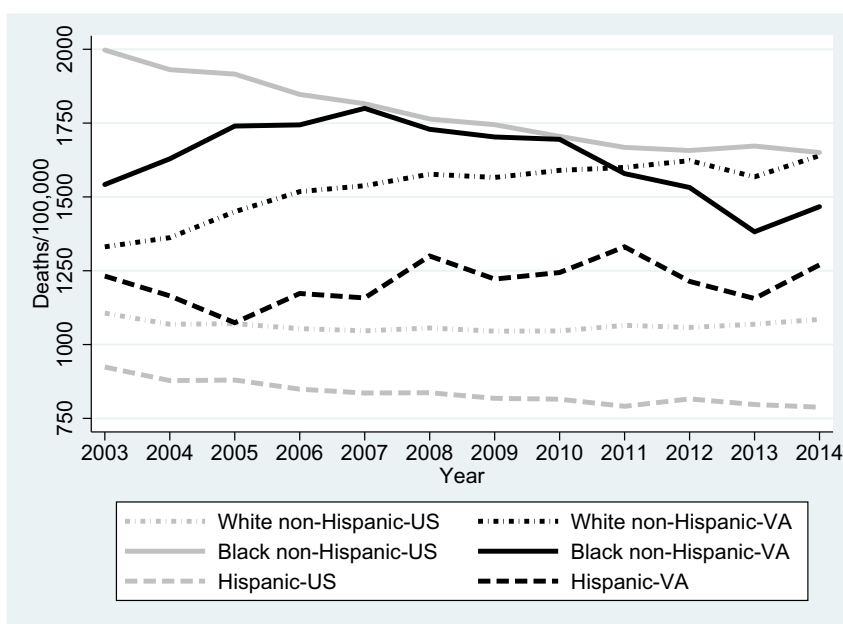


Figure 2. All-cause mortality by race/ethnicity among male Veterans, ages 55–64, 2003–2014. US United States VA Veterans Affairs.

Table 2. Annual all-cause death rates/100,000 for Unites States and Veteran male populations ages 55–64 by race.

Year	White non-Hispanic		Black non-Hispanic		Hispanic	
	US	VA	US	VA	US	VA
2003	1106	1331	1997	1542	924	1232
2004	1069	1362	1931	1629	878	1165
2005	1071	1450	1916	1740	880	1074
2006	1054	1518	1847	1744	849	1173
2007	1047	1538	1815	1800	836	1158
2008	1056	1577	1764	1729	837	1300
2009	1045	1566	1745	1703	818	1222
2010	1046	1590	1705	1695	815	1244
2011	1050	1600	1668	1579	791	1331
2012	1058	1623	1657	1532	816	1214
2013	1069	1568	1672	1382	797	1156
2014	1085	1640	1650	1467	788	1270

US United States VA Veterans Affairs.

