Alcoholic cardiomyopathy mortality and social vulnerability index: A nationwide cross-sectional analysis

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ARTICLE INFO
Handling editor: D Levy

Keywords:
Alcohol
Social vulnerability
Disparities
Epidemiology

ABSTRACT

Background: Social vulnerability index (SVI) plays a pivotal role in the outcomes of cardiovascular diseases and prevalence of alcohol use. We evaluated the impact of the SVI on alcoholic cardiomyopathy (ACM) mortality.

Methods: Mortality data from 1999 to 2020 and the SVI were obtained from CDC databases. Demographics such as age, sex, race/ethnicity, and geographic residence were obtained from death certificates. The SVI was divided into quartiles, with the fourth quartile (Q4) representing the highest vulnerability. Age-adjusted mortality rates across SVI quartiles were compared, and excess deaths due to higher SVI were calculated. Risk ratios were calculated using univariable Poisson regression.

Results: A total of 2779 deaths were seen in Q4 compared to 1672 deaths in Q1. Higher SVI accounted for 1107 excess deaths in the US and 0.05 excess deaths per 100,000 person-years (RR: 1.38). Similar trends were seen for both male (RR: 1.43) and female (RR: 1.67) populations. Higher SVI accounted for 0.06 excess deaths per 100,000 person-years in Hispanic populations (RR: 2.50) and 0.06 excess deaths per 100,000 person-years in non-Hispanic populations (RR: 1.46).

Conclusion: Counties with elevated SVI experienced higher ACM mortality rates. Recognizing the impact of SVI on ACM mortality can guide targeted interventions and public health strategies, emphasizing health equity and minimizing disparities.

1. Introduction

Social vulnerability refers to the negative effects caused by external stressors on community infrastructure and individual well-being. The social vulnerability index (SVI) is a measure of social vulnerability consisting of 16 social components aggregated under one ranking system to determine a community’s social vulnerability (Table 1) [1]. In the United States (US), communities that have been severely affected by social vulnerability are also characterized by higher densities of alcohol outlets, leading to higher levels of alcohol consumption [2]. The SVI has been shown to impact many aspects of the cardiovascular disease care continuum, including prevalence of cardiovascular disease (CVD) risk factors and prevalence, outcomes including morbidity and mortality, readmission rates, and access to healthcare [3–7].

Alcoholic cardiomyopathy (ACM) is a prominent cause of dilated cardiomyopathy in the US; however, no previous analyses have investigated the impact of the SVI on ACM mortality. This study aimed to evaluate the association between SVI and ACM mortality in the US.

2. Methods

We gathered US mortality data from the Centers for Disease Control and Prevention (CDC) Wide-ranging Online Data for Epidemiologic Research database and obtained the county-level 2018 release SVI rankings from the CDC Agency for Toxic Substances and Disease Registry database [1,8]. All deaths related to ACM as the underlying cause of death were queried from 1999 to 2020 in the form of International Classification of Diseases, Tenth Revision (ICD-10) code I42.6.
mortality data were compared across SVI quartiles. Excess deaths rankings were connected to mortality data using county codes and quartile (Q4) represented the most socially vulnerable group. SVI (Q1) denoting the least socially vulnerable group, while the fourth percentile ranking were divided into quartiles with the first quartile indicating the highest level of social vulnerability. Counties in each SVI percentile ranking were divided into quartiles with the first quartile (Q1) denoting the least socially vulnerable group, while the fourth quartile (Q4) represented the most socially vulnerable group. SVI rankings were connected to mortality data using county codes and mortality data were compared across SVI quartiles. Excess deaths attributable to higher SVI were obtained by comparing AAMR between Q4 and Q1. We also utilized univariable Poisson regression to estimate the risk ratio (RR) between Q4 and Q1. Statistical significance was determined by confidence intervals that did not include 1. This study did not require Institutional Review Board approval given the publicly available and anonymized nature of the data.

3. Results

There were a total of 1672 ACM deaths in Q1 compared to 2779 ACM deaths in Q4, with higher SVI accounting for 1107 excess-deaths in the US (Table S1). AAMR in Q4 (0.18) was higher compared to Q1 (0.13), with higher SVI accounting for 0.05 excess deaths per 100,000 person years (RR: 1.38 [95% CI, 1.26–1.50]) (Table 2). Higher SVI was associated with increased mortality rates among both sexes, with higher SVI accounting for 0.02 excess deaths per 100,000 person-years (RR: 1.67 [95% CI, 1.42–1.93]) in females and 0.09 excess deaths per 100,000 person-years (RR: 1.43 [95% CI, 1.31–1.58]) in males. Among all three of our included age-groups, an increase in SVI lead to higher mortality rates. Higher SVI accounted for 0.03 excess deaths per 100,000 person-years (RR: 2.5 [95% CI, 1.33–2.50]) in individuals ≤44 years, 0.10 excess deaths per 100,000 person-years (RR: 1.29 [95% CI, 1.17–1.44]) in individuals 46–64 years, and 0.11 excess deaths per 100,000 person-years (RR: 1.39 [95% CI, 1.20–1.68]) in individuals ≥65 years.

