Patients from Distressed Communities have Decreased Survival after Open Thoracic Aneurysm Repair

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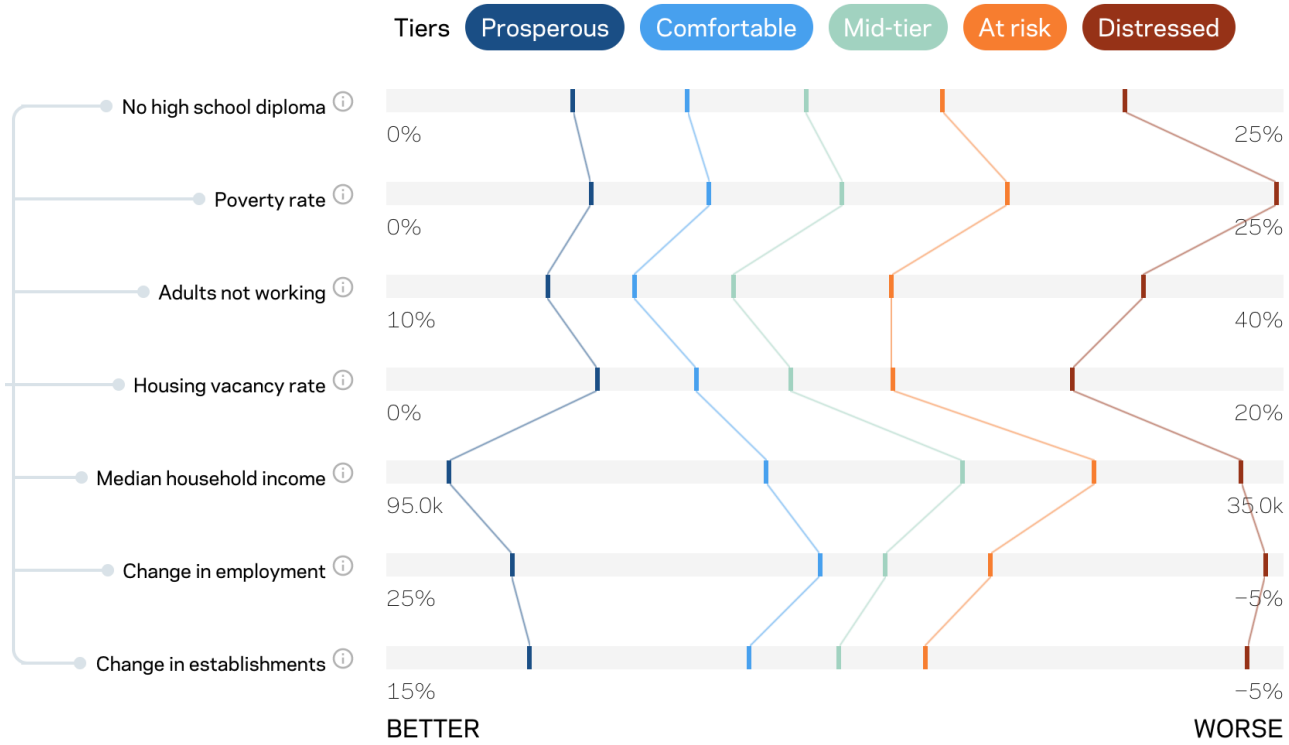
Why Thoracic Aortic Aneurysms (TAA) and Socioeconomic Status (SES)?

- SES has been widely studied in patients who have undergone cardiac surgery.
  - **Patients with lower SES have worse outcomes following CABG.[1,2]**
- The relationship between SES and open TAA repair has not been well defined in the literature.
- **Patients with lower SES have higher rates of Hypertension, Smoking, and Dyslipidemia.[3]**
- Looking into SES effect on outcomes can help elucidate healthcare disparities and provide insight on solutions towards equity.

