

eTable1. Associations of cardiorespiratory fitness (CRF) with child cardiometabolic risk factors and biomarkers of endothelial function by sex.* HCHS/SOL Youth (n=1380)

Cardiovascular risk factor	Continuous		CRF Quartile 2	CRF Quartile 3	CRF Quartile 4	P-interaction
	Beta (95% CI) ‡	P	Beta (95% CI) †	Beta (95% CI) †	Beta (95% CI) †	
Girls						
BMI Z-score	-0.50 (-0.67, -0.33)	<0.0001	-0.40 (-0.70, -0.11)	-0.57 (-0.90, -0.24)	-0.98 (-1.33, -0.63)	0.948
Waist circumference Z-score	-0.45 (-0.57, -0.33)	<0.0001	-0.48 (-0.71, -0.25)	-0.63 (-0.89, -0.37)	-0.82 (-1.05, -0.58)	0.240
% body fat, %	-4.8 (-6.1, -3.6)	<0.0001	-5.0 (-7.1, -2.9)	-6.9 (-9.2, -4.6)	-9.3 (-11.8, -6.9)	0.060
SBP, percentile	-4.5 (-7.3, -1.8)	0.0015	2.2 (-3.5, 7.8)	-2.1 (-8.1, 3.9)	-9.7 (-15.6, -3.7)	0.427
DBP, percentile	-6.7 (-9.1, -4.3)	<0.0001	-4.0 (-9.2, 1.1)	-8.8 (-14.7, -2.8)	-11.8 (-16.9, -6.7)	0.462
FPG, mg/dL	-0.6 (-1.6, 0.3)	0.2075	-1.2 (-2.9, 0.5)	-0.7 (-2.4, 1.0)	-1.3 (-3.4, 0.8)	0.897
Glycated hemoglobin A1c, %	-0.04 (-0.08, 0.00)	0.0445	-0.09 (-0.16, -0.01)	-0.06 (-0.14, 0.02)	-0.06 (-0.14, 0.03)	0.602
log(HOMA-IR)	-0.27 (-0.36, -0.19)	<0.0001	-0.37 (-0.54, -0.20)	-0.36 (-0.53, -0.19)	-0.49 (-0.68, -0.30)	0.264
Total cholesterol, mg/dL	-3.6 (-6.6, -0.5)	0.0209	-2.1 (-8.6, 4.3)	-4.4 (-11.4, 2.5)	-9.5 (-15.8, -3.1)	0.386
HDL, mg/dL	1.8 (0.6, 3.1)	0.0036	2.1 (-0.2, 4.4)	2.0 (-0.6, 4.6)	3.0 (0.3, 5.8)	0.572
LDL, mg/dL	-3.0 (-5.9, -0.1)	0.0428	-2.2 (-8.1, 3.7)	-3.0 (-9.4, 3.4)	-8.1 (-13.9, -2.2)	0.539
log(Triglycerides, mg/dL)	-0.15 (-0.22, -0.07)	0.0001	-0.12 (-0.25, 0.00)	-0.19 (-0.31, -0.06)	-0.29 (-0.44, -0.14)	0.106
log(CRP, mg/dL)	-0.43 (-0.58, -0.28)	<0.0001	-0.51 (-0.79, -0.23)	-0.66 (-0.96, -0.35)	-0.79 (-1.13, -0.45)	0.579
Adiponectin, ug/mL	0.81 (0.34, 1.27)	0.0008	0.82 (-0.12, 1.75)	0.59 (-0.52, 1.70)	1.41 (0.26, 2.57)	0.359
