

# Cardiovascular magnetic resonance reference ranges from the Healthy Hearts

## Consortium

Zahra Raisi-Estabragh (MChB, PhD)<sup>a, b\*</sup>, Liliana Szabo (MBBS, PhD)<sup>a, b, c\*</sup>, Celeste McCracken (MSc)<sup>d</sup>, Robin Bülow (MD)<sup>e</sup>, Giovanni Donato Aquaro (MD)<sup>f</sup>, Florian Andre (MD)<sup>g</sup>, Thu-Thao Le (PhD)<sup>h</sup>, Dominika Suchá (MD, PhD)<sup>j</sup>, Dorina-Gabriela Condurache (MBBS)<sup>a, b</sup>, Ahmed Salih (PhD)<sup>a, b</sup>, Sucharitha Chadalavada (MBBS)<sup>a, b</sup>, Nay Aung (MBBS, PhD)<sup>a, b</sup>, Aaron Mark Lee (MBBS, PhD)<sup>a</sup>, Nicholas C. Harvey (MBBS, PhD)<sup>j, k</sup>, Tim Leiner (MD, PhD)<sup>j, m</sup>, Calvin W.L. Chin (MD)<sup>h, i</sup>, Matthias G. Friedrich (MD)<sup>g, n</sup>, Andrea Barison (MD, PhD)<sup>o</sup>, Marcus Dörr (MD)<sup>p, q</sup>, Steffen E. Petersen (MBBS, DPhil)<sup>a, b, r, s</sup>

- a) William Harvey Research Institute, NIHR Barts Biomedical Research Centre, Queen Mary University of London, Charterhouse Square, London, EC1M 6BQ, UK
- b) Barts Heart Centre, St Bartholomew's Hospital, Barts Health NHS Trust, West Smithfield, London, EC1A 7BE, UK
- c) Semmelweis University, Heart and Vascular Center, Budapest Hungary
- d) Division of Cardiovascular Medicine, Radcliffe Department of Medicine, University of Oxford, National Institute for Health Research Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust, Oxford, OX3 9DU, UK
- e) Institute for Diagnostic Radiology and Neuroradiology, University Medicine, Ernst Moritz Arndt University Greifswald, Ferdinand-Sauerbruch-Straße 1, 17475 Greifswald, Germany
- f) Academic Radiology, Department of Surgical, Medical and Molecular pathology and of critical area, University of Pisa, Italy.
- g) Department of Cardiology, Angiology and Pneumology, University of Heidelberg, Im Neuenheimer Feld 410, Heidelberg, 69120, Germany.
- h) National Heart Centre Singapore, 5 Hospital Drive, Singapore 169609, Singapore.

- i) Cardiovascular ACP, Duke-NUS Medical School, Singapore
- j) University Medical Center Utrecht, Department of Radiology, Utrecht, the Netherlands.
- k) MRC Lifecourse Epidemiology Centre, University of Southampton, Southampton, SO16 6YD, UK
- l) NIHR Southampton Biomedical Research Centre, University of Southampton and University Hospital Southampton NHS Foundation Trust, Southampton, SO16 6YD, UK
- m) Mayo Clinic, Department of Radiology, Rochester, Minnesota, USA.
- n) Department of Medicine and Diagnostic Radiology, McGill University, Montreal, Quebec, Canada
- o) Cardiology and Cardiovascular Medicine, Fondazione Toscana Gabriele Monasterio, Pisa, Italy
- p) Department of Internal Medicine B, Cardiology, Pneumology, Infectious Diseases, Intensive Care Medicine, University Medicine, Ernst Moritz Arndt University, Ferdinand-Sauerbruch-Straße 1,17475 Greifswald, Germany
- q) DZHK (German Centre for Cardiovascular Research), Greifswald, Germany
- r) Health Data Research UK, London, UK
- s) Alan Turing Institute, London, UK

\* Zahra Raisi-Estabragh and Liliana Szabo have contributed equally to this work and share first authorship.

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**Address for correspondence:** Professor Steffen E. Petersen. William Harvey Research Institute, NIHR Barts Biomedical Research Centre, Queen Mary University of London, Charterhouse Square, London, EC1M 6BQ. E-mail: s.e.petersen@qmul.ac.uk, Tel: +44 (20) 37658766, X handle: @s\_e\_petersen

## Structured Abstract

**Background:** The absence of population stratified cardiovascular magnetic resonance (CMR) reference ranges from large cohorts is a major shortcoming for clinical care.

**Objectives:** This paper provides age, sex, and ethnicity-specific CMR reference ranges for atrial and ventricular metrics from the Healthy Hearts Consortium, an international collaborative comprising 9,088 CMR studies from verified healthy individuals covering the complete adult age spectrum across both sexes and the highest ethnic diversity reported to date.

**Methods:** CMR studies were analyzed using certified software with batch processing capability (cvi42™, Circle Cardiovascular Imaging, version 5.14 prototype) by two expert readers. Three segmentation methods (smooth, papillary, anatomical) were used to contour the endocardial and epicardial borders of the ventricles and atria from long and short axis cine series. Clinically established ventricular and atrial metrics were extracted and stratified by age, sex, and ethnicity. Variations by segmentation method, scanner vendor, and magnet strength were examined. Reference ranges are reported as 95% prediction intervals.

**Results:** The sample included 4,452 (49.0%) men and 4,636 (51.0%) women with average age of 61.1 (SD 12.9, range 18-83) years-old. Among these, 7,425 (81.7%) were from White, 510 (5.6%) South Asian, 478 (5.3%) Mixed/Other, 340 (3.7%) Black, and 335 (3.7%) Chinese ethnicities. Images were acquired using 1.5 Tesla (n=8,779, 96.6%) and 3 Tesla (n=309, 3.4%) scanners from Siemens (n=8,299, 91.3%), Philips (n=498, 5.5%), and GE (n=291, 3.2%). Reference ranges are presented in downloadable tables and available via: <https://www.healthy-hearts.org.uk>.

**Conclusions:** The work represents a resource with healthy CMR-derived volumetric reference ranges ready for clinical implementation.

**Keywords:** Cardiovascular magnetic resonance; healthy reference ranges; sex differences;

ethnicity; automated analysis; artificial intelligence

**Abbreviations list**

CMR: Cardiovascular magnetic resonance

HHC: Healthy Hearts Consortium

LA: Left atrium

LV: Left ventricle

RA: Right atrium

RV: Right ventricle

## Introduction

Cardiovascular imaging is essential to clinical decision making in cardiology. Image-derived measures of cardiac chamber size and function are key in guiding cardiovascular risk stratification, diagnosis, and treatment decisions. Cardiovascular magnetic resonance (CMR) is the reference modality for the assessment of cardiac structure and function<sup>1</sup>. Accurate distinction of health from disease is crucial for maximizing the clinical utility of CMR.

Despite known ethnic and sex differences in healthy cardiovascular phenotypes<sup>2,3</sup>, reference ranges specific to these factors are not available in large cohorts. Existing CMR normal reference ranges are based on small, ethnically homogeneous cohorts with limited age distributions. In a recent meta-analysis<sup>4</sup>, we demonstrated large variation between published CMR healthy reference ranges, attributed to a multitude of population-related and technical factors. While some researchers have produced ranges from pooled results of existing publications<sup>5</sup>, the high between-study heterogeneity limits the reliability of reference ranges produced by meta-analysis of summary statistics from these works. There is a need for development of unified healthy reference ranges with appropriate population stratifications to guide clinical practice and to allow global comparison of CMR measures.

To address these knowledge gaps, we established the Healthy Hearts Consortium (HHC), a multicenter international collaborative comprising over 9,000 CMR studies from verified healthy cohorts contributed by six institutions. The HHC represents a unique databank of healthy CMR studies providing a complete adult age spectrum (18-83 years), ethnic diversity, and an opportunity to assess technical sources of variation in derived CMR metrics (e.g., scanner vendor, magnet strength).

This paper presents sex, age, and ethnicity specific CMR healthy reference ranges from the HHC dataset. We include a wide range of clinically established metrics extracted from the left and right ventricles (LV, RV) and the left and right atria (LA, RA). This work

has important and immediate relevance to patient care across the world. The manuscript is accompanied by a linked website (<https://www.healthy-hearts.org.uk>) for ease of access and wide dissemination.

## **Methods**

### **Healthy Hearts Consortium**

The HHC is an international collaborative comprising the largest CMR image bank of healthy adult hearts in the world, including 9,088 studies contributed by six institutions (**Central illustration**). The dataset is unique in its size, age spectrum, and ethnic diversity. Published CMR reference range papers in adults using 1.5T or 3T scanners and balanced steady-state free precession cine sequences with long and short axis slices acquired in accordance with international guidelines were identified through a systematic literature review, which is available as a separate publication<sup>4</sup>. The review is registered online with the International Prospective Register of Systematic Reviews (PROSPERO registration number: CRD42019147161)<sup>4</sup>. Cohorts with large datasets, appropriate ethical approvals, data-sharing agreements, and linked population and technical details were invited to join. The contributing sites comprise published normal reference range cohorts from Utrecht (The Netherlands)<sup>6</sup>, Pisa (Italy)<sup>7</sup>, Heidelberg (Germany)<sup>8</sup>, Singapore<sup>9</sup>, and healthy subsets from the Study of Health in Pomerania (SHIP)<sup>10</sup> and UK Biobank<sup>11</sup> cohorts. Details of participant selection for these studies are summarized in **Table S1**. The Pisa (Italy) cohort comprises participants scanned in the Pisa center of the published multicenter healthy reference range paper by Aquaro et al.<sup>7</sup> and further verified healthy participants selected using the same inclusion criteria and methods as the original paper and scanned in the same center in Pisa. The data available includes anonymized CMR images in DICOM (Digital Imaging and Communications in Medicine) format, demographics, body size measurements, and selected

technical details. The data are centrally managed at the William Harvey Research Institute, National Institute for Health and Care Research, Barts Biomedical Research Centre, Queen Mary University of London. Further details about the HHC resource can be found at:

<https://www.healthy-hearts.org.uk>.

### **The UK Biobank healthy subset**

Our systematic review identified one healthy reference range paper from the UK Biobank<sup>11</sup>. Since this publication, there has been expansion and enrichment of the UK Biobank imaging cohort. Therefore, in the present analysis, we have reconfigured the UK Biobank healthy subset to address several shortcomings in the source paper. Firstly, health record linkage in the UK Biobank was not well-established at time of the original publication. As such, identification of disease status was based on UK Biobank self-report assessments, which may be subject to misclassification or recall bias. In the present analysis, we have defined healthy status by cross checking across all UK Biobank self-report assessment questions, as well as all available linked electronic health records, including Hospital Episode Statistics and primary care records. Second, the original study was limited to White ethnicities, as few participants from ethnicities other than White had completed the CMR protocol at the time. Many more UK Biobank participants have now completed CMR scanning, permitting consideration of a wider range of ethnic groups. Finally, there is increased awareness of healthy participant bias in the UK Biobank<sup>12</sup>, with participants having healthier profiles and lower levels of deprivation than national averages, which would be further augmented in a healthy subset. Drawing the boundaries between health and disease from such a “hyper-healthy” cohort has questionable utility when applied to the general population with the potential to inappropriately lower the threshold for disease. To address this issue, we recalibrated the demographic, socio-economic, lifestyle, and morbidity profile



of the healthy UK Biobank subset to reflect that of the general population using data from the Health Survey for England. This resulted in a healthy UK Biobank subset (n=7,672) free from cardiovascular disease, including a range of ethnicities, and with a comparable profile to the general population. A detailed description of the approach to sample selection to create this cohort can be found in the **Supplementary Methods**.

### **Ethics statement**

This study complies with the Declaration of Helsinki. Analysis of the UK Biobank was covered by ethical approval from the NHS National Research Ethics Service on 17th June 2011(Ref 11/NW/0382) and extended on 18th June 2021(Ref 21/NW/0157) with written informed consent obtained from all participants. For all other cohorts, appropriate ethical approval was verified by each contributing site.

### **Image segmentation**

For the image analysis, we used a specific prototype (version 5.14 prototype) of a certified software (cvi42™, Circle Cardiovascular Imaging Inc., Calgary, AB, Canada) with batch processing capability. An overview of the image analysis and quality control pipeline is presented in **Figure 1**. A fully automated segmentation method was utilized to draw the endo- and epicardial contours for short and long axis cine CMR images covering all four cardiac chambers (**Figure 2** and **Figure 3**). Short axis images covering both left and right ventricle were analyzed using three pre-defined segmentation protocols selected to capture established clinical practices (

**Figure 4**), all of which are endorsed by the Society for Cardiovascular Magnetic Resonance: **1) Smooth:** Segmentation of endocardial contours, where papillary muscles and trabecular tissue are excluded from the LV mass (included in the blood pool). **2) Papillary:** Smooth endocardial contours with inclusion of papillary muscles (but not trabecular tissue) in the LV mass. **3) Anatomical:** Inclusion of both papillary muscles and trabecular tissue in the LV mass.

### **Quality control**

A statistical quality control approach was implemented for the UK Biobank healthy subset, using a 3-standard deviation (3SD) threshold to remove extreme biologically implausible values. Manual visual quality control was performed for all other contributing cohorts by two expert readers (LS, SEP) using a custom-built Shiny app developed in-house (**Supplementary Methods**). This app provides a platform for quality scoring across three domains: image acquisition, image planning, and segmentation. Each dimension is scored on a three-level score system where 1 = ‘perfect’, 2 = ‘satisfactory’, and 3 = ‘unacceptable for clinical use’. All values that received a quality score of 3, indicating poor quality, were removed from the analysis. The acceptable rate of smooth, papillary and anatomical segmentation methods was similar, the number of cases removed from analysis due to image, segmentation, or planning quality issues is shown in **Figure S1**.

### **Calculation of CMR metrics**

The batch processing pipeline outputs measures of left and right ventricular and atrial volume and function. For calculation of LV and RV parameters, the full short-axis stack was

utilized as per the segmentation protocols described above. Ventricular volumes were calculated based on the 'sum of disks' method. LA volumes were extracted from volume curves which were created using the area-length method from 4- and 2-chamber views,  $\text{volume} = (0.848 \times \text{area}_{4\text{ch}} \times \text{area}_{2\text{ch}}) / ((\text{length}_{2\text{ch}} + \text{length}_{4\text{ch}}) / 2)$ . RA volumes were derived from 4ch images.

Using these methods we extracted a wide range of clinically established metrics encompassing LV end-diastolic volume (LVEDV), LV end-systolic volume (LVESV), LV stroke volume (LVSV), LV cardiac output (LVCO), LV ejection fraction (LVEF), LV myocardial mass in end-diastole (LVM), RV end-diastolic volume (RVEDV), RV end-systolic volume (RVESV), RV stroke volume (RVSV), RV cardiac output (RVCO), RV ejection fraction (RVEF), RV myocardial mass in end-diastole (RVM), LA end-systolic volume (LAESV), maximum LA volume (LA max), LA ejection fraction (LAEF), RA end-systolic volume (RAESV), maximum RA volume (RA max), and RA ejection fraction (RAEF). LAEF and RAEF were computed using the minimum and maximum volume indices of the LA and RA, respectively.

Our pipeline comprised a uniform, fully automated segmentation process without any manual adjustments. The reproducibility of the derived measures was confirmed in a subset of participants by repeatedly deriving the metrics.

### **Body size adjustment**

To accommodate body size adjustment methods commonly used in clinical practice, we provide all volumetric and mass measurements as indexed to both body surface area (BSA) and height. We obtained the height and weight of participants at the time of imaging to calculate the BSA, using the Mosteller formula. This formula calculates BSA by taking the square root of the product of height (in cm) and weight (in kg), divided by 3,600. To maintain

consistency and emphasize the potential technical variations within the dataset, we report BSA indexed values within the main text of our manuscript. We have included both BSA and height indexed normal ranges in the supplementary material.

### **Population-related and technical source of variation**

We considered age, sex, ethnicity, body size, and technical factors as potential sources of variation in CMR metrics. Each HHC contributor provided details of CMR scanner vendor/model and magnet strength (1.5T or 3T). Participant age was recorded at time of imaging. Ethnicity and sex were self-reported. The Utrecht, Heidelberg, and SHIP cohorts reported participants from White/Caucasian ethnic backgrounds only. The Pisa cohort included one individual from Black ethnicities, while the remainder of the cohort was of White/Caucasian ethnic backgrounds. The Singapore cohort contained only participants of “Chinese” descent. Ethnicity categories supplied by the UK Biobank are: “White”, “Black or Black British”, “Asian or Asian British”, “Chinese”, “Mixed”, and “Other”. In the UK Biobank, “Asian or Asian British” refers to Indian, Pakistani, Bangladeshi or “any other Asian” backgrounds in line with UK government definitions for ethnic groups; we labelled this cohort “South Asian”.

### **Statistical analysis**

Statistical analysis was performed using R version 4.1.2 and RStudio version 2022.12.0+353. Descriptive statistics, including mean, standard deviation, and range, were used to summarize the dataset. All CMR variables were examined for normality using histograms and q-q plots. They were unimodal and sufficiently symmetrically distributed to be well-represented by parametric statistical methods. Variations in CMR metrics by age, sex, ethnicity, and segmentation method, magnet strength, and scanner vendor were

examined. Age was categorized into groups from 18 to over 70 years old. Reference ranges are reported as 95% prediction intervals, representing the range which is likely to include the value of a single new observation given set parameters. For each CMR metric, sex, age, ethnicity, and segmentation method specific reference ranges are provided. Normal reference ranges are not reported in age groups where fewer than 10 studies were available.

## Results

### Population characteristics

The analysis sample and exclusions are summarized in **Figure S1**. The analysis sample is characterized in **Table 1. Summary Characteristics**. The individual contributing cohorts are in **Table S2**. The final sample comprises 9,088 CMR scans, including 4,452 (49.0%) men and 4,636 (51.0%) women with an average age of  $61.1 \pm 12.9$  years old, ranging from 18 to 83 years old. The sample comprised 7,425 (81.7%) individuals from White ethnic backgrounds, with smaller contributions from South Asian (n=510, 5.6%), Mixed/Other (n=478, 5.3%), Black (n=340, 3.7%), and Chinese (n=335, 3.7%) ethnicities.

### Quality control

The quality control analysis of the CMR segmentations revealed that in approximately 1% of cases, short-axis ventricular segmentations were deemed unacceptable for clinical use, primarily due to the program segmenting transverse images instead of the short-axis slice (**Figure S1**). Atrial segmentation from long-axis images demonstrated a higher failure rate, with 20% of 2-chamber images and 26% of 4-chamber images considered unacceptable. Long-axis image planning prioritizes optimization for accurate ventricular volume assessment. At times, this is at the compromise of atrial chamber visualization (e.g., significant foreshortening), which makes accurate atrial assessment impossible. Thus, the

higher failure rates for atrial segmentation were not unexpected and attributed to suboptimal atrial visualization on long-axis slices rather than issues with the segmentation tool itself, an issue that has been highlighted in previous work<sup>13</sup>.

### **Segmentation method**

The smooth segmentation method produced larger LVEDVi and smaller LVMI, compared to the papillary and anatomical methods (**Figure S2**). The mean difference between LVEDVi derived from smooth and anatomical contours was 7.3 ml/m<sup>2</sup> [6.9, 7.6]. The mean difference between LVMI derived from anatomical and smooth contours was 7.7 g/m<sup>2</sup> [5.5, 7.9]. The LVEF was lowest when measured using the smooth and highest when using anatomical contours. There was minimal variation in LVSVi by segmentation method. Similarly, RVEDVi and RVEF showed little variation across segmentation methods.

### **Magnet strength**

Most scans (n=8,779, 96.6%) were performed on 1.5T scanners. Those performed on 3T scanners include a high proportion of Chinese ethnicities (58%; 180/309). We generally observed marginally larger chamber volumes and higher LV and RV mass in the scans performed using 1.5T compared to 3T scanners (**Figure S3**). The LV and RA ejection fractions were higher in the 3T scans compared to 1.5T, while RV and LA ejection fractions were higher in the 1.5T scanners.

### **Scanner Vendor**

There were minor differences in left and right ventricular volume and mass metrics across different scanner vendors. Whilst some of these variations were statistically significant, they did not represent clinically important differences (**Figure S3**). Left and right

atrial volumes were larger in the GE scans compared to Siemens or Philips, and accordingly, the corresponding ejection fractions were smaller.

### **Age and sex**

Across the entire age range, after indexation to BSA, compared to women, men had on average, larger LV and RV volumes, larger LV and RV stroke volumes and cardiac output, and lower LVEF (**Figure 5**). Increasing age was linked to smaller left and right ventricular volumes, lower LVMi, lower stroke volumes and cardiac output, and higher LV and RV ejection fractions. There were comparable age-related trajectories in men and women. There was minimal age and sex dependency of atrial metrics, as such we present the sex specific atrial normal ranges, without age stratification for both male and female participants. Compared to women, men had, on average, larger RA volumes and lower RAEF, but with a near flat age trend. There was minimal age and sex variation in LA volumes or LAEF.

### **Ethnicity**

Overall, similar sex and age trends were observed across all ethnic groups. The greatest ethnic differences were between White and South Asians cohorts, with more subtle differences between White and Chinese and Black ethnic groups. In general, there was greater ethnic variation among women (**Figure S4**) than men (**Figure S5**).

Compared to White ethnic groups, after indexation to BSA, individuals from South Asian ethnicities had on average, smaller LV and RV volumes, lower LV and RV stroke volumes and cardiac output, and higher LVEF. Individuals from Chinese backgrounds had lower ventricular volumes than White ethnicities, but higher values than the South Asian cohort. These differences were greatest at younger, compared to older ages where all

ethnicities appeared to converge. There was close alignment of LV and RV ejection fractions across all ethnic groups with a similar increasing trajectory with older age.

Regarding the LV mass index, the Black ethnic group had the highest values in both men and women. In men, there was an age-related trend of decreasing LV mass across all ethnicities with a slightly steeper trajectory in White and Black ethnicities, compared to Chinese and South Asian groups with a less rapid age-related decline in LV mass. Among women, a similar age-related decreasing trend was observed in the White ethnic group, however in women from all other ethnicities, LV mass showed a trend toward *increasing* values with age. There was little age-related change in RV mass among Asian and White ethnicities. Black ethnicities showed a negative trend of RV mass with increasing age, which was more marked among women than men.

Unexpectedly, Chinese men and women had a steep positive trend of RV mass with increasing age. Exploratory analyses revealed this trend to be entirely driven by values from the Singapore cohort, with complete separation of the distribution of RVMi towards lower values in Chinese participants from Singapore compared to those from the UK Biobank (**Figure S6**). Given the potential for wide variations in RVM values due the outlined technical factors, we took the consensus decision to remove RVM values from reported reference ranges in the paper.

There were minimal ethnicity differences across LA and RA metrics, consistent across different age groups and across men and women.

### **CMR reference ranges**

Simplified reference ranges for right and left ventricular metrics, derived using three segmentation methods, stratified by sex, age, and ethnicity are presented in **Table 2** to **Table 4**. Simplified reference ranges for left and right atrial metrics in the White ethnic group



stratified by age are presented **Table 5. Left and right atrial parameters for White women and men pooled from all age groups (> 18 years-old)** Comprehensive reference range tables, stratified by age, sex, and ethnicity, for all three segmentation methods are provided in both height and BSA indexed formats in the Supplementary Materials (**Tables S3-62**) and are available from the linked website: <https://www.healthy-hearts.org.uk>

## **Discussion**

This paper presents age, sex, and ethnicity-specific ventricular and atrial reference ranges derived from 9,088 verified healthy adults segmented using three standardized segmentation protocols. The work represents a resource designed for ready implementation into clinical pathways in CMR centers worldwide and is a key step towards standardization and global cross-comparability of the technique.

The first notable observation from this work is that variation in CMR metrics in published reference range papers is substantially reduced by the implementation of uniform post-processing software and standardized image analysis protocols. While there is some variation in derived metrics due to technical variables such as scanner vendor and magnet strength, these do not result in clinically important variation among healthy adults. Thus, image analysis methodology is the most important technical factor in heterogeneity across reference ranges.

Segmentation methods play a crucial role in the analysis of CMR data, as they directly affect the derived measurements of cardiac function. In our study, we observed that the smooth segmentation method produced larger ventricular volumes, smaller mass, and lower LVEF measurements. The highest LVEF was obtained using the anatomical segmentation method. These findings are consistent with the existing literature, confirming the impact of segmentation methods on CMR-derived measurements<sup>11,14,15</sup>.

Our study contributes to the understanding of how different segmentation methods

can influence CMR measurements, thus reaffirming the need for clinicians and researchers to be aware of these differences when selecting a segmentation method for their practice. While we did not observe clinically important differences between metrics derived using the various segmentation methods in our healthy sample, this may not be the case in the presence of disease. This may be particularly pertinent for discrimination of conditions with prominent LV and papillary muscle hypertrophy, such as hypertrophic cardiomyopathy or hypertensive heart disease. Further work is required to determine the utility of metrics derived using different contouring methods for disease discrimination and for outcome prediction. Our findings demonstrate that different segmentation methods produce comparable ventricular and atrial metrics in the healthy state.

Implementing an artificial intelligence (AI) powered segmentation tool in the current analysis further enhances the reproducibility and cross-comparability of CMR metrics across different sites. By automating the segmentation process and minimizing human error, AI algorithms may contribute to the establishment of universally accepted standards for CMR segmentation, leading to greater precision in evaluations of cardiac structure and function. The HHC comprises the largest CMR image bank of healthy adults with adequate representation of men and women across the entire adult age range. We were thus able to describe, with high precision, the sex and age dependence of ventricular and atrial CMR metrics. In line with previous work, we confirmed larger ventricular chamber volumes in men compared to women, even after BSA indexation. There was a declining trend of ventricular volumes in older ages, with corresponding reduction in measures of ventricular function such as stroke volume and cardiac output. The age and sex variations of LA and RA volume and function metrics were minimal.

Both LV and RV ejection fractions increased with increasing age. The observed relationship of age with ejection fraction aligns with previous individual reference range

papers, shown with greater granularity in our work. It is also in keeping with increasingly recognized limitations of LV ejection fraction as a marker of cardiovascular health<sup>16,17</sup>. These observations further corroborate reports of adverse prognostic associations of supranormal LV ejection fraction in population cohorts<sup>18</sup>. Alternative measures of LV function may better reflect myocardial contractility and overall cardiovascular health<sup>19,20</sup>. In our analysis, LV and RV stroke volume and cardiac output metrics had linear declining trends with increasing age, suggesting that these may be more accurate representations of age-related decline in ventricular function compared to ejection fraction.

A key aim of our work was to address the limited ethnic diversity in existing CMR normal reference ranges. Collation of CMR studies across multiple cohorts permitted curation of a large set of healthy CMR studies from White, South Asian, Chinese, Black, and Mixed/Other ethnicities and calculation of age and sex-specific ranges across these ethnic groups. Among the ethnic groups considered, the greatest difference was among Asian and White ethnicities. Individuals from Asian backgrounds had smaller ventricular chamber volumes, lower stroke volume and cardiac output and lower LV ejection fraction across all age groups. We demonstrate that, overall, age and sex reference ranges for different ethnic groups are closely aligned. Thus, in the absence of ethnicity-specific reference ranges, age and sex-stratified reference ranges may be applied across different ethnicities with reasonable confidence.

We found an unexpected steep positive trend of RVMi with increasing age in Chinese individuals. Further investigation of this relationship led us to conclude that the increasing RVMi trend with older age in Chinese participants is artefactually driven by two primary factors: (1) changing case mix and (2) differences in pixel size. Firstly, the Chinese cohort in our sample is derived from two sources: the Singapore cohort<sup>9</sup> and the UK Biobank healthy subset<sup>11</sup>, with the latter contributing to ages over 40 years old and all younger ages

contributed by the former. On examination of the distribution of RVMi across these two sources, we found complete separation of distributions with the Singapore cohort having lower RVMi than those in the UK Biobank. We further identified significantly smaller interpolated pixel size in the Singapore cohort (approximately 0.9 mm x 0.9 mm) compared to the UK Biobank (approximately 1.9 mm x 1.9 mm). The segmentation algorithm used for determining RVMi relies on a mathematical method to create the segmentation for the epicardial border of the RV, rather than edge tracing. The accuracy of this method is therefore sensitive to the thinness of the RV wall relative to the pixel size. Thus, the lower RVMi in the Singapore cohort may be driven by the smaller pixel size in these studies leading to a smaller area between the RV endocardial and epicardial borders when the algorithm is applied. The increasing age trend of RVMi is an artefact reflecting the systematically lower RVMi in younger (under 40 years old) participants who are all from the Singapore set. The thin RV wall means that RVM measures are particularly susceptible to such technical artifacts, while other metrics, derived using edge tracing (e.g. LVM) are not importantly affected. Given the demonstrable susceptibility of RVM to wide variations, we elected to remove these metrics from our reported reference ranges.

## **Limitations**

The image analysis is performed using a specific software package (cvi42™, Circle Cardiovascular Imaging, version 5.14 prototype), currently the most commonly used post-processing software in the UK and worldwide. The provided reference ranges may not apply to images analyzed using different image analysis software. There may also be some variations in the CMR measures produced across different versions of the Circle Cardiovascular imaging (cvi42™) software. Prior to implementation of the present values into clinical practice, individual centers may wish to conduct a small calibration test to better

understand the magnitude of such variations. The variations by magnet strength and scanner vendor should be interpreted with caution, given the significant disparities in sample size between the 1.5T and 3T scanners and the disproportionate representation of Chinese ethnicities in the 3T scans. Through collation of scans from multiple cohorts, the HHC provides greater representation from ethnicities other than White than any individual published cohort. However, the ethnic diversity remained limited by that in the source studies, and over 80% of CMR studies in the HHC were among White ethnic groups. The differences in ethnic groups should be interpreted with caution, considering these sample size variations. There is a need for dedicated efforts to ensure a wider representation of ethnic groups in future reference range studies.

## **Clinical perspective**

**Competency in Medical Knowledge:** CMR is the reference modality for volumetric chamber quantification, this information is critical for many diagnosis and treatment decisions in cardiology.

## **Translational outlook**

In this paper we present CMR normal reference ranges stratified by age, sex and ethnicity using the HHC dataset, including the entire adult age spectrum, adequate representation of both sexes and the greatest ethnic diversity of any previously published resource. The images were analyzed using uniform fully automated standard operating procedures according to three segmentation protocols and the results are presented in a ready to use format for clinical practice. The findings from this paper represent an important resource which is ready for direct translation into CMR centres across the world.

This represents an important step towards development of international CMR reference ranges. Further research is needed to understand which segmentation method offers best discrimination between health and disease and allows for more accurate risk prediction for this longitudinal analysis with adequate follow up when required. Minority ethnic groups remain underrepresented and there is need to dedicated efforts to better understand CMR phenotypes across different ethnic groups.

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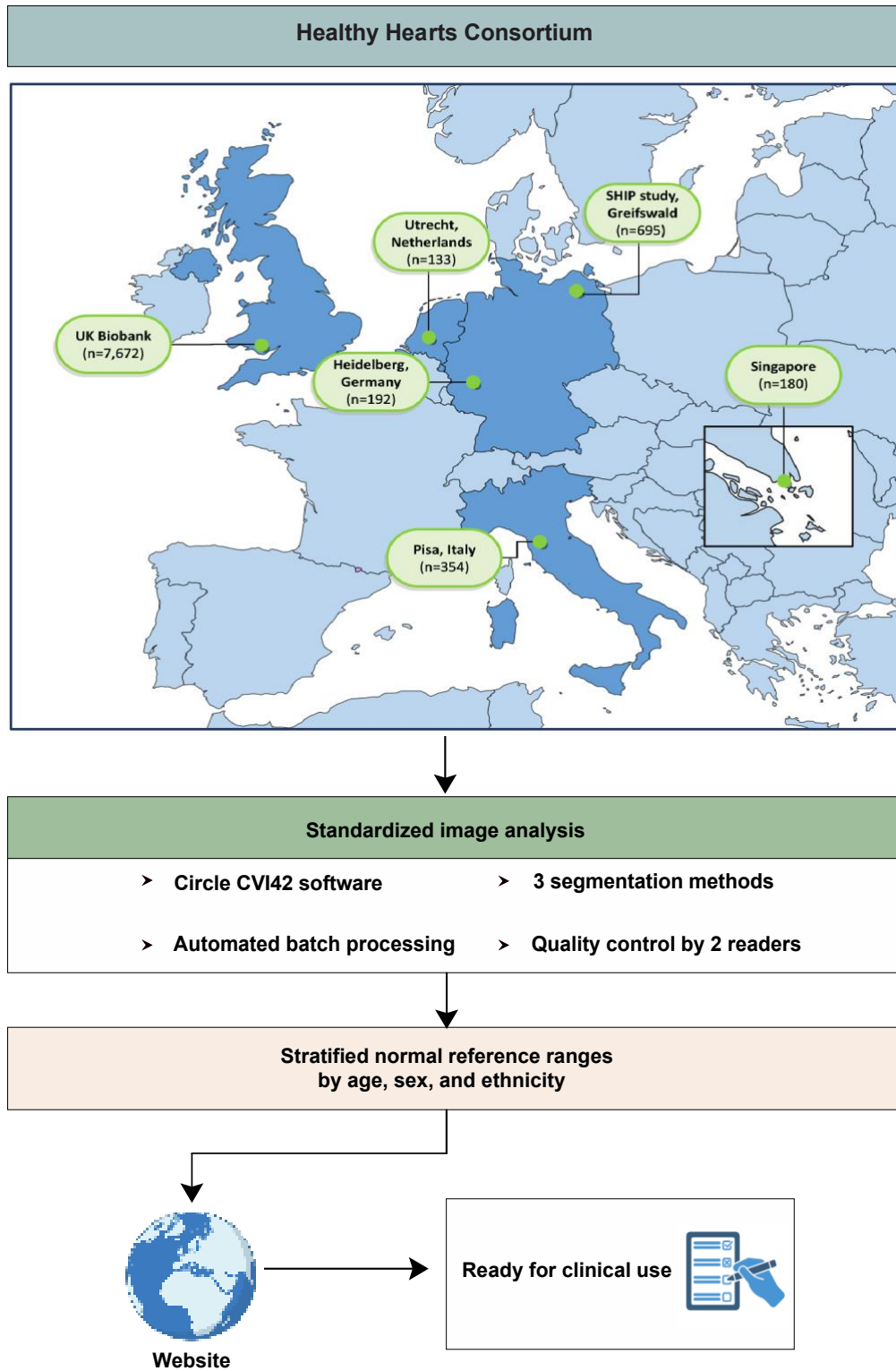
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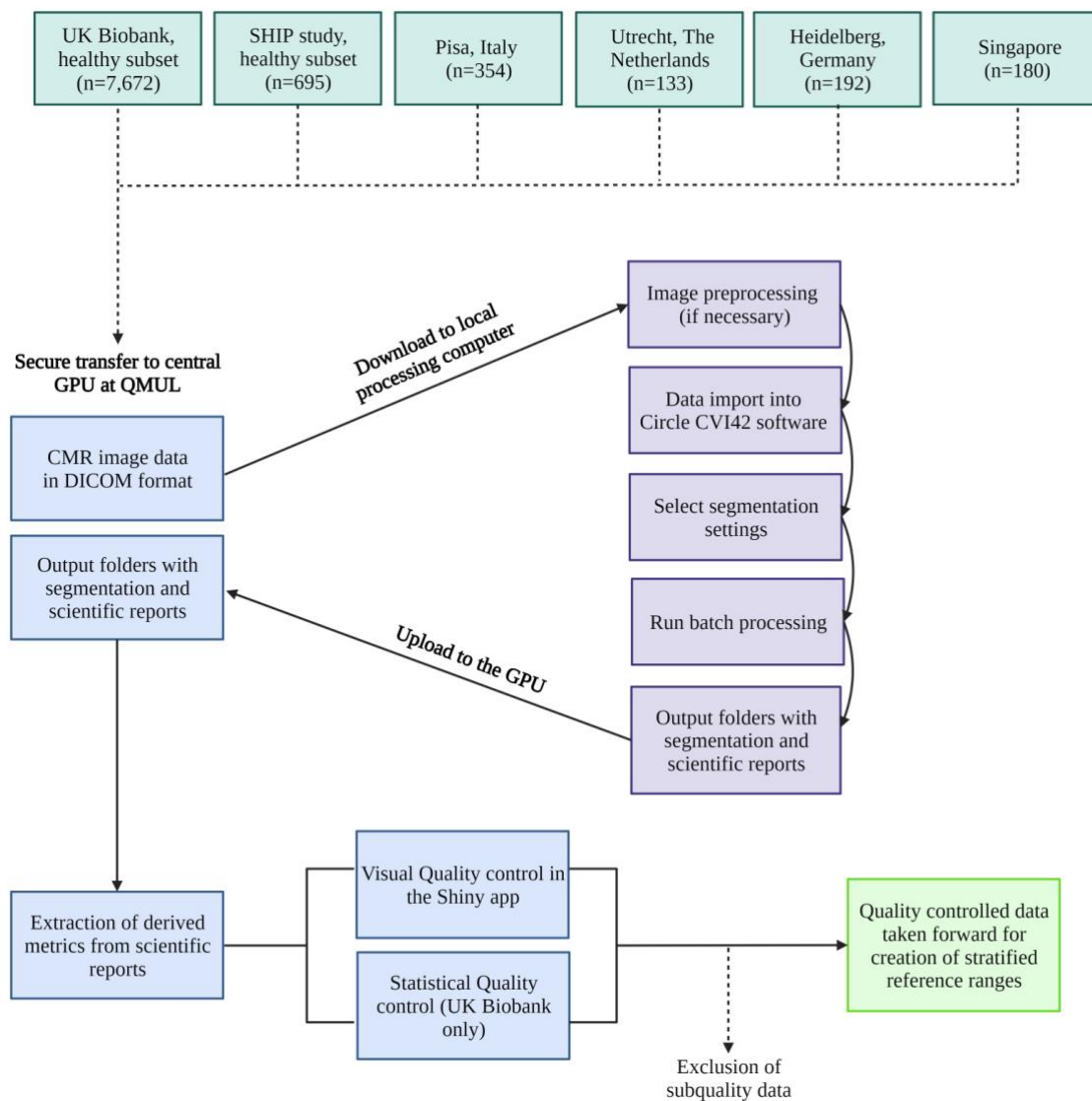
# Figure legend

Central illustration: CMR reference ranges from the Healthy Hearts Consortium



**Caption:** This figures provides an overview of the Healthy Hearts Consortium and the approach taken to deriving ventricular and atrial reference ranges from this cohort. Certified software with batch processing capability (cvi42™, Circle Cardiovascular Imaging) and quality control procedures were used. Reference ranges are provided for three segmentation (smooth, papillary, anatomical) and two body size correction (body surface area, height) methods; and stratified by age, sex, and ethnicity. Downloadable reference range tables are available via: <https://www.healthy-hearts.org.uk>.

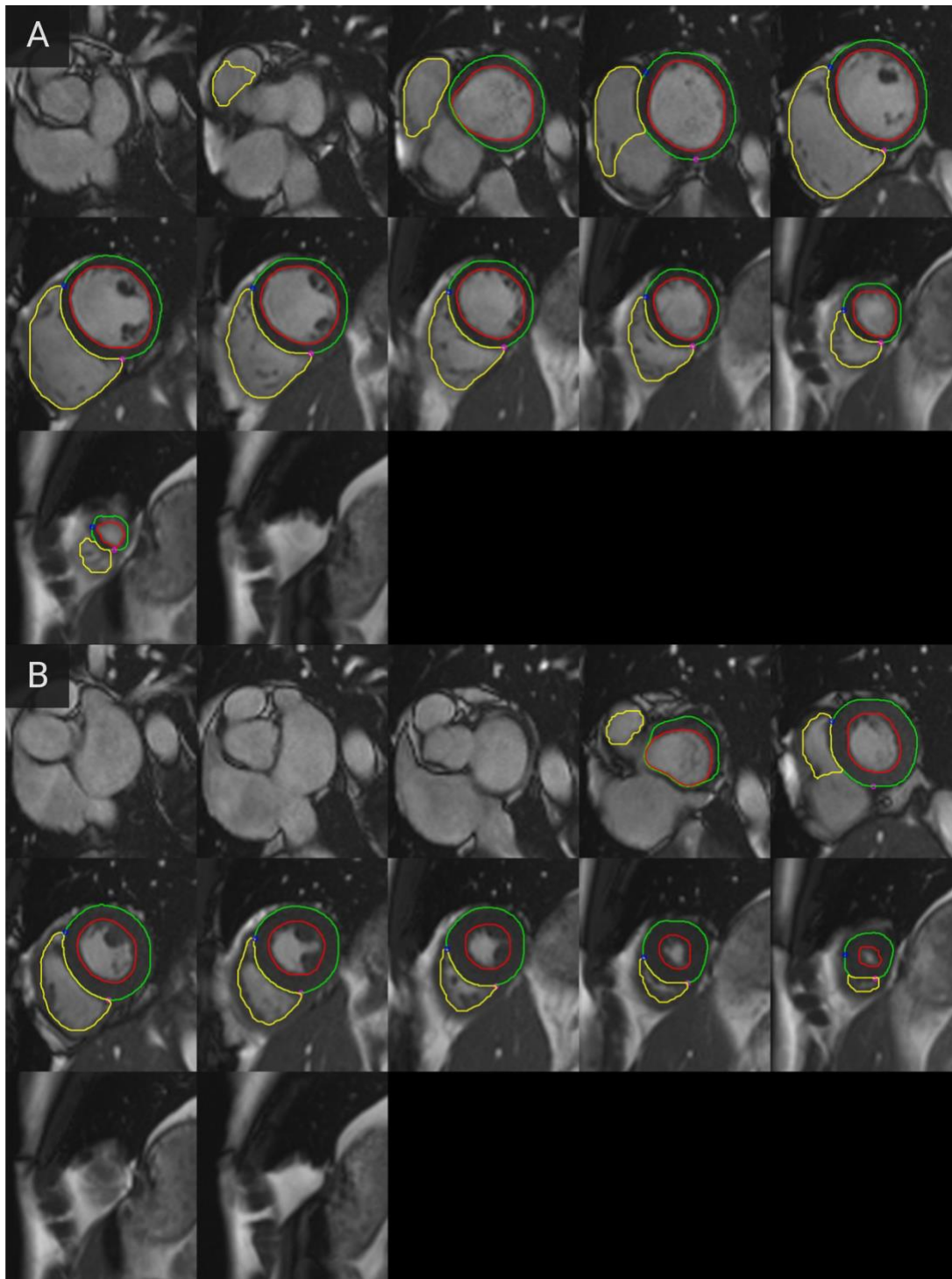
**Figure 1. Overview of the image analysis and quality control pipeline**



**Figure 1 footnote:** The image illustrates an overview of the image analysis pipeline. First,

imaging data in DICOM format was collected at the central graphics processing unit at the William Harvey Research Institute, Queen Mary University of London. Second, the data underwent batch processing on local processing computers, as per the predefined segmentation protocols, which generated smooth, papillary, and anatomical contours for each participant. Third, scientific reports and images were uploaded to the GPU. Imaging output was subjected to visual quality control, and CMR metrics were extracted from the scientific reports. Finally, substandard data was removed from the analysis, and only high-quality cases were included for data analysis. CMR: cardiovascular magnetic resonance; DICOM: Digital Imaging and Communications in Medicine); GPU: graphics processing unit; SHIP: Study of Health in Pomerania.

