CardioScape

A survey of the European cardiovascular research landscape

PROJECT NO.	FP7 – 306086
INSTRUMENT	Coordination and Support Action
THEME	[HEALTH.2012.4.1-5] Preparing the future for health research and innovation
START DATE OF PROJECT	1 November 2012
DURATION	23 months
DELIVERABLE	D5.1 – Summary report on CVD research landscape in Europe D6.1 – Recommendations for future strategic coordination document
DISSEMINATION LEVEL	Public
LEAD CONTRACTOR FOR THIS DELIVERABLE	European Society of Cardiology (ESC)

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 306086. These findings represent the views and recommendations that emerged from the data collected by CardioScape. The contents of this publication do not necessarily reflect the position or opinion of the European Commission. Neither the European Commission nor any person acting in its behalf is liable for any use made of this information.

TABLE OF CONTENTS

Foreword 3
Executive summary 4
Introduction 7
1. Project Description 8
Structure 8
Methodology 9
I. Data Collection 9
II. Data Processing & Compiling 10
III. Data Analysis 11
IV. Project Challenges & Limitations 11
2. Survey results 14
I. Information Collection 14
II. CardioScape database 14
III. General analysis 14
IV. Geographical analysis 15
V. Demographic analysis 16
VI. Economic analysis 17
VII. Distribution of funding by research area 17
VIII. Origin of funding 19
IX. Top 10 funding organisations (public & private separated) 20
X. Distribution of funding by research topic 21
XI. Comparison with research spend for other non-communicable diseases 23
3. Conclusions 24
4. Recommendations 24
5. CardioScape Spin Off 28
6. Annexes 29
Annex 1: CardioScape Committees Composition 29
Annex 2: CardioScape Questionnaire 32
Annex 3: List of Contacted Funding Organisations 34
Annex 4: CardioScape Taxonomy 43
Annex 5: www.CardioScape.eu Website Snapshot 51
Annex 6: Country Codes 52

FOREWORD

It is expected that the incidence of cardiovascular and other chronic disorders will double by 2050[1], placing an increasing burden on the health economies of individual nations and impairing the quality of life of their citizens. It is therefore imperative that cardiovascular research in Europe is framed in this context, with a focus on prevention, novel therapies and management strategies for the most common and disabling disorders.

CardioScape is a unique FP7 funded project that provides, for the first time, an understanding of the European research landscape in the area of cardiology and cardiovascular diseases (CVD). It identifies where research is performed, how it is funded and by whom. Based on its relevance for data providers and users and the involved technology, it can be transformed into an on-line, continuously updated resource of great relevance for researchers, funding bodies and policymakers. In this sense it can be a role model for wider ranging activities to map research funding in Europe.

CardioScape is led by the European Society of Cardiology (ESC), in which many dedicated, passionate cardiologists, scientists and healthcare professionals gave their time freely to assemble a database of research performed in 28 European Union (EU) countries in order to provide a snapshot of cardiovascular research at a European and national level to guide future research priorities. They should be thanked warmly for their commitment in this ambitious project.

PNO, Europe's largest independent innovation grants consultancy, partnered in the CardioScape project and oversaw the collection of information on the available funding sources for CVD research in Europe as well as the dissemination part of the project.

The funding bodies have been sharing their data, giving input into the process and the formatting of the database and report. This project would not have been possible without their support.

By understanding what cardiovascular research is being done, we will be better informed to guide future research and development (R&D), to identify where duplication is happening, to encourage more collaboration between researchers and to help funders decide where to invest their funds so that, in such difficult economic constraints, every Euro is rightly invested not only to serve science and ultimately patients, but to contribute to a healthier and more productive European society.

Funding bodies and investigators are now invited to continue populating the CardioScape database with research projects funded from 2012 onwards to make it a living repository of cardiovascular research in Europe.

Frans Van de Werf
Chair, CardioScape Steering Committee

David Wood
Chair, CardioScape Scientific Committee

[1] EU Report: cardiovascular diseases in the European Union, 2009

EXECUTIVE SUMMARY

CardioScape: project overview

› CardioScape - a survey of the European cardiovascular research landscape and recommendations for future research strategy - is a 23 month project funded by the European Union FP7 research programme[2].

› CardioScape aims to outline the current CVD research and innovation landscape across Europe towards establishing the extent of duplication across national research programmes and the existence of gaps that reduce opportunities for innovation.