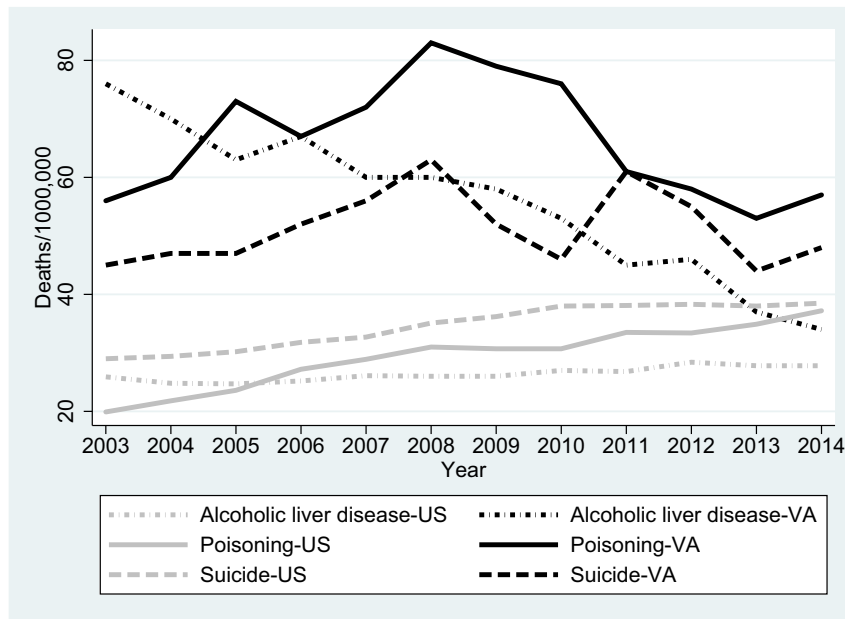


Figure 3. Cause specific mortality rates for White non-Hispanic men, ages 45–54, 2003–2014. US United States VA Veterans Affairs.

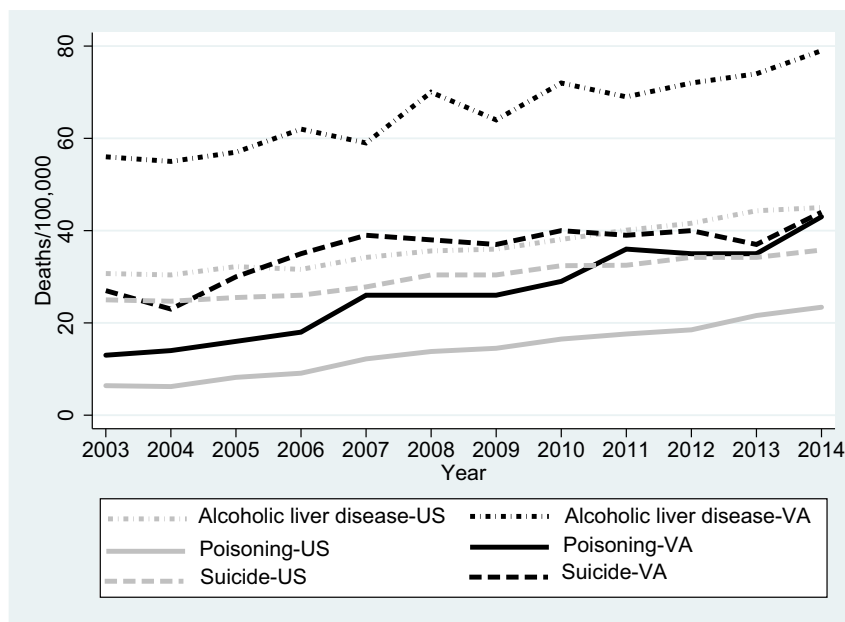


Figure 4. Cause specific mortality rates for White non-Hispanic men, ages 55–64, 2003–2014. US United States VA Veterans Affairs.

100,000. Death rates for all 3 causes were higher in male Veterans than for similar age men in the US population.

In the 55–64 age group, there were notable increases in death rates for all 3 causes in both the male Veteran and US male population (Figure 4, Table 4). For male Veterans, death rates for alcoholic liver disease increased 41% from 56 to 79/100,000 and death rates for suicide increased 63% from 27 to 44/100,000. Most notably, death rates for poisoning increased over 231% from 13 to 43/100,000. In US men, death rates due to alcoholic liver disease increased 45% from 31 to 45/100,000 and death rates for suicide increased 44% from 25 to 36/100,000. As with Veteran men, death rates for poisoning increased 293% from 6 to 23/100,000. As was the case for the 45–54 age group, death rates for all 3 causes were higher in Veteran men.

Figure 5 displays cause specific death rates for Black non-Hispanic and Hispanic among male veterans. For Black non-Hispanic male VA

patients ages 45–54 there were decreases in deaths due to alcoholic liver disease and poisoning. In the 55–64 age group, there was an increase in death rates for poisoning (Figure 5). For all 3 race/ethnicity groups in the 55–64 age category, trends in death rates for alcoholic liver disease, poisoning, and suicide did not differ according to rural urban location (Figure 6). For White non-Hispanic male Veterans 55–64, the increases in mortality due to alcoholic liver disease, poisoning, and suicide were observed across all 4 census regions (Figure 7). Given small numbers for Black non-Hispanic and Hispanic male Veterans for each geographic region, trends were not readily apparent.

