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*FAST*TRACK – CLINICAL RESEARCH
Interventional cardiology

Atlas of interventional cardiology 2023: European Society of Cardiology and European Association of Percutaneous Coronary Interventions

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Abstract

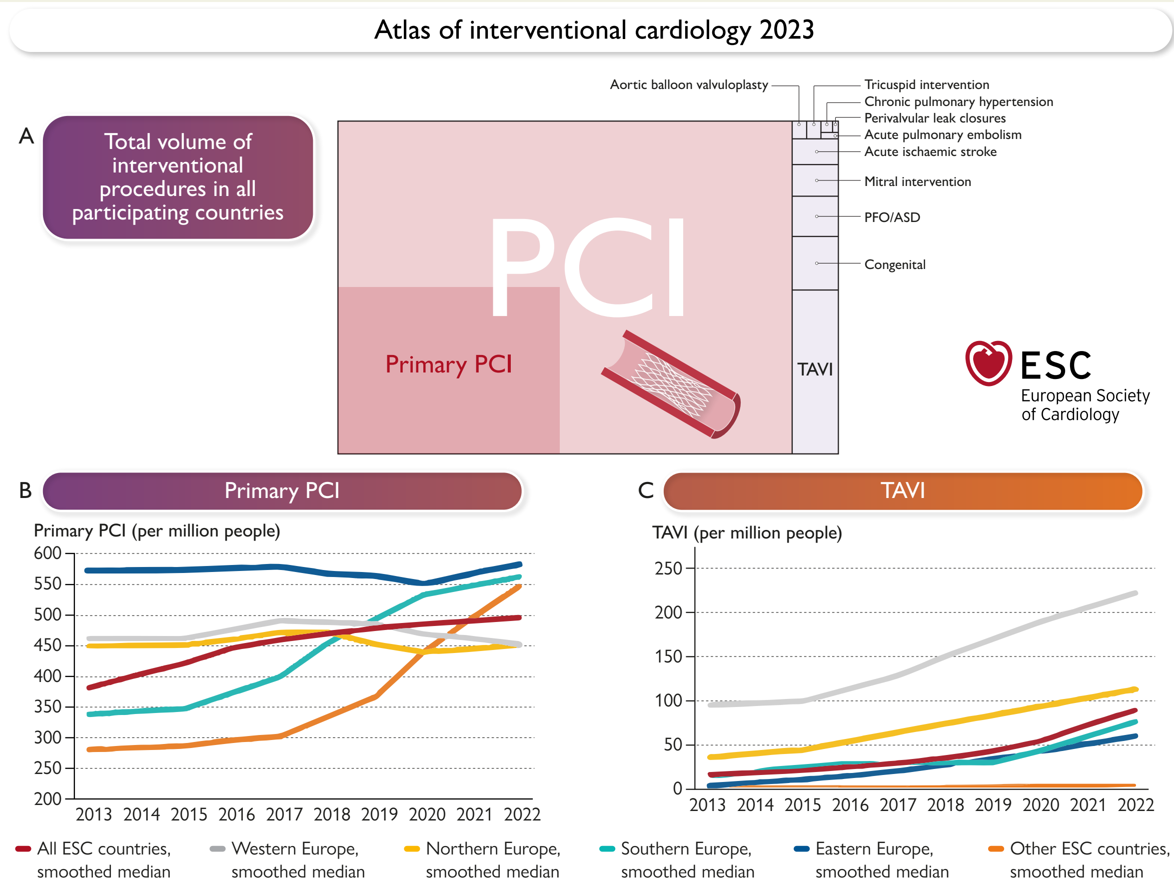
Background and Aims This study aims to provide the most comprehensive assessment to date of interventional cardiology practices across European Society of Cardiology (ESC) national society member countries, with a focus on infrastructure, procedural volumes, temporal trends (2013–22), regional disparities, and adherence to guideline-recommended care.

Methods The third edition of the ESC–European Association of Percutaneous Cardiovascular Interventions Atlas presents data from 50 ESC national society member countries, collected through a dedicated 2023 survey of national cardiac societies and interventional working groups. Data were subjected to a rigorous multi-step quality control process to ensure consistency and accuracy. Key metrics include interventional resources, such as the number of hospitals with catheterization laboratories, trained personnel, and the proportion of women in the interventional workforce; procedural volumes and types, including percutaneous coronary intervention (PCI), primary PCI, transcatheter aortic valve implantation, transcatheter mitral valve procedures, transcatheter tricuspid valve procedures; and procedural characteristics, including arterial access site, use of intracoronary imaging, physiological lesion assessment, and sex-specific data on patient care delivery.

Results Despite the ongoing expansion of structural heart transcatheter interventions, PCI remains the dominant procedure, accounting for >90% of all percutaneous cardiovascular interventions. Percutaneous coronary intervention volumes showed limited variation across ESC member countries and demonstrated no significant association with gross national income per capita. In contrast, important regional disparities were observed in the use of transcatheter aortic valve implantation, transcatheter mitral valve procedures, and transcatheter tricuspid valve procedures with procedure rates strongly correlated with gross national income ($r = .86$; $r = .63$; and $r = .64$). Workforce data revealed that while women constitute 39% of all cardiologists, they represent only 10% of interventional cardiologists across ESC member countries. Although interventional cardiology has helped reduce female disparity in access compared with cardiac surgery, inequalities persist, e.g. <30% of PCI recipients are women, despite women representing >40% of patients with ischaemic heart disease. Temporal trend analysis showed a narrowing gap in PCI and primary PCI volumes between regions, reflecting improved access across all economic strata. However, growth in structural valve interventions remained disproportionately concentrated in wealthier countries.

Conclusions The third edition of the ESC–European Association of Percutaneous Cardiovascular Interventions Atlas highlights significant progress in percutaneous cardiovascular interventions across Europe but also underscores persistent disparities. These findings reinforce the need for balanced investment strategies, harmonized training, greater sex equity, and enhanced data infrastructures to support more equitable and evidence-based cardiovascular care.

Structured Graphical Abstract



A. Relative proportions of percutaneous cardiovascular interventions among ESC
B. Temporal trends in primary PCI procedures, grouped by UN geoscheme, reflect progress in coronary care. Lower-income regions have progressively closed the gap with more affluent ones, likely to reflect the successful implementation of ESC guidelines and initiatives such as "Stent for Life"
C. Temporal trends in TAVI procedures, grouped by UN geoscheme, shows that while all regions progressed, the disparity between higher- and lower-income regions widened over time, reinforcing the urgency of initiatives such as Valve for Life

ASD, atrial septal defect; Congenital, transcatheter interventions for congenital heart disease in either children or adults; **PCI**, percutaneous coronary intervention; **PFO**, patent foramen ovale; **TAVI**, transcatheter aortic valve implantation; UN, United Nation Van Belle E, *et al. European Heart Journal.*

(A) Relative proportions of percutaneous cardiovascular interventions among European Society of Cardiology countries reflect the overwhelming dominance of percutaneous coronary intervention (PCI): PCI (including primary PCI) represents 90.7% of all interventions; all valve interventions combined (transcatheter aortic valve implantation, aortic balloon valvuloplasty, mitral, tricuspid, and paravalvular leak closure) represent 5.8%; all other procedures (e.g. congenital interventions, patent foramen ovale/atrial septal defect closure, stroke, pulmonary embolism, and pulmonary hypertension) represent 3.5%.

(B) Temporal trends in primary PCI procedures, grouped by the United Nations geoscheme, reflect progress in coronary care. Lower-income regions have progressively closed the gap with more affluent ones, likely to reflect the successful implementation of European Society of Cardiology guidelines and initiatives such as 'Stent for Life'.

(C) Temporal trends in transcatheter aortic valve implantation procedures, grouped by the United Nations geoscheme, show that while all regions progressed, the disparity between higher- and lower-income regions widened over time, reinforcing the urgency of initiatives such as 'Valve for Life'.

ASD, atrial septal defect; PCI, percutaneous coronary intervention; PFO, patent foramen ovale; TAVI, transcatheter aortic valve implantation; UN, United Nations.

Keywords Interventional cardiology • ESC Atlas • PCI • TAVI • Structural interventions • Disparities • Workforce • Europe

Introduction

The ESC–EAPCI Atlas of Interventional Cardiology is a joint initiative between the European Association of Percutaneous Cardiovascular Interventions (EAPCI) and the European Society of Cardiology (ESC). It serves as a comprehensive data source on interventional cardiology practice, infrastructure, and healthcare delivery across ESC member countries.[1,2] This third edition expands on prior efforts by including 50 countries and introducing the first decade-long trend analysis of key procedures.

Five cornerstone percutaneous cardiovascular interventions known to improve cardiovascular outcomes and quality of life are evaluated: percutaneous coronary intervention (PCI), primary PCI (pPCI), transcatheter aortic valve implantation (TAVI), transcatheter mitral valve procedures (TMVP), and transcatheter tricuspid valve procedures (TTVP).[3–5] These are examined in the context of country-level socio-economic and health indicators.[6–8]

The Atlas also reports on hospital capability, interventional workforce composition, the use of diagnostic and adjunctive tools (e.g. intracoronary pressure, intracoronary imaging, and calcific plaque modification techniques), and the presence of formal training programmes. It aims to support policy development, guideline implementation, and equitable access to care across Europe.[9]

Methods

Data sources and collection

This third ESC–EAPCI Atlas edition is based on the 2023 ESC–EAPCI Interventional Atlas Survey. Fifty participating countries provided data through national cardiac societies or working groups. Survey was capturing both infrastructure and procedural volumes.

Data underwent quality control through comparison with independent sources to identify discrepancies. Outliers were reviewed and resolved in collaboration with national representatives. Final datasets were validated by independent experts before approval (see Supplementary data online, *Methods*, for more details on data quality process).

Historical data (since 2013) were sourced from previous ESC and ESC–EAPCI Atlas editions.[1,2,10] Socio-economic data were obtained from the World Bank (WB).[11]

Geographic region classification

European Society of Cardiology member countries were categorized into five geographic regions per the United Nations geoscheme, adapted to European Union borders[8]: Western Europe (WE; $n = 7$; Austria, Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland), Northern Europe (NE; $n = 10$; Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, the UK), Southern Europe (SE; $n = 14$; Albania, Bosnia and Herzegovina, Cyprus, Croatia, Greece, Italy, Kosovo, North Macedonia, Malta, Portugal, San Marino, Serbia, Slovenia, Spain), Eastern Europe (EE; $n = 8$; Bulgaria, the Czech Republic, Hungary, Moldova, Poland, Romania, Slovakia, Ukraine), and other ESC countries (OE; $n = 11$; Algeria, Armenia, Azerbaijan, Egypt, Georgia, Israel, Kazakhstan, Kyrgyzstan, Tunisia, Türkiye, Uzbekistan) (*Figure 1A*).