› The lead CardioScape project partner is the European Society of Cardiology (ESC), representing over 80,000 cardiology professionals across Europe and the Mediterranean. Its mission is to reduce the burden of cardiovascular disease in Europe.

› PNO, Europe's leading independent innovation grants consultancy, is the second project partner. Founded in 1985, PNO is Europe's largest independent public funding advisory, annually raising over €250 million on behalf of its clients.

› 157 organisations from all EU Member States were invited to report information on the funding provided for cardiovascular research. The accurateness of the CardioScape data and of the analysis in this report is based on the assumption that the information received was truthful.

CardioScape: the first-ever database on CVD research in Europe

› The CardioScape database provides a snapshot of cardiovascular research project grants ≥ € 100 000 for the period 2010 – 2012 in the European Union. It is covering funding schemes that are directly accessible to all researchers, but not strategic research funding directed at institutions or specific research consortia within a national context.

› CardioScape's findings should be interpreted cautiously, because there is not necessarily a strong correlation between the level of funding for a specific topic and the impact this has on human health and the wealth of the economy.

› Although industry funding for cardiovascular research represents an important share of the overall available funding for research at a European and national level it was not possible to collect such data in the CardioScape project.

› An exhaustive inventory of EU funding for cardiovascular research was not within the scope of the CardioScape project. Information on FP7 funding in 2010, 2011 and 2012 is referenced in this report as means of comparison with sources of national funding.

[2] Seventh Framework Programme for Research and Technological Development (FP7) 2007-2013

› European and national funding bodies and scientists from all areas of cardiovascular research may access the CardioScape database, which is freely available to the whole scientific community, to understand who is doing what research and where and funded by whom.

› Automatic computer classification allowed the continuous categorisation of new entries from different sources into the common CardioScape taxonomy of research (see Annex 4), which was developed uniquely by experts for the CardioScape project. Stakeholders are able to populate the CardioScape database with their own project information by contacting the CardioScape team through the website (www.cardioscape.eu).

› Using a web-based user interface, the data can be interrogated from very different viewpoints by different types of users (e.g. policymakers, funding bodies, researchers): Does funding for clinical cardiovascular research in Europe correspond to population size? Are the obvious gaps in funding for a specific field in a specific country? Which projects on the use of a certain approach are currently funded in Europe?

› Data collection, classification and interrogation processes developed for CardioScape could be expanded to other relevant areas of medical research in Europe.

› CardioScape is an incentive for researchers and funding bodies to include new data in the database, in order to maintain an up to date European picture of cardiovascular funding. Overall, this will improve the extent and quality of knowledge on cardiovascular research funded and performed in the EU.

CardioScape: a picture of the CVD research landscape in Europe

› At least €876 million was awarded for CVD research project grants under competitive open funding schemes in the EU over a three years period (2010 – 2012)

› 2/3 (€ 618 M) of surveyed CVD research funding comes from national sources (government/public and charity/private), while the remaining 1/3 (€ 258 M) comes from the EU. National funding sources appear as key for research performed within national borders and find an important complement in EU funding that focuses on transnational cardiovascular research.

› 130 funding organisations, government/public and charity/private, fund CVD research across the EU-28

› Government/public funding in cardiovascular research in Europe accounts for 53% of total grants awarded. Charity/private agencies provide 47% of cardiovascular research funding in Europe.

› One funding agency alone, the British Heart Foundation, accounts for 14% of total funding in CVD research, including EU funding, and 22% of CVD research funding across EU-28 excluding EU funding.

- 3 funding agencies[3] account for over 50% of nationally provided competitive grant funding dedicated to CVD research.
- Only 3 charity/private agencies have budgets higher than €10 million for CVD research in 2010-2011-2012
- 7 government/public agencies have budgets above €10 million for CVD research in 2010-2011-2012
- Although CVD is the most common cause of death in EU, research funding is larger for cancer: €2.25 billion over three years (latest available data from 2002-2003)
- Research spend is highest for the area of human/clinical research, which generally entails much higher costs than basic research, and lowest for research in prevention/population/public health.

[2]British Heart Foundation (UK), Wellcome Trust (UK), Deutsche Forschungsgemeinschaft (DFG) (DE)

INTRODUCTION

PROJECT SUMMARY	
PROJECT TYPE:	Coordination and Support Action
PROJECT LEADER:	European Society of Cardiology
PROJECT PARTNER:	PNO Consultants
START DATE:	1 November 2012
END DATE:	30 September 2014
EU CONTRIBUTION:	487,365.00 EUR

Cardiovascular disease (CVD) is the n°1 killer in Europe, causing the death of over 4 million people per year in the WHO European Region[4] and 1.9 million in the EU. It is one of the primary causes of premature mortality in Europe, as well as of reduced quality of life in the elderly.

