



Supplemental Tables for

## **High-Risk Cardiovascular Conditions in Sports- Related Sudden Death:**

Prevalence in 5,169 Schoolchildren Screened via  
Cardiac Magnetic Resonance

---

*Paolo Angelini, MD, Benjamin Y. Cheong, MD, Veronica V. Lenge De Rosen, MD, Alberto Lopez, MD, Carlo Uribe, MD, Anthony H. Masso, PhD, Syed W. Ali, BS, Barry R. Davis, MD, PhD, Raja Muthupillai, PhD, and James T. Willerson, MD*

*Correspondence to: [pangelini@leachmancardiology.com](mailto:pangelini@leachmancardiology.com)*

---

Supplemental Table I. Reference Values for Cardiac Anatomic and Physiologic Measurements (n=1,139)

Supplemental Table II. Non-High-Risk Electrocardiographic Abnormalities

Supplemental Table III. Quantitative Evaluation of LVEF in 395 Cases of Noncompaction Left Ventricle

Supplemental Table IV. Incidental Findings of 32 Non-High-Risk Cardiovascular Conditions Detected by Cardiac Magnetic Resonance

Supplemental Table V. Relative Frequency of High-Risk Cardiovascular Conditions in Accordance with Prolonged QT Interval

**SUPPLEMENTAL TABLE I.** Reference Values for Cardiac Anatomic and Physiologic Measurements (n=1,139)

Age, yr (n)	Black				Hispanic				White			
	Female		Male		Female		Male		Female		Male	
Left ventricular mass index (g/m <sup>2</sup> )*												
11 (215)	44.92 ± 5.9 (43)	48.25 ± 12.4 (37)	44.15 ± 9.9 (15)	49.74 ± 11.7 (15)	43.75 ± 9.7 (36)	48 ± 7.6 (69)						
12 (351)	50.86 ± 9.8 (63)	53.68 ± 10 (95)	51.4 ± 7.5 (33)	45.68 ± 9 (34)	50.04 ± 10.4 (39)	46.81 ± 6.5 (87)						
13 (375)	57.98 ± 10.3 (70)	46.35 ± 8.5 (116)	44.24 ± 13.6 (40)	52.78 ± 7.8 (42)	50.23 ± 8.9 (38)	54.99 ± 9 (69)						
14 (198)	46.42 ± 6 (38)	60.03 ± 10.6 (46)	44.66 ± 5.7 (20)	55.58 ± 8.6 (28)	48.64 ± 6.4 (13)	58.37 ± 9 (53)						
Left ventricular mass (g)												
11 (215)	69.38 ± 14.67 (43)	71.57 ± 22.11 (37)	64.48 ± 15.46 (15)	70.46 ± 22.78 (15)	58.02 ± 12.45 (36)	65.32 ± 18.8 (69)						
12 (351)	85.01 ± 24.47 (63)	81.16 ± 23.16 (95)	70.88 ± 18.14 (33)	78.17 ± 17.07 (34)	68.32 ± 15.17 (39)	71.34 ± 17.72 (87)						
13 (375)	73.87 ± 16.54 (70)	100.01 ± 26.55 (116)	69.66 ± 17.13 (40)	92.99 ± 18.1 (42)	83.76 ± 20.59 (38)	90.83 ± 26.28 (69)						
14 (198)	77.6 ± 16.79 (38)	105.46 ± 26.26 (46)	70.57 ± 15.1 (20)	97.42 ± 20.35 (28)	77.77 ± 13.31 (13)	98.25 ± 22.88 (53)						
Interventricular septal thickness (cm)												
11 (215)	0.73 ± 0.14 (43)	0.75 ± 0.16 (37)	0.73 ± 0.17 (15)	0.75 ± 0.15 (15)	0.7 ± 0.15 (36)	0.73 ± 0.12 (69)						
12 (351)	0.81 ± 0.14 (63)	0.8 ± 0.14 (95)	0.74 ± 0.12 (33)	0.77 ± 0.11 (34)	0.67 ± 0.1 (39)	0.76 ± 0.12 (69)						
13 (375)	0.76 ± 0.13 (70)	0.86 ± 0.14 (116)	0.75 ± 0.12 (40)	0.83 ± 0.11 (42)	0.77 ± 0.14 (38)	0.83 ± 0.14 (69)						
14 (198)	0.76 ± 0.12 (38)	0.85 ± 0.16 (46)	0.71 ± 0.11 (20)	0.8 ± 0.14 (28)	0.75 ± 0.1 (13)	0.86 ± 0.13 (53)						
LVEDV (mL)												
11 (215)	109.79 ± 22.7 (43)	107.87 ± 26.12 (37)	100.03 ± 20.78 (15)	106.85 ± 25.17 (15)	96.4 ± 25.78 (36)	102.98 ± 22.97 (69)						
12 (351)	123.86 ± 26.56 (63)	127 ± 28.46 (95)	110.29 ± 18.12 (33)	117.34 ± 19.27 (34)	111.77 ± 19.64 (39)	111.09 ± 22.58 (69)						
13 (375)	114.56 ± 21.73 (70)	142.62 ± 29.04 (116)	108.64 ± 18.92 (40)	138.89 ± 24.02 (42)	131.08 ± 27.5 (38)	135.27 ± 29.11 (69)						
14 (198)	125.68 ± 22.25 (38)	147.14 ± 31.69 (46)	112.84 ± 18.71 (20)	147.21 ± 25.31 (28)	126.01 ± 25.85 (13)	142.23 ± 26.91 (53)						
LVESV (mL)												
11 (215)	40.44 ± 12.63 (43)	40.53 ± 12.9 (37)	36.9 ± 10.31 (15)	39.77 ± 11.96 (15)	35.75 ± 11.89 (36)	37.89 ± 10.57 (69)						
12 (351)	48 ± 13.16 (63)	49.32 ± 14 (95)	40.04 ± 10.59 (33)	44.51 ± 9.82 (34)	41.67 ± 8.98 (39)	41.23 ± 12.09 (69)						
13 (375)	44.61 ± 12.08 (70)	56.51 ± 15.9 (116)	41.72 ± 12.19 (40)	54.19 ± 13.86 (42)	50.98 ± 14.05 (38)	53.54 ± 15.21 (69)						
14 (198)	77.6 ± 16.79 (38)	50.11 ± 11.73 (46)	41.37 ± 7.99 (20)	57.3 ± 14.82 (28)	49.97 ± 12.75 (13)	53.56 ± 13.95 (53)						