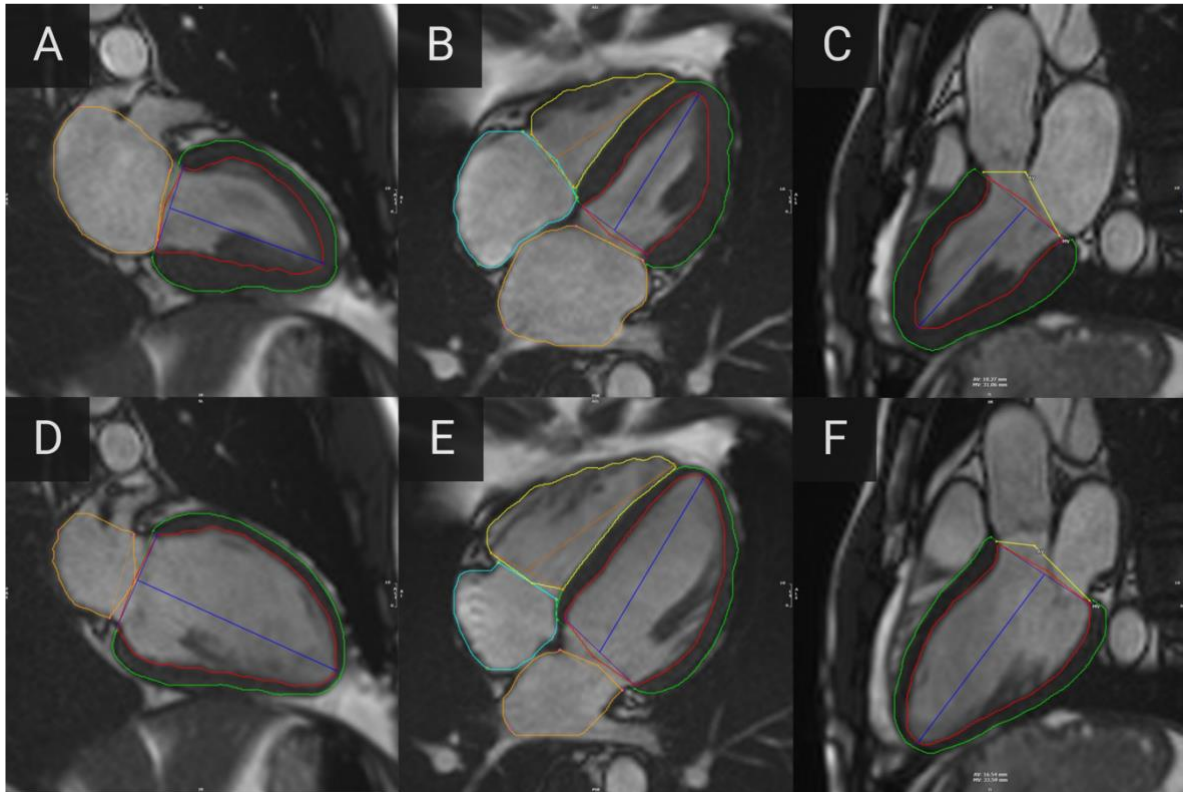
**Figure 2. Automated contours of the left ventricle (LV) and right ventricle (RV) on short axis cine images, using the smooth segmentation method**



**Figure 2 footnote:** A short-axis cine CMR stack showing the smooth segmentation from base to apex, Panel A represents images at end-diastole, while Panel B shows images at end-systole. The segmentations visible in both panels are derived automatically using the CVI42

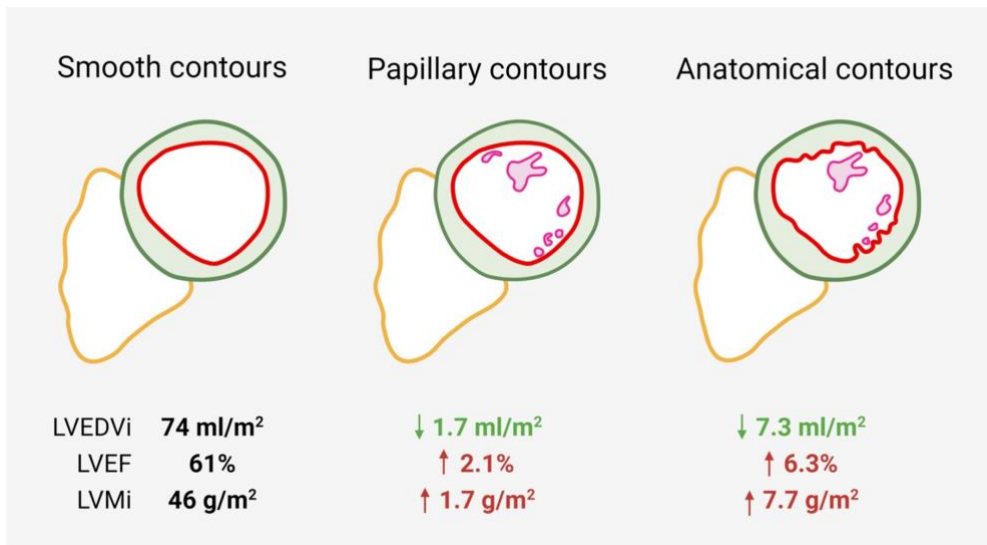
tool, with no manual human input.

**Figure 3. Automated contours of all cardiac chambers on long axis cine images**



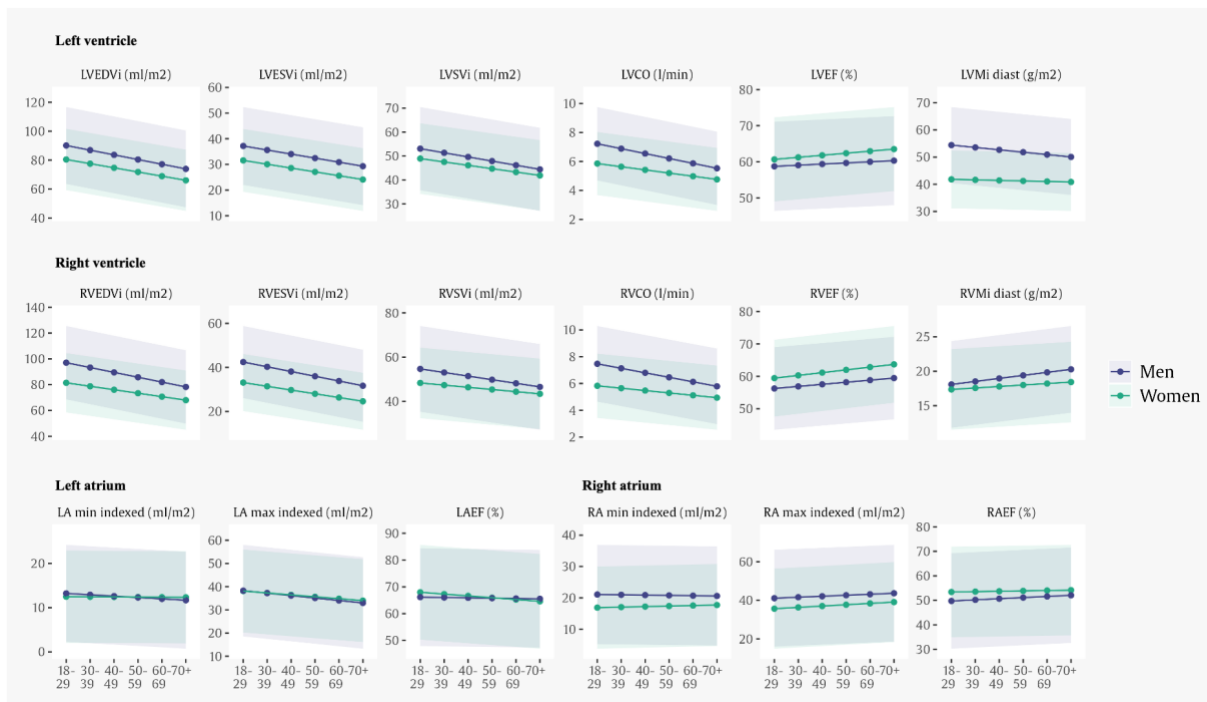
**Figure 3 footnote:** Long axis cine CMR images, showing the automated segmentation on 2CH (Panels A and D), 4CH (Panels B and E) and 3CH (Panels C and F) in end-systole and end-diastole using the automated software solution.

**Figure 4. Illustration of segmentation methods**



**Figure 4. footnote.** Predefined segmentation methods generated smooth, papillary and anatomical contours. Mean CMR values are shown for the smooth contours, and the mean change with respect to papillary and anatomical contours to capture the change driven by the different methods. Mean values were calculated for each run, balanced with respect to all covariates (age, sex, ethnicity, scanner). LVEDVi: Left ventricular end-diastolic volume index; LVEF: left ventricular ejection fraction; LVMI: left ventricular mass index.

**Figure 5. CMR metrics stratified by sex and age**



**Figure 5 footnote.** Points are fitted age estimates from linear regression models relating age to CMR metric, where each metric and sex were modelled separately. The colored shaded areas indicate the 95% prediction interval for each sex. CMR: cardiovascular magnetic resonance; LVEDVi: Left ventricular end-diastolic volume index; LVESVi: Left ventricular end-systolic volume index; LVSVi: left ventricular stroke volume index; LVCO: left ventricular cardiac output; LVEF: left ventricular ejection fraction; LVMi diast: left ventricular mass in end-diastole index; RVEDVi: right ventricular end-diastolic volume index; RVESVi: right ventricular end-systolic volume index; RVSVi: right ventricular stroke volume index; RVCO: right ventricular cardiac output; RVEF: right ventricular ejection fraction; RVMi diast: right ventricular mass in end-diastole index; LA min: left atrial minimum volume; LA max; left atrial





**Table 1. Summary Characteristics**

<b>Variable</b>	<b>Whole sample (n= 9,088)</b>	<b>Women (n= 4,636, 51%)</b>	<b>Men (n= 4,452, 49%)</b>
<b>Age</b>			
18-29 years	258 (2.8%)	121 (2.6%)	137 (3.1%)
30-39 years	310 (3.4%)	157 (3.4%)	153 (3.4%)
40-49 years	1,086 (11.9%)	577 (12.4%)	509 (11.4%)
50-59 years	2,491 (27.4%)	1,316 (28.4%)	1,175 (26.4%)
60-69 years	2,322 (25.6%)	1,231 (26.6%)	1,091 (24.5%)
70 or more	2,621 (28.8%)	1,234 (26.6%)	1,387 (31.2%)
<b>Ethnicity</b>			
White	7,424 (81.7%)	3,761 (81.1%)	3,663 (82.3%)
South Asian	510 (5.6%)	190 (4.1%)	320 (7.2%)
Black	341 (3.7%)	192 (4.1%)	149 (3.3%)
Chinese	335 (3.7%)	188 (4.1%)	147 (3.3%)
Mixed/Other	478 (5.3%)	305 (6.6%)	173 (3.9%)
<b>Cohort</b>			
UK Biobank	7,672 (84.4%)	3,921 (84.6%)	3,751 (84.3%)
SHIP	627 (6.9%)	330 (7.1%)	297 (6.7%)
Pisa	291 (3.2%)	147 (3.2%)	144 (3.2%)
Heidelberg	190 (2.1%)	85 (1.8%)	105 (2.4%)
Singapore	180 (2.0%)	89 (1.9%)	91 (2.0%)
Utrecht	128 (1.4%)	64 (1.4%)	64 (1.4%)
<b>Scanner vendor</b>			
Siemens	8,299 (91.3%)	4,251 (91.7%)	4,048 (90.9%)
Philips	498 (5.5%)	238 (5.1%)	260 (5.8%)
General Electric	291 (3.2%)	147 (3.2%)	144 (3.2%)
<b>Magnet strength</b>			
1.5 Tesla	8,779 (96.6%)	4,482 (96.7%)	4,297 (96.5%)
3 Tesla	309 (3.4%)	154 (3.3%)	155 (3.5%)

**Table 1 footnote.** SHIP: Study of Health in Pomerania

**Table 2. Left and right ventricular parameters for all ethnicities by age group, papillary muscles and trabeculae excluded from the LV mass (smooth segmentation), indexed by body surface**

<b>White ethnicity</b>												
<b>Variable</b>	<b>18-29</b>		<b>30-39</b>		<b>40-49</b>		<b>50-59</b>		<b>60-69</b>		<b>70+</b>	
N (min-max)	(50-102)	(52-113)	(84-137)	(67-135)	(458-518)	(378-447)	(858-926)	(784-839)	(875-929)	(771-817)	(1,033-1,116)	(1,212-1,283)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>	81 [60, 102]	92 [65, 119]	78 [57, 99]	89 [61, 116]	75 [54, 96]	85 [58, 112]	72 [51, 93]	82 [54, 109]	69 [48, 90]	78 [51, 106]	66 [46, 87]	75 [48, 102]
LVESVi; ml/m <sup>2</sup>	32 [20, 44]	38 [22, 54]	31 [19, 42]	36 [21, 52]	29 [17, 41]	35 [19, 50]	27 [15, 39]	33 [18, 49]	26 [14, 38]	32 [16, 47]	24 [12, 36]	30 [14, 46]
LVSVi; ml/m <sup>2</sup>	49 [34, 64]	54 [36, 72]	48 [33, 62]	52 [34, 70]	46 [32, 61]	50 [32, 68]	45 [30, 59]	48 [31, 66]	43 [29, 58]	47 [29, 64]	42 [27, 57]	45 [27, 63]
LVEF; %	60 [49, 72]	59 [46, 71]	61 [49, 72]	59 [46, 71]	62 [50, 73]	59 [47, 72]	62 [51, 74]	59 [47, 72]	63 [51, 74]	60 [47, 72]	64 [52, 75]	60 [48, 73]
LVMi; g/m <sup>2</sup>	42 [32, 52]	55 [42, 69]	42 [32, 52]	54 [41, 68]	42 [32, 51]	53 [40, 67]	41 [31, 51]	53 [39, 66]	41 [31, 51]	52 [38, 65]	41 [31, 50]	51 [37, 64]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>	82 [60, 104]	99 [70, 128]	79 [57, 102]	95 [66, 124]	76 [54, 99]	91 [62, 120]	74 [51, 96]	87 [58, 116]	71 [48, 93]	83 [54, 112]	68 [46, 91]	79 [50, 108]
RVESVi; ml/m <sup>2</sup>	33 [21, 46]	43 [26, 60]	32 [19, 44]	41 [24, 58]	30 [17, 43]	39 [22, 56]	28 [15, 41]	37 [20, 53]	26 [14, 39]	34 [17, 51]	25 [12, 37]	32 [15, 49]
RVSVi; ml/m <sup>2</sup>	49 [33, 65]	56 [36, 76]	48 [32, 64]	54 [34, 74]	47 [31, 63]	52 [32, 72]	46 [30, 62]	51 [31, 71]	45 [29, 61]	49 [29, 69]	44 [28, 60]	47 [27, 67]
RVEF; %	59 [47, 71]	56 [43, 69]	60 [48, 72]	57 [44, 70]	61 [49, 73]	58 [45, 71]	62 [50, 74]	58 [45, 71]	63 [51, 75]	59 [46, 72]	64 [52, 76]	59 [46, 72]
<b>Black ethnicity</b>												
<b>Variable</b>	<b>18-29</b>		<b>30-39</b>		<b>40-49</b>		<b>50-59</b>		<b>60-69</b>		<b>70+</b>	
N (min-max)					(10)		(93-96)	(72-78)	(62-67)	(46-48)	(16-18)	(13-14)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>					76 [55, 96]		72 [52, 93]	81 [53, 108]	69 [49, 89]	78 [50, 105]	66 [45, 86]	75 [47, 103]
LVESVi; ml/m <sup>2</sup>					30 [18, 42]		28 [17, 40]	33 [16, 50]	27 [15, 38]	31 [14, 48]	25 [13, 37]	30 [13, 47]
LVSVi; ml/m <sup>2</sup>					45 [31, 60]		44 [29, 58]	47 [31, 63]	42 [28, 56]	46 [29, 62]	40 [26, 55]	44 [28, 61]
LVEF; %					60 [48, 72]		61 [49, 72]	59 [46, 72]	61 [50, 73]	60 [47, 73]	62 [50, 74]	60 [47, 73]
LVMi; g/m <sup>2</sup>					43 [31, 54]		44 [32, 55]	54 [39, 69]	44 [33, 56]	53 [38, 68]	45 [34, 57]	52 [37, 67]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>					77 [54, 101]		75 [52, 98]	85 [58, 111]	73 [49, 96]	83 [57, 109]	70 [47, 94]	81 [54, 108]
RVESVi; ml/m <sup>2</sup>					30 [17, 44]		29 [16, 42]	36 [21, 51]	28 [15, 41]	34 [19, 49]	27 [14, 40]	32 [17, 47]

RVSVi; ml/m <sup>2</sup>					47 [32, 62]		46 [31, 61]	49 [31, 68]	45 [30, 60]	49 [31, 67]	44 [28, 59]	49 [30, 67]
RVEF; %					61 [49, 73]		61 [50, 73]	58 [46, 69]	62 [50, 73]	59 [48, 71]	62 [50, 74]	61 [49, 73]
<b>South Asian ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)					(10)	(19-21)	(81-84)	(131-134)	(61-64)	(117-122)	(28-31)	(40-43)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>					67 [50, 84]	75 [52, 97]	65 [48, 82]	72 [50, 95]	63 [46, 80]	70 [48, 92]	61 [44, 78]	68 [46, 90]
LVESVi; ml/m <sup>2</sup>					25 [15, 34]	30 [17, 42]	24 [14, 33]	28 [16, 41]	22 [13, 32]	27 [14, 39]	21 [12, 31]	25 [13, 38]
LVSVi; ml/m <sup>2</sup>					42 [30, 55]	45 [30, 60]	41 [29, 54]	44 [29, 59]	40 [28, 53]	43 [28, 58]	40 [27, 52]	42 [27, 57]
LVEF; %					63 [52, 74]	60 [49, 71]	64 [53, 75]	61 [50, 72]	64 [53, 76]	62 [51, 73]	65 [54, 76]	62 [51, 74]
LVMi; g/m <sup>2</sup>					37 [28, 47]	47 [34, 60]	38 [29, 47]	46 [34, 59]	38 [29, 47]	46 [33, 59]	38 [29, 48]	45 [33, 58]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>					65 [45, 84]	78 [54, 102]	65 [46, 85]	76 [53, 100]	65 [46, 85]	74 [51, 98]	66 [46, 85]	72 [49, 96]
RVESVi; ml/m <sup>2</sup>					24 [14, 35]	33 [20, 46]	24 [14, 34]	31 [18, 45]	24 [14, 34]	30 [17, 43]	23 [13, 33]	29 [16, 42]
RVSVi; ml/m <sup>2</sup>					40 [27, 53]	45 [30, 61]	41 [28, 54]	45 [29, 60]	42 [28, 55]	44 [29, 60]	42 [29, 55]	44 [28, 59]
RVEF; %					62 [52, 72]	58 [47, 69]	63 [53, 73]	59 [48, 70]	64 [53, 74]	59 [49, 70]	64 [54, 74]	60 [49, 71]
<b>Chinese ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)	(13-16)	(16-19)	(18)	(14-17)	(10-24)	(10-20)	(46-66)	(24-49)	(35-52)	(21-37)	(11-12)	
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>	76 [59, 94]	84 [63, 105]	74 [56, 91]	81 [60, 102]	72 [54, 89]	78 [57, 99]	69 [52, 87]	75 [54, 96]	67 [49, 84]	72 [51, 93]	65 [47, 82]	
LVESVi; ml/m <sup>2</sup>	29 [18, 39]	35 [22, 48]	27 [17, 38]	33 [20, 46]	26 [15, 36]	31 [19, 44]	24 [14, 35]	30 [17, 43]	23 [13, 34]	28 [15, 41]	22 [11, 32]	
LVSVi; ml/m <sup>2</sup>	48 [34, 62]	49 [36, 63]	47 [33, 61]	48 [34, 61]	46 [32, 60]	47 [33, 60]	45 [31, 59]	45 [32, 59]	44 [30, 58]	44 [30, 57]	43 [29, 57]	
LVEF; %	62 [52, 73]	59 [45, 72]	63 [52, 74]	59 [46, 73]	64 [53, 75]	60 [47, 73]	65 [54, 76]	60 [47, 74]	66 [55, 77]	61 [48, 74]	66 [56, 77]	
LVMi; g/m <sup>2</sup>	37 [28, 47]	50 [38, 62]	38 [29, 47]	50 [38, 61]	39 [30, 48]	49 [37, 61]	40 [31, 49]	49 [37, 60]	41 [32, 50]	48 [36, 60]	42 [32, 51]	
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>	79 [58, 100]	93 [68, 118]	76 [55, 97]	89 [64, 114]	73 [52, 94]	85 [60, 110]	70 [49, 91]	81 [57, 106]	68 [47, 89]	78 [53, 102]	65 [44, 86]	
RVESVi; ml/m <sup>2</sup>	33 [20, 46]	43 [27, 60]	31 [18, 43]	41 [24, 57]	29 [16, 41]	38 [22, 55]	26 [14, 39]	35 [19, 52]	24 [12, 37]	33 [16, 49]	22 [10, 35]	
RVSVi; ml/m <sup>2</sup>	46 [32, 60]	49 [33, 66]	45 [31, 59]	48 [32, 64]	45 [31, 59]	47 [31, 63]	44 [30, 58]	46 [30, 62]	43 [29, 57]	45 [29, 61]	43 [29, 57]	
RVEF; %	58 [47, 70]	53 [39, 67]	60 [48, 71]	54 [41, 68]	61 [50, 72]	56 [42, 69]	63 [51, 74]	57 [43, 71]	64 [53, 75]	58 [44, 72]	66 [54, 77]	

Mixed/Other ethnicity												
Variable	18-29		30-39		40-49		50-59		60-69		70+	
N (min-max)							(133-137)	(65-68)	(107-111)	(59-62)	(47-51)	(32-36)
Left ventricle	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
LVEDVi; ml/m <sup>2</sup>							71 [51, 92]	82 [58, 107]	68 [47, 89]	76 [52, 100]	65 [44, 85]	70 [45, 94]
LVESVi; ml/m <sup>2</sup>							26 [15, 37]	33 [18, 47]	25 [14, 36]	30 [16, 45]	24 [13, 35]	28 [14, 43]
LVSVi; ml/m <sup>2</sup>							45 [31, 60]	50 [34, 65]	43 [29, 58]	46 [30, 62]	41 [26, 56]	43 [27, 59]
LVEF; %							63 [53, 74]	61 [49, 72]	63 [52, 74]	61 [49, 72]	63 [52, 74]	60 [49, 72]
LVMi; g/m <sup>2</sup>							41 [29, 52]	52 [38, 67]	40 [29, 52]	51 [37, 65]	40 [29, 52]	50 [35, 64]
Right ventricle	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
RVEDVi; ml/m <sup>2</sup>							73 [51, 96]	88 [59, 117]	70 [48, 93]	82 [53, 111]	67 [45, 90]	76 [47, 105]
RVESVi; ml/m <sup>2</sup>							28 [16, 39]	36 [21, 50]	26 [15, 37]	34 [19, 49]	25 [13, 36]	32 [17, 47]
RVSVi; ml/m <sup>2</sup>							46 [30, 61]	52 [33, 71]	44 [29, 59]	49 [30, 67]	42 [27, 58]	45 [26, 64]
RVEF; %							63 [53, 72]	60 [50, 69]	63 [53, 72]	59 [49, 69]	63 [53, 73]	58 [48, 68]

**Table 2 footnote.** Abbreviations: LVEDVi - Left ventricular end-diastolic volume index, LVESVi - Left ventricular end-systolic volume index, LVSVi - Left ventricular stroke volume index, LVEF - Left ventricular ejection fraction, LVMi - Left ventricular mass index (in diastole), RVEDVi - Right ventricular end-diastolic volume index, RVESVi - Right ventricular end-systolic volume index, RVSVi - Right ventricular stroke volume index, RVEF - Right ventricular ejection fraction.

**Table 3. Left and right ventricular parameters for all ethnicities by age group, using papillary segmentation, indexed by body surface area**

<b>White ethnicity</b>																		
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>							
N (min-max)	(50 - 102)	(52 - 113)	(84 - 137)	(67 - 135)	(458 - 518)	(378 - 447)	(858 - 926)	(784 - 839)	(875 - 930)	(771 - 818)	(1,033 - 1,116)	(1,212 - 1,283)						
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>						
LVEDVi; ml/m <sup>2</sup>	79 [59, 100]	92 [65, 119]	76 [56, 97]	86 [59, 113]	74 [53, 94]	83 [56, 110]	71 [50, 91]	80 [53, 106]	68 [47, 88]	76 [50, 103]	65 [45, 85]	73 [46, 100]						
LVESVi; ml/m <sup>2</sup>	30 [19, 41]	38 [22, 54]	28 [17, 40]	34 [19, 48]	27 [16, 38]	32 [17, 47]	25 [14, 37]	31 [16, 45]	24 [13, 35]	29 [14, 44]	22 [11, 34]	28 [13, 42]						
LVSVi; ml/m <sup>2</sup>	49 [35, 64]	54 [36, 72]	48 [33, 63]	53 [35, 70]	47 [32, 61]	51 [33, 69]	45 [31, 60]	49 [31, 67]	44 [29, 59]	47 [29, 65]	43 [28, 57]	45 [27, 63]						
LVEF; %	62 [51, 73]	59 [46, 71]	63 [51, 74]	61 [49, 73]	63 [52, 75]	61 [49, 73]	64 [53, 75]	62 [49, 74]	65 [54, 76]	62 [50, 74]	66 [54, 77]	62 [50, 75]						
LVMi; g/m <sup>2</sup>	44 [34, 55]	55 [42, 69]	44 [33, 54]	57 [42, 72]	43 [33, 54]	56 [41, 71]	43 [32, 53]	55 [40, 69]	42 [32, 53]	54 [39, 68]	42 [32, 52]	52 [38, 67]						
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>						
RVEDVi; ml/m <sup>2</sup>	80 [58, 103]	97 [68, 125]	78 [56, 100]	93 [65, 122]	75 [53, 97]	89 [61, 118]	73 [51, 95]	86 [57, 114]	70 [48, 92]	82 [54, 111]	68 [45, 90]	78 [50, 107]						
RVESVi; ml/m <sup>2</sup>	32 [20, 45]	41 [25, 58]	31 [18, 43]	39 [23, 56]	29 [17, 42]	38 [21, 54]	28 [15, 40]	36 [19, 52]	26 [14, 38]	34 [17, 50]	25 [12, 37]	32 [15, 48]						
RVSVi; ml/m <sup>2</sup>	48 [32, 64]	56 [36, 75]	47 [31, 63]	54 [34, 74]	46 [30, 62]	52 [32, 72]	45 [29, 61]	50 [30, 70]	44 [28, 60]	48 [29, 68]	43 [27, 59]	47 [27, 66]						
RVEF; %	60 [48, 72]	57 [44, 70]	61 [49, 73]	58 [45, 71]	61 [49, 73]	58 [45, 71]	62 [50, 74]	59 [45, 72]	63 [51, 75]	59 [46, 72]	64 [52, 76]	59 [46, 72]						
<b>Black ethnicity</b>																		
<b>Variable</b>	<b>18-29</b>		<b>30-39</b>		<b>40-49</b>		<b>50-59</b>		<b>60-69</b>		<b>70+</b>							
N (min-max)					(10)		(93-96)		(72-78)		(62-67)		(46-48)		(16-18)		(13-14)	
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>						
LVEDVi; ml/m <sup>2</sup>					74 [54, 94]		71 [51, 91]		79 [52, 106]		67 [47, 87]		76 [49, 103]		64 [44, 84]		73 [45, 100]	
LVESVi; ml/m <sup>2</sup>					29 [17, 40]		26 [15, 38]		30 [14, 45]		24 [13, 36]		29 [13, 44]		22 [11, 34]		27 [12, 43]	
LVSVi; ml/m <sup>2</sup>					46 [31, 60]		44 [30, 59]		48 [31, 64]		43 [28, 57]		46 [30, 63]		41 [27, 56]		45 [28, 62]	
LVEF; %					62 [50, 73]		63 [51, 74]		61 [48, 74]		64 [52, 75]		62 [49, 75]		65 [53, 76]		63 [50, 76]	
LVMi; g/m <sup>2</sup>					44 [32, 57]		45 [33, 57]		56 [41, 71]		46 [34, 58]		55 [39, 70]		47 [35, 59]		53 [38, 69]	
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>						
RVEDVi; ml/m <sup>2</sup>					76 [53, 100]		74 [51, 97]		84 [58, 110]		72 [49, 95]		82 [56, 108]		70 [46, 93]		80 [54, 106]	
RVESVi; ml/m <sup>2</sup>					30 [17, 43]		29 [16, 42]		35 [20, 50]		28 [15, 41]		33 [18, 48]		26 [13, 40]		31 [16, 46]	

RVSVi; ml/m <sup>2</sup>					46 [31, 61]		45 [30, 60]	49 [31, 67]	44 [29, 59]	49 [31, 67]	43 [28, 58]	48 [30, 67]
RVEF; %					61 [50, 72]		61 [50, 73]	58 [46, 70]	62 [51, 73]	60 [48, 71]	62 [51, 73]	61 [49, 73]
<b>South Asian ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)					(10)	(19-21)	(81-84)	(131-134)	(61-64)	(117-122)	(28-31)	(40-43)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>					66 [49, 83]	73 [51, 95]	64 [47, 80]	71 [49, 93]	62 [45, 78]	69 [47, 90]	60 [43, 76]	66 [45, 88]
LVESVi; ml/m <sup>2</sup>					23 [14, 32]	28 [16, 40]	22 [13, 31]	26 [15, 38]	21 [12, 30]	25 [13, 37]	20 [10, 29]	23 [12, 35]
LVSVi; ml/m <sup>2</sup>					42 [30, 55]	45 [30, 60]	42 [29, 54]	44 [30, 59]	41 [28, 54]	43 [29, 58]	40 [28, 53]	43 [28, 57]
LVEF; %					64 [53, 75]	62 [51, 73]	65 [54, 76]	63 [52, 74]	66 [55, 78]	64 [52, 75]	68 [56, 79]	64 [53, 76]
LVMi; g/m <sup>2</sup>					39 [29, 48]	49 [35, 62]	39 [29, 48]	48 [35, 62]	39 [30, 49]	47 [34, 61]	39 [30, 49]	47 [33, 61]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>					64 [45, 84]	77 [54, 101]	65 [45, 84]	75 [52, 99]	65 [46, 84]	73 [50, 97]	65 [46, 84]	71 [48, 95]
RVESVi; ml/m <sup>2</sup>					24 [14, 34]	33 [20, 46]	24 [14, 34]	31 [18, 44]	24 [14, 33]	30 [17, 43]	23 [13, 33]	28 [15, 41]
RVSVi; ml/m <sup>2</sup>					40 [27, 53]	45 [29, 60]	41 [28, 54]	44 [29, 60]	41 [28, 54]	44 [28, 59]	42 [29, 55]	43 [28, 59]
RVEF; %					62 [52, 73]	59 [48, 69]	63 [53, 73]	59 [48, 70]	64 [53, 74]	60 [49, 70]	64 [54, 74]	60 [49, 71]
<b>Chinese ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)	(13-16)	(16-19)	(18)	(14-17)	(10-24)	(10-20)	(46-66)	(28-49)	(35-52)	(21-37)	(11-12)	
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>	75 [57, 92]	82 [61, 102]	73 [55, 90]	79 [58, 99]	70 [53, 87]	76 [56, 97]	68 [51, 85]	73 [53, 94]	66 [49, 83]	71 [50, 91]	63 [46, 81]	
LVESVi; ml/m <sup>2</sup>	26 [16, 37]	31 [19, 44]	25 [15, 35]	30 [18, 42]	24 [14, 34]	29 [16, 41]	23 [12, 33]	27 [15, 40]	21 [11, 31]	26 [14, 39]	20 [10, 30]	
LVSVi; ml/m <sup>2</sup>	49 [35, 63]	50 [37, 64]	48 [34, 61]	49 [35, 62]	47 [33, 60]	47 [34, 61]	46 [32, 59]	46 [33, 59]	45 [31, 58]	44 [31, 58]	44 [30, 57]	
LVEF; %	65 [54, 76]	62 [49, 74]	66 [55, 77]	62 [49, 75]	66 [55, 77]	62 [50, 75]	67 [56, 78]	63 [50, 76]	68 [57, 79]	63 [50, 76]	69 [58, 80]	
LVMi; g/m <sup>2</sup>	39 [29, 48]	52 [40, 65]	40 [30, 49]	52 [39, 64]	40 [31, 50]	51 [39, 63]	41 [32, 51]	50 [38, 63]	42 [32, 52]	50 [37, 62]	43 [33, 53]	
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>	74 [53, 94]	83 [58, 108]	72 [51, 92]	81 [56, 106]	70 [50, 90]	79 [55, 104]	68 [48, 88]	77 [53, 102]	66 [46, 87]	76 [51, 100]	65 [44, 85]	
RVESVi; ml/m <sup>2</sup>	28 [16, 40]	34 [20, 49]	27 [15, 39]	33 [19, 48]	26 [14, 38]	33 [19, 47]	25 [13, 37]	32 [18, 46]	24 [12, 36]	32 [17, 46]	23 [11, 35]	
RVSVi; ml/m <sup>2</sup>	45 [31, 59]	49 [32, 66]	45 [31, 58]	48 [31, 64]	44 [30, 58]	46 [30, 63]	43 [29, 57]	45 [29, 62]	43 [29, 57]	44 [27, 61]	42 [28, 56]	
RVEF; %	62 [50, 73]	59 [46, 72]	62 [51, 74]	59 [46, 72]	63 [52, 74]	59 [46, 72]	64 [52, 75]	59 [45, 72]	64 [53, 76]	59 [45, 72]	65 [54, 77]	

Mixed/Other ethnicity												
Variable	18- 29		30- 39		40- 49		50- 59		60- 69		70+	
N (min-max)							(133-137)	(65-68)	(107-111)	(58-62)	(47-51)	(32-36)
Left ventricle	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
LVEDVi; ml/m <sup>2</sup>							70 [50, 90]	81 [57, 104]	67 [47, 87]	74 [51, 98]	64 [43, 84]	68 [44, 92]
LVESVi; ml/m <sup>2</sup>							24 [14, 35]	30 [17, 44]	23 [12, 34]	28 [14, 42]	22 [11, 33]	26 [12, 40]
LVSVi; ml/m <sup>2</sup>							46 [31, 60]	50 [34, 66]	44 [29, 58]	47 [31, 63]	41 [27, 56]	43 [27, 59]
LVEF; %							65 [54, 76]	63 [51, 74]	65 [54, 76]	63 [51, 74]	65 [55, 76]	63 [51, 74]
LVMi; g/m <sup>2</sup>							42 [30, 54]	54 [39, 69]	42 [30, 54]	53 [38, 68]	42 [30, 53]	51 [36, 67]
Right ventricle	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
RVEDVi; ml/m <sup>2</sup>							73 [50, 95]	87 [58, 116]	70 [47, 92]	81 [52, 110]	66 [44, 89]	75 [46, 104]
RVESVi; ml/m <sup>2</sup>							27 [16, 38]	35 [21, 50]	26 [15, 37]	33 [19, 48]	24 [13, 36]	32 [17, 46]
RVSVi; ml/m <sup>2</sup>							45 [30, 60]	52 [33, 70]	44 [28, 59]	48 [30, 66]	42 [27, 57]	45 [26, 63]
RVEF; %							63 [53, 72]	60 [50, 70]	63 [53, 73]	59 [49, 69]	63 [53, 73]	58 [48, 68]

**Table 3 footnote.** Abbreviations: LVEDVi - Left ventricular end-diastolic volume index, LVESVi - Left ventricular end-systolic volume index, LVSVi - Left ventricular stroke volume index, LVEF - Left ventricular ejection fraction, LVMi - Left ventricular mass index (in diastole), RVEDVi - Right ventricular end-diastolic volume index, RVESVi - Right ventricular end-systolic volume index, RVSVi - Right ventricular stroke volume index, RVEF - Right ventricular ejection fraction.



**Table 4. Left and right ventricular parameters for all ethnicities by age group, using anatomical segmentation, indexed by body surface area**

<b>White ethnicity</b>												
<b>Variable</b>	<b>18-29</b>		<b>30-39</b>		<b>40-49</b>		<b>50-59</b>		<b>60-69</b>		<b>70+</b>	
N (min-max)	(50-102)	(52-113)	(84-137)	(67-135)	(458-518)	(378-447)	(858-926)	(784-840)	(875-929)	(771-818)	(1,033-1,118)	(1,212-1,283)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>	74 [55, 94]	83 [58, 109]	71 [52, 91]	80 [55, 106]	68 [49, 88]	77 [51, 102]	66 [46, 85]	73 [48, 99]	63 [43, 82]	70 [45, 96]	60 [40, 79]	67 [41, 92]
LVESVi; ml/m <sup>2</sup>	26 [16, 36]	30 [17, 44]	24 [14, 35]	29 [15, 42]	23 [13, 33]	27 [13, 40]	21 [11, 31]	25 [12, 39]	19 [9, 30]	24 [10, 37]	18 [8, 28]	22 [9, 35]
LVSVi; ml/m <sup>2</sup>	48 [34, 62]	53 [36, 71]	47 [33, 61]	52 [34, 69]	46 [32, 60]	50 [32, 67]	44 [30, 58]	48 [31, 66]	43 [29, 57]	46 [29, 64]	42 [28, 56]	45 [27, 62]
LVEF; %	65 [54, 76]	64 [51, 76]	66 [55, 77]	64 [52, 77]	67 [56, 78]	65 [53, 77]	68 [57, 79]	66 [53, 78]	69 [58, 80]	66 [54, 79]	70 [59, 81]	67 [55, 80]
LVMi; g/m <sup>2</sup>	49 [38, 61]	65 [48, 81]	49 [37, 61]	63 [47, 80]	49 [37, 60]	62 [46, 79]	48 [37, 60]	61 [45, 78]	48 [36, 60]	60 [44, 77]	48 [36, 59]	59 [43, 76]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>	80 [58, 102]	96 [68, 125]	78 [56, 100]	93 [64, 121]	75 [53, 97]	89 [61, 118]	73 [51, 95]	86 [57, 114]	70 [48, 93]	82 [54, 111]	68 [46, 90]	79 [50, 107]
RVESVi; ml/m <sup>2</sup>	32 [20, 45]	41 [24, 58]	31 [18, 44]	40 [23, 56]	30 [17, 42]	38 [21, 55]	28 [16, 41]	36 [20, 53]	27 [14, 40]	35 [18, 52]	26 [13, 38]	33 [16, 50]
RVSVi; ml/m <sup>2</sup>	48 [32, 63]	55 [36, 74]	47 [31, 62]	53 [34, 73]	46 [30, 61]	51 [32, 71]	45 [29, 60]	49 [30, 69]	43 [28, 59]	48 [28, 67]	42 [27, 58]	46 [26, 65]
RVEF; %	60 [48, 72]	57 [44, 70]	60 [48, 72]	57 [44, 70]	61 [49, 73]	58 [44, 71]	61 [49, 73]	58 [45, 71]	62 [50, 74]	58 [45, 71]	62 [50, 74]	58 [45, 71]
<b>Black ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)					(10)		(93-96)	(72-78)	(62-67)	(46-48)	(16-18)	(13-14)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>					69 [50, 88]		66 [47, 84]	73 [47, 98]	62 [43, 81]	70 [44, 95]	59 [40, 78]	67 [41, 93]
LVESVi; ml/m <sup>2</sup>					24 [13, 34]		22 [11, 32]	24 [11, 38]	19 [9, 30]	23 [9, 37]	17 [7, 27]	22 [8, 36]
LVSVi; ml/m <sup>2</sup>					45 [31, 59]		44 [30, 57]	47 [31, 63]	42 [29, 56]	46 [30, 62]	41 [27, 55]	45 [29, 61]
LVEF; %					66 [54, 77]		67 [55, 79]	66 [53, 79]	69 [57, 80]	67 [54, 80]	70 [58, 82]	68 [55, 81]
LVMi; g/m <sup>2</sup>					50 [36, 64]		51 [37, 65]	63 [45, 80]	52 [38, 66]	62 [44, 79]	53 [39, 67]	61 [43, 78]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>					78 [54, 102]		75 [52, 99]	84 [59, 109]	72 [49, 96]	82 [58, 107]	70 [46, 94]	81 [56, 106]
RVESVi; ml/m <sup>2</sup>					32 [18, 46]		31 [16, 45]	37 [21, 52]	29 [15, 43]	35 [20, 51]	28 [14, 42]	34 [18, 49]

RVSVi; ml/m <sup>2</sup>					46 [31, 61]		45 [30, 60]	47 [31, 64]	44 [29, 58]	47 [31, 63]	42 [27, 57]	47 [30, 63]
RVEF; %					59 [47, 71]		60 [48, 72]	56 [44, 68]	60 [48, 72]	57 [46, 69]	60 [48, 72]	59 [47, 71]
<b>South Asian ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)					(10)	(19-21)	(81-84)	(131-134)	(61-64)	(117-122)	(28-31)	(40-43)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>					61 [45, 77]	67 [47, 87]	59 [43, 75]	65 [45, 85]	57 [41, 73]	63 [43, 83]	55 [39, 71]	61 [41, 81]
LVESVi; ml/m <sup>2</sup>					20 [11, 28]	23 [12, 34]	18 [10, 27]	21 [10, 32]	17 [8, 25]	20 [9, 31]	15 [7, 24]	19 [8, 30]
LVSVi; ml/m <sup>2</sup>					41 [29, 54]	45 [31, 58]	41 [29, 53]	44 [30, 57]	40 [28, 52]	42 [29, 56]	40 [28, 52]	41 [28, 55]
LVEF; %					68 [56, 79]	66 [55, 78]	69 [58, 81]	67 [56, 79]	71 [60, 82]	68 [57, 80]	73 [61, 84]	69 [57, 81]
LVMi; g/m <sup>2</sup>					44 [33, 55]	55 [39, 70]	44 [33, 55]	54 [39, 70]	44 [33, 56]	54 [38, 69]	45 [34, 56]	53 [38, 69]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>					65 [46, 84]	78 [55, 101]	65 [46, 84]	76 [53, 99]	65 [46, 84]	74 [50, 97]	65 [46, 84]	72 [48, 95]
RVESVi; ml/m <sup>2</sup>					25 [15, 35]	34 [21, 47]	25 [15, 35]	32 [19, 45]	24 [14, 34]	31 [18, 44]	24 [14, 34]	29 [17, 42]
RVSVi; ml/m <sup>2</sup>					40 [27, 52]	44 [29, 60]	40 [27, 53]	43 [28, 59]	40 [28, 53]	43 [28, 58]	41 [28, 54]	42 [27, 57]
RVEF; %					61 [51, 71]	57 [46, 68]	62 [51, 72]	58 [47, 68]	62 [52, 73]	58 [47, 69]	63 [53, 74]	59 [48, 70]
<b>Chinese ethnicity</b>												
<b>Variable</b>	<b>18- 29</b>		<b>30- 39</b>		<b>40- 49</b>		<b>50- 59</b>		<b>60- 69</b>		<b>70+</b>	
N (min-max)	(13-16)	(16-19)	(18)	(14-17)	(10-24)	(10-20)	(46-66)	(24-49)	(35-52)	(21-37)	(11-12)	
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>	71 [55, 88]	78 [58, 97]	69 [52, 85]	75 [55, 94]	66 [50, 82]	72 [52, 91]	64 [47, 80]	69 [49, 88]	61 [45, 77]	65 [46, 85]	58 [42, 75]	
LVESVi; ml/m <sup>2</sup>	24 [14, 33]	28 [17, 39]	22 [13, 31]	26 [15, 38]	20 [11, 29]	25 [14, 36]	19 [10, 28]	23 [12, 34]	17 [8, 26]	21 [10, 32]	15 [6, 25]	
LVSVi; ml/m <sup>2</sup>	48 [35, 61]	50 [36, 64]	47 [34, 60]	48 [35, 62]	46 [33, 59]	47 [33, 61]	45 [32, 58]	46 [32, 59]	44 [31, 57]	44 [30, 58]	43 [30, 56]	
LVEF; %	67 [56, 78]	64 [51, 76]	68 [57, 79]	65 [52, 77]	69 [59, 80]	66 [53, 78]	71 [60, 82]	67 [54, 79]	72 [61, 83]	68 [55, 80]	73 [62, 84]	
LVMi; g/m <sup>2</sup>	42 [31, 53]	56 [43, 70]	43 [33, 54]	56 [43, 69]	45 [34, 55]	56 [42, 69]	46 [35, 57]	55 [42, 69]	47 [36, 58]	55 [42, 68]	48 [37, 59]	
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>	70 [49, 91]	78 [52, 104]	69 [48, 90]	77 [51, 103]	68 [48, 89]	77 [51, 103]	67 [47, 88]	76 [50, 102]	66 [46, 87]	75 [49, 101]	65 [45, 86]	
RVESVi; ml/m <sup>2</sup>	27 [14, 39]	31 [16, 47]	26 [14, 39]	32 [17, 47]	26 [13, 38]	32 [17, 47]	25 [13, 38]	32 [17, 47]	25 [12, 37]	32 [17, 47]	24 [12, 37]	
RVSVi; ml/m <sup>2</sup>	43 [29, 57]	47 [29, 64]	43 [29, 57]	46 [28, 63]	42 [29, 56]	45 [27, 63]	42 [28, 56]	44 [26, 62]	41 [28, 55]	43 [25, 61]	41 [27, 55]	
RVEF; %	62 [50, 75]	60 [45, 74]	62 [50, 75]	59 [45, 73]	62 [50, 75]	59 [45, 73]	63 [50, 75]	58 [44, 72]	63 [50, 75]	58 [43, 72]	63 [51, 75]	

Mixed/Other ethnicity												
Variable	18- 29		30- 39		40- 49		50- 59		60- 69		70+	
N (min-max)							(133-137)	(65-68)	(107-111)	(59-62)	(47-51)	(32-36)
<b>Left ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
LVEDVi; ml/m <sup>2</sup>							65 [46, 83]	74 [51, 97]	62 [43, 80]	68 [45, 91]	59 [40, 78]	62 [39, 85]
LVESVi; ml/m <sup>2</sup>							20 [10, 30]	24 [12, 37]	19 [9, 29]	23 [10, 36]	17 [7, 28]	21 [8, 34]
LVSVi; ml/m <sup>2</sup>							45 [31, 58]	49 [34, 65]	43 [29, 56]	46 [30, 62]	41 [27, 55]	43 [27, 59]
LVEF; %							69 [58, 80]	67 [56, 79]	70 [59, 81]	67 [56, 79]	71 [59, 82]	67 [56, 79]
LVMi; g/m <sup>2</sup>							47 [34, 61]	61 [44, 78]	47 [34, 60]	59 [43, 76]	47 [34, 60]	58 [41, 75]
<b>Right ventricle</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>	<b>Women</b>	<b>Men</b>
RVEDVi; ml/m <sup>2</sup>							73 [51, 96]	88 [59, 117]	70 [48, 92]	82 [53, 111]	67 [45, 89]	76 [46, 105]
RVESVi; ml/m <sup>2</sup>							28 [17, 40]	36 [21, 52]	27 [16, 38]	35 [19, 50]	26 [14, 37]	33 [18, 49]
RVSVi; ml/m <sup>2</sup>							45 [30, 60]	51 [34, 69]	43 [28, 58]	47 [29, 65]	41 [26, 56]	43 [25, 61]
RVEF; %							61 [52, 71]	59 [49, 68]	61 [51, 71]	57 [48, 67]	61 [51, 71]	56 [47, 66]

**Table 4 footnote.** Abbreviations: LVEDVi - Left ventricular end-diastolic volume index, LVESVi - Left ventricular end-systolic volume index, LVSVi - Left ventricular stroke volume index, LVEF - Left ventricular ejection fraction, LVMi - Left ventricular mass index (in diastole), RVEDVi - Right ventricular end-diastolic volume index, RVESVi - Right ventricular end-systolic volume index, RVSVi - Right ventricular stroke volume index, RVEF - Right ventricular ejection fraction.