Statistical analysis

Descriptive statistics are reported as medians with interquartile ranges (IQRs). Associations between variables were assessed using the Spearman correlation coefficient with significance tested via permutation.[12] No causation was implied when reporting statistically significant correlations. Group and pair comparisons were performed using Kruskal–Wallis (KW) and pairwise Wilcoxon rank-sum tests, respectively.[13] Benjamini–Hochberg correction was applied in multiple pairwise testing.[14] Country-level missing time series data were imputed with linear interpolation. Next, aggregated time series data were visualized as medians per region alongside overall median, smoothed with locally weighted polynomial regression.[15] Temporal trends were assessed using ordinary least squares regression.[16]

Detailed data definitions are presented in Supplementary data online, *Table S1*. We recognize the contributing working groups and national representatives in Supplementary data online, *Table S2*.

Ethical considerations

As this study used aggregate, anonymized national data and did not involve patient-level information, ethical approval was not required.

Results

Socio-economic and demographic characteristics

In 2022, gross national income (GNI) per capita ranged from USD 5 700 in OE to USD 59 000 in NE (*Figure 1B*). Current healthcare expenditure (HCE) per capita varied similarly, from USD 900 in OE to USD 7300 in WE (see Supplementary data online, *Figure S1A*). Life expectancy ranged from 73.5 years in OE to 81.7 years in NE (see Supplementary data online, *Figure S1B*), while the age-standardized cardiovascular death rate ranged from 227 per 100 000 in WE to 871 per 100 000 in OE (*Figure 1C*). The proportion of the population aged ≥65 years ranged from <10% in OE to ≥19% in WE, NE, SE, and EE (*Figure 1D*).

Resources for invasive coronary angiography and percutaneous coronary interventions

Workforce

The median number of interventional cardiologists (ICs) was 13.1 per million inhabitants (IQR: 9.2–19.4), with limited national or regional variation and no association with GNI per capita ($r = .24$; $P = .10$) (*Figures 2A* and *3A*; *Table 1*).

Trend analysis (2013–22) showed a modest increase in ICs ($\beta = +.28$; $P = .003$), with notable growth in SE ($\beta = +1.28$; $P < .001$), EE ($\beta = +.23$; $P = .009$) and OE ($\beta = +.57$; $P = .001$), but a decline in NE ($\beta = -.16$; $P = .006$) and WE ($\beta = -.34$; $P = .014$) (*Figure 4A*).

Formal IC training programmes were available in 60% of countries, ranging from 42% in SE to 86% in EE (see Supplementary data online, *Figure S2A*).

Infrastructure

The median number of hospitals with cardiac catheterization laboratory was 3.0 per million (IQR: 2.3–4.2), with minimal variation across regions and no association with GNI per capita ($r = .10$; $P = .53$) (*Figures 2B* and *3C*; *Table 1*). Regional values ranged from 2.2 per million in EE to 4.1 in WE (*Figure 3C*; $P = .16$).

Trend analysis showed a small increase in number of hospitals with catheterization laboratories over the past decade ($\beta = +.05$; $P = .001$), primarily driven by EE ($\beta = +.08$; $P = .001$) and SE ($\beta = +.08$; $P = .001$) (*Figure 4B*). Availability of 24/7 catheterization laboratory services remained stable throughout the study period.

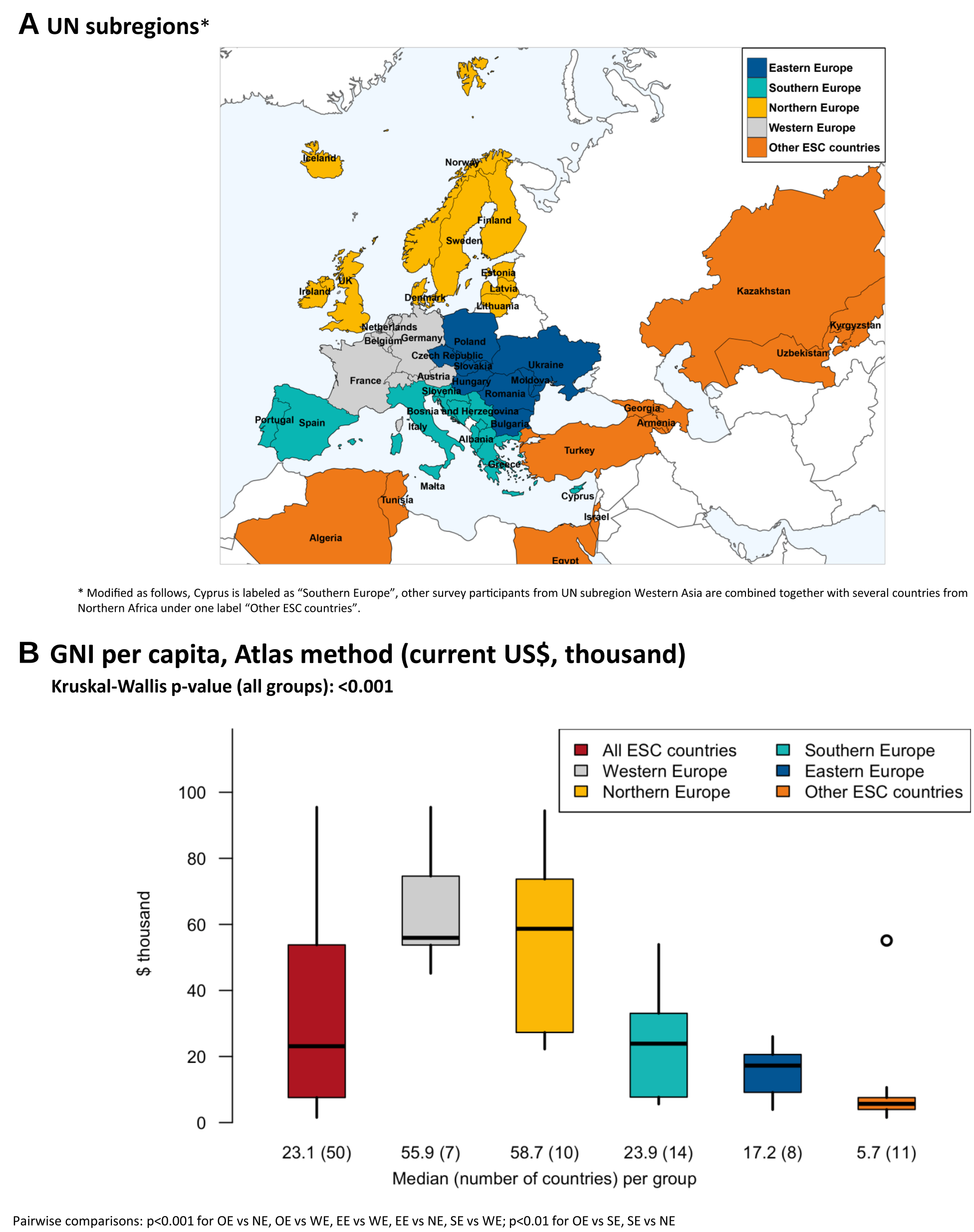


Figure 1 Socio-demographic characteristics of the 50 European Society of Cardiology countries, grouped by United Nations geoscheme. (*A*) Geographical distribution (colour-coded map); Western Europe ($n = 7$, Austria, Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland), Northern Europe ($n = 10$, Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, the UK), Southern Europe ($n = 14$ Albania, Bosnia and Herzegovina, Cyprus, Croatia, Greece, Italy, Kosovo, North Macedonia, Malta, Portugal, San Marino, Serbia, Slovenia, Spain), Eastern Europe ($n = 8$, Bulgaria, the Czech Republic, Hungary, Moldova, Poland, Romania, Slovakia, Ukraine), other ESC countries ($n = 11$, Algeria, Armenia, Azerbaijan, Egypt, Georgia, Israel, Kazakhstan, Kyrgyzstan, Tunisia, Türkiye, Uzbekistan). (*B*) Gross national income per capita. (*C*) Age-standardized cardiovascular death rate. (*D*) Proportion of population aged ≥65 years

Invasive coronary angiography

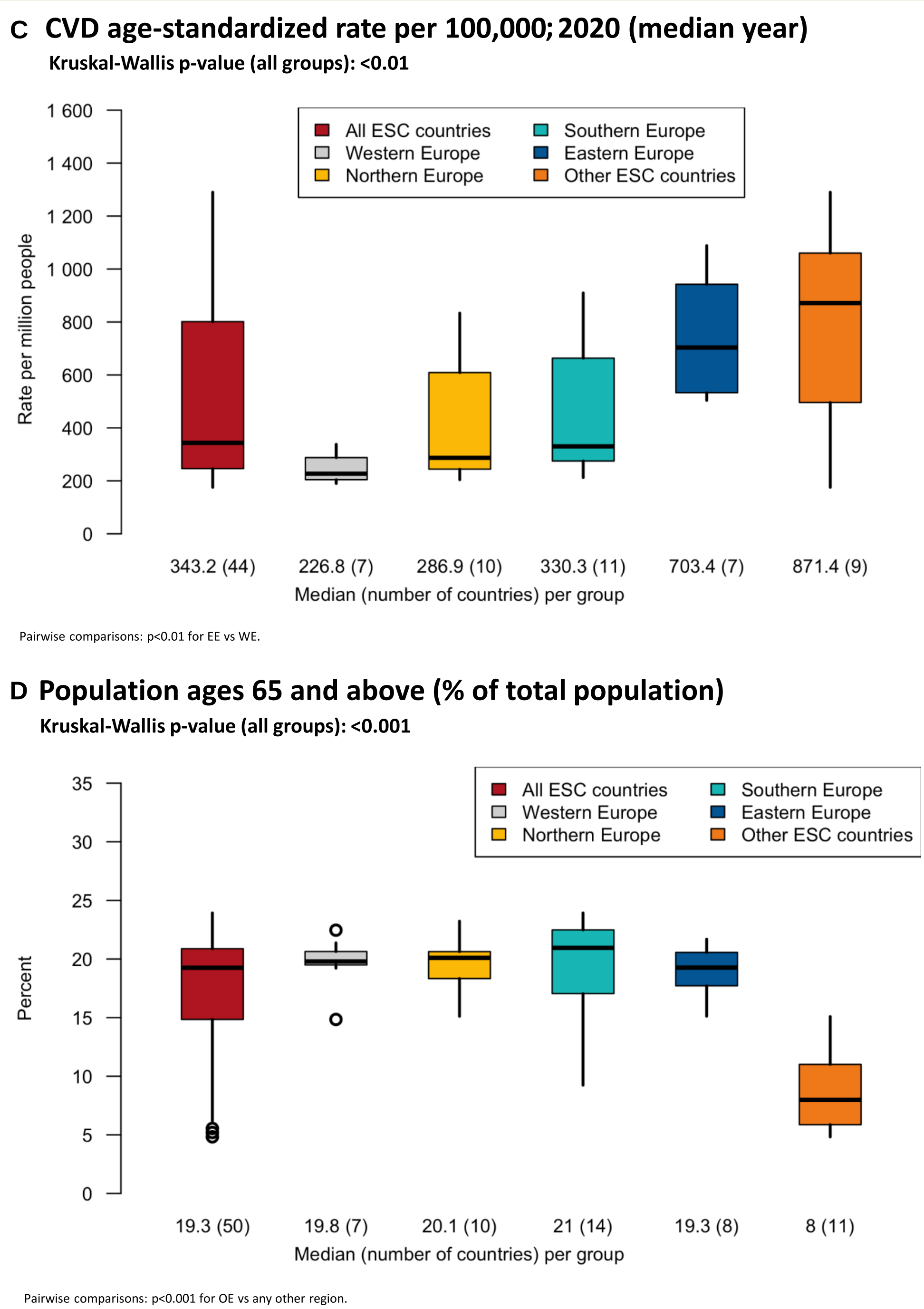
A median of 3696 invasive coronary angiography (ICA) procedures per million population were performed in 2022 (IQR: 2882–5585), with rates ranging from 2643 in OE to 5988 in WE ($P = .13$) (see Supplementary data online, *Figure S3A*).

