Search Strategies

Databases' search strategy	
MEDLINE	Database: Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present> Search Strategy: --- 1 Ventricular Function, Left/ (32622) 2 Ventricular Dysfunction, Left/ (24705) 3 left ventric*.mp. (179585) 4 LV.mp. (41504) 5 1 or 2 or 3 or 4 (198982) 6 Echocardiography/ (78179) 7 speckle tracking.mp. (3722) 8 STE.mp. (1905) 9 strain.mp. (385200) 10 deformation.mp. (36853) 11 mechanic*.mp. (390628) 12 torsion.mp. (22257) 13 twist.mp. (10298) 14 rotation.mp. (95760) 15 GLS.mp. (1508) 16 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 (963614) 17 Cardiovascular Diseases/ (128863) 18 cardiovascular disease*.mp. (220948) 19 Heart Failure/ (103286) 20 Heart failure.mp. (176882) 21 HF.mp. (35998) 22 Mortality/ (39168) 23 mortality.mp. (670200) 24 Death/ (16230) 25 death.mp. (691814) 26 Morbidity/ (27417) 27 morbidity.mp. (330859) 28 (cardi* adj3 (event* or outcome*)).mp. (66991) 29 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 (1690357) 30 predict*.mp. (1382430) 31 prognos*.mp. (734497)

	32 30 or 31 (1934125) 33 exp Cohort Studies/ (1714168) 34 (cohort adj (study or studies)).mp. (310492) 35 (Follow up adj (study or studies)).mp. (604740) 36 Longitudinal.mp. (250750) 37 (observational adj (study or studies)).mp. (109821) 38 Epidemiologic studies/ (7611) 39 (epidemiologic* adj (study or studies)).mp. (79971) 40 population based study.mp. (24755) 41 general population.mp. (85498) 42 communit*.mp. (535197) 43 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 (2539317) 44 5 and 16 and 29 and 32 and 43 (2940)
EMBASE	Database: Embase Classic+Embase <1947 to 2018 February 27> Search Strategy: --- 1 heart left ventricle function/ (39176) 2 left ventric*.mp. (332499) 3 LV.mp. (83461) 4 1 or 2 or 3 (353062) 5 echocardiography/ (178295) 6 exp speckle tracking echocardiography/ (3150) 7 speckle tracking.mp. (10536) 8 STE.mp. (4416) 9 strain.mp. (762166) 10 deformation.mp. (42935) 11 mechanic*.mp. (498347) 12 torsion.mp. (27446) 13 twist.mp. (12502) 14 rotation.mp. (109923) 15 GLS.mp. (3938) 16 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 (1553350) 17 cardiovascular disease/ (241943) 18 cardiovascular disease*.mp. (336057) 19 heart failure/ (212076) 20 Heart Failure.mp. (347509) 21 HF.mp. (60866) 22 mortality/ (722163) 23 cardiovascular mortality/ (29486)

	24 all cause mortality/ (4807) 25 mortality.mp. (1271143) 26 death/ (284488) 27 death.mp. (1097060) 28 morbidity/ (309365) 29 morbidity.mp. (569914) 30 (cardi* adj3 (event* or outcome*)).mp. (110928) 31 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 (2824491) 32 predict*.mp. (1798936) 33 prognos*.mp. (982782) 34 32 or 33 (2544622) 35 longitudinal study/ (109328) 36 longitudinal.mp. (297876) 37 prospective study/ (426930) 38 cohort analysis/ (346132) 39 (Cohort adj (study or studies)).mp. (217636) 40 (follow up adj (study or studies)).mp. (63815) 41 (observational adj (study or studies)).mp. (172984) 42 (epidemiologic* adj (study or studies)).mp. (100634) 43 population based study.mp. (33254) 44 general population.mp. (124629) 45 communit*.mp. (641283) 46 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 (1963334) 47 4 and 16 and 31 and 34 and 46 (4098)

‘adj3’ is a proximity operator and indicates within three words;

‘OR and AND’ are Boolean operators;

‘*’ indicates truncation;

‘mp.’ means a keyword search of title, abstract, original title, name of substance word, subject heading word and keyword heading word.