CVD is also a major cause of increasing healthcare costs. Overall, it is estimated to cost the EU economy € 196 billion every year.[5]

Based on current trends, a significant increase in CVD prevalence is expected over the next 20 years and therefore finding new approaches to screening and prevention, early detection and management, new and innovative treatments and effective and cost effective service delivery to tackle CVD is essential.

CardioScape - a survey of the European cardiovascular research landscape in order to inform future transnational and national research strategies - is a 23-month project funded by the European Union FP7 research programme.

Coordinated by the European Society of Cardiology (ESC), together with PNO - Europe's leading independent innovation grants consultancy, the project determined the current CVD research and innovation landscape across Europe.

The data on CVD research funding, generously provided by European and national funding bodies in the public and private sectors, will allow experts from academia, the funding bodies and industry to evaluate the extent of duplication across national research programmes within the type of grants examined in this report. It will help to identify gaps that reduce opportunities for innovation, highlight areas where coordination can be improved and define future funding priorities and strategies for CVD research in Europe.

This report[6] outlines the funded CVD research activities based on data collected over the time period 2010 – 2012 (three years) and presents an overview of this scientific landscape. The CardioScape database is a publicly available resource (www.cardioscape.eu) for the whole scientific community.

[4] http://www.who.int/choice/demography/euro_region/en/
[5] European Cardiovascular Disease Statistics 2012, European Society of Cardiology, European Heart Network
[6] Deliverable 5.1 – Summary report on CVD research landscape in Europe

1. PROJECT DESCRIPTION

STRUCTURE

The CardioScape project was structured in seven separate work packages (see Fig. 1) the coordination of which was overseen by the CardioScape Steering Committee (see Annex 1), the formal decision-making body of the consortium with the overall responsibility for the administrative and technical management for the project.

FIG. 1 - PROJECT STRUCTURE

WP1	ESC, PNO	Project management and reporting
WP2	ESC	Survey of CVD research projects in Europe
WP3	ESC	Data processing & setup CVD research and funding database
WP4	PNO	Survey of CVD research funding in Europe
WP5	ESC	Analysis of compiled data on CVD research projects & funding
WP6	ESC, PNO	Recommendations for an improved future research strategy
WP7	ESC, PNO	Dissemination of project results

A Project Coordinator led the data collection, supported the Steering Committee and oversaw its interaction with the Scientific Committee and the Stakeholders Group. The Project Coordinator headed the Project Secretariat, including a Project Manager, responsible for the deployment of the project's support activities.

The Scientific Committee was the body appointed to analyse the data and draw conclusions to help shape the future of cardiovascular research in Europe. It is composed of expert senior physicians and researchers, members of research and academic medical institutions, many of whom are also leaders within the ESC and ESC constituent bodies.

The Stakeholders Group, a broad based grouping comprising medical scientists, engineers and healthcare providers, connecting academia, industry, patient advocacy groups and national/European policymakers was consulted for the formulation and development of a proposed future European R&D agenda for CVD research.

METHODOLOGY

I. DATA COLLECTION

The survey of CVD research projects in Europe (WP2) ran over a period of 16 months. Projects were tracked at both a European and national level.

A preliminary feasibility study tested the process in Belgium, the Netherlands, Slovenia and Spain. The validated process was then extended to all EU-28 Member States.

In order to maximise the response rate and obtain a complete and reliable picture, a multi-step process was developed. The Presidents of the EU28 National Cardiac Societies, which are members of the ESC, were invited to identify three leading experts in CVD research in their country, one for each of the following areas: basic, clinical and epidemiological science. The identified experts provided a list of CVD research funding organisations in their area of expertise. Funding organisations were then invited to fill in an online questionnaire (see Annex 2). The questionnaire focused only on minimum data of interest in order to increase the chances of a positive feedback and maximise the response rate.