From 2013 to 2022, ICA volumes insignificantly decreased overall (β coefficient slope = −10.3; $P = .401$), while regions demonstrated bidirectional dynamics with the most marked reductions in EE ($\beta = -126.91$; $P < .001$) and NE ($\beta = -141.84$; $P < .001$), which were offset by increases in SE ($\beta = +47.76$; $P = .09$) and OE ($\beta = +72.59$; $P = .006$).

Percutaneous coronary intervention and indications

Overall percutaneous coronary intervention volumes

The median PCI rate was 2220 per million people (IQR: 1416–2528), ranging from 1237 in OE to 2406 in WE (KW; $P = .50$). Percutaneous coronary intervention accounted on average for 92% (IQR: 88.1%–96.1%) of all percutaneous cardiovascular procedures ranging from 88% in WE to 96% in OE (KW; $P = .047$; *Figure 5A and B*).



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Trend analysis demonstrated a significant increase in PCI volumes across ESC countries ($\beta = +38.74$; $P < .001$), particularly in OE ($\beta = +55.6$; $P < .001$), EE ($\beta = +29.4$; $P = .001$), and SE ($\beta = +51.25$; $P = .012$).

Primary percutaneous coronary intervention

A median of 509 per million (IQR: 445–628) primary PCI procedures were performed across ESC member countries, comprising 22.4% of all PCI procedures. Primary PCI procedure rates showed small and non-significant differences between countries and regions ($P = .29$) (*Figure 3D*) and were unassociated with GNI per capita ($r = .21$; $P = .15$) (*Figure 2C*; *Table 1*). Primary PCI volumes increased significantly in OE ($\beta = +22.46$; $P = .004$) and SE ($\beta = +26.17$; $P < .001$) while remaining stable, or slightly declining, in other regions (*Figure 4C*). A temporary dip, in 2020, was observed in EE and NE, while the decline continued steadily in WE (*Figure 4C*).

Other percutaneous coronary intervention indications

Among other indications for PCI, chronic total coronary occlusion ranged from 3% to 4% (see Supplementary data online, *Figure S3B*),

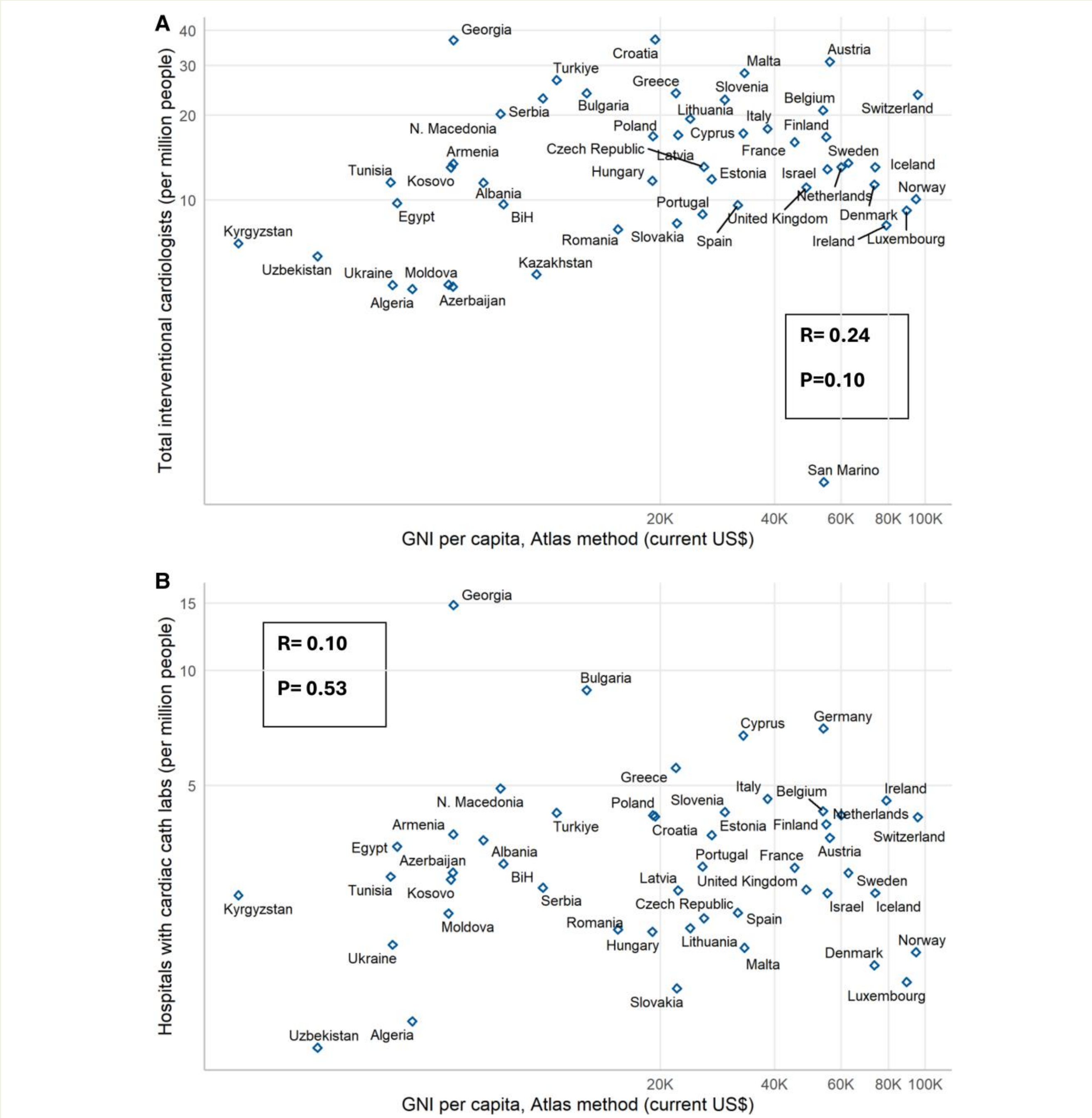


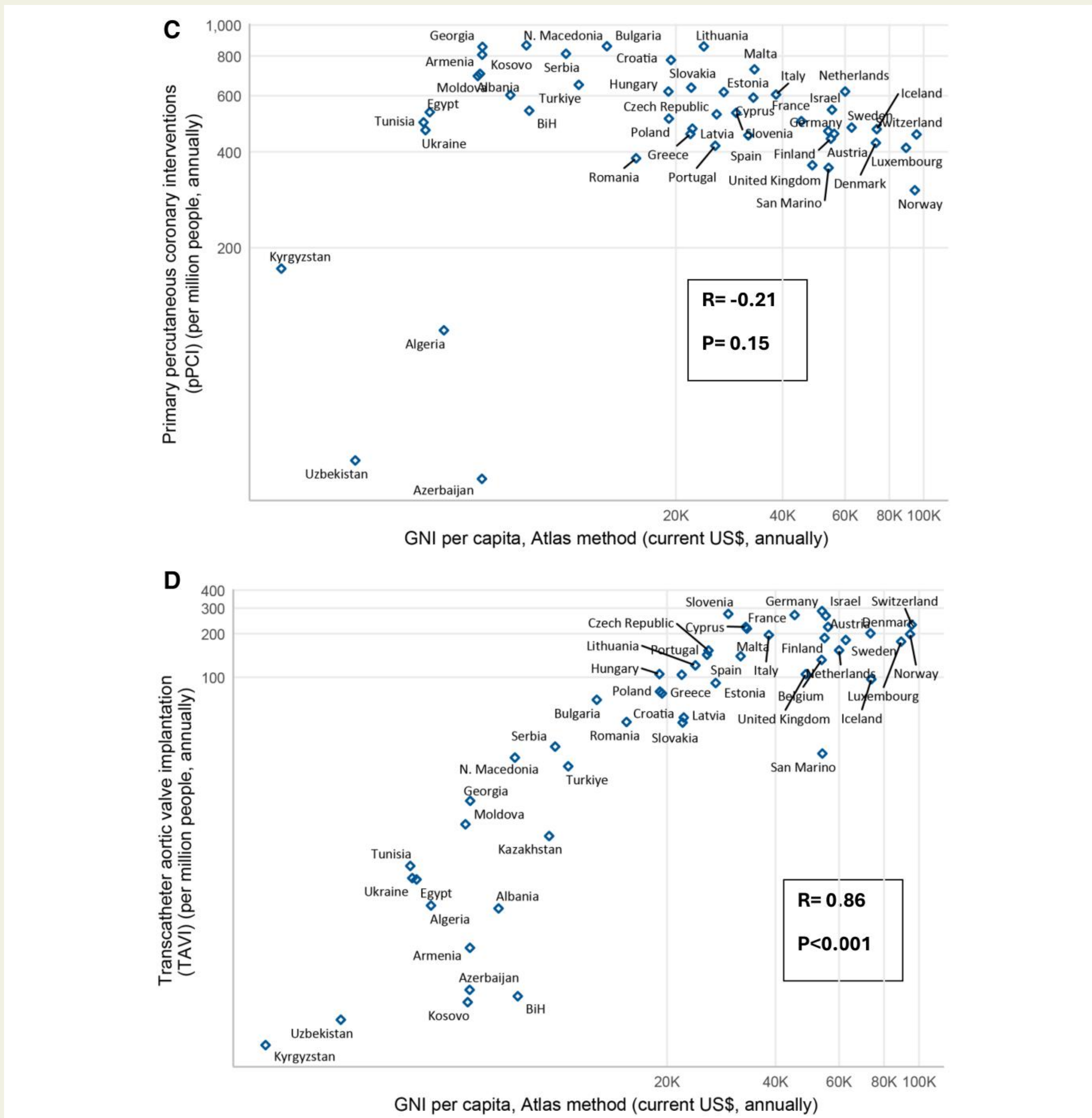
Figure 2 Interventional cardiology resources and care delivery by country and their association with national income. (*A*) Number of interventional cardiologists per million inhabitants. (*B*) Number of hospitals with catheterization laboratories per million inhabitants. (*C*) Number of primary percutaneous coronary intervention procedures per year and per million inhabitants. (*D*) Number of transcatheter aortic valve implantation procedures per year and per million inhabitants. (*E*) Number of transcatheter mitral interventions per year and per million inhabitants. (*F*) Number of transcatheter tricuspid interventions per year and per million inhabitants

unprotected left main (ULM) ranged from 3% to 6% (see Supplementary data online, *Figure S3C*), and in-stent restenosis ranged from 3% to 6% across all five regions (see Supplementary data online, *Figure S3D*). Since 2017, rates of PCI for ULM have been increasing in most countries, while rates of PCI for in-stent restenosis have been decreasing.