4. Discussion

The major purpose of this study was to determine whether the findings for the general population described by Case and Deaton applied to

Table 3. Annual cause specific death rates/100,000 for Unites States and Veteran White non-Hispanic male populations ages 45-54.

Year	Alcoholic liver disease		Poisoning		Suicide	
	US	VA	US	VA	US	VA
2003	26	76	21	56	29	45
2004	25	70	22	60	29	47
2005	25	63	24	73	30	47
2006	25	67	28	67	32	52
2007	26	60	30	72	33	56
2008	26	60	32	83	35	63
2009	26	58	31	79	36	52
2010	27	53	31	76	38	46
2011	27	45	34	61	38	61
2012	28	46	34	58	38	55
2013	28	37	34	53	38	44
2014	28	34	38	57	39	48

Table 4. Annual cause specific death rates/100,000 for Unites States and Veteran White non-Hispanic male populations ages 55-64.

Year	Alcoholic liver disease		Poisoning		Suicide	
	US	VA	US	VA	US	VA
2003	31	56	6	13	25	27
2004	30	55	6	14	25	23
2005	32	57	8	16	26	30
2006	32	62	9	18	26	35
2007	34	59	12	26	28	39
2008	36	70	14	26	30	38
2009	36	64	15	26	30	37
2010	38	72	17	29	32	40
2011	40	69	18	36	33	39
2012	42	72	19	35	34	40
2013	44	74	22	35	34	37
2014	45	79	23	43	36	44

the Veteran men [1]. For White non-Hispanic male Veterans ages 55–64 enrolled in VA primary care, the increase in all-cause mortality from 2003 to 2014 was accompanied by significant increases in deaths due to alcoholic liver disease, poisoning, and suicide. The magnitude of these changes was substantial as changes over the 12-year period represented 41%, 231% and 63% increases, respectively. These changes coincided with those among US men 55–64, who experienced similar increases in death rates for alcoholic liver disease (45%), poisoning (293%) and suicide (44%). It is noteworthy that death rates for White non-Hispanic male Veterans were considerably higher than those for similar aged men in the US population. These findings are consistent with results from a study of Washington State White non-Hispanic male Veterans [2]. These results are particularly disturbing as many of the underlying causes were associated with self-harm in the form of suicide, accidental death due to drug overdose, or end stage liver disease due to excess alcohol consumption. It should be noted that the poisoning category includes a variety of modes of accidental deaths. Accidental death due to drug or alcohol overdoses, including opioids, is one of the most common of these modes.

Case and Deaton first reported these disturbing trends in White non-Hispanic men and women ages 45–54 [1]. Our results for Veteran men only differed in that the changes were not evident in this younger group but were quite apparent in the 55–64 age group. For Veteran White non-Hispanic men ages 45–54 as well as for Black non-Hispanic and Hispanic male Veterans, there was a marked decline in all-cause death rates. In the US, all-cause death rates declined for Black non-Hispanic and Hispanic men but remained constant for White non-Hispanic men. For Veteran White non-Hispanic men ages 45–54, there was a sharp decrease

in deaths due to alcoholic liver disease and no change in death rates for poisoning and suicide. For US White non-Hispanic men, there were no changes in deaths due to alcoholic liver disease, but there were noticeable increases in death rates for poisoning and suicide.

It was remarkable that Black non-Hispanic Veteran men had lower all-cause death rates than Black non-Hispanic US men. It was also the case that Black non-Hispanic Veteran men ages 45–54 had lower death rates than their White non-Hispanic counterparts. It is beyond the scope of this paper to explain why this was the case, although possible reasons have to do with a higher educational levels of Black non-Hispanics entering the military as well as military service having a more favorable impact on the lives of Black non-Hispanic men [11].

