

RESPONSE LETTER TO THE EDITOR

Response by Pinheiro et al to Letter Regarding Article, “Multiple Vulnerabilities to Health Disparities and Incident Heart Failure Hospitalization in the REGARDS Study”

In Response:

On behalf of my co-authors, we would like to thank Norris-Grey and her colleagues for their thoughtful perspective on our article, “Multiple Vulnerabilities to Health Disparities and Incident Heart Failure Hospitalization in the REGARDS study.”¹ We agree with the authors that considering the cumulative effects of social determinants of health or socially determined vulnerabilities (SDVs) allows for a more comprehensive understanding of the influence of these understudied factors on the incidence of heart failure hospitalization. A simple count of SDVs may be a quick and easy indicator of patients who are at increased risk of heart failure. REGARDS, a United States national, bi-racial, prospective cohort study of 30239 community-dwelling adults who have been followed for 10+ years,² is well-suited for studying the influence of SDVs on a variety of cardiovascular-related end points including heart failure,¹ stroke,³ 90-day mortality after a heart failure hospitalization,⁴ and coronary heart disease.⁵

We would like to thank the authors for the opportunity to reflect on our analytic approach for identifying the 6 SDVs that were included in our count variable. There is no consensus in the statistical methodological literature regarding a single recommended variable selection method. One of our motivations for choosing the bivariate approach was to allow clinicians to see the unadjusted associations between individual SDVs and our outcome of interest. However, the authors are correct that bivariate models do not account for potential confounders. Although we used a more liberal α -level cutoff ($P < 0.10$) for variable inclusion to decrease chances of omitting important confounders and variables, we recognize that there are alternative methods available for selecting SDVs. For example, machine learning can potentially account for high-level interactions between variables and could offer a promising approach to examining the complex interplay of SDV and various outcomes—this is an area of interest to our research team, and we look forward to sharing this work in the future.

The authors have brought up excellent points regarding the need to (1) develop education interventions, (2) examine relationships between heart failure quality indicators and costs, and (3) determine the possible impact of coronavirus disease 2019 (COVID-19) on care seeking behavior for heart failure. Although our article was written in the pre-COVID world, chronic stress and negative psychological states have undoubtedly worsened since March 2020 and may exacerbate the impact of SDVs on a variety of these health outcomes. Clearly, understanding the underlying mechanisms by which multiple SDVs increase the risk of incident heart failure hospitalization is critical to addressing these 3 important issues.

Laura C. Pinheiro, PhD,
MPH
Evgeniya Reshetnyak^{ID},
PhD
Madeline R. Sterling^{ID},
MD, MPH, MS
Emily B. Levitan^{ID}, ScD
Monika M. Safford, MD
Parag Goyal^{ID}, MD, MSc

© 2020 American Heart Association, Inc.

<https://www.ahajournals.org/journal/circoutcomes>

ARTICLE INFORMATION

Affiliations

Division of General Internal Medicine, Department of Medicine (L.C.P., E.R., M.R.S., M.M.S., P.G.) and Division of Cardiology, Department of Medicine (P.G.), Weill Cornell Medicine, NY. Department of Epidemiology, University of Alabama at Birmingham (E.B.L.).

Sources of Funding

This research project is supported by cooperative agreement U01 NS041588 co-funded by the National Institute of Neurological Disorders and Stroke (NINDS) and the National Institute on Aging (NIA), National Institutes of Health, Department of Health and Human Service. This work is also supported by R01 HL80477 from the National Heart Lung and Blood Institute (NHLBI), National Institutes of Health, Department of Health and Human Service. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NINDS, NIA or NHLBI. Representatives of the NINDS were involved in the review of the manuscript but were not directly involved in the collection, management, analysis or interpretation of the data.

Disclosures

Dr Safford receives salary support from Amgen for investigator-initiated research. Dr Levitan receives research support from Amgen, has served on Amgen advisory boards, and as a consultant for a research project funded by

Novartis. All authors have read and approved this response for submission to *Circulation: Cardiovascular Quality and Outcomes*. The other authors report no conflicts.

REFERENCES

1. Pinheiro LC, Reshetnyak E, Sterling MR, Levitan EB, Safford MM, Goyal P. Multiple vulnerabilities to health disparities and incident heart failure hospitalization in the REGARDS study. *Circ Cardiovasc Qual Outcomes*. 2020;13:e006438. doi: 10.1161/CIRCOUTCOMES.119.006438
2. Howard VJ, Cushman M, Pulley L, Gomez CR, Go RC, Prineas RJ, Graham A, Moy CS, Howard G. The reasons for geographic and racial differences in stroke study: objectives and design. *Neuroepidemiology*. 2005;25:135–143. doi: 10.1159/000086678
3. Reshetnyak E, Ntamatungiro M, Pinheiro LC, Howard VJ, Carson AP, Martin KD, Safford MM. Impact of multiple social determinants of health on incident stroke. *Stroke*. 2020;51:2445–2453. doi: 10.1161/STROKEAHA.120.028530
4. Sterling MR, Ringel JB, Pinheiro LC, Safford MM, Levitan EB, Phillips E, Brown TM, Goyal P. Social determinants of health and 90-day mortality after hospitalization for heart failure in the REGARDS study. *J Am Heart Assoc*. 2020;9:e014836. doi: 10.1161/JAHA.119.014836
5. Safford MM, Reshetnyak E, Sterling MR, Richman JS, Muntner PM, Durant RW, Booth J, Pinheiro LC. Number of social determinants of health and fatal and nonfatal incident coronary heart disease in the REasons for Geographic and Racial Differences in Stroke (REGARDS) study. *Circulation* (in press).