

SUPPLEMENTAL APPENDIX

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Methods Supplement

Study Population

CHC participants completed standardized computer-assisted personal interviews while the remainder were recruited via mail-based general population sampling. Baseline data collected at enrollment included demographic (including self-reported race), socioeconomic, lifestyle, physical activity, and medical history.

Depressive symptoms and medications


CESD-10 assesses each symptom on a 4-point scale (ranging from 0 to 3 for ‘rarely or none of the time,’ ‘some or a little of the time,’ ‘occasionally or a moderate amount of the time,’ and ‘all of the time’), yielding a total score from 0 to 30.

Cardiovascular and Behavioral Risk Factors

At enrollment, demographic factors, including self-reported race were recorded. Medical conditions, including the traditional cardiovascular risk factors HTN, hyperlipidemia (HLD), DM, as well as history of stroke or transient ischemic attack (TIA) were ascertained via participant self-report of a physician diagnosis of the condition. In the majority (90%), BMI was calculated from self-reported height and weight; a previously validated method against objective measures.(1) Smoking and alcohol intake were self-reported. Prior studies in the SCCS have demonstrated accuracy and validity for self-reported measures.(2) Physical activity was assessed via questionnaire validated for use in the SCCS.(3)

Social Determinants of Health

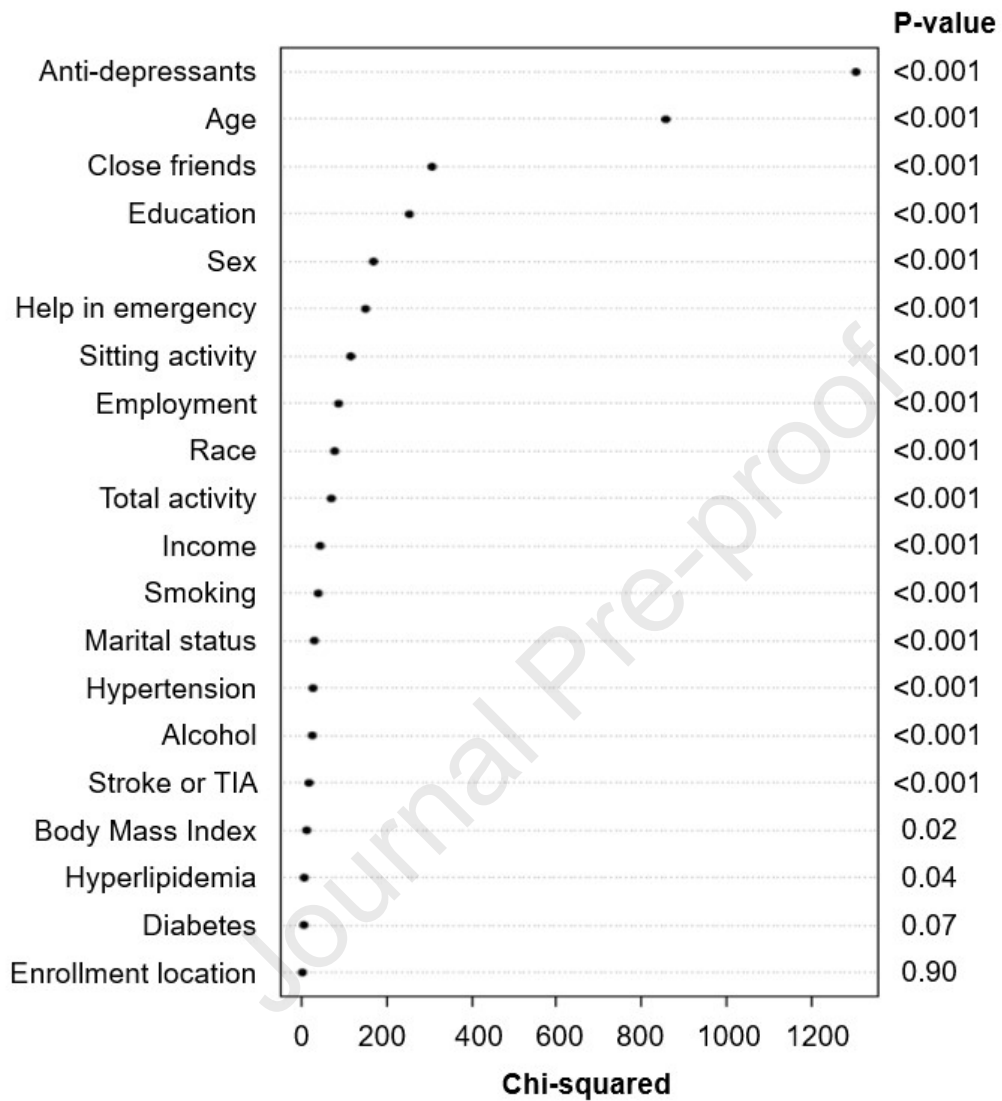
Participants reported highest attained education, household income over the last year, employment status, and marital status. Similar to the Multidimensional Scale of Perceived Social Support, other social support questions included (1) How many close friends or relatives would