1. Mehaffey, JTCVS (2020)
2. Newell, JTCVS (2022)
3. Hawkins, JVS (2019)

Social Determinants of Health & The Distressed Communities Index (DCI)

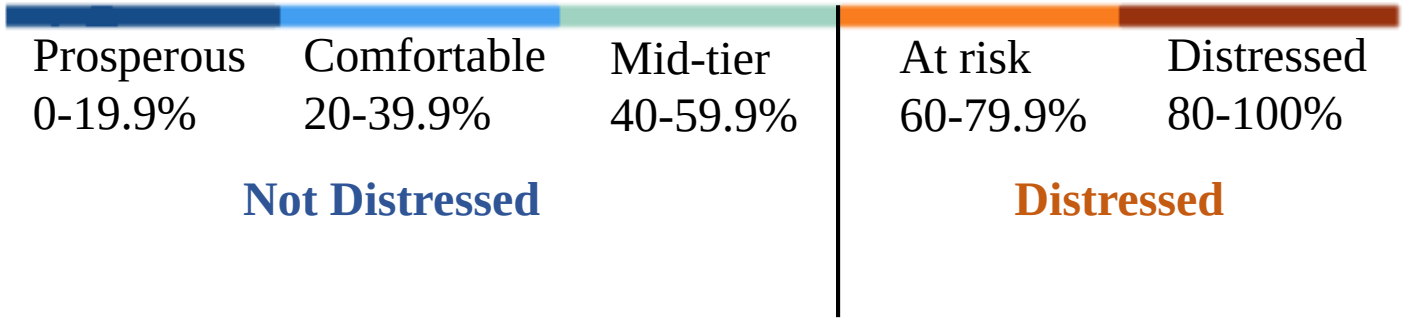


Objective: To examine the relationship between community level socioeconomic status and long-term mortality in open thoracic aortic aneurysm repair.

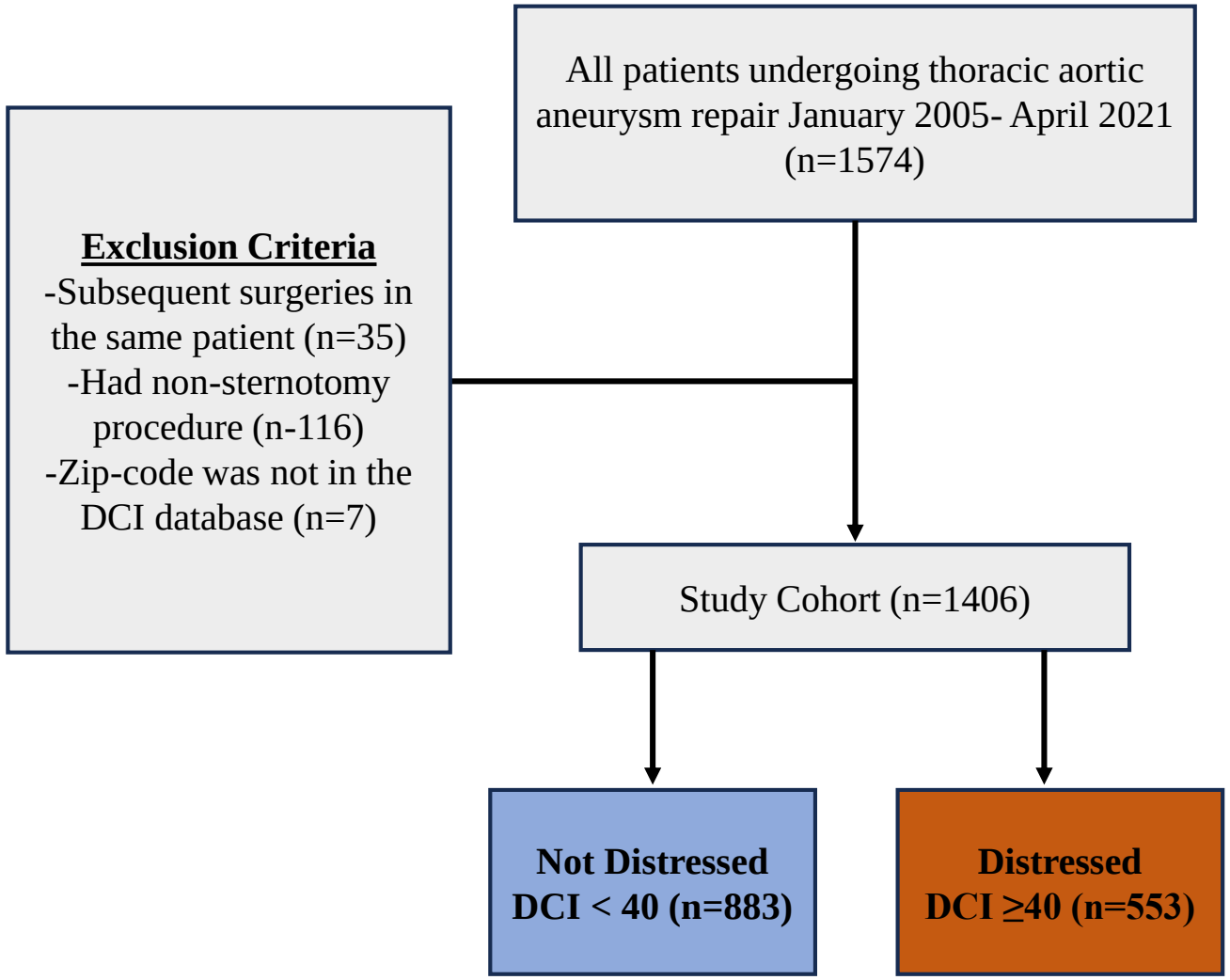
- Hypothesis:
  - A lower SES is associated with a decreased long-term survival following open thoracic aortic aneurysm repair.