Supplemental Table 1. Studies reporting Kaplan-Meier data as descriptive information

Citation (Author, year)	Categories	P value	Outcomes	Participants
Russo et al (2014)	Event-free probability in participants with any LVSD (GLS LVSD or LVEF LVSD) vs. no LVSD	<0.001, log-rank p	**Composite CV end point** **n=58** (included ischemic stroke [n=16], myocardial infarction [n=10], and vascular death [n=32])	All
	Event-free probability in participants with LVEF-LVSD, GLS-LVSD and no LVSD	<0.001, log-rank p		
Russo et al (2015)	Cumulative incidence in participants with GLS>−14.7% vs. GLS≤−14.7%	<0.001, p for comparison	**Atrial fibrillation (AF)**	All
	Cumulative incidence in participants with: Group 1: Normal GLS/normal LAVi Group 2: Abnormal GLS/normal LAVi Group 3: Normal GLS/abnormal LAVi Group 4: Abnormal GLS/abnormal LAVi	<0.001, p for comparison		
Kuznetsova et al (2016)	Cumulative incidence according to the quartiles of mid-wall strain: Low, low-medium, medium-high and high LV mid-wall strain quartile	<0.0001, p for trend	**Composite CV end point** **n=96** (comprised cardiac end points, stroke, transient ischemic attack, aortic aneurysm, arterial embolism, and revascularization of peripheral arteries) **Composite cardiac end point** **n=68** (Included coronary events, fatal and nonfatal HF, pulmonary heart disease, new-onset AF, and life-threatening arrhythmias)	All
	Cumulative incidence according to the groups with 0, 1, 2, 3 LV abnormalities in echocardiography including abnormal mid-wall strain, LVH and LVDD)	<0.0001, log-rank p		
Biering-Sorensen et al (2017)	Cumulative incidence stratified by quartiles of GLS (quartile 1, 2, 3 and 4)	<0.001, Log rank p	**Composite cardiac end point** **n=149** (comprising AMI [n=43], HF [n=78], and CV death [n=74])	All
		<0.001, Log rank p	**HF**: n = 78	

		0.016, Log rank p	**AMI**: n = 43	
		0.15, Log rank p	**CV death**: n= 74	
	Cumulative incidence stratified by quartiles of GLS (quartile 1, 2, 3 and 4)	0.12, Log rank p	**Composite cardiac end point** **n=77** (comprising AMI, HF, and CV death)	Female
		0.09, Log rank p	**HF**	
		0.28, Log rank p	**AMI**	
		0.37, Log rank p	**CV death**	
	Cumulative incidence stratified by quartiles of GLS (quartile 1, 2, 3 and 4)	<0.001, Log rank p	**Composite cardiac end point** **n=72** (comprising AMI], HF, and CV death)	Male
		<0.001, Log rank p	**HF**	
		0.030, Log rank p	**AMI**	
		0.22, Log rank p	**CV death**	
Brainin et al (2018)	Cumulative incidence stratified by number of walls displaying post systolic shortening (no wall, 1 wall, and ≥2 walls)	<0.001, Log rank p	**Composite cardiac end point** **n=149 (11.5%)** (composite of HF [n=78], MI [n=43], and CV death [n=74])	All
		<0.001, Log rank p	**Deaths** n=236 (18.1%)	
Modin et al (2018)	Cumulative incidence stratified by median GLS in hypertensive individuals: lower vs upper half	P=0.016	**Composite cardiac end point** (Composite of either IHD or HF) n=145 (65%) in hypertensive and n=77 (35%) in non-hypertensive	Hypertensive participants
	Cumulative incidence stratified by median GLS in non-hypertensive individuals: lower vs upper half	P<0.001		Non-hypertensive participants

Abbreviations: AMI, acute myocardial infarction; CV, cardiovascular; HF, heart failure; IHD, ischemic heart disease; LAVi, left atrial volume index; LV, left ventricular; LVDD, LV diastolic dysfunction; LVEF, LV ejection fraction; LVH, LV hypertrophy; LVSD, LV systolic dysfunction; GLS, global longitudinal strain.