Only projects meeting the following criteria qualified for the database:

- Grant awards ≥ € 100 000 or equivalent in other currencies
- Projects awarded in one of the following years: 2010, 2011 and 2012
- The funding scheme was open to researchers or research groups, i.e. no institutional funding

A systematic follow up (written letters, emailing and telephone reminders) was carried out by the CardioScape Secretariat. Cardiologists involved in the identification of funding bodies, namely the Presidents of National Cardiac Societies and their nominated research experts, as well as Steering and Scientific Committee members, provided support in countries where the data collection was delayed or challenging.

A list of all the funding organisations contacted for the project can be found in Annex 3.

Collected research and funding data include (non exhaustive):

- Research project titles and corresponding funding agency
- Geographical coverage of the project
- Number and type of partners
- Research area (basic, clinical, epidemiological)
- Research topics, based on taxonomy developed for the project (see IV. Data Collection Challenges)
- Total Funding awarded
- Project duration

II. Data Processing & Compiling

Paper and online questionnaires were disseminated to the identified organisations. A dedicated web database was developed to store the collected data and to provide exports of the data for subsequent expert review and analysis.

The database was made public on the dedicated CardioScape website – www.cardioscape.eu (Annex 5) - developed by the ESC Web Department. It is expected that the database will be maintained by the ESC and will be accessible for future reference beyond the end of the project. The website also provides information, when available, on project objectives, methods, the investigators and relevant contact details.

The database was designed to easily and quickly find information related to CVD research related projects funded in Europe. It used search fields to allow different types of queries including:

- Country: the search can be done at the level of one country, several countries or all EU countries together.
- Research area: this field allows an automatic sort of projects divided in three research areas: basic/preclinical research, human/clinical research and epidemiology/population/prevention research.
- Research topic: this field is based on the CardioScape taxonomy.
- Funding agency: the field allows searching for funding agencies one by one or several together. The search field prompts a drop down menu listing all agencies that populate the CardioScape database.
- Years: The CardioScape database allows searching for projects running in 2010, 2011 and 2012. However, the database also contains projects awarded before and after this time period, which have been submitted by the stakeholders.
- Funding amount: two search fields allow searching for projects by their funding amount defining a minimum and/or a maximum amount.
- Keywords: including the AND, OR and NOT functionalities allows combining several keywords or excluding others.

All search fields can be combined for an advanced search. The results are displayed in columns by projects and the first results page indicates the number of projects found for each search.

The CardioScape website also provides information, when available, on the project's objectives, structure, involved parties and the relevant news and contact details. The collection of the names of the principal investigators was not within the scope of this project.

III. Data Analysis

The Scientific Committee analysed the data exported from the database and developed the present report on the current research landscape in the form of a European inventory of CVD research.

IV. Project Challenges & Limitations

› *Target*

Originally, CardioScape's objective was to identify and track CVD research projects in the WHO European region with a heightened focus on European countries with the biggest contribution to medical research: France, UK, Germany, Italy, Sweden, Netherlands and Belgium, as well as Poland, being a large eastern European country that will allow for an E/W comparison. However, at the start of the project, the European Commission invited the project partners, ESC and PNO, to expand the focus of CardioScape to all EU-28 Member States.

The broadening of the project's objectives, together with the setting up of an elaborate process to collect data from EU Member States on their cardiovascular research funding (see section I – Data Collection), prolonged the time necessary to complete the survey. The European Commission agreed to extend the project by five months, with a completion date at the end of September 2014 instead of April 2014, as planned. This facilitated direct involvement of National Cardiac Societies and national experts and improved the quality of the data that were collected.

An exhaustive inventory of EU funding for cardiovascular research was not within the scope of the CardioScape project. FP7 funding for cardiovascular research in the years 2010 – 2011 – 2012 was included in the CardioScape database for easy reference and was listed in the present report as a means of comparison with national funding for cardiovascular research. Other funding provided by the EU – for instance through the Public Health Programme – was not included in the CardioScape survey.

› *Sample size*

Only projects awarded during the years 2010, 2011 or 2012, with a budget ≥ €100,000, and open to researchers and/or research groups were surveyed. Projects, awarded before or after the CardioScape period of analysis or with lower budgets, and for which data was provided, may appear in the CardioScape database when they were submitted by funders but were excluded from the analysis.

CardioScape covers funding schemes that are directly accessible to all researchers, but not strategic research funding directed at institutions or specific research consortia within a national context. Depending on national funding policies, the fraction of the research support that is made available through open competitive calls may vary considerably and may represent an important source of research funding. Examples of directed and strategic funding include the funding of INSERM units in France, where approval for funding is based on rigorous peer review, but not open to competitive

application. In Germany, the government introduced a funding scheme for centres of excellence[7], including in cardiovascular research where the applicants are institutions. In the Netherlands, public-private partnerships under CTMM also included cardiovascular support[8].