Percutaneous coronary intervention techniques and adjunctive tools

Access site and device use

Percutaneous coronary intervention was performed through radial access in 87% (IQR: 84%–93%) of procedures, exceeding 85% in all the regions without significant differences (*Figure 6A*). Rates have increased



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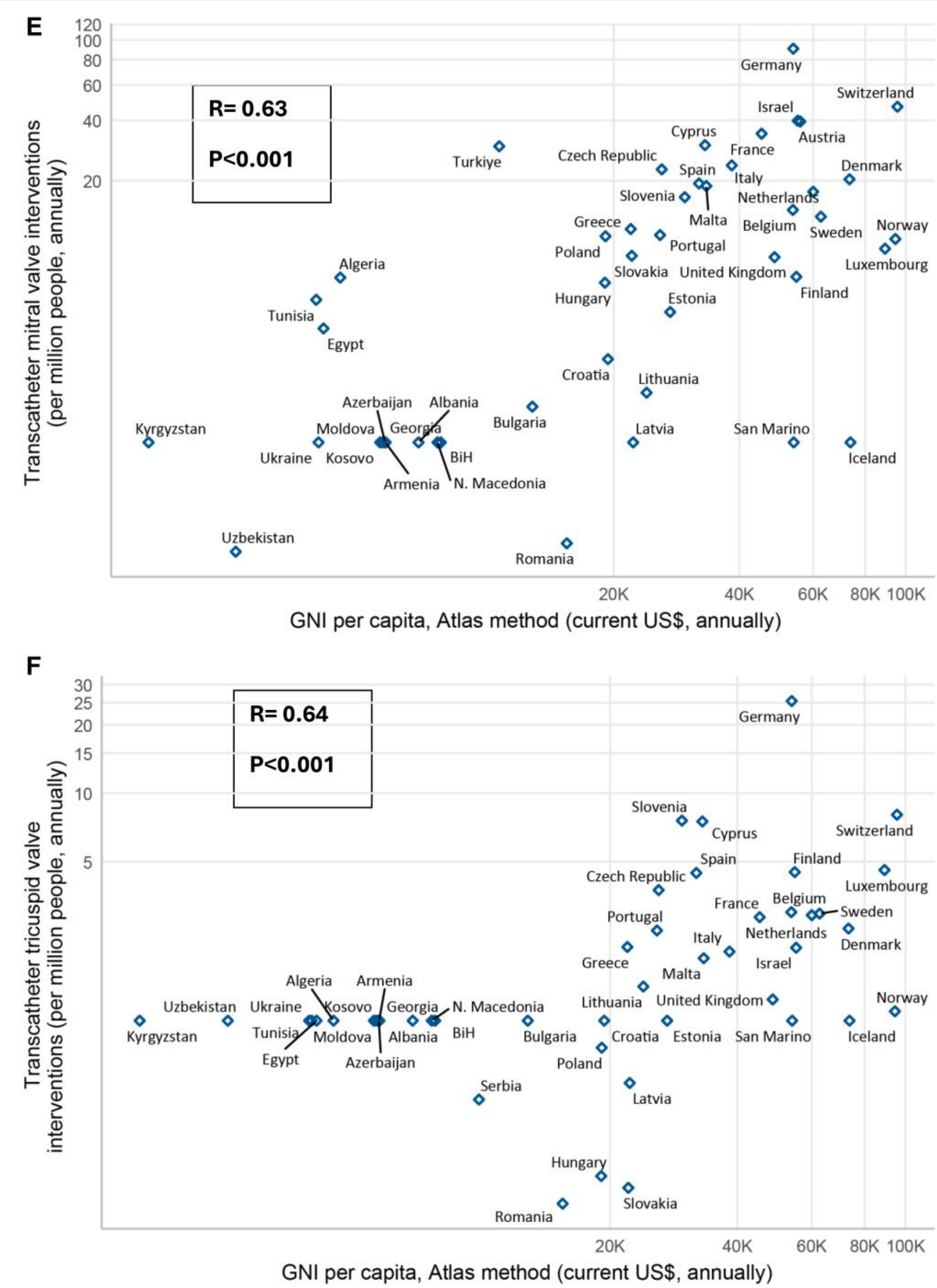
by 10% since 2017 in OE, EE, and SE (*P*-values for the increasing trend are <.001, .002, and .035, respectively). Drug-eluting stents (DESs) were used in 89%–94% of cases (see Supplementary data online, *Figure S4A*), with the lowest rates in NE countries (89%). Bare metal stents were infrequently used, and bioresorbable scaffolds (BRSs) were effectively abandoned. The number of stents deployed per procedure ranged from 1.4 to 1.6 across all regions (see Supplementary data online, *Figure S4B*). Drug-coated balloons (DCBs) were utilized in 0.5%–6% of cases (see Supplementary data online, *Figure S4C*), with the highest rates in NE countries, peaking at 16% in Finland. Plain old balloons (POBAs) were used in 1%–3% of cases. Since 2017, the use of DCBs has increased in most countries and regions, while the use of BRS has decreased.

Plaque modification, functional and intracoronary imaging assessment, and mechanical circulatory support

Rotational/orbital atherectomy (ROA) (see Supplementary data online, *Figure S4D*) and/or intravascular lithotripsy (IVL) (see Supplementary data online, *Figure S4E*) were performed in less than 1% of PCI



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procedures each (see Supplementary data online, *Figure S4F*), with rates increasing in recent years. The use of both plaque-modifying procedures was evenly distributed across regions, except in OE, where IVL was scarcely utilized, although the differences between the regions were statistically insignificant (see Supplementary data online, *Figure S4F*).

Invasive coronary pressure measurement [fraction flow reserve (FFR), instantaneous wave-free ratio (iFR), etc.] was performed in 9% of PCI procedures, varying from 0% in OE to 24% in WE (KW; $P = .001$; $P < .05$ in SE vs WE and OE vs all countries; *Figure 6B*). Usage has been increasing since 2017 in all countries except France and Lithuania, showing considerable heterogeneity both within and between regions. For instance, among NE countries, its use ranged from 4% in Latvia to 43% in Denmark.

Intracoronary imaging [intravascular ultrasound (IVUS), optical coherence tomography (OCT)] was utilized in 4% of PCI procedures, varying from 0% in OE to 3% in EE and SE and 7%–10% in NE and WE (KW; $P = .002$; $P < .05$ OE vs WE, OE vs NE; *Figure 6C*). There were notable intraregional differences behind these average values. In NE, e.g. the application of intracoronary imaging ranged from 3%

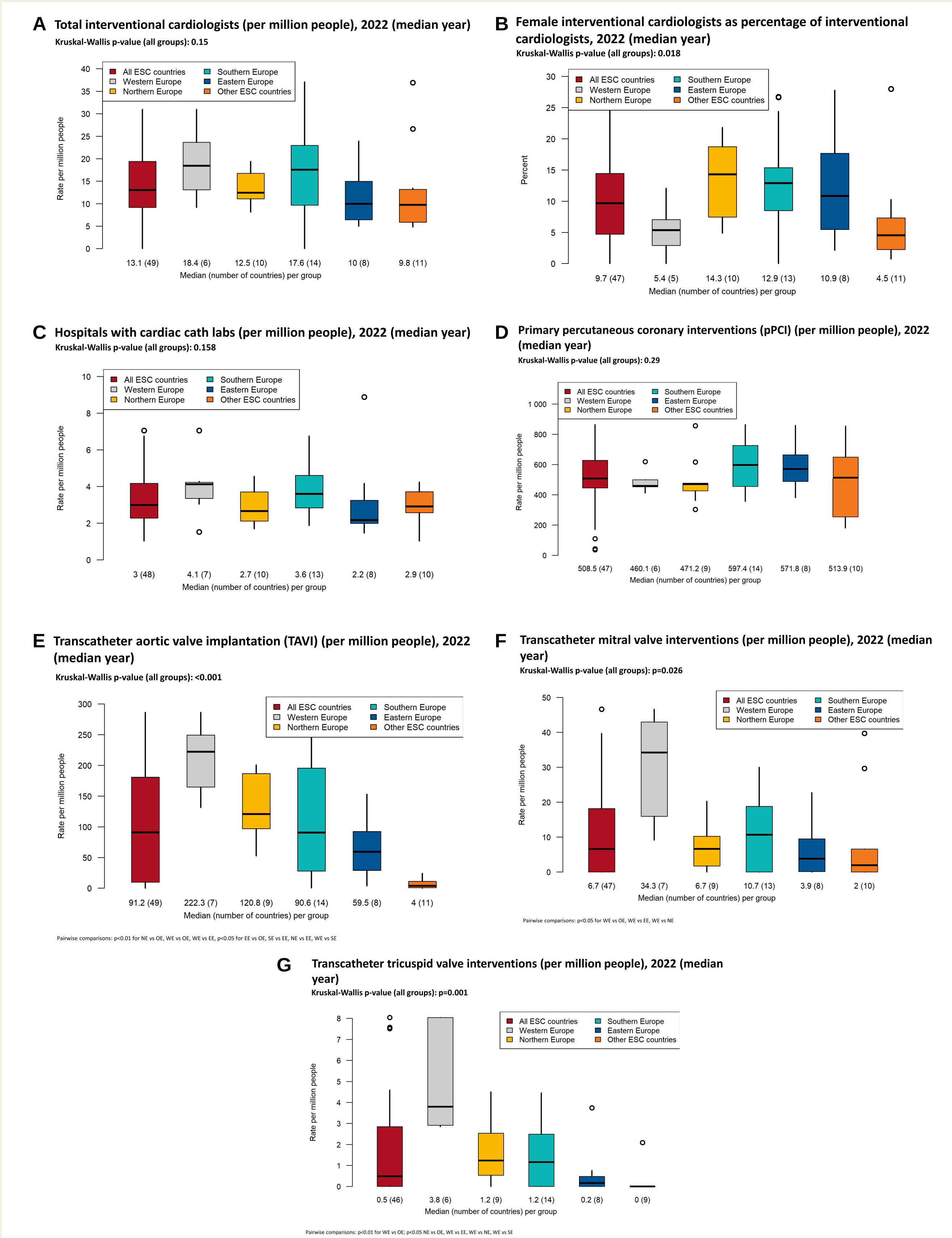

Figure 3 Interventional cardiology resources and care delivery across European Society of Cardiology countries, grouped by the United Nations geoscheme. (*A*) Interventional cardiologists per million inhabitants. (*B*) Female interventional cardiologists as percentage of interventional cardiologists. (*C*) Hospitals with catheterization laboratories per million inhabitants. (*D*) Primary percutaneous coronary intervention procedures per million inhabitants. (*E*) Transcatheter aortic valve implantation procedures per million inhabitants. (*F*) Transcatheter mitral interventions per million inhabitants. (*G*) Transcatheter tricuspid interventions per million inhabitants