Why death rates for male White non-Hispanic Veterans were higher than those for their counterparts in the US population is not entirely clear. It may be that middle age male Veterans have poorer health than non-Veterans. Veterans who use VA health care have a substantially elevated health care burden, compared to Veterans who do not use VA health care; this is especially the case concerning mental illness [12,13]. In addition, post traumatic stress disorder, which affects large numbers of Veterans, is associated with increased risk of suicide and accidental death [5,14]. Male Veterans in this study were enrolled in VA primary care and had access to integrated health care, including suicide prevention programs and substance and alcohol use disorder treatment, as well as an array of benefits (e.g. compensation for service connected disabilities, education benefits, home loan assistance) not available to the general population [15]. Receipt of these benefits, including health care, could have delayed the onset of death or in some cases prevented it.

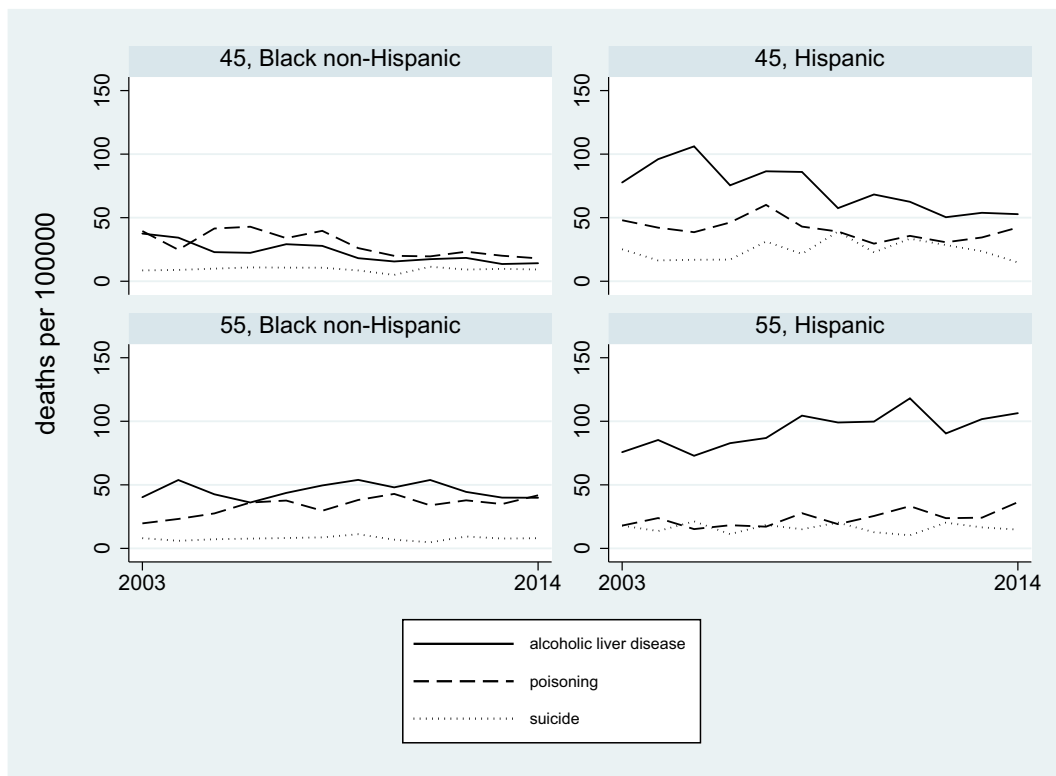


Figure 5. Cause specific mortality rates for Black non-Hispanic and Hispanic men by age, 2003–2014.