*Continued on next page*

**SUPPLEMENTAL TABLE I Continued.** Reference Values for Cardiac Anatomic and Physiologic Measurements (n=1,139)

Age, yr (n)	Black		Hispanic		White	
	Female	Male	Female	Male	Female	Male
LVEF (%)						
11 (215)	62.55 ± 4.49 (43)	61.42 ± 8.34 (37)	61.56 ± 11.37 (15)	62.34 ± 7.74 (15)	61.65 ± 11.64 (36)	63.34 ± 4.76 (69)
12 (351)	60.62 ± 8.76 (63)	60.77 ± 8.15 (95)	63.98 ± 5.8 (33)	62.24 ± 4.83 (34)	62.62 ± 4.96 (39)	62.44 ± 8.71 (69)
13 (375)	61.29 ± 5.49 (70)	60.28 ± 5.01 (116)	62.46 ± 5.75 (40)	61.21 ± 6.15 (42)	60.49 ± 8.63 (38)	60.59 ± 4.73 (69)
14 (198)	60.17 ± 5.5 (38)	61.45 ± 5.84 (46)	62.99 ± 6.03 (20)	61.43 ± 5.83 (28)	60.39 ± 5.26 (13)	62.26 ± 6.18 (53)

LVEDV = left ventricular end-diastolic volume; LVEF = left ventricular ejection fraction; LVESV = left ventricular end-systolic volume

\*Indexed by body surface area (BSA) in accordance with the Mosteller method: BSA (m<sup>2</sup>) = √ ((weight (kg) × height (cm)) / 3,600).

Data are presented as mean ± SD or as number and percentage.

**SUPPLEMENTAL TABLE II.** Non-High-Risk Electrocardiographic Abnormalities

ECG Finding	No. (%)
≥2nd-degree AVB	1 (0.02)
LV hypertrophy*	388 (7.5)
RV hypertrophy*	331 (6.3)
Early repolarization**	766 (14.7)

AVB = atrioventricular block; ECG = electrocardiographic; LV = left ventricular; RV = right ventricular

\*By ECG voltage criteria alone, not ST-T changes

\*\*By computer reading

Among 5,169 participants, 1,486 (28.7%) had mild-but-frequent ECG abnormalities. None of these were found in any participant identified as having a high-risk cardiovascular condition during magnetic resonance screening.

**SUPPLEMENTAL TABLE III.** Quantitative Evaluation of LVEF in 395 Cases of Noncompaction Left Ventricle

LVEF*	No. (%)**
>0.55 (normal)	356 (90.1)
0.50–0.55 (low normal)	29 (7.3)
0.40–0.50 (mild DCM)	10 (2.5)
<0.40 (DCM)	0

DCM = dilated cardiomyopathy; LVEF = left ventricular ejection fraction

\*Computed for all 395 participants

\*\*Of the 959 participants with noncompaction left ventricle, 395 (40.2%) had a short-axis study in end-diastole and end-systole during magnetic resonance imaging.

**SUPPLEMENTAL TABLE IV.** Incidental Findings of 32 Non-High-Risk Cardiovascular Conditions Detected by Cardiac Magnetic Resonance

Incidental Conditions	No.
Idiopathic dilation of pulmonary artery	6
Patent foramen ovale or small atrial septal defect	6
Minor coronary artery anomalies (low or no risk)	5
Bicuspid aortic valve	3
Pericardial cysts	3
Left superior vena cava draining into coronary sinus	2
Mitral valve prolapse	2
Left ventricular diverticulum	1
Mediastinal nodule	1
Pericardial effusion	1
Retroesophageal subclavian artery	1
Small muscular ventricular septal defect	1

**SUPPLEMENTAL TABLE V.** Relative Frequency of High-Risk Cardiovascular Conditions in Accordance with Prolonged QT Interval

Variable	QTc (ms)	
	470–489	≥490
Total hr-CVC	76 (100)	49 (100)
hr-ACAOS	23 (30.3)	23 (46.9)
hr-CMP	14 (18.4)	14 (28.6)
ECG hr-CVC	39 (51.3)	12 (24.5)

ECG = electrocardiographic; hr-ACAOS = high-risk anomalous coronary artery originating from the opposite sinus; hr-CMP = high-risk cardiomyopathy; hr-CVC = high-risk cardiovascular conditions

Data are presented as number and percentage.