Maximally adjusted models of included studies

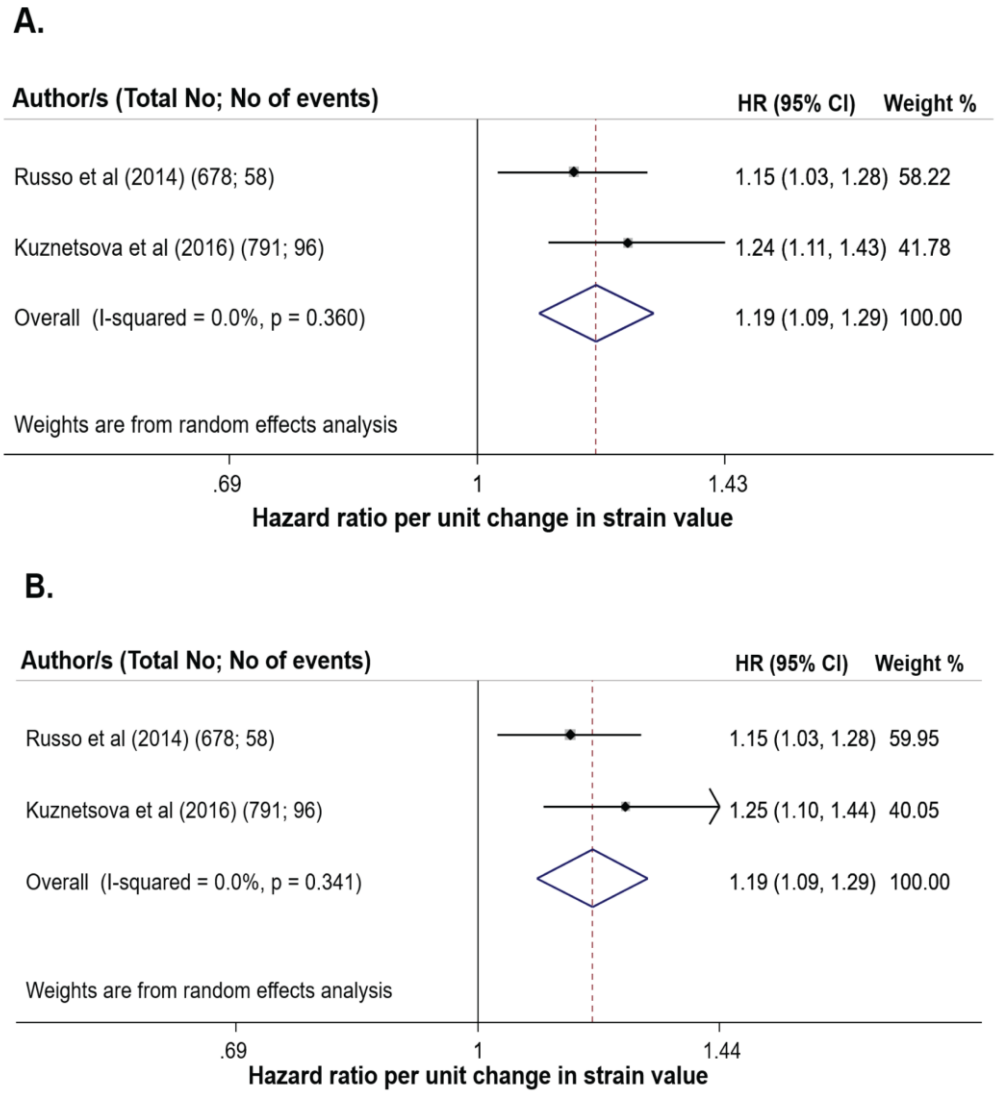
- **Russo et al (2014):** adjusted for age, sex, systolic blood pressure (SPB), diastolic BP, hypertension, anti-hypertensive medications, diabetes mellitus (DM), left ventricular mass index (LVMi), relative wall thickness, left atrial volume index, diastolic dysfunction, atrial fibrillation and LVEF.
- **Kuznetsova et al (2016):** adjusted for family clusters, sex, age, body mass index (BMI), SBP, serum cholesterol, smoking, antihypertensive treatment, DM, and a history of cardiac disease, TDI e' and LVMi.
- **Cheng et al (2015):** adjusted for age, sex, ethnicity, BMI, SBP, diastolic BP, anti-hypertensive treatment, total/ HDL cholesterol, DM, smoking status, left ventricular (LV) mass (LVM), LV fractional shortening, and heart rate (HR).
- **Biering-Sorensen et al (2017):** adjusted for age, sex, HR, hypertension, DM, previous ischemic heart disease, SBP, and pro-BNP (>150 pmol/L), LVEF (<50%), LVMi, LV dimension, deceleration time, left atrial dimension, and E/e′.

