Patients from distressed communities have decreased survival after open thoracic aneurysm repair

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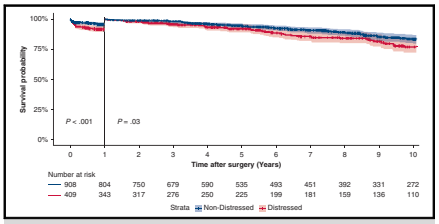
ABSTRACT

Objective: This study investigates the relationship between the Distressed Communities Index and long-term mortality in thoracic aortic aneurysm repair.

Methods: This single-center retrospective study includes patients who underwent open thoracic aortic aneurysm repair between 2005 and 2021. The Distressed Communities Index served as a metric for socioeconomic status by providing distress scores for each patient's zip code. Patients were placed into the nondistressed group with a score of 50 or less or the distressed group with a score greater than 50. The primary outcome of this study was 10-year mortality. Multivariable Cox regression evaluated factors associated with long-term mortality while accounting for patient demographics and operative characteristics.

Results: Of 1317 patients, 31% (n = 409) comprised the distressed group, which had higher rates of hypertension ($P = .002$), chronic obstructive pulmonary disease ($P = .03$), diabetes ($P = .008$), cerebrovascular disease ($P = .04$), and chronic kidney disease ($P = .04$). This group also experienced higher rates of surgical site infection ($P = .02$), postoperative respiratory failure ($P = .006$), and longer hospital stays ($P < .001$), as well as decreased survival probability at 1 year ($P < .001$) and beyond ($P = .03$). Multivariable logistic regression revealed that being in the distressed group was independently associated with increased long-term mortality risk (hazard ratio, 1.66; $P = .005$).

Conclusions: Being from a distressed community is associated with worse long-term mortality after thoracic aortic aneurysm repair. Socioeconomic status should be considered in surgical planning to improve patient outcomes and dismantle healthcare disparities. (JTCVS Open 2025;24:472-83)



Kaplan–Meier conditional survival analysis after 1 year comparing the ND and D groups.

CENTRAL MESSAGE

In patients undergoing aortic surgery, lower SES is associated with worse long-term outcomes compared with patients with higher SES.

PERSPECTIVE

The association between SES and mortality is poorly defined after open TAA repair. Our findings demonstrate an increased long-term mortality risk after TAA repair in patients with lower SES, further strengthening the need for interventions to address these healthcare disparities.

Social determinants of health are conditions in which people live, learn, and are born in that affect health outcomes.[1] One such condition is socioeconomic status (SES). SES and its impact in cardiac surgery have been heavily explored. Patients with lower SES have worse outcomes after coronary artery bypass grafting and valve surgery, and higher rates of failure to rescue after cardiac surgery.[2-5] These same communities are disproportionally affected by higher rates of smoking, obesity, and hypertension,[6] which place patients at increased risk for thoracic aortic aneurysm (TAA) development and fatal complications.[7,8] Patients who then receive TAA repairs and the relationship with SES have been unexplored in the literature. One study did investigate SES and thoracoabdominal aneurysm repair. However, median income was used to analyze SES, which fails to represent the multiple factors that formulate SES.[2,9-11] SES encompasses not only median income but also education attainment, financial security, and occupation.[9,12] Therefore, researchers in cardiac surgery have opted to use the Distressed Communities Index (DCI), which provides a metric for SES that encompasses

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Abbreviations and Acronyms
D = distressed
DCI = Distressed Communities Index
ND = nondistressed
SES = socioeconomic status
TAA = thoracic aortic aneurysm

multiple variables.[2,3,5] With the use of DCI as a holistic metric of SES, identifying the association between SES and outcomes after specific surgeries can better inform surgeons before operating.

MATERIAL AND METHODS

Patient Data

This study was approved by the Columbia University Medical Center Institutional Review Board (AAAR2949 approved April 19, 2022). Adult patients who underwent open TAA repair at New York Presbyterian/Columbia University Irving Medical Center from January 2005 to April 2021 (n = 1570) were included. Baseline demographics, zip codes, intraoperative characteristics, postoperative characteristics, and follow-up data were obtained from our Columbia Aortic Center database and the electronic medical record. Variables were defined based on the Society of Thoracic Surgeons Adult Cardiac Database Version 4.20.1. Exclusion criteria included undergoing a nonsternotomy operative approach (n = 212), being unidentifiable in the electronic medical record (n = 35), and having a zip code not in the DCI database (n = 6), leaving a final cohort of 1317 patients (Figure 1).