Methods

- Single center, retrospective study of 1406 patients from our Aortic Center Database who received open repair for thoracic aortic aneurysm (2005-2021).
- **Primary End point**: Death within 10 years from surgical date.



Study Population



Statistical Analysis

Kaplan Meier curves were created to analyze unadjusted survival rates at 10 years.

Landmark analysis at 1 year was done due to significant mortality within the first year.

Univariable regression ran with all clinical variables.

Multivariable regression was run with clinically significant variables from the univariable regression.

Variables that did not fulfill the proportional hazards assumption as tested by the Schoenfeld global test were removed.

Results -- Baseline characteristics

Variables	Not-Distressed Group DCI < 40 n= 883	Distressed Group DCI ≥ 40 n=533	P value
Age, yrs (median [IQR])	62.0 [51.0, 72.0]	62.0 [52.0-72.0]	0.81
Female, n (%)	204 (23.1)	118 (22.1)	0.72
Race & Ethnicity			**<0.001**
Non-Hispanic White	725 (82.1)	281 (52.7)	
Hispanic White	48 (5.4)	76 (14.3)	
Non-Hispanic Black	26 (2.9)	59 (11.1)	
Hispanic Black	1 (0.1)	11 (2.1)	
Non-Hispanic Asian	20 (2.3)	19 (3.6)	
Hispanic Asian	1 (0.1)	2 (0.4)	
Non-Hispanic Other	41 (4.6)	35 (6.6)	
Hispanic Other	21 (2.4)	50 (9.4)	
BMI (median [IQR])	27.2 [24.6 -30.4]	27.7 [24.8 - 31.6]	**0.06**
HTN, n (%)	612 (69.3)	410 (76.9)	**0.002**
Dyslipidemia, n (%)	476 (53.9)	293 (55.0)	0.738
COPD, n (%)	62 (7.0)	61 (11.4)	**0.006**