Supplement Table 2. Quality assessment of the included papers based on NEWCASTLE - OTTAWA QUALITY ASSESSMENT SCALE - COHORT STUDIES

	Russo et al [1]	Cheng et al [2]	Russo et al [3]	Kuznetsova et al [4]	Biering-Sorensen et al [5]	Brainin et al [6]	Modin et al [7]	Shah et al [8]
Selection category								
1- Representativeness of the cohort a) Truly representative of the average person in the community ⁎ b) Somewhat representative of the average person in the community (sampling described and designed to achieve adequately representative sample of the community)⁎ c) Selected group e.g. nurses, volunteers d) No description of the derivation of the cohort	⁎	⁎	⁎	⁎	⁎	⁎	⁎	⁎
2- Assessment of exposure reliability a) Include assessment of inter- and intra-observer variabilities ⁎ b) Include assessment of intra-observer variability ⁎ **c)** No description	⁎	⁎	⁎	⁎	⁎	⁎		⁎
3- Completeness of collection of potential confounders (i.e. CVD risk factors) a) Complete ⁎ b) Partially complete (≥ 5) ⁎ c) Partially complete (< 5) **d)** No description	⁎	⁎	⁎	⁎	⁎	⁎	⁎	⁎
4- Demonstration that the outcome of interest not present at start of study (and/or sensitively analysis) a) Yes □ b) No	⁎	⁎	⁎	⁎	⁎	⁎	⁎	⁎
Outcome category								
1- Assessment of outcome a) Independent blind assessment ⁎ b) Record linkage ⁎ c) Self-report d) No description	⁎	⁎	⁎	⁎	⁎	⁎	⁎	⁎