Socioeconomic Status

SES was determined using the DCI, a database capturing more than 99% of the United States in zip codes with at least 500 residents. The DCI produces a composite score of 7 metrics: no high school diploma, poverty rate, adults not working, housing vacancy rate, median income ratio, change in employment, and establishment. Each metric is evenly analyzed to produce a score for every zip code from 0 (no distress) to 100 (severe distress). These metrics are derived from the American Community Survey 5-Year Estimates from 2014 to 2018 and the US Census Business Patterns.[13]

Statistical Analysis

Patients were divided into 2 groups based on DCI score. A score of 50 or less designated the nondistressed (ND) group and greater than 50 designated the distressed (D) group. This grouping was created to facilitate analysis, based on previous literature,[2,3,5] and by the relationship on cubic spline (Figure E1). Categorical variables were displayed as numbers and percentages. Continuous variables were presented as median and interquartile range. Random forest single imputation was used to account for missingness, with no variable missing more than 10% of data (Table E1).

The Kaplan–Meier method analyzed 10-year survival. Because of significant mortality within the first year and the hazard function plot results (Figure E2), a conditional survival analysis was done at the 1-year mark and the subset of data was further analyzed. Baseline demographics, intraoperative characteristics, and postoperative outcomes of the subgroup cohort are shown in Tables E2-E4.

Univariate and multivariate logistic regression were performed to determine variables associated with long-term mortality after TAA repair in patients who survived past 1 year (Table E5). Variables for the multivariable model were identified based on univariate analysis and clinical acumen. Stepwise regression using both forward and backward selection analyzed these variables to produce a final multivariable model with the lowest Akaike information criterion. Although not selected through stepwise regression, race was included in the final model due to its relationship with SES. Race as an interaction term with DCI was also explored but did not achieve significance within the multivariable model and was excluded from the final model. The final model was checked for the proportional hazard's assumption, and all variables were checked for multicollinearity using a variance inflation factor less than 5. An adjusted cubic spline using variables from the univariate analysis was created to reassess the relationship between DCI and hazard ratio (Figure E3). R Studio version 4.2.1 was used for all analyses.

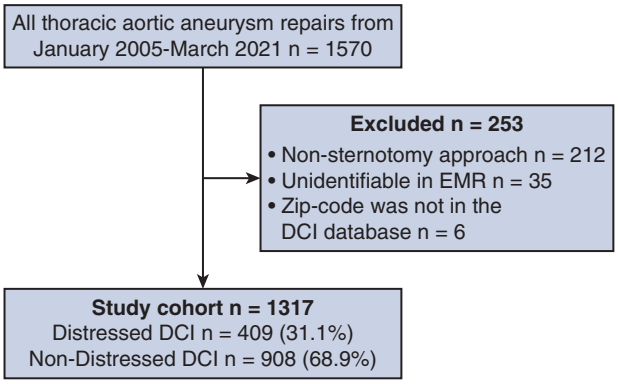

FIGURE 1. Flow diagram showing exclusion criteria and the final cohort of 1317 patients. *EMR*, Electronic medical record; *DCI*, Distressed Communities Index.

RESULTS

Patient Characteristics and Distressed Communities Index Metrics

Patient characteristics are listed in Table 1. Of the 1317 patients, 908 composed the ND group, and 409 composed the D group. The median age was 62 years in the D group and 63 years in the ND group ($P = .20$). Both groups were similar regarding age, sex, body mass index, rates of dyslipidemia, prior cardiac intervention, history of heart failure, Marfan syndrome, prior myocardial infarction, and surgical status (Table 1). However, the D group had higher rates of comorbidities such as hypertension (D group: 78.5% [321/409] vs ND group: 70.2% [637/908]; $P = .002$), chronic obstructive pulmonary disease (D group: 11.7% [48/409] vs ND group: 7.8% [71/908]; $P = .03$), diabetes (D group: 15.4% [63/409] vs ND group: 10.1% [92/908]; $P = .008$), cerebrovascular disease (D group: 7.3% [30/409] vs ND group: 4.4% [40/908]; $P = .04$), and chronic kidney disease (D group: 22.2% [91/409] vs ND group: 17.2% [156/908]; $P = .04$). Additionally, higher rates of patients who identify as Black were seen within the D group (D group: 14.2% [58/409] vs ND group: 4.0% [36/908]) and patients who identify as Other (D group: 24.4% [100/409] vs ND group: 9.4% [85/908]), whereas the ND group had higher rates of patients who identified as White (ND group: 86.7% [787/908] vs D group: 61.4% [251/409]; $P < .001$). Additionally, the D group demonstrated higher averages