**Table 5. Left and right atrial parameters for White women and men pooled from all age groups (> 18 years-old)**

Variable	Women	Men
<b>Left atria</b>		
LAESVi; ml/m <sup>2</sup>	33 [15, 52]	32 [11, 52]
LA max indexed; ml/m <sup>2</sup>	35 [17, 54]	34 [14, 55]
LAEF; %	66 [48, 83]	66 [36, 86]
<b>Right atria</b>		
RAESVi; ml/m <sup>2</sup>	37 [17, 57]	42 [15, 68]
RA max indexed; ml/m <sup>2</sup>	38 [18, 58]	44 [17, 70]
RAEF; %	54 [36, 73]	52 [32, 72]

**Table 5. Abbreviations:** LAESVi - Left atrial end-systolic volume index, LA max indexed - Left atrial maximum volume index, LAEF - Left atrial ejection fraction, RAESVi - Right atrial end-systolic volume index, RA max indexed - Right atrial maximum volume index, RAEF - Right atrial ejection fraction.

## Supplementary Material

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## LIST OF ABBREVIATIONS

BSA – body surface area

i – indexed (to height or BSA as indicated in the table title)

LA – left atria

LA max – maximum left atrial volume

LAEF – left atrial ejection fraction

LAESV – left atrial end-systolic volume

LV – left ventricle

LVCO – left ventricular cardiac output

LVEDV – left ventricular end-diastolic volume

LVEF – left ventricular ejection fraction

LVESV – left ventricular end-systolic volume

LVM diast – left ventricular mass in diastole

LVM syst – left ventricular mass in systole

LVSV – left ventricular stroke volume

RA – right atria

RA max – maximum right atrial volume

RAEF – right atrial ejection fraction

RAESV – right atrial end-systolic volume

RV – right ventricle

RVCO – right ventricular cardiac output

RVEDV – right ventricular end-diastolic volume

RVEF – right ventricular ejection fraction

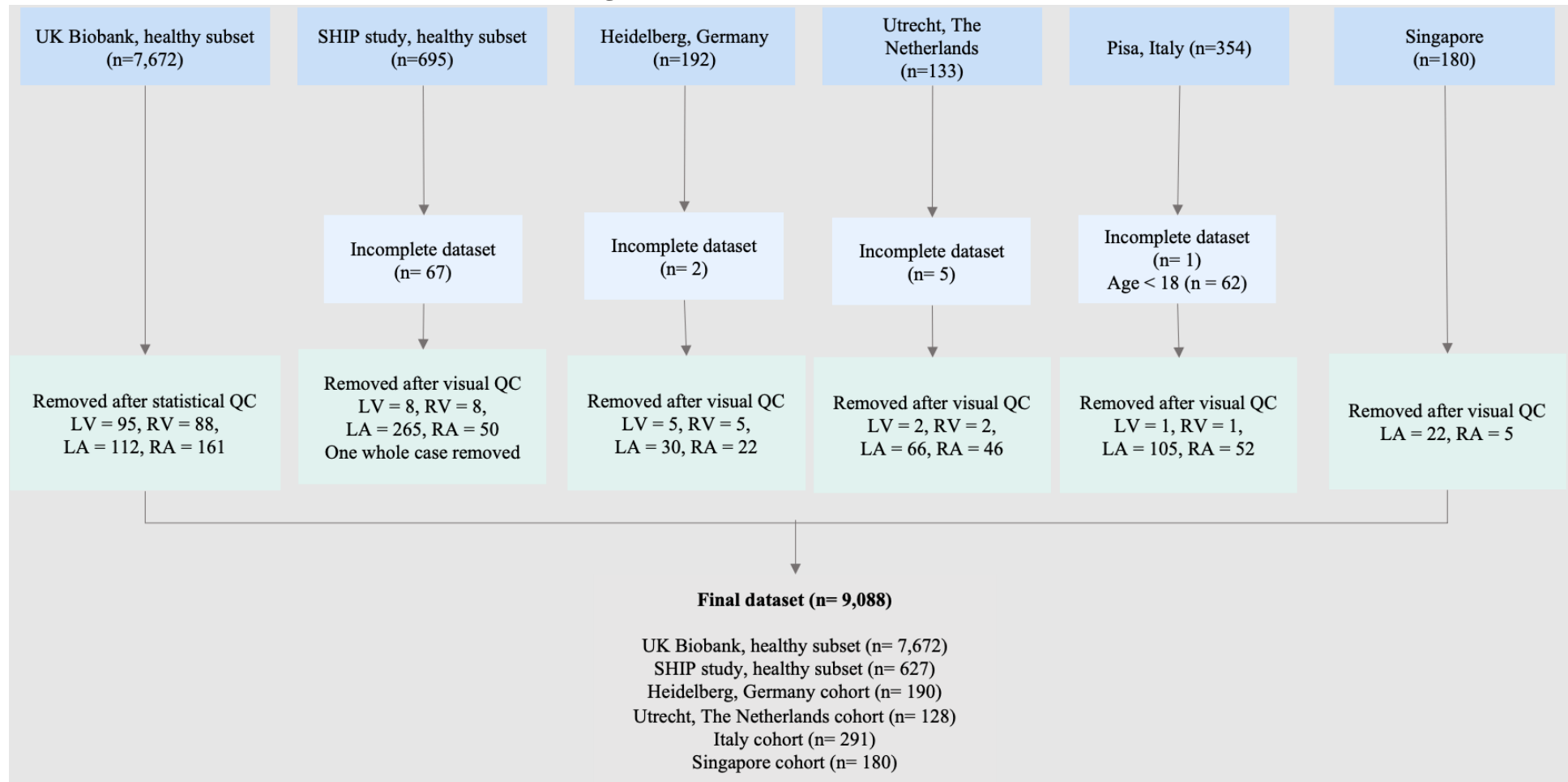
RVESV – right ventricular end-systolic volume

RVM diast – right ventricular mass in diastole

RVM syst – right ventricular mass in systole

RVSV – right ventricular stroke volume

**Figure S01: Flow chart / Cohorts**



**Figure S01 footnote.** SHIP: study of health in Pomerania; QC: quality control; LV: left ventricle; LA: left atrium; RV: right ventricle; RA: right atrium; UK: United Kingdom

## Supplementary Methods: Guided sample selection in UK Biobank

We started with a maximum pool of 54,982 scans available from 50,018 participants across two imaging visits. All 50,018 participants had a scan at the first imaging visit (between August 2013 and May 2022), and 4,964 participants had a repeat imaging visit (between June 2018 and March 2022).

Our goal was to produce a healthy sample of participants from UK Biobank that were as near as possible to the UK population at large. Participants with heart disease at the time of imaging were excluded (n= 7,010), leaving 47,972 scans in the main sampling pool. Heart disease at imaging was ascertained via the following UK Biobank fields and codes:

Source	UK Biobank Field ID or Code
Algorithm	42000, 42000
Diagnosed by doctor	3627, 3894, 6150: 1, 6150: 2, 3894, 6150: 1
First occurrences	131296, 131298, 131300, 131302, 131304, 131306, 131298, 131300, 131302, 131342, 131344, 131346, 131348, 131350, 131352, 131350, 131288, 131292, 131338, 131340, 131314, 131316, 131318, 131276, 131278, 131280, 131282, 131322, 131324, 131326, 131328, 131330, 131332, 131354
ICD10	I20, I21, I22, I23, I24, I25, I21, I22, I23, I241, I252, I44, I45, I46, I47, I48, I49, I48, I480, I481, I482, I489, I11, I13, I42, I43, I300, I301, I308, I309, I310, I311, I312, I313, I318, I319, I320, I321, I328, I05, I06, I07, I08, I34, I35, I36, I37, I38, I39, I500, I501, I509
ICD9	410, 411, 412, 413, 414, 42979, 410, 411, 412, 42979, 426, 427, 4273, 4020, 4021, 4029, 4040, 4041, 4049, 4250, 4253, 4255, 393, 420, 423, 4280, 4281, 4289
OPCS4	K40, K41, K42, K43, K44, K45, K46, K47, K48, K49, K50, K51, K75, K60, K61, K73, K74, U31
Self-report (20002)	1074, 1075, 1075, 1077, 1471, 1483, 1485, 1486, 1487, 1471, 1079, 1588, 1080, 1589, 1078, 1489, 1490, 1584, 1585, 1586, 1587, 1076
Self-report (20004)	1070, 1095, 1523, 1096, 1550, 1551

Scans from participants in under-represented categories were included by default, for example ethnicities other than White (n= 1,483), the highest quintile for Townsend Deprivation index (n= 1,173), and participants from Scotland or Wales (n= 712).

From there, we randomly sampled from the remaining scans to obtain a final set of 7,672, with the most even spread possible across the age range (44-83) and the quintiles of Townsend Deprivation index, with a 50/50 split between men and women. This was done with best-efforts matching for the UK prevalence for hypertension, diabetes, alcohol intake frequency, smoking, and obesity with reference to Fry et al. (2017), the Health Survey for England and the UK Data Service.

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## Supplementary Methods: QC procedure

Our in-house developed Shiny app provides a safe platform for easy case tracking and visual scoring of the cases. The cvi42 prototype outputs video files showing the contour tracing in the long-axis 2,3,4 chamber cines and the sax-cine images. These images are loaded into the Shiny app. Within the platform the operator assessing the quality must perform the scoring based on the following principles, with regards to the LV, RV, LA and RA. QC Score 1): Contours considered of excellent quality with no operator corrections needed; QC Score 2): Clinically acceptable contours with minor or negligible inaccuracies in the segmentation considered not clinically relevant; QC Score 3): Significantly inaccurate segmentation or requiring significant manual changes to make them clinically acceptable. Images scored 1 and 2 are included in the analysis, score 3 is removed from the analysis. The operator is also tasked to give a reason for the score: SQ – segmentation quality, PQ – planning quality, IQ – image quality or other. These are also summarized in the final QC report.

### Assessment of the short-axis image-, segmentation- and planning quality

The screenshot displays the SHIP Image QC App interface. On the left, there is a sidebar with the following elements:

- SHIP Image QC App** (Title)
- N studies:** 356
- Study number:** 3
- Navigation:** Previous study, Next study
- Search study ID:** [Input field]
- Search:** [Button]
- Keys:** IQ = image quality, SQ = Segmentation quality, PQ = Planning quality
- Keyboard shortcuts:** Previous = Left arrow, Next = Right arrow, Add QC = Ctrl+a
- Archive mode:**
- Footer:** Created and maintained by Dr Nay Aung (n.aung@qmul.ac.uk)

The main area shows a grid of cardiac MRI images with segmentation contours. The images are arranged in a 3x5 grid. The first two rows show short-axis views of the heart, and the third row shows long-axis views. Each image has a date and time stamp (e.g., 2009-04-24 11:07:15.22) and a patient ID (e.g., 41cumba 67-7931122). The contours are color-coded: red for the left ventricle (LV), green for the right ventricle (RV), and yellow for the left atrium (LA) and right atrium (RA). A video player interface is visible at the bottom of the grid, showing a progress bar at 0:02 / 0:03.

At the bottom of the app, there are three sections for scoring and commenting:

- QC score for LV:** 1 (selected), 2, 3
- QC cat for LV:**  IQ,  SQ,  PQ,  Others
- QC comment for LV:** [Input field]
- QC score for RV:** 1 (selected), 2, 3
- QC cat for RV:**  IQ,  SQ,  PQ,  Others
- QC comment for RV:** [Input field]

## Assessment of the long-axis image-, segmentation- and planning quality

### SHIP Image QC App

N studies: 356

Study number: 3

Previous study   Next study

Search study ID:

Search

**Keys**

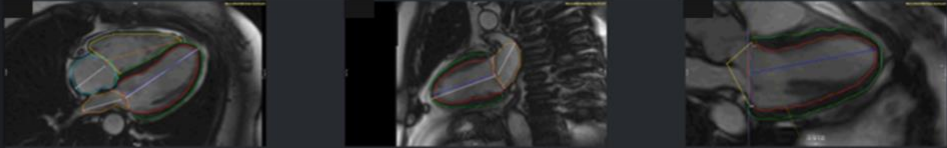
IQ = Image quality  
SQ = Segmentation quality  
PQ = Planning quality

**Keyboard shortcuts**

Previous = Left arrow  
Next = Right arrow  
Add QC = Ctrl+a

Archive mode

Created and maintained by  
Dr Nay Aung (n.aung@qmul.ac.uk)



QC score for 4Ch LA:  1  2  3

QC cat for 4Ch LA:  IQ  SQ  PQ  Others

QC comment for 4Ch LA:

QC score for 2Ch LA:  1  2  3

QC cat for 2Ch LA:  IQ  SQ  PQ  Others

QC comment for 2Ch LA:

QC score for 3Ch LV:  1  2  3

QC cat for 3Ch LV:  IQ  SQ  PQ  Others

QC comment for 3Ch LV:

QC score for 4Ch LV:  1  2  3

QC cat for 4Ch LV:  IQ  SQ  PQ  Others

QC comment for 4Ch LV:

QC score for 2Ch LV:  1  2  3

QC cat for 2Ch LV:  IQ  SQ  PQ  Others

QC comment for 2Ch LV:

QC score for 4Ch RA:  1  2  3

QC cat for 4Ch RA:  IQ  SQ  PQ  Others

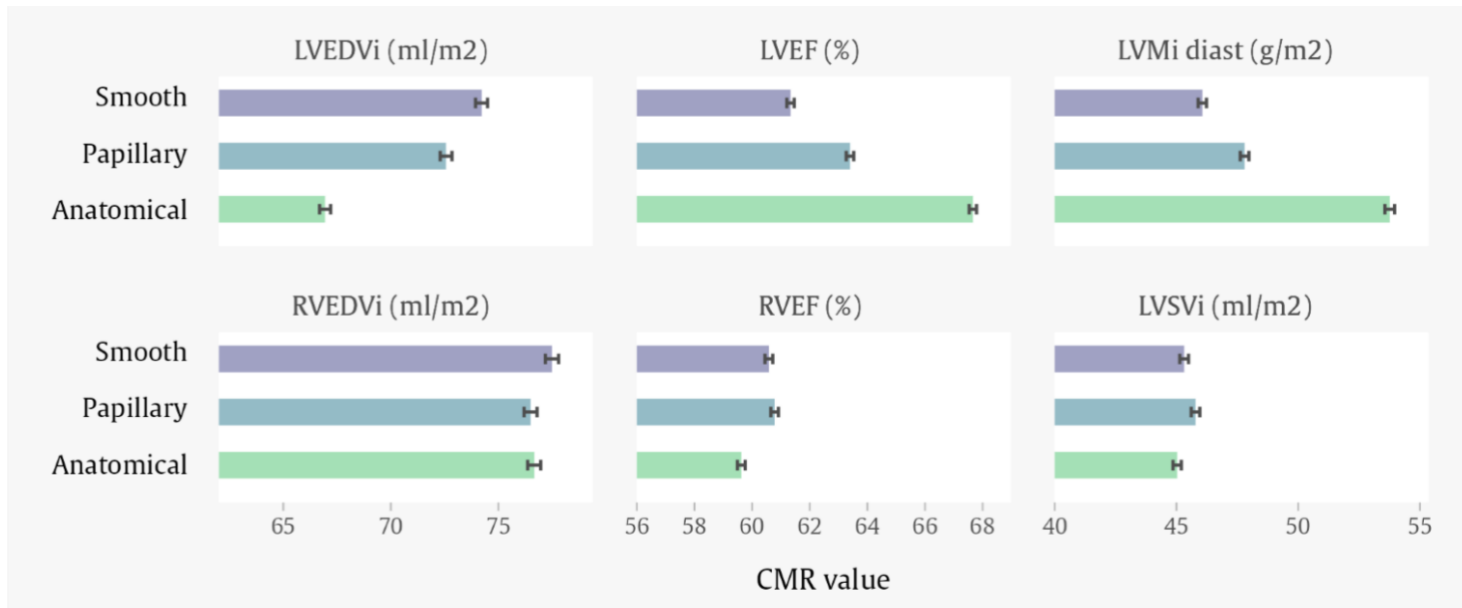
QC comment for 4Ch RA:

QC score for 4Ch RV:  1  2  3

QC cat for 4Ch RV:  IQ  SQ  PQ  Others

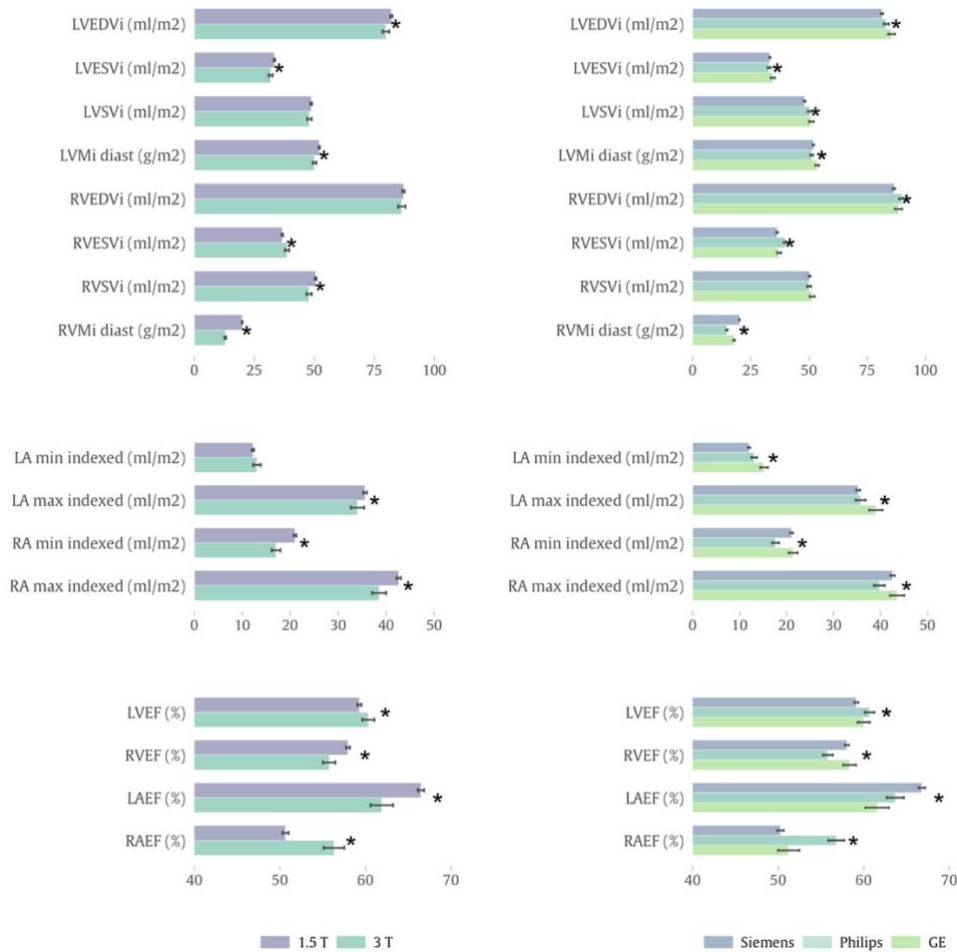
QC comment for 4Ch RV:

**Figure S02. Variation of selected ventricular metrics by segmentation method**



**Figure S02 footnote.** Bars show mean values for each metric for each run, with intervals showing the 95% confidence interval of the mean. Segmentation methods were balanced with respect to all covariates (age, sex, ethnicity, scanner). LVEDVi: Left ventricular end-diastolic volume index; LVEF: left ventricular ejection fraction; LVMi: left ventricular mass index; RVEDVi: right ventricular end-diastolic volume index; RVEF: right ventricular ejection fraction. All indexations are to body surface area.

**Figure S03. Variation of selected CMR metrics by field strength and scanner vendor**

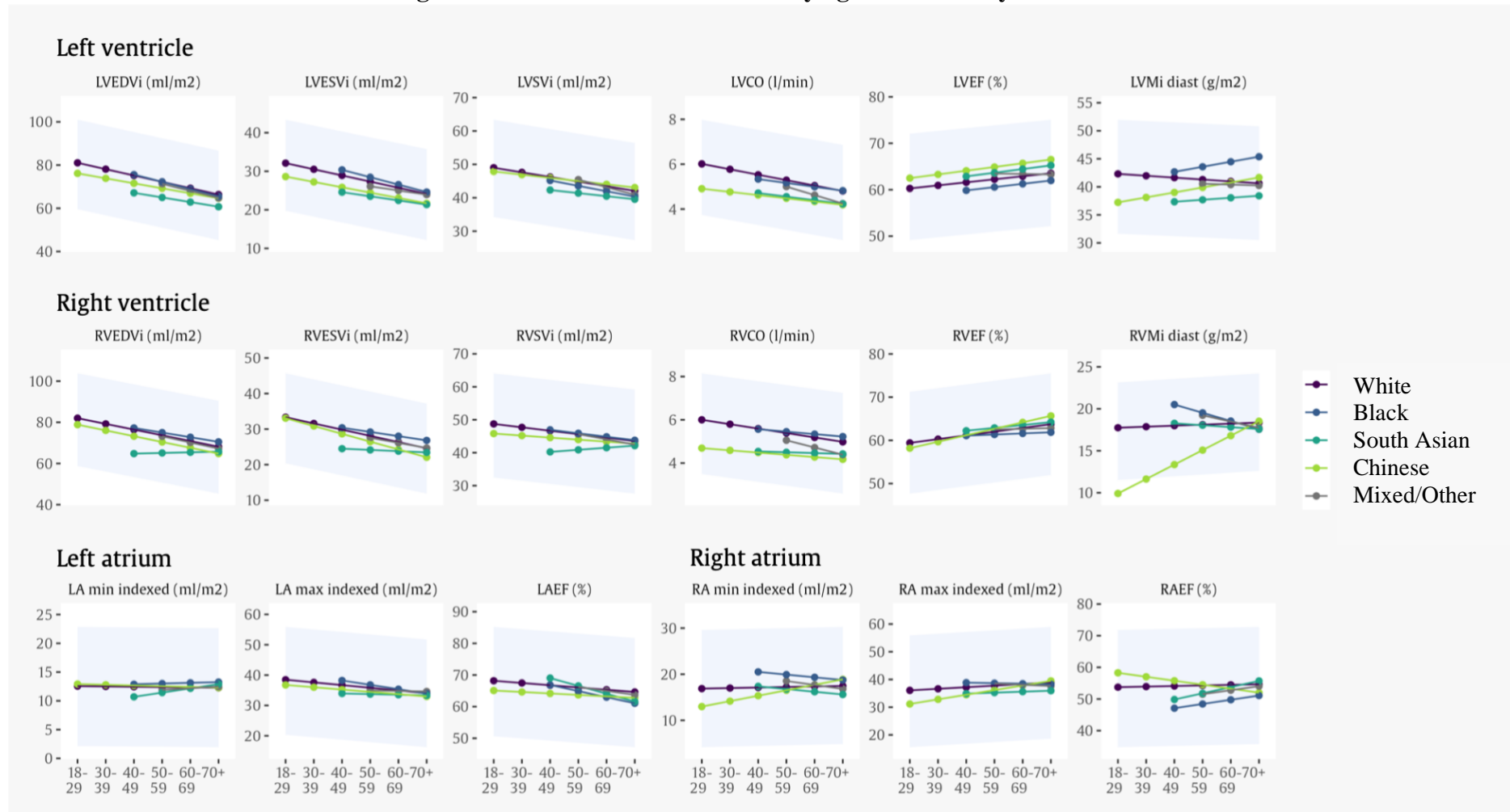


**Figure S03 footnote.** Bars show the average value for each CMR metric and scanner setting for a 50-year-old male using smooth segmentation. Adjusted means were calculated by linear regression models relating CMR metric to scanner setting (magnet strength or scanner vendor) adjusted by age and sex, where each metric was modeled separately. Intervals show 95% confidence intervals for the adjusted mean, and an asterisk (\*) indicates statistically significant difference between group.

LVEDVi: Left ventricular end-diastolic volume index; LVESVi: Left ventricular end-systolic volume index; LVSVi: left ventricular stroke volume index; LVMi diast: left ventricular mass in end-diastole index; RVEDVi: right ventricular end-diastolic volume index; RVESVi: right ventricular end-systolic volume index; RVSVi: right ventricular stroke volume index; RVMi diast: right ventricular mass in end-diastole index; LA min: left atrial minimum volume; LA max: left atrial maximum index; RA min: right atrial minimum volume; RA max: right atrial maximum volume; LVEF: left ventricular ejection fraction; RVEF: right ventricular ejection fraction; LAEF: left atrial ejection fraction; RAEF: right atrial ejection fraction. . All indexations are to body surface area.

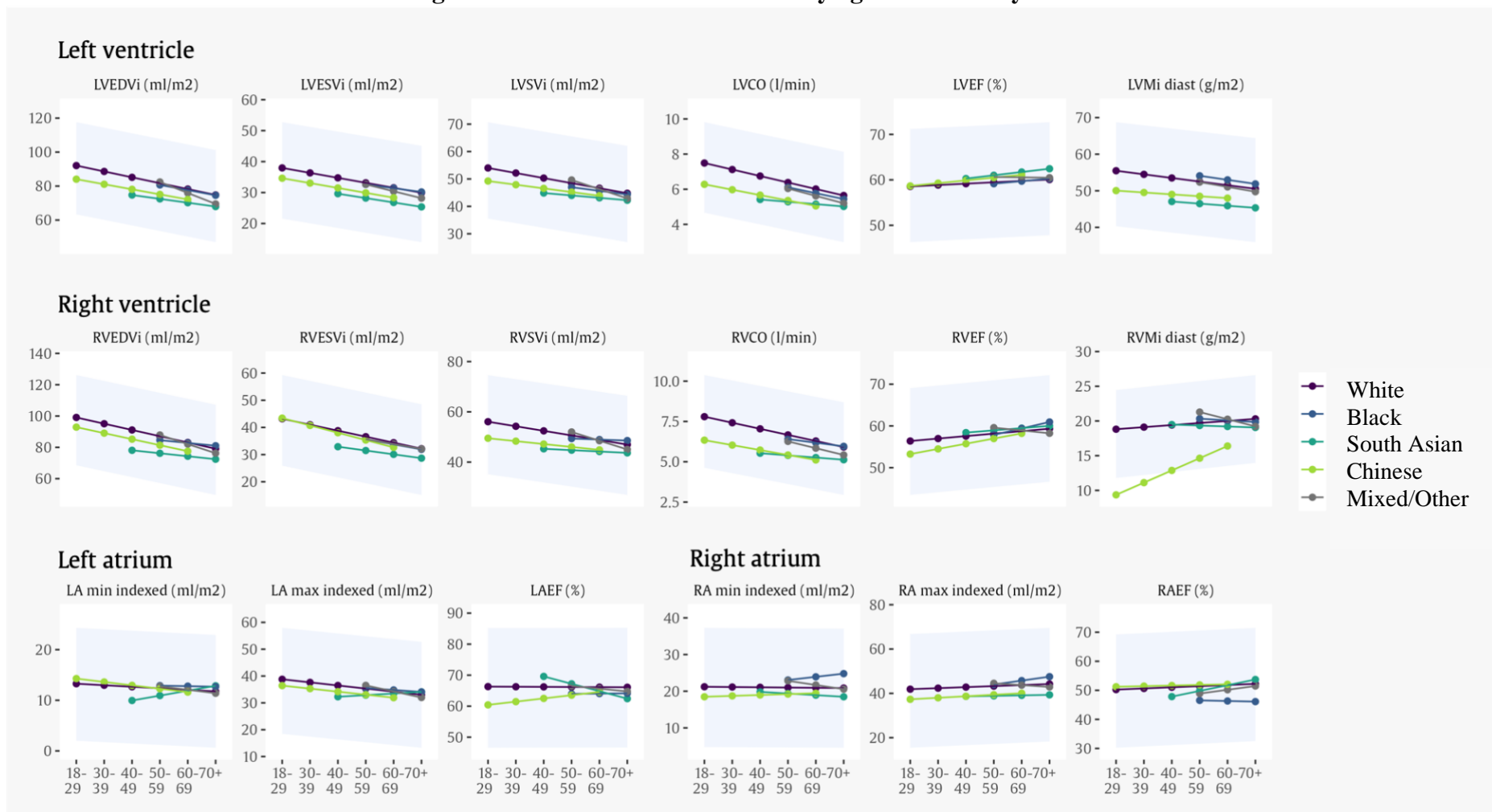


**Figure S04. CMR metrics stratified by age and ethnicity in women**



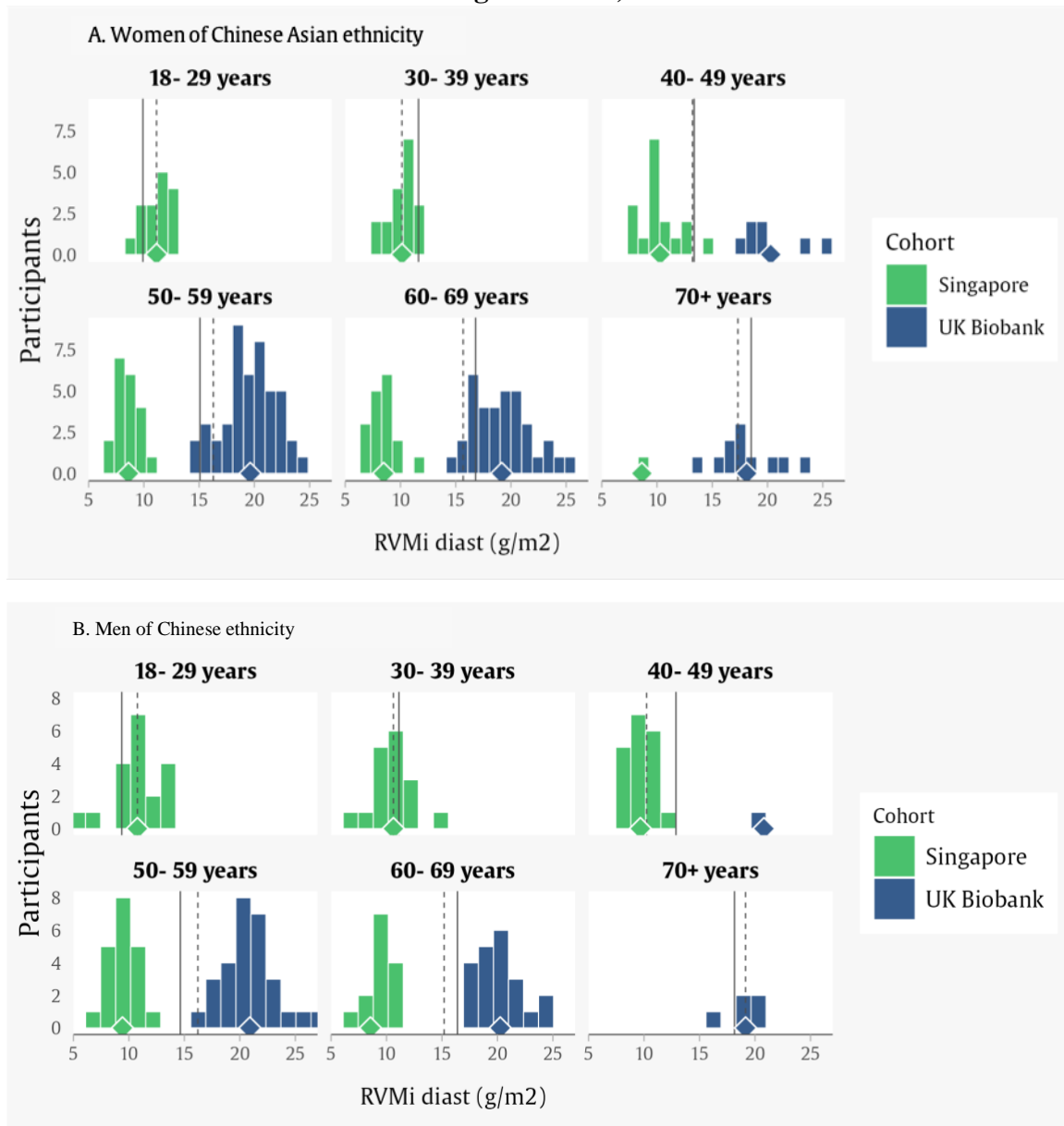
**Figure S04 footnote.** Points are fitted age estimates from linear regression models relating age to CMR metric, where each metric, sex and ethnic group was modeled separately. The blue shaded area indicates the normal reference range for women in the overall sample. CMR measures are indexed to BSA.

**Figure S05. CMR metrics stratified by age and ethnicity in men**



**Figure S05 footnote.** Points are fitted age estimates from linear regression models relating age to CMR metric, where each metric, sex and ethnic group was modeled separately. The blue shaded area indicates the normal reference range for men in the overall sample. CMR measures are indexed to BSA.

**Figure S06: Ventricular mass in Chinese ethnicity -UK Biobank vs Singapore (smooth segmentation)**



**Figure S06 footnote.** Right ventricular mass indexed to surface area stratified by age in participants of Chinese ethnicity. Plots show that the increasing RVMi age trend shown in previous plots is actually an artefact of changing case-mix between the Singapore and UK Biobank cohorts. Plots show RVMi diast histograms by sex and age. Solid line shows the age group mean by linear best fit model, dotted line shows the raw age group mean. Green diamond shows the Singapore age group mean and blue diamond shows the UK Biobank age group mean. RVM indexed to BSA.

**Table S01. Summary of participant selection criteria for each Healthy Hearts Consortium cohort**

Contributing cohort	Selection criteria
Utrecht (The Netherlands)	<ul style="list-style-type: none"> <li>• Aged between 25 and 35 years</li> <li>• No prior history of cardiovascular disease</li> <li>• No cardiac arrhythmias</li> <li>• No record of cardiovascular preventive medication</li> </ul>
Pisa (Italy)	<ul style="list-style-type: none"> <li>• Age between 15 and 80 years</li> <li>• No personal history of cardiac or non-cardiac disease that may affect cardiac function.</li> <li>• No family history of genetic disease</li> <li>• Normal physical examination</li> <li>• Normal electrocardiogram</li> <li>• Normal echocardiographic examination</li> <li>• No coronary risk factors including diabetes, hypertension (defined as diastolic blood pressure &gt;90 mmHg, systolic blood pressure &gt;140 mm Hg, or receiving treatment for hypertension), hyperlipidemia (abnormal lipid levels or receiving lipid-lowering therapy), obesity (defined as body mass index <math>\geq 30 \text{ kg/m}^2</math>).</li> <li>• No history of smoking or drug use</li> </ul>
Heidelberg (Germany)	<ul style="list-style-type: none"> <li>• Aged over 20 years old</li> <li>• No signs, symptoms or history of any cardiac disease, including arterial hypertension, cardiovascular, cerebrovascular or non-cardiac diseases, any regular medication except for contraceptives or vitamins</li> <li>• Screening was performed with clinical history, physical examination, 12-lead ECG, and a resting blood pressure</li> <li>• Fasting glucose and HbA1c were measured, and those with impaired glucose tolerance were excluded</li> <li>• In all participants, CMR stress test (first-pass perfusion with adenosine-induced vasodilation or stress function CMR during dobutamine) was performed to exclude significant coronary artery disease</li> </ul>
Singapore	<ul style="list-style-type: none"> <li>• Aged 20 to 69 years old</li> <li>• No symptoms, clinical or family history of cardiovascular or cerebrovascular disease</li> <li>• No history of hypertension, hyperlipidemia, or diabetes mellitus.</li> <li>• Individuals with valvular heart disease or wall motion abnormalities detected on CMR were excluded</li> </ul>
Study of Health in Pomerania (SHIP)	<ul style="list-style-type: none"> <li>• Aged 20 to 80 years</li> <li>• No prior arterial hypertension (measured blood pressure), diabetes mellitus (measured HbA1c), myocardial infarction (self-report, 12-lead ECG), self-reported cardiac surgery, heart failure, stroke, chronic lung disease, peripheral artery disease.</li> <li>• No cardiovascular/pulmonary medication</li> <li>• subjects with ECG signs of atrial fibrillation or left or right bundle branch block and participants with late gadolinium enhancement in CMR imaging were excluded from the reference population</li> </ul>
UK Biobank	<ul style="list-style-type: none"> <li>• Age 44 to 83 years old</li> <li>• Exclusion of any record of cardiovascular disease according to self-report in UK Biobank assessments, or linked electronic health records – including hospital episode statistics and Office of Population Censuses and Surveys Classification of Interventions and Procedures</li> <li>• Matched deprivation and risk factor profile to the UK general population</li> <li>• For further details see <b>Supplemental Methods</b></li> </ul>

**Table S01 footnote.** CMR: cardiovascular magnetic resonance; ECG: electrocardiogram; HbA1c: glycated haemoglobin.

**Table S02. Summary of characteristics of the Healthy Hearts Consortium cohorts**

Cohort	n	Age	Sex	Ethnicity	Scanner Vendor	Scanner model	Magnet strength
UK Biobank	7672	Mean: 64.2 SD: 10.0 Range: 44 to 83	Men: 3,751 (49%) Women: 3,921 (51%)	White = 6,189 (81%) Black = 340 (4%) South Asian = 510 (7%) Chinese = 155 (2%) Mixed/Other = 478 (6%)	Siemens	Magnetom Aera	1.5 T
SHIP	627	Mean: 45.1 SD: 11.9 Range: 21 to 81	Men: 297 (47%) Women: 330 (53%)	White	Siemens	Magnetom Avanto	1.5 T
Utrecht	128	Mean: 28 SD: 3.1 Range: 22 to 34	Men: 64 (50%) Women: 64 (50%)	White	Philips	Achieva	3 T
Heidelberg	190	Mean: 49.3 SD: 12.4 Range: 21 to 74	Men: 105 (55%) Women: 85 (45%)	White	Philips	Achieva	1.5 T
Pisa	291	Mean: 44.3 SD: 15.5 Range: 18 to 77	Men = 144 (49%) Women: 147 (51%)	White = 280 Black = 1	General Electric	Excite HDX 1 (< 1%) Signa Artist 99 (34%) Signa CVi 191 (66%)	1.5 T = 290 (> 99%) 3 T = 1 (< 1%)
Singapore	180	Mean: 44.7 SD: 13.5 Range: 21 to 70	Men: 91 (51%) Women: 89 (49%)	Chinese	Philips	Ingenia	3 T

**Table S02 footnote.** SHIP: Study of health in Pomerania; T: Tesla; SD: standard deviation

**Table S03. CMR metrics in women of White ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(50 - 102)	(84 - 137)	(458 - 518)	(858 - 926)	(875 - 929)	(1,033 - 1,116)
<b>Left ventricle</b>						
LVEDV (ml)	149 [107, 191]	143 [101, 185]	137 [94, 179]	130 [88, 173]	124 [82, 166]	118 [76, 160]
LVEDVi (ml/m <sup>2</sup> )	81 [60, 102]	78 [57, 99]	75 [54, 96]	72 [51, 93]	69 [48, 90]	66 [46, 87]
LVESV (ml)	59 [36, 82]	56 [33, 78]	53 [30, 75]	49 [27, 72]	46 [24, 69]	43 [20, 66]
LVESVi (ml/m <sup>2</sup> )	32 [20, 44]	31 [19, 42]	29 [17, 41]	27 [15, 39]	26 [14, 38]	24 [12, 36]
LVSV (ml)	90 [62, 119]	87 [58, 116]	84 [55, 113]	81 [52, 110]	78 [49, 107]	75 [46, 103]
LVSVi (ml/m <sup>2</sup> )	49 [34, 64]	48 [33, 62]	46 [32, 61]	45 [30, 59]	43 [29, 58]	42 [27, 57]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	60 [49, 72]	61 [49, 72]	62 [50, 73]	62 [51, 74]	63 [51, 74]	64 [52, 75]
LVM diast (g)	78 [55, 102]	77 [54, 101]	76 [53, 99]	75 [51, 98]	74 [50, 97]	73 [49, 96]
LVMi diast (g/m <sup>2</sup> )	42 [32, 52]	42 [32, 52]	42 [32, 51]	41 [31, 51]	41 [31, 51]	41 [31, 50]
LVM syst (g)	76 [49, 102]	75 [48, 101]	74 [47, 100]	73 [46, 99]	72 [45, 98]	71 [44, 97]
LVMi syst (g/m <sup>2</sup> )	41 [29, 53]	41 [28, 53]	40 [28, 53]	40 [28, 52]	40 [28, 52]	40 [27, 52]
<b>Right ventricle</b>						
RVEDV (ml)	151 [105, 197]	145 [99, 191]	139 [93, 185]	133 [87, 179]	127 [81, 173]	121 [75, 167]
RVEDVi (ml/m <sup>2</sup> )	82 [60, 104]	79 [57, 102]	76 [54, 99]	74 [51, 96]	71 [48, 93]	68 [46, 91]
RVESV (ml)	61 [37, 86]	58 [33, 82]	54 [30, 79]	51 [26, 75]	47 [23, 72]	44 [19, 68]
RVESVi (ml/m <sup>2</sup> )	33 [21, 46]	32 [19, 44]	30 [17, 43]	28 [15, 41]	26 [14, 39]	25 [12, 37]
RVSV (ml)	90 [59, 121]	88 [56, 119]	85 [54, 116]	82 [51, 114]	80 [49, 111]	77 [46, 109]
RVSVi (ml/m <sup>2</sup> )	49 [33, 65]	48 [32, 64]	47 [31, 63]	46 [30, 62]	45 [29, 61]	44 [28, 60]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [47, 71]	60 [48, 72]	61 [49, 73]	62 [50, 74]	63 [51, 75]	64 [52, 76]
<b>Left atrium</b>						
LAESV (ml)	68 [33, 103]	66 [31, 101]	64 [28, 99]	61 [26, 97]	59 [24, 94]	57 [22, 92]
LAESVi (ml/m <sup>2</sup> )	36 [18, 55]	35 [17, 54]	35 [16, 53]	34 [15, 52]	33 [15, 51]	32 [14, 51]
LA max (ml)	72 [37, 108]	70 [35, 105]	68 [32, 103]	65 [30, 101]	63 [28, 98]	61 [25, 96]
LA max i (ml/m <sup>2</sup> )	38 [20, 57]	38 [19, 56]	37 [18, 55]	36 [18, 54]	35 [17, 53]	34 [16, 52]
LAEF (%)	68 [50, 86]	67 [50, 85]	67 [49, 85]	66 [48, 84]	65 [48, 83]	65 [47, 82]
<b>Right atrium</b>						
RAESV (ml)	64 [28, 100]	65 [29, 100]	65 [29, 101]	66 [30, 101]	66 [30, 102]	66 [31, 102]
RAESVi (ml/m <sup>2</sup> )	35 [15, 55]	35 [15, 55]	36 [16, 56]	36 [16, 56]	37 [17, 57]	37 [17, 57]
RA max (ml)	67 [31, 103]	67 [31, 103]	68 [32, 104]	68 [32, 104]	69 [33, 105]	69 [33, 105]
RA max i (ml/m <sup>2</sup> )	36 [16, 56]	37 [16, 57]	37 [17, 57]	38 [17, 58]	38 [18, 59]	39 [19, 59]
RAEF (%)	54 [35, 72]	54 [35, 73]	54 [35, 73]	54 [36, 73]	54 [36, 73]	55 [36, 73]