log(PAI-1, ng/mL)	-0.24 (-0.34, -0.13)	<0.0001	-0.39 (-0.59, -0.20)	-0.34 (-0.56, -0.13)	-0.48 (-0.72, -0.24)	0.016
log(e-selectin, ng/mL)	-0.08 (-0.13, -0.03)	0.0032	-0.08 (-0.17, 0.01)	-0.11 (-0.21, 0.00)	-0.15 (-0.25, -0.04)	0.798
Boys						
BMI Z-score	-0.49 (-0.63, -0.35)	<0.0001	-0.37 (-0.66, -0.08)	-0.76 (-1.06, -0.47)	-1.03 (-1.33, -0.74)	
Waist circumference Z-score	-0.56 (-0.70, -0.42)	<0.0001	-0.45 (-0.78, -0.13)	-0.85 (-1.16, -0.54)	-1.11 (-1.41, -0.82)	
% body fat, %	-6.6 (-8.0, -5.1)	<0.0001	-5.9 (-9.5, -2.3)	-10.8 (-14.1, -7.5)	-13.8 (-16.9, -10.7)	
SBP, percentile	-2.8 (-6.0, 0.5)	0.0958	-2.9 (-10.9, 5.1)	-3.2 (-11.4, 5.0)	-9.4 (-16.4, -2.5)	
DBP, percentile	-5.3 (-8.3, -2.3)	0.0005	-3.1 (-10.0, 3.8)	-8.4 (-14.3, -2.4)	-12.3 (-18.3, -6.3)	
FPG, mg/dL	-0.7 (-1.5, 0.0)	0.0662	-0.3 (-1.8, 1.3)	-1.5 (-3.1, 0.1)	-1.5 (-3.1, 0.0)	
Glycated hemoglobin A1c, %	-0.03 (-0.06, 0.01)	0.1539	-0.06 (-0.15, 0.03)	-0.10 (-0.19, -0.01)	-0.05 (-0.13, 0.04)	
log(HOMA-IR)	-0.34 (-0.41, -0.26)	<0.0001	-0.26 (-0.44, -0.08)	-0.41 (-0.61, -0.22)	-0.69 (-0.85, -0.53)	
Total cholesterol, mg/dL	-5.6 (-8.9, -2.2)	0.0012	-3.9 (-11.8, 3.9)	-5.9 (-15.0, 3.2)	-9.9 (-17.7, -2.0)	
HDL, mg/dL	2.4 (1.0, 3.8)	0.0009	3.4 (0.2, 6.5)	3.8 (0.5, 7.0)	6.0 (3.0, 9.0)	
LDL, mg/dL	-4.2 (-6.9, -1.5)	0.0028	-3.6 (-10.1, 2.8)	-5.2 (-12.7, 2.2)	-8.0 (-14.4, -1.7)	
log(Triglycerides, mg/dL)	-0.23 (-0.30, -0.16)	<0.0001	-0.19 (-0.35, -0.03)	-0.29 (-0.46, -0.11)	-0.47 (-0.62, -0.33)	
log(CRP, mg/dL)	-0.48 (-0.63, -0.34)	<0.0001	-0.43 (-0.80, -0.06)	-0.77 (-1.13, -0.41)	-1.01 (-1.35, -0.67)	
Adiponectin, ug/mL	0.50 (0.01, 1.00)	0.0466	0.66 (-0.60, 1.91)	1.09 (0.00, 2.18)	1.45 (0.52, 2.37)	
log(PAI-1, ng/mL)	-0.39 (-0.49, -0.28)	<0.0001	-0.18 (-0.39, 0.04)	-0.43 (-0.64, -0.21)	-0.75 (-0.96, -0.54)	
log(e-selectin, ng/mL)	-0.08 (-0.14, -0.03)	0.0032	-0.04 (-0.17, 0.08)	-0.05 (-0.15, 0.06)	-0.18 (-0.29, -0.07)	