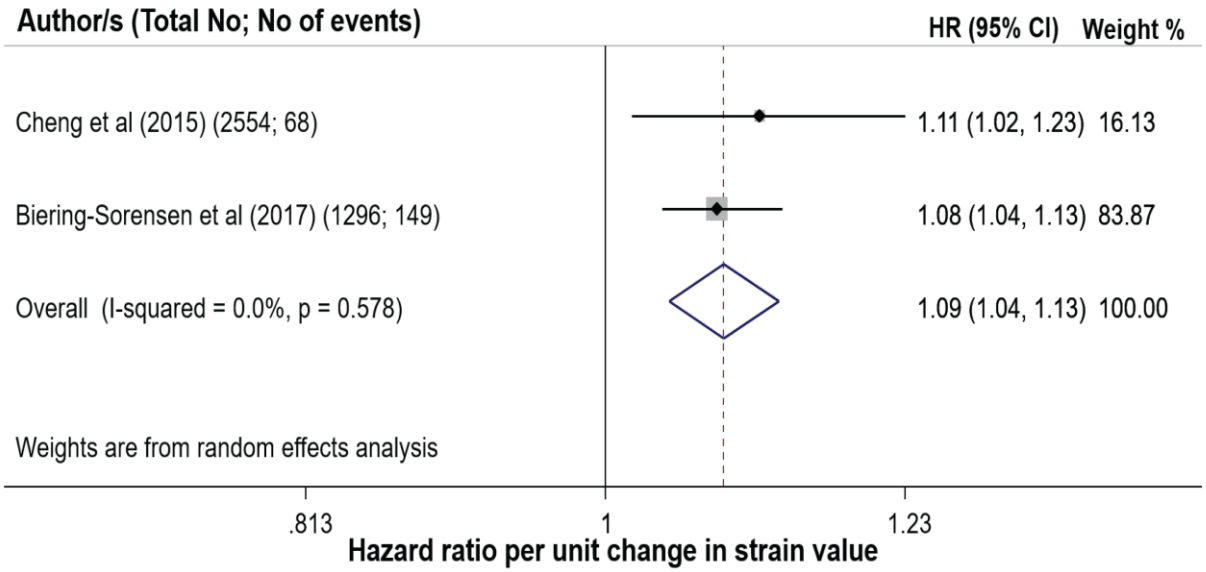
2- Was follow-up long enough for outcomes to occur a) yes (an adequate follow up period for outcome of interest is a year) ⁕ **b)** no	⁕	⁕	⁕	⁕	⁕	⁕	⁕	⁕
3- Adequacy of follow up of cohorts a) Complete follow up - all subjects accounted for ⁕ b) Subjects lost to follow up unlikely to introduce bias - small number lost - > 80% follow up, or description provided of those lost ⁕ c) Follow up rate < 80% and no description of those lost d) No statement	⁕	⁕	⁕	⁕	⁕	⁕	⁕	⁕
Total								
Average of both reviewers	7	7	7	7	7	7	6	7

Supplement Figure 1 Global longitudinal strain as a predictor of composite cardiovascular end-point on maximally adjusted models.



Sensitivity analysis of replacing the endocardial strain with **(A)** mid-wall and **(B)** epicardial strains for Kuznetsova et al (2016) study. HRs are per unit change in strain value. The heterogeneity assessment including the I^2 statistics and p-value of Q test are shown.

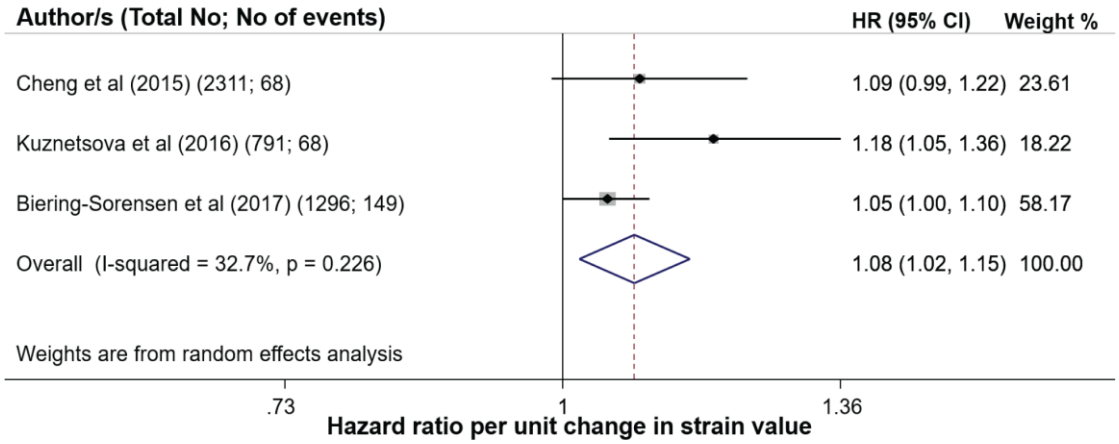
Supplement Figure 2. Global longitudinal strain as a predictor of composite cardiac-end point on minimally adjusted models