**Table S04. CMR metrics in women of White ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(50 - 102)	(84 - 137)	(458 - 518)	(858 - 925)	(874 - 928)	(1,041 - 1,116)
<b>Left ventricle</b>						
LVEDV (ml)	149 [107, 191]	143 [101, 185]	137 [94, 179]	130 [88, 173]	124 [82, 166]	118 [76, 160]
LVEDVi (ml/m)	88 [64, 112]	85 [61, 109]	82 [58, 107]	79 [55, 104]	76 [52, 101]	74 [49, 98]
LVESV (ml)	59 [36, 82]	56 [33, 78]	53 [30, 75]	49 [27, 72]	46 [24, 69]	43 [20, 66]
LVESVi (ml/m)	35 [22, 48]	33 [20, 47]	32 [18, 45]	30 [17, 43]	28 [15, 42]	27 [14, 40]
LVSV (ml/m)	90 [62, 119]	87 [58, 116]	84 [55, 113]	81 [52, 110]	78 [49, 107]	75 [46, 103]
LVSVi (ml/m)	53 [37, 70]	52 [35, 69]	51 [34, 67]	49 [33, 66]	48 [31, 65]	47 [30, 63]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	60 [49, 72]	61 [49, 72]	62 [50, 73]	62 [51, 74]	63 [51, 74]	64 [52, 75]
LVM diast (g)	78 [55, 102]	77 [54, 101]	76 [53, 99]	75 [51, 98]	74 [50, 97]	73 [49, 96]
LVMi diast (g)	46 [33, 60]	46 [32, 60]	46 [32, 59]	46 [32, 59]	45 [32, 59]	45 [32, 59]
LVM syst (g)	76 [49, 102]	75 [48, 101]	74 [47, 100]	73 [46, 99]	72 [45, 98]	71 [44, 97]
LVMi syst (g/m)	45 [29, 60]	45 [29, 60]	44 [29, 60]	44 [29, 60]	44 [29, 60]	44 [29, 59]
<b>Right ventricle</b>						
RVEDV (ml)	151 [105, 197]	145 [99, 191]	139 [93, 185]	133 [87, 179]	127 [81, 173]	121 [75, 167]
RVEDVi (ml/m)	89 [63, 116]	87 [60, 113]	84 [57, 110]	81 [55, 108]	78 [52, 105]	76 [49, 102]
RVESV (ml)	61 [37, 86]	58 [33, 82]	54 [30, 79]	51 [26, 75]	47 [23, 72]	44 [19, 68]
RVESVi (ml/m)	36 [22, 51]	35 [20, 49]	33 [18, 47]	31 [16, 45]	29 [15, 44]	27 [13, 42]
RVSV (ml)	90 [59, 121]	88 [56, 119]	85 [54, 116]	82 [51, 114]	80 [49, 111]	77 [46, 109]
RVSVi (ml/m)	53 [35, 71]	52 [34, 70]	51 [33, 69]	50 [32, 68]	49 [31, 67]	48 [30, 66]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [47, 71]	60 [48, 72]	61 [49, 73]	62 [50, 74]	63 [51, 75]	64 [52, 76]
<b>Left atrium</b>						
LAESV (ml)	68 [33, 103]	66 [31, 101]	64 [28, 99]	61 [26, 97]	59 [24, 94]	57 [22, 92]
LAESVi (ml/m)	40 [19, 62]	39 [18, 61]	38 [17, 60]	37 [16, 59]	37 [15, 58]	36 [14, 57]
LA max (ml)	72 [37, 108]	70 [35, 105]	68 [32, 103]	65 [30, 101]	63 [28, 98]	61 [25, 96]
LA max i (ml/m)	43 [21, 64]	42 [20, 63]	41 [19, 62]	40 [18, 61]	39 [17, 60]	38 [16, 59]
LAEF (%)	68 [50, 86]	67 [50, 85]	67 [49, 85]	66 [48, 84]	65 [48, 83]	65 [47, 82]
<b>Right atrium</b>						
RAESV (ml)	64 [28, 100]	65 [29, 100]	65 [29, 101]	66 [30, 101]	66 [30, 102]	66 [31, 102]
RAESVi (ml/m)	38 [16, 59]	39 [17, 60]	39 [18, 61]	40 [19, 61]	41 [19, 62]	41 [20, 63]
RA max (ml)	67 [31, 103]	67 [31, 103]	68 [32, 104]	68 [32, 104]	69 [33, 105]	69 [33, 105]
RA max i (ml/m)	39 [18, 61]	40 [19, 61]	41 [19, 62]	42 [20, 63]	42 [21, 64]	43 [22, 64]
RAEF (%)	54 [35, 72]	54 [35, 73]	54 [35, 73]	54 [36, 73]	54 [36, 73]	55 [36, 73]

**Table S05. CMR metrics in women of White ethnicity using papillary segmentation, indexed by body surface area**

Variable	18- 29	30- 39	40- 49	50- 59	60- 69	70+
N (min – max)	(50 - 102)	(84 - 137)	(458 - 518)	(858 - 926)	(875 - 930)	(1,033 - 1,116)
<b>Left ventricle</b>						
LVEDV (ml)	146 [104, 187]	140 [98, 181]	134 [92, 175]	128 [86, 169]	122 [80, 163]	116 [74, 157]
LVEDVi (ml/m <sup>2</sup> )	79 [59, 100]	76 [56, 97]	74 [53, 94]	71 [50, 91]	68 [47, 88]	65 [45, 85]
LVESV (ml)	55 [34, 76]	52 [31, 73]	49 [28, 70]	46 [25, 67]	43 [21, 64]	40 [18, 61]
LVESVi (ml/m <sup>2</sup> )	30 [19, 41]	28 [17, 40]	27 [16, 38]	25 [14, 37]	24 [13, 35]	22 [11, 34]
LVSV (ml)	91 [62, 120]	88 [59, 116]	85 [56, 113]	82 [53, 110]	79 [50, 107]	76 [47, 104]
LVSVi (ml/m <sup>2</sup> )	49 [35, 64]	48 [33, 63]	47 [32, 61]	45 [31, 60]	44 [29, 59]	43 [28, 57]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [51, 73]	63 [51, 74]	63 [52, 75]	64 [53, 75]	65 [54, 76]	66 [54, 77]
LVM diast (g)	82 [57, 107]	80 [56, 105]	79 [54, 104]	78 [53, 103]	76 [52, 101]	75 [50, 100]
LVMi diast (g/m <sup>2</sup> )	44 [34, 55]	44 [33, 54]	43 [33, 54]	43 [32, 53]	42 [32, 53]	42 [32, 52]
LVM syst (g)	80 [52, 108]	79 [51, 107]	78 [49, 106]	76 [48, 105]	75 [47, 104]	74 [46, 102]
LVMi syst (g/m <sup>2</sup> )	43 [30, 56]	43 [30, 56]	43 [29, 56]	42 [29, 55]	42 [29, 55]	42 [28, 55]
<b>Right ventricle</b>						
RVEDV (ml)	148 [103, 194]	143 [98, 188]	137 [92, 182]	132 [86, 177]	126 [81, 171]	120 [75, 166]
RVEDVi (ml/m <sup>2</sup> )	80 [58, 103]	78 [56, 100]	75 [53, 97]	73 [51, 95]	70 [48, 92]	68 [45, 90]
RVESV (ml)	59 [35, 83]	56 [32, 80]	53 [29, 77]	50 [26, 74]	47 [23, 71]	44 [20, 68]
RVESVi (ml/m <sup>2</sup> )	32 [20, 45]	31 [18, 43]	29 [17, 42]	28 [15, 40]	26 [14, 38]	25 [12, 37]
RVSV (ml)	89 [58, 120]	87 [56, 118]	84 [53, 115]	82 [51, 113]	79 [48, 110]	77 [46, 108]
RVSVi (ml/m <sup>2</sup> )	48 [32, 64]	47 [31, 63]	46 [30, 62]	45 [29, 61]	44 [28, 60]	43 [27, 59]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	60 [48, 72]	61 [49, 73]	61 [49, 73]	62 [50, 74]	63 [51, 75]	64 [52, 76]
<b>Left atrium</b>						
LAESV (ml)	68 [33, 103]	66 [31, 101]	64 [28, 99]	61 [26, 97]	59 [24, 94]	57 [22, 92]
LAESVi (ml/m <sup>2</sup> )	36 [18, 55]	35 [17, 54]	35 [16, 53]	34 [15, 52]	33 [15, 51]	32 [14, 51]
LA max (ml)	72 [37, 108]	70 [35, 105]	68 [32, 103]	65 [30, 101]	63 [28, 98]	61 [25, 96]
LA max i (ml/m <sup>2</sup> )	38 [20, 57]	38 [19, 56]	37 [18, 55]	36 [18, 54]	35 [17, 53]	34 [16, 52]
LAEF (%)	68 [50, 86]	67 [50, 85]	67 [49, 85]	66 [48, 84]	65 [48, 83]	65 [47, 82]
<b>Right atrium</b>						
RAESV (ml)	64 [28, 100]	65 [29, 100]	65 [29, 101]	66 [30, 101]	66 [30, 102]	66 [31, 102]
RAESVi (ml/m <sup>2</sup> )	35 [15, 55]	35 [15, 55]	36 [16, 56]	36 [16, 56]	37 [17, 57]	37 [17, 57]
RA max (ml)	67 [31, 103]	67 [31, 103]	68 [32, 104]	68 [32, 104]	69 [33, 105]	69 [33, 105]
RA max i (ml/m <sup>2</sup> )	36 [16, 56]	37 [16, 57]	37 [17, 57]	38 [17, 58]	38 [18, 59]	39 [19, 59]
RAEF (%)	54 [35, 72]	54 [35, 73]	54 [35, 73]	54 [36, 73]	54 [36, 73]	55 [36, 73]



**Table S06. CMR metrics in women of White ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(50 - 102)	(84 - 137)	(458 - 518)	(858 - 924)	(874 - 929)	(1,041 - 1,116)
<b>Left ventricle</b>						
LVEDV (ml)	146 [104, 187]	140 [98, 181]	134 [92, 175]	128 [86, 169]	122 [80, 163]	116 [74, 157]
LVEDVi (ml/m)	86 [63, 110]	84 [60, 107]	81 [57, 104]	78 [54, 101]	75 [51, 99]	72 [48, 96]
LVESV (ml)	55 [34, 76]	52 [31, 73]	49 [28, 70]	46 [25, 67]	43 [21, 64]	40 [18, 61]
LVESVi (ml/m)	33 [20, 45]	31 [18, 44]	29 [17, 42]	28 [15, 40]	26 [14, 39]	25 [12, 37]
LVSV (ml/m)	91 [62, 120]	88 [59, 116]	85 [56, 113]	82 [53, 110]	79 [50, 107]	76 [47, 104]
LVSVi (ml/m)	54 [37, 70]	52 [36, 69]	51 [34, 68]	50 [33, 66]	48 [32, 65]	47 [30, 64]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [51, 73]	63 [51, 74]	63 [52, 75]	64 [53, 75]	65 [54, 76]	66 [54, 77]
LVM diast (g)	82 [57, 107]	80 [56, 105]	79 [54, 104]	78 [53, 103]	76 [52, 101]	75 [50, 100]
LVMi diast (g)	48 [34, 63]	48 [34, 62]	48 [33, 62]	47 [33, 62]	47 [33, 61]	47 [32, 61]
LVM syst (g)	80 [52, 108]	79 [51, 107]	78 [49, 106]	76 [48, 105]	75 [47, 104]	74 [46, 102]
LVMi syst (g/m)	47 [31, 64]	47 [31, 64]	47 [30, 63]	47 [30, 63]	46 [30, 63]	46 [30, 63]
<b>Right ventricle</b>						
RVEDV (ml)	148 [103, 194]	143 [98, 188]	137 [92, 182]	132 [86, 177]	126 [81, 171]	120 [75, 166]
RVEDVi (ml/m)	88 [62, 114]	85 [59, 111]	83 [56, 109]	80 [54, 106]	78 [51, 104]	75 [49, 101]
RVESV (ml)	59 [35, 83]	56 [32, 80]	53 [29, 77]	50 [26, 74]	47 [23, 71]	44 [20, 68]
RVESVi (ml/m)	35 [21, 49]	34 [19, 48]	32 [18, 46]	30 [16, 45]	29 [15, 43]	27 [13, 41]
RVSV (ml)	89 [58, 120]	87 [56, 118]	84 [53, 115]	82 [51, 113]	79 [48, 110]	77 [46, 108]
RVSVi (ml/m)	53 [35, 71]	52 [34, 70]	51 [33, 69]	50 [32, 68]	49 [31, 67]	48 [30, 66]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	60 [48, 72]	61 [49, 73]	61 [49, 73]	62 [50, 74]	63 [51, 75]	64 [52, 76]
<b>Left atrium</b>						
LAESV (ml)	68 [33, 103]	66 [31, 101]	64 [28, 99]	61 [26, 97]	59 [24, 94]	57 [22, 92]
LAESVi (ml/m)	40 [19, 62]	39 [18, 61]	38 [17, 60]	37 [16, 59]	37 [15, 58]	36 [14, 57]
LA max (ml)	72 [37, 108]	70 [35, 105]	68 [32, 103]	65 [30, 101]	63 [28, 98]	61 [25, 96]
LA max i (ml/m)	43 [21, 64]	42 [20, 63]	41 [19, 62]	40 [18, 61]	39 [17, 60]	38 [16, 59]
LAEF (%)	68 [50, 86]	67 [50, 85]	67 [49, 85]	66 [48, 84]	65 [48, 83]	65 [47, 82]
<b>Right atrium</b>						
RAESV (ml)	64 [28, 100]	65 [29, 100]	65 [29, 101]	66 [30, 101]	66 [30, 102]	66 [31, 102]
RAESVi (ml/m)	38 [16, 59]	39 [17, 60]	39 [18, 61]	40 [19, 61]	41 [19, 62]	41 [20, 63]
RA max (ml)	67 [31, 103]	67 [31, 103]	68 [32, 104]	68 [32, 104]	69 [33, 105]	69 [33, 105]
RA max i (ml/m)	39 [18, 61]	40 [19, 61]	41 [19, 62]	42 [20, 63]	42 [21, 64]	43 [22, 64]
RAEF (%)	54 [35, 72]	54 [35, 73]	54 [35, 73]	54 [36, 73]	54 [36, 73]	55 [36, 73]

**Table S07. CMR metrics in women of White ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(50 - 102)	(84 - 137)	(458 - 518)	(858 - 926)	(875 - 929)	(1,033 - 1,118)
<b>Left ventricle</b>						
LVEDV (ml)	136 [98, 175]	130 [92, 169]	124 [86, 163]	118 [80, 157]	112 [74, 151]	106 [68, 145]
LVEDVi (ml/m <sup>2</sup> )	74 [55, 94]	71 [52, 91]	68 [49, 88]	66 [46, 85]	63 [43, 82]	60 [40, 79]
LVESV (ml)	48 [29, 67]	44 [25, 63]	41 [22, 60]	38 [19, 57]	35 [16, 54]	32 [13, 51]
LVESVi (ml/m <sup>2</sup> )	26 [16, 36]	24 [14, 35]	23 [13, 33]	21 [11, 31]	19 [9, 30]	18 [8, 28]
LVSV (ml)	89 [61, 116]	86 [58, 114]	83 [55, 111]	80 [53, 108]	77 [50, 105]	74 [47, 102]
LVSVi (ml/m <sup>2</sup> )	48 [34, 62]	47 [33, 61]	46 [32, 60]	44 [30, 58]	43 [29, 57]	42 [28, 56]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	65 [54, 76]	66 [55, 77]	67 [56, 78]	68 [57, 79]	69 [58, 80]	70 [59, 81]
LVM diast (g)	91 [63, 119]	90 [62, 118]	89 [61, 117]	88 [60, 116]	86 [58, 114]	85 [57, 113]
LVMi diast (g/m <sup>2</sup> )	49 [38, 61]	49 [37, 61]	49 [37, 60]	48 [37, 60]	48 [36, 60]	48 [36, 59]
LVM syst (g)	88 [56, 119]	87 [55, 119]	86 [55, 118]	85 [54, 117]	85 [53, 116]	84 [52, 115]
LVMi syst (g/m <sup>2</sup> )	47 [33, 62]	47 [33, 62]	47 [33, 62]	47 [33, 62]	47 [33, 61]	47 [33, 61]
<b>Right ventricle</b>						
RVEDV (ml)	148 [102, 194]	143 [97, 188]	137 [92, 183]	132 [86, 177]	127 [81, 172]	121 [76, 167]
RVEDVi (ml/m <sup>2</sup> )	80 [58, 102]	78 [56, 100]	75 [53, 97]	73 [51, 95]	70 [48, 93]	68 [46, 90]
RVESV (ml)	60 [35, 84]	57 [32, 81]	54 [30, 79]	51 [27, 76]	49 [24, 73]	46 [22, 70]
RVESVi (ml/m <sup>2</sup> )	32 [20, 45]	31 [18, 44]	30 [17, 42]	28 [16, 41]	27 [14, 40]	26 [13, 38]
RVSV (ml)	88 [58, 119]	86 [55, 116]	83 [53, 113]	80 [50, 111]	78 [48, 108]	75 [45, 105]
RVSVi (ml/m <sup>2</sup> )	48 [32, 63]	47 [31, 62]	46 [30, 61]	45 [29, 60]	43 [28, 59]	42 [27, 58]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
RVEF (%)	60 [48, 72]	60 [48, 72]	61 [49, 73]	61 [49, 73]	62 [50, 74]	62 [50, 74]
<b>Left atrium</b>						
LAESV (ml)	68 [33, 103]	66 [31, 101]	64 [28, 99]	61 [26, 97]	59 [24, 94]	57 [22, 92]
LAESVi (ml/m <sup>2</sup> )	36 [18, 55]	35 [17, 54]	35 [16, 53]	34 [15, 52]	33 [15, 51]	32 [14, 51]
LA max (ml)	72 [37, 108]	70 [35, 105]	68 [32, 103]	65 [30, 101]	63 [28, 98]	61 [25, 96]
LA max i (ml/m <sup>2</sup> )	38 [20, 57]	38 [19, 56]	37 [18, 55]	36 [18, 54]	35 [17, 53]	34 [16, 52]
LAEF (%)	68 [50, 86]	67 [50, 85]	67 [49, 85]	66 [48, 84]	65 [48, 83]	65 [47, 82]
<b>Right atrium</b>						
RAESV (ml)	64 [28, 100]	65 [29, 100]	65 [29, 101]	66 [30, 101]	66 [30, 102]	66 [31, 102]
RAESVi (ml/m <sup>2</sup> )	35 [15, 55]	35 [15, 55]	36 [16, 56]	36 [16, 56]	37 [17, 57]	37 [17, 57]
RA max (ml)	67 [31, 103]	67 [31, 103]	68 [32, 104]	68 [32, 104]	69 [33, 105]	69 [33, 105]
RA max i (ml/m <sup>2</sup> )	36 [16, 56]	37 [16, 57]	37 [17, 57]	38 [17, 58]	38 [18, 59]	39 [19, 59]
RAEF (%)	54 [35, 72]	54 [35, 73]	54 [35, 73]	54 [36, 73]	54 [36, 73]	55 [36, 73]

**Table S08. CMR metrics in women of White ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(50 - 102)	(84 - 137)	(458 - 518)	(858 - 923)	(874 - 928)	(1,041 - 1,118)
<b>Left ventricle</b>						
LVEDV (ml)	136 [98, 175]	130 [92, 169]	124 [86, 163]	118 [80, 157]	112 [74, 151]	106 [68, 145]
LVEDVi (ml/m)	81 [59, 103]	78 [56, 100]	75 [53, 97]	72 [50, 94]	69 [47, 91]	66 [44, 88]
LVESV (ml)	48 [29, 67]	44 [25, 63]	41 [22, 60]	38 [19, 57]	35 [16, 54]	32 [13, 51]
LVESVi (ml/m)	28 [17, 39]	27 [15, 38]	25 [14, 36]	23 [12, 34]	21 [10, 33]	20 [9, 31]
LVSV (ml/m)	89 [61, 116]	86 [58, 114]	83 [55, 111]	80 [53, 108]	77 [50, 105]	74 [47, 102]
LVSVi (ml/m)	53 [37, 69]	51 [35, 67]	50 [34, 66]	49 [33, 65]	48 [32, 64]	46 [30, 62]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	65 [54, 76]	66 [55, 77]	67 [56, 78]	68 [57, 79]	69 [58, 80]	70 [59, 81]
LVM diast (g)	91 [63, 119]	90 [62, 118]	89 [61, 117]	88 [60, 116]	86 [58, 114]	85 [57, 113]
LVMi diast (g)	54 [38, 70]	54 [38, 70]	54 [37, 70]	53 [37, 70]	53 [37, 69]	53 [37, 69]
LVM syst (g)	88 [56, 119]	87 [55, 119]	86 [55, 118]	85 [54, 117]	85 [53, 116]	84 [52, 115]
LVMi syst (g/m)	52 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 71]	52 [34, 71]	52 [34, 71]
<b>Right ventricle</b>						
RVEDV (ml)	148 [102, 194]	143 [97, 188]	137 [92, 183]	132 [86, 177]	127 [81, 172]	121 [76, 167]
RVEDVi (ml/m)	88 [61, 114]	85 [59, 111]	83 [57, 109]	80 [54, 106]	78 [52, 104]	76 [49, 102]
RVESV (ml)	60 [35, 84]	57 [32, 81]	54 [30, 79]	51 [27, 76]	49 [24, 73]	46 [22, 70]
RVESVi (ml/m)	35 [21, 50]	34 [20, 48]	33 [18, 47]	31 [17, 46]	30 [16, 44]	29 [14, 43]
RVSV (ml)	88 [58, 119]	86 [55, 116]	83 [53, 113]	80 [50, 111]	78 [48, 108]	75 [45, 105]
RVSVi (ml/m)	52 [35, 70]	51 [34, 69]	50 [32, 68]	49 [31, 67]	48 [30, 66]	47 [29, 64]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
RVEF (%)	60 [48, 72]	60 [48, 72]	61 [49, 73]	61 [49, 73]	62 [50, 74]	62 [50, 74]
<b>Left atrium</b>						
LAESV (ml)	68 [33, 103]	66 [31, 101]	64 [28, 99]	61 [26, 97]	59 [24, 94]	57 [22, 92]
LAESVi (ml/m)	40 [19, 62]	39 [18, 61]	38 [17, 60]	37 [16, 59]	37 [15, 58]	36 [14, 57]
LA max (ml)	72 [37, 108]	70 [35, 105]	68 [32, 103]	65 [30, 101]	63 [28, 98]	61 [25, 96]
LA max i (ml/m)	43 [21, 64]	42 [20, 63]	41 [19, 62]	40 [18, 61]	39 [17, 60]	38 [16, 59]
LAEF (%)	68 [50, 86]	67 [50, 85]	67 [49, 85]	66 [48, 84]	65 [48, 83]	65 [47, 82]
<b>Right atrium</b>						
RAESV (ml)	64 [28, 100]	65 [29, 100]	65 [29, 101]	66 [30, 101]	66 [30, 102]	66 [31, 102]
RAESVi (ml/m)	38 [16, 59]	39 [17, 60]	39 [18, 61]	40 [19, 61]	41 [19, 62]	41 [20, 63]
RA max (ml)	67 [31, 103]	67 [31, 103]	68 [32, 104]	68 [32, 104]	69 [33, 105]	69 [33, 105]
RA max i (ml/m)	39 [18, 61]	40 [19, 61]	41 [19, 62]	42 [20, 63]	42 [21, 64]	43 [22, 64]
RAEF (%)	54 [35, 72]	54 [35, 73]	54 [35, 73]	54 [36, 73]	54 [36, 73]	55 [36, 73]

**Table S09. CMR metrics in women of Black ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	40- 49	50- 59	60- 69	70+
N (min – max)	(10)	(93 - 96)	(62 - 67)	(16 - 18)
<b>Left ventricle</b>				
LVEDV (ml)		134 [88, 181]	126 [80, 172]	118 [71, 164]
LVEDVi (ml/m <sup>2</sup> )	76 [55, 96]	72 [52, 93]	69 [49, 89]	66 [45, 86]
LVESV (ml)		53 [28, 78]	49 [24, 74]	45 [20, 70]
LVESVi (ml/m <sup>2</sup> )	30 [18, 42]	28 [17, 40]	27 [15, 38]	25 [13, 37]
LVSV (ml)		81 [51, 110]	77 [47, 107]	73 [43, 103]
LVSVi (ml/m <sup>2</sup> )	45 [31, 60]	44 [29, 58]	42 [28, 56]	40 [26, 55]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	60 [48, 72]	61 [49, 72]	61 [50, 73]	62 [50, 74]
LVM diast (g)	81 [53, 109]	81 [54, 109]	82 [54, 109]	82 [54, 110]
LVMi diast (g/m <sup>2</sup> )	43 [31, 54]	44 [32, 55]	44 [33, 56]	45 [34, 57]
LVM syst (g)	81 [51, 111]	82 [52, 112]	82 [52, 112]	83 [53, 113]
LVMi syst (g/m <sup>2</sup> )	42 [29, 55]	44 [31, 56]	45 [32, 58]	46 [33, 59]
<b>Right ventricle</b>				
RVEDV (ml)	148 [96, 201]	141 [89, 193]	134 [82, 186]	126 [74, 179]
RVEDVi (ml/m <sup>2</sup> )	77 [54, 101]	75 [52, 98]	73 [49, 96]	70 [47, 94]
RVESV (ml)	58 [30, 86]	55 [28, 82]	52 [24, 79]	49 [21, 76]
RVESVi (ml/m <sup>2</sup> )	30 [17, 44]	29 [16, 42]	28 [15, 41]	27 [14, 40]
RVSV (ml)	90 [57, 123]	86 [53, 119]	82 [50, 115]	78 [45, 112]
RVSVi (ml/m <sup>2</sup> )	47 [32, 62]	46 [31, 61]	45 [30, 60]	44 [28, 59]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 8]	5 [3, 8]
RVEF (%)	61 [49, 73]	61 [50, 73]	62 [50, 73]	62 [50, 74]
<b>Left atrium</b>				
LAESV (ml)	71 [38, 104]	66 [33, 99]	62 [29, 95]	57 [24, 91]
LAESVi (ml/m <sup>2</sup> )	37 [20, 53]	35 [19, 52]	34 [17, 50]	32 [16, 49]
LA max (ml)	74 [40, 107]	69 [36, 102]	65 [32, 98]	60 [27, 94]
LA max i (ml/m <sup>2</sup> )	38 [22, 54]	37 [21, 53]	35 [19, 51]	34 [18, 50]
LAEF (%)	67 [53, 80]	65 [52, 78]	63 [50, 76]	61 [48, 75]
<b>Right atrium</b>				
RAESV (ml)	73 [36, 109]	70 [34, 106]	67 [31, 103]	64 [27, 100]
RAESVi (ml/m <sup>2</sup> )	38 [18, 58]	37 [17, 57]	37 [17, 57]	37 [17, 57]
RA max (ml)	75 [37, 114]	73 [35, 111]	70 [32, 109]	68 [29, 107]
RA max i (ml/m <sup>2</sup> )	39 [19, 59]	39 [19, 58]	38 [19, 58]	38 [18, 58]
RAEF (%)	47 [30, 65]	48 [31, 66]	50 [32, 67]	51 [34, 69]

**Table S10. CMR metrics in women of Black ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(93 - 96)	(62 - 67)	(16 - 18)
<b>Left ventricle</b>				
LVEDV (ml)		134 [88, 181]	126 [80, 172]	118 [71, 164]
LVEDVi (ml/m)		82 [57, 107]	78 [53, 103]	75 [49, 100]
LVESV (ml)		53 [28, 78]	49 [24, 74]	45 [20, 70]
LVESVi (ml/m)		32 [18, 46]	30 [16, 44]	28 [14, 42]
LVSV (ml/m)		81 [51, 110]	77 [47, 107]	73 [43, 103]
LVSVi (ml/m)		49 [32, 66]	48 [31, 65]	46 [29, 63]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	60 [48, 72]	61 [49, 72]	61 [50, 73]	62 [50, 74]
LVM diast (g)	81 [53, 109]	81 [54, 109]	82 [54, 109]	82 [54, 110]
LVMi diast (g)	49 [33, 65]	50 [34, 66]	51 [35, 67]	52 [35, 68]
LVM syst (g)	81 [51, 111]	82 [52, 112]	82 [52, 112]	83 [53, 113]
LVMi syst (g/m)	49 [31, 66]	50 [33, 67]	51 [34, 68]	52 [35, 69]
<b>Right ventricle</b>				
RVEDV (ml)	148 [96, 201]	141 [89, 193]	134 [82, 186]	126 [74, 179]
RVEDVi (ml/m)		86 [57, 114]	83 [54, 111]	80 [51, 109]
RVESV (ml)	58 [30, 86]	55 [28, 82]	52 [24, 79]	49 [21, 76]
RVESVi (ml/m)	35 [19, 51]	34 [18, 50]	32 [16, 48]	31 [14, 47]
RVSV (ml)	90 [57, 123]	86 [53, 119]	82 [50, 115]	78 [45, 112]
RVSVi (ml/m)	54 [36, 73]	53 [34, 71]	51 [33, 69]	49 [31, 68]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 8]	5 [3, 8]
RVEF (%)	61 [49, 73]	61 [50, 73]	62 [50, 73]	62 [50, 74]
<b>Left atrium</b>				
LAESV (ml)	71 [38, 104]	66 [33, 99]	62 [29, 95]	57 [24, 91]
LAESVi (ml/m)	43 [23, 63]	40 [21, 60]	38 [19, 58]	36 [16, 56]
LA max (ml)	74 [40, 107]	69 [36, 102]	65 [32, 98]	60 [27, 94]
LA max i (ml/m)	44 [25, 64]	42 [23, 62]	40 [21, 60]	38 [18, 58]
LAEF (%)	67 [53, 80]	65 [52, 78]	63 [50, 76]	61 [48, 75]
<b>Right atrium</b>				
RAESV (ml)	73 [36, 109]	70 [34, 106]	67 [31, 103]	64 [27, 100]
RAESVi (ml/m)	44 [22, 65]	42 [21, 64]	41 [20, 62]	40 [19, 62]
RA max (ml)	75 [37, 114]	73 [35, 111]	70 [32, 109]	68 [29, 107]
RA max i (ml/m)	46 [24, 67]	44 [23, 66]	43 [21, 65]	42 [20, 64]
RAEF (%)	47 [30, 65]	48 [31, 66]	50 [32, 67]	51 [34, 69]

**Table S11. CMR metrics in women of Black ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(93 - 96)	(62 - 67)	(16 - 18)
<b>Left ventricle</b>				
LVEDV (ml)		132 [87, 177]	123 [78, 168]	115 [69, 160]
LVEDVi (ml/m <sup>2</sup> )	74 [54, 94]	71 [51, 91]	67 [47, 87]	64 [44, 84]
LVESV (ml)	54 [31, 78]	50 [26, 73]	45 [22, 68]	40 [17, 63]
LVESVi (ml/m <sup>2</sup> )	29 [17, 40]	26 [15, 38]	24 [13, 36]	22 [11, 34]
LVSV (ml)		82 [52, 112]	78 [48, 108]	75 [44, 105]
LVSVi (ml/m <sup>2</sup> )	46 [31, 60]	44 [30, 59]	43 [28, 57]	41 [27, 56]
LVCO (l/min)	5 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [50, 73]	63 [51, 74]	64 [52, 75]	65 [53, 76]
LVM diast (g)	84 [54, 114]	84 [55, 114]	85 [55, 114]	85 [55, 115]
LVMi diast (g/m <sup>2</sup> )	44 [32, 57]	45 [33, 57]	46 [34, 58]	47 [35, 59]
LVM syst (g)	85 [53, 117]	86 [54, 117]	86 [55, 118]	87 [55, 119]
LVMi syst (g/m <sup>2</sup> )	44 [31, 58]	46 [32, 59]	47 [34, 60]	49 [35, 62]
<b>Right ventricle</b>				
RVEDV (ml)	147 [94, 200]	140 [88, 192]	133 [80, 185]	125 [73, 178]
RVEDVi (ml/m <sup>2</sup> )	76 [53, 100]	74 [51, 97]	72 [49, 95]	70 [46, 93]
RVESV (ml)	58 [30, 85]	54 [27, 81]	51 [24, 78]	48 [21, 75]
RVESVi (ml/m <sup>2</sup> )	30 [17, 43]	29 [16, 42]	28 [15, 41]	26 [13, 40]
RVSV (ml)	89 [56, 122]	86 [53, 118]	82 [49, 115]	78 [45, 111]
RVSVi (ml/m <sup>2</sup> )	46 [31, 61]	45 [30, 60]	44 [29, 59]	43 [28, 58]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 8]	5 [3, 8]
RVEF (%)	61 [50, 72]	61 [50, 73]	62 [51, 73]	62 [51, 73]
<b>Left atrium</b>				
LAESV (ml)	71 [38, 104]	66 [33, 99]	62 [29, 95]	57 [24, 91]
LAESVi (ml/m <sup>2</sup> )	37 [20, 53]	35 [19, 52]	34 [17, 50]	32 [16, 49]
LA max (ml)	74 [40, 107]	69 [36, 102]	65 [32, 98]	60 [27, 94]
LA max i (ml/m <sup>2</sup> )	38 [22, 54]	37 [21, 53]	35 [19, 51]	34 [18, 50]
LAEF (%)	67 [53, 80]	65 [52, 78]	63 [50, 76]	61 [48, 75]
<b>Right atrium</b>				
RAESV (ml)	73 [36, 109]	70 [34, 106]	67 [31, 103]	64 [27, 100]
RAESVi (ml/m <sup>2</sup> )	38 [18, 58]	37 [17, 57]	37 [17, 57]	37 [17, 57]
RA max (ml)	75 [37, 114]	73 [35, 111]	70 [32, 109]	68 [29, 107]
RA max i (ml/m <sup>2</sup> )	39 [19, 59]	39 [19, 58]	38 [19, 58]	38 [18, 58]
RAEF (%)	47 [30, 65]	48 [31, 66]	50 [32, 67]	51 [34, 69]

**Table S12. CMR metrics in women of Black ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(93 - 96)	(62 - 67)	(16 - 18)
<b>Left ventricle</b>				
LVEDV (ml)		132 [87, 177]	123 [78, 168]	115 [69, 160]
LVEDVi (ml/m)		81 [56, 105]	77 [52, 101]	73 [48, 97]
LVESV (ml)	54 [31, 78]	50 [26, 73]	45 [22, 68]	40 [17, 63]
LVESVi (ml/m)	33 [19, 46]	30 [17, 44]	28 [14, 41]	25 [12, 39]
LVSV (ml/m)		82 [52, 112]	78 [48, 108]	75 [44, 105]
LVSVi (ml/m)		50 [33, 67]	48 [31, 66]	47 [30, 64]
LVCO (l/min)	5 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [50, 73]	63 [51, 74]	64 [52, 75]	65 [53, 76]
LVM diast (g)	84 [54, 114]	84 [55, 114]	85 [55, 114]	85 [55, 115]
LVMi diast (g)	51 [33, 68]	52 [34, 69]	53 [35, 70]	53 [36, 71]
LVM syst (g)	85 [53, 117]	86 [54, 117]	86 [55, 118]	87 [55, 119]
LVMi syst (g/m)	51 [32, 70]	52 [34, 71]	54 [35, 72]	55 [36, 74]
<b>Right ventricle</b>				
RVEDV (ml)	147 [94, 200]	140 [88, 192]	133 [80, 185]	125 [73, 178]
RVEDVi (ml/m)		85 [56, 113]	82 [54, 111]	80 [51, 108]
RVESV (ml)	58 [30, 85]	54 [27, 81]	51 [24, 78]	48 [21, 75]
RVESVi (ml/m)	35 [19, 50]	33 [17, 49]	32 [16, 47]	30 [14, 46]
RVSV (ml)	89 [56, 122]	86 [53, 118]	82 [49, 115]	78 [45, 111]
RVSVi (ml/m)	54 [35, 72]	52 [34, 71]	51 [32, 69]	49 [30, 68]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 8]	5 [3, 8]
RVEF (%)	61 [50, 72]	61 [50, 73]	62 [51, 73]	62 [51, 73]
<b>Left atrium</b>				
LAESV (ml)	71 [38, 104]	66 [33, 99]	62 [29, 95]	57 [24, 91]
LAESVi (ml/m)	43 [23, 63]	40 [21, 60]	38 [19, 58]	36 [16, 56]
LA max (ml)	74 [40, 107]	69 [36, 102]	65 [32, 98]	60 [27, 94]
LA max i (ml/m)	44 [25, 64]	42 [23, 62]	40 [21, 60]	38 [18, 58]
LAEF (%)	67 [53, 80]	65 [52, 78]	63 [50, 76]	61 [48, 75]
<b>Right atrium</b>				
RAESV (ml)	73 [36, 109]	70 [34, 106]	67 [31, 103]	64 [27, 100]
RAESVi (ml/m)	44 [22, 65]	42 [21, 64]	41 [20, 62]	40 [19, 62]
RA max (ml)	75 [37, 114]	73 [35, 111]	70 [32, 109]	68 [29, 107]
RA max i (ml/m)	46 [24, 67]	44 [23, 66]	43 [21, 65]	42 [20, 64]
RAEF (%)	47 [30, 65]	48 [31, 66]	50 [32, 67]	51 [34, 69]

**Table S13. CMR metrics in women of Black ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(93 - 96)	(62 - 67)	(16 - 18)
<b>Left ventricle</b>				
LVEDV (ml)		122 [80, 164]	113 [72, 155]	105 [63, 147]
LVEDVi (ml/m <sup>2</sup> )	69 [50, 88]	66 [47, 84]	62 [43, 81]	59 [40, 78]
LVESV (ml)	45 [24, 66]	40 [20, 61]	36 [15, 56]	31 [10, 52]
LVESVi (ml/m <sup>2</sup> )	24 [13, 34]	22 [11, 32]	19 [9, 30]	17 [7, 27]
LVSV (ml)		81 [52, 110]	78 [48, 107]	74 [45, 103]
LVSVi (ml/m <sup>2</sup> )	45 [31, 59]	44 [30, 57]	42 [29, 56]	41 [27, 55]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	66 [54, 77]	67 [55, 79]	69 [57, 80]	70 [58, 82]
LVM diast (g)	95 [61, 129]	95 [61, 129]	95 [62, 129]	95 [62, 129]
LVMi diast (g/m <sup>2</sup> )	50 [36, 64]	51 [37, 65]	52 [38, 66]	53 [39, 67]
LVM syst (g)	95 [60, 131]	96 [61, 131]	97 [62, 132]	98 [63, 133]
LVMi syst (g/m <sup>2</sup> )	50 [35, 64]	51 [37, 66]	53 [38, 67]	54 [40, 69]
<b>Right ventricle</b>				
RVEDV (ml)	150 [97, 202]	141 [90, 193]	133 [81, 185]	125 [73, 177]
RVEDVi (ml/m <sup>2</sup> )	78 [54, 102]	75 [52, 99]	72 [49, 96]	70 [46, 94]
RVESV (ml)	61 [33, 89]	57 [29, 85]	54 [26, 82]	50 [22, 78]
RVESVi (ml/m <sup>2</sup> )	32 [18, 46]	31 [16, 45]	29 [15, 43]	28 [14, 42]
RVSV (ml)	89 [56, 121]	84 [52, 116]	80 [48, 112]	76 [43, 108]
RVSVi (ml/m <sup>2</sup> )	46 [31, 61]	45 [30, 60]	44 [29, 58]	42 [27, 57]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [47, 71]	60 [48, 72]	60 [48, 72]	60 [48, 72]
<b>Left atrium</b>				
LAESV (ml)	71 [38, 104]	66 [33, 99]	62 [29, 95]	57 [24, 91]
LAESVi (ml/m <sup>2</sup> )	37 [20, 53]	35 [19, 52]	34 [17, 50]	32 [16, 49]
LA max (ml)	74 [40, 107]	69 [36, 102]	65 [32, 98]	60 [27, 94]
LA max i (ml/m <sup>2</sup> )	38 [22, 54]	37 [21, 53]	35 [19, 51]	34 [18, 50]
LAEF (%)	67 [53, 80]	65 [52, 78]	63 [50, 76]	61 [48, 75]
<b>Right atrium</b>				
RAESV (ml)	73 [36, 109]	70 [34, 106]	67 [31, 103]	64 [27, 100]
RAESVi (ml/m <sup>2</sup> )	38 [18, 58]	37 [17, 57]	37 [17, 57]	37 [17, 57]
RA max (ml)	75 [37, 114]	73 [35, 111]	70 [32, 109]	68 [29, 107]
RA max i (ml/m <sup>2</sup> )	39 [19, 59]	39 [19, 58]	38 [19, 58]	38 [18, 58]
RAEF (%)	47 [30, 65]	48 [31, 66]	50 [32, 67]	51 [34, 69]



**Table S14. CMR metrics in women of Black ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(93 - 96)	(62 - 67)	(16 - 18)
<b>Left ventricle</b>				
LVEDV (ml)		122 [80, 164]	113 [72, 155]	105 [63, 147]
LVEDVi (ml/m)		74 [52, 97]	71 [48, 93]	67 [44, 89]
LVESV (ml)	45 [24, 66]	40 [20, 61]	36 [15, 56]	31 [10, 52]
LVESVi (ml/m)	27 [15, 39]	25 [13, 37]	22 [10, 34]	20 [7, 32]
LVSV (ml/m)		81 [52, 110]	78 [48, 107]	74 [45, 103]
LVSVi (ml/m)		50 [33, 66]	48 [32, 65]	47 [30, 63]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	66 [54, 77]	67 [55, 79]	69 [57, 80]	70 [58, 82]
LVM diast (g)	95 [61, 129]	95 [61, 129]	95 [62, 129]	95 [62, 129]
LVMi diast (g)	57 [37, 77]	58 [38, 78]	59 [39, 79]	60 [40, 80]
LVM syst (g)	95 [60, 131]	96 [61, 131]	97 [62, 132]	98 [63, 133]
LVMi syst (g/m)	57 [37, 78]	59 [38, 79]	60 [40, 81]	62 [41, 82]
<b>Right ventricle</b>				
RVEDV (ml)	150 [97, 202]	141 [90, 193]	133 [81, 185]	125 [73, 177]
RVEDVi (ml/m)	90 [61, 119]	86 [58, 115]	82 [54, 111]	79 [50, 107]
RVESV (ml)	61 [33, 89]	57 [29, 85]	54 [26, 82]	50 [22, 78]
RVESVi (ml/m)	37 [20, 53]	35 [19, 51]	33 [17, 49]	31 [15, 48]
RVSV (ml)	89 [56, 121]	84 [52, 116]	80 [48, 112]	76 [43, 108]
RVSVi (ml/m)	53 [35, 71]	51 [33, 69]	50 [32, 67]	48 [29, 66]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [47, 71]	60 [48, 72]	60 [48, 72]	60 [48, 72]
<b>Left atrium</b>				
LAESV (ml)	71 [38, 104]	66 [33, 99]	62 [29, 95]	57 [24, 91]
LAESVi (ml/m)	43 [23, 63]	40 [21, 60]	38 [19, 58]	36 [16, 56]
LA max (ml)	74 [40, 107]	69 [36, 102]	65 [32, 98]	60 [27, 94]
LA max i (ml/m)	44 [25, 64]	42 [23, 62]	40 [21, 60]	38 [18, 58]
LAEF (%)	67 [53, 80]	65 [52, 78]	63 [50, 76]	61 [48, 75]
<b>Right atrium</b>				
RAESV (ml)	73 [36, 109]	70 [34, 106]	67 [31, 103]	64 [27, 100]
RAESVi (ml/m)	44 [22, 65]	42 [21, 64]	41 [20, 62]	40 [19, 62]
RA max (ml)	75 [37, 114]	73 [35, 111]	70 [32, 109]	68 [29, 107]
RA max i (ml/m)	46 [24, 67]	44 [23, 66]	43 [21, 65]	42 [20, 64]
RAEF (%)	47 [30, 65]	48 [31, 66]	50 [32, 67]	51 [34, 69]