Hispanic populations had a higher AAMR in Q4 (0.10) compared to Q1 (0.04) with higher SVI accounting for 0.06 excess deaths per 100,000 person-years (RR: 2.50 [95% CI, 1.71–4.30]). Similarly, Non-Hispanic populations also had a higher AAMR in Q4 (0.19) compared to Q1 (0.13), with higher SVI accounting for 0.06 excess deaths per 100,000 person-years (RR: 1.46 [95% CI, 1.45–1.47]). Both Black and White populations were impacted by greater mortality rates in counties with the highest SVI; however, the AAMR in Q4 for Black populations (0.24) were higher compared to the AAMR in White populations (0.15) in Q4. Specifically, higher SVI accounted for 0.07 excess deaths per 100,000 person-years (RR: 1.41 [95% CI, 1.36–1.44]) in Black populations and 0.04 excess deaths per 100,000 person-years (RR: 1.36 [95% CI, 1.35–1.37]) in White populations.

Metropolitan regions had a higher AAMR in Q4 (0.17) compared to Q1 (0.10), with higher SVI accounting for 0.07 excess deaths per 100,000 person-years (RR: 1.7 [95% CI, 1.44–2.08]). In contrast, no differences in AAMR were observed among non-metropolitan regions in Q4 (0.19) compared to Q1 (0.19). Higher SVI accounted for 0.02 excess deaths per 100,000 person-years (RR: 1.15 [95% CI, 1.10–1.20]) in Northeastern regions, 0.08 excess deaths per 100,000 person-years (RR: 1.62 [95% CI, 1.45–1.79]) in Midwestern regions, 0.05 excess deaths per 100,000 person-years (RR: 1.63 [95% CI, 1.43–1.83]) in Southern regions, and 0.11 excess deaths per 100,000 person-years (RR: 1.85 [95% CI, 1.57–2.15]) in Western regions.

4. Discussion

Our study revealed greater ACM mortality among counties impacted

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<th>SVI-Q1 (95% CI)</th>
<th>SVI-Q2 (95% CI)</th>
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<th>SVI-Q4 (95% CI)</th>
<th>Risk Ratio (95% CI)</th>
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Abbreviations: ACM = alcoholic cardiomyopathy, CI = confidence interval, SVI = social vulnerability index.
by higher SVI rankings, cumulatively and across demographic sub-populations. Specifically, greater social vulnerability accounted for 0.05 excess ACM related deaths per 100,000 person-years in the US. For a populous nation like the US, this may lead to thousands of excess deaths over a decade, resulting in ripple effects on communities and healthcare systems. Although the SVI has been explored across multiple components within the cardiovascular disease care continuum, no previous analysis has explored its relationship with ACM. Given that ACM is a leading cause of non-ischemic cardiomyopathy in the US, it is imperative to understand this entity and subgroups that are more likely to be impacted in efforts to promote health equity and minimize disparities [9].

Greater SVI conveys higher mortality rates from ACM due to a confluence of socioeconomic and healthcare access factors. Communities with higher SVI are ones with greater economic inequality, increased environmental exposures, lack of education, and limited access to healthcare [10]. The SVI has been correlated with poor health-care access to individuals with CVD, increased readmission rates related to heart failure, and greater burden of cardiovascular mortality and risk factors [3-7]. Individuals with lower health literacy are also more likely to have a higher prevalence of CVD [11,12]. Additionally, communities facing financial stressors who also lack other recreational activities, given disadvantaged neighborhood structures, are more likely to use alcohol as a coping mechanism [12].

Our findings revealed that ACM mortality in Q4 were higher for males compared to females, aligning with the results of other studies [9]. This is likely related to more frequent alcohol consumption in males as compared to females [13]. However, this gender gap in alcohol use has been closing as women’s drinking habits have been on the rise [14]. Additionally, both Black and White populations were impacted by higher ACM mortality in regions with higher SVI rankings. However, Black populations had a higher AAMR in Q4 compared to White populations that may relate to poorer access to primary care providers and health insurance coverage leading to advanced stages of disease and higher mortality rates amongst Black communities [15-17]. Black populations are more likely to undergo dire consequences associated with alcohol use including dependency symptoms, alcohol use disorder, and social and financial repercussions in the setting of residential segregation, unemployment, and educational disparities [18-20].

Metropolitan regions were impacted by higher ACM rates in regions with higher SVI; however, this finding was not seen in non-metropolitan regions. This is possibly due socioeconomic differences seen in rural areas that are not accounted for by the SVI. Moreover, one study found that overall cardiovascular death were higher in non-metropolitan regions; however, this observed discrepancy likely underscores the rates of alcohol consumption in metropolitan regions leading to increased rates of ACM mortality [21,22].

There are limitations to this study. Given the use of ICD-10 codes, misclassification bias may contribute to our findings. However, this is unlikely to explain the discrepancies observed. Given the cross-sectional design of our analysis, we are unable to establish causality. Lastly, we are unable to account for alcohol intake in our analyses, which may contribute to the sociodemographic differences in ACM mortality that we describe amongst different groups of patients.

5. Conclusion

Our findings revealed that populations impacted by greater SVI have a higher ACM mortality. Future areas of research should focus on alcohol use amongst the populations that we have identified to determine whether the excess mortality relates to greater alcohol consumption, or differences in clinical services in managing the medical and psychosocial complications of alcohol once established.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

All data are available in publicly available repositories.

Declaration of competing interest

Authors have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijcpr.2023.200224.

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[8] Center for Disease Control and Prevention National Center for Health Statistics. CDC Wonder: Multiple Cause of Death 1999-2018. Center for Disease Control and Prevention..