Information on principal investigators (PIs) was not collected, based on the fact that it is not readily available in all countries due to data protection policies.

› *Lack of available data*

Response rates from the EU-28 countries and the quality and detail of the data provided varied considerably from country to country. The completeness and precision of information provided by funding bodies obviously impacts the CardioScape results.

The Deutsche Forschungsgemeinschaft (DFG) was not able to provide funding amounts awarded for each project, but did agree to share, for the sake of analysis, a total funding envelope per year (2010, 2011 and 2012). DLR (Deutschen Zentrum für Luft- und Raumfahrt), one of the agencies managing health research funds from the German Ministry of Research, was also only able to provide total budget indications and projects were grouped in larger categories to allow for the analysis.

In Romania and Malta, no funding organisations were identified by the experts nominated by the national cardiac societies. In Bulgaria, Cyprus, Croatia, Estonia, Lithuania and Portugal no funding > € 100 000 was available for CV research in the period 2010-2012.

› *Reliability of Data*

CardioScape's findings should be interpreted cautiously. The information of research spend was 'self reported' and not independently verified. Consequently, the accurateness of the CardioScape data and of the analysis in this report is based on the assumption that the information received was truthful.

› *Access*

Although industry funding (pharmaceutical, diagnostic, imaging or medical devices sectors, large companies or SMEs) for cardiovascular research represents an important share of the overall available funding for research at a European and national level it was not possible to collect such data in the CardioScape project.

The CardioScape Steering Committee anticipated reluctance from industry to disclose what are considered highly sensitive data and thus consulted the ESC Cardiovascular Roundtable (CRT) [9]. CardioScape was presented to 20 industry members of the CRT on two occasions (20 November 2012 and 23 October 2013) and a short survey was sent to all

[7] www. dzhk.de
[8] www.ctmm.nl/en/themas/hart-en-vaatziekten
[9] The CRT is a strategic forum for high level dialogue between industry (pharmaceutical, devices and equipment) and ESC leadership to identify and discuss key strategic issues for the future of cardiovascular health in Europe

members with the objective to collect information on the amount of money dedicated to CVD R&D in Europe in 2010, 2011 and 2012. The response rate was very low, with feedback from only 5 companies. Of these, only one company agreed to share the requested information. The other four declined the invitation to share information, citing internal company policies on the disclosure of data related to R&D investment. It was also argued that companies use different approaches regarding cost allocations and the collected information would thus not be comparable.

› *Classification & Taxonomy of Research Content*

When building the CardioScape questionnaire, it became apparent that there was a need for a detailed taxonomy of research content, which would encompass the whole domain of cardiology, in order to facilitate the analysis of data. Three young cardiologists voluntarily contributed to this immense task and compiled a unique taxonomy (see Annex 4) based upon the topic list of the ESC congress abstracts and the topic lists and keywords from each of the six ESC specialty journals.

All projects were classified into three broad areas: epidemiology/prevention/public health, basic/preclinical or clinical/human research. A hierarchy of terms was developed so that major topics and sub-topics could be assigned to each project according to project details provided by the funding agency. The number of terms assigned to each project depended on the details provided by the funding body and ranged from only a project title to a complete outline of the planned project.

The classification of research projects using this taxonomy was initially made manually by the Scientific Committee, with the support of the three young cardiologists, but this process was found to be too time-consuming and revealed inconsistencies in classifications. Also, it would not allow the transformation of the CardioScape approach into a continuously updated database allowing on-line access to actual data.

The Scientific Committee reached out to the Structural Bioinformatics Group of the Charité Medical School in Berlin. The Structural Bioinformatics Group generated a systematic and automatic analysis programme based on the taxonomy developed for CardioScape, which sorted projects by research area and topics, prioritising the main topic based on several criteria. The accuracy of the automatic classification was progressively improved with the use of synonyms and evaluated by simultaneous manual classification performed by the three cardiology fellows reaching a very high concordance between automatic and manual classifications.

› *Translation*

All CardioScape communication was in English. Therefore data provided by funding organisations was requested in English. Language was never cited as a reason for not sharing information with CardioScape. In one country the data was provided in the national language only and had to be translated into English.