**Table S15. CMR metrics in women of South Asian ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(81 - 84)	(61 - 64)	(28 - 31)
<b>Left ventricle</b>				
LVEDV (ml)	115 [80, 151]	111 [75, 146]	106 [71, 142]	102 [66, 137]
LVEDVi (ml/m <sup>2</sup> )	67 [50, 84]	65 [48, 82]	63 [46, 80]	61 [44, 78]
LVESV (ml)	43 [25, 60]	40 [23, 57]	38 [20, 55]	35 [18, 53]
LVESVi (ml/m <sup>2</sup> )	25 [15, 34]	24 [14, 33]	22 [13, 32]	21 [12, 31]
LVSV (ml)	73 [49, 97]	70 [47, 94]	68 [44, 91]	65 [41, 89]
LVSVi (ml/m <sup>2</sup> )	42 [30, 55]	41 [29, 54]	40 [28, 53]	40 [27, 52]
LVCO (l/min)	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	63 [52, 74]	64 [53, 75]	64 [53, 76]	65 [54, 76]
LVM diast (g)	64 [42, 87]	64 [42, 86]	64 [42, 86]	64 [42, 86]
LVMi diast (g/m <sup>2</sup> )	37 [28, 47]	38 [29, 47]	38 [29, 47]	38 [29, 48]
LVM syst (g)	64 [40, 87]	63 [39, 86]	62 [39, 86]	61 [38, 85]
LVMi syst (g/m <sup>2</sup> )	37 [26, 48]	37 [26, 48]	37 [26, 48]	37 [26, 48]
<b>Right ventricle</b>				
RVEDV (ml)	113 [75, 150]	111 [74, 148]	109 [72, 146]	108 [70, 145]
RVEDVi (ml/m <sup>2</sup> )	65 [45, 84]	65 [46, 85]	65 [46, 85]	66 [46, 85]
RVESV (ml)	43 [24, 62]	41 [23, 60]	40 [21, 59]	39 [20, 57]
RVESVi (ml/m <sup>2</sup> )	24 [14, 35]	24 [14, 34]	24 [14, 34]	23 [13, 33]
RVSV (ml)	70 [45, 95]	70 [45, 94]	69 [45, 94]	69 [44, 94]
RVSVi (ml/m <sup>2</sup> )	40 [27, 53]	41 [28, 54]	42 [28, 55]	42 [29, 55]
RVCO (l/min)	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [3, 6]
RVEF (%)	62 [52, 72]	63 [53, 73]	64 [53, 74]	64 [54, 74]
<b>Left atrium</b>				
LAESV (ml)	56 [31, 81]	55 [30, 80]	54 [29, 79]	53 [28, 78]
LAESVi (ml/m <sup>2</sup> )	33 [19, 46]	32 [19, 45]	32 [19, 45]	32 [18, 45]
LA max (ml)	59 [33, 84]	58 [32, 83]	56 [31, 82]	55 [30, 80]
LA max i (ml/m <sup>2</sup> )	34 [20, 48]	34 [20, 48]	34 [20, 47]	33 [19, 47]
LAEF (%)	69 [53, 85]	67 [50, 83]	64 [48, 80]	62 [45, 78]
<b>Right atrium</b>				
RAESV (ml)	59 [30, 89]	58 [29, 87]	57 [28, 86]	55 [26, 84]
RAESVi (ml/m <sup>2</sup> )	34 [16, 52]	34 [16, 52]	34 [16, 52]	34 [16, 52]
RA max (ml)	61 [31, 92]	60 [30, 90]	59 [29, 90]	59 [28, 89]
RA max i (ml/m <sup>2</sup> )	35 [17, 53]	35 [18, 53]	36 [18, 53]	36 [18, 54]
RAEF (%)	50 [33, 67]	52 [35, 69]	54 [37, 71]	56 [39, 73]

**Table S16. CMR metrics in women of South Asian ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(81 - 84)	(61 - 64)	(28 - 31)
<b>Left ventricle</b>				
LVEDV (ml)	115 [80, 151]	111 [75, 146]	106 [71, 142]	102 [66, 137]
LVEDVi (ml/m)	72 [51, 92]	69 [49, 90]	67 [47, 87]	65 [45, 85]
LVESV (ml)	43 [25, 60]	40 [23, 57]	38 [20, 55]	35 [18, 53]
LVESVi (ml/m)	26 [16, 37]	25 [15, 36]	24 [13, 34]	22 [12, 33]
LVSV (ml/m)	73 [49, 97]	70 [47, 94]	68 [44, 91]	65 [41, 89]
LVSVi (ml/m)	45 [31, 60]	44 [30, 58]	43 [29, 57]	42 [28, 56]
LVCO (l/min)	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	63 [52, 74]	64 [53, 75]	64 [53, 76]	65 [54, 76]
LVM diast (g)	64 [42, 87]	64 [42, 86]	64 [42, 86]	64 [42, 86]
LVMi diast (g)	40 [28, 53]	40 [28, 53]	41 [28, 53]	41 [28, 53]
LVM syst (g)	64 [40, 87]	63 [39, 86]	62 [39, 86]	61 [38, 85]
LVMi syst (g/m)	39 [25, 54]	39 [25, 54]	39 [25, 54]	39 [25, 54]
<b>Right ventricle</b>				
RVEDV (ml)	113 [75, 150]	111 [74, 148]	109 [72, 146]	108 [70, 145]
RVEDVi (ml/m)	70 [48, 92]	70 [48, 92]	69 [47, 91]	69 [47, 91]
RVESV (ml)	43 [24, 62]	41 [23, 60]	40 [21, 59]	39 [20, 57]
RVESVi (ml/m)	27 [15, 38]	26 [15, 37]	25 [14, 37]	25 [13, 36]
RVSV (ml)	70 [45, 95]	70 [45, 94]	69 [45, 94]	69 [44, 94]
RVSVi (ml/m)	43 [28, 58]	44 [29, 58]	44 [29, 59]	44 [29, 59]
RVCO (l/min)	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [3, 6]
RVEF (%)	62 [52, 72]	63 [53, 73]	64 [53, 74]	64 [54, 74]
<b>Left atrium</b>				
LAESV (ml)	56 [31, 81]	55 [30, 80]	54 [29, 79]	53 [28, 78]
LAESVi (ml/m)	35 [20, 50]	34 [19, 50]	34 [19, 49]	33 [18, 49]
LA max (ml)	59 [33, 84]	58 [32, 83]	56 [31, 82]	55 [30, 80]
LA max i (ml/m)	37 [21, 52]	36 [20, 52]	36 [20, 51]	35 [19, 51]
LAEF (%)	69 [53, 85]	67 [50, 83]	64 [48, 80]	62 [45, 78]
<b>Right atrium</b>				
RAESV (ml)	59 [30, 89]	58 [29, 87]	57 [28, 86]	55 [26, 84]
RAESVi (ml/m)	37 [19, 55]	36 [19, 54]	36 [18, 54]	35 [18, 53]
RA max (ml)	61 [31, 92]	60 [30, 90]	59 [29, 90]	59 [28, 89]
RA max i (ml/m)	38 [20, 56]	38 [20, 55]	38 [20, 55]	37 [19, 55]
RAEF (%)	50 [33, 67]	52 [35, 69]	54 [37, 71]	56 [39, 73]

**Table S17. CMR metrics in women of South Asian ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(81 - 84)	(61 - 64)	(28 - 31)
<b>Left ventricle</b>				
LVEDV (ml)	113 [78, 148]	109 [74, 144]	104 [70, 139]	100 [65, 135]
LVEDVi (ml/m <sup>2</sup> )	66 [49, 83]	64 [47, 80]	62 [45, 78]	60 [43, 76]
LVESV (ml)	40 [24, 57]	38 [21, 54]	35 [18, 51]	32 [16, 49]
LVESVi (ml/m <sup>2</sup> )	23 [14, 32]	22 [13, 31]	21 [12, 30]	20 [10, 29]
LVSV (ml)	73 [49, 97]	71 [47, 95]	69 [45, 92]	66 [42, 90]
LVSVi (ml/m <sup>2</sup> )	42 [30, 55]	42 [29, 54]	41 [28, 54]	40 [28, 53]
LVCO (l/min)	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	64 [53, 75]	65 [54, 76]	66 [55, 78]	68 [56, 79]
LVM diast (g)	67 [43, 90]	66 [43, 89]	66 [43, 89]	66 [43, 89]
LVMi diast (g/m <sup>2</sup> )	39 [29, 48]	39 [29, 48]	39 [30, 49]	39 [30, 49]
LVM syst (g)	66 [41, 91]	66 [41, 91]	65 [40, 90]	64 [39, 90]
LVMi syst (g/m <sup>2</sup> )	38 [27, 50]	38 [27, 50]	38 [27, 50]	39 [27, 50]
<b>Right ventricle</b>				
RVEDV (ml)	112 [75, 149]	110 [73, 147]	108 [72, 145]	106 [70, 143]
RVEDVi (ml/m <sup>2</sup> )	64 [45, 84]	65 [45, 84]	65 [46, 84]	65 [46, 84]
RVESV (ml)	42 [24, 61]	41 [23, 59]	40 [21, 58]	38 [20, 57]
RVESVi (ml/m <sup>2</sup> )	24 [14, 34]	24 [14, 34]	24 [14, 33]	23 [13, 33]
RVSV (ml)	70 [45, 94]	69 [45, 94]	69 [44, 93]	68 [44, 93]
RVSVi (ml/m <sup>2</sup> )	40 [27, 53]	41 [28, 54]	41 [28, 54]	42 [29, 55]
RVCO (l/min)	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [3, 6]
RVEF (%)	62 [52, 73]	63 [53, 73]	64 [53, 74]	64 [54, 74]
<b>Left atrium</b>				
LAESV (ml)	56 [31, 81]	55 [30, 80]	54 [29, 79]	53 [28, 78]
LAESVi (ml/m <sup>2</sup> )	33 [19, 46]	32 [19, 45]	32 [19, 45]	32 [18, 45]
LA max (ml)	59 [33, 84]	58 [32, 83]	56 [31, 82]	55 [30, 80]
LA max i (ml/m <sup>2</sup> )	34 [20, 48]	34 [20, 48]	34 [20, 47]	33 [19, 47]
LAEF (%)	69 [53, 85]	67 [50, 83]	64 [48, 80]	62 [45, 78]
<b>Right atrium</b>				
RAESV (ml)	59 [30, 89]	58 [29, 87]	57 [28, 86]	55 [26, 84]
RAESVi (ml/m <sup>2</sup> )	34 [16, 52]	34 [16, 52]	34 [16, 52]	34 [16, 52]
RA max (ml)	61 [31, 92]	60 [30, 90]	59 [29, 90]	59 [28, 89]
RA max i (ml/m <sup>2</sup> )	35 [17, 53]	35 [18, 53]	36 [18, 53]	36 [18, 54]
RAEF (%)	50 [33, 67]	52 [35, 69]	54 [37, 71]	56 [39, 73]

**Table S18. CMR metrics in women of South Asian ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(81 - 84)	(61 - 64)	(28 - 31)
<b>Left ventricle</b>				
LVEDV (ml)	113 [78, 148]	109 [74, 144]	104 [70, 139]	100 [65, 135]
LVEDVi (ml/m)	70 [50, 91]	68 [48, 89]	66 [46, 86]	64 [44, 84]
LVESV (ml)	40 [24, 57]	38 [21, 54]	35 [18, 51]	32 [16, 49]
LVESVi (ml/m)	25 [15, 35]	24 [14, 34]	22 [12, 32]	21 [11, 31]
LVSV (ml/m)	73 [49, 97]	71 [47, 95]	69 [45, 92]	66 [42, 90]
LVSVi (ml/m)	46 [31, 60]	45 [30, 59]	43 [29, 58]	42 [28, 57]
LVCO (l/min)	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	64 [53, 75]	65 [54, 76]	66 [55, 78]	68 [56, 79]
LVM diast (g)	67 [43, 90]	66 [43, 89]	66 [43, 89]	66 [43, 89]
LVMi diast (g)	41 [28, 55]	42 [28, 55]	42 [28, 56]	42 [29, 56]
LVM syst (g)	66 [41, 91]	66 [41, 91]	65 [40, 90]	64 [39, 90]
LVMi syst (g/m)	41 [26, 56]	41 [26, 56]	41 [26, 56]	41 [26, 56]
<b>Right ventricle</b>				
RVEDV (ml)	112 [75, 149]	110 [73, 147]	108 [72, 145]	106 [70, 143]
RVEDVi (ml/m)	69 [48, 91]	69 [47, 91]	69 [47, 90]	68 [46, 90]
RVESV (ml)	42 [24, 61]	41 [23, 59]	40 [21, 58]	38 [20, 57]
RVESVi (ml/m)	26 [15, 38]	26 [15, 37]	25 [14, 36]	24 [13, 36]
RVSV (ml)	70 [45, 94]	69 [45, 94]	69 [44, 93]	68 [44, 93]
RVSVi (ml/m)	43 [28, 58]	43 [29, 58]	44 [29, 58]	44 [29, 59]
RVCO (l/min)	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [3, 6]
RVEF (%)	62 [52, 73]	63 [53, 73]	64 [53, 74]	64 [54, 74]
<b>Left atrium</b>				
LAESV (ml)	56 [31, 81]	55 [30, 80]	54 [29, 79]	53 [28, 78]
LAESVi (ml/m)	35 [20, 50]	34 [19, 50]	34 [19, 49]	33 [18, 49]
LA max (ml)	59 [33, 84]	58 [32, 83]	56 [31, 82]	55 [30, 80]
LA max i (ml/m)	37 [21, 52]	36 [20, 52]	36 [20, 51]	35 [19, 51]
LAEF (%)	69 [53, 85]	67 [50, 83]	64 [48, 80]	62 [45, 78]
<b>Right atrium</b>				
RAESV (ml)	59 [30, 89]	58 [29, 87]	57 [28, 86]	55 [26, 84]
RAESVi (ml/m)	37 [19, 55]	36 [19, 54]	36 [18, 54]	35 [18, 53]
RA max (ml)	61 [31, 92]	60 [30, 90]	59 [29, 90]	59 [28, 89]
RA max i (ml/m)	38 [20, 56]	38 [20, 55]	38 [20, 55]	37 [19, 55]
RAEF (%)	50 [33, 67]	52 [35, 69]	54 [37, 71]	56 [39, 73]

**Table S19. CMR metrics in women of South Asian ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(81 - 84)	(61 - 64)	(28 - 31)
<b>Left ventricle</b>				
LVEDV (ml)	105 [73, 138]	101 [68, 133]	96 [64, 128]	92 [59, 124]
LVEDVi (ml/m <sup>2</sup> )	61 [45, 77]	59 [43, 75]	57 [41, 73]	55 [39, 71]
LVESV (ml)	34 [18, 49]	31 [16, 46]	28 [13, 43]	25 [10, 40]
LVESVi (ml/m <sup>2</sup> )	20 [11, 28]	18 [10, 27]	17 [8, 25]	15 [7, 24]
LVSV (ml)	72 [49, 95]	70 [47, 92]	67 [45, 90]	65 [42, 88]
LVSVi (ml/m <sup>2</sup> )	41 [29, 54]	41 [29, 53]	40 [28, 52]	40 [28, 52]
LVCO (l/min)	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	68 [56, 79]	69 [58, 81]	71 [60, 82]	73 [61, 84]
LVM diast (g)	76 [50, 102]	75 [49, 101]	75 [49, 101]	75 [48, 101]
LVMi diast (g/m <sup>2</sup> )	44 [33, 55]	44 [33, 55]	44 [33, 56]	45 [34, 56]
LVM syst (g)	74 [47, 101]	74 [47, 101]	73 [46, 100]	73 [46, 100]
LVMi syst (g/m <sup>2</sup> )	43 [31, 55]	43 [31, 55]	43 [31, 55]	44 [32, 56]
<b>Right ventricle</b>				
RVEDV (ml)	113 [76, 150]	111 [74, 147]	108 [72, 145]	106 [69, 143]
RVEDVi (ml/m <sup>2</sup> )	65 [46, 84]	65 [46, 84]	65 [46, 84]	65 [46, 84]
RVESV (ml)	44 [25, 63]	43 [24, 61]	41 [22, 60]	39 [20, 58]
RVESVi (ml/m <sup>2</sup> )	25 [15, 35]	25 [15, 35]	24 [14, 34]	24 [14, 34]
RVSV (ml)	69 [44, 93]	68 [44, 92]	68 [43, 92]	67 [43, 91]
RVSVi (ml/m <sup>2</sup> )	40 [27, 52]	40 [27, 53]	40 [28, 53]	41 [28, 54]
RVCO (l/min)	4 [3, 6]	4 [3, 6]	4 [3, 6]	4 [3, 6]
RVEF (%)	61 [51, 71]	62 [51, 72]	62 [52, 73]	63 [53, 74]
<b>Left atrium</b>				
LAESV (ml)	56 [31, 81]	55 [30, 80]	54 [29, 79]	53 [28, 78]
LAESVi (ml/m <sup>2</sup> )	33 [19, 46]	32 [19, 45]	32 [19, 45]	32 [18, 45]
LA max (ml)	59 [33, 84]	58 [32, 83]	56 [31, 82]	55 [30, 80]
LA max i (ml/m <sup>2</sup> )	34 [20, 48]	34 [20, 48]	34 [20, 47]	33 [19, 47]
LAEF (%)	69 [53, 85]	67 [50, 83]	64 [48, 80]	62 [45, 78]
<b>Right atrium</b>				
RAESV (ml)	59 [30, 89]	58 [29, 87]	57 [28, 86]	55 [26, 84]
RAESVi (ml/m <sup>2</sup> )	34 [16, 52]	34 [16, 52]	34 [16, 52]	34 [16, 52]
RA max (ml)	61 [31, 92]	60 [30, 90]	59 [29, 90]	59 [28, 89]
RA max i (ml/m <sup>2</sup> )	35 [17, 53]	35 [18, 53]	36 [18, 53]	36 [18, 54]
RAEF (%)	50 [33, 67]	52 [35, 69]	54 [37, 71]	56 [39, 73]

**Table S20. CMR metrics in women of South Asian ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(10)	(81 - 84)	(61 - 64)	(28 - 31)
<b>Left ventricle</b>				
LVEDV (ml)	105 [73, 138]	101 [68, 133]	96 [64, 128]	92 [59, 124]
LVEDVi (ml/m)	65 [46, 84]	63 [44, 82]	61 [42, 80]	59 [40, 78]
LVESV (ml)	34 [18, 49]	31 [16, 46]	28 [13, 43]	25 [10, 40]
LVESVi (ml/m)	21 [12, 30]	19 [10, 28]	18 [8, 27]	16 [7, 25]
LVSV (ml/m)	72 [49, 95]	70 [47, 92]	67 [45, 90]	65 [42, 88]
LVSVi (ml/m)	44 [31, 58]	44 [30, 57]	43 [29, 56]	42 [28, 56]
LVCO (l/min)	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	68 [56, 79]	69 [58, 81]	71 [60, 82]	73 [61, 84]
LVM diast (g)	76 [50, 102]	75 [49, 101]	75 [49, 101]	75 [48, 101]
LVMi diast (g)	47 [32, 63]	47 [32, 62]	47 [32, 62]	47 [32, 62]
LVM syst (g)	74 [47, 101]	74 [47, 101]	73 [46, 100]	73 [46, 100]
LVMi syst (g/m)	46 [30, 62]	46 [30, 62]	47 [30, 63]	47 [31, 63]
<b>Right ventricle</b>				
RVEDV (ml)	113 [76, 150]	111 [74, 147]	108 [72, 145]	106 [69, 143]
RVEDVi (ml/m)	70 [48, 92]	69 [48, 91]	69 [47, 90]	68 [46, 90]
RVESV (ml)	44 [25, 63]	43 [24, 61]	41 [22, 60]	39 [20, 58]
RVESVi (ml/m)	27 [16, 39]	27 [15, 38]	26 [15, 37]	25 [14, 36]
RVSV (ml)	69 [44, 93]	68 [44, 92]	68 [43, 92]	67 [43, 91]
RVSVi (ml/m)	43 [28, 57]	43 [28, 57]	43 [28, 57]	43 [28, 58]
RVCO (l/min)	4 [3, 6]	4 [3, 6]	4 [3, 6]	4 [3, 6]
RVEF (%)	61 [51, 71]	62 [51, 72]	62 [52, 73]	63 [53, 74]
<b>Left atrium</b>				
LAESV (ml)	56 [31, 81]	55 [30, 80]	54 [29, 79]	53 [28, 78]
LAESVi (ml/m)	35 [20, 50]	34 [19, 50]	34 [19, 49]	33 [18, 49]
LA max (ml)	59 [33, 84]	58 [32, 83]	56 [31, 82]	55 [30, 80]
LA max i (ml/m)	37 [21, 52]	36 [20, 52]	36 [20, 51]	35 [19, 51]
LAEF (%)	69 [53, 85]	67 [50, 83]	64 [48, 80]	62 [45, 78]
<b>Right atrium</b>				
RAESV (ml)	59 [30, 89]	58 [29, 87]	57 [28, 86]	55 [26, 84]
RAESVi (ml/m)	37 [19, 55]	36 [19, 54]	36 [18, 54]	35 [18, 53]
RA max (ml)	61 [31, 92]	60 [30, 90]	59 [29, 90]	59 [28, 89]
RA max i (ml/m)	38 [20, 56]	38 [20, 55]	38 [20, 55]	37 [19, 55]
RAEF (%)	50 [33, 67]	52 [35, 69]	54 [37, 71]	56 [39, 73]

**Table S21. CMR metrics in women of Chinese ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(13 - 16)	(18)	(10 - 24)	(46 - 66)	(35 - 52)	(11 - 12)
<b>Left ventricle</b>						
LVEDV (ml)	120 [86, 154]	116 [83, 150]	113 [79, 146]	109 [75, 142]	105 [72, 139]	101 [68, 135]
LVEDVi (ml/m <sup>2</sup> )	76 [59, 94]	74 [56, 91]	72 [54, 89]	69 [52, 87]	67 [49, 84]	65 [47, 82]
LVESV (ml)	45 [26, 63]	43 [24, 61]	41 [22, 59]	38 [20, 57]	36 [18, 54]	34 [16, 52]
LVESVi (ml/m <sup>2</sup> )	29 [18, 39]	27 [17, 38]	26 [15, 36]	24 [14, 35]	23 [13, 34]	22 [11, 32]
LVSV (ml)	75 [51, 100]	74 [50, 98]	72 [48, 96]	71 [46, 95]	69 [45, 93]	67 [43, 92]
LVSVi (ml/m <sup>2</sup> )	48 [34, 62]	47 [33, 61]	46 [32, 60]	45 [31, 59]	44 [30, 58]	43 [29, 57]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	62 [52, 73]	63 [52, 74]	64 [53, 75]	65 [54, 76]	66 [55, 77]	66 [56, 77]
LVM diast (g)	58 [38, 78]	60 [40, 80]	61 [42, 81]	63 [43, 82]	64 [44, 84]	66 [46, 85]
LVMi diast (g/m <sup>2</sup> )	37 [28, 47]	38 [29, 47]	39 [30, 48]	40 [31, 49]	41 [32, 50]	42 [32, 51]
LVM syst (g)	62 [40, 83]	62 [41, 83]	63 [41, 84]	63 [42, 84]	63 [42, 85]	64 [43, 85]
LVMi syst (g/m <sup>2</sup> )	39 [29, 50]	39 [29, 50]	40 [29, 50]	40 [30, 50]	40 [30, 51]	40 [30, 51]
<b>Right ventricle</b>						
RVEDV (ml)	124 [85, 163]	119 [81, 158]	115 [76, 154]	111 [72, 149]	106 [67, 145]	102 [63, 141]
RVEDVi (ml/m <sup>2</sup> )	79 [58, 100]	76 [55, 97]	73 [52, 94]	70 [49, 91]	68 [47, 89]	65 [44, 86]
RVESV (ml)	52 [30, 73]	48 [27, 70]	45 [24, 66]	42 [20, 63]	38 [17, 59]	35 [13, 56]
RVESVi (ml/m <sup>2</sup> )	33 [20, 46]	31 [18, 43]	29 [16, 41]	26 [14, 39]	24 [12, 37]	22 [10, 35]
RVSV (ml)	72 [47, 97]	71 [46, 96]	70 [45, 95]	69 [44, 94]	68 [43, 93]	67 [42, 92]
RVSVi (ml/m <sup>2</sup> )	46 [32, 60]	45 [31, 59]	45 [31, 59]	44 [30, 58]	43 [29, 57]	43 [29, 57]
RVCO (l/min)	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]	4 [2, 6]
RVEF (%)	58 [47, 70]	60 [48, 71]	61 [50, 72]	63 [51, 74]	64 [53, 75]	66 [54, 77]
<b>Left atrium</b>						
LAESV (ml)	55 [30, 80]	53 [29, 78]	52 [28, 77]	51 [26, 76]	50 [25, 75]	49 [24, 74]
LAESVi (ml/m <sup>2</sup> )	35 [20, 50]	34 [19, 49]	33 [18, 48]	33 [18, 48]	32 [17, 47]	31 [16, 46]
LA max (ml)	58 [32, 83]	57 [31, 82]	55 [30, 81]	54 [29, 79]	53 [28, 78]	52 [26, 77]
LA max i (ml/m <sup>2</sup> )	37 [21, 52]	36 [21, 51]	35 [20, 50]	34 [19, 50]	34 [18, 49]	33 [18, 48]
LAEF (%)	65 [50, 80]	65 [50, 80]	64 [49, 79]	64 [49, 79]	63 [48, 78]	63 [48, 78]
<b>Right atrium</b>						
RAESV (ml)	48 [20, 75]	50 [22, 77]	52 [25, 80]	54 [27, 82]	56 [29, 84]	59 [31, 86]
RAESVi (ml/m <sup>2</sup> )	30 [12, 48]	32 [14, 50]	33 [15, 51]	35 [17, 53]	36 [18, 54]	38 [20, 56]
RA max (ml)	49 [21, 77]	52 [24, 79]	54 [27, 82]	57 [29, 84]	59 [31, 87]	61 [34, 89]
RA max i (ml/m <sup>2</sup> )	31 [13, 49]	33 [15, 51]	34 [17, 52]	36 [18, 54]	38 [20, 56]	39 [22, 57]
RAEF (%)	58 [44, 73]	57 [42, 72]	56 [41, 70]	55 [40, 69]	53 [39, 68]	52 [37, 67]



**Table S22. CMR metrics in women of Chinese ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(13 - 16)	(18)	(10 - 24)	(46 - 66)	(35 - 52)	(11 - 12)
<b>Left ventricle</b>						
LVEDV (ml)	120 [86, 154]	116 [83, 150]	113 [79, 146]	109 [75, 142]	105 [72, 139]	101 [68, 135]
LVEDVi (ml/m)	74 [54, 94]	73 [53, 92]	71 [51, 91]	69 [49, 89]	67 [47, 87]	65 [45, 85]
LVESV (ml)	45 [26, 63]	43 [24, 61]	41 [22, 59]	38 [20, 57]	36 [18, 54]	34 [16, 52]
LVESVi (ml/m)	28 [17, 39]	27 [15, 38]	25 [14, 37]	24 [13, 35]	23 [12, 34]	22 [11, 33]
LVSV (ml/m)	75 [51, 100]	74 [50, 98]	72 [48, 96]	71 [46, 95]	69 [45, 93]	67 [43, 92]
LVSVi (ml/m)	47 [32, 61]	46 [32, 61]	45 [31, 60]	45 [30, 59]	44 [30, 59]	43 [29, 58]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	62 [52, 73]	63 [52, 74]	64 [53, 75]	65 [54, 76]	66 [55, 77]	66 [56, 77]
LVM diast (g)	58 [38, 78]	60 [40, 80]	61 [42, 81]	63 [43, 82]	64 [44, 84]	66 [46, 85]
LVMi diast (g)	36 [24, 48]	37 [26, 49]	39 [27, 50]	40 [28, 51]	41 [29, 53]	42 [30, 54]
LVM syst (g)	62 [40, 83]	62 [41, 83]	63 [41, 84]	63 [42, 84]	63 [42, 85]	64 [43, 85]
LVMi syst (g/m)	38 [25, 51]	39 [26, 52]	39 [27, 52]	40 [27, 53]	40 [28, 53]	41 [28, 54]
<b>Right ventricle</b>						
RVEDV (ml)	124 [85, 163]	119 [81, 158]	115 [76, 154]	111 [72, 149]	106 [67, 145]	102 [63, 141]
RVEDVi (ml/m)	77 [53, 100]	75 [51, 98]	72 [49, 95]	70 [47, 93]	68 [45, 91]	66 [42, 89]
RVESV (ml)	52 [30, 73]	48 [27, 70]	45 [24, 66]	42 [20, 63]	38 [17, 59]	35 [13, 56]
RVESVi (ml/m)	32 [19, 45]	30 [17, 43]	28 [15, 41]	26 [13, 39]	24 [11, 37]	22 [9, 36]
RVSV (ml)	72 [47, 97]	71 [46, 96]	70 [45, 95]	69 [44, 94]	68 [43, 93]	67 [42, 92]
RVSVi (ml/m)	45 [30, 60]	44 [29, 59]	44 [29, 59]	44 [29, 59]	43 [28, 58]	43 [28, 58]
RVCO (l/min)	5 [3, 7]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]	4 [2, 6]
RVEF (%)	58 [47, 70]	60 [48, 71]	61 [50, 72]	63 [51, 74]	64 [53, 75]	66 [54, 77]
<b>Left atrium</b>						
LAESV (ml)	55 [30, 80]	53 [29, 78]	52 [28, 77]	51 [26, 76]	50 [25, 75]	49 [24, 74]
LAESVi (ml/m)	34 [18, 50]	33 [18, 49]	33 [17, 48]	32 [17, 48]	32 [16, 48]	32 [16, 47]
LA max (ml)	58 [32, 83]	57 [31, 82]	55 [30, 81]	54 [29, 79]	53 [28, 78]	52 [26, 77]
LA max i (ml/m)	36 [20, 52]	35 [19, 51]	35 [19, 51]	34 [19, 50]	34 [18, 50]	33 [17, 49]
LAEF (%)	65 [50, 80]	65 [50, 80]	64 [49, 79]	64 [49, 79]	63 [48, 78]	63 [48, 78]
<b>Right atrium</b>						
RAESV (ml)	48 [20, 75]	50 [22, 77]	52 [25, 80]	54 [27, 82]	56 [29, 84]	59 [31, 86]
RAESVi (ml/m)	30 [12, 47]	31 [14, 48]	33 [16, 50]	34 [17, 51]	36 [19, 53]	38 [20, 55]
RA max (ml)	49 [21, 77]	52 [24, 79]	54 [27, 82]	57 [29, 84]	59 [31, 87]	61 [34, 89]
RA max i (ml/m)	30 [13, 48]	32 [15, 49]	34 [17, 51]	36 [19, 53]	38 [21, 55]	39 [22, 57]
RAEF (%)	58 [44, 73]	57 [42, 72]	56 [41, 70]	55 [40, 69]	53 [39, 68]	52 [37, 67]

**Table S23. CMR metrics in women of Chinese ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(13 - 16)	(18)	(10 - 24)	(46 - 66)	(35 - 52)	(11 - 12)
<b>Left ventricle</b>						
LVEDV (ml)	118 [85, 151]	114 [81, 147]	111 [78, 143]	107 [74, 139]	103 [70, 136]	99 [67, 132]
LVEDVi (ml/m <sup>2</sup> )	75 [57, 92]	73 [55, 90]	70 [53, 87]	68 [51, 85]	66 [49, 83]	63 [46, 81]
LVESV (ml)	41 [24, 59]	39 [22, 57]	37 [20, 55]	35 [18, 53]	33 [16, 51]	31 [14, 49]
LVESVi (ml/m <sup>2</sup> )	26 [16, 37]	25 [15, 35]	24 [14, 34]	23 [12, 33]	21 [11, 31]	20 [10, 30]
LVSV (ml)	77 [52, 101]	75 [51, 99]	73 [49, 98]	72 [47, 96]	70 [46, 94]	68 [44, 93]
LVSVi (ml/m <sup>2</sup> )	49 [35, 63]	48 [34, 61]	47 [33, 60]	46 [32, 59]	45 [31, 58]	44 [30, 57]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	5 [3, 6]	5 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	65 [54, 76]	66 [55, 77]	66 [55, 77]	67 [56, 78]	68 [57, 79]	69 [58, 80]
LVM diast (g)	61 [40, 82]	62 [41, 83]	63 [43, 84]	65 [44, 86]	66 [45, 87]	68 [47, 88]
LVMi diast (g/m <sup>2</sup> )	39 [29, 48]	40 [30, 49]	40 [31, 50]	41 [32, 51]	42 [32, 52]	43 [33, 53]
LVM syst (g)	65 [42, 88]	66 [43, 88]	66 [43, 89]	66 [44, 89]	67 [44, 89]	67 [44, 90]
LVMi syst (g/m <sup>2</sup> )	42 [30, 53]	42 [31, 53]	42 [31, 53]	42 [31, 53]	42 [31, 53]	42 [31, 54]
<b>Right ventricle</b>						
RVEDV (ml)	116 [77, 154]	113 [75, 151]	110 [72, 148]	107 [69, 145]	104 [67, 142]	102 [64, 140]
RVEDVi (ml/m <sup>2</sup> )	74 [53, 94]	72 [51, 92]	70 [50, 90]	68 [48, 88]	66 [46, 87]	65 [44, 85]
RVESV (ml)	45 [24, 65]	43 [22, 63]	41 [21, 61]	39 [19, 60]	37 [17, 58]	36 [15, 56]
RVESVi (ml/m <sup>2</sup> )	28 [16, 40]	27 [15, 39]	26 [14, 38]	25 [13, 37]	24 [12, 36]	23 [11, 35]
RVSV (ml)	71 [46, 96]	70 [45, 95]	69 [44, 94]	68 [43, 93]	67 [42, 92]	66 [41, 91]
RVSVi (ml/m <sup>2</sup> )	45 [31, 59]	45 [31, 58]	44 [30, 58]	43 [29, 57]	43 [29, 57]	42 [28, 56]
RVCO (l/min)	5 [3, 6]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]	4 [2, 6]
RVEF (%)	62 [50, 73]	62 [51, 74]	63 [52, 74]	64 [52, 75]	64 [53, 76]	65 [54, 77]
<b>Left atrium</b>						
LAESV (ml)	55 [30, 80]	53 [29, 78]	52 [28, 77]	51 [26, 76]	50 [25, 75]	49 [24, 74]
LAESVi (ml/m <sup>2</sup> )	35 [20, 50]	34 [19, 49]	33 [18, 48]	33 [18, 48]	32 [17, 47]	31 [16, 46]
LA max (ml)	58 [32, 83]	57 [31, 82]	55 [30, 81]	54 [29, 79]	53 [28, 78]	52 [26, 77]
LA max i (ml/m <sup>2</sup> )	37 [21, 52]	36 [21, 51]	35 [20, 50]	34 [19, 50]	34 [18, 49]	33 [18, 48]
LAEF (%)	65 [50, 80]	65 [50, 80]	64 [49, 79]	64 [49, 79]	63 [48, 78]	63 [48, 78]
<b>Right atrium</b>						
RAESV (ml)	48 [20, 75]	50 [22, 77]	52 [25, 80]	54 [27, 82]	56 [29, 84]	59 [31, 86]
RAESVi (ml/m <sup>2</sup> )	30 [12, 48]	32 [14, 50]	33 [15, 51]	35 [17, 53]	36 [18, 54]	38 [20, 56]
RA max (ml)	49 [21, 77]	52 [24, 79]	54 [27, 82]	57 [29, 84]	59 [31, 87]	61 [34, 89]
RA max i (ml/m <sup>2</sup> )	31 [13, 49]	33 [15, 51]	34 [17, 52]	36 [18, 54]	38 [20, 56]	39 [22, 57]
RAEF (%)	58 [44, 73]	57 [42, 72]	56 [41, 70]	55 [40, 69]	53 [39, 68]	52 [37, 67]

**Table S24. CMR metrics in women of Chinese ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(13 - 16)	(18)	(10 - 24)	(46 - 66)	(35 - 52)	(11 - 12)
<b>Left ventricle</b>						
LVEDV (ml)	118 [85, 151]	114 [81, 147]	111 [78, 143]	107 [74, 139]	103 [70, 136]	99 [67, 132]
LVEDVi (ml/m)	73 [54, 93]	71 [52, 91]	69 [50, 89]	68 [48, 87]	66 [47, 85]	64 [45, 83]
LVESV (ml)	41 [24, 59]	39 [22, 57]	37 [20, 55]	35 [18, 53]	33 [16, 51]	31 [14, 49]
LVESVi (ml/m)	26 [15, 36]	25 [14, 35]	23 [13, 34]	22 [12, 33]	21 [11, 32]	20 [9, 31]
LVSV (ml/m)	77 [52, 101]	75 [51, 99]	73 [49, 98]	72 [47, 96]	70 [46, 94]	68 [44, 93]
LVSVi (ml/m)	47 [33, 62]	47 [32, 61]	46 [32, 61]	45 [31, 60]	45 [30, 59]	44 [29, 59]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	5 [3, 6]	5 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	65 [54, 76]	66 [55, 77]	66 [55, 77]	67 [56, 78]	68 [57, 79]	69 [58, 80]
LVM diast (g)	61 [40, 82]	62 [41, 83]	63 [43, 84]	65 [44, 86]	66 [45, 87]	68 [47, 88]
LVMi diast (g)	38 [25, 50]	39 [26, 51]	40 [28, 52]	41 [29, 53]	42 [30, 55]	43 [31, 56]
LVM syst (g)	65 [42, 88]	66 [43, 88]	66 [43, 89]	66 [44, 89]	67 [44, 89]	67 [44, 90]
LVMi syst (g/m)	40 [27, 54]	41 [27, 55]	41 [28, 55]	42 [28, 56]	42 [29, 56]	43 [29, 57]
<b>Right ventricle</b>						
RVEDV (ml)	116 [77, 154]	113 [75, 151]	110 [72, 148]	107 [69, 145]	104 [67, 142]	102 [64, 140]
RVEDVi (ml/m)	72 [49, 94]	70 [48, 93]	69 [47, 92]	68 [45, 90]	67 [44, 89]	65 [43, 88]
RVESV (ml)	45 [24, 65]	43 [22, 63]	41 [21, 61]	39 [19, 60]	37 [17, 58]	36 [15, 56]
RVESVi (ml/m)	28 [15, 40]	27 [14, 39]	26 [13, 38]	25 [12, 37]	24 [11, 36]	23 [10, 36]
RVSV (ml)	71 [46, 96]	70 [45, 95]	69 [44, 94]	68 [43, 93]	67 [42, 92]	66 [41, 91]
RVSVi (ml/m)	44 [29, 59]	44 [29, 59]	43 [29, 58]	43 [28, 58]	43 [28, 58]	42 [27, 57]
RVCO (l/min)	5 [3, 6]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]	4 [2, 6]
RVEF (%)	62 [50, 73]	62 [51, 74]	63 [52, 74]	64 [52, 75]	64 [53, 76]	65 [54, 77]
<b>Left atrium</b>						
LAESV (ml)	55 [30, 80]	53 [29, 78]	52 [28, 77]	51 [26, 76]	50 [25, 75]	49 [24, 74]
LAESVi (ml/m)	34 [18, 50]	33 [18, 49]	33 [17, 48]	32 [17, 48]	32 [16, 48]	32 [16, 47]
LA max (ml)	58 [32, 83]	57 [31, 82]	55 [30, 81]	54 [29, 79]	53 [28, 78]	52 [26, 77]
LA max i (ml/m)	36 [20, 52]	35 [19, 51]	35 [19, 51]	34 [19, 50]	34 [18, 50]	33 [17, 49]
LAEF (%)	65 [50, 80]	65 [50, 80]	64 [49, 79]	64 [49, 79]	63 [48, 78]	63 [48, 78]
<b>Right atrium</b>						
RAESV (ml)	48 [20, 75]	50 [22, 77]	52 [25, 80]	54 [27, 82]	56 [29, 84]	59 [31, 86]
RAESVi (ml/m)	30 [12, 47]	31 [14, 48]	33 [16, 50]	34 [17, 51]	36 [19, 53]	38 [20, 55]
RA max (ml)	49 [21, 77]	52 [24, 79]	54 [27, 82]	57 [29, 84]	59 [31, 87]	61 [34, 89]
RA max i (ml/m)	30 [13, 48]	32 [15, 49]	34 [17, 51]	36 [19, 53]	38 [21, 55]	39 [22, 57]
RAEF (%)	58 [44, 73]	57 [42, 72]	56 [41, 70]	55 [40, 69]	53 [39, 68]	52 [37, 67]

**Table S25. CMR metrics in women of Chinese ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(13 - 16)	(18)	(10 - 24)	(46 - 66)	(35 - 52)	(11 - 12)
<b>Left ventricle</b>						
LVEDV (ml)	112 [81, 143]	108 [77, 139]	104 [73, 135]	100 [69, 131]	96 [65, 126]	91 [61, 122]
LVEDVi (ml/m <sup>2</sup> )	71 [55, 88]	69 [52, 85]	66 [50, 82]	64 [47, 80]	61 [45, 77]	58 [42, 75]
LVESV (ml)	37 [22, 53]	35 [19, 50]	32 [17, 47]	29 [14, 45]	27 [11, 42]	24 [9, 40]
LVESVi (ml/m <sup>2</sup> )	24 [14, 33]	22 [13, 31]	20 [11, 29]	19 [10, 28]	17 [8, 26]	15 [6, 25]
LVSV (ml)	75 [52, 99]	74 [50, 97]	72 [49, 96]	71 [47, 94]	69 [46, 92]	68 [44, 91]
LVSVi (ml/m <sup>2</sup> )	48 [35, 61]	47 [34, 60]	46 [33, 59]	45 [32, 58]	44 [31, 57]	43 [30, 56]
LVCO (l/min)	5 [3, 7]	5 [3, 6]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	67 [56, 78]	68 [57, 79]	69 [59, 80]	71 [60, 82]	72 [61, 83]	73 [62, 84]
LVM diast (g)	66 [43, 90]	68 [45, 91]	70 [47, 93]	72 [49, 95]	74 [51, 97]	76 [53, 99]
LVMi diast (g/m <sup>2</sup> )	42 [31, 53]	43 [33, 54]	45 [34, 55]	46 [35, 57]	47 [36, 58]	48 [37, 59]
LVM syst (g)	70 [44, 95]	71 [46, 96]	72 [47, 97]	73 [48, 98]	74 [49, 99]	75 [50, 100]
LVMi syst (g/m <sup>2</sup> )	44 [32, 57]	45 [33, 57]	46 [33, 58]	46 [34, 58]	47 [35, 59]	47 [35, 60]
<b>Right ventricle</b>						
RVEDV (ml)	110 [72, 148]	109 [70, 147]	107 [69, 145]	105 [68, 143]	104 [66, 142]	102 [64, 141]
RVEDVi (ml/m <sup>2</sup> )	70 [49, 91]	69 [48, 90]	68 [48, 89]	67 [47, 88]	66 [46, 87]	65 [45, 86]
RVESV (ml)	42 [20, 63]	41 [20, 62]	40 [19, 62]	40 [19, 61]	39 [18, 60]	38 [17, 60]
RVESVi (ml/m <sup>2</sup> )	27 [14, 39]	26 [14, 39]	26 [13, 38]	25 [13, 38]	25 [12, 37]	24 [12, 37]
RVSV (ml)	68 [44, 93]	67 [43, 92]	67 [42, 91]	66 [41, 90]	65 [40, 89]	64 [40, 89]
RVSVi (ml/m <sup>2</sup> )	43 [29, 57]	43 [29, 57]	42 [29, 56]	42 [28, 56]	41 [28, 55]	41 [27, 55]
RVCO (l/min)	4 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]	4 [2, 6]	4 [2, 6]
RVEF (%)	62 [50, 75]	62 [50, 75]	62 [50, 75]	63 [50, 75]	63 [50, 75]	63 [51, 75]
<b>Left atrium</b>						
LAESV (ml)	55 [30, 80]	53 [29, 78]	52 [28, 77]	51 [26, 76]	50 [25, 75]	49 [24, 74]
LAESVi (ml/m <sup>2</sup> )	35 [20, 50]	34 [19, 49]	33 [18, 48]	33 [18, 48]	32 [17, 47]	31 [16, 46]
LA max (ml)	58 [32, 83]	57 [31, 82]	55 [30, 81]	54 [29, 79]	53 [28, 78]	52 [26, 77]
LA max i (ml/m <sup>2</sup> )	37 [21, 52]	36 [21, 51]	35 [20, 50]	34 [19, 50]	34 [18, 49]	33 [18, 48]
LAEF (%)	65 [50, 80]	65 [50, 80]	64 [49, 79]	64 [49, 79]	63 [48, 78]	63 [48, 78]
<b>Right atrium</b>						
RAESV (ml)	48 [20, 75]	50 [22, 77]	52 [25, 80]	54 [27, 82]	56 [29, 84]	59 [31, 86]
RAESVi (ml/m <sup>2</sup> )	30 [12, 48]	32 [14, 50]	33 [15, 51]	35 [17, 53]	36 [18, 54]	38 [20, 56]
RA max (ml)	49 [21, 77]	52 [24, 79]	54 [27, 82]	57 [29, 84]	59 [31, 87]	61 [34, 89]
RA max i (ml/m <sup>2</sup> )	31 [13, 49]	33 [15, 51]	34 [17, 52]	36 [18, 54]	38 [20, 56]	39 [22, 57]
RAEF (%)	58 [44, 73]	57 [42, 72]	56 [41, 70]	55 [40, 69]	53 [39, 68]	52 [37, 67]