*Estimates derived from models with terms for the interaction between cardiorespiratory fitness (in quartile and continuous forms) and age, sex, or obesity status, while adjusting for age, sex, field center, national background, birth in US mainland, annual household income, and parent education level; P-values derived from models using the continuous cardiorespiratory fitness variable; presented p-values were derived from models in which cardiorespiratory fitness was treated as a continuous variable.

†Lowest quartile (Q1) is reference category; ‡Each 10 ml/kg/min increment; **Boldface** signifies statistically significant interaction between cardiorespiratory fitness and sex.

BMI, body mass index; CRP, C-reactive protein; DBP, diastolic blood pressure; FPG, fasting plasma glucose; HDL, high density lipoprotein; HOMA-IR, homeostasis model assessment – insulin resistance; PAI-1, plasminogen activator inhibitor-1; SBP, systolic blood pressure.

eTable2. Associations of cardiorespiratory fitness (CRF) with child cardiometabolic risk factors and biomarkers of endothelial function by age group.* HCHS/SOL Youth (n=1380)

Cardiovascular risk factor	Continuous		CRF Quartile 2	CRF Quartile 3	CRF Quartile 4	p-interaction
	Beta (95% CI)‡	p-value	Beta (95% CI)†	Beta (95% CI)†	Beta (95% CI)†	
AMONG AGE 8-12 YEARS						
BMI Z-score	-0.60 (-0.72, -0.47)	<0.0001	-0.61 (-0.84, -0.38)	-0.85 (-1.11, -0.59)	-1.22 (-1.48, -0.95)	0.043
Waist circumference Z-score	-0.49 (-0.60, -0.39)	<0.0001	-0.55 (-0.76, -0.33)	-0.74 (-0.96, -0.52)	-1.00 (-1.21, -0.80)	0.851
% body fat, %	-6.1 (-7.2, -5.0)	<0.0001	-6.7 (-9.3, -4.2)	-9.5 (-12.1, -7.0)	-12.6 (-15.0, -10.2)	0.423
SBP, percentile	-4.0 (-7.2, -0.8)	0.0148	-0.3 (-6.4, 5.8)	-7.3 (-13.6, -0.9)	-9.0 (-15.3, -2.7)	0.800
DBP, percentile	-5.7 (-8.4, -3.1)	<0.0001	-3.2 (-8.6, 2.2)	-9.1 (-14.4, -3.9)	-11.8 (-17.2, -6.4)	0.789
FPG, mg/dL	-0.4 (-1.3, 0.6)	0.4450	-0.3 (-2.2, 1.5)	-1.2 (-3.0, 0.6)	-0.9 (-2.8, 1.0)	0.302
Glycated hemoglobin A1c, %	-0.04 (-0.08, -0.01)	0.0228	-0.09 (-0.16, -0.02)	-0.08 (-0.15, 0.00)	-0.10 (-0.17, -0.02)	0.427
log(HOMA-IR)	-0.29 (-0.38, -0.21)	<0.0001	-0.31 (-0.49, -0.13)	-0.41 (-0.59, -0.22)	-0.60 (-0.79, -0.42)	0.658
Total cholesterol, mg/dL	-4.2 (-7.7, -0.7)	0.0189	-1.6 (-8.6, 5.5)	-4.5 (-11.8, 2.8)	-8.4 (-15.8, -0.9)	0.740
HDL, mg/dL	2.3 (0.9, 3.7)	0.0015	1.3 (-1.4, 3.9)	2.1 (-1.0, 5.2)	4.3 (1.3, 7.3)	0.728