Table 1 Correlation between the main interventional cardiology resources and care delivery with socio-demographic parameters (2022)

Variable[a]	Median[a] (interquartile range)	GNI per capita, Atlas method (current US$)	Current health expenditure per capita, PPP (current international $)	Life expectancy at birth (years)	Cardiovascular death age-standardized rate per 100 000	Population age ≥65 (% of total population)
Interventional cardiologists	13.1 (9.2–19.4)	Rho: .24; *P*: .10	Rho: .26; *P*: .068	Rho: .16; *P*: .275	Rho: −.2; *P*: .175	Moderate + rho: .39; *P*: .007
Hospitals with cardiac catheterization laboratory	3.0 (2.3–4.2)	Rho: .1; *P*: .532	Rho: .08; *P*: .599	Rho: .07; *P*: .643	Rho: −.04; *P*: .79	Rho: .27; *P*: .063
Invasive coronary angiography	3696 (2882–5585)	Rho: .25; *P*: .082	Rho: .23; *P*: .116	Rho: .12; *P*: .405	Rho: −.26; *P*: .076	Moderate + rho: .54; *P*: <.001
Percutaneous coronary intervention	2220 (1416–2528)	Weak + rho: .31; *P*: .035[a]	Rho: .27; *P*: .068	Rho: .13; *P*: .361	Rho: −.23; *P*: .109	Moderate + rho: .41; *P*: .004
Primary percutaneous coronary intervention	509 (445–628)	Rho: −.2; *P*: .18	Rho: −.13; *P*: .392	Rho: −.25; *P*: .092	Rho: .18; *P*: .228	Rho: .09; *P*: .525
Transcatheter aortic valve implantation	91.2 (9.6–180.7)	Strong + rho: .86; *P*: <.001	Strong + rho: .76; *P*: <.001	Strong + rho: .75; *P*: <.001	Strong − rho: −.75; *P*: <.001	Moderate + rho: .51; *P*: <.001
Transcatheter mitral valve interventions	6.7 (0–18.2)	Moderate + rho: .63; *P*: <.001	Moderate + rho: .56; *P*: <.001	Moderate + rho: .67; *P*: <.001	Moderate − rho: −.65; *P*: <.001	Moderate + rho: .3; *P*: .04[a]
Transcatheter native mitral valve repairs	4.6 (0–15.1)	Strong + rho: .75; *P*: <.001	Strong + rho: .75; *P*: <.001	Strong + rho: .8; *P*: <.001	Moderate − rho: −.64; *P*: <.001	Moderate + rho: .43; *P*: .006
Transcatheter tricuspid valve interventions	.49 (0–2.8)	Moderate + rho: .64; *P*: <.001	Moderate + rho: .62; *P*: <.001	Moderate + rho: .64; *P*: <.001	Moderate − rho: −.62; *P*: <.001	Rho: .24 *P*: .112[a]

PCI, percutaneous coronary intervention; TAVI, transcatheter aortic valve implantation; GNI, gross national income; HCE, current health expenditure; CVD, cardiovascular death; IQR; interquartile range; CVD; cardiovascular disease; PPP, purchasing power parity.
[a]Number per million people.

(Lithuania) to 23% (Sweden and the UK) of procedures and in WE from 3% in France to 21% in Luxembourg (see Supplementary data online, *Figure S4G*). Its use has been increasing across all regions, though with variability.

The use of mechanical circulatory support (MCS) during coronary interventions was rare in OE (.1 per million), while in other regions, it ranged from 9.2 to 15.3 per million, showing an increasing trend in recent years (see Supplementary data online, *Figure S4H*).

Transcatheter valve procedures

A median of 104.7 (IQR: 10.3–195.5) transcatheter valve procedures per million population, including TAVI, transcatheter mitral and tricuspid valve interventions, aortic balloon valvuloplasty, and paravalvular leak (PVL) closures, were performed across ESC member countries (see Supplementary data online, *Figure 5A*). These procedures accounted for 5.8% of all percutaneous cardiovascular interventions overall, with a median value of 4.2% (IQR: 1.25%–8.30%) and range from 1% in OE to 8% in WE (*Figure 5A*; Supplementary data online, *Figure S5B*).

Resources for transcatheter valve procedures

The median number of ICs performing valve procedures was 2.4 per million (IQR: 1.3–4.1), with significant regional variation: from .7/million in OE to 4.6/million in WE. Valve operators represented 5% of ICs in OE; 14%–18% in EE, SE, and NE; and up to 41% in WE, although the interregional differences were not significant(see Supplementary data online, *Figure S5C*).

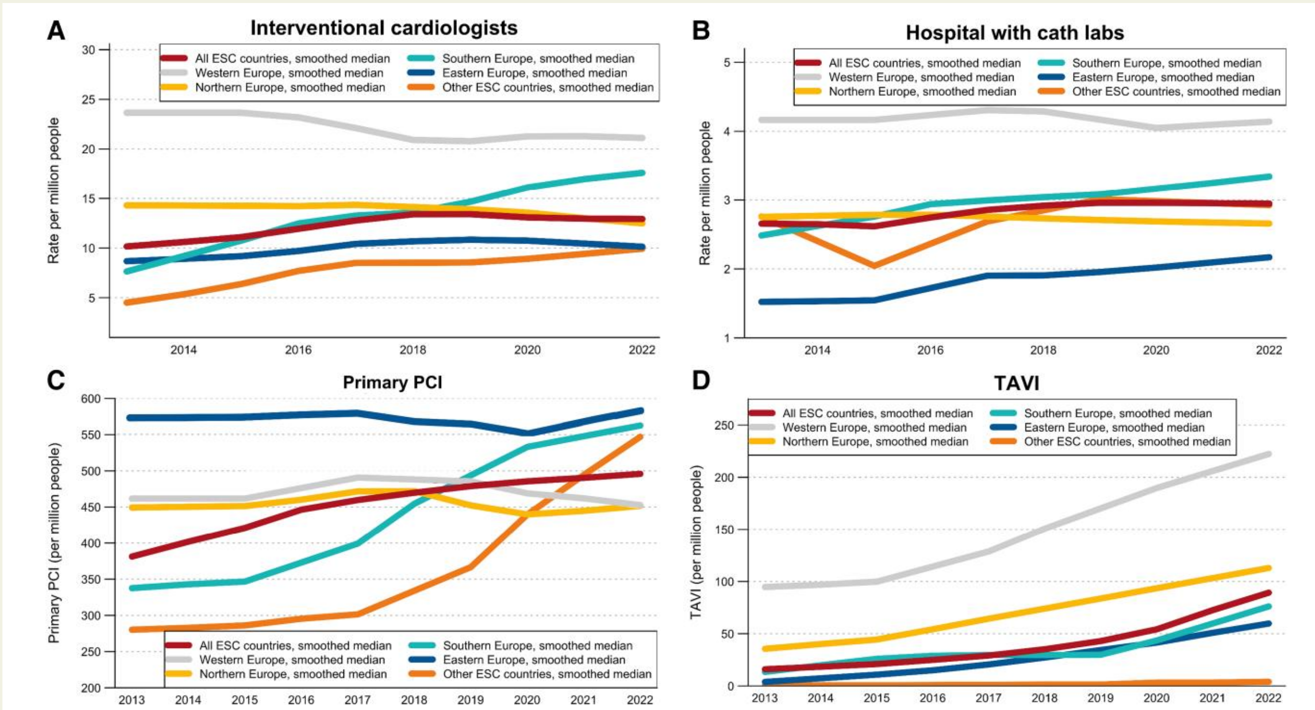

Figure 4 Temporal trends (2013–22) in interventional cardiology resources and procedures, grouped by the United Nations geoscheme. (*A*) Number of interventional cardiologists per million inhabitants. All European Society of Cardiology countries: beta of the slope = 0.28; CI [.13–.44]; *P* = .003. Western Europe: beta of the slope = −.43; CI [−.64 to −.22]; *P* =.002. Northern Europe: beta of the slope = −0.08; CI [−0.22–0.05]; *P* = .18. Southern Europe: beta of the slope = 1.28; CI [1.01–1.55]; *P* = <.001. Eastern Europe: beta of the slope = 0.23; CI [0.08–0.38]; *P* = .009. Other European Society of Cardiology countries: beta of the slope = 0.57; CI [0.3–0.84]; *P* = .001. (*B*) Number of hospitals with catheterization laboratories per million inhabitants. All European Society of Cardiology countries: beta of the slope = 0.05; CI [0.03–0.06]; *P* = .001. Western Europe: beta of the slope = −0.02; CI [−0.04–0.01]; *P* = .13. Northern Europe: beta of the slope = −0.01; CI [−0.03–0.01]; *P* = .284. Southern Europe: beta of the slope = 0.08; CI [0.05–0.11]; *P* = .001. Eastern Europe: beta of the slope = 0.08; CI [0.05–0.1]; *P* = .001. Other European Society of Cardiology countries: beta of the slope = 0.09; CI [0–0.18]; *P* = .06. (*C*) Number of primary percutaneous coronary intervention procedures per million inhabitants. All European Society of Cardiology countries: beta of the slope = 8.94; CI [5.9–11.98]; *P* = <.001. Western Europe: beta of the slope = −4.96; CI [−9.1–−0.82]; *P* = .025. Northern Europe: beta of the slope = −1.43; CI [−1.08–3.93]; *P* = .225. Southern Europe: beta of the slope = 26.17; CI [17.32–35.02]; *P* = <.001. Eastern Europe: beta of the slope = 0.59; CI [−5.69–6.87]; *P* = .83. Other European Society of Cardiology countries: beta of the slope = 22.46; CI [14.15–30.78]; *P* < .001. (*D*) Number of transcatheter aortic valve implantation procedures per million inhabitants. All European Society of Cardiology countries: beta of the slope = 7.33; CI [5.94–8.73]; *P* = <.001. Western Europe: beta of the slope = 18.45; CI [16.76–20.13]; *P* = <.001. Northern Europe: beta of the slope = 9.92; CI [8.44–11.41]; *P* = <.001. Southern Europe: beta of the slope = 6.49; CI [4.34–8.64]; *P* = <.001. Eastern Europe: beta of the slope = 6.77; CI [6.17–7.38]; *P* = <.001. Other European Society of Cardiology countries: beta of the slope = 0.40; CI [0.28–0.52]; *P* = <.001

The number of hospitals performing TAVI procedures was .98 per million (IQR: .58–1.5), ranging from .6 in OE to 1.6 in SE (see Supplementary data online, *Figure S5D*). In all regions, this was equivalent to or slightly lower than the number of hospitals combining both interventional cardiology and cardiac surgery facilities on-site, which was 1.25 per million (IQR: .85–1.73), ranging from .9 in NE to 1.7 in SE (see Supplementary data online, *Figure S5E*). The number of TAVI centres remained stable, except in OE and SE, where increases were linked to a rise in hospitals with cardiac surgery (e.g. Spain, Portugal, and Egypt) and expansion of TAVI access in non-surgical centres (e.g. Italy, Spain, Egypt, and Armenia).