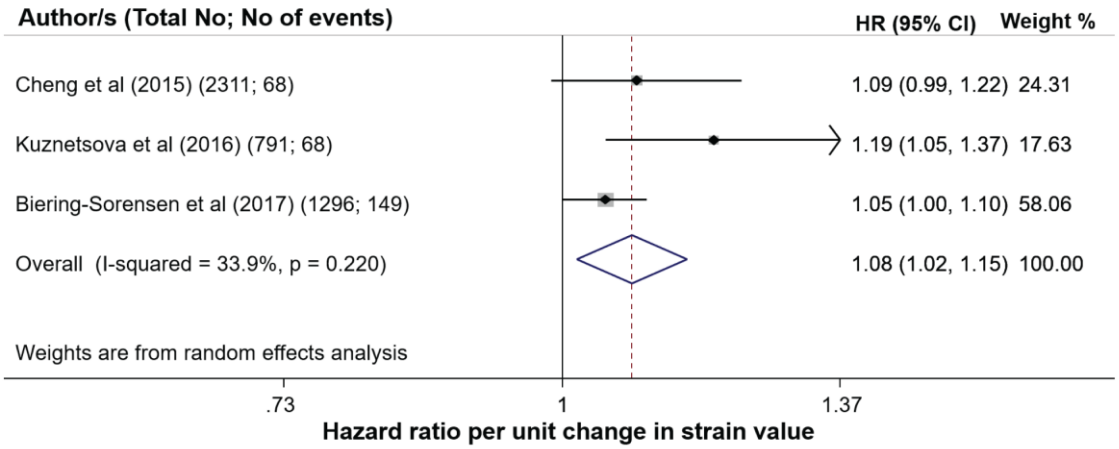
Cheng et al (2015) adjusted for age, sex and ethnicity and Bering-Sorensen et al (2017) adjusted for age and sex. HRs are per unit change in strain value. The heterogeneity assessment including the I^2 statistics and p-value of Q test are shown.

Supplement Figure 3. Global longitudinal strain as a predictor of composite cardiac end-point on maximally adjusted models.

A.