**Table S26. CMR metrics in women of Chinese ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(13 - 16)	(18)	(10 - 24)	(46 - 66)	(35 - 52)	(11 - 12)
<b>Left ventricle</b>						
LVEDV (ml)	112 [81, 143]	108 [77, 139]	104 [73, 135]	100 [69, 131]	96 [65, 126]	91 [61, 122]
LVEDVi (ml/m)	70 [51, 88]	68 [49, 86]	65 [47, 84]	63 [45, 81]	61 [43, 79]	59 [41, 77]
LVESV (ml)	37 [22, 53]	35 [19, 50]	32 [17, 47]	29 [14, 45]	27 [11, 42]	24 [9, 40]
LVESVi (ml/m)	23 [13, 33]	22 [12, 31]	20 [11, 30]	19 [9, 28]	17 [8, 27]	16 [6, 25]
LVSV (ml/m)	75 [52, 99]	74 [50, 97]	72 [49, 96]	71 [47, 94]	69 [46, 92]	68 [44, 91]
LVSVi (ml/m)	47 [33, 61]	46 [32, 60]	45 [32, 59]	45 [31, 59]	44 [30, 58]	43 [29, 57]
LVCO (l/min)	5 [3, 7]	5 [3, 6]	5 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]
LVEF (%)	67 [56, 78]	68 [57, 79]	69 [59, 80]	71 [60, 82]	72 [61, 83]	73 [62, 84]
LVM diast (g)	66 [43, 90]	68 [45, 91]	70 [47, 93]	72 [49, 95]	74 [51, 97]	76 [53, 99]
LVMi diast (g)	41 [27, 55]	43 [29, 56]	44 [30, 58]	46 [32, 59]	47 [33, 61]	49 [35, 63]
LVM syst (g)	70 [44, 95]	71 [46, 96]	72 [47, 97]	73 [48, 98]	74 [49, 99]	75 [50, 100]
LVMi syst (g/m)	43 [28, 58]	44 [29, 59]	45 [30, 60]	46 [31, 61]	47 [32, 62]	48 [33, 63]
<b>Right ventricle</b>						
RVEDV (ml)	110 [72, 148]	109 [70, 147]	107 [69, 145]	105 [68, 143]	104 [66, 142]	102 [64, 141]
RVEDVi (ml/m)	68 [45, 91]	68 [45, 90]	67 [45, 90]	67 [44, 89]	66 [44, 89]	66 [43, 89]
RVESV (ml)	42 [20, 63]	41 [20, 62]	40 [19, 62]	40 [19, 61]	39 [18, 60]	38 [17, 60]
RVESVi (ml/m)	26 [13, 39]	26 [13, 39]	25 [12, 38]	25 [12, 38]	25 [12, 38]	25 [12, 38]
RVSV (ml)	68 [44, 93]	67 [43, 92]	67 [42, 91]	66 [41, 90]	65 [40, 89]	64 [40, 89]
RVSVi (ml/m)	42 [27, 57]	42 [27, 57]	42 [27, 56]	42 [27, 56]	41 [27, 56]	41 [27, 56]
RVCO (l/min)	4 [3, 6]	4 [3, 6]	4 [3, 6]	4 [2, 6]	4 [2, 6]	4 [2, 6]
RVEF (%)	62 [50, 75]	62 [50, 75]	62 [50, 75]	63 [50, 75]	63 [50, 75]	63 [51, 75]
<b>Left atrium</b>						
LAESV (ml)	55 [30, 80]	53 [29, 78]	52 [28, 77]	51 [26, 76]	50 [25, 75]	49 [24, 74]
LAESVi (ml/m)	34 [18, 50]	33 [18, 49]	33 [17, 48]	32 [17, 48]	32 [16, 48]	32 [16, 47]
LA max (ml)	58 [32, 83]	57 [31, 82]	55 [30, 81]	54 [29, 79]	53 [28, 78]	52 [26, 77]
LA max i (ml/m)	36 [20, 52]	35 [19, 51]	35 [19, 51]	34 [19, 50]	34 [18, 50]	33 [17, 49]
LAEF (%)	65 [50, 80]	65 [50, 80]	64 [49, 79]	64 [49, 79]	63 [48, 78]	63 [48, 78]
<b>Right atrium</b>						
RAESV (ml)	48 [20, 75]	50 [22, 77]	52 [25, 80]	54 [27, 82]	56 [29, 84]	59 [31, 86]
RAESVi (ml/m)	30 [12, 47]	31 [14, 48]	33 [16, 50]	34 [17, 51]	36 [19, 53]	38 [20, 55]
RA max (ml)	49 [21, 77]	52 [24, 79]	54 [27, 82]	57 [29, 84]	59 [31, 87]	61 [34, 89]
RA max i (ml/m)	30 [13, 48]	32 [15, 49]	34 [17, 51]	36 [19, 53]	38 [21, 55]	39 [22, 57]
RAEF (%)	58 [44, 73]	57 [42, 72]	56 [41, 70]	55 [40, 69]	53 [39, 68]	52 [37, 67]

**Table S27. CMR metrics in women of Mixed/Other ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(133 - 137)	(107 - 111)	(47 - 51)
<b>Left ventricle</b>			
LVEDV (ml)	127 [85, 169]	118 [76, 160]	109 [66, 151]
LVEDVi (ml/m <sup>2</sup> )	71 [51, 92]	68 [47, 89]	65 [44, 85]
LVESV (ml)	47 [25, 68]	43 [22, 65]	40 [18, 62]
LVESVi (ml/m <sup>2</sup> )	26 [15, 37]	25 [14, 36]	24 [13, 35]
LVSV (ml)	81 [52, 109]	75 [46, 103]	69 [40, 97]
LVSVi (ml/m <sup>2</sup> )	45 [31, 60]	43 [29, 58]	41 [26, 56]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
LVEF (%)	63 [53, 74]	63 [52, 74]	63 [52, 74]
LVM diast (g)	72 [48, 95]	70 [46, 94]	68 [44, 92]
LVMi diast (g/m <sup>2</sup> )	41 [29, 52]	40 [29, 52]	40 [29, 52]
LVM syst (g)	69 [45, 94]	68 [43, 93]	67 [42, 92]
LVMi syst (g/m <sup>2</sup> )	39 [27, 51]	40 [28, 51]	40 [28, 52]
<b>Right ventricle</b>			
RVEDV (ml)	130 [84, 177]	121 [75, 168]	112 [65, 159]
RVEDVi (ml/m <sup>2</sup> )	73 [51, 96]	70 [48, 93]	67 [45, 90]
RVESV (ml)	49 [27, 71]	45 [23, 67]	41 [19, 64]
RVESVi (ml/m <sup>2</sup> )	28 [16, 39]	26 [15, 37]	25 [13, 36]
RVSV (ml)	81 [52, 110]	76 [47, 105]	71 [42, 100]
RVSVi (ml/m <sup>2</sup> )	46 [30, 61]	44 [29, 59]	42 [27, 58]
RVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 7]
RVEF (%)	63 [53, 72]	63 [53, 72]	63 [53, 73]
<b>Left atrium</b>			
LAESV (ml)	58 [27, 90]	56 [25, 88]	54 [23, 86]
LAESVi (ml/m <sup>2</sup> )	33 [17, 49]	33 [16, 49]	32 [16, 49]
LA max (ml)	62 [31, 93]	60 [29, 91]	58 [27, 90]
LA max i (ml/m <sup>2</sup> )	35 [19, 51]	35 [19, 51]	35 [19, 51]
LAEF (%)	66 [51, 81]	65 [50, 80]	64 [49, 79]
<b>Right atrium</b>			
RAESV (ml)	67 [28, 105]	63 [25, 102]	59 [21, 98]
RAESVi (ml/m <sup>2</sup> )	37 [16, 59]	36 [15, 58]	36 [14, 57]
RA max (ml)	69 [30, 108]	66 [27, 105]	63 [24, 102]
RA max i (ml/m <sup>2</sup> )	39 [17, 60]	38 [17, 59]	38 [17, 59]
RAEF (%)	52 [34, 69]	53 [35, 71]	54 [36, 72]

**Table S28. CMR metrics in women of Mixed/Other ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(133 - 137)	(107 - 111)	(46 - 51)
<b>Left ventricle</b>			
LVEDV (ml)	127 [85, 169]	118 [76, 160]	109 [66, 151]
LVEDVi (ml/m)	78 [54, 102]	74 [50, 98]	69 [45, 93]
LVESV (ml)	47 [25, 68]	43 [22, 65]	40 [18, 62]
LVESVi (ml/m)	29 [16, 41]	27 [14, 40]	25 [13, 38]
LVSV (ml/m)	81 [52, 109]	75 [46, 103]	69 [40, 97]
LVSVi (ml/m)	50 [33, 66]	47 [30, 63]	44 [27, 60]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
LVEF (%)	63 [53, 74]	63 [52, 74]	63 [52, 74]
LVM diast (g)	72 [48, 95]	70 [46, 94]	68 [44, 92]
LVMi diast (g)	44 [30, 58]	44 [30, 57]	43 [29, 57]
LVM syst (g)	69 [45, 94]	68 [43, 93]	67 [42, 92]
LVMi syst (g/m)	43 [28, 57]	43 [28, 57]	42 [28, 57]
<b>Right ventricle</b>			
RVEDV (ml)	130 [84, 177]	121 [75, 168]	112 [65, 159]
RVEDVi (ml/m)	80 [53, 107]	76 [49, 103]	72 [45, 99]
RVESV (ml)	49 [27, 71]	45 [23, 67]	41 [19, 64]
RVESVi (ml/m)	30 [17, 43]	28 [15, 41]	26 [13, 39]
RVSV (ml)	81 [52, 110]	76 [47, 105]	71 [42, 100]
RVSVi (ml/m)	50 [33, 67]	47 [30, 65]	45 [28, 62]
RVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 7]
RVEF (%)	63 [53, 72]	63 [53, 72]	63 [53, 73]
<b>Left atrium</b>			
LAESV (ml)	58 [27, 90]	56 [25, 88]	54 [23, 86]
LAESVi (ml/m)	36 [17, 55]	35 [16, 54]	34 [15, 53]
LA max (ml)	62 [31, 93]	60 [29, 91]	58 [27, 90]
LA max i (ml/m)	38 [20, 57]	38 [19, 56]	37 [18, 55]
LAEF (%)	66 [51, 81]	65 [50, 80]	64 [49, 79]
<b>Right atrium</b>			
RAESV (ml)	67 [28, 105]	63 [25, 102]	59 [21, 98]
RAESVi (ml/m)	41 [18, 64]	39 [17, 62]	38 [15, 60]
RA max (ml)	69 [30, 108]	66 [27, 105]	63 [24, 102]
RA max i (ml/m)	42 [20, 65]	41 [19, 63]	40 [17, 62]
RAEF (%)	52 [34, 69]	53 [35, 71]	54 [36, 72]

**Table S29. CMR metrics in women of Mixed/Other ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(133 - 137)	(107 - 111)	(47 - 51)
<b>Left ventricle</b>			
LVEDV (ml)	124 [83, 166]	116 [74, 157]	107 [65, 148]
LVEDVi (ml/m <sup>2</sup> )	70 [50, 90]	67 [47, 87]	64 [43, 84]
LVESV (ml)	43 [23, 64]	40 [20, 60]	37 [16, 57]
LVESVi (ml/m <sup>2</sup> )	24 [14, 35]	23 [12, 34]	22 [11, 33]
LVSV (ml)	81 [53, 110]	75 [47, 104]	70 [41, 98]
LVSVi (ml/m <sup>2</sup> )	46 [31, 60]	44 [29, 58]	41 [27, 56]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
LVEF (%)	65 [54, 76]	65 [54, 76]	65 [55, 76]
LVM diast (g)	74 [49, 99]	72 [47, 97]	70 [45, 95]
LVMi diast (g/m <sup>2</sup> )	42 [30, 54]	42 [30, 54]	42 [30, 53]
LVM syst (g)	72 [46, 99]	71 [45, 97]	70 [44, 96]
LVMi syst (g/m <sup>2</sup> )	41 [28, 54]	41 [29, 54]	42 [29, 54]
<b>Right ventricle</b>			
RVEDV (ml)	129 [83, 175]	120 [74, 166]	111 [65, 157]
RVEDVi (ml/m <sup>2</sup> )	73 [50, 95]	70 [47, 92]	66 [44, 89]
RVESV (ml)	49 [27, 70]	45 [23, 67]	41 [19, 63]
RVESVi (ml/m <sup>2</sup> )	27 [16, 38]	26 [15, 37]	24 [13, 36]
RVSV (ml)	80 [51, 109]	75 [46, 104]	70 [41, 100]
RVSVi (ml/m <sup>2</sup> )	45 [30, 60]	44 [28, 59]	42 [27, 57]
RVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 7]
RVEF (%)	63 [53, 72]	63 [53, 73]	63 [53, 73]
<b>Left atrium</b>			
LAESV (ml)	58 [27, 90]	56 [25, 88]	54 [23, 86]
LAESVi (ml/m <sup>2</sup> )	33 [17, 49]	33 [16, 49]	32 [16, 49]
LA max (ml)	62 [31, 93]	60 [29, 91]	58 [27, 90]
LA max i (ml/m <sup>2</sup> )	35 [19, 51]	35 [19, 51]	35 [19, 51]
LAEF (%)	66 [51, 81]	65 [50, 80]	64 [49, 79]
<b>Right atrium</b>			
RAESV (ml)	67 [28, 105]	63 [25, 102]	59 [21, 98]
RAESVi (ml/m <sup>2</sup> )	37 [16, 59]	36 [15, 58]	36 [14, 57]
RA max (ml)	69 [30, 108]	66 [27, 105]	63 [24, 102]
RA max i (ml/m <sup>2</sup> )	39 [17, 60]	38 [17, 59]	38 [17, 59]
RAEF (%)	52 [34, 69]	53 [35, 71]	54 [36, 72]



**Table S30. CMR metrics in women of Mixed/Other ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(133 - 137)	(107 - 111)	(46 - 51)
<b>Left ventricle</b>			
LVEDV (ml)	124 [83, 166]	116 [74, 157]	107 [65, 148]
LVEDVi (ml/m)	77 [53, 100]	72 [49, 96]	68 [44, 91]
LVESV (ml)	43 [23, 64]	40 [20, 60]	37 [16, 57]
LVESVi (ml/m)	27 [15, 39]	25 [13, 37]	23 [11, 35]
LVSV (ml/m)	81 [53, 110]	75 [47, 104]	70 [41, 98]
LVSVi (ml/m)	50 [34, 66]	47 [31, 64]	44 [28, 61]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
LVEF (%)	65 [54, 76]	65 [54, 76]	65 [55, 76]
LVM diast (g)	74 [49, 99]	72 [47, 97]	70 [45, 95]
LVMi diast (g)	46 [31, 60]	45 [30, 60]	44 [30, 59]
LVM syst (g)	72 [46, 99]	71 [45, 97]	70 [44, 96]
LVMi syst (g/m)	45 [29, 60]	45 [29, 60]	45 [29, 60]
<b>Right ventricle</b>			
RVEDV (ml)	129 [83, 175]	120 [74, 166]	111 [65, 157]
RVEDVi (ml/m)	79 [53, 106]	75 [49, 102]	71 [44, 98]
RVESV (ml)	49 [27, 70]	45 [23, 67]	41 [19, 63]
RVESVi (ml/m)	30 [17, 43]	28 [15, 41]	26 [13, 39]
RVSV (ml)	80 [51, 109]	75 [46, 104]	70 [41, 100]
RVSVi (ml/m)	49 [32, 66]	47 [30, 64]	45 [28, 62]
RVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 7]
RVEF (%)	63 [53, 72]	63 [53, 73]	63 [53, 73]
<b>Left atrium</b>			
LAESV (ml)	58 [27, 90]	56 [25, 88]	54 [23, 86]
LAESVi (ml/m)	36 [17, 55]	35 [16, 54]	34 [15, 53]
LA max (ml)	62 [31, 93]	60 [29, 91]	58 [27, 90]
LA max i (ml/m)	38 [20, 57]	38 [19, 56]	37 [18, 55]
LAEF (%)	66 [51, 81]	65 [50, 80]	64 [49, 79]
<b>Right atrium</b>			
RAESV (ml)	67 [28, 105]	63 [25, 102]	59 [21, 98]
RAESVi (ml/m)	41 [18, 64]	39 [17, 62]	38 [15, 60]
RA max (ml)	69 [30, 108]	66 [27, 105]	63 [24, 102]
RA max i (ml/m)	42 [20, 65]	41 [19, 63]	40 [17, 62]
RAEF (%)	52 [34, 69]	53 [35, 71]	54 [36, 72]

**Table S31. CMR metrics in women of Mixed/Other ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(133 - 137)	(107 - 111)	(47 - 51)
<b>Left ventricle</b>			
LVEDV (ml)	115 [77, 154]	106 [68, 145]	98 [59, 136]
LVEDVi (ml/m <sup>2</sup> )	65 [46, 83]	62 [43, 80]	59 [40, 78]
LVESV (ml)	36 [17, 54]	32 [14, 51]	29 [10, 48]
LVESVi (ml/m <sup>2</sup> )	20 [10, 30]	19 [9, 29]	17 [7, 28]
LVSV (ml)	79 [52, 107]	74 [46, 101]	68 [41, 96]
LVSVi (ml/m <sup>2</sup> )	45 [31, 58]	43 [29, 56]	41 [27, 55]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
LVEF (%)	69 [58, 80]	70 [59, 81]	71 [59, 82]
LVM diast (g)	84 [55, 112]	81 [53, 110]	79 [51, 107]
LVMi diast (g/m <sup>2</sup> )	47 [34, 61]	47 [34, 60]	47 [34, 60]
LVM syst (g)	81 [52, 110]	80 [50, 109]	79 [49, 108]
LVMi syst (g/m <sup>2</sup> )	46 [32, 60]	46 [32, 60]	46 [32, 61]
<b>Right ventricle</b>			
RVEDV (ml)	130 [84, 176]	121 [75, 167]	112 [66, 158]
RVEDVi (ml/m <sup>2</sup> )	73 [51, 96]	70 [48, 92]	67 [45, 89]
RVESV (ml)	51 [29, 73]	47 [24, 69]	43 [20, 65]
RVESVi (ml/m <sup>2</sup> )	28 [17, 40]	27 [16, 38]	26 [14, 37]
RVSV (ml)	79 [51, 107]	74 [46, 102]	69 [41, 98]
RVSVi (ml/m <sup>2</sup> )	45 [30, 60]	43 [28, 58]	41 [26, 56]
RVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
RVEF (%)	61 [52, 71]	61 [51, 71]	61 [51, 71]
<b>Left atrium</b>			
LAESV (ml)	58 [27, 90]	56 [25, 88]	54 [23, 86]
LAESVi (ml/m <sup>2</sup> )	33 [17, 49]	33 [16, 49]	32 [16, 49]
LA max (ml)	62 [31, 93]	60 [29, 91]	58 [27, 90]
LA max i (ml/m <sup>2</sup> )	35 [19, 51]	35 [19, 51]	35 [19, 51]
LAEF (%)	66 [51, 81]	65 [50, 80]	64 [49, 79]
<b>Right atrium</b>			
RAESV (ml)	67 [28, 105]	63 [25, 102]	59 [21, 98]
RAESVi (ml/m <sup>2</sup> )	37 [16, 59]	36 [15, 58]	36 [14, 57]
RA max (ml)	69 [30, 108]	66 [27, 105]	63 [24, 102]
RA max i (ml/m <sup>2</sup> )	39 [17, 60]	38 [17, 59]	38 [17, 59]
RAEF (%)	52 [34, 69]	53 [35, 71]	54 [36, 72]

**Table S32. CMR metrics in women of Mixed/Other ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(133 - 137)	(107 - 111)	(46 - 51)
<b>Left ventricle</b>			
LVEDV (ml)	115 [77, 154]	106 [68, 145]	98 [59, 136]
LVEDVi (ml/m)	71 [49, 93]	67 [45, 88]	62 [40, 84]
LVESV (ml)	36 [17, 54]	32 [14, 51]	29 [10, 48]
LVESVi (ml/m)	22 [11, 33]	20 [9, 31]	18 [7, 30]
LVSV (ml/m)	79 [52, 107]	74 [46, 101]	68 [41, 96]
LVSVi (ml/m)	49 [33, 64]	46 [31, 62]	43 [28, 59]
LVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
LVEF (%)	69 [58, 80]	70 [59, 81]	71 [59, 82]
LVM diast (g)	84 [55, 112]	81 [53, 110]	79 [51, 107]
LVMi diast (g)	52 [35, 68]	51 [34, 67]	50 [34, 67]
LVM syst (g)	81 [52, 110]	80 [50, 109]	79 [49, 108]
LVMi syst (g/m)	50 [33, 67]	50 [33, 67]	50 [33, 67]
<b>Right ventricle</b>			
RVEDV (ml)	130 [84, 176]	121 [75, 167]	112 [66, 158]
RVEDVi (ml/m)	80 [54, 106]	76 [50, 102]	71 [45, 98]
RVESV (ml)	51 [29, 73]	47 [24, 69]	43 [20, 65]
RVESVi (ml/m)	31 [18, 44]	29 [16, 42]	27 [14, 40]
RVSV (ml)	79 [51, 107]	74 [46, 102]	69 [41, 98]
RVSVi (ml/m)	49 [32, 65]	46 [30, 63]	44 [27, 61]
RVCO (l/min)	5 [3, 7]	5 [3, 7]	4 [2, 6]
RVEF (%)	61 [52, 71]	61 [51, 71]	61 [51, 71]
<b>Left atrium</b>			
LAESV (ml)	58 [27, 90]	56 [25, 88]	54 [23, 86]
LAESVi (ml/m)	36 [17, 55]	35 [16, 54]	34 [15, 53]
LA max (ml)	62 [31, 93]	60 [29, 91]	58 [27, 90]
LA max i (ml/m)	38 [20, 57]	38 [19, 56]	37 [18, 55]
LAEF (%)	66 [51, 81]	65 [50, 80]	64 [49, 79]
<b>Right atrium</b>			
RAESV (ml)	67 [28, 105]	63 [25, 102]	59 [21, 98]
RAESVi (ml/m)	41 [18, 64]	39 [17, 62]	38 [15, 60]
RA max (ml)	69 [30, 108]	66 [27, 105]	63 [24, 102]
RA max i (ml/m)	42 [20, 65]	41 [19, 63]	40 [17, 62]
RAEF (%)	52 [34, 69]	53 [35, 71]	54 [36, 72]

**Table S33. CMR metrics in men of White ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(52 - 113)	(67 - 135)	(378 - 447)	(784 - 839)	(771 - 817)	(1,212 - 1,283)
<b>Left ventricle</b>						
LVEDV (ml)	193 [134, 252]	185 [126, 244]	176 [117, 235]	168 [109, 227]	159 [101, 218]	151 [92, 210]
LVEDVi (ml/m <sup>2</sup> )	92 [65, 119]	89 [61, 116]	85 [58, 112]	82 [54, 109]	78 [51, 106]	75 [48, 102]
LVESV (ml)	80 [46, 113]	76 [42, 109]	72 [39, 105]	68 [35, 101]	64 [31, 98]	61 [27, 94]
LVESVi (ml/m <sup>2</sup> )	38 [22, 54]	36 [21, 52]	35 [19, 50]	33 [18, 49]	32 [16, 47]	30 [14, 46]
LVSV (ml)	113 [75, 151]	109 [71, 147]	104 [66, 142]	100 [62, 137]	95 [57, 133]	90 [52, 128]
LVSVi (ml/m <sup>2</sup> )	54 [36, 72]	52 [34, 70]	50 [32, 68]	48 [31, 66]	47 [29, 64]	45 [27, 63]
LVCO (l/min)	7 [5, 10]	7 [5, 10]	7 [4, 9]	6 [4, 9]	6 [3, 9]	6 [3, 8]
LVEF (%)	59 [46, 71]	59 [46, 71]	59 [47, 72]	59 [47, 72]	60 [47, 72]	60 [48, 73]
LVM diast (g)	117 [82, 152]	114 [79, 149]	111 [76, 147]	108 [73, 144]	105 [70, 141]	102 [67, 138]
LVMi diast (g/m <sup>2</sup> )	55 [42, 69]	54 [41, 68]	53 [40, 67]	53 [39, 66]	52 [38, 65]	51 [37, 64]
LVM syst (g)	114 [75, 154]	112 [73, 151]	109 [70, 148]	107 [67, 146]	104 [65, 143]	101 [62, 140]
LVMi syst (g/m <sup>2</sup> )	54 [38, 71]	54 [37, 70]	53 [36, 69]	52 [35, 68]	51 [35, 67]	50 [34, 66]
<b>Right ventricle</b>						
RVEDV (ml)	208 [146, 269]	198 [136, 260]	188 [127, 250]	179 [117, 240]	169 [108, 231]	160 [98, 221]
RVEDVi (ml/m <sup>2</sup> )	99 [70, 128]	95 [66, 124]	91 [62, 120]	87 [58, 116]	83 [54, 112]	79 [50, 108]
RVESV (ml)	90 [55, 126]	85 [50, 121]	80 [45, 116]	75 [40, 111]	70 [34, 106]	65 [29, 101]
RVESVi (ml/m <sup>2</sup> )	43 [26, 60]	41 [24, 58]	39 [22, 56]	37 [20, 53]	34 [17, 51]	32 [15, 49]
RVSV (ml)	118 [76, 159]	113 [71, 155]	108 [67, 150]	104 [62, 146]	99 [58, 141]	95 [53, 136]
RVSVi (ml/m <sup>2</sup> )	56 [36, 76]	54 [34, 74]	52 [32, 72]	51 [31, 71]	49 [29, 69]	47 [27, 67]
RVCO (l/min)	8 [5, 11]	7 [5, 10]	7 [4, 10]	7 [4, 10]	6 [3, 9]	6 [3, 9]
RVEF (%)	56 [43, 69]	57 [44, 70]	58 [45, 71]	58 [45, 71]	59 [46, 72]	59 [46, 72]
<b>Left atrium</b>						
LAESV (ml)	77 [34, 120]	74 [31, 117]	71 [28, 114]	68 [25, 111]	65 [22, 108]	62 [19, 105]
LAESVi (ml/m <sup>2</sup> )	36 [16, 56]	35 [15, 55]	34 [14, 54]	33 [13, 53]	32 [11, 52]	31 [10, 51]
LA max (ml)	83 [40, 126]	80 [37, 123]	76 [33, 119]	73 [30, 116]	70 [27, 113]	67 [24, 110]
LA max i (ml/m <sup>2</sup> )	39 [19, 59]	38 [17, 58]	36 [16, 57]	35 [15, 56]	34 [14, 54]	33 [13, 53]
LAEF (%)	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]
<b>Right atrium</b>						
RAESV (ml)	86 [33, 139]	86 [33, 138]	85 [33, 138]	85 [32, 137]	84 [32, 137]	84 [32, 136]
RAESVi (ml/m <sup>2</sup> )	40 [14, 67]	41 [14, 67]	41 [15, 67]	41 [15, 68]	42 [15, 68]	42 [16, 68]
RA max (ml)	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]
RA max i (ml/m <sup>2</sup> )	42 [16, 68]	42 [16, 68]	43 [17, 69]	43 [17, 69]	44 [18, 70]	44 [18, 70]
RAEF (%)	50 [30, 70]	51 [31, 71]	51 [31, 71]	51 [32, 71]	52 [32, 72]	52 [32, 72]

**Table S34. CMR metrics in men of White ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(52 - 113)	(67 - 135)	(378 - 446)	(784 - 838)	(773 - 817)	(1,212 - 1,283)
<b>Left ventricle</b>						
LVEDV (ml)	193 [134, 252]	185 [126, 244]	176 [117, 235]	168 [109, 227]	159 [101, 218]	151 [92, 210]
LVEDVi (ml/m)	106 [75, 138]	102 [71, 134]	99 [67, 130]	95 [63, 126]	91 [59, 122]	87 [55, 118]
LVESV (ml)	80 [46, 113]	76 [42, 109]	72 [39, 105]	68 [35, 101]	64 [31, 98]	61 [27, 94]
LVESVi (ml/m)	44 [26, 62]	42 [24, 60]	40 [22, 58]	38 [20, 57]	37 [18, 55]	35 [17, 53]
LVSV (ml/m)	113 [75, 151]	109 [71, 147]	104 [66, 142]	100 [62, 137]	95 [57, 133]	90 [52, 128]
LVSVi (ml/m)	62 [42, 83]	60 [40, 81]	58 [38, 79]	56 [35, 77]	54 [33, 75]	52 [31, 72]
LVCO (l/min)	7 [5, 10]	7 [5, 10]	7 [4, 9]	6 [4, 9]	6 [3, 9]	6 [3, 8]
LVEF (%)	59 [46, 71]	59 [46, 71]	59 [47, 72]	59 [47, 72]	60 [47, 72]	60 [48, 73]
LVM diast (g)	117 [82, 152]	114 [79, 149]	111 [76, 147]	108 [73, 144]	105 [70, 141]	102 [67, 138]
LVMi diast (g)	64 [45, 83]	63 [44, 82]	62 [43, 81]	61 [42, 80]	60 [41, 79]	59 [40, 78]
LVM syst (g)	114 [75, 154]	112 [73, 151]	109 [70, 148]	107 [67, 146]	104 [65, 143]	101 [62, 140]
LVMi syst (g/m)	63 [42, 84]	62 [41, 83]	61 [40, 82]	60 [39, 82]	59 [38, 81]	58 [37, 80]
<b>Right ventricle</b>						
RVEDV (ml)	208 [146, 269]	198 [136, 260]	188 [127, 250]	179 [117, 240]	169 [108, 231]	160 [98, 221]
RVEDVi (ml/m)	114 [81, 147]	110 [77, 143]	105 [72, 138]	101 [68, 134]	96 [63, 129]	92 [59, 125]
RVESV (ml)	90 [55, 126]	85 [50, 121]	80 [45, 116]	75 [40, 111]	70 [34, 106]	65 [29, 101]
RVESVi (ml/m)	50 [30, 69]	47 [28, 67]	45 [25, 64]	42 [23, 62]	40 [20, 59]	37 [18, 57]
RVSV (ml)	118 [76, 159]	113 [71, 155]	108 [67, 150]	104 [62, 146]	99 [58, 141]	95 [53, 136]
RVSVi (ml/m)	65 [42, 87]	63 [40, 85]	61 [38, 83]	59 [36, 81]	56 [34, 79]	54 [32, 77]
RVCO (l/min)	8 [5, 11]	7 [5, 10]	7 [4, 10]	7 [4, 10]	6 [3, 9]	6 [3, 9]
RVEF (%)	56 [43, 69]	57 [44, 70]	58 [45, 71]	58 [45, 71]	59 [46, 72]	59 [46, 72]
<b>Left atrium</b>						
LAESV (ml)	77 [34, 120]	74 [31, 117]	71 [28, 114]	68 [25, 111]	65 [22, 108]	62 [19, 105]
LAESVi (ml/m)	42 [18, 66]	41 [17, 65]	40 [15, 64]	38 [14, 62]	37 [13, 61]	35 [11, 60]
LA max (ml)	83 [40, 126]	80 [37, 123]	76 [33, 119]	73 [30, 116]	70 [27, 113]	67 [24, 110]
LA max i (ml/m)	46 [21, 70]	44 [20, 68]	43 [18, 67]	41 [17, 65]	40 [16, 64]	38 [14, 63]
LAEF (%)	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]
<b>Right atrium</b>						
RAESV (ml)	86 [33, 139]	86 [33, 138]	85 [33, 138]	85 [32, 137]	84 [32, 137]	84 [32, 136]
RAESVi (ml/m)	47 [18, 76]	47 [18, 76]	48 [19, 77]	48 [19, 77]	48 [19, 77]	48 [19, 77]
RA max (ml)	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]
RA max i (ml/m)	49 [20, 78]	49 [21, 78]	50 [21, 78]	50 [21, 79]	50 [22, 79]	51 [22, 80]
RAEF (%)	50 [30, 70]	51 [31, 71]	51 [31, 71]	51 [32, 71]	52 [32, 72]	52 [32, 72]

**Table S35. CMR metrics in men of White ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(52 - 113)	(67 - 135)	(378 - 447)	(784 - 839)	(771 - 818)	(1,212 - 1,283)
<b>Left ventricle</b>						
LVEDV (ml)	188 [130, 245]	180 [122, 237]	172 [114, 229]	164 [106, 221]	156 [98, 213]	148 [90, 205]
LVEDVi (ml/m <sup>2</sup> )	90 [63, 116]	86 [59, 113]	83 [56, 110]	80 [53, 106]	76 [50, 103]	73 [46, 100]
LVESV (ml)	74 [42, 105]	70 [39, 101]	66 [35, 98]	63 [32, 94]	59 [28, 91]	56 [25, 87]
LVESVi (ml/m <sup>2</sup> )	35 [20, 50]	34 [19, 48]	32 [17, 47]	31 [16, 45]	29 [14, 44]	28 [13, 42]
LVSV (ml)	114 [76, 152]	109 [72, 147]	105 [67, 143]	100 [63, 138]	96 [58, 134]	92 [54, 129]
LVSVi (ml/m <sup>2</sup> )	54 [36, 72]	53 [35, 70]	51 [33, 69]	49 [31, 67]	47 [29, 65]	45 [27, 63]
LVCO (l/min)	8 [5, 10]	7 [5, 10]	7 [4, 9]	6 [4, 9]	6 [4, 9]	6 [3, 8]
LVEF (%)	61 [48, 73]	61 [49, 73]	61 [49, 73]	62 [49, 74]	62 [50, 74]	62 [50, 75]
LVM diast (g)	122 [85, 160]	119 [82, 156]	116 [79, 153]	113 [76, 150]	109 [72, 146]	106 [69, 143]
LVMi diast (g/m <sup>2</sup> )	58 [43, 73]	57 [42, 72]	56 [41, 71]	55 [40, 69]	54 [39, 68]	52 [38, 67]
LVM syst (g)	121 [79, 163]	118 [76, 160]	115 [73, 157]	112 [70, 154]	109 [67, 151]	106 [65, 148]
LVMi syst (g/m <sup>2</sup> )	58 [40, 75]	57 [39, 74]	56 [38, 73]	55 [37, 72]	53 [36, 71]	52 [35, 70]
<b>Right ventricle</b>						
RVEDV (ml)	203 [142, 264]	194 [133, 255]	185 [124, 246]	176 [115, 237]	167 [106, 228]	158 [97, 219]
RVEDVi (ml/m <sup>2</sup> )	97 [68, 125]	93 [65, 122]	89 [61, 118]	86 [57, 114]	82 [54, 111]	78 [50, 107]
RVESV (ml)	87 [52, 122]	82 [47, 117]	78 [43, 113]	73 [38, 108]	69 [34, 104]	65 [30, 99]
RVESVi (ml/m <sup>2</sup> )	41 [25, 58]	39 [23, 56]	38 [21, 54]	36 [19, 52]	34 [17, 50]	32 [15, 48]
RVSV (ml)	117 [75, 158]	112 [71, 153]	108 [66, 149]	103 [62, 144]	98 [57, 140]	94 [53, 135]
RVSVi (ml/m <sup>2</sup> )	56 [36, 75]	54 [34, 74]	52 [32, 72]	50 [30, 70]	48 [29, 68]	47 [27, 66]
RVCO (l/min)	8 [5, 11]	7 [5, 10]	7 [4, 10]	7 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	57 [44, 70]	58 [45, 71]	58 [45, 71]	59 [45, 72]	59 [46, 72]	59 [46, 72]
<b>Left atrium</b>						
LAESV (ml)	77 [34, 120]	74 [31, 117]	71 [28, 114]	68 [25, 111]	65 [22, 108]	62 [19, 105]
LAESVi (ml/m <sup>2</sup> )	36 [16, 56]	35 [15, 55]	34 [14, 54]	33 [13, 53]	32 [11, 52]	31 [10, 51]
LA max (ml)	83 [40, 126]	80 [37, 123]	76 [33, 119]	73 [30, 116]	70 [27, 113]	67 [24, 110]
LA max i (ml/m <sup>2</sup> )	39 [19, 59]	38 [17, 58]	36 [16, 57]	35 [15, 56]	34 [14, 54]	33 [13, 53]
LAEF (%)	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]
<b>Right atrium</b>						
RAESV (ml)	86 [33, 139]	86 [33, 138]	85 [33, 138]	85 [32, 137]	84 [32, 137]	84 [32, 136]
RAESVi (ml/m <sup>2</sup> )	40 [14, 67]	41 [14, 67]	41 [15, 67]	41 [15, 68]	42 [15, 68]	42 [16, 68]
RA max (ml)	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]
RA max i (ml/m <sup>2</sup> )	42 [16, 68]	42 [16, 68]	43 [17, 69]	43 [17, 69]	44 [18, 70]	44 [18, 70]
RAEF (%)	50 [30, 70]	51 [31, 71]	51 [31, 71]	51 [32, 71]	52 [32, 72]	52 [32, 72]

**Table S36. CMR metrics in men of White ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(52 - 113)	(67 - 135)	(378 - 445)	(784 - 838)	(773 - 817)	(1,212 - 1,283)
<b>Left ventricle</b>						
LVEDV (ml)	188 [130, 245]	180 [122, 237]	172 [114, 229]	164 [106, 221]	156 [98, 213]	148 [90, 205]
LVEDVi (ml/m)	103 [72, 134]	100 [69, 131]	96 [65, 127]	92 [61, 123]	88 [58, 119]	85 [54, 116]
LVESV (ml)	74 [42, 105]	70 [39, 101]	66 [35, 98]	63 [32, 94]	59 [28, 91]	56 [25, 87]
LVESVi (ml/m)	41 [23, 58]	39 [22, 56]	37 [20, 54]	35 [18, 53]	34 [17, 51]	32 [15, 49]
LVSV (ml/m)	114 [76, 152]	109 [72, 147]	105 [67, 143]	100 [63, 138]	96 [58, 134]	92 [54, 129]
LVSVi (ml/m)	63 [42, 83]	61 [40, 81]	59 [38, 79]	57 [36, 77]	55 [34, 75]	53 [32, 73]
LVCO (l/min)	8 [5, 10]	7 [5, 10]	7 [4, 9]	6 [4, 9]	6 [4, 9]	6 [3, 8]
LVEF (%)	61 [48, 73]	61 [49, 73]	61 [49, 73]	62 [49, 74]	62 [50, 74]	62 [50, 75]
LVM diast (g)	122 [85, 160]	119 [82, 156]	116 [79, 153]	113 [76, 150]	109 [72, 146]	106 [69, 143]
LVMi diast (g)	67 [48, 87]	66 [46, 86]	65 [45, 85]	64 [44, 83]	62 [42, 82]	61 [41, 81]
LVM syst (g)	121 [79, 163]	118 [76, 160]	115 [73, 157]	112 [70, 154]	109 [67, 151]	106 [65, 148]
LVMi syst (g/m)	67 [44, 89]	65 [43, 88]	64 [42, 87]	63 [40, 86]	62 [39, 85]	61 [38, 84]
<b>Right ventricle</b>						
RVEDV (ml)	203 [142, 264]	194 [133, 255]	185 [124, 246]	176 [115, 237]	167 [106, 228]	158 [97, 219]
RVEDVi (ml/m)	112 [79, 145]	108 [75, 140]	103 [71, 136]	99 [66, 132]	95 [62, 128]	91 [58, 124]
RVESV (ml)	87 [52, 122]	82 [47, 117]	78 [43, 113]	73 [38, 108]	69 [34, 104]	65 [30, 99]
RVESVi (ml/m)	48 [29, 67]	46 [27, 65]	43 [24, 63]	41 [22, 60]	39 [20, 58]	37 [18, 56]
RVSV (ml)	117 [75, 158]	112 [71, 153]	108 [66, 149]	103 [62, 144]	98 [57, 140]	94 [53, 135]
RVSVi (ml/m)	64 [42, 87]	62 [40, 85]	60 [38, 83]	58 [36, 81]	56 [33, 79]	54 [31, 76]
RVCO (l/min)	8 [5, 11]	7 [5, 10]	7 [4, 10]	7 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	57 [44, 70]	58 [45, 71]	58 [45, 71]	59 [45, 72]	59 [46, 72]	59 [46, 72]
<b>Left atrium</b>						
LAESV (ml)	77 [34, 120]	74 [31, 117]	71 [28, 114]	68 [25, 111]	65 [22, 108]	62 [19, 105]
LAESVi (ml/m)	42 [18, 66]	41 [17, 65]	40 [15, 64]	38 [14, 62]	37 [13, 61]	35 [11, 60]
LA max (ml)	83 [40, 126]	80 [37, 123]	76 [33, 119]	73 [30, 116]	70 [27, 113]	67 [24, 110]
LA max i (ml/m)	46 [21, 70]	44 [20, 68]	43 [18, 67]	41 [17, 65]	40 [16, 64]	38 [14, 63]
LAEF (%)	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]
<b>Right atrium</b>						
RAESV (ml)	86 [33, 139]	86 [33, 138]	85 [33, 138]	85 [32, 137]	84 [32, 137]	84 [32, 136]
RAESVi (ml/m)	47 [18, 76]	47 [18, 76]	48 [19, 77]	48 [19, 77]	48 [19, 77]	48 [19, 77]
RA max (ml)	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]
RA max i (ml/m)	49 [20, 78]	49 [21, 78]	50 [21, 78]	50 [21, 79]	50 [22, 79]	51 [22, 80]
RAEF (%)	50 [30, 70]	51 [31, 71]	51 [31, 71]	51 [32, 71]	52 [32, 72]	52 [32, 72]