Transcatheter aortic valve implantation

A median of 91.2 TAVI procedures per million population (IQR: 9.6–180.7) were performed across ESC countries. Rates ranged widely from 4 in OE to 222 per million in WE (KW; *P* < .01; *P* < .01 for WE vs any other region and *P* < .05 for OE vs any other region) (*Figure 3E*). Similarly, the number of TAVI performed by hospital varied substantially from 13.0 in OE to 179.3 in WE (KW; *P* < .001; *P* < .05 OE vs EE, SE vs NE, SE vs WE, OE vs NE, OE vs WE) (see Supplementary data online, *Figure S5F*). These procedures accounted for <5% of all percutaneous therapeutic interventions (*Figure 5*).

National TAVI volume strongly correlated with the proportion of population aged ≥65 years ($r = .51$; $P < .001$) and GNI per capita ($r = .86$; $P < .001$) (*Figure 2D*; *Table 1*).

Transcatheter aortic valve implantation volumes increased steadily from 2013 to 2022 across all regions, although at different rates (OE, $\beta = +.4$; WE, $\beta = +18.45$) (*Figure 4D*). No temporary drop was observed in 2020.

Transfemoral access was used in ≥90% of cases across all regions (see Supplementary data online, *Figure S6A*). Cerebral embolic protection devices were rarely used, except for Switzerland, where they were employed in 20% of TAVI cases.

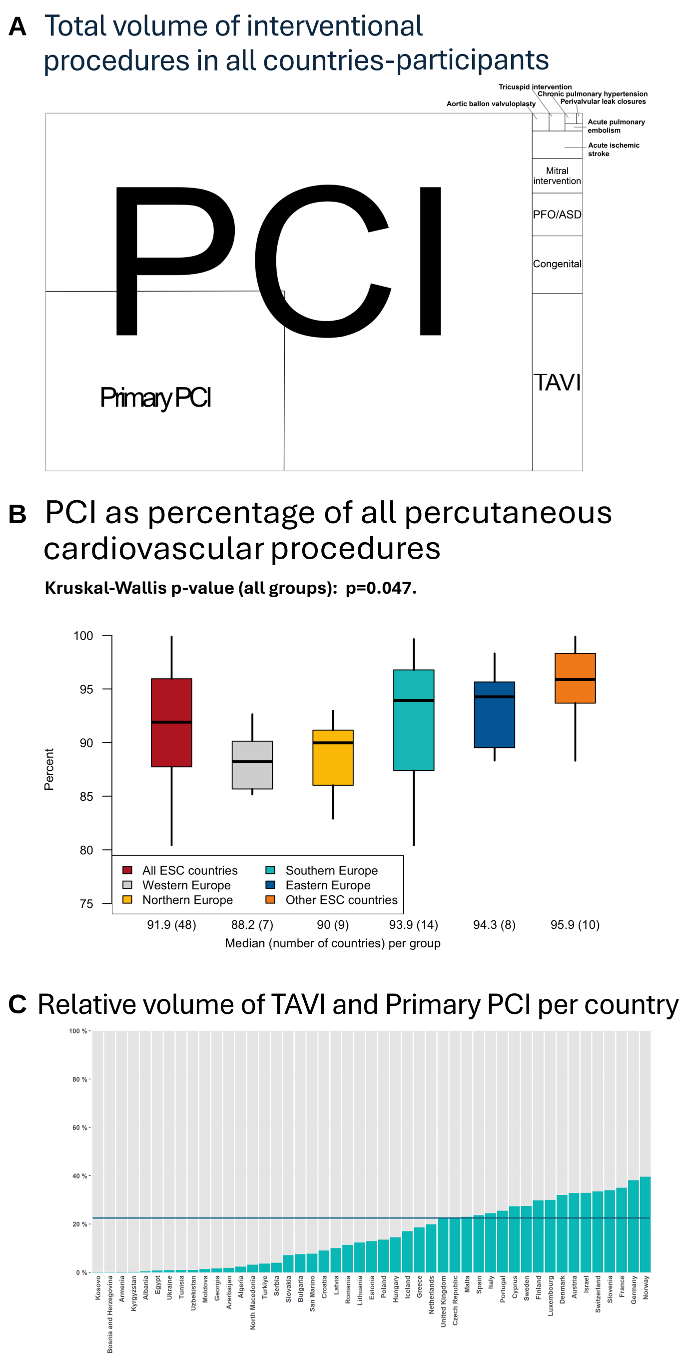

Figure 5 Distribution of percutaneous cardiovascular interventions across European Society of Cardiology countries. (*A*) Relative proportions among European Society of Cardiology countries: percutaneous coronary intervention (including primary percutaneous coronary intervention) 90.7%; all valve interventions combined (transcatheter aortic valve implantation, aortic balloon valvuloplasty, mitral, tricuspid, and paravalvular leak closure) 5.8%; and all other procedures (e.g. congenital interventions, patent foramen ovale/atrial septal defect closure, stroke, pulmonary embolism, and pulmonary hypertension) 3.5%. (*B*) Proportion of percutaneous coronary intervention among European Society of Cardiology regions, ranging from 88.2 in Western Europe to 95.9 in other European Society of Cardiology countries. Kruskal–Wallis *P*-value (all groups): .047. (*C*) Proportion of transcatheter aortic valve implantation relative to primary percutaneous coronary intervention among European Society of Cardiology countries: transcatheter aortic valve implantation represents 22.4% of the total volume of transcatheter aortic valve implantation + primary percutaneous coronary intervention combined

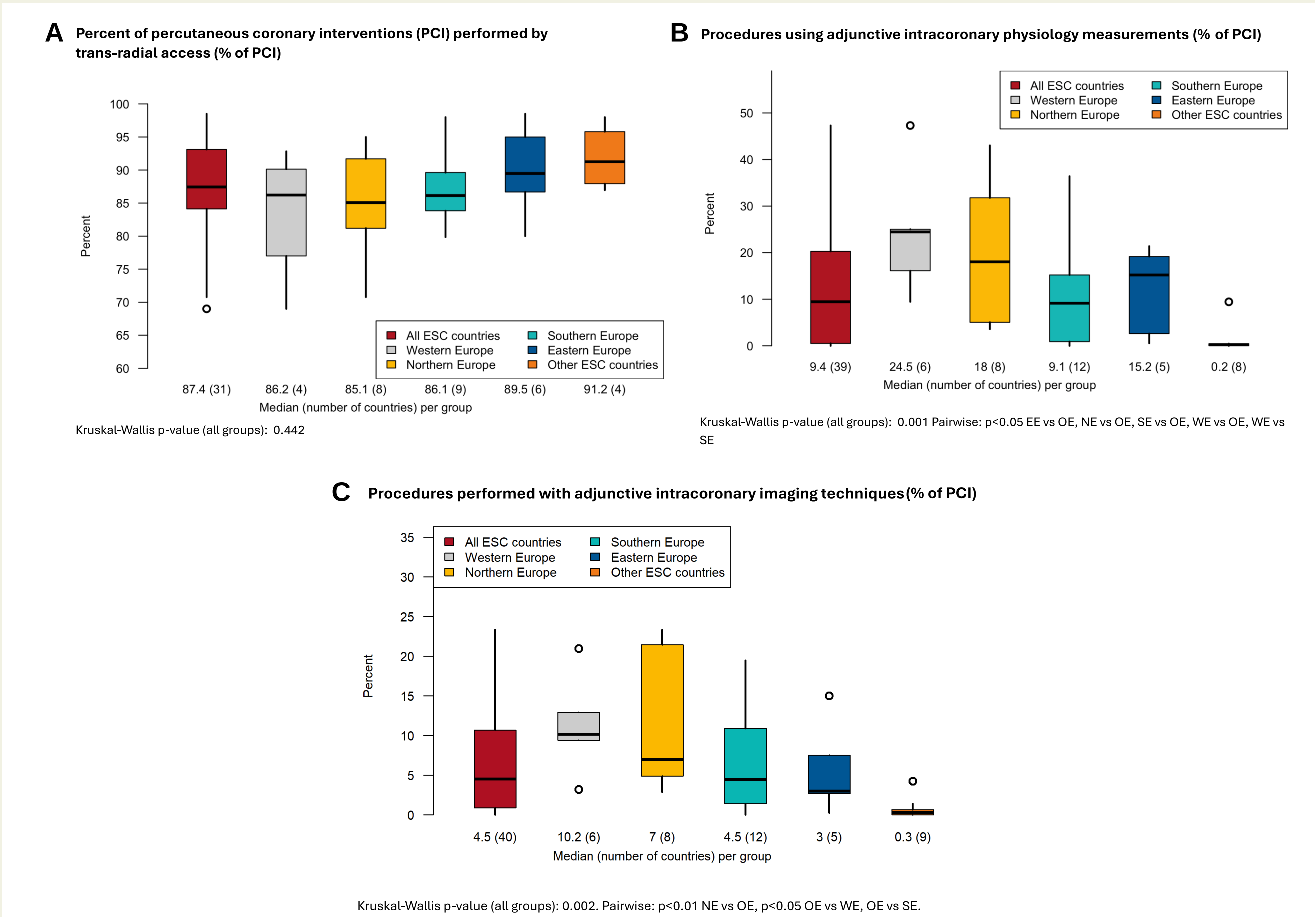

Figure 6 Technical aspects of percutaneous coronary intervention procedures across European Society of Cardiology countries, by the United Nations geoscheme. (*A*) Use of radial access as percentage of percutaneous coronary interventions. (*B*) Use of coronary physiological assessment (e.g. FFR and iFR) as percentage of percutaneous coronary interventions. (*C*) Use of intracoronary imaging (IVUS or OCT) as percentage of percutaneous coronary interventions

Valve-in-valve TAVI for surgical bioprosthetic valve failure accounted for <2% of procedures overall, but exceeded 4% in Finland, Italy, Slovenia, Czechia, and Albania. Transcatheter aortic valve implantation-in-TAVI procedures and TAVI for pure aortic regurgitation were rarely reported.

Transcatheter aortic balloon valvuloplasty

Standalone aortic balloon valvuloplasty was performed at a median rate of 1.95 per million (IQR: .3–4.9), with little change observed since 2019.

Transcatheter mitral valve procedures

A median of 6.7 mitral interventions per million (IQR: 0–18.2) were performed, ranging from <4 in OE and EE to >30 in WE (*Figure 3F*). These accounted for <1% of all percutaneous cardiovascular therapeutic procedures (*Figure 5*). National procedure rates correlated with the proportion of the population aged >65 years($r = .3$; $P = .04$) and with GNI per capita ($r = .63$; $P < .001$) (*Figure 2E*; *Table 1*). Rates have increased since 2017 ($\beta = +1.27$; $P = .001$) in all regions except OE.