TABLE 1. Baseline characteristics of all patients

Variables	DCI group ≤50 n = 908	DCI group > 50 n = 409	*P* value
Age, y, median [IQR]	63.0 [52.0-72.0]	62.0 [52.0-71.0]	.20
Female (%)	202 (22.2)	94 (23.0)	.82
Race (%)			**<.001**
White	787 (86.7)	251 (61.4)	
Black	36 (4.0)	58 (14.2)	
Other	85 (9.4)	100 (24.4)	
BMI, median [IQR]	27.3 [24.7-30.8]	27.5 [24.4-31.0]	.92
Hypertension, (%)	637 (70.2)	321 (78.5)	**.002**
Dyslipidemia, (%)	497 (54.7)	214 (52.3)	.45
Chronic obstructive pulmonary disease, (%)	71 (7.8)	48 (11.7)	**.03**
Diabetes, (%)	92 (10.1)	63 (15.4)	**.008**
Prior cardiac intervention, (%)	193 (21.3)	97 (23.7)	.36
Cerebrovascular disease, (%)	40 (4.4)	30 (7.3)	**.04**
Heart failure, (%)	387 (42.6)	197 (48.2)	.07
Marfan syndrome, (%)	14 (1.5)	13 (3.2)	.08
Prior myocardial infarction, (%)	42 (4.6)	21 (5.1)	.79
Smoking, (%)			**.04**
Never smoker	538 (59.3)	250 (61.1)	
Current smoker	75 (8.3)	48 (11.7)	
Former smoker	295 (32.5)	111 (27.1)	
LVEF, median [IQR]	55.0 [54.0-59.3]	55.0 [50.0-58.0]	**.02**
Surgical status, (%)			.25
Elective	766 (84.4)	334 (81.7)	
Nonelective	142 (15.6)	75 (18.3)	
Chronic kidney disease,* (%)	156 (17.2)	91 (22.2)	**.04**

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *IQR*, interquartile range; *BMI*, body mass index; *LVEF*, left ventricular ejection fraction. *Chronic kidney disease was defined as a glomerular filtration rate of <60 mL/min/1.73 m^2.

of socioeconomic distress in 6 of the 7 metrics used in DCI creation when compared with the ND group (Table 2).

Intraoperative Characteristics

Intraoperative characteristics are listed in Table 3. Both groups had similar aortic crossclamp time and had undergone similar rates of concomitant aortic valve procedures. However, the D group had longer cardiopulmonary bypass time (D group: 145.0 [108.0-187.0] vs ND group: 132.0 [105.0-168.0]; $P = .002$), higher rates of circulatory arrest (D group: 47.4% [194/409] vs ND group: 38.3% [348/908]; $P = .002$), and higher rates of more extensive arch replacements ($P = .001$).

TABLE 2. Distressed Communities Index metrics of all patients

Variables	DCI group ≤50 n = 908	DCI group >50 n = 409	*P* value
No high school degree (%), median [IQR]	6.2 [4.3-8.9]	19.4 [14.1-26.7]	**<.001**
Poverty rate (%), median [IQR]	5.7 [3.8-8.4]	19.6 [15.0-23.2]	**<.001**
Adults not working (%), median [IQR]	18.1 [15.6-20.2]	23.8 [20.8-28.1]	**<.001**
Housing vacancy rate (%), median [IQR]	5.4 [4.0-7.0]	6.7 [4.8-9.2]	**<.001**
Median income ratio (%), median [IQR]	140.5 [117.3-166.7]	73.5 [62.8-83.3]	**<.001**
Change in employment (%), median [IQR]	5.7 [−0.3 to 13.5]	6.2 [0.1-14.2]	.56
Change in establishments (%), median [IQR]	1.6 [−1.8 to 4.7]	2.3 [−0.7 to 6.0]	**<.001**

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *IQR*, interquartile range.

TABLE 3. Operative details for all patients

Variables	DCI group ≤50 n = 908	DCI group >50 n = 409	*P* value
Cardiopulmonary bypass time (min), median [IQR]	132.0 [105.0-168.0]	145.0 [108.0-187.0]	**.002**
Aortic crossclamp time (min), median [IQR]	99.0 [77.0-128.0]	101.0 [73.0-137.0]	.57
Lowest body temperature (°C), median [IQR]	32.0 [28.0-32.2]	31.0 [28.0-32.0]	**.001**
Circulatory arrest, (%)	348 (38.3)	194 (47.4)	**.002**
Aortic replacement extent, (%)			**.001**
Root replacement only	387 (42.6)	153 (37.4)	
Ascending aorta only	168 (18.5)	58 (14.2)	
Root + distal*	221 (24.3)	105 (25.7)	
Ascending aorta + distal†	132 (14.5)	93 (22.7)	
Concomitant AV procedure, (%)			.92
No concomitant AV procedure	579 (63.8)	261 (63.8)	
AV replacement	178 (19.6)	77 (18.8)	
AV repair	151 (16.6)	71 (17.4)	

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *IQR*, interquartile range; *AV*, aortic valve. *Hemi arch, Partial arch, Total arch. †Hemi arch, Partial arch, Total arch, Zone 4.