2. SURVEY RESULTS

I. INFORMATION COLLECTION

- 157 organisations from all EU-28 Member States were contacted
- 130 organisations responded to the questionnaire
    - 48% provided a complete response
    - 35% organisations did not meet the CardioScape criteria (i.e. had not funded projects in the last three years (22%) and/or awarded grants ≥ € 100 000 (13%)
    - 11% refused to provide any information
    - 4% provided incomplete information (e.g. missing abstract, no budget indication by project)
- 2476 research projects were included in the CardioScape database

II. CARDIOSCAPE DATABASE

Not all submitted projects fell within the scope of CardioScape (i.e. projects awarded during the years 2010, 2011 or 2012 with a budget ≥ €100,000). Other projects, awarded before or after the CardioScape period of analysis or with lower budgets, and for which data was provided, all appear in the CardioScape database but were excluded from the analysis. The CardioScape database, accessible on the CardioScape website, is being updated with new data received from funding organisations and investigators. Any corrections required to any of the data appearing on the CardioScape website can be notified to the ESC.

III. GENERAL ANALYSIS

The CardioScape survey shows that at least €876 million was awarded to cardiovascular disease research in the EU-28 in 2010, 2011 and 2012 under the funding schemes examined: government/public funding and EU funding account for 53% of total funding, charity/private agencies provide 47% of cardiovascular research funding. EU funding alone accounts for 30% of overall cardiovascular research funding in Europe. Strategic research funding directed at institutions or specific research consortia within a national context is not included in the CardioScape project.

Following breaking down the grant into annual awards, CardioScape data indicate that a large majority of projects (70%) have an average grant level of €100,000 or less per year.

IV. GEOGRAPHICAL ANALYSIS

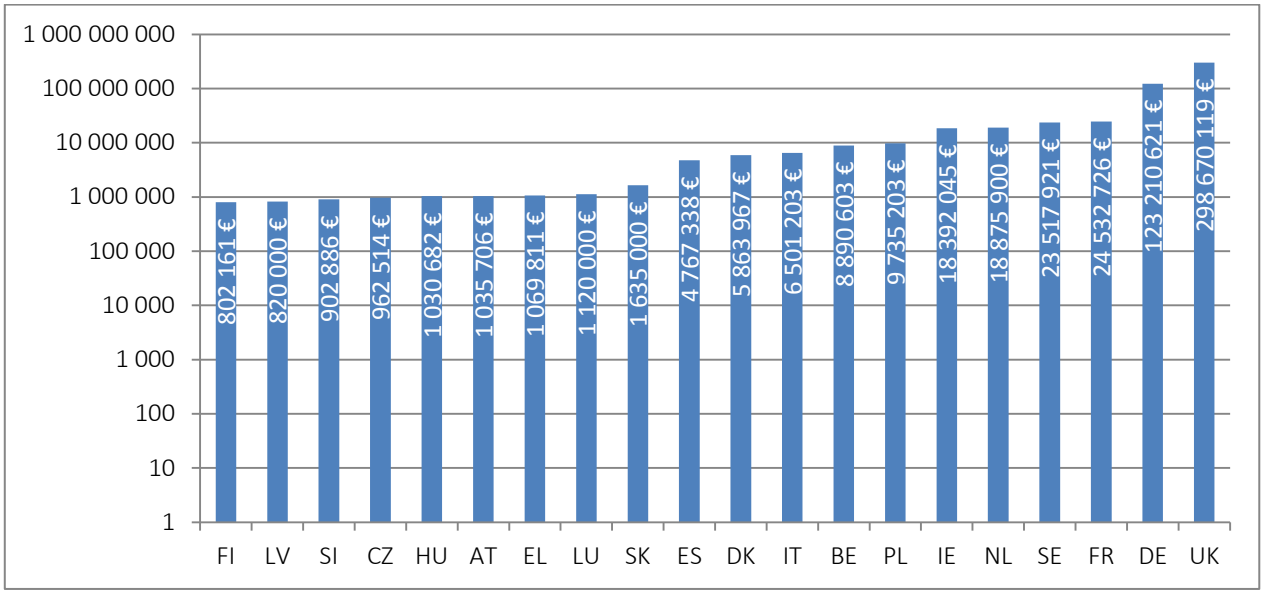

FIGURE 2: DISTRIBUTION OF CVD RESEARCH FUNDING IN THE EU BY COUNTRY (2010-2012) (LOGARITHMIC VIEW)

Based on the data submitted by the contacted funding agencies, the UK appears to be the dominant country in the European CVD research funding landscape, followed by Germany.