Mitral transcatheter edge-to-edge repair

Mitral transcatheter edge-to-edge repair (M-TEER) was the dominant mitral intervention, performed at a median rate of 4.63 per million (IQR: 0–15.1), ranging from none in OE to 28.4 per million in WE (see Supplementary data online, *Figure S6B*). The number of procedures correlated with the proportion of subjects >65 years old ($r = .43$; $P = .006$) and GNI per capita ($r = .75$; $P < .001$) (*Table 1*). Volumes increased significantly in all regions except OE since 2017.

Transcatheter mitral valve implantation

Transcatheter mitral valve implantation (TMVI) in native valves, or for valve in valve or valve in ring (median = 0/million people; IQR = 0–.8), was barely performed except in WE in which it is 2.5/million people. Similarly, it represented 0%–1% of all mitral interventions in OE and SE and 7%–10% in the three other regions.

Transcatheter mitral valvuloplasty for mitral stenosis

While the technique is virtually not used in EE and NE (0–.2/million), it is used in .9–1.6/million in SE, OE, and WE (see Supplementary data online, *Figure S6C*). The number of procedures has been stable since

Table 2 Proportion of women benefiting from interventional cardiology interventions and cardiac surgery procedures according to the burden of disease

Transcatheter interventions			Burden of disease		Surgical interventions	
Type of intervention	Number of countries (%)	Female (median %)	Type of disease	Female (%)	Type of surgery	Female (%)
Percutaneous coronary intervention	$N = 20(42\%)^a$	29%	Ischaemic heart disease	41%[b]	Coronary artery bypass graft	17%[18] 16%[19]
Primary percutaneous coronary intervention	$N = 18(38\%)^a$	26%	Ischaemic heart disease	41%[b]		
TAVI	$N = 27\ (55\%)^a$	48%	Aortic valve disease	45%[b]	Surgical aortic valve replacement	30%[20] 30%[21]
Mitral intervention	$N = 9(26\%)^a$	35%	Mitral valve disease	31%[bc]	Surgical mitral valve intervention	41%[18] 36%[19]
Tricuspid intervention	$N = 8(30\%)^a$	54%	Tricuspid valve disease	50%[17]	Surgical tricuspid valve intervention	61%[22]

PCI, percutaneous coronary intervention; TAVI, transcatheter aortic valve implantation; CABG, coronary artery bypass graft; SAVR, surgical aortic valve replacement; SMVI, surgical mitral valve intervention; STVI, surgical tricuspid valve intervention.
[a]Denominator is the number of countries in which the activity is reported to be present.
[b]Estimates obtained from Institute for Health Metrics and Evaluation (IHME) restricted to the countries in which sex-specific transcatheter intervention delivery data were available.
[c]Non-rheumatic degenerative mitral valve disease. No reliable data on the global prevalence of functional mitral regurgitation is currently available.

2017. In OE, this accounted for 96% of all mitral interventions, compared with <10% in other regions (see Supplementary data online, *Figure S6D*).

Tricuspid valve interventions

Tricuspid transcatheter edge-to-edge repair (T-TEER) accounted for >89% of transcatheter tricuspid interventions. These were performed at a median rate of .5 per million (IQR: 0–2.8), representing ∼1% of all percutaneous cardiovascular procedures (*Figure 3G*; *Figure 5*). They correlated with GNI per capita ($r = .64$; $P < .001$) (*Figure 2F*; *Table 1*). Transcatheter tricuspid procedures were primarily conducted in NE (1.2/million) and WE (3.8/million) and were performed seven times more frequently in Germany than in other WE countries (*Figure 3G*). Tricuspid valve implantation (TTVI) was rarely performed.

Paravalvular leak closure procedures

Paravalvular leak closure volumes were extremely low across all regions (median, .7/million; IQR, 0–1.5), ranging from 0/million in OE to 1.6 in WE (see Supplementary data online, *Figure S6E*). This activity has not increased since 2017.

Data on other interventional procedures are presented as supplemental results and in Supplementary data online, *Figure S7*.

Sex disparities in interventional care

Workforce representation

Women accounted for 39% of cardiologists across ESC member countries (see Supplementary data online, *Figure S2B*). However, they represented only 10% of ICs, with substantial regional variation; dropping to 5% in WE and OE (KW; $P = .034$; *Figure 3B*).

Access to interventional care

Sex-specific data on recipients of interventional care were not consistently collected prospectively across ESC member countries. Among countries performing the respective procedures, reporting rates were 55% for TAVI, 42% for PCI, 38% for primary PCI, and only 26% and 30% for mitral and tricuspid interventions, respectively (*Table 2*). Due to these limitations, regional analyses of sex-based recipients of interventional care were not performed.

In countries where data were available, transcatheter procedures, both coronary and valvular, were associated with lower sex-based disparities in access to care compared with surgical interventions (*Table 2*). However, women remained underrepresented among patients undergoing coronary interventions, particularly relative to their disease burden. While women account for 41% of patients with ischaemic heart disease, they represented only 29% of those undergoing PCI and 26% of those receiving primary PCI (*Table 2*). This imbalance was less pronounced in valve interventions. Women represent 45% of patients with aortic valve disease and accounted for 48% of those undergoing TAVI. Similarly, transcatheter mitral and tricuspid interventions demonstrated relatively balanced representation (*Table 2*).

Distribution of interventional procedures

Percutaneous coronary intervention accounted for >90% of all therapeutic percutaneous cardiovascular procedures (*Figure 5A and B*). Transcatheter aortic valve implantation represented <5% of procedures. All other structural heart interventions, including mitral, tricuspid, aortic balloon valvuloplasty, and PVL closures, collectively comprised ∼1%. Even when focusing exclusively on the two most lifesaving procedures, namely primary PCI and TAVI, primary PCI remained dominant, with TAVI comprising only 22% of the combined total (*Figure 5C*). These aggregate figures mask substantial differences across countries. In some countries, TAVI is not performed at all. In contrast, France, Germany, and Norway reported that TAVI accounted for ∼40% of all primary PCI + TAVI procedures (*Figure 5C*). Mitral and tricuspid interventions remain low in volume and unevenly distributed, with certain countries performing nearly all procedures within their respective regions.

Discussion

Contemporary percutaneous cardiovascular interventions have been shown to alter the natural course of coronary artery disease, valvular heart disease, and heart failure, as reflected in the latest ESC guidelines on acute and chronic coronary syndromes and on heart valve disease.[3–5] This third edition of the ESC–EAPCI Atlas of Interventional Cardiology offers the most comprehensive overview of percutaneous cardiovascular intervention practice across 50 ESC member countries. Building on prior editions, covering 16 countries in 2016 and 35 in 2018, the current edition enables detailed regional and cross-country comparisons and introduces the first decade-long trend analysis(2013–22) of key interventional procedures.

Its expanded scope allows for a more precise evaluation of the relative uptake of various interventions, the identification of regional disparities,[6,9,10] and the assessment of progress towards alignment with clinical guideline recommendations.[3–5]

The five main findings of our study are the followings: (i) PCI remains the overwhelmingly dominant procedure, accounting for >90% of all percutaneous cardiovascular interventions, despite continued growth in structural and valve therapies; (ii) trend analysis of coronary interventions (e.g. primary PCI) shows that lower-income regions have progressively closed the gap with more affluent ones; (iii) trend analysis of valve procedures (e.g. TAVI) shows that while all regions progressed, the disparity between higher- and lower-income regions widened over time; (iv) women account for only 10% of ICs, despite representing 39% of the cardiology workforce overall; and (v) only ∼50% of countries collect sex-specific data on interventional care. Nevertheless, available data suggest that, compared with surgery, transcatheter approaches may help reduce sex-based disparities, particularly in coronary and aortic valve disease (*Structured Graphical Abstract*).

Coronary artery disease: the core of percutaneous cardiovascular interventions

Despite growing clinical research interest in structural heart therapies,[5] >90% of all therapeutic percutaneous cardiovascular procedures in 2022 were directed towards coronary artery disease. Valve-related interventions accounted for <6% of total procedures. Notably, annual TAVI volumes remained below one-fifth of primary PCI volumes. Other structural interventions combined, such as transcatheter mitral or tricuspid therapies and PVL closures, represented ∼1% or less. Non-valvular procedures, including interventions for congenital defects, patent foramen ovale (PFO) closures, acute pulmonary embolism, and pulmonary hypertension, made up <4%. These data clearly reaffirm that coronary revascularization remains the cornerstone of interventional cardiology across ESC member countries.

The continued predominance of PCI has important implications for healthcare systems and training programmes. It underscores the need for well-distributed networks of 24/7 PCI-capable centres, particularly for timely ST-elevation myocardial infarction care, and reinforces PCI skills as a core component of interventional cardiology training. While transcatheter structural interventions are expanding, our findings suggest they are evolving to complement, not replace, coronary interventions and highlight the importance of training programmes that maintain coronary intervention expertise, even as structural heart programmes expand. Accordingly, healthcare policymakers should pursue balanced investments that support the growth of structural heart programmes while maintaining and strengthening coronary intervention infrastructure.

Regional disparities and socio-economic influences

Our report highlights regional disparities in access to percutaneous cardiovascular interventions, particularly for high-cost procedures, which strongly correlate with economic indicators such as GNI per capita. Utilization of TAVI and other transcatheter valve interventions showed a clear positive correlation with national wealth, whereas PCI rates and catheterization laboratory availability demonstrated weaker, or no, association with income levels.

Earlier analyses, such as those from 2014, revealed a stronger link between PCI rates, resource availability, and economic status (see Supplementary data online, *Table S3*). The weaker association observed in 2022 suggests that many lower-income countries have since improved access to PCI. This progress likely reflects adoption of guideline-driven national policies[3,4] and initiatives such as the 'Stent for Life'[23] programmes.

However, the high cost of transcatheter heart valve devices remains a significant barrier in economically disadvantaged regions. As a result, uptake of these interventions continues to differ sharply between wealthier and less affluent ESC member countries. The 'Valve for Life' initiative is actively working to reduce these disparities in access to care and treatment.[24] Equally important is the development of structured care networks, including expert centres that manage complex structural heart cases while offering support and training to other hospitals. As recommended in the ESC/EACTS Guidelines,[5] this model should be further promoted to ensure equitable access to high-quality care and the spread of best practices across all regions, including low-income areas.

Temporal trends (2013–22)

Decadal trends highlight encouraging development alongside persistent challenges.

A notable contrast emerged between the modest increase in resources allocated to percutaneous cardiovascular interventions, specifically the number of ICs and hospitals with catheterization laboratories, and the much larger rise in the number of procedures performed, suggesting a significant effort in healthcare system organization and efficiency.

Overall PCI volumes have risen steadily, driven primarily by increased uptake of primary PCI in less affluent regions. In contrast, regions with higher socio-economic indicators have shown relatively stable, or slightly declining, numbers of ICA, primary PCI, and total PCI procedures. This reflects the flatter burden of coronary artery disease in these regions, supported by a comprehensive approach to cardiovascular prevention, including dietary, lifestyle, and pharmacological measures, as well as the presence of well-organized PCI networks.[3,4]

Notably, in some lower-income regions, annual primary PCI rates have doubled since 2013, reaching levels comparable to those in wealthier areas. This significant progress reflects successful implementation of guideline-based revascularization strategies, supported by initiatives such as the ESC's 'Stent for Life', national healthcare reforms, and the declining cost of coronary stents.