Postoperative Outcomes

The postoperative characteristics of all the patients are shown in Table 4. The D group had higher rates of respiratory failure (D group: 16.1% [66/409] vs ND group: 10.6% [96/908]; $P = .006$), surgical site infections (D group: 1.7% [7/409] vs ND group: 0.3% [3/908]; $P = .02$), and longer hospital length of stay (D group: 9.00 [6.00-15.0] vs ND group: 7.00 [6.00-11.0]; $P < .001$). Rates of postoperative stroke, atrial fibrillation, 30-day mortality by any cause, reoperation for bleeding, and renal failure were similar between the groups.

There were 206 mortalities within the large cohort. After conditional survival analysis was conducted to focus on 1-year survivors, mortalities within the 10-year period were 135, with a median follow-up time of 8.65 [8.29-9.25] years. Kaplan–Meier analysis demonstrated a significant difference in survival over 1 year before conditional survival analysis (D group: 91.8%, [95% CI, 89.1%-94.5%] vs ND group: 95.7%, [95% CI, 94.4%-97.1%]; $P = .004$). This trend continued after the first year with the D group having decreased survival at 10 years (D group: 78.0%, [95% CI, 72.6%-83.8%] vs ND group: 83.9%, [95% CI, 80.7%-87.3%]; $P = .03$) (Figure 2).

Multivariable logistic regression demonstrated that being in the DCI D group was independently associated with long-term mortality after TAA repair. Age, gender, history of heart failure, prior myocardial infarction, and bypass time were also independently associated with long-term mortality after TAA repair. Similar trends were noted when DCI was analyzed as a continuous variable (Table 5).

DISCUSSION

When using DCI, a composite measure of socioeconomic distress, patients from distressed communities were independently associated with an increased risk of mortality over 10 years, a novel finding for this aortic pathology. These patients were also more likely to have undergone more complex surgical procedures as seen by the differences in intraoperative characteristics. Higher rates of postoperative complications were also seen in the lower DCI

TABLE 4. Postoperative complications for all patients stratified by Distressed Communities Index group

Variables	DCI group ≤50 n = 908	DCI group >50 n = 409	*P* value
Stroke, (%)	36 (4.0)	24 (5.9)	.17
Surgical site infection, (%)	3 (0.3)	7 (1.7)	**.02**
Respiratory failure, (%)	96 (10.6)	66 (16.1)	**.006**
Atrial fibrillation, (%)	330 (36.3)	150 (36.7)	.96
30-d mortality, (%)	17 (1.9)	13 (3.2)	.20
Total hospital length of stay (d), median [IQR]	7.00 [6.00-11.0]	9.00 [6.00-15.0]	**<.001**
Reoperation for bleeding, (%)	40 (4.4)	22 (5.4)	.53
Renal failure, (%)	53 (5.8)	29 (7.1)	.46

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *IQR*, interquartile range.