In Romania and Malta, no funding organisations were identified by the experts nominated by the National Cardiac Societies. In Bulgaria, Cyprus, Croatia, Estonia, Lithuania and Portugal no funding > € 100 000 was available for CV research in the period 2010-2012. FP7 projects funding is not included in Fig. 2 & 3.

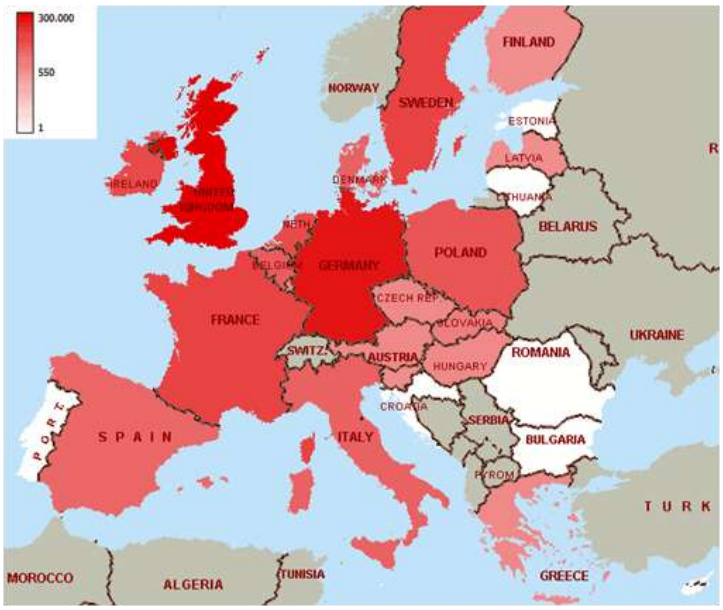

FIGURE 3: CVD RESEARCH PROJECT FUNDING IN EU 28 (2010-2012)

V. DEMOGRAPHIC ANALYSIS

CVD RESEARCH FUNDING VS POPULATION

The CardioScape analysis shows that there is no or little relationship between the total national funding and a country's population size. Countries with powerful charity/private organisations and/or fund raising cultures and activities (UK, Ireland, Netherlands, Sweden) appear to have a far greater ratio of CVD research spending per capita.

FIGURE 4: CVD RESEARCH SPEND BY COUNTRY VS POPULATION IN € (2010-2012)

CVD RESEARCH FUNDING VS CVD MORTALITY

Figure 5[10] shows that the level of CVD research funding is not proportional to the CVD mortality rates. Eastern and Central European countries, where CVD causes up to 50% of deaths for both men and women (e.g. Bulgaria, Romania) have little if any health research dedicated to CVD within the funding schemes examined. On the contrary, project funding dedicated to cardiology and CVD research is high in North and Western Europe, where CVD mortality has significantly fallen over the last decades. The reason behind this observation presumably lies in the economic development of the countries: the poorer the country, the less available R&D funding.

FIGURE 5: CVD RESEARCH SPEND BY COUNTRY VS CVD MORTALITY IN € (2010-2012)

[10] *Source: European Cardiovascular Disease Statistics, 2012, European Heart Network, European Society of Cardiology*

VI. ECONOMIC ANALYSIS

Figure 6[11] shows the relation between CVD research project funding by country and the Gross Domestic Product (GDP) per capita. Not surprisingly, there is an obvious correlation between each country's wealth (GDP) and the amount of funding dedicated to CVD research.