LDL, mg/dL	-3.6 (-6.7, -0.5)	0.0232	-0.5 (-7.0, 6.0)	-3.1 (-9.6, 3.4)	-6.8 (-13.4, -0.2)	0.995
log(Triglycerides, mg/dL)	-0.19 (-0.25, -0.12)	<0.0001	-0.12 (-0.24, 0.00)	-0.20 (-0.35, -0.06)	-0.38 (-0.52, -0.23)	0.877
log(CRP, mg/dL)	-0.45 (-0.58, -0.32)	<0.0001	-0.56 (-0.85, -0.27)	-0.66 (-0.95, -0.37)	-0.92 (-1.22, -0.61)	0.844
Adiponectin, ug/mL	0.93 (0.43, 1.42)	0.0003	0.82 (-0.01, 1.66)	0.90 (-0.14, 1.93)	1.95 (0.97, 2.94)	0.101
log(PAI-1, ng/mL)	-0.35 (-0.46, -0.24)	<0.0001	-0.38 (-0.59, -0.17)	-0.50 (-0.71, -0.28)	-0.73 (-0.95, -0.50)	0.328
log(e-selectin, ng/mL)	-0.12 (-0.17, -0.07)	<0.0001	-0.13 (-0.23, -0.04)	-0.17 (-0.26, -0.08)	-0.25 (-0.36, -0.15)	0.025
AMONG AGE 13-16 YEARS						
BMI Z-score	-0.39 (-0.57, -0.21)	<0.0001	-0.14 (-0.53, 0.25)	-0.46 (-0.82, -0.11)	-0.77 (-1.15, -0.39)	
Waist circumference Z-score	-0.51 (-0.66, -0.36)	<0.0001	-0.36 (-0.72, 0.00)	-0.72 (-1.04, -0.41)	-0.95 (-1.26, -0.64)	
% body fat, %	-5.3 (-6.9, -3.8)	<0.0001	-3.5 (-6.8, -0.1)	-7.7 (-10.5, -5.0)	-10.5 (-13.5, -7.5)	
SBP, percentile	-3.4 (-6.4, -0.4)	0.0273	0.0 (-6.4, 6.4)	3.2 (-4.3, 10.7)	-9.2 (-15.7, -2.7)	
DBP, percentile	-6.3 (-9.2, -3.4)	<0.0001	-4.1 (-10.2, 2.0)	-7.9 (-14.3, -1.5)	-12.6 (-18.7, -6.5)	
FPG, mg/dL	-1.0 (-1.7, -0.2)	0.0127	-1.3 (-2.8, 0.3)	-1.0 (-2.7, 0.7)	-2.0 (-3.8, -0.2)	
Glycated hemoglobin A1c, %	-0.02 (-0.06, 0.02)	0.2429	-0.06 (-0.15, 0.04)	-0.09 (-0.19, 0.00)	0.00 (-0.10, 0.09)	
log(HOMA-IR)	-0.32 (-0.39, -0.25)	<0.0001	-0.33 (-0.53, -0.13)	-0.35 (-0.52, -0.17)	-0.62 (-0.79, -0.46)	
Total cholesterol, mg/dL	-5.1 (-8.7, -1.5)	0.0052	-4.3 (-11.3, 2.7)	-5.7 (-14.9, 3.6)	-10.6 (-18.2, -2.9)	
HDL, mg/dL	1.9 (0.5, 3.3)	0.0071	4.1 (0.8, 7.4)	3.2 (0.4, 6.0)	4.9 (1.9, 7.9)	
LDL, mg/dL	-3.6 (-6.4, -0.8)	0.0111	-5.5 (-11.1, 0.1)	-5.0 (-12.6, 2.5)	-8.9 (-15.0, -2.9)	
log(Triglycerides, mg/dL)	-0.20 (-0.27, -0.12)	<0.0001	-0.18 (-0.38, 0.03)	-0.25 (-0.41, -0.09)	-0.39 (-0.56, -0.23)	
log(CRP, mg/dL)	-0.47 (-0.63, -0.31)	<0.0001	-0.35 (-0.69, -0.01)	-0.79 (-1.17, -0.41)	-0.92 (-1.28, -0.56)	
Adiponectin, ug/mL	0.34 (-0.18, 0.86)	0.1946	0.68 (-0.77, 2.12)	0.77 (-0.52, 2.06)	0.86 (-0.32, 2.04)	
log(PAI-1, ng/mL)	-0.28 (-0.39, -0.18)	<0.0001	-0.21 (-0.42, 0.00)	-0.27 (-0.48, -0.06)	-0.57 (-0.81, -0.33)	
log(e-selectin, ng/mL)	-0.04 (-0.09, 0.02)	0.1811	0.01 (-0.11, 0.13)	0.03 (-0.07, 0.14)	-0.09 (-0.20, 0.02)	