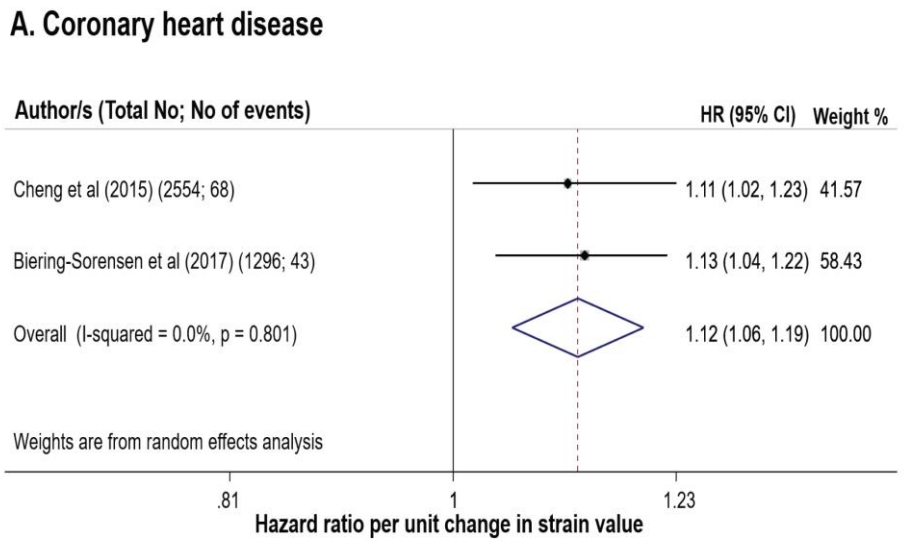


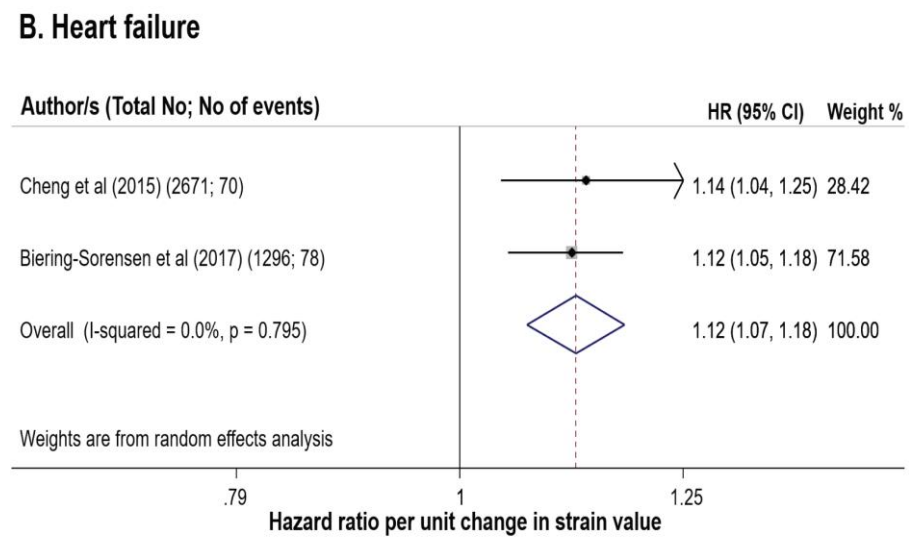
B.



Sensitivity analysis of replacing the endocardial strain with **(A)** mid-wall and **(B)** epicardial strains for Kuznetsova et al (2016) study. HRs are per unit change in strain value. The heterogeneity assessment including the I^2 statistics and p-value of Q test are shown.

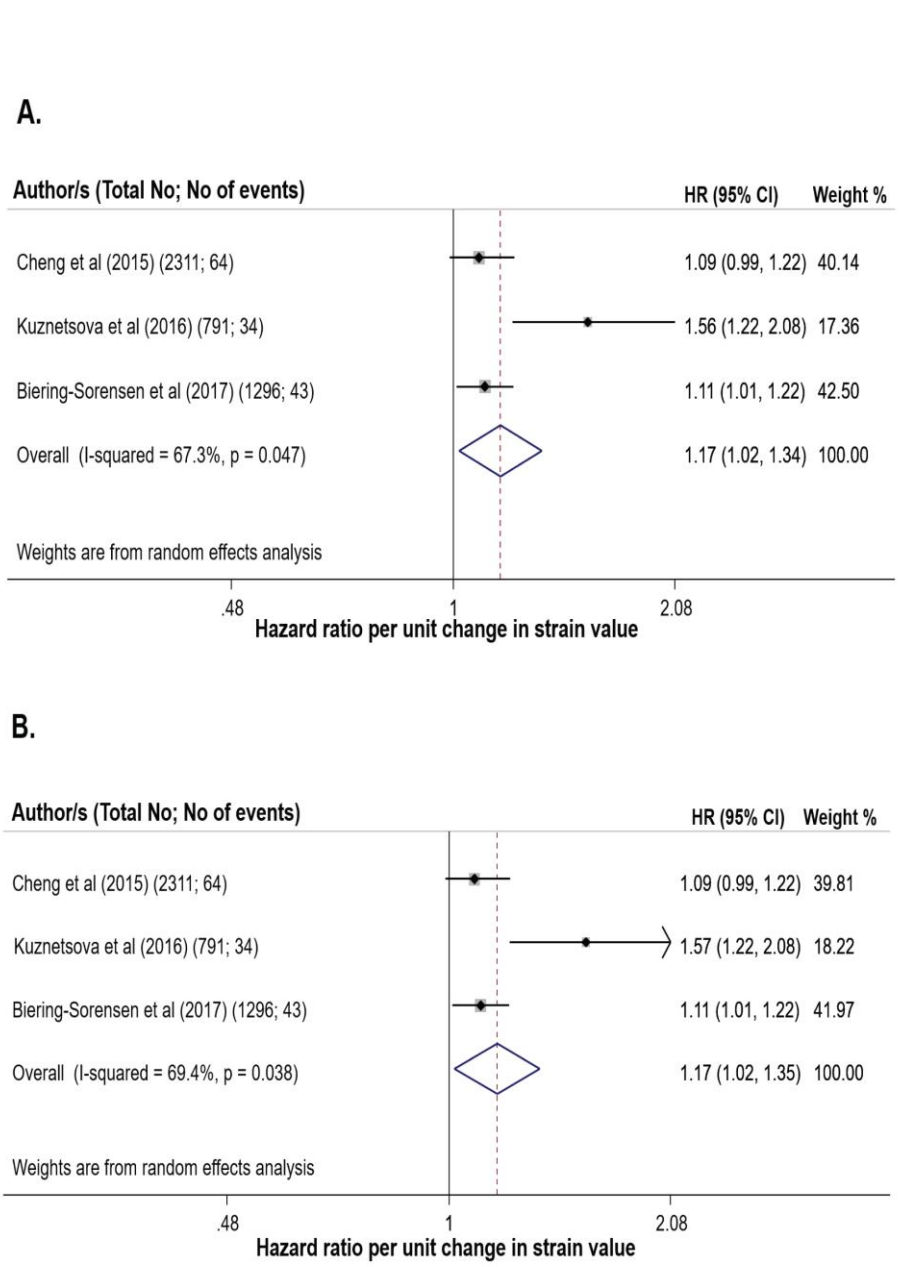
Supplement Figure 4. Global longitudinal strain as a predictor of (A) coronary artery disease and (heart failure) on minimally adjusted models.





