

## **SUPPLEMENTAL MATERIAL**

Cigarette smoking and incident heart failure: Insights from the Jackson Heart Study

Daisuke Kamimura; Loretta R. Cain; Robert J. Mentz; Wendy B. White; Michael J. Blaha;

Andrew P. DeFilippis; Ervin R. Fox; Carlos J. Rodriguez; Rachel J. Keith; Emelia J.

Benjamin; Javed Butler; Aruni Bhatnagar; Rose M. Robertson; Michael D. Winniford;

Adolfo Correa; and Michael E. Hall

## Supplemental Methods

### Echocardiography

Echocardiograms were performed by appropriately trained sonographers and interpreted by experienced cardiologists in the Echocardiography Reading Center at the University of Mississippi Medical Center. Standard echocardiographic views were obtained by trained sonographers and measurements were performed by one interpreting cardiologist (TES) who was blinded to participants' clinical data.<sup>1</sup> Mitral and aortic leaflet morphology was evaluated. Then, a classification of "None or Minimal Sclerosis" was assigned when no more than a slight increase in echogenicity of the leaflets was present and valve motion was normal. "Definite sclerosis" was classified when echogenicity in the leaflets was clearly abnormal and/or there was leaflet thickening with no more than mild restriction to leaflet motion. "Definite stenosis" was assigned when leaflet motion was significantly restricted. The study protocol did not specifically call for continuous wave Doppler data to estimate valve gradient or area, but if obtained by the technician as supplemental data, this may have been used for assignment of valve abnormality. The presence and severity of valve regurgitation based on integration of all the color flow data was recorded.

**Supplemental Table 1**

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	Smoking burden (pack-years) among Ever Smokers				
	Never Smoker	0~7.5	7.5~15	15~30	≥30
Never Smokers (n)	2884	0	0	0	0
Former Smokers (n)	0	126	144	215	257
Current Smokers (n)	0	108	112	147	136
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Current Smokers Among	—	46.2	43.8	40.6	34.6
Ever Smokers (%)					
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Time Since quitting	—	13.7	14.9	16.2	16.8
Among Former Smokers (yrs)					

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**Supplemental Table 2. Smoking status and cardiac structure and function assessed by CMR**

**at Visit 3 additionally adjusting for class of anti-hypertensive medication use**

<b>Model 3</b>			
	<b>Never Smoker</b>	<b>Former Smoker</b>	<b>Current Smoker</b>
	<b>(n=791)</b>	<b>(n=198)</b>	<b>(N=103)</b>
<b>Variable</b>		<b><math>\beta</math> (95%CI)</b>	<b><math>\beta</math> (95%CI)</b>
<b>LVEDVI, ml/m<sup>2</sup></b>	Ref.	<b>-3.16 (-5.57, -0.756) *</b>	<b>-3.73 (-6.89, -0.581) *</b>
<b>LVESVI, ml<sup>2</sup></b>	Ref.	-1.54 (-3.10, 0.02)	-0.75 (-2.79, 1.30)
<b>SVI, ml<sup>2</sup></b>	Ref.	<b>-1.62 (-3.19, -0.05) *</b>	<b>-2.98 (-5.04, -0.93) †</b>
<b>LVEF, %</b>	Ref.	0.29 (-1.26, 1.85)	-0.92 (-2.95, 1.10)
<b>LVMI, g/m<sup>2</sup></b>	Ref.	<b>-2.93 (-5.03, -0.84) †</b>	<b>4.15 (1.42, 6.89) †</b>
<b>LV mass /</b>	Ref.	0.01 (-0.03, 0.06)	<b>0.13 (0.06, 0.19) †</b>

**volume**

**LV Strain#**

<b>Total Strain, %</b>	Ref.	0.02 (-0.38, 0.43)	<b>0.68 (0.15, 1.20) *</b>
<b>Base Strain, %</b>	Ref.	0.15 (-0.36, 0.65)	<b>0.73 (0.08, 1.39) *</b>
<b>Mid Strain, %</b>	Ref.	-0.12 (-0.66, 0.41)	0.51 (-0.18, 1.20)
<b>Apex Strain, %</b>	Ref.	0.06 (-0.43, 0.55)	<b>0.84 (0.20, 1.48) *</b>
<b>PWV, m/sec</b>	Ref.	0.18 (-0.80, 1.16)	<b>1.54 (0.24, 2.85) *</b>