help you with your emotional problems or feelings if you need it? and (2) How many people could you ask for help in an emergency or with lending you money? (4)

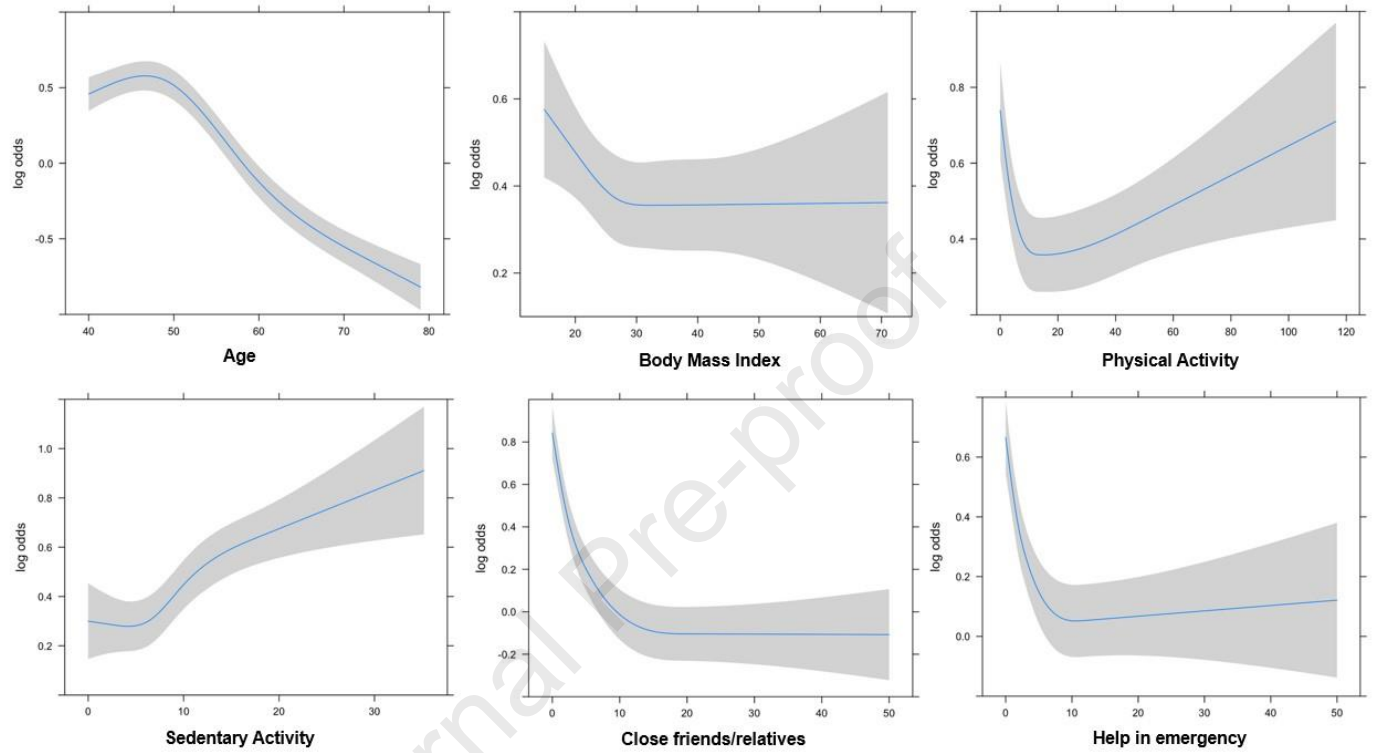
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Supplemental Figure 1A. Relative strength of association of clinical, socioeconomic, and behavioral factors with CESD-10 score.