**Table S37. CMR metrics in men of White ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(52 - 113)	(67 - 135)	(378 - 447)	(784 - 840)	(771 - 818)	(1,212 - 1,283)
<b>Left ventricle</b>						
LVEDV (ml)	175 [120, 229]	167 [113, 221]	159 [105, 213]	151 [97, 205]	143 [89, 197]	135 [81, 189]
LVEDVi (ml/m <sup>2</sup> )	83 [58, 109]	80 [55, 106]	77 [51, 102]	73 [48, 99]	70 [45, 96]	67 [41, 92]
LVESV (ml)	63 [35, 91]	59 [31, 87]	56 [28, 84]	52 [24, 80]	48 [20, 76]	45 [17, 73]
LVESVi (ml/m <sup>2</sup> )	30 [17, 44]	29 [15, 42]	27 [13, 40]	25 [12, 39]	24 [10, 37]	22 [9, 35]
LVSV (ml)	112 [75, 149]	107 [70, 144]	103 [66, 140]	99 [62, 136]	94 [58, 131]	90 [53, 127]
LVSVi (ml/m <sup>2</sup> )	53 [36, 71]	52 [34, 69]	50 [32, 67]	48 [31, 66]	46 [29, 64]	45 [27, 62]
LVCO (l/min)	7 [5, 10]	7 [5, 10]	7 [4, 9]	6 [4, 9]	6 [4, 8]	6 [3, 8]
LVEF (%)	64 [51, 76]	64 [52, 77]	65 [53, 77]	66 [53, 78]	66 [54, 79]	67 [55, 80]
LVM diast (g)	136 [94, 178]	133 [91, 175]	130 [88, 171]	126 [84, 168]	123 [81, 165]	120 [78, 161]
LVMi diast (g/m <sup>2</sup> )	65 [48, 81]	63 [47, 80]	62 [46, 79]	61 [45, 78]	60 [44, 77]	59 [43, 76]
LVM syst (g)	133 [86, 179]	130 [83, 177]	128 [81, 174]	125 [78, 172]	122 [76, 169]	120 [73, 167]
LVMi syst (g/m <sup>2</sup> )	63 [44, 82]	62 [43, 82]	61 [42, 81]	61 [41, 80]	60 [41, 79]	59 [40, 78]
<b>Right ventricle</b>						
RVEDV (ml)	202 [140, 264]	193 [132, 255]	185 [123, 246]	176 [115, 238]	168 [106, 229]	159 [98, 221]
RVEDVi (ml/m <sup>2</sup> )	96 [68, 125]	93 [64, 121]	89 [61, 118]	86 [57, 114]	82 [54, 111]	79 [50, 107]
RVESV (ml)	86 [51, 122]	83 [47, 118]	79 [43, 114]	75 [39, 110]	71 [35, 107]	67 [32, 103]
RVESVi (ml/m <sup>2</sup> )	41 [24, 58]	40 [23, 56]	38 [21, 55]	36 [20, 53]	35 [18, 52]	33 [16, 50]
RVSV (ml)	116 [75, 156]	111 [70, 151]	106 [66, 147]	102 [61, 142]	97 [56, 137]	92 [52, 133]
RVSVi (ml/m <sup>2</sup> )	55 [36, 74]	53 [34, 73]	51 [32, 71]	49 [30, 69]	48 [28, 67]	46 [26, 65]
RVCO (l/min)	8 [5, 10]	7 [5, 10]	7 [4, 10]	7 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	57 [44, 70]	57 [44, 70]	58 [44, 71]	58 [45, 71]	58 [45, 71]	58 [45, 71]
<b>Left atrium</b>						
LAESV (ml)	77 [34, 120]	74 [31, 117]	71 [28, 114]	68 [25, 111]	65 [22, 108]	62 [19, 105]
LAESVi (ml/m <sup>2</sup> )	36 [16, 56]	35 [15, 55]	34 [14, 54]	33 [13, 53]	32 [11, 52]	31 [10, 51]
LA max (ml)	83 [40, 126]	80 [37, 123]	76 [33, 119]	73 [30, 116]	70 [27, 113]	67 [24, 110]
LA max i (ml/m <sup>2</sup> )	39 [19, 59]	38 [17, 58]	36 [16, 57]	35 [15, 56]	34 [14, 54]	33 [13, 53]
LAEF (%)	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]
<b>Right atrium</b>						
RAESV (ml)	86 [33, 139]	86 [33, 138]	85 [33, 138]	85 [32, 137]	84 [32, 137]	84 [32, 136]
RAESVi (ml/m <sup>2</sup> )	40 [14, 67]	41 [14, 67]	41 [15, 67]	41 [15, 68]	42 [15, 68]	42 [16, 68]
RA max (ml)	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]
RA max i (ml/m <sup>2</sup> )	42 [16, 68]	42 [16, 68]	43 [17, 69]	43 [17, 69]	44 [18, 70]	44 [18, 70]
RAEF (%)	50 [30, 70]	51 [31, 71]	51 [31, 71]	51 [32, 71]	52 [32, 72]	52 [32, 72]



**Table S38. CMR metrics in men of White ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(52 - 113)	(67 - 135)	(378 - 446)	(784 - 840)	(773 - 815)	(1,212 - 1,283)
<b>Left ventricle</b>						
LVEDV (ml)	175 [120, 229]	167 [113, 221]	159 [105, 213]	151 [97, 205]	143 [89, 197]	135 [81, 189]
LVEDVi (ml/m)	96 [67, 125]	93 [63, 122]	89 [60, 118]	85 [56, 114]	81 [52, 110]	77 [48, 107]
LVESV (ml)	63 [35, 91]	59 [31, 87]	56 [28, 84]	52 [24, 80]	48 [20, 76]	45 [17, 73]
LVESVi (ml/m)	35 [19, 50]	33 [17, 48]	31 [16, 47]	29 [14, 45]	27 [12, 43]	26 [10, 41]
LVSV (ml/m)	112 [75, 149]	107 [70, 144]	103 [66, 140]	99 [62, 136]	94 [58, 131]	90 [53, 127]
LVSVi (ml/m)	61 [41, 82]	60 [39, 80]	58 [38, 78]	56 [36, 76]	54 [34, 74]	52 [32, 72]
LVCO (l/min)	7 [5, 10]	7 [5, 10]	7 [4, 9]	7 [4, 9]	6 [4, 8]	6 [3, 8]
LVEF (%)	64 [51, 76]	64 [52, 77]	65 [53, 77]	66 [53, 78]	66 [54, 79]	67 [55, 80]
LVM diast (g)	136 [94, 178]	133 [91, 175]	130 [88, 171]	126 [84, 168]	123 [81, 165]	120 [78, 161]
LVMi diast (g)	75 [52, 97]	74 [51, 96]	72 [50, 95]	71 [49, 94]	70 [47, 92]	69 [46, 91]
LVM syst (g)	133 [86, 179]	130 [83, 177]	128 [81, 174]	125 [78, 172]	122 [76, 169]	120 [73, 167]
LVMi syst (g/m)	73 [47, 99]	72 [47, 98]	71 [46, 97]	70 [45, 96]	70 [44, 95]	69 [43, 94]
<b>Right ventricle</b>						
RVEDV (ml)	202 [140, 264]	193 [132, 255]	185 [123, 246]	176 [115, 238]	168 [106, 229]	159 [98, 221]
RVEDVi (ml/m)	111 [78, 144]	107 [74, 140]	103 [70, 136]	99 [66, 132]	95 [62, 128]	91 [58, 125]
RVESV (ml)	86 [51, 122]	83 [47, 118]	79 [43, 114]	75 [39, 110]	71 [35, 107]	67 [32, 103]
RVESVi (ml/m)	48 [28, 67]	46 [26, 65]	44 [24, 64]	42 [23, 62]	40 [21, 60]	39 [19, 58]
RVSV (ml)	116 [75, 156]	111 [70, 151]	106 [66, 147]	102 [61, 142]	97 [56, 137]	92 [52, 133]
RVSVi (ml/m)	64 [41, 86]	61 [39, 84]	59 [37, 81]	57 [35, 79]	55 [33, 77]	53 [31, 75]
RVCO (l/min)	8 [5, 10]	7 [5, 10]	7 [4, 10]	7 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	57 [44, 70]	57 [44, 70]	58 [44, 71]	58 [45, 71]	58 [45, 71]	58 [45, 71]
<b>Left atrium</b>						
LAESV (ml)	77 [34, 120]	74 [31, 117]	71 [28, 114]	68 [25, 111]	65 [22, 108]	62 [19, 105]
LAESVi (ml/m)	42 [18, 66]	41 [17, 65]	40 [15, 64]	38 [14, 62]	37 [13, 61]	35 [11, 60]
LA max (ml)	83 [40, 126]	80 [37, 123]	76 [33, 119]	73 [30, 116]	70 [27, 113]	67 [24, 110]
LA max i (ml/m)	46 [21, 70]	44 [20, 68]	43 [18, 67]	41 [17, 65]	40 [16, 64]	38 [14, 63]
LAEF (%)	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]	66 [46, 86]
<b>Right atrium</b>						
RAESV (ml)	86 [33, 139]	86 [33, 138]	85 [33, 138]	85 [32, 137]	84 [32, 137]	84 [32, 136]
RAESVi (ml/m)	47 [18, 76]	47 [18, 76]	48 [19, 77]	48 [19, 77]	48 [19, 77]	48 [19, 77]
RA max (ml)	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]	89 [37, 141]
RA max i (ml/m)	49 [20, 78]	49 [21, 78]	50 [21, 78]	50 [21, 79]	50 [22, 79]	51 [22, 80]
RAEF (%)	50 [30, 70]	51 [31, 71]	51 [31, 71]	51 [32, 71]	52 [32, 72]	52 [32, 72]

**Table S39. CMR metrics in men of Black ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(72 - 78)	(46 - 48)	(13 - 14)
<b>Left ventricle</b>			
LVEDV (ml)	167 [104, 229]	155 [93, 218]	144 [81, 207]
LVEDVi (ml/m <sup>2</sup> )	81 [53, 108]	78 [50, 105]	75 [47, 103]
LVESV (ml)	68 [30, 106]	63 [26, 101]	59 [21, 97]
LVESVi (ml/m <sup>2</sup> )	33 [16, 50]	31 [14, 48]	30 [13, 47]
LVSV (ml)	96 [58, 135]	91 [53, 130]	86 [47, 125]
LVSVi (ml/m <sup>2</sup> )	47 [31, 63]	46 [29, 62]	44 [28, 61]
LVCO (l/min)	6 [3, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	59 [46, 72]	60 [47, 73]	60 [47, 73]
LVM diast (g)	112 [74, 150]	106 [69, 144]	101 [63, 139]
LVMi diast (g/m <sup>2</sup> )	54 [39, 69]	53 [38, 68]	52 [37, 67]
LVM syst (g)	112 [72, 151]	106 [67, 145]	101 [61, 140]
LVMi syst (g/m <sup>2</sup> )	54 [38, 70]	53 [37, 69]	52 [35, 68]
<b>Right ventricle</b>			
RVEDV (ml)	174 [114, 235]	166 [106, 226]	158 [96, 219]
RVEDVi (ml/m <sup>2</sup> )	85 [58, 111]	83 [57, 109]	81 [54, 108]
RVESV (ml)	73 [41, 106]	68 [35, 100]	62 [29, 95]
RVESVi (ml/m <sup>2</sup> )	36 [21, 51]	34 [19, 49]	32 [17, 47]
RVSV (ml)	100 [63, 137]	98 [60, 135]	95 [57, 133]
RVSVi (ml/m <sup>2</sup> )	49 [31, 68]	49 [31, 67]	49 [30, 67]
RVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	58 [46, 69]	59 [48, 71]	61 [49, 73]
<b>Left atrium</b>			
LAESV (ml)	67 [27, 108]	65 [24, 105]	62 [21, 103]
LAESVi (ml/m <sup>2</sup> )	33 [13, 54]	33 [12, 53]	32 [11, 53]
LA max (ml)	72 [31, 113]	69 [28, 110]	66 [24, 107]
LA max i (ml/m <sup>2</sup> )	36 [15, 56]	35 [14, 55]	34 [13, 55]
LAEF (%)	64 [50, 78]	64 [50, 78]	64 [50, 79]
<b>Right atrium</b>			
RAESV (ml)	87 [43, 131]	87 [43, 132]	87 [42, 132]
RAESVi (ml/m <sup>2</sup> )	42 [22, 63]	43 [22, 64]	44 [23, 65]
RA max (ml)	90 [45, 136]	91 [46, 137]	93 [46, 139]
RA max i (ml/m <sup>2</sup> )	44 [22, 66]	46 [24, 68]	48 [25, 70]
RAEF (%)	47 [31, 63]	46 [30, 62]	46 [30, 62]

**Table S40. CMR metrics in men of Black ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(72 - 78)	(46 - 48)	(13 - 14)
<b>Left ventricle</b>			
LVEDV (ml)	167 [104, 229]	155 [93, 218]	144 [81, 207]
LVEDVi (ml/m)	94 [61, 128]	89 [55, 122]	83 [49, 117]
LVESV (ml)	68 [30, 106]	63 [26, 101]	59 [21, 97]
LVESVi (ml/m)	38 [18, 59]	36 [15, 57]	34 [13, 55]
LVSV (ml/m)	96 [58, 135]	91 [53, 130]	86 [47, 125]
LVSVi (ml/m)	55 [35, 74]	52 [33, 72]	50 [30, 69]
LVCO (l/min)	6 [3, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	59 [46, 72]	60 [47, 73]	60 [47, 73]
LVM diast (g)	112 [74, 150]	106 [69, 144]	101 [63, 139]
LVMi diast (g)	63 [43, 84]	61 [40, 81]	58 [37, 79]
LVM syst (g)	112 [72, 151]	106 [67, 145]	101 [61, 140]
LVMi syst (g/m)	63 [42, 85]	61 [39, 82]	58 [36, 79]
<b>Right ventricle</b>			
RVEDV (ml)	174 [114, 235]	166 [106, 226]	158 [96, 219]
RVEDVi (ml/m)	99 [67, 130]	95 [63, 126]	91 [59, 122]
RVESV (ml)	73 [41, 106]	68 [35, 100]	62 [29, 95]
RVESVi (ml/m)	42 [24, 60]	39 [21, 57]	36 [17, 54]
RVSV (ml)	100 [63, 137]	98 [60, 135]	95 [57, 133]
RVSVi (ml/m)	57 [37, 77]	56 [35, 76]	55 [34, 76]
RVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	58 [46, 69]	59 [48, 71]	61 [49, 73]
<b>Left atrium</b>			
LAESV (ml)	67 [27, 108]	65 [24, 105]	62 [21, 103]
LAESVi (ml/m)	38 [15, 61]	37 [14, 60]	36 [12, 59]
LA max (ml)	72 [31, 113]	69 [28, 110]	66 [24, 107]
LA max i (ml/m)	41 [18, 64]	39 [16, 63]	38 [14, 61]
LAEF (%)	64 [50, 78]	64 [50, 78]	64 [50, 79]
<b>Right atrium</b>			
RAESV (ml)	87 [43, 131]	87 [43, 132]	87 [42, 132]
RAESVi (ml/m)	50 [25, 74]	50 [25, 74]	50 [25, 75]
RA max (ml)	90 [45, 136]	91 [46, 137]	93 [46, 139]
RA max i (ml/m)	51 [26, 77]	52 [27, 78]	53 [28, 79]
RAEF (%)	47 [31, 63]	46 [30, 62]	46 [30, 62]

**Table S41. CMR metrics in men of Black ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(72 - 78)	(46 - 48)	(13 - 14)
<b>Left ventricle</b>			
LVEDV (ml)	163 [102, 223]	152 [91, 212]	141 [79, 202]
LVEDVi (ml/m <sup>2</sup> )	79 [52, 106]	76 [49, 103]	73 [45, 100]
LVESV (ml)	62 [28, 96]	58 [24, 92]	53 [19, 88]
LVESVi (ml/m <sup>2</sup> )	30 [14, 45]	29 [13, 44]	27 [12, 43]
LVSV (ml)	98 [59, 137]	93 [54, 132]	88 [48, 127]
LVSVi (ml/m <sup>2</sup> )	48 [31, 64]	46 [30, 63]	45 [28, 62]
LVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 8]
LVEF (%)	61 [48, 74]	62 [49, 75]	63 [50, 76]
LVM diast (g)	116 [76, 156]	110 [70, 150]	105 [64, 145]
LVMi diast (g/m <sup>2</sup> )	56 [41, 71]	55 [39, 70]	53 [38, 69]
LVM syst (g)	117 [75, 160]	112 [69, 154]	106 [63, 149]
LVMi syst (g/m <sup>2</sup> )	57 [39, 74]	56 [38, 73]	55 [37, 72]
<b>Right ventricle</b>			
RVEDV (ml)	173 [114, 232]	165 [105, 224]	156 [96, 216]
RVEDVi (ml/m <sup>2</sup> )	84 [58, 110]	82 [56, 108]	80 [54, 106]
RVESV (ml)	72 [40, 105]	67 [34, 99]	61 [28, 94]
RVESVi (ml/m <sup>2</sup> )	35 [20, 50]	33 [18, 48]	31 [16, 46]
RVSV (ml)	100 [63, 137]	97 [60, 134]	95 [57, 132]
RVSVi (ml/m <sup>2</sup> )	49 [31, 67]	49 [31, 67]	48 [30, 67]
RVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	58 [46, 70]	60 [48, 71]	61 [49, 73]
<b>Left atrium</b>			
LAESV (ml)	67 [27, 108]	65 [24, 105]	62 [21, 103]
LAESVi (ml/m <sup>2</sup> )	33 [13, 54]	33 [12, 53]	32 [11, 53]
LA max (ml)	72 [31, 113]	69 [28, 110]	66 [24, 107]
LA max i (ml/m <sup>2</sup> )	36 [15, 56]	35 [14, 55]	34 [13, 55]
LAEF (%)	64 [50, 78]	64 [50, 78]	64 [50, 79]
<b>Right atrium</b>			
RAESV (ml)	87 [43, 131]	87 [43, 132]	87 [42, 132]
RAESVi (ml/m <sup>2</sup> )	42 [22, 63]	43 [22, 64]	44 [23, 65]
RA max (ml)	90 [45, 136]	91 [46, 137]	93 [46, 139]
RA max i (ml/m <sup>2</sup> )	44 [22, 66]	46 [24, 68]	48 [25, 70]
RAEF (%)	47 [31, 63]	46 [30, 62]	46 [30, 62]

**Table S42. CMR metrics in men of Black ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(72 - 78)	(46 - 48)	(13 - 14)
<b>Left ventricle</b>			
LVEDV (ml)	163 [102, 223]	152 [91, 212]	141 [79, 202]
LVEDVi (ml/m)	92 [60, 125]	87 [54, 119]	81 [48, 114]
LVESV (ml)	62 [28, 96]	58 [24, 92]	53 [19, 88]
LVESVi (ml/m)	35 [16, 54]	33 [14, 52]	31 [11, 50]
LVSV (ml/m)	98 [59, 137]	93 [54, 132]	88 [48, 127]
LVSVi (ml/m)	56 [36, 75]	53 [33, 73]	51 [30, 71]
LVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 8]
LVEF (%)	61 [48, 74]	62 [49, 75]	63 [50, 76]
LVM diast (g)	116 [76, 156]	110 [70, 150]	105 [64, 145]
LVMi diast (g)	66 [44, 87]	63 [41, 84]	60 [38, 82]
LVM syst (g)	117 [75, 160]	112 [69, 154]	106 [63, 149]
LVMi syst (g/m)	66 [43, 89]	64 [41, 87]	61 [38, 84]
<b>Right ventricle</b>			
RVEDV (ml)	173 [114, 232]	165 [105, 224]	156 [96, 216]
RVEDVi (ml/m)	98 [67, 128]	94 [63, 124]	90 [59, 121]
RVESV (ml)	72 [40, 105]	67 [34, 99]	61 [28, 94]
RVESVi (ml/m)	41 [23, 59]	38 [20, 56]	35 [17, 53]
RVSV (ml)	100 [63, 137]	97 [60, 134]	95 [57, 132]
RVSVi (ml/m)	56 [37, 76]	55 [36, 75]	54 [35, 74]
RVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 9]
RVEF (%)	58 [46, 70]	60 [48, 71]	61 [49, 73]
<b>Left atrium</b>			
LAESV (ml)	67 [27, 108]	65 [24, 105]	62 [21, 103]
LAESVi (ml/m)	38 [15, 61]	37 [14, 60]	36 [12, 59]
LA max (ml)	72 [31, 113]	69 [28, 110]	66 [24, 107]
LA max i (ml/m)	41 [18, 64]	39 [16, 63]	38 [14, 61]
LAEF (%)	64 [50, 78]	64 [50, 78]	64 [50, 79]
<b>Right atrium</b>			
RAESV (ml)	87 [43, 131]	87 [43, 132]	87 [42, 132]
RAESVi (ml/m)	50 [25, 74]	50 [25, 74]	50 [25, 75]
RA max (ml)	90 [45, 136]	91 [46, 137]	93 [46, 139]
RA max i (ml/m)	51 [26, 77]	52 [27, 78]	53 [28, 79]
RAEF (%)	47 [31, 63]	46 [30, 62]	46 [30, 62]

**Table S43. CMR metrics in men of Black ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(72 - 78)	(46 - 48)	(13 - 14)
<b>Left ventricle</b>			
LVEDV (ml)	150 [93, 207]	140 [83, 196]	129 [71, 186]
LVEDVi (ml/m <sup>2</sup> )	73 [47, 98]	70 [44, 95]	67 [41, 93]
LVESV (ml)	51 [20, 81]	46 [16, 77]	42 [11, 73]
LVESVi (ml/m <sup>2</sup> )	24 [11, 38]	23 [9, 37]	22 [8, 36]
LVSV (ml)	98 [62, 133]	92 [56, 128]	87 [51, 123]
LVSVi (ml/m <sup>2</sup> )	47 [31, 63]	46 [30, 62]	45 [29, 61]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	6 [3, 8]
LVEF (%)	66 [53, 79]	67 [54, 80]	68 [55, 81]
LVM diast (g)	129 [84, 175]	124 [78, 169]	118 [72, 164]
LVMi diast (g/m <sup>2</sup> )	63 [45, 80]	62 [44, 79]	61 [43, 78]
LVM syst (g)	132 [83, 181]	126 [77, 175]	120 [70, 170]
LVMi syst (g/m <sup>2</sup> )	64 [44, 83]	63 [43, 82]	62 [42, 82]
<b>Right ventricle</b>			
RVEDV (ml)	175 [114, 236]	166 [105, 227]	156 [94, 218]
RVEDVi (ml/m <sup>2</sup> )	84 [59, 109]	82 [58, 107]	81 [56, 106]
RVESV (ml)	76 [43, 108]	70 [38, 103]	65 [32, 98]
RVESVi (ml/m <sup>2</sup> )	37 [21, 52]	35 [20, 51]	34 [18, 49]
RVSV (ml)	98 [62, 135]	94 [57, 131]	90 [53, 127]
RVSVi (ml/m <sup>2</sup> )	47 [31, 64]	47 [31, 63]	47 [30, 63]
RVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 8]
RVEF (%)	56 [44, 68]	57 [46, 69]	59 [47, 71]
<b>Left atrium</b>			
LAESV (ml)	67 [27, 108]	65 [24, 105]	62 [21, 103]
LAESVi (ml/m <sup>2</sup> )	33 [13, 54]	33 [12, 53]	32 [11, 53]
LA max (ml)	72 [31, 113]	69 [28, 110]	66 [24, 107]
LA max i (ml/m <sup>2</sup> )	36 [15, 56]	35 [14, 55]	34 [13, 55]
LAEF (%)	64 [50, 78]	64 [50, 78]	64 [50, 79]
<b>Right atrium</b>			
RAESV (ml)	87 [43, 131]	87 [43, 132]	87 [42, 132]
RAESVi (ml/m <sup>2</sup> )	42 [22, 63]	43 [22, 64]	44 [23, 65]
RA max (ml)	90 [45, 136]	91 [46, 137]	93 [46, 139]
RA max i (ml/m <sup>2</sup> )	44 [22, 66]	46 [24, 68]	48 [25, 70]
RAEF (%)	47 [31, 63]	46 [30, 62]	46 [30, 62]

**Table S44. CMR metrics in men of Black ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(72 - 78)	(46 - 48)	(13 - 14)
<b>Left ventricle</b>			
LVEDV (ml)	150 [93, 207]	140 [83, 196]	129 [71, 186]
LVEDVi (ml/m)	85 [55, 116]	80 [49, 110]	74 [43, 105]
LVESV (ml)	51 [20, 81]	46 [16, 77]	42 [11, 73]
LVESVi (ml/m)	29 [12, 46]	27 [10, 43]	24 [7, 41]
LVSV (ml/m)	98 [62, 133]	92 [56, 128]	87 [51, 123]
LVSVi (ml/m)	55 [36, 75]	53 [33, 72]	50 [30, 70]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	6 [3, 8]
LVEF (%)	66 [53, 79]	67 [54, 80]	68 [55, 81]
LVM diast (g)	129 [84, 175]	124 [78, 169]	118 [72, 164]
LVMi diast (g)	73 [49, 98]	71 [46, 95]	68 [43, 93]
LVM syst (g)	132 [83, 181]	126 [77, 175]	120 [70, 170]
LVMi syst (g/m)	75 [48, 101]	72 [45, 98]	69 [42, 96]
<b>Right ventricle</b>			
RVEDV (ml)	175 [114, 236]	166 [105, 227]	156 [94, 218]
RVEDVi (ml/m)	99 [68, 130]	94 [63, 126]	90 [58, 121]
RVESV (ml)	76 [43, 108]	70 [38, 103]	65 [32, 98]
RVESVi (ml/m)	43 [25, 61]	40 [22, 58]	37 [19, 56]
RVSV (ml)	98 [62, 135]	94 [57, 131]	90 [53, 127]
RVSVi (ml/m)	55 [36, 75]	54 [34, 73]	52 [32, 71]
RVCO (l/min)	6 [4, 9]	6 [3, 9]	6 [3, 8]
RVEF (%)	56 [44, 68]	57 [46, 69]	59 [47, 71]
<b>Left atrium</b>			
LAESV (ml)	67 [27, 108]	65 [24, 105]	62 [21, 103]
LAESVi (ml/m)	38 [15, 61]	37 [14, 60]	36 [12, 59]
LA max (ml)	72 [31, 113]	69 [28, 110]	66 [24, 107]
LA max i (ml/m)	41 [18, 64]	39 [16, 63]	38 [14, 61]
LAEF (%)	64 [50, 78]	64 [50, 78]	64 [50, 79]
<b>Right atrium</b>			
RAESV (ml)	87 [43, 131]	87 [43, 132]	87 [42, 132]
RAESVi (ml/m)	50 [25, 74]	50 [25, 74]	50 [25, 75]
RA max (ml)	90 [45, 136]	91 [46, 137]	93 [46, 139]
RA max i (ml/m)	51 [26, 77]	52 [27, 78]	53 [28, 79]
RAEF (%)	47 [31, 63]	46 [30, 62]	46 [30, 62]

**Table S45. CMR metrics in men of South Asian ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(19 - 21)	(131 - 134)	(117 - 122)	(40 - 43)
<b>Left ventricle</b>				
LVEDV (ml)	147 [100, 193]	139 [93, 185]	131 [85, 178]	124 [77, 170]
LVEDVi (ml/m <sup>2</sup> )	75 [52, 97]	72 [50, 95]	70 [48, 92]	68 [46, 90]
LVESV (ml)	59 [33, 85]	55 [29, 80]	50 [25, 76]	46 [20, 72]
LVESVi (ml/m <sup>2</sup> )	30 [17, 42]	28 [16, 41]	27 [14, 39]	25 [13, 38]
LVSV (ml)	88 [57, 119]	85 [54, 116]	81 [50, 112]	78 [47, 109]
LVSVi (ml/m <sup>2</sup> )	45 [30, 60]	44 [29, 59]	43 [28, 58]	42 [27, 57]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	60 [49, 71]	61 [50, 72]	62 [51, 73]	62 [51, 74]
LVM diast (g)	93 [63, 124]	90 [59, 120]	86 [56, 117]	83 [52, 113]
LVMi diast (g/m <sup>2</sup> )	47 [34, 60]	46 [34, 59]	46 [33, 59]	45 [33, 58]
LVM syst (g)	94 [62, 127]	89 [57, 122]	85 [53, 117]	80 [48, 112]
LVMi syst (g/m <sup>2</sup> )	48 [34, 62]	46 [33, 60]	45 [31, 59]	44 [30, 58]
<b>Right ventricle</b>				
RVEDV (ml)	155 [103, 206]	147 [96, 199]	140 [88, 191]	132 [80, 184]
RVEDVi (ml/m <sup>2</sup> )	78 [54, 102]	76 [53, 100]	74 [51, 98]	72 [49, 96]
RVESV (ml)	65 [38, 92]	61 [34, 87]	56 [30, 83]	52 [26, 79]
RVESVi (ml/m <sup>2</sup> )	33 [20, 46]	31 [18, 45]	30 [17, 43]	29 [16, 42]
RVSV (ml)	90 [57, 123]	86 [54, 119]	83 [50, 116]	80 [47, 113]
RVSVi (ml/m <sup>2</sup> )	45 [30, 61]	45 [29, 60]	44 [29, 60]	44 [28, 59]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	58 [47, 69]	59 [48, 70]	59 [49, 70]	60 [49, 71]
<b>Left atrium</b>				
LAESV (ml)	61 [28, 95]	60 [27, 94]	59 [26, 93]	58 [25, 92]
LAESVi (ml/m <sup>2</sup> )	31 [15, 47]	31 [15, 47]	31 [15, 47]	32 [16, 48]
LA max (ml)	64 [31, 98]	64 [30, 97]	63 [29, 97]	62 [29, 96]
LA max i (ml/m <sup>2</sup> )	32 [16, 48]	33 [17, 49]	33 [18, 49]	34 [18, 50]
LAEF (%)	70 [54, 85]	67 [52, 83]	65 [49, 80]	62 [47, 78]
<b>Right atrium</b>				
RAESV (ml)	75 [33, 116]	72 [31, 114]	70 [29, 111]	68 [27, 109]
RAESVi (ml/m <sup>2</sup> )	38 [17, 59]	38 [17, 59]	37 [16, 59]	37 [16, 59]
RA max (ml)	76 [35, 117]	75 [34, 116]	73 [33, 114]	72 [31, 113]
RA max i (ml/m <sup>2</sup> )	39 [18, 60]	39 [18, 60]	39 [18, 60]	39 [18, 60]
RAEF (%)	48 [31, 65]	50 [33, 67]	52 [35, 69]	54 [36, 71]



**Table S46. CMR metrics in men of South Asian ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(19 - 21)	(131 - 134)	(117 - 122)	(40 - 43)
<b>Left ventricle</b>				
LVEDV (ml)	147 [100, 193]	139 [93, 185]	131 [85, 178]	124 [77, 170]
LVEDVi (ml/m)	85 [59, 110]	81 [55, 106]	77 [52, 103]	73 [48, 99]
LVESV (ml)	59 [33, 85]	55 [29, 80]	50 [25, 76]	46 [20, 72]
LVESVi (ml/m)	34 [19, 48]	32 [17, 46]	29 [15, 44]	27 [13, 42]
LVSV (ml/m)	88 [57, 119]	85 [54, 116]	81 [50, 112]	78 [47, 109]
LVSVi (ml/m)	51 [33, 68]	49 [32, 67]	48 [30, 65]	46 [29, 64]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	60 [49, 71]	61 [50, 72]	62 [51, 73]	62 [51, 74]
LVM diast (g)	93 [63, 124]	90 [59, 120]	86 [56, 117]	83 [52, 113]
LVMi diast (g)	53 [37, 70]	52 [35, 69]	51 [34, 67]	49 [32, 66]
LVM syst (g)	94 [62, 127]	89 [57, 122]	85 [53, 117]	80 [48, 112]
LVMi syst (g/m)	54 [36, 72]	52 [34, 70]	50 [32, 68]	47 [29, 65]
<b>Right ventricle</b>				
RVEDV (ml)	155 [103, 206]	147 [96, 199]	140 [88, 191]	132 [80, 184]
RVEDVi (ml/m)	89 [60, 118]	85 [57, 114]	82 [53, 110]	78 [50, 107]
RVESV (ml)	65 [38, 92]	61 [34, 87]	56 [30, 83]	52 [26, 79]
RVESVi (ml/m)	37 [22, 53]	35 [20, 50]	33 [18, 48]	31 [16, 46]
RVSV (ml)	90 [57, 123]	86 [54, 119]	83 [50, 116]	80 [47, 113]
RVSVi (ml/m)	52 [34, 70]	50 [32, 68]	49 [31, 67]	47 [29, 65]
RVCO (l/min)	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	58 [47, 69]	59 [48, 70]	59 [49, 70]	60 [49, 71]
<b>Left atrium</b>				
LAESV (ml)	61 [28, 95]	60 [27, 94]	59 [26, 93]	58 [25, 92]
LAESVi (ml/m)	35 [16, 54]	35 [16, 54]	35 [16, 54]	34 [16, 53]
LA max (ml)	64 [31, 98]	64 [30, 97]	63 [29, 97]	62 [29, 96]
LA max i (ml/m)	37 [18, 55]	37 [18, 55]	37 [18, 55]	37 [18, 55]
LAEF (%)	70 [54, 85]	67 [52, 83]	65 [49, 80]	62 [47, 78]
<b>Right atrium</b>				
RAESV (ml)	75 [33, 116]	72 [31, 114]	70 [29, 111]	68 [27, 109]
RAESVi (ml/m)	43 [20, 66]	42 [19, 65]	41 [18, 64]	40 [17, 63]
RA max (ml)	76 [35, 117]	75 [34, 116]	73 [33, 114]	72 [31, 113]
RA max i (ml/m)	44 [21, 67]	43 [21, 66]	43 [20, 66]	42 [19, 65]
RAEF (%)	48 [31, 65]	50 [33, 67]	52 [35, 69]	54 [36, 71]

**Table S47. CMR metrics in men of South Asian ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(19 - 21)	(131 - 134)	(117 - 122)	(40 - 43)
<b>Left ventricle</b>				
LVEDV (ml)	144 [98, 189]	136 [91, 182]	129 [83, 175]	122 [76, 168]
LVEDVi (ml/m <sup>2</sup> )	73 [51, 95]	71 [49, 93]	69 [47, 90]	66 [45, 88]
LVESV (ml)	55 [31, 80]	51 [27, 76]	47 [22, 72]	43 [18, 67]
LVESVi (ml/m <sup>2</sup> )	28 [16, 40]	26 [15, 38]	25 [13, 37]	23 [12, 35]
LVSV (ml)	89 [57, 120]	85 [54, 116]	82 [51, 113]	78 [47, 109]
LVSVi (ml/m <sup>2</sup> )	45 [30, 60]	44 [30, 59]	43 [29, 58]	43 [28, 57]
LVCO (l/min)	5 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [51, 73]	63 [52, 74]	64 [52, 75]	64 [53, 76]
LVM diast (g)	96 [64, 129]	93 [61, 125]	89 [57, 121]	86 [53, 118]
LVMi diast (g/m <sup>2</sup> )	49 [35, 62]	48 [35, 62]	47 [34, 61]	47 [33, 61]
LVM syst (g)	98 [64, 133]	93 [59, 128]	88 [54, 123]	84 [49, 118]
LVMi syst (g/m <sup>2</sup> )	50 [35, 64]	48 [34, 63]	47 [33, 62]	46 [31, 60]
<b>Right ventricle</b>				
RVEDV (ml)	153 [101, 205]	146 [94, 197]	138 [87, 190]	131 [79, 183]
RVEDVi (ml/m <sup>2</sup> )	77 [54, 101]	75 [52, 99]	73 [50, 97]	71 [48, 95]
RVESV (ml)	64 [38, 91]	60 [34, 86]	56 [30, 82]	52 [25, 78]
RVESVi (ml/m <sup>2</sup> )	33 [20, 46]	31 [18, 44]	30 [17, 43]	28 [15, 41]
RVSV (ml)	89 [56, 122]	86 [53, 118]	82 [49, 115]	79 [46, 111]
RVSVi (ml/m <sup>2</sup> )	45 [29, 60]	44 [29, 60]	44 [28, 59]	43 [28, 59]
RVCO (l/min)	5 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [48, 69]	59 [48, 70]	60 [49, 70]	60 [49, 71]
<b>Left atrium</b>				
LAESV (ml)	61 [28, 95]	60 [27, 94]	59 [26, 93]	58 [25, 92]
LAESVi (ml/m <sup>2</sup> )	31 [15, 47]	31 [15, 47]	31 [15, 47]	32 [16, 48]
LA max (ml)	64 [31, 98]	64 [30, 97]	63 [29, 97]	62 [29, 96]
LA max i (ml/m <sup>2</sup> )	32 [16, 48]	33 [17, 49]	33 [18, 49]	34 [18, 50]
LAEF (%)	70 [54, 85]	67 [52, 83]	65 [49, 80]	62 [47, 78]
<b>Right atrium</b>				
RAESV (ml)	75 [33, 116]	72 [31, 114]	70 [29, 111]	68 [27, 109]
RAESVi (ml/m <sup>2</sup> )	38 [17, 59]	38 [17, 59]	37 [16, 59]	37 [16, 59]
RA max (ml)	76 [35, 117]	75 [34, 116]	73 [33, 114]	72 [31, 113]
RA max i (ml/m <sup>2</sup> )	39 [18, 60]	39 [18, 60]	39 [18, 60]	39 [18, 60]
RAEF (%)	48 [31, 65]	50 [33, 67]	52 [35, 69]	54 [36, 71]

**Table S48. CMR metrics in men of South Asian ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(19 - 21)	(131 - 134)	(117 - 122)	(40 - 43)
<b>Left ventricle</b>				
LVEDV (ml)	144 [98, 189]	136 [91, 182]	129 [83, 175]	122 [76, 168]
LVEDVi (ml/m)	83 [57, 108]	79 [54, 104]	76 [50, 101]	72 [47, 97]
LVESV (ml)	55 [31, 80]	51 [27, 76]	47 [22, 72]	43 [18, 67]
LVESVi (ml/m)	32 [18, 46]	30 [16, 43]	27 [14, 41]	25 [12, 39]
LVSV (ml/m)	89 [57, 120]	85 [54, 116]	82 [51, 113]	78 [47, 109]
LVSVi (ml/m)	51 [34, 68]	49 [32, 67]	48 [31, 65]	46 [29, 64]
LVCO (l/min)	5 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [51, 73]	63 [52, 74]	64 [52, 75]	64 [53, 76]
LVM diast (g)	96 [64, 129]	93 [61, 125]	89 [57, 121]	86 [53, 118]
LVMi diast (g)	55 [38, 73]	54 [36, 71]	52 [35, 70]	51 [33, 68]
LVM syst (g)	98 [64, 133]	93 [59, 128]	88 [54, 123]	84 [49, 118]
LVMi syst (g/m)	56 [37, 75]	54 [35, 73]	52 [33, 70]	49 [30, 68]
<b>Right ventricle</b>				
RVEDV (ml)	153 [101, 205]	146 [94, 197]	138 [87, 190]	131 [79, 183]
RVEDVi (ml/m)	88 [60, 117]	85 [56, 113]	81 [53, 110]	78 [49, 106]
RVESV (ml)	64 [38, 91]	60 [34, 86]	56 [30, 82]	52 [25, 78]
RVESVi (ml/m)	37 [22, 52]	35 [20, 50]	33 [18, 48]	31 [16, 46]
RVSV (ml)	89 [56, 122]	86 [53, 118]	82 [49, 115]	79 [46, 111]
RVSVi (ml/m)	51 [33, 69]	50 [32, 68]	48 [30, 66]	47 [28, 65]
RVCO (l/min)	5 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [48, 69]	59 [48, 70]	60 [49, 70]	60 [49, 71]
<b>Left atrium</b>				
LAESV (ml)	61 [28, 95]	60 [27, 94]	59 [26, 93]	58 [25, 92]
LAESVi (ml/m)	35 [16, 54]	35 [16, 54]	35 [16, 54]	34 [16, 53]
LA max (ml)	64 [31, 98]	64 [30, 97]	63 [29, 97]	62 [29, 96]
LA max i (ml/m)	37 [18, 55]	37 [18, 55]	37 [18, 55]	37 [18, 55]
LAEF (%)	70 [54, 85]	67 [52, 83]	65 [49, 80]	62 [47, 78]
<b>Right atrium</b>				
RAESV (ml)	75 [33, 116]	72 [31, 114]	70 [29, 111]	68 [27, 109]
RAESVi (ml/m)	43 [20, 66]	42 [19, 65]	41 [18, 64]	40 [17, 63]
RA max (ml)	76 [35, 117]	75 [34, 116]	73 [33, 114]	72 [31, 113]
RA max i (ml/m)	44 [21, 67]	43 [21, 66]	43 [20, 66]	42 [19, 65]
RAEF (%)	48 [31, 65]	50 [33, 67]	52 [35, 69]	54 [36, 71]

**Table S49. CMR metrics in men of South Asian ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(19 - 21)	(131 - 134)	(117 - 122)	(40 - 43)
<b>Left ventricle</b>				
LVEDV (ml)	132 [90, 175]	125 [83, 167]	118 [76, 160]	111 [69, 154]
LVEDVi (ml/m <sup>2</sup> )	67 [47, 87]	65 [45, 85]	63 [43, 83]	61 [41, 81]
LVESV (ml)	45 [23, 67]	41 [20, 63]	38 [16, 59]	34 [12, 56]
LVESVi (ml/m <sup>2</sup> )	23 [12, 34]	21 [10, 32]	20 [9, 31]	19 [8, 30]
LVSV (ml)	88 [58, 117]	84 [55, 113]	80 [51, 109]	76 [47, 106]
LVSVi (ml/m <sup>2</sup> )	45 [31, 58]	44 [30, 57]	42 [29, 56]	41 [28, 55]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	66 [55, 78]	67 [56, 79]	68 [57, 80]	69 [57, 81]
LVM diast (g)	108 [71, 145]	104 [68, 141]	101 [64, 137]	97 [60, 134]
LVMi diast (g/m <sup>2</sup> )	55 [39, 70]	54 [39, 70]	54 [38, 69]	53 [38, 69]
LVM syst (g)	109 [71, 147]	104 [67, 142]	99 [61, 136]	94 [56, 132]
LVMi syst (g/m <sup>2</sup> )	55 [39, 72]	54 [38, 70]	53 [37, 69]	52 [35, 68]
<b>Right ventricle</b>				
RVEDV (ml)	154 [103, 206]	146 [95, 198]	139 [87, 190]	131 [79, 182]
RVEDVi (ml/m <sup>2</sup> )	78 [55, 101]	76 [53, 99]	74 [50, 97]	72 [48, 95]
RVESV (ml)	67 [40, 94]	62 [36, 89]	58 [31, 85]	54 [27, 80]
RVESVi (ml/m <sup>2</sup> )	34 [21, 47]	32 [19, 45]	31 [18, 44]	29 [17, 42]
RVSV (ml)	88 [56, 121]	84 [52, 117]	80 [48, 113]	76 [43, 109]
RVSVi (ml/m <sup>2</sup> )	44 [29, 60]	43 [28, 59]	43 [28, 58]	42 [27, 57]
RVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
RVEF (%)	57 [46, 68]	58 [47, 68]	58 [47, 69]	59 [48, 70]
<b>Left atrium</b>				
LAESV (ml)	61 [28, 95]	60 [27, 94]	59 [26, 93]	58 [25, 92]
LAESVi (ml/m <sup>2</sup> )	31 [15, 47]	31 [15, 47]	31 [15, 47]	32 [16, 48]
LA max (ml)	64 [31, 98]	64 [30, 97]	63 [29, 97]	62 [29, 96]
LA max i (ml/m <sup>2</sup> )	32 [16, 48]	33 [17, 49]	33 [18, 49]	34 [18, 50]
LAEF (%)	70 [54, 85]	67 [52, 83]	65 [49, 80]	62 [47, 78]
<b>Right atrium</b>				
RAESV (ml)	75 [33, 116]	72 [31, 114]	70 [29, 111]	68 [27, 109]
RAESVi (ml/m <sup>2</sup> )	38 [17, 59]	38 [17, 59]	37 [16, 59]	37 [16, 59]
RA max (ml)	76 [35, 117]	75 [34, 116]	73 [33, 114]	72 [31, 113]
RA max i (ml/m <sup>2</sup> )	39 [18, 60]	39 [18, 60]	39 [18, 60]	39 [18, 60]
RAEF (%)	48 [31, 65]	50 [33, 67]	52 [35, 69]	54 [36, 71]