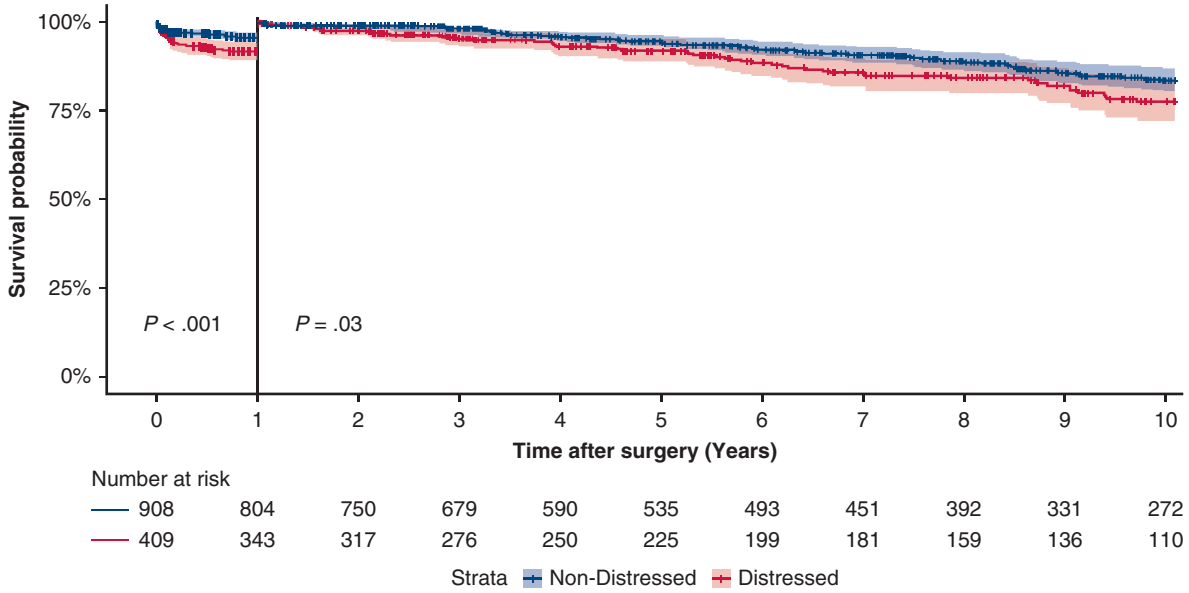

FIGURE 2. Kaplan–Meier conditional survival analysis after 1 year comparing the ND and D groups. The 10-year survival of patients in the ND group was 83.9% (95% CI, 80.7-87.3), which was higher than in the D group at 78.0% (95% CI, 72.6-83.8).

group, which is consistent with previous studies that investigated surgery cases and SES.[2,14-17] Finally, the 10-year survival probability was lower for patients in distressed communities.

This study's findings align with previous literature exploring the association between SES and other types of cardiac surgery.[2,3,5] However, our study diverges regarding the grouping classification. Our study demonstrates that a lower threshold should be considered when deciding which patients are at risk. Mehaffey and colleagues[2] and Strobel and colleagues[3,5] have cutoff points of 60 and 75, with our study demonstrating that patients with an even lower DCI should be considered. With the higher cutoffs, patients are missed, creating fewer opportunities to support these patients. Furthermore, the incorporation of DCI into standard risk models can help identify these at-risk patients. The Society of Thoracic Surgery risk model incorporates social factors, such as insurance status and demographics. However, previous studies have demonstrated that these individual metrics do not consistently reflect the risk added by SES.[2,9-11] Adding individual and area-level SES metrics improves

TABLE 5. Multivariable analysis of the subgroup cohort

Variable	Hazard ratio*	*P* value	Hazard ratio†	*P* value
Age	1.07 [1.05-1.09]	**<.001**	1.07 [1.05-1.10]	**<.001**
Female sex	1.48 [1.01-2.15]	**.041**	1.50 [1.03-2.18]	**.03**
Race				
White	Reference		Reference	
Black	1.23 [0.64-2.39]	.53	1.20 [0.62-2.34]	.59
Other	0.89 [0.57-1.41]	.63	0.91 [0.58-1.44]	.69
Prior cardiac intervention	1.38 [0.91-2.10]	.13	1.38 [0.91-2.11]	.13
Heart failure	1.54 [1.07-2.22]	**.02**	1.55 [1.08-2.24]	**.02**
Prior myocardial infarction	2.62 [1.43-4.81]	**.002**	2.46 [1.34-4.50]	**.004**
DCI as a continuous variable	n/a	n/a	1.01 [1.002-1.02]	**.02**
DCI >50	1.68 [1.17-2.43]	**.005**	n/a	n/a
Surgical status: Nonelective	1.50 [0.88-2.56]	.13	1.50 [0.88-2.55]	.14
Cardiopulmonary bypass time	1.004 [1.001-1.01]	**.02**	1.004 [1.001-1.01]	**.02**

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *n/a*, not available. *Multivariable regression with DCI as a categorical variable. †Multivariate regression with DCI as a continuous variable.

risk stratification,[18] further demonstrating the need to incorporate DCI into risk models.

The origin of the risk seen in distressed communities has many theories. One theory formulates that because this population has higher rates of comorbidities and postoperative complications and are undergoing more intricate procedures, they are a higher-risk population at baseline.[14] However, despite adjusting for these factors, distressed communities still demonstrate increased risk.[19,20] Another theory is that people in distressed communities are at risk for increased levels of stress, less social support, and access to resources.[1,20,21] This leads to patients presenting more acutely to the hospital, using the emergency department more frequently than ambulatory care, and experience higher rates of medication nonadherence due to physical and social barriers.[11,22-26] Therefore, increasing the social support available for these patients can help combat these disparities. This can be achieved through increasing access to healthcare, healthier foods, affordable housing, and affordable medication acquisition. Increasing the quality of care is equally important. Patients requiring cardiac surgery are medically complex, necessitating strong medical outpatient care that may be difficult to obtain. Uninsured and publicly insured patients tend to be cared for in the resident primary care clinics rather than by attending physicians in faculty practices.[27] This results in patients seen at resident clinics having longer appointment scheduling times and larger provider turnover rates, and they are less likely to achieve chronic disease quality of care measures.[27,28] Public healthcare systems may be able to provide more equitable care by allowing a mixing of faculty and resident practices or by advocating for a more universal healthcare option.[27,29] However, these interventions take time. A prompt intervention may include institutions offering subsidized transportation, which may alleviate the cost burden in postoperative follow-up visits. Surgeons also can directly minimize these disparities at different stages of care. At discharge, surgeons can solidify patient understanding of postoperative care by focusing on patient-centered communication and addressing health literacy deficiencies.[30] These conversations can be supplemented by culturally competent resources and services, strengthening patient adherence and understanding.[31] After discharge, surgeons can provide patients with more targeted follow-up support through more frequent follow-up calls and increased surveillance imaging. The potential impact of these and other such interventions provide a fruitful avenue for further investigation.