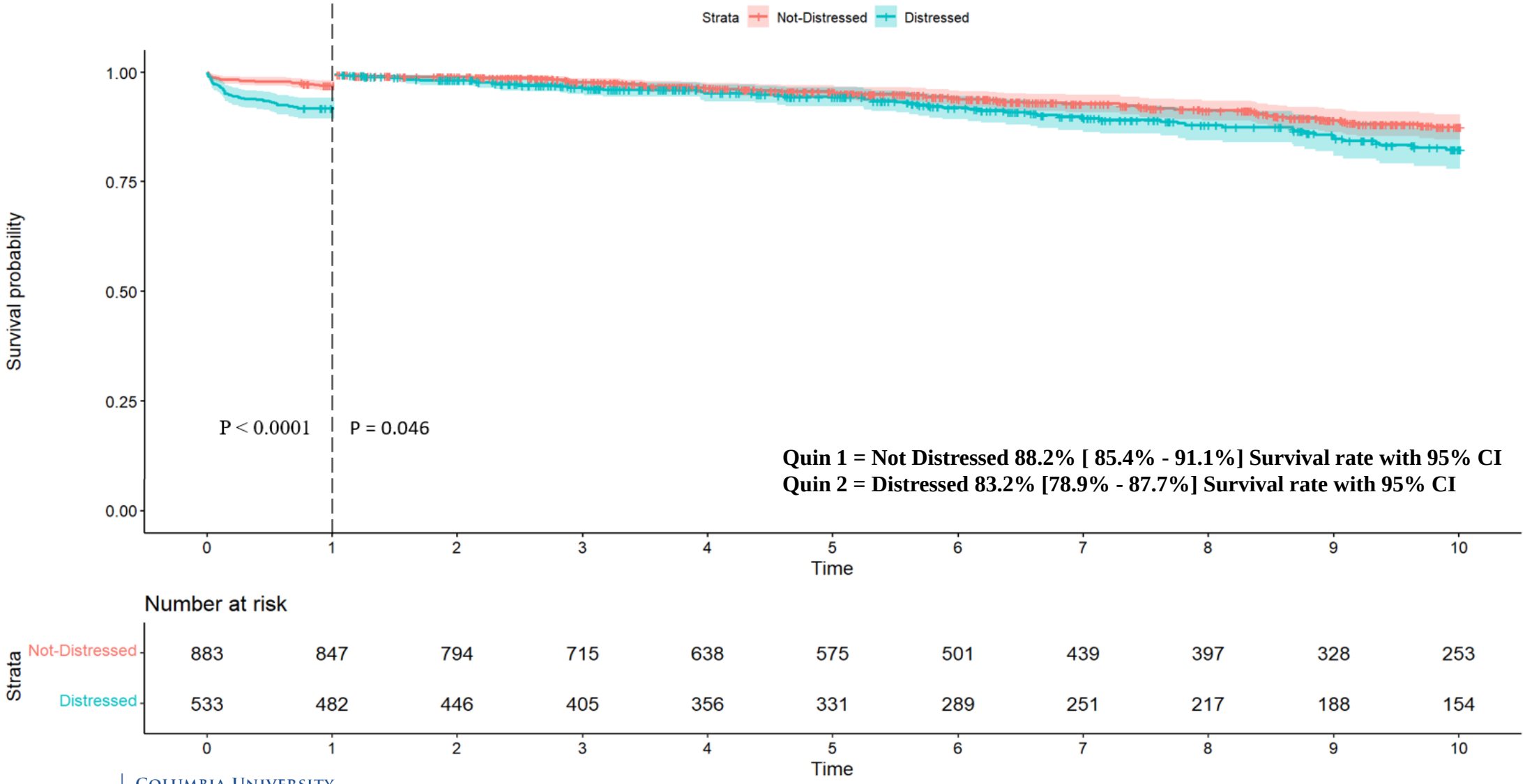
Variables	Not-Distressed Group DCI < 40 n= 883	Distressed Group DCI ≥ 40 n=533	P-value
DM, n (%)	86 (9.7)	79 (14.8)	**0.005**
CAD, n (%)	407 (46.1)	229 (43.0)	0.275
Prior Cardiac Intervention, n (%)	176 (19.9)	125 (23.5)	0.133
Prior CVA, n (%)	35 (4.0)	38 (7.1)	**0.013**
Heart Failure, n (%)	377 (42.7)	251 (47.1)	0.119
Marfan syndrome, n (%)	15 (1.7)	14 (2.6)	0.317
Prior MI, n (%)	39 (4.4)	29 (5.4)	0.456
Smoking, n (%)			0.16
No tobacco use	549 (62.2)	313 (58.7)	
Current tobacco use	71 (8.0)	58 (10.9)	
Prior tobacco use	263 (29.8)	162 (30.4)	
LVEF (median [IQR])	55.0 [54.0 - 60.0]	55.0 [50.0 - 58.0]	**<0.001**
Surgical Status, n (%)			0.319
Elective	741 (83.9)	434 (81.4)	
Urgent	131 (14.8)	88 (16.5)	
Emergent	11 (1.2)	11 (2.1)	
Emergent Salvage	0 (0.0)	0 (0.0)	
CKD, n (%)	147 (16.6)	116 (21.8)	**0.020**