**Table S50. CMR metrics in men of South Asian ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(19 - 21)	(131 - 134)	(117 - 122)	(40 - 43)
<b>Left ventricle</b>				
LVEDV (ml)	132 [90, 175]	125 [83, 167]	118 [76, 160]	111 [69, 154]
LVEDVi (ml/m)	76 [53, 100]	73 [50, 96]	69 [46, 93]	66 [43, 89]
LVESV (ml)	45 [23, 67]	41 [20, 63]	38 [16, 59]	34 [12, 56]
LVESVi (ml/m)	26 [14, 38]	24 [12, 36]	22 [10, 34]	20 [8, 32]
LVSV (ml/m)	88 [58, 117]	84 [55, 113]	80 [51, 109]	76 [47, 106]
LVSVi (ml/m)	51 [34, 67]	49 [32, 65]	47 [31, 63]	45 [29, 62]
LVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
LVEF (%)	66 [55, 78]	67 [56, 79]	68 [57, 80]	69 [57, 81]
LVM diast (g)	108 [71, 145]	104 [68, 141]	101 [64, 137]	97 [60, 134]
LVMi diast (g)	62 [42, 82]	61 [40, 81]	59 [39, 79]	58 [37, 78]
LVM syst (g)	109 [71, 147]	104 [67, 142]	99 [61, 136]	94 [56, 132]
LVMi syst (g/m)	63 [42, 84]	60 [40, 81]	58 [37, 79]	56 [35, 77]
<b>Right ventricle</b>				
RVEDV (ml)	154 [103, 206]	146 [95, 198]	139 [87, 190]	131 [79, 182]
RVEDVi (ml/m)	89 [61, 117]	85 [57, 113]	81 [53, 109]	77 [49, 105]
RVESV (ml)	67 [40, 94]	62 [36, 89]	58 [31, 85]	54 [27, 80]
RVESVi (ml/m)	38 [23, 53]	36 [21, 51]	34 [19, 49]	32 [17, 47]
RVSV (ml)	88 [56, 121]	84 [52, 117]	80 [48, 113]	76 [43, 109]
RVSVi (ml/m)	51 [33, 69]	49 [31, 67]	47 [29, 65]	45 [27, 63]
RVCO (l/min)	5 [3, 8]	5 [3, 7]	5 [3, 7]	5 [3, 7]
RVEF (%)	57 [46, 68]	58 [47, 68]	58 [47, 69]	59 [48, 70]
<b>Left atrium</b>				
LAESV (ml)	61 [28, 95]	60 [27, 94]	59 [26, 93]	58 [25, 92]
LAESVi (ml/m)	35 [16, 54]	35 [16, 54]	35 [16, 54]	34 [16, 53]
LA max (ml)	64 [31, 98]	64 [30, 97]	63 [29, 97]	62 [29, 96]
LA max i (ml/m)	37 [18, 55]	37 [18, 55]	37 [18, 55]	37 [18, 55]
LAEF (%)	70 [54, 85]	67 [52, 83]	65 [49, 80]	62 [47, 78]
<b>Right atrium</b>				
RAESV (ml)	75 [33, 116]	72 [31, 114]	70 [29, 111]	68 [27, 109]
RAESVi (ml/m)	43 [20, 66]	42 [19, 65]	41 [18, 64]	40 [17, 63]
RA max (ml)	76 [35, 117]	75 [34, 116]	73 [33, 114]	72 [31, 113]
RA max i (ml/m)	44 [21, 67]	43 [21, 66]	43 [20, 66]	42 [19, 65]
RAEF (%)	48 [31, 65]	50 [33, 67]	52 [35, 69]	54 [36, 71]

**Table S51. CMR metrics in men of Chinese ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>
N (min – max)	(16 - 19)	(14 - 17)	(10 - 20)	(29 - 49)	(21 - 37)
<b>Left ventricle</b>					
LVEDV (ml)	159 [117, 201]	152 [110, 193]	145 [103, 186]	137 [96, 179]	130 [88, 171]
LVEDVi (ml/m <sup>2</sup> )	84 [63, 105]	81 [60, 102]	78 [57, 99]	75 [54, 96]	72 [51, 93]
LVESV (ml)	66 [40, 91]	62 [37, 87]	58 [33, 84]	55 [30, 80]	51 [26, 76]
LVESVi (ml/m <sup>2</sup> )	35 [22, 48]	33 [20, 46]	31 [19, 44]	30 [17, 43]	28 [15, 41]
LVSV (ml)	93 [67, 120]	90 [63, 116]	86 [60, 112]	83 [56, 109]	79 [53, 105]
LVSVi (ml/m <sup>2</sup> )	49 [36, 63]	48 [34, 61]	47 [33, 60]	45 [32, 59]	44 [30, 57]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	59 [45, 72]	59 [46, 73]	60 [47, 73]	60 [47, 74]	61 [48, 74]
LVM diast (g)	95 [66, 125]	93 [64, 122]	91 [62, 120]	89 [60, 118]	87 [58, 116]
LVMi diast (g/m <sup>2</sup> )	50 [38, 62]	50 [38, 61]	49 [37, 61]	49 [37, 60]	48 [36, 60]
LVM syst (g)	100 [61, 139]	96 [58, 135]	93 [55, 131]	89 [51, 128]	86 [47, 124]
LVMi syst (g/m <sup>2</sup> )	53 [34, 71]	51 [32, 70]	50 [31, 69]	49 [30, 67]	48 [29, 66]
<b>Right ventricle</b>					
RVEDV (ml)	176 [125, 227]	167 [117, 217]	158 [108, 208]	149 [99, 199]	140 [89, 190]
RVEDVi (ml/m <sup>2</sup> )	93 [68, 118]	89 [64, 114]	85 [60, 110]	81 [57, 106]	78 [53, 102]
RVESV (ml)	82 [49, 115]	76 [44, 109]	71 [38, 103]	65 [32, 97]	59 [26, 92]
RVESVi (ml/m <sup>2</sup> )	43 [27, 60]	41 [24, 57]	38 [22, 55]	35 [19, 52]	33 [16, 49]
RVSV (ml)	94 [63, 124]	90 [60, 121]	87 [57, 117]	84 [54, 114]	81 [51, 111]
RVSVi (ml/m <sup>2</sup> )	49 [33, 66]	48 [32, 64]	47 [31, 63]	46 [30, 62]	45 [29, 61]
RVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 8]	5 [3, 7]
RVEF (%)	53 [39, 67]	54 [41, 68]	56 [42, 69]	57 [43, 71]	58 [44, 72]
<b>Left atrium</b>					
LAESV (ml)	63 [36, 89]	60 [34, 87]	58 [32, 84]	56 [30, 82]	54 [27, 80]
LAESVi (ml/m <sup>2</sup> )	33 [19, 47]	32 [18, 46]	31 [17, 45]	30 [16, 44]	30 [16, 44]
LA max (ml)	69 [43, 96]	66 [40, 92]	64 [38, 89]	61 [35, 87]	58 [32, 84]
LA max i (ml/m <sup>2</sup> )	36 [23, 50]	35 [22, 49]	34 [21, 48]	33 [20, 47]	32 [18, 45]
LAEF (%)	60 [45, 76]	61 [46, 76]	62 [48, 77]	64 [49, 78]	65 [50, 80]
<b>Right atrium</b>					
RAESV (ml)	67 [28, 107]	68 [29, 107]	69 [29, 108]	69 [30, 109]	70 [31, 110]
RAESVi (ml/m <sup>2</sup> )	35 [14, 56]	36 [15, 57]	37 [16, 58]	38 [17, 59]	39 [18, 60]
RA max (ml)	71 [31, 112]	72 [31, 112]	72 [32, 112]	72 [32, 112]	73 [32, 113]
RA max i (ml/m <sup>2</sup> )	37 [16, 59]	38 [16, 60]	39 [17, 60]	39 [18, 61]	40 [19, 62]
RAEF (%)	51 [33, 70]	51 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 70]

**Table S52. CMR metrics in men of Chinese ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>
N (min – max)	(16 - 19)	(14 - 17)	(10 - 20)	(29 - 49)	(21 - 37)
<b>Left ventricle</b>					
LVEDV (ml)	159 [117, 201]	152 [110, 193]	145 [103, 186]	137 [96, 179]	130 [88, 171]
LVEDVi (ml/m)	91 [68, 113]	87 [65, 110]	84 [62, 106]	81 [58, 103]	77 [55, 100]
LVESV (ml)	66 [40, 91]	62 [37, 87]	58 [33, 84]	55 [30, 80]	51 [26, 76]
LVESVi (ml/m)	37 [23, 52]	36 [22, 50]	34 [20, 48]	32 [18, 46]	30 [16, 44]
LVSV (ml/m)	93 [67, 120]	90 [63, 116]	86 [60, 112]	83 [56, 109]	79 [53, 105]
LVSVi (ml/m)	53 [38, 68]	52 [37, 66]	50 [36, 65]	49 [34, 63]	47 [32, 62]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	59 [45, 72]	59 [46, 73]	60 [47, 73]	60 [47, 74]	61 [48, 74]
LVM diast (g)	95 [66, 125]	93 [64, 122]	91 [62, 120]	89 [60, 118]	87 [58, 116]
LVMi diast (g)	54 [38, 71]	54 [38, 70]	53 [37, 69]	53 [36, 69]	52 [36, 68]
LVM syst (g)	100 [61, 139]	96 [58, 135]	93 [55, 131]	89 [51, 128]	86 [47, 124]
LVMi syst (g/m)	57 [35, 79]	56 [34, 77]	54 [32, 76]	53 [31, 74]	51 [29, 73]
<b>Right ventricle</b>					
RVEDV (ml)	176 [125, 227]	167 [117, 217]	158 [108, 208]	149 [99, 199]	140 [89, 190]
RVEDVi (ml/m)	100 [73, 128]	96 [69, 124]	92 [64, 119]	87 [60, 115]	83 [56, 111]
RVESV (ml)	82 [49, 115]	76 [44, 109]	71 [38, 103]	65 [32, 97]	59 [26, 92]
RVESVi (ml/m)	47 [29, 65]	44 [26, 62]	41 [23, 59]	38 [20, 56]	35 [17, 53]
RVSV (ml)	94 [63, 124]	90 [60, 121]	87 [57, 117]	84 [54, 114]	81 [51, 111]
RVSVi (ml/m)	53 [36, 71]	52 [35, 69]	51 [34, 68]	49 [32, 66]	48 [31, 65]
RVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 8]	5 [3, 7]
RVEF (%)	53 [39, 67]	54 [41, 68]	56 [42, 69]	57 [43, 71]	58 [44, 72]
<b>Left atrium</b>					
LAESV (ml)	63 [36, 89]	60 [34, 87]	58 [32, 84]	56 [30, 82]	54 [27, 80]
LAESVi (ml/m)	36 [20, 51]	35 [19, 50]	34 [19, 49]	33 [18, 48]	32 [16, 47]
LA max (ml)	69 [43, 96]	66 [40, 92]	64 [38, 89]	61 [35, 87]	58 [32, 84]
LA max i (ml/m)	40 [25, 55]	38 [23, 53]	37 [22, 52]	36 [21, 51]	34 [19, 49]
LAEF (%)	60 [45, 76]	61 [46, 76]	62 [48, 77]	64 [49, 78]	65 [50, 80]
<b>Right atrium</b>					
RAESV (ml)	67 [28, 107]	68 [29, 107]	69 [29, 108]	69 [30, 109]	70 [31, 110]
RAESVi (ml/m)	38 [15, 61]	39 [17, 62]	40 [17, 63]	41 [18, 63]	42 [19, 64]
RA max (ml)	71 [31, 112]	72 [31, 112]	72 [32, 112]	72 [32, 112]	73 [32, 113]
RA max i (ml/m)	41 [17, 64]	41 [18, 64]	42 [19, 65]	42 [20, 65]	43 [20, 66]
RAEF (%)	51 [33, 70]	51 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 70]

**Table S53. CMR metrics in men of Chinese ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>
N (min – max)	(16 - 19)	(14 - 17)	(10 - 20)	(28 - 49)	(21 - 37)
<b>Left ventricle</b>					
LVEDV (ml)	155 [114, 196]	148 [107, 188]	141 [101, 181]	134 [94, 174]	127 [87, 167]
LVEDVi (ml/m <sup>2</sup> )	82 [61, 102]	79 [58, 99]	76 [56, 97]	73 [53, 94]	71 [50, 91]
LVESV (ml)	59 [36, 83]	56 [33, 80]	53 [30, 77]	50 [27, 74]	47 [24, 71]
LVESVi (ml/m <sup>2</sup> )	31 [19, 44]	30 [18, 42]	29 [16, 41]	27 [15, 40]	26 [14, 39]
LVSV (ml)	95 [69, 122]	91 [65, 118]	88 [61, 114]	84 [57, 110]	80 [54, 106]
LVSVi (ml/m <sup>2</sup> )	50 [37, 64]	49 [35, 62]	47 [34, 61]	46 [33, 59]	44 [31, 58]
LVC0 (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [49, 74]	62 [49, 75]	62 [50, 75]	63 [50, 76]	63 [50, 76]
LVM diast (g)	100 [70, 130]	97 [67, 127]	95 [65, 125]	92 [62, 122]	90 [60, 120]
LVMi diast (g/m <sup>2</sup> )	52 [40, 65]	52 [39, 64]	51 [39, 63]	50 [38, 63]	50 [37, 62]
LVM syst (g)	106 [64, 148]	102 [61, 144]	98 [57, 140]	94 [53, 136]	90 [48, 132]
LVMi syst (g/m <sup>2</sup> )	56 [36, 76]	54 [35, 74]	53 [33, 72]	51 [32, 71]	50 [30, 69]
<b>Right ventricle</b>					
RVEDV (ml)	157 [108, 205]	152 [104, 200]	146 [99, 194]	141 [93, 189]	136 [88, 184]
RVEDVi (ml/m <sup>2</sup> )	83 [58, 108]	81 [56, 106]	79 [55, 104]	77 [53, 102]	76 [51, 100]
RVESV (ml)	65 [36, 93]	63 [35, 91]	61 [33, 89]	59 [31, 87]	57 [29, 85]
RVESVi (ml/m <sup>2</sup> )	34 [20, 49]	33 [19, 48]	33 [19, 47]	32 [18, 46]	32 [17, 46]
RVSV (ml)	92 [61, 123]	89 [58, 120]	86 [55, 117]	82 [52, 113]	79 [48, 110]
RVSVi (ml/m <sup>2</sup> )	49 [32, 66]	48 [31, 64]	46 [30, 63]	45 [29, 62]	44 [27, 61]
RVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [46, 72]	59 [46, 72]	59 [46, 72]	59 [45, 72]	59 [45, 72]
<b>Left atrium</b>					
LAESV (ml)	63 [36, 89]	60 [34, 87]	58 [32, 84]	56 [30, 82]	54 [27, 80]
LAESVi (ml/m <sup>2</sup> )	33 [19, 47]	32 [18, 46]	31 [17, 45]	30 [16, 44]	30 [16, 44]
LA max (ml)	69 [43, 96]	66 [40, 92]	64 [38, 89]	61 [35, 87]	58 [32, 84]
LA max i (ml/m <sup>2</sup> )	36 [23, 50]	35 [22, 49]	34 [21, 48]	33 [20, 47]	32 [18, 45]
LAEF (%)	60 [45, 76]	61 [46, 76]	62 [48, 77]	64 [49, 78]	65 [50, 80]
<b>Right atrium</b>					
RAESV (ml)	67 [28, 107]	68 [29, 107]	69 [29, 108]	69 [30, 109]	70 [31, 110]
RAESVi (ml/m <sup>2</sup> )	35 [14, 56]	36 [15, 57]	37 [16, 58]	38 [17, 59]	39 [18, 60]
RA max (ml)	71 [31, 112]	72 [31, 112]	72 [32, 112]	72 [32, 112]	73 [32, 113]
RA max i (ml/m <sup>2</sup> )	37 [16, 59]	38 [16, 60]	39 [17, 60]	39 [18, 61]	40 [19, 62]
RAEF (%)	51 [33, 70]	51 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 70]



**Table S54. CMR metrics in men of Chinese ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>
N (min – max)	(16 - 19)	(14 - 17)	(10 - 20)	(29 - 49)	(21 - 37)
<b>Left ventricle</b>					
LVEDV (ml)	155 [114, 196]	148 [107, 188]	141 [101, 181]	134 [94, 174]	127 [87, 167]
LVEDVi (ml/m)	88 [66, 110]	85 [63, 107]	82 [60, 104]	79 [57, 100]	76 [54, 97]
LVESV (ml)	59 [36, 83]	56 [33, 80]	53 [30, 77]	50 [27, 74]	47 [24, 71]
LVESVi (ml/m)	34 [21, 47]	32 [19, 45]	31 [18, 44]	29 [16, 42]	28 [15, 41]
LVSV (ml/m)	95 [69, 122]	91 [65, 118]	88 [61, 114]	84 [57, 110]	80 [54, 106]
LVSVi (ml/m)	54 [40, 69]	53 [38, 67]	51 [36, 66]	49 [35, 64]	48 [33, 62]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	62 [49, 74]	62 [49, 75]	62 [50, 75]	63 [50, 76]	63 [50, 76]
LVM diast (g)	100 [70, 130]	97 [67, 127]	95 [65, 125]	92 [62, 122]	90 [60, 120]
LVMi diast (g)	57 [40, 74]	56 [40, 73]	55 [39, 72]	54 [38, 71]	53 [37, 70]
LVM syst (g)	106 [64, 148]	102 [61, 144]	98 [57, 140]	94 [53, 136]	90 [48, 132]
LVMi syst (g/m)	61 [37, 84]	59 [35, 83]	57 [34, 81]	55 [32, 79]	54 [30, 77]
<b>Right ventricle</b>					
RVEDV (ml)	157 [108, 205]	152 [104, 200]	146 [99, 194]	141 [93, 189]	136 [88, 184]
RVEDVi (ml/m)	90 [63, 116]	87 [61, 114]	85 [59, 112]	83 [57, 110]	81 [54, 108]
RVESV (ml)	65 [36, 93]	63 [35, 91]	61 [33, 89]	59 [31, 87]	57 [29, 85]
RVESVi (ml/m)	37 [21, 53]	36 [20, 52]	35 [20, 51]	35 [19, 50]	34 [18, 50]
RVSV (ml)	92 [61, 123]	89 [58, 120]	86 [55, 117]	82 [52, 113]	79 [48, 110]
RVSVi (ml/m)	53 [35, 70]	51 [34, 69]	50 [32, 67]	49 [31, 66]	47 [29, 65]
RVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	59 [46, 72]	59 [46, 72]	59 [46, 72]	59 [45, 72]	59 [45, 72]
<b>Left atrium</b>					
LAESV (ml)	63 [36, 89]	60 [34, 87]	58 [32, 84]	56 [30, 82]	54 [27, 80]
LAESVi (ml/m)	36 [20, 51]	35 [19, 50]	34 [19, 49]	33 [18, 48]	32 [16, 47]
LA max (ml)	69 [43, 96]	66 [40, 92]	64 [38, 89]	61 [35, 87]	58 [32, 84]
LA max i (ml/m)	40 [25, 55]	38 [23, 53]	37 [22, 52]	36 [21, 51]	34 [19, 49]
LAEF (%)	60 [45, 76]	61 [46, 76]	62 [48, 77]	64 [49, 78]	65 [50, 80]
<b>Right atrium</b>					
RAESV (ml)	67 [28, 107]	68 [29, 107]	69 [29, 108]	69 [30, 109]	70 [31, 110]
RAESVi (ml/m)	38 [15, 61]	39 [17, 62]	40 [17, 63]	41 [18, 63]	42 [19, 64]
RA max (ml)	71 [31, 112]	72 [31, 112]	72 [32, 112]	72 [32, 112]	73 [32, 113]
RA max i (ml/m)	41 [17, 64]	41 [18, 64]	42 [19, 65]	42 [20, 65]	43 [20, 66]
RAEF (%)	51 [33, 70]	51 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 70]

**Table S55. CMR metrics in men of Chinese ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>
N (min – max)	(16 - 19)	(14 - 17)	(10 - 20)	(29 - 49)	(21 - 37)
<b>Left ventricle</b>					
LVEDV (ml)	147 [109, 186]	140 [102, 178]	133 [95, 171]	125 [87, 163]	118 [80, 156]
LVEDVi (ml/m <sup>2</sup> )	78 [58, 97]	75 [55, 94]	72 [52, 91]	69 [49, 88]	65 [46, 85]
LVESV (ml)	53 [32, 74]	50 [29, 70]	46 [25, 67]	42 [21, 63]	38 [18, 59]
LVESVi (ml/m <sup>2</sup> )	28 [17, 39]	26 [15, 38]	25 [14, 36]	23 [12, 34]	21 [10, 32]
LVSV (ml)	94 [67, 121]	91 [64, 117]	87 [60, 113]	83 [56, 110]	79 [53, 106]
LVSVi (ml/m <sup>2</sup> )	50 [36, 64]	48 [35, 62]	47 [33, 61]	46 [32, 59]	44 [30, 58]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	64 [51, 76]	65 [52, 77]	66 [53, 78]	67 [54, 79]	68 [55, 80]
LVM diast (g)	108 [75, 140]	105 [73, 138]	103 [71, 135]	101 [69, 133]	99 [67, 131]
LVMi diast (g/m <sup>2</sup> )	56 [43, 70]	56 [43, 69]	56 [42, 69]	55 [42, 69]	55 [42, 68]
LVM syst (g)	113 [67, 159]	110 [64, 155]	106 [61, 152]	103 [57, 149]	100 [54, 145]
LVMi syst (g/m <sup>2</sup> )	59 [38, 80]	58 [37, 79]	57 [36, 78]	56 [35, 76]	55 [34, 75]
<b>Right ventricle</b>					
RVEDV (ml)	148 [98, 198]	145 [95, 195]	142 [92, 191]	139 [89, 188]	136 [86, 185]
RVEDVi (ml/m <sup>2</sup> )	78 [52, 104]	77 [51, 103]	77 [51, 103]	76 [50, 102]	75 [49, 101]
RVESV (ml)	60 [30, 89]	59 [30, 88]	59 [30, 88]	58 [29, 87]	58 [29, 87]
RVESVi (ml/m <sup>2</sup> )	31 [16, 47]	32 [17, 47]	32 [17, 47]	32 [17, 47]	32 [17, 47]
RVSV (ml)	88 [55, 121]	86 [53, 118]	83 [50, 116]	80 [47, 113]	78 [45, 110]
RVSVi (ml/m <sup>2</sup> )	47 [29, 64]	46 [28, 63]	45 [27, 63]	44 [26, 62]	43 [25, 61]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	60 [45, 74]	59 [45, 73]	59 [45, 73]	58 [44, 72]	58 [43, 72]
<b>Left atrium</b>					
LAESV (ml)	63 [36, 89]	60 [34, 87]	58 [32, 84]	56 [30, 82]	54 [27, 80]
LAESVi (ml/m <sup>2</sup> )	33 [19, 47]	32 [18, 46]	31 [17, 45]	30 [16, 44]	30 [16, 44]
LA max (ml)	69 [43, 96]	66 [40, 92]	64 [38, 89]	61 [35, 87]	58 [32, 84]
LA max i (ml/m <sup>2</sup> )	36 [23, 50]	35 [22, 49]	34 [21, 48]	33 [20, 47]	32 [18, 45]
LAEF (%)	60 [45, 76]	61 [46, 76]	62 [48, 77]	64 [49, 78]	65 [50, 80]
<b>Right atrium</b>					
RAESV (ml)	67 [28, 107]	68 [29, 107]	69 [29, 108]	69 [30, 109]	70 [31, 110]
RAESVi (ml/m <sup>2</sup> )	35 [14, 56]	36 [15, 57]	37 [16, 58]	38 [17, 59]	39 [18, 60]
RA max (ml)	71 [31, 112]	72 [31, 112]	72 [32, 112]	72 [32, 112]	73 [32, 113]
RA max i (ml/m <sup>2</sup> )	37 [16, 59]	38 [16, 60]	39 [17, 60]	39 [18, 61]	40 [19, 62]
RAEF (%)	51 [33, 70]	51 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 70]

**Table S56. CMR metrics in men of Chinese ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>18- 29</b>	<b>30- 39</b>	<b>40- 49</b>	<b>50- 59</b>	<b>60- 69</b>
N (min – max)	(16 - 19)	(14 - 17)	(10 - 20)	(29 - 49)	(21 - 37)
<b>Left ventricle</b>					
LVEDV (ml)	147 [109, 186]	140 [102, 178]	133 [95, 171]	125 [87, 163]	118 [80, 156]
LVEDVi (ml/m)	84 [63, 105]	81 [60, 101]	77 [57, 98]	74 [53, 94]	70 [50, 91]
LVESV (ml)	53 [32, 74]	50 [29, 70]	46 [25, 67]	42 [21, 63]	38 [18, 59]
LVESVi (ml/m)	30 [19, 42]	29 [17, 40]	27 [15, 38]	25 [13, 36]	23 [11, 34]
LVSV (ml/m)	94 [67, 121]	91 [64, 117]	87 [60, 113]	83 [56, 110]	79 [53, 106]
LVSVi (ml/m)	54 [39, 69]	52 [37, 67]	51 [36, 65]	49 [34, 64]	47 [32, 62]
LVCO (l/min)	6 [4, 8]	6 [4, 8]	6 [4, 8]	5 [3, 7]	5 [3, 7]
LVEF (%)	64 [51, 76]	65 [52, 77]	66 [53, 78]	67 [54, 79]	68 [55, 80]
LVM diast (g)	108 [75, 140]	105 [73, 138]	103 [71, 135]	101 [69, 133]	99 [67, 131]
LVMi diast (g)	61 [44, 79]	61 [43, 78]	60 [43, 78]	60 [42, 77]	59 [41, 77]
LVM syst (g)	113 [67, 159]	110 [64, 155]	106 [61, 152]	103 [57, 149]	100 [54, 145]
LVMi syst (g/m)	64 [38, 91]	63 [37, 89]	62 [36, 88]	61 [35, 86]	59 [33, 85]
<b>Right ventricle</b>					
RVEDV (ml)	148 [98, 198]	145 [95, 195]	142 [92, 191]	139 [89, 188]	136 [86, 185]
RVEDVi (ml/m)	84 [56, 112]	83 [56, 111]	83 [55, 110]	82 [54, 109]	81 [53, 108]
RVESV (ml)	60 [30, 89]	59 [30, 88]	59 [30, 88]	58 [29, 87]	58 [29, 87]
RVESVi (ml/m)	34 [18, 51]	34 [18, 51]	34 [18, 51]	34 [18, 51]	35 [18, 51]
RVSV (ml)	88 [55, 121]	86 [53, 118]	83 [50, 116]	80 [47, 113]	78 [45, 110]
RVSVi (ml/m)	50 [31, 69]	49 [31, 68]	48 [30, 67]	47 [28, 66]	46 [27, 65]
RVCO (l/min)	6 [4, 8]	6 [3, 8]	5 [3, 8]	5 [3, 7]	5 [3, 7]
RVEF (%)	60 [45, 74]	59 [45, 73]	59 [45, 73]	58 [44, 72]	58 [43, 72]
<b>Left atrium</b>					
LAESV (ml)	63 [36, 89]	60 [34, 87]	58 [32, 84]	56 [30, 82]	54 [27, 80]
LAESVi (ml/m)	36 [20, 51]	35 [19, 50]	34 [19, 49]	33 [18, 48]	32 [16, 47]
LA max (ml)	69 [43, 96]	66 [40, 92]	64 [38, 89]	61 [35, 87]	58 [32, 84]
LA max i (ml/m)	40 [25, 55]	38 [23, 53]	37 [22, 52]	36 [21, 51]	34 [19, 49]
LAEF (%)	60 [45, 76]	61 [46, 76]	62 [48, 77]	64 [49, 78]	65 [50, 80]
<b>Right atrium</b>					
RAESV (ml)	67 [28, 107]	68 [29, 107]	69 [29, 108]	69 [30, 109]	70 [31, 110]
RAESVi (ml/m)	38 [15, 61]	39 [17, 62]	40 [17, 63]	41 [18, 63]	42 [19, 64]
RA max (ml)	71 [31, 112]	72 [31, 112]	72 [32, 112]	72 [32, 112]	73 [32, 113]
RA max i (ml/m)	41 [17, 64]	41 [18, 64]	42 [19, 65]	42 [20, 65]	43 [20, 66]
RAEF (%)	51 [33, 70]	51 [33, 70]	52 [33, 70]	52 [34, 70]	52 [34, 70]

**Table S57. CMR metrics in men of Mixed/Other ethnicity using smooth segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(65 - 68)	(59 - 62)	(32 - 36)
<b>Left ventricle</b>			
LVEDV (ml)	164 [113, 215]	149 [98, 200]	134 [83, 186]
LVEDVi (ml/m <sup>2</sup> )	82 [58, 107]	76 [52, 100]	70 [45, 94]
LVESV (ml)	64 [34, 94]	59 [29, 89]	54 [24, 84]
LVESVi (ml/m <sup>2</sup> )	33 [18, 47]	30 [16, 45]	28 [14, 43]
LVSV (ml)	98 [66, 131]	91 [58, 123]	83 [50, 116]
LVSVi (ml/m <sup>2</sup> )	50 [34, 65]	46 [30, 62]	43 [27, 59]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	61 [49, 72]	61 [49, 72]	60 [49, 72]
LVM diast (g)	105 [67, 143]	101 [63, 139]	97 [58, 135]
LVMi diast (g/m <sup>2</sup> )	52 [38, 67]	51 [37, 65]	50 [35, 64]
LVM syst (g)	106 [62, 150]	100 [56, 144]	95 [51, 139]
LVMi syst (g/m <sup>2</sup> )	53 [36, 70]	51 [34, 68]	50 [33, 67]
<b>Right ventricle</b>			
RVEDV (ml)	176 [112, 239]	162 [98, 225]	148 [84, 212]
RVEDVi (ml/m <sup>2</sup> )	88 [59, 117]	82 [53, 111]	76 [47, 105]
RVESV (ml)	70 [40, 100]	67 [36, 97]	63 [33, 93]
RVESVi (ml/m <sup>2</sup> )	36 [21, 50]	34 [19, 49]	32 [17, 47]
RVSV (ml)	103 [64, 142]	95 [57, 134]	88 [49, 127]
RVSVi (ml/m <sup>2</sup> )	52 [33, 71]	49 [30, 67]	45 [26, 64]
RVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
RVEF (%)	60 [50, 69]	59 [49, 69]	58 [48, 68]
<b>Left atrium</b>			
LAESV (ml)	67 [26, 108]	63 [22, 103]	58 [17, 99]
LAESVi (ml/m <sup>2</sup> )	34 [14, 55]	32 [12, 52]	30 [9, 50]
LA max (ml)	72 [32, 113]	67 [27, 108]	62 [21, 103]
LA max i (ml/m <sup>2</sup> )	37 [17, 56]	34 [15, 54]	32 [12, 52]
LAEF (%)	67 [49, 84]	66 [49, 83]	65 [48, 82]
<b>Right atrium</b>			
RAESV (ml)	85 [32, 138]	82 [29, 135]	79 [25, 132]
RAESVi (ml/m <sup>2</sup> )	43 [16, 70]	42 [15, 69]	41 [14, 68]
RA max (ml)	88 [36, 141]	85 [33, 138]	83 [30, 135]
RA max i (ml/m <sup>2</sup> )	45 [18, 71]	44 [17, 70]	43 [16, 70]
RAEF (%)	49 [33, 65]	50 [34, 67]	51 [35, 68]

**Table S58. CMR metrics in men of Mixed/Other ethnicity using smooth segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(66 - 68)	(59 - 62)	(32 - 36)
<b>Left ventricle</b>			
LVEDV (ml)	164 [113, 215]	149 [98, 200]	134 [83, 186]
LVEDVi (ml/m)	93 [66, 120]	86 [59, 113]	79 [52, 106]
LVESV (ml)	64 [34, 94]	59 [29, 89]	54 [24, 84]
LVESVi (ml/m)	37 [21, 53]	34 [18, 50]	32 [15, 48]
LVSV (ml/m)	98 [66, 131]	91 [58, 123]	83 [50, 116]
LVSVi (ml/m)	56 [39, 74]	53 [35, 70]	49 [31, 67]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	61 [49, 72]	61 [49, 72]	60 [49, 72]
LVM diast (g)	105 [67, 143]	101 [63, 139]	97 [58, 135]
LVMi diast (g)	60 [39, 81]	58 [37, 79]	57 [36, 78]
LVM syst (g)	106 [62, 150]	100 [56, 144]	95 [51, 139]
LVMi syst (g/m)	60 [37, 83]	58 [36, 81]	56 [34, 79]
<b>Right ventricle</b>			
RVEDV (ml)	176 [112, 239]	162 [98, 225]	148 [84, 212]
RVEDVi (ml/m)	100 [67, 133]	93 [60, 126]	87 [54, 120]
RVESV (ml)	70 [40, 100]	67 [36, 97]	63 [33, 93]
RVESVi (ml/m)	40 [24, 57]	38 [22, 55]	37 [20, 53]
RVSV (ml)	103 [64, 142]	95 [57, 134]	88 [49, 127]
RVSVi (ml/m)	59 [38, 80]	55 [34, 76]	51 [30, 72]
RVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
RVEF (%)	60 [50, 69]	59 [49, 69]	58 [48, 68]
<b>Left atrium</b>			
LAESV (ml)	67 [26, 108]	63 [22, 103]	58 [17, 99]
LAESVi (ml/m)	38 [15, 62]	36 [13, 60]	34 [11, 58]
LA max (ml)	72 [32, 113]	67 [27, 108]	62 [21, 103]
LA max i (ml/m)	42 [18, 65]	39 [16, 62]	36 [13, 60]
LAEF (%)	67 [49, 84]	66 [49, 83]	65 [48, 82]
<b>Right atrium</b>			
RAESV (ml)	85 [32, 138]	82 [29, 135]	79 [25, 132]
RAESVi (ml/m)	49 [19, 78]	47 [18, 77]	46 [16, 76]
RA max (ml)	88 [36, 141]	85 [33, 138]	83 [30, 135]
RA max i (ml/m)	51 [21, 80]	49 [20, 78]	48 [19, 77]
RAEF (%)	49 [33, 65]	50 [34, 67]	51 [35, 68]

**Table S59. CMR metrics in men of Mixed/Other ethnicity using papillary segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(65 - 68)	(58 - 62)	(32 - 36)
<b>Left ventricle</b>			
LVEDV (ml)	160 [110, 210]	146 [96, 195]	131 [81, 181]
LVEDVi (ml/m <sup>2</sup> )	81 [57, 104]	74 [51, 98]	68 [44, 92]
LVESV (ml)	60 [31, 89]	54 [25, 83]	49 [20, 78]
LVESVi (ml/m <sup>2</sup> )	30 [17, 44]	28 [14, 42]	26 [12, 40]
LVSV (ml)	99 [67, 132]	92 [59, 125]	84 [51, 117]
LVSVi (ml/m <sup>2</sup> )	50 [34, 66]	47 [31, 63]	43 [27, 59]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	63 [51, 74]	63 [51, 74]	63 [51, 74]
LVM diast (g)	109 [69, 149]	104 [64, 145]	100 [60, 140]
LVMi diast (g/m <sup>2</sup> )	54 [39, 69]	53 [38, 68]	51 [36, 67]
LVM syst (g)	110 [64, 155]	105 [60, 150]	100 [55, 145]
LVMi syst (g/m <sup>2</sup> )	55 [37, 73]	54 [36, 72]	52 [34, 70]
<b>Right ventricle</b>			
RVEDV (ml)	174 [111, 237]	160 [97, 223]	146 [83, 209]
RVEDVi (ml/m <sup>2</sup> )	87 [58, 116]	81 [52, 110]	75 [46, 104]
RVESV (ml)	69 [39, 99]	66 [36, 95]	62 [32, 92]
RVESVi (ml/m <sup>2</sup> )	35 [21, 50]	33 [19, 48]	32 [17, 46]
RVSV (ml)	103 [64, 141]	95 [56, 133]	87 [48, 125]
RVSVi (ml/m <sup>2</sup> )	52 [33, 70]	48 [30, 66]	45 [26, 63]
RVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
RVEF (%)	60 [50, 70]	59 [49, 69]	58 [48, 68]
<b>Left atrium</b>			
LAESV (ml)	67 [26, 108]	63 [22, 103]	58 [17, 99]
LAESVi (ml/m <sup>2</sup> )	34 [14, 55]	32 [12, 52]	30 [9, 50]
LA max (ml)	72 [32, 113]	67 [27, 108]	62 [21, 103]
LA max i (ml/m <sup>2</sup> )	37 [17, 56]	34 [15, 54]	32 [12, 52]
LAEF (%)	67 [49, 84]	66 [49, 83]	65 [48, 82]
<b>Right atrium</b>			
RAESV (ml)	85 [32, 138]	82 [29, 135]	79 [25, 132]
RAESVi (ml/m <sup>2</sup> )	43 [16, 70]	42 [15, 69]	41 [14, 68]
RA max (ml)	88 [36, 141]	85 [33, 138]	83 [30, 135]
RA max i (ml/m <sup>2</sup> )	45 [18, 71]	44 [17, 70]	43 [16, 70]
RAEF (%)	49 [33, 65]	50 [34, 67]	51 [35, 68]

**Table S60. CMR metrics in men of Mixed/Other ethnicity using papillary segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(66 - 68)	(58 - 62)	(32 - 36)
<b>Left ventricle</b>			
LVEDV (ml)	160 [110, 210]	146 [96, 195]	131 [81, 181]
LVEDVi (ml/m)	91 [65, 117]	84 [58, 110]	77 [51, 104]
LVESV (ml)	60 [31, 89]	54 [25, 83]	49 [20, 78]
LVESVi (ml/m)	34 [18, 50]	31 [15, 48]	29 [12, 45]
LVSV (ml/m)	99 [67, 132]	92 [59, 125]	84 [51, 117]
LVSVi (ml/m)	57 [39, 75]	53 [35, 71]	49 [31, 67]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	63 [51, 74]	63 [51, 74]	63 [51, 74]
LVM diast (g)	109 [69, 149]	104 [64, 145]	100 [60, 140]
LVMi diast (g)	62 [40, 84]	60 [38, 82]	58 [36, 81]
LVM syst (g)	110 [64, 155]	105 [60, 150]	100 [55, 145]
LVMi syst (g/m)	63 [39, 87]	61 [37, 85]	59 [35, 83]
<b>Right ventricle</b>			
RVEDV (ml)	174 [111, 237]	160 [97, 223]	146 [83, 209]
RVEDVi (ml/m)	99 [66, 132]	92 [60, 125]	86 [53, 118]
RVESV (ml)	69 [39, 99]	66 [36, 95]	62 [32, 92]
RVESVi (ml/m)	40 [23, 56]	38 [21, 54]	36 [20, 53]
RVSV (ml)	103 [64, 141]	95 [56, 133]	87 [48, 125]
RVSVi (ml/m)	59 [38, 79]	55 [34, 75]	50 [30, 71]
RVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
RVEF (%)	60 [50, 70]	59 [49, 69]	58 [48, 68]
<b>Left atrium</b>			
LAESV (ml)	67 [26, 108]	63 [22, 103]	58 [17, 99]
LAESVi (ml/m)	38 [15, 62]	36 [13, 60]	34 [11, 58]
LA max (ml)	72 [32, 113]	67 [27, 108]	62 [21, 103]
LA max i (ml/m)	42 [18, 65]	39 [16, 62]	36 [13, 60]
LAEF (%)	67 [49, 84]	66 [49, 83]	65 [48, 82]
<b>Right atrium</b>			
RAESV (ml)	85 [32, 138]	82 [29, 135]	79 [25, 132]
RAESVi (ml/m)	49 [19, 78]	47 [18, 77]	46 [16, 76]
RA max (ml)	88 [36, 141]	85 [33, 138]	83 [30, 135]
RA max i (ml/m)	51 [21, 80]	49 [20, 78]	48 [19, 77]
RAEF (%)	49 [33, 65]	50 [34, 67]	51 [35, 68]

**Table S61. CMR metrics in men of Mixed/Other ethnicity using anatomical segmentation, indexed by body surface area**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(65 - 68)	(59 - 62)	(32 - 36)
<b>Left ventricle</b>			
LVEDV (ml)	147 [101, 194]	134 [87, 181]	120 [73, 167]
LVEDVi (ml/m <sup>2</sup> )	74 [51, 97]	68 [45, 91]	62 [39, 85]
LVESV (ml)	48 [24, 73]	44 [19, 68]	39 [15, 64]
LVESVi (ml/m <sup>2</sup> )	24 [12, 37]	23 [10, 36]	21 [8, 34]
LVSV (ml)	98 [66, 130]	90 [58, 122]	82 [50, 114]
LVSVi (ml/m <sup>2</sup> )	49 [34, 65]	46 [30, 62]	43 [27, 59]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	67 [56, 79]	67 [56, 79]	67 [56, 79]
LVM diast (g)	122 [77, 167]	117 [73, 162]	113 [68, 158]
LVMi diast (g/m <sup>2</sup> )	61 [44, 78]	59 [43, 76]	58 [41, 75]
LVM syst (g)	123 [74, 171]	118 [70, 166]	113 [64, 162]
LVMi syst (g/m <sup>2</sup> )	61 [42, 81]	60 [40, 79]	58 [38, 77]
<b>Right ventricle</b>			
RVEDV (ml)	175 [112, 239]	161 [98, 224]	147 [83, 210]
RVEDVi (ml/m <sup>2</sup> )	88 [59, 117]	82 [53, 111]	76 [46, 105]
RVESV (ml)	72 [40, 105]	68 [36, 101]	64 [32, 97]
RVESVi (ml/m <sup>2</sup> )	36 [21, 52]	35 [19, 50]	33 [18, 49]
RVSV (ml)	101 [64, 139]	93 [55, 130]	84 [46, 121]
RVSVi (ml/m <sup>2</sup> )	51 [34, 69]	47 [29, 65]	43 [25, 61]
RVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
RVEF (%)	59 [49, 68]	57 [48, 67]	56 [47, 66]
<b>Left atrium</b>			
LAESV (ml)	67 [26, 108]	63 [22, 103]	58 [17, 99]
LAESVi (ml/m <sup>2</sup> )	34 [14, 55]	32 [12, 52]	30 [9, 50]
LA max (ml)	72 [32, 113]	67 [27, 108]	62 [21, 103]
LA max i (ml/m <sup>2</sup> )	37 [17, 56]	34 [15, 54]	32 [12, 52]
LAEF (%)	67 [49, 84]	66 [49, 83]	65 [48, 82]
<b>Right atrium</b>			
RAESV (ml)	85 [32, 138]	82 [29, 135]	79 [25, 132]
RAESVi (ml/m <sup>2</sup> )	43 [16, 70]	42 [15, 69]	41 [14, 68]
RA max (ml)	88 [36, 141]	85 [33, 138]	83 [30, 135]
RA max i (ml/m <sup>2</sup> )	45 [18, 71]	44 [17, 70]	43 [16, 70]
RAEF (%)	49 [33, 65]	50 [34, 67]	51 [35, 68]



**Table S62. CMR metrics in men of Mixed/Other ethnicity using anatomical segmentation, indexed by height**

<b>Variable</b>	<b>50- 59</b>	<b>60- 69</b>	<b>70+</b>
N (min – max)	(66 - 68)	(59 - 62)	(32 - 36)
<b>Left ventricle</b>			
LVEDV (ml)	147 [101, 194]	134 [87, 181]	120 [73, 167]
LVEDVi (ml/m)	84 [59, 109]	77 [53, 102]	71 [46, 96]
LVESV (ml)	48 [24, 73]	44 [19, 68]	39 [15, 64]
LVESVi (ml/m)	28 [14, 41]	25 [12, 39]	23 [9, 37]
LVSV (ml/m)	98 [66, 130]	90 [58, 122]	82 [50, 114]
LVSVi (ml/m)	56 [39, 74]	52 [35, 69]	48 [30, 65]
LVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
LVEF (%)	67 [56, 79]	67 [56, 79]	67 [56, 79]
LVM diast (g)	122 [77, 167]	117 [73, 162]	113 [68, 158]
LVMi diast (g)	70 [46, 94]	68 [44, 92]	66 [41, 90]
LVM syst (g)	123 [74, 171]	118 [70, 166]	113 [64, 162]
LVMi syst (g/m)	70 [44, 97]	68 [42, 94]	66 [39, 93]
<b>Right ventricle</b>			
RVEDV (ml)	175 [112, 239]	161 [98, 224]	147 [83, 210]
RVEDVi (ml/m)	100 [67, 133]	93 [60, 126]	86 [53, 119]
RVESV (ml)	72 [40, 105]	68 [36, 101]	64 [32, 97]
RVESVi (ml/m)	41 [24, 59]	39 [22, 57]	38 [20, 55]
RVSV (ml)	101 [64, 139]	93 [55, 130]	84 [46, 121]
RVSVi (ml/m)	58 [38, 78]	53 [34, 73]	49 [29, 69]
RVCO (l/min)	6 [4, 9]	6 [3, 8]	5 [3, 8]
RVEF (%)	59 [49, 68]	57 [48, 67]	56 [47, 66]
<b>Left atrium</b>			
LAESV (ml)	67 [26, 108]	63 [22, 103]	58 [17, 99]
LAESVi (ml/m)	38 [15, 62]	36 [13, 60]	34 [11, 58]
LA max (ml)	72 [32, 113]	67 [27, 108]	62 [21, 103]
LA max i (ml/m)	42 [18, 65]	39 [16, 62]	36 [13, 60]
LAEF (%)	67 [49, 84]	66 [49, 83]	65 [48, 82]
<b>Right atrium</b>			
RAESV (ml)	85 [32, 138]	82 [29, 135]	79 [25, 132]
RAESVi (ml/m)	49 [19, 78]	47 [18, 77]	46 [16, 76]
RA max (ml)	88 [36, 141]	85 [33, 138]	83 [30, 135]
RA max i (ml/m)	51 [21, 80]	49 [20, 78]	48 [19, 77]
RAEF (%)	49 [33, 65]	50 [34, 67]	51 [35, 68]