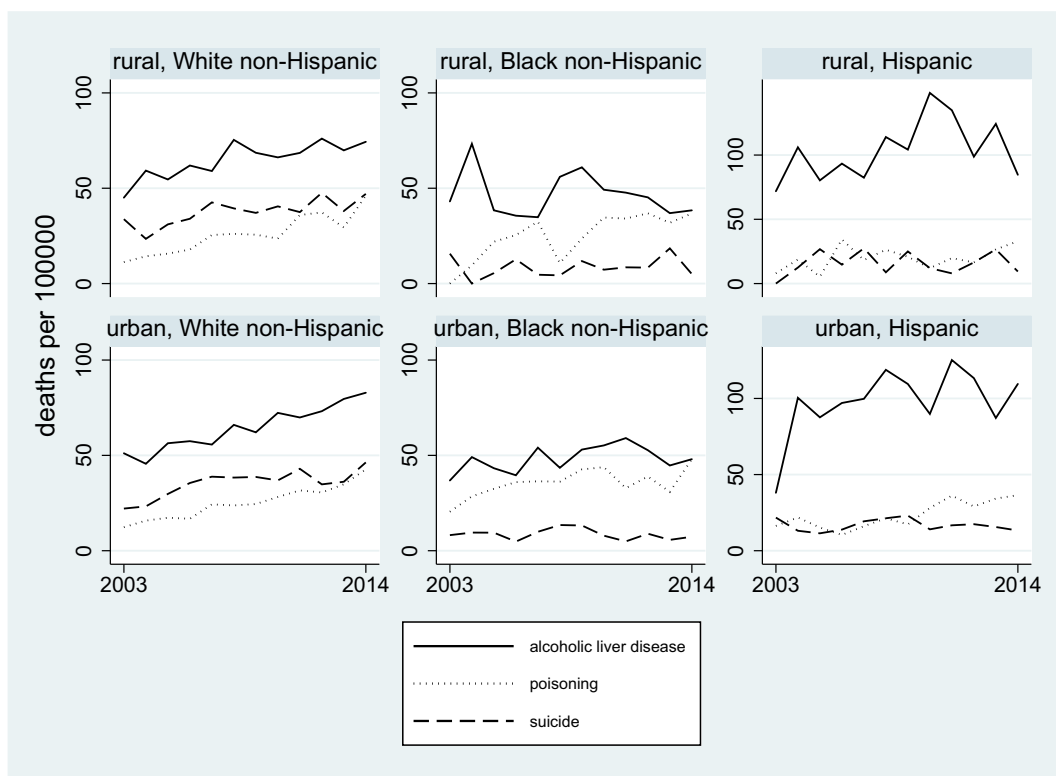


Figure 6. Cause specific mortality rates by race and rural-urban location, 2003–2014.

The results of this study should be considered in the light of several contingencies. First, these men not only were enrolled in VA health care, but they had access to primary care and a health care team that is able to coordinate primary care with other types of care including mental health

and substance use disorder treatment [16]. Veterans who use primary care may be different from those who don't use VA health care or even VA primary health care, although they represent the majority of about 9 million Veterans who are enrolled in VA health care. In this study, we