In contrast, valve interventions, driven primarily by TAVI procedures, have expanded across all regions without signs of plateauing. This trend is unsurprising, given the rising incidence of aortic stenosis in the absence of preventive measures, an ageing population, and growing evidence supporting the safety and efficacy of TAVI and mitral interventions.[5] However, the growth has been disproportionately greater in wealthier countries, leading to a widening gap in TAVI accessibility. This disparity persists despite similar demographic needs and comparable availability of facilities capable of performing percutaneous valve procedures. Economic constraints therefore remain a key barrier to broader adoption of TAVI and other valve interventions in resource-limited settings.[9]

Consistent with previous nationwide reports,[25–29] we observed that the COVID-19 pandemic in 2020 had a limited impact on primary PCI trend, particularly in NE, WE, and EE, while no discernible effect was seen on TAVI trends.

Adherence to guidelines and percutaneous coronary intervention practice

Guideline implementation continues to show significant variability.[3,4] Some recommendations have seen broad uptake; e.g. radial artery access is now used in ∼87% of PCI procedures, aligning with guidelines aimed at reducing procedural complications. Similarly, bioresorbable vascular scaffolds have been largely phased out in accordance with clinical evidence. In contrast, physiological lesion assessment using FFR or iFR, despite Class I recommendations since 2016, is employed in only about 10% of PCIs. Intracoronary imaging techniques such as IVUS and OCT are similarly underutilized, with adoption rates ∼5%. While cost may be a factor in some settings, other contributors likely include lack of coding and/or reimbursement, operator preferences, limited training, and challenges integrating these tools into routine workflow. Ongoing monitoring and targeted strategies will be essential to improving adherence to these evidence-based practices.

Technical aspects of valve interventions and European Society of Cardiology guidelines

Encouragingly, most centres performing TAVI achieved volumes consistent with high-quality care standards. In 2022, median annual TAVI procedures per hospital approached 100, exceeding 50 cases per hospital in most regions, aligning with ESC guidelines linking higher volumes to improved outcomes.[5] Adherence to procedural guidelines was also high, with transfemoral access used in >90% of cases. Interestingly, a few countries (e.g. Italy and Spain) permit TAVI in centres without on-site cardiac surgery, reflecting adaptations to local healthcare resources and policies and warranting continued surveillance to ensure patient safety.

Workforce and training considerations

With only 10% of women among ICs, our data underscore the ongoing underrepresentation of women and highlight the urgent need for targeted diversity and inclusion initiatives within the subspecialty. Of note, women members of EAPCI are 19%, with many in trainee.

Additionally, dedicated interventional cardiology training programmes are available in about half of participating countries, revealing broader inconsistencies in educational access. Strengthening efforts to harmonize training standards and expand structured programmes across all regions could help reduce variability in clinical practice and foster a more equitable and skilled workforce.

Sex-specific data collection and care delivery

Collecting data on the proportion of women receiving interventional care remains challenging. Depending on the type of intervention, only 26%–52% of countries performing these procedures routinely record sex-specific information prospectively. This highlights the widespread absence of systematic sex data collection in national registries. Addressing this gap should be a priority to improve the quality and equity of cardiovascular care for women.[9]

Care delivery in this population presents a mixed picture. Women are often underrepresented among patients undergoing percutaneous cardiovascular interventions relative to their actual disease burden; particularly in coronary procedures. However, percutaneous interventions may offer an opportunity to reduce sex disparities when compared with surgical approaches. For example, although women account for 40%–45% of patients with ischaemic heart disease or aortic valve disease, they represent <20% of those undergoing coronary artery bypass grafting[18,19] and ∼30% of those undergoing surgical aortic valve replacement.[20,21] In contrast, women represent 29% of patients undergoing PCI and 48% of those receiving TAVI.

This more balanced representation with transcatheter procedures likely reflects their less invasive nature and greater accessibility, helping to overcome some of the barriers that have historically limited surgical referrals for women.[9] While transcatheter approaches may mitigate sex-based disparities observed with surgical interventions, this potential benefit depends on earlier presentation of women to medical care, which remains a challenge in many healthcare settings.

Limitations

A key strength of this study is the independence of the EAPCI Atlas survey from commercial influence, as well as its provision of national interventional data that are not available from other sources. Another important strength is its broad geographic coverage, with participation from 50 member countries, along with trend analysis dating back to 2013.

Those strengths are associated with intrinsic limitations. Even in the absence of special funding and other financial incentives, national infrastructure, workforce data, and core procedural metrics (including PCI, primary PCI, TAVI, and mitral and tricuspid interventions) were >90% complete; however, some procedural details were less comprehensively reported. To ensure reliability, only those indicators are included in the analysis that were submitted by at least two-thirds (66%) of countries with exception of sex-specific data, which were particularly difficult to obtain, reflecting the widespread lack of prospective data collection in many countries. Retrospective longitudinal data were affected by missingness, and to offset this limitation, data imputation was used. Wide geographical expanse of the study covered diverse healthcare practices and thus included settings without national registries. In these cases, data were obtained directly from national societies or working groups, which might have some impact on the parity of the estimates. Nevertheless, multi-stage procedure for data quality assurance and validation alongside dedicated efforts to ensure the same understanding of the definitions likely helped to mitigate this limitation.

Reported disparities across countries may be underestimated due to differences in population age structures, particularly for procedures targeting older patients such as TAVI. However, because patient-level age data were unavailable, age-standardized rates could not be calculated. Even so, crude rates remain highly relevant for evaluating system capacity, planning, and policy development. This is why organizations such as the OECD and the ESC Atlas of Cardiology also use crude rates as standard indicators.

Given the current focus on percutaneous procedures, national data on surgical coronary and structural interventions were not included, limiting assessment of the overall number of patients treated. This gap will be addressed in future editions of the Atlas. Similarly, data on waiting times for procedures and national reimbursement frameworks were unavailable, constraining the ability to fully evaluate access to care and economic influences; these aspects will also be incorporated in future editions.

Because the Atlas uses aggregated data, it cannot evaluate the appropriateness of interventions in relation to patients' clinical characteristics or guideline recommendations. Moreover, the relatively small number of TTVR procedures performed to date means these findings should be interpreted with caution. Future editions of the ESC–EAPCI Atlas are expected to offer greater clarity on this topic.

Statistically significant correlations were observed between certain interventional resources and procedures and broader socio-economic indicators and mortality rates. While these associations suggest potential links, the observational nature of the study prevents any conclusions about causality.

Conclusions

The third edition of the ESC–EAPCI Atlas provides the most comprehensive overview of interventional cardiology practice in Europe. It documents substantial progress in the efficiency of percutaneous programmes, with an increased availability of primary PCI, paralleled by notable reductions in previously reported regional disparities. At the same time, it highlights ongoing disparities in transcatheter structural heart intervention access and workforce composition and draws attention to persistent economic barriers that continue to limit equitable access to advanced structural heart interventions such as TAVI. Policymakers and healthcare leaders should aim for balanced investment strategies, maintaining robust coronary intervention networks while gradually expanding interventional valve programmes and attracting more women to become ICs. Strengthening national data collection systems is essential for accurately tracking procedural trends, resource allocation, and patient outcomes. The ESC–EAPCI Atlas can support this goal by offering standardized data fields that foster consistent reporting and enable meaningful comparisons across countries and regions. Future efforts should also focus on closer collaboration with ESC clinical registries to improve data completeness, enhance interoperability, and increase the clinical relevance of the findings.

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Supplementary data

Supplementary data are available at *European Heart Journal* online.

Declarations

Disclosure of Interest

F.S. reports payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events from Abbott, Edwards, Medtronic, Philips, Boston Scientific, Amarin, Amgen, Daiichi, and Sanofi and participation on data safety monitoring boards or advisory boards for Abbott, Edwards, Medtronic, Philips, Amarin, Amgen, and Sanofi. M.H. reports grants from Novo Nordisk (ARTEMIS trial national leader, Poland, probably not connected with the area of the present work) and holds leadership positions as president of the Polish Association of Cardiovascular Interventions and co-chair of the EAPCI National Cardiac Societies Committee. V.P. reports institutional grants from Abbott Vascular; payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events from Elixir, Abbott Vascular, Boston Scientific, Novo Nordisk, and SMT (all personal); support for attending meetings and/or travel from Novartis (personal); and leadership roles as EAPCI Congress Committee chair and ESC CPC member. E.R. reports consulting fees from Edwards Lifesciences, Sanofi, Shockwave Medical, and Vantis; payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events from Abbott, AstraZeneca, Bayer, Boston Scientific, Bristol Myers Squibb, German Society of Cardiology, Edwards Lifesciences, Merit Medical, and Pfizer; support for attending meetings and/or travel from German Society of Cardiology, Europa Group (EuroPCR), and AstraZeneca; participation on data safety monitoring boards or advisory boards for Bayer, Sanofi, Shockwave Medical, and Vantis; leadership or fiduciary roles in AGIK (DGK), ESC, and EAPCI committees; and stock or stock options in Biontech and Moderna. I.C.-G. reports proctor and consultant fees for SMT, Boston Scientific, Abbott, Medtronic, Edwards, and IHT. R.L. reports consulting fees from Chiesi Scientific (not relevant for this work) and honoraria from Chiesi and Boston Scientific (not relevant for this work). H.T. reports an educational grant from Boston Scientific, an educational grant from Chiesi Pharma, payment for a lecture from Chiesi Pharma, and service as chairman of the Interventional Cardiology Section, Finnish Cardiology Society (2021–23). S.E.P. reports that the ESC–EAPCI Atlas of Interventional Cardiology project is fully funded by the European Society of Cardiology. S.E.P. also reports grants from UKRI, Barts Charity, Medical Research Council, National Institute for Health and Care Research, and British Heart Foundation; royalties from the Oxford University CMR textbook; consulting fees from Circle Cardiovascular Imaging, Inc.; payment for lectures at the CMR Academy (Berlin); and support for attending meetings as president and immediate past president of EACVI and serves as chair of the Data and Safety Monitoring Board for the Proteus Trial. P.V. reports consulting fees from Hygeia Hospitals Group (HHG). A.C. reports consulting fees from Abbott Vascular, Menarini, Cordis, Penumbra, Abiomed, and Boehringer. A.C. also reports payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events. The following authors declare no conflict of interest: E.V.B., R.P., R.C.T., M.A.M., G.T., T.K., M.S., R.J., A.M., J.K., D.K., R.H., N.T., A.T., M.G., E.B., and D.D..

Data Availability

All the data presented in this report are available upon request to the corresponding author. Access will be granted following review with ESC–EAPCI Atlas investigators and agreement with the authors of this manuscript.

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Ethical Approval

Ethical approval was not required.

Pre-registered Clinical Trial Number

Not applicable.

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