Cheng et al (2015) adjusted for age, sex and ethnicity and Bering-Sorensen et al (2017) adjusted for age and sex. HRs are per unit change in strain value. The heterogeneity assessment including the I^2 statistics and p-value of Q test are shown.

Supplement Figure 5. Global longitudinal strain as a predictor of coronary heart disease on maximally adjusted models.



Sensitivity analysis of replacing the endocardial strain with **(A)** mid-wall and **(B)** epicardial strains for Kuznetsova et al (2016) study. HRs are per unit change in strain value. The heterogeneity assessment including the I^2 statistics and p-value of Q test are shown.

References

1. Russo C, Jin Z, Elkind MS, et al. Prevalence and prognostic value of subclinical left ventricular systolic dysfunction by global longitudinal strain in a community-based cohort. *Eur J Heart Fail.* 2014;16(12):1301-1309.
2. Cheng S, McCabe EL, Larson MG, et al. Distinct Aspects of Left Ventricular Mechanical Function Are Differentially Associated With Cardiovascular Outcomes and All-Cause Mortality in the Community. *J Am Heart Assoc.* 2015;4(10):e002071.
3. Russo C, Jin Z, Sera F, et al. Left Ventricular Systolic Dysfunction by Longitudinal Strain Is an Independent Predictor of Incident Atrial Fibrillation: A Community-Based Cohort Study. *Circ Cardiovasc Imaging.* 2015;8(8):e003520.
4. Kuznetsova T, Cauwenberghs N, Knez J, et al. Additive Prognostic Value of Left Ventricular Systolic Dysfunction in a Population-Based Cohort. *Circ Cardiovasc Imaging.* 2016;9(7).
5. Biering-Sorensen T, Biering-Sorensen SR, Olsen FJ, et al. Global Longitudinal Strain by Echocardiography Predicts Long-Term Risk of Cardiovascular Morbidity and Mortality in a Low-Risk General Population: The Copenhagen City Heart Study. *Circ Cardiovasc Imaging.* 2017;10(3).
6. Brainin P, Biering-Sorensen SR, Mogelvang R, Sogaard P, Jensen JS, Biering-Sorensen T. Postsystolic Shortening by Speckle Tracking Echocardiography Is an Independent Predictor of Cardiovascular Events and Mortality in the General Population. *J Am Heart Assoc.* 2018;7(6).
7. Modin D, Biering-Sorensen SR, Mogelvang R, Landler N, Jensen JS, Biering-Sorensen T. Prognostic Value of Echocardiography in Hypertensive Versus Nonhypertensive Participants From the General Population. *Hypertension.* 2018;26:26.
8. Shah AM, Claggett B, Loehr LR, et al. Heart Failure Stages Among Older Adults in the Community: The Atherosclerosis Risk in Communities Study. *Circulation.* 2017;135(3):224-240.