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LVEDV: left ventricular end-diastolic volume, LVEF: left ventricular ejection fraction, LVESV: left ventricular end-systolic volume, LVMI: left ventricular mass index, PWV: pulse wave velocity from ascending aorta to descending aorta. #: Strain indicators represent mean peak systolic circumferential strain. Visit 3 smoking status information was used for the analysis. Model 6 adjusted for age, sex, systolic blood pressure, body mass index, diabetes, calcium channel blocker use, beta blocker use, diuretics use, angiotensin converting enzyme inhibitor or angiotensin receptor blocker use

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and estimated glomerular filtration rate. \*:  $p < 0.05$ , †:  $p < 0.01$ .

**Supplemental Table 3. Smoking status, intensity, burden and BNP levels (log transformed) at visit 1 additionally adjusting for status of valvular heart disease**

<b>Smoking Status</b>	<b>Never Smoker</b>	<b>Former Smoker</b>		<b>Current Smoker</b>	
<b>Model</b>		$\beta$ (95%CI)		$\beta$ (95%CI)	
<b>Model 4</b>	Ref.	0.057 (-0.017, 0.130)		<b>0.157 (0.070, 0.244) *</b>	

<b>Smoking Intensity‡</b>	<b>Never Smoker</b>	<b>&lt;10 Cigarettes/day</b>	<b>10-19 Cigarettes/day</b>	<b>≥ 20 Cigarettes/day</b>	
<b>Model</b>		$\beta$ (95%CI)	$\beta$ (95%CI)	$\beta$ (95%CI)	
<b>Model 4</b>	Ref.	0.044 (-0.106, 0.193)	0.129 (-0.005, 0.263)	<b>0.285 (0.143, 0.427) †</b>	

<b>Smoking Burden‡</b>	<b>Never Smoker</b>	<b>&lt; 7.5 Pack-years</b>	<b>7.5-15 Pack-years</b>	<b>15-30 Pack-years</b>	<b>≥ 30 Pack-years</b>
<b>Model</b>		$\beta$ (95%CI)	$\beta$ (95%CI)	$\beta$ (95%CI)	$\beta$ (95%CI)

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<b>Model 4</b>	Ref.	-0.020 (-0.157, 0.117)	0.109 (-0.002, 0.220)	0.074 (-0.024, 0.174)	<b>0.142 (0.049, 0.236) †</b>
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Model 4: adjusted for age, sex, body mass index, systolic blood pressure, anti-hypertensive medication use, diabetes, estimated glomerular filtration rate, grade of aortic valve sclerosis or stenosis, and grade of mitral regurgitation. \*: p<0.05, †: p<0.01. ‡Smoking intensity analyses include only never smoker and current smoker. Smoking burden analyses include never smoker and ever smoker.



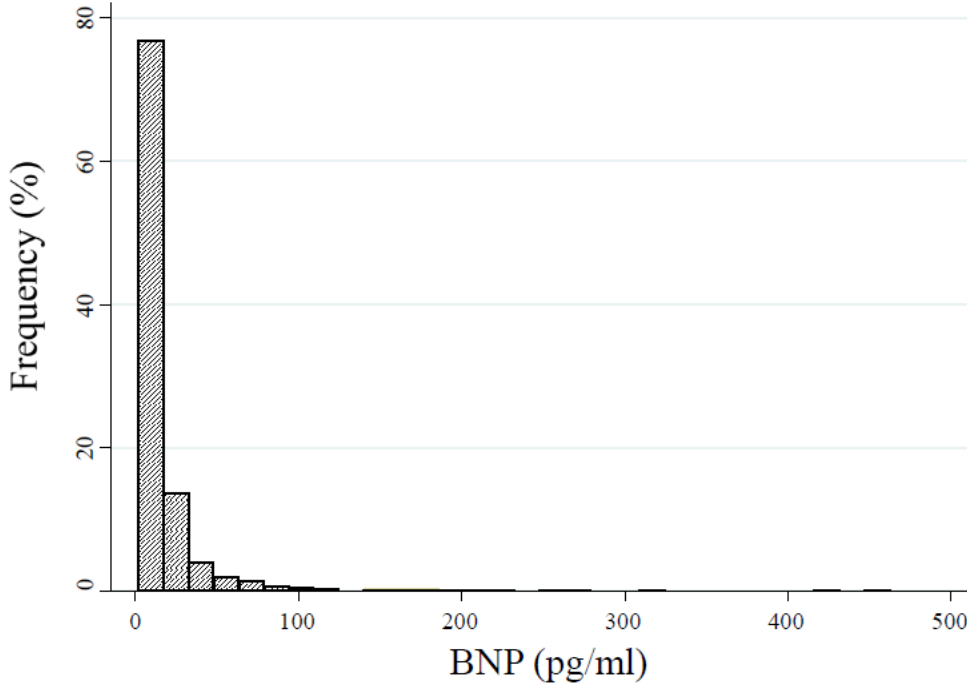
**Supplemental Table 4. Smoking status, intensity, burden and incident HF hospitalization additionally adjusting for status of valvular heart disease**