In addition to the disparities mentioned, lower SES disproportionally affects people of color. US census data demonstrate that lower median income populations are primarily composed of people of color.[32] This aligns with our study cohort, which found higher rates of Black patients within distressed communities. However, specific race groups did not demonstrate an increased risk of mortality. Given this finding, consideration should be taken when analyzing race as a risk factor because race may not be the causal factor but rather the conditions these races are placed into, further strengthening the need for DCI in risk stratification.

Limitations

Our study has several limitations. First, this was a retrospective study in a high-volume institution, limiting our generalizability. Additionally, although DCI has been demonstrated as a reliable composite metric for SES, many of the patients in this study live in New York City, where significant overlap may occur between communities, which may make zip code a difficult SES surrogate. DCI also lacks the granularity of individual SES metrics such as median income or insurance status. Last, our DCI cutoffs are consistent with our cohort, and using different cutoff points may reveal other differences.

CONCLUSIONS

This study demonstrated that patients with a higher DCI are independently associated with an increased risk of long-term mortality after TAA repair. This study, alongside the growing body of research regarding this topic, further demonstrates the need for cardiac surgeons to strongly consider SES as a part of surgical planning to improve patient outcomes and help dismantle healthcare disparities.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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Key Words: aortic surgery, DCI, disparities, socioeconomic status

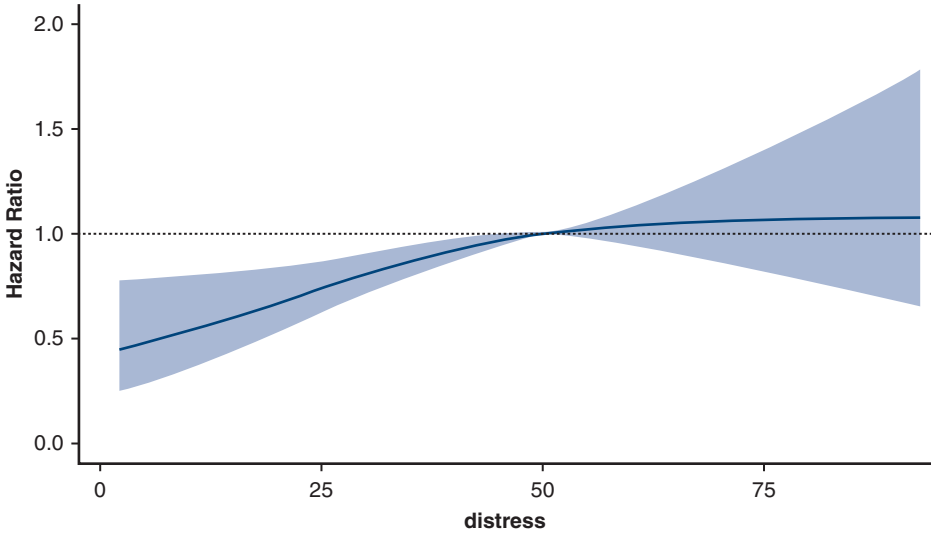

FIGURE E1. Cubic spline analysis for DCI score versus hazard ratio of the entire cohort.

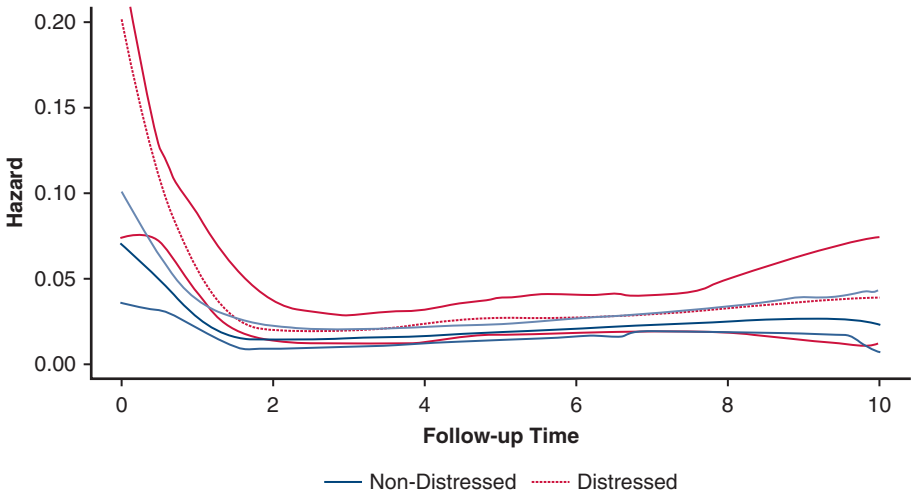

FIGURE E2. Instantaneous hazard rate of the whole cohort over 10 years.