*Estimates derived from models with terms for the interaction between cardiorespiratory fitness (in quartile and continuous forms) and age, sex, or obesity status, while adjusting for age, sex, field center, national background, birth in US mainland, annual household income, and parent education level; P-values derived from models using the continuous cardiorespiratory fitness variable; presented p-values were derived from models in which cardiorespiratory fitness was treated as a continuous variable.

†Lowest quartile (Q1) is reference category; ‡Each 10 ml/kg/min increment; **Boldface** signifies statistically significant interaction between cardiorespiratory fitness and age.

BMI, body mass index; CRP, C-reactive protein; DBP, diastolic blood pressure; FPG, fasting plasma glucose; HDL, high density lipoprotein; HOMA-IR, homeostasis model assessment – insulin resistance; PAI-1, plasminogen activator inhibitor-1; SBP, systolic blood pressure.

eTable3. Associations of cardiorespiratory fitness (CRF) with child cardiometabolic risk factors and biomarkers of endothelial function, by obesity status.* HCHS/SOL Youth (n=1380)

Cardiovascular risk factor	Continuous		CRF Quartile 2	CRF Quartile 3	CRF Quartile 4	p-interaction
	Beta (95% CI) [‡]	p-value	Beta (95% CI) [†]	Beta (95% CI) [†]	Beta (95% CI) [†]	
WITHOUT OBESITY (BMI %ile <95)						
BMI Z-score	-0.18 (-0.32, -0.04)	0.0107	-0.02 (-0.30, 0.25)	-0.14 (-0.43, 0.15)	-0.35 (-0.65, -0.04)	0.213
Waist circumference Z-score	-0.15 (-0.22, -0.08)	<0.0001	-0.05 (-0.20, 0.09)	-0.13 (-0.30, 0.05)	-0.26 (-0.41, -0.10)	0.144
% body fat, %	-2.5 (-3.3, -1.6)	<0.0001	-1.8 (-3.4, -0.2)	-3.4 (-5.0, -1.8)	-4.9 (-6.6, -3.2)	0.964
SBP, percentile	-4.0 (-6.7, -1.2)	0.0049	-2.4 (-8.2, 3.4)	-3.6 (-10.0, 2.8)	-10.4 (-16.0, -4.8)	0.314
DBP, percentile	-4.7 (-7.3, -2.2)	0.0003	-3.2 (-9.0, 2.7)	-5.8 (-11.3, -0.3)	-9.8 (-14.8, -4.7)	0.808
FPG, mg/dL	-0.6 (-1.3, 0.1)	0.0713	-1.1 (-2.6, 0.4)	-0.9 (-2.4, 0.6)	-1.7 (-3.2, -0.2)	0.551
Glycated hemoglobin A1c, %	0.00 (-0.04, 0.03)	0.8082	-0.04 (-0.10, 0.03)	-0.04 (-0.11, 0.04)	0.00 (-0.08, 0.08)	0.279
log(HOMA-IR)	-0.17 (-0.23, -0.10)	<0.0001	-0.19 (-0.35, -0.03)	-0.15 (-0.31, 0.00)	-0.33 (-0.47, -0.18)	0.465
Total cholesterol, mg/dL	-3.4 (-6.3, -0.6)	0.0176	-1.4 (-7.4, 4.6)	-3.8 (-10.9, 3.4)	-6.7 (-13.0, -0.5)	0.514
HDL, mg/dL	0.3 (-0.7, 1.3)	0.5335	1.2 (-1.3, 3.7)	0.5 (-2.0, 3.0)	1.3 (-1.0, 3.6)	0.719
LDL, mg/dL	-1.7 (-3.9, 0.6)	0.1468	-0.8 (-5.7, 4.2)	-1.5 (-7.3, 4.4)	-3.9 (-9.0, 1.1)	0.359
log(Triglycerides, mg/dL)	-0.13 (-0.19, -0.06)	0.0001	-0.09 (-0.25, 0.07)	-0.16 (-0.30, -0.01)	-0.25 (-0.40, -0.10)	0.466
log(CRP, mg/dL)	-0.21 (-0.33, -0.08)	0.0014	-0.24 (-0.48, 0.01)	-0.31 (-0.59, -0.04)	-0.41 (-0.69, -0.13)	0.887
Adiponectin, ug/mL	0.10 (-0.36, 0.56)	0.6630	0.37 (-0.77, 1.51)	0.04 (-1.08, 1.15)	0.46 (-0.54, 1.45)	0.205