<b>Smoking Status</b>	<b>Never Smoker</b>	<b>Former Smoker</b>		<b>Current Smoker</b>	
<b>Model</b>		<b>H.R. (95%CI)</b>		<b>H.R. (95%CI)</b>	
<b>Model 5</b>	Ref (1)	1.444 (0.964, 2.161)		<b>2.909 (1.727, 4.898) †</b>	
<b>Smoking Intensity‡</b>	<b>Never Smoker</b>	<b>&lt;10 Cigarettes/day</b>	<b>10-19 Cigarettes/day</b>	<b>≥ 20 Cigarettes/day</b>	
<b>Model</b>		<b>H.R. (95%CI)</b>	<b>H.R. (95%CI)</b>	<b>H.R. (95%CI)</b>	
<b>Model 5</b>	Ref (1)	1.738 (0.626, 4.829)	<b>2.839 (1.269, 6.348)*</b>	<b>3.476 (1.586, 7.618) †</b>	
<b>Smoking Burden‡</b>	<b>Never Smoker</b>	<b>&lt; 7.5 Pack-years</b>	<b>7.5-15 Pack-years</b>	<b>15-30 Pack-years</b>	<b>≥ 30 Pack-years</b>
<b>Model</b>		<b>β (95%CI)</b>	<b>β (95%CI)</b>	<b>β (95%CI)</b>	<b>β (95%CI)</b>

<b>Model 5</b>	Ref.	0.340 (0.047, 2.460)	1.360 (0.676, 2.735)	<b>2.220 (1.367, 3.606) *</b>	<b>1.512 (0.926, 2.468) *</b>
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Model 5: adjusted for age, sex, systolic blood pressure, anti-hypertensive medication use, body mass index, diabetes, estimated glomerular filtration rate, grade of aortic valve sclerosis or stenosis, mitral valve regurgitation and incident coronary heart disease as a time dependent variable. \*:  $p < 0.05$ , †:  $p < 0.01$ . ‡Smoking intensity and burden analyses include only never smoker and current smoker. The number of each smoking status is as follows; Never smoker  $n=2884$ , Former smoker  $n=742$ , Current smoker  $n=503$ . The number of each smoking intensity is as follows;  $<10$  Cigarettes/day  $n=143$ ,  $10-19$  Cigarettes/day  $n=187$ ,  $\geq 20$  Cigarettes/day  $n=162$ . The number of each smoking burden is as follows;  $<7.5$  pack years  $n=234$ ,  $7.5-15$  pack years  $n=256$ ,  $15-30$  pack years  $n=362$ ,  $\geq 30$   $n=393$ .

**Supplemental Figure**



**Supplemental Figure Legend**

Frequency and distribution of brain natriuretic peptide (BNP) levels in Jackson Heart Study participants

## Supplemental References

1. Samdarshi TE, Taylor HA, Edwards DQ, Liebson PR, Sarpong DF, Shreenivas SS, Howard G, Garrison RJ and Fox ER. Distribution and determinants of Doppler-derived diastolic flow indices in African Americans: the Jackson Heart Study (JHS). *Am Heart J.* 2009;158:209-216.