Caption: Socioeconomic factors and anti-depressant/anxiolytic medication are most strongly associated with CESD-10 score. Results from multivariable ordinal logistic regression model adjusted for all variables shown. TIA= transient ischemic attack.

Supplemental Figure 1B. Predicted plots of the associations between non-linear continuous variables and CESD-10 from the multivariable-adjusted ordinal regression model including all variables shown in Supplemental Figure 1A.



Caption: The association of these variables with CESD-10 score are non-linear. For example, individuals <60 years of age are more likely to have higher CESD10 scores whereas those over 60 years of age are less likely to have higher CESD10 scores.

Supplemental Table 1. Multivariable-adjusted odds ratios for the association with CESD-10 score.

Factor	OR	95% CI	P-value
Sex	0.70	(0.66, 0.74)	<0.001
Race	0.78	(0.74, 0.82)	<0.001
Hypertension	1.14	(1.08, 1.20)	<0.001
Diabetes	1.06	(1.00, 1.12)	0.07
Hyperlipidemia	1.06	(1.00, 1.11)	0.04
Cerebrovascular disease	1.19	(1.09, 1.29)	<0.001
Smoking ^a	0.87	(0.82, 0.92)	<0.001
Education	0.77	(0.74, 0.79)	<0.001
Income	0.89	(0.86, 0.92)	<0.001
Employment	0.73	(0.68, 0.78)	<0.001
Alcohol	1.01	(1.00, 1.01)	<0.001
Marital status ^b	0.85	(0.80, 0.90)	<0.001
Anti-depressant use	2.89	(2.73, 3.06)	<0.001

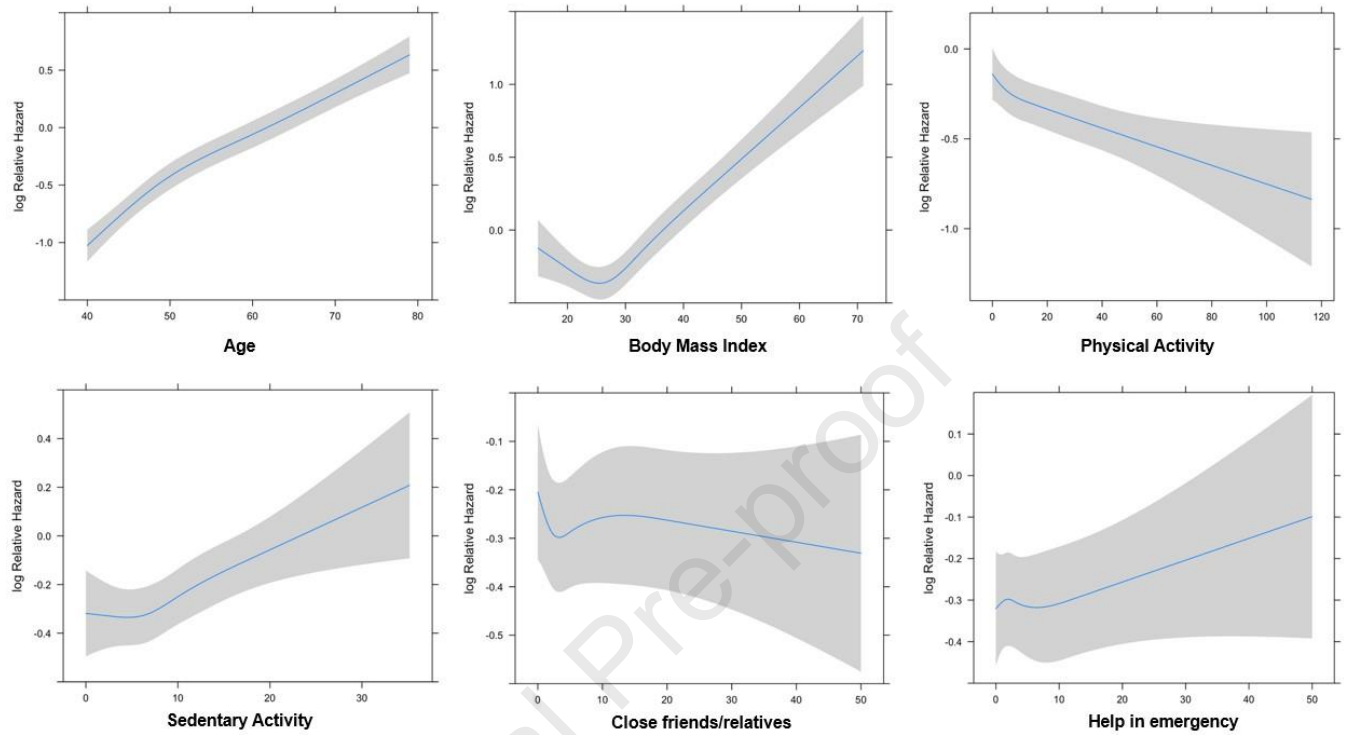
^aSmoking: current vs. never; ^bMarital: married vs. divorced/separated