log(PAI-1, ng/mL)	-0.18 (-0.27, -0.10)	<0.0001	-0.19 (-0.36, -0.03)	-0.16 (-0.34, 0.03)	-0.40 (-0.59, -0.21)	0.215
log(e-selectin, ng/mL)	-0.05 (-0.10, 0.00)	0.0527	-0.02 (-0.11, 0.06)	-0.01 (-0.09, 0.08)	-0.09 (-0.18, 0.00)	0.264
WITH OBESITY (BMI %ile ≥95)						
BMI Z-score	-0.09 (-0.15, -0.03)	0.0057	-0.04 (-0.13, 0.05)	-0.14 (-0.27, -0.01)	-0.16 (-0.31, 0.00)	
Waist circumference Z-score	-0.25 (-0.38, -0.13)	0.0001	-0.17 (-0.39, 0.05)	-0.38 (-0.63, -0.14)	-0.39 (-0.71, -0.07)	
% body fat, %	-2.5 (-3.6, -1.4)	<0.0001	-1.8 (-4.0, 0.3)	-3.8 (-6.1, -1.5)	-5.6 (-8.3, -2.9)	
SBP, percentile	-1.3 (-5.8, 3.2)	0.5630	4.8 (-2.2, 11.7)	-0.7 (-9.0, 7.6)	-5.9 (-17.8, 6.1)	
DBP, percentile	-4.2 (-7.8, -0.5)	0.0262	0.2 (-6.0, 6.5)	-9.6 (-17.8, -1.5)	-7.7 (-16.9, 1.5)	
FPG, mg/dL	-0.2 (-1.5, 1.1)	0.7772	0.1 (-1.8, 2.0)	-2.1 (-4.3, 0.2)	1.1 (-1.4, 3.6)	
Glycated hemoglobin A1c, %	-0.03 (-0.08, 0.01)	0.1080	-0.08 (-0.16, 0.01)	-0.06 (-0.16, 0.03)	0.00 (-0.10, 0.09)	
log(HOMA-IR)	-0.13 (-0.21, -0.05)	0.0012	-0.11 (-0.25, 0.03)	-0.16 (-0.35, 0.04)	-0.31 (-0.51, -0.11)	
Total cholesterol, mg/dL	-5.3 (-10.1, -0.5)	0.0313	-2.8 (-11.8, 6.3)	-2.2 (-12.3, 7.9)	-13.3 (-23.9, -2.8)	
HDL, mg/dL	0.0 (-1.6, 1.5)	0.9825	-0.2 (-2.6, 2.3)	-1.7 (-4.6, 1.3)	0.3 (-3.8, 4.4)	
LDL, mg/dL	-3.9 (-8.1, 0.4)	0.0763	-1.8 (-9.4, 5.8)	-1.8 (-10.5, 6.9)	-9.7 (-19.0, -0.3)	
log(Triglycerides, mg/dL)	-0.09 (-0.18, 0.00)	0.0414	-0.05 (-0.17, 0.08)	0.02 (-0.18, 0.22)	-0.26 (-0.47, -0.05)	
log(CRP, mg/dL)	-0.22 (-0.38, -0.06)	0.0059	-0.12 (-0.42, 0.18)	-0.36 (-0.78, 0.06)	-0.56 (-0.89, -0.24)	
Adiponectin, ug/mL	-0.29 (-0.70, 0.12)	0.1702	-0.34 (-1.10, 0.42)	-0.26 (-1.10, 0.58)	-0.69 (-1.66, 0.28)	
log(PAI-1, ng/mL)	-0.09 (-0.23, 0.05)	0.2037	-0.03 (-0.27, 0.22)	-0.19 (-0.45, 0.08)	-0.11 (-0.52, 0.31)	
log(e-selectin, ng/mL)	-0.01 (-0.07, 0.05)	0.8265	-0.01 (-0.11, 0.10)	-0.01 (-0.15, 0.13)	-0.09 (-0.25, 0.07)	

*Estimates derived from models with terms for the interaction between cardiorespiratory fitness (in quartile and continuous forms) and age, sex, or obesity status, while adjusting for age, sex, field center, national background, birth in US mainland, annual household income, and parent education level; P-values derived from models using the continuous cardiorespiratory fitness variable; presented p-values were derived from models in which cardiorespiratory fitness was treated as a continuous variable.

†Lowest quartile (Q1) is reference category; ‡Each 10 ml/kg/min increment; **Boldface** signifies statistically significant interaction between cardiorespiratory fitness and age.

BMI, body mass index; CRP, C-reactive protein; DBP, diastolic blood pressure; FPG, fasting plasma glucose; HDL, high density lipoprotein; HOMA-IR, homeostasis model assessment – insulin resistance; PAI-1, plasminogen activator inhibitor-1; SBP, systolic blood pressure.