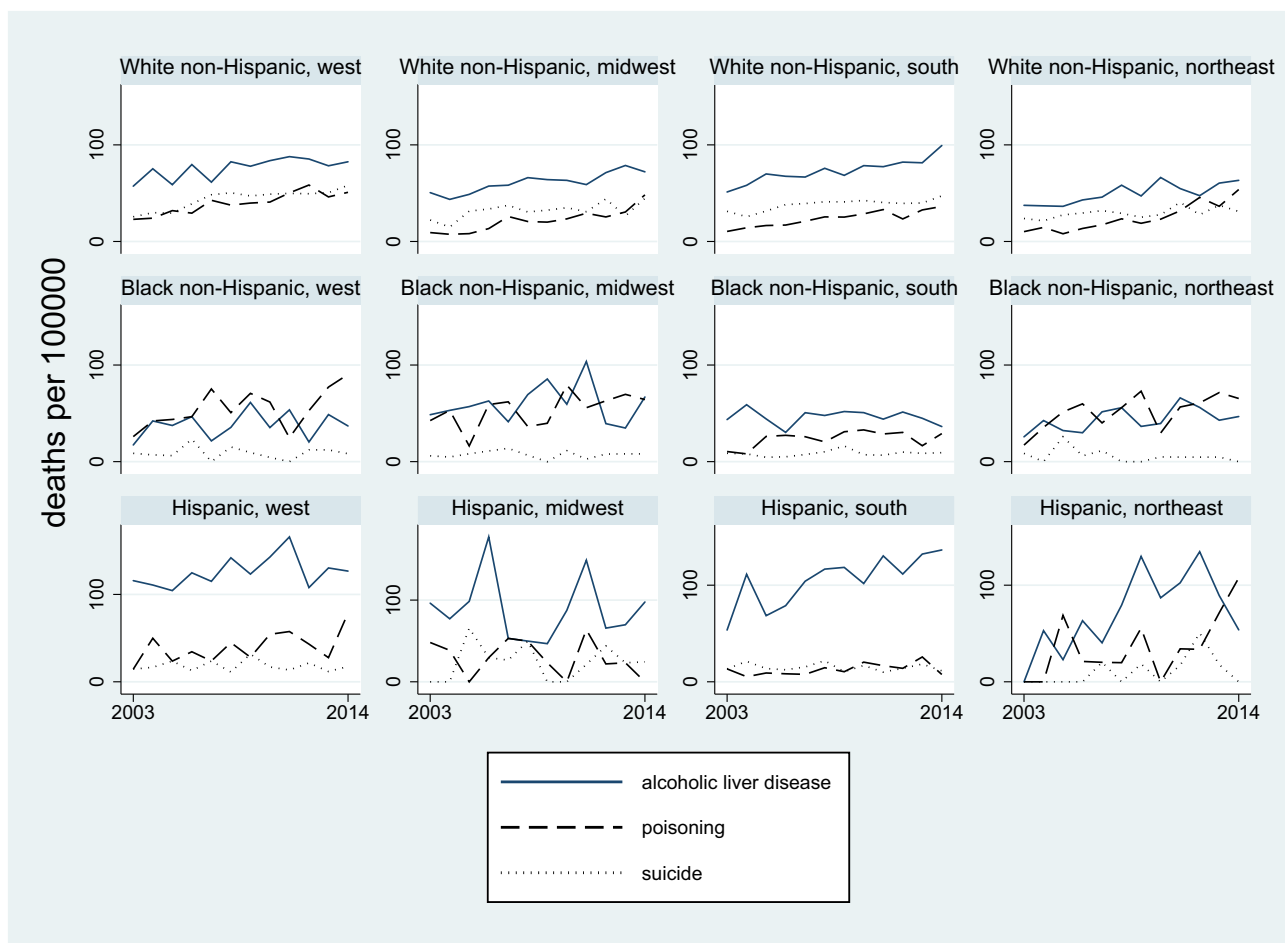


Figure 7. Cause specific mortality rates by race and region, 2003–2014.

were unable to examine the effect of receipt of VA health care on death rates. Second, Veteran women and other race/ethnicity groups were not included in this study, because their numbers were relatively small, resulting in unstable death rates. Third, the death rates did not account for the Veteran's military service experience, including rank, service branch, period of service, or combat exposure. Fourth, there are always concerns about the determination of intent in distinguishing accidental deaths from suicide. In certain cases, it is difficult for the coroner or medical examiner to make that judgement [17].

The important finding of this study was that White non-Hispanic male Veterans ages 55–64 had a significant increase in all-cause death rates from 2003 through 2014. Increases in deaths due to suicide, accidental poisoning, and alcoholic liver disease accompanied the change in all-cause death rates. These disturbing findings emphasize the critical importance of suicide prevention programs as well as primary care and mental health and substance use disorder treatment programs available to Veterans and also point to the need for future research to evaluate these programs.

Declarations

Author contribution statement

C.F. Liu: conceived and designed the experiments; performed the experiments; analyzed and interpreted the data; contributed reagents, materials, analysis tools or data; Wrote the paper.

P. Hebert, E.S. Wong, K. Nelson: conceived and designed the experiments; analyzed and interpreted the data; Wrote the paper.

C. Maynard: conceived and designed the experiments; performed the experiments; analyzed and interpreted the data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

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