Supplemental Table 2. Effect size of categorical variables included in the multivariable-adjusted Cox model for incident heart failure shown in Table 2, Model 3

Factor	HR	95% CI	P-value
Sex	1.13	(1.06, 1.20)	<0.001
Race	0.90	(0.85, 0.96)	0.001
Hypertension	1.55	(1.45, 1.66)	<0.001
Diabetes	1.61	(1.52,1.71)	<0.001
Hyperlipidemia	0.96	(0.91, 1.01)	0.20
Cerebrovascular disease	1.34	(1.23, 1.46)	<0.001
Smoking ^a	0.74	(0.69, 0.79)	<0.001
Education	0.94	(0.90, 0.98)	0.002
Income	0.89	(0.85, 0.93)	<0.001
Employment	0.82	(0.75, 0.90)	<0.001
Alcohol	1.00	(1.00, 1.00)	0.69
Marital status ^b	1.00	(0.93, 1.07)	0.29
Anti-depressant use	1.05	(0.98, 1.12)	0.24

^aSmoking: current vs. never; ^bMarital: married vs. divorced/separated

Supplemental Figure 2. Predicted plots for non-linear continuous variables included in the multivariable-adjusted Cox model for incident heart failure shown in Table 2, Model 3



Caption: Represented as log of relative hazard, thus the more positive the value the higher the risk of incident heart failure. For example, older age, higher body mass index, and less physical activity are associated with increased risk of HF.

Supplemental Table 3. Baseline Characteristics by Incident Heart Failure Status

Characteristic	No HF (N=17856)	HF (N=6081)	<i>p</i>
Age, years	52 (45, 63)	58 (50, 66)	<0.001
Female, %	63	66	<0.001
Black, %	70	70	0.88
Education, %			<0.001
<High school	36	44	
HS/vocational/junior college	55	49	
≥ College degree	9	7	
Annual income < \$15,000, %	69	74	<0.001
Employed, %	17	11	<0.001
Comorbidities, %			
Hypertension	60	75	<0.001
Diabetes	21	38	<0.001
Hyperlipidemia	35	43	<0.001
Cerebrovascular disease	7	12	<0.001
BMI	28.4 (24.4, 33.7)	31.0 (26.1, 37.1)	<0.001
Smoking, %			<0.001
Current	42	37	
Former	22	28	
Never	36	35	
Physical activity			
Sitting, hrs/day	8.0 (5.5,11.5)	8.0 (5.5,11.7)	0.07
Total activity, met-hrs/day	13.7 (6.9, 24.6)	11.7 (6.1, 20.4)	<0.001
Alcohol per day ^a	1.2 ± 3.9	0.9 ± 3.3	<0.001
Marital Status, %			<0.001
Married	29	29	
Divorced or separated	34	34	
Widowed	12	19	
Never married	25	18	
Close friends/relatives, n	3 (2, 6)	3 (2, 6)	0.30
Help in emergency, n	2 (1, 5)	2 (1, 5)	0.54
Anti-depressants/anxiolytics, %	27	28	0.14
History of Depression, %	32	32	0.52
CESD-10 Score	9 (5, 13)	9 (5, 13)	0.90