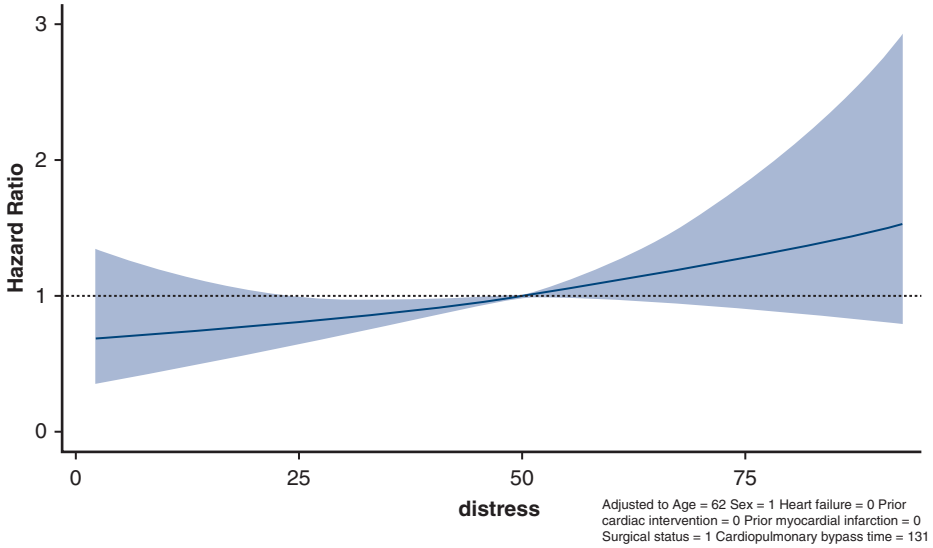

FIGURE E3. Adjusted cubic spline analysis for DCI score versus hazard ratio using subgroup cohort.

TABLE E1. Missing data

Variables	Missing %
Body mass index	0.15
Race	7.29
Smoking status	1.97
LVEF	0.53
Marfan syndrome	0.08
Aortic crossclamp time	0.53
Cardiopulmonary bypass time	0.08
Minimum temperature	0.23

LVEF, Left ventricular ejection fraction.

TABLE E2. Baseline demographics of subgroup cohort divided by Distressed Communities Index group

Variables	DCI group ≤50 n = 804	DCI group >50 n = 343	*P* value
Age, y, median [IQR]	63.0 [52.0-72.0]	62.0 [52.0-70.0]	.20
Female, (%)	179 (22.3)	81 (23.6)	.70
Race, (%)			**<.001**
White	696 (86.6)	206 (60.1)	
Black	32 (4.0)	45 (13.1)	
Other	76 (9.5)	92 (26.8)	
BMI, median [IQR]	27.2 [24.7-30.7]	27.7 [24.4-31.0]	.53
Hypertension, (%)	562 (69.9)	269 (78.4)	**.004**
Dyslipidemia, (%)	435 (54.1)	176 (51.3)	.42
Chronic obstructive pulmonary disease, (%)	62 (7.7)	40 (11.7)	**.04**
Diabetes, (%)	80 (10.0)	48 (14.0)	.06
Prior cardiac intervention, (%)	161 (20.0)	67 (19.5)	.91
Prior cerebrovascular disease, (%)	33 (4.1)	24 (7.0)	.06
Heart failure, (%)	351 (43.7)	163 (47.5)	.25
Marfan syndrome, (%)	13 (1.6)	12 (3.5)	.08
Prior myocardial infarction, (%)	34 (4.2)	14 (4.1)	1.0
Smoking, (%)			**.02**
Never smoker	467 (58.1)	213 (62.1)	
Current smoker	63 (7.8)	38 (11.1)	
Former smoker	274 (34.1)	92 (26.8)	
LVEF, median [IQR]	55.0 [54.0-60.0]	55.0 [50.0-58.0]	.07
Surgical status, (%)			.36
Elective	689 (85.7)	286 (83.4)	
Nonelective	115 (14.3)	57 (16.6)	
Chronic kidney disease,* (%)	126 (15.7)	75 (21.9)	**.02**

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *IQR*, interquartile range; *BMI*, body mass index; *LVEF*, left ventricular ejection fraction. *Chronic kidney disease was defined as a glomerular filtration rate of <60 mL/min/1.73 m^2.