Results -- Intra-op & Post-op characteristics

Variables	Not-Distressed Group DCI < 40 n= 883	Distressed Group DCI ≥ 40 n=533	P value
CPB Time (min), median [IQR]	131.00 [103.0 - 168.5]	143.0 [107.0 - 179.0]	0.004
Aortic cross clamp time (min), median [IQR]	99.0 [76.0-129.0]	99.0 [74.0-133.0]	0.807
Lowest body temperature (°C), median [IQR]	32.0 [28.0-32.4]	31.8 [28.0-32.0]	**0.001**
Circulatory arrest, n (%)	331 (37.5)	237 (44.5)	**0.011**
Aortic Replacement Extent, n (%)			**0.002**
No Aortic Root or Arch replacement	177 (20.0)	86 (16.2)	
Only Aortic Arch Replacement	126 (14.3)	116 (21.8)	
Only Aortic Root Replacement	372 (42.1)	205 (38.5)	
Both Aortic Root and Arch replacement	208 (23.6)	125 (23.5)	
Replacement distal to the Aortic Arch	0 (0.0)	0 (0.0)	

Variables	Not-Distressed Group DCI < 40 n= 883	Distressed Group DCI ≥ 40 n=533	P value
Stroke	38 (4.3)	29 (5.4)	0.397
In-Hospital Mortality	17 (1.9)	26 (4.9)	**0.003**
Surgical Site Infection	2 (0.2)	8 (0.3)	**0.014**
Respiratory Failure	87 (9.9)	85 (15.9)	**0.001**
Atrial Fibrillation	311 (35.2)	199 (37.3)	0.456
30-day Mortality	15 (1.7)	17 (3.2)	**0.100**
Total hospital LOS (days), median [IQR]	7.00 [6.00-11.0]	9.00 [6.00-15.0]	**<0.001**
Reoperation for bleeding, n (%)	38 (4.3)	27 (5.1)	0.594
Renal Failure, n (%)	46 (5.2)	40 (7.5)	0.102

Results -- Survival rate



Quin 1 = Not Distressed 88.2% [85.4% - 91.1%] Survival rate with 95% CI
Quin 2 = Distressed 83.2% [78.9% - 87.7%] Survival rate with 95% CI

Results -- Multivariable analysis

Variable	HR	P-value
Age	1.07 [1.05 – 1.09]	**<0.01**
Female Sex	1.50 [1.00 – 2.30]	0.06
Race & Ethnicity		
Non-Hispanic White	Reference	
Hispanic White	0.82 [0.40 – 1.67]	0.58
Non-Hispanic Black	1.13 [0.50 – 2.52]	0.77
Hispanic Black	0.99 [0.13 – 7.40]	0.99
Non-Hispanic Asian	1.00 [0.33 – 2.77]	0.94
Hispanic Asian	Sample size too small to analyze	
Non-Hispanic Other	1.83 [1.03 – 3.24]	**0.04**
Hispanic Other	0.50 [0.20 – 1.23]	0.13
COPD	1.11 [0.64 – 1.93]	0.70
Hypertension	0.72 [0.44 – 1.20]	0.21

Variable	HR	P-value
Heart Failure	1.58 [1.05 – 2.40]	**0.03**
Prior CVA	1.57 [0.80 – 3.11]	0.20
Prior MI	3.35 [1.77 – 6.34]	**< 0.01**
Smoking Status		
Never Smoker	Reference	
Active Smoker	1.45 [0.70 – 3.01]	0.32
Former Smoker	1.55 [1.04 – 2.30]	**0.03**
LVEF Avg	0.99 [0.97 – 1.01]	0.31
Distressed status		
Non-Distressed	Reference	
Distressed	1.68 [1.13 – 2.50]	**0.01**
Minimum Temperature	0.96 [0.91 – 1.02]	0.23
Circulatory Arrest	1.20 [0.73 – 1.95]	0.48

Limitations

- Retrospective, Single-center study limits generalizability.
- DCI is a community level SES metric which only provides us with an estimate of a person's SES.

Conclusions

- A higher distressed score as characterized by the DCI, is associated with worse long-term survival following open thoracic aortic aneurysm repair.
- Surgeons should consider SDOH, specifically SES, when risk stratifying patients as closer follow up may be warranted in this patient population.