^aAll continuous variables are displayed as median (25th, 75th percentile) except where indicated by (^a) for which mean ± SD is displayed. BMI = body mass index, hrs= hours, HS= high school

Supplemental Table 4. Clinical Trials testing treatment of depression in patients with prevalent heart failure

Acronym/ Clinical Trial/ Author, Year	Key inclusion criteria	Design	Intervention	Primary Endpoint	Results
Gottlieb, 2007(5)	HFrEF (EF ≤ 40%) NYHA II-III BDI score ≥ 10	Multicenter Double-blind Randomized Placebo-controlled	Paroxetine 12 weeks	Depression symptoms and QOL	Reduction in depression and improvement in psychological QOL factors
Fraguas, 2009(6)	HF (EF <50) Clinical MDD	Single center Double-blind Randomized Placebo-controlled	Citalopram 8 weeks	Change in Ham-D	Terminated early due to high placebo response rate
SADHART-CHF NCT00078286 O'Connor, 2010(7)	HFrEF (EF ≤ 45%) NYHA II-VI Clinical MDD	Multicenter Double-blind Randomized Placebo-controlled	Sertraline 12 weeks	Depression severity Cardiovascular status	No reduction in depression or improvement in CV status
MOOD-HF ISRCTN33128015 Angermann, 2016(8)	HFrEF (EF ≤ 45%) NYHA II-VI Clinical MDD	Multicenter Double-blind Randomized Placebo-controlled	Escitalopram 24 months	Time to all-cause death or hospitalization	No difference
OCEAN NCT02057406 Jiang, 2018(9)	HF, NYHA > II Clinical MDD HAM-D ≥ 18	Multicenter Double-blind Randomized Placebo-controlled	Long-Chain Omega-3 12 weeks	Depressive symptoms Red blood cell levels of EPA	No difference in depression Increased red blood cell levels
HF- ACTION NCT00047437 Blumenthal, 2012(10)	HFrEF (EF ≤ 35%) NYHA II-III BDI-II completion	Multicenter Randomized Controlled	Exercise program 12 months	Composite of all-cause death or hospitalization Change in BDI-II scores	Reduction in depressive symptoms

Abdelbasset, 2019(11)	HFrEF (EF < 40%) NYHA II-III PHQ-9 score 5-19	Single center Single blind Randomized	Exercise program 12 weeks	Depression status	Reduction in depression levels
Gary, 2010(12)	HF(EF ≥ 15%) NYHA II-III BDI- II score ≥ 10	Single center Randomized Single-Blind	Exercise + CBT 12 weeks	Depressive symptoms, physical function, and health- related QOL	Improvement in physical function only
Dekker, 2012(13)	HF hospitalization NYHA III-IV BDI-II 10-28	Multicenter Randomized	CBT 2 episodes	Depressive symptoms	No difference
NCT01028625 Freedland, 2015(14)	HF diagnosis NYHA I-III BDI-II ≥ 14	Single center Randomized Single-blind	CBT 6 months	BDI-II score Self-care score	Reduction in depression scores but no difference in self-care scores
NCT01681771 Lundgren, 2016(15)	HF diagnosis PHQ-9 ≥ 5	Multicenter Randomized	Internet-based CBT 9 weeks	Depressive symptoms	No difference
NCT02044211 Rollman, 2021(16)	HFrEF (EF < 45%) NYHA II-IV PHQ-9 ≥ 10	Multicenter Single-blind Randomized	Blended Collaborative care 12 months	Mental Health QOL	Improvement in QOL compared to usual care

BDI = Beck depression index, CBT = cognitive behavior therapy, CV= cardiovascular, EF = ejection fraction, EPA = eicosapentaenoic acid, Ham-D = Hamilton Rating Scale- Depression, HF = heart failure, HFrEF = heart failure reduced ejection fraction, NYHA = New York Heart Association, MDD = major depressive disorder, PHQ-9 = Patient Health Questionnaire 9, QOL = quality of life

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