TABLE E3. Intraoperative characteristics of subgroup cohort divided by Distressed Communities Index group

Variables	DCI group ≤50 n = 804	DCI group >50 n = 343	*P* value
Cardiopulmonary bypass time; (min), median [IQR]	128.5 [102.8-163.3]	137.0 [105.0-173.0]	.07
Aortic crossclamp time (min), median [IQR]	97.0 [76.0-125.0]	97.0 [71.0-129.5]	.998
Lowest body temperature (°C), median [IQR]	32.0 [28.0-32.2]	31.2 [28.0-32.0]	**.002**
Circulatory arrest, (%)	305 (37.9)	159 (46.4)	**.009**
Aortic replacement extent, (%)			**.002**
Root replacement only	344 (42.8)	129 (37.6)	
Ascending aorta only	152 (18.9)	50 (14.6)	
Root + distal*	199 (24.8)	88 (25.7)	
Ascending aorta + distal†	109 (13.6)	76 (22.2)	
Concomitant AV procedure, (%)			.95
No concomitant AV procedure	522 (64.9)	221 (64.4)	
AV replacement	157 (19.5)	66 (19.2)	
AV repair	125 (15.5)	56 (16.3)	

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *IQR*, interquartile range; *AV*, aortic valve. *Hemi arch, Partial arch, Total arch. †Hemi arch, Partial arch, Total arch, Zone 4.

TABLE E4. Postoperative outcomes of subgroup cohort divided by Distressed Communities Index group

Variables	DCI group ≤50 n = 804	DCI group >50 n = 343	*P* value
Stroke, (%)	23 (2.9)	17 (5.0)	.11
Surgical site infection, (%)	1 (0.1)	4 (1.2)	.05
Respiratory failure, (%)	65 (8.1)	41 (12.0)	.05
Atrial fibrillation, (%)	297 (36.9)	121 (35.3)	.64
30-d mortality, (%)	N/A	N/A	
Total hospital length of stay (d), median [IQR]	7.00 [6.00-11.0]	9.00 [6.00-14.0]	**<.001**
Reoperation for bleeding, (%)	29 (3.6)	12 (3.5)	1.0
Renal failure, (%)	38 (4.7)	14 (4.1)	.75

Bold indicates $P < .5$. *DCI*, Distressed Communities Index; *N/A*, not available; *IQR*, interquartile range.

TABLE E5. Univariable analysis for subgroup cohort

Variable	Hazard ratio	*P* value
Age	1.07 [1.06-1.09]	<.001
Female sex	1.79 [1.26-2.56]	.001
Race		
White	Reference	
Black	1.25 [0.65-2.39]	.51
Other	1.16 [0.75-1.79]	.52
BMI	0.97 [0.94-1.01]	.09
Hypertension	1.75 [1.14-2.69]	.01
Dyslipidemia	1.34 [0.95-1.88]	.098
Diabetes	1.28 [0.77-2.13]	.34
Chronic obstructive pulmonary disease	1.91 [1.21-3.01]	.01
Prior cardiac intervention	1.56 [1.05-2.30]	.03
Heart failure	2.25 [1.58-3.2]	<.001
Cerebrovascular disease	1.76 [0.92-3.34]	.09
Marfan syndrome	0.90 [0.29-2.82]	.85
Prior myocardial infarction	3.08 [1.74-5.46]	<.001
LVEF	0.99 [0.98-1.01]	.30
Smoking		
Never smoker	Reference	
Active smoker	1.24 [0.64-2.42]	.52
Former smoker	1.68 [1.18-2.39]	.004
Chronic kidney disease	1.61 [1.09-2.38]	.02
DCI as a continuous variable	1.007 [1.00-1.01]	.047
DCI >50	1.47 [1.04-2.08]	.03
Operative status: nonelective	1.98 [1.18-3.33]	.01
Cardiopulmonary bypass time	1.00 [0.9998-1.01]	.07
Aortic crossclamp time	0.999 [0.99-1.00]	.58
Lowest body temperature	0.92 [0.89-0.96]	<.001
Circulatory arrest	1.31 [0.93-1.84]	.12
Aortic replacement extent		
Isolated root replacement	Reference	
Isolated ascending aorta replacement	1.85 [1.14-3.01]	.01
Root + distal*	1.23 [0.77-1.96]	.39
Ascending aorta + distal†	2.23 [1.39-3.57]	<.001
Concomitant AV intervention		
No concomitant AV intervention	Reference	
AV replacement	1.58 [1.07-2.34]	.02
AV repair	0.63 [0.36-1.11]	.11

BMI, Body mass index; *LVEF*, left ventricular ejection fraction; *DCI*, Distressed Communities Index; *AV*, aortic valve. *Hemi arch, Partial arch, Total arch. †Hemi arch, Partial arch, Total arch, Zone 4.