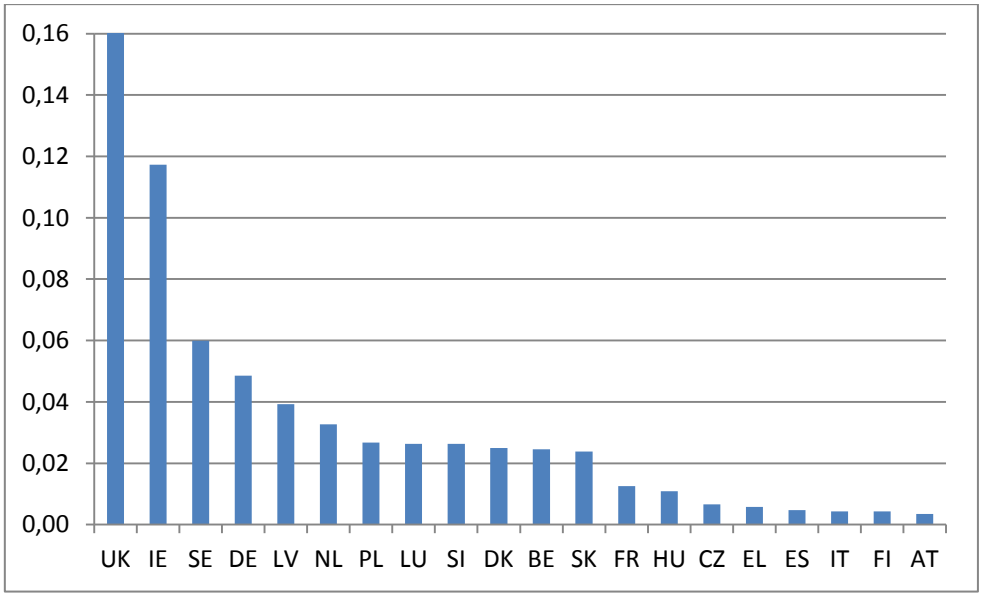

FIGURE 6: CVD RESEARCH SPEND BY COUNTRY VS GDP (IN %) PER CAPITA IN € (2010-2012)[12]

VII. DISTRIBUTION OF FUNDING BY RESEARCH AREA

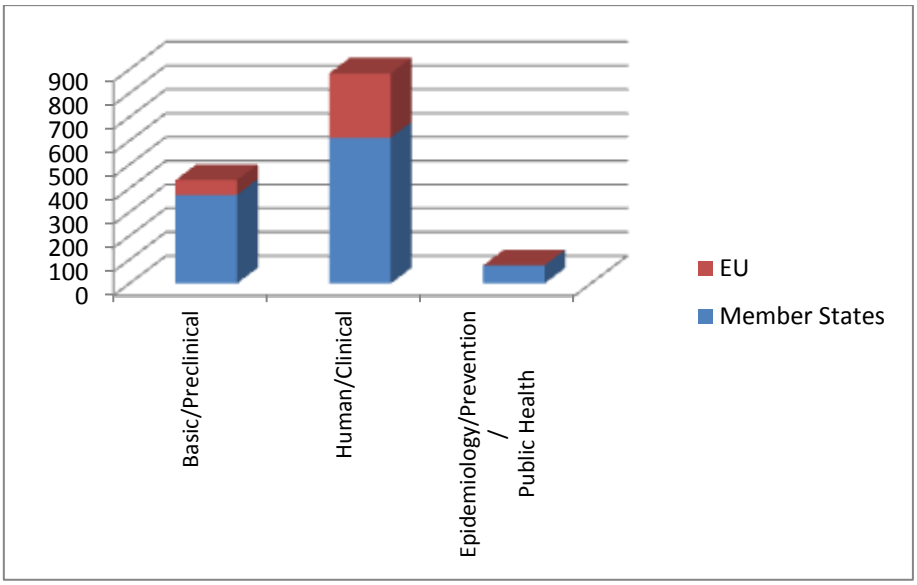

FIGURE 7: DISTRIBUTION OF CVD RESEARCH SPEND BY RESEARCH AREA IN M€ IN EU 28 (2010 - 2012)

[11] Source: International Monetary Fund, World Economic Outlook Database, April 2013 edition
[12] FP7 Projects funding is not included.

CardioScape shows that total funding awarded is highest for human and clinical research and lowest for epidemiology/population/public health research.

The number of research projects funded is similar for human/clinical and basic/pre-clinical and smallest for prevention/population/public health, indicating the size of grants is considerably larger in the human/clinical field.

By adding data on European Union Framework Programme 7 (FP7) projects under the collaboration scheme, CardioScape shows that EU funding is almost 5 times greater for human/clinical research than for basic/preclinical research. This is explained by the clear focus of FP7 on translation, including clinical research and public health. EU FP7 funding for epidemiology/population/public health is less visible in the database, because of projects' classification resulting as clinical research in a primary label. In addition, it is to be noted that data from the EU Public Health Programme do not appear in this survey. During the 2010-2012 period, the European Union co-funded the EuroHeart II project worth €2.7 million, including a European Commission contribution of €1.023 million.

Regarding basic research, cardiovascular topics may have been included under IMI and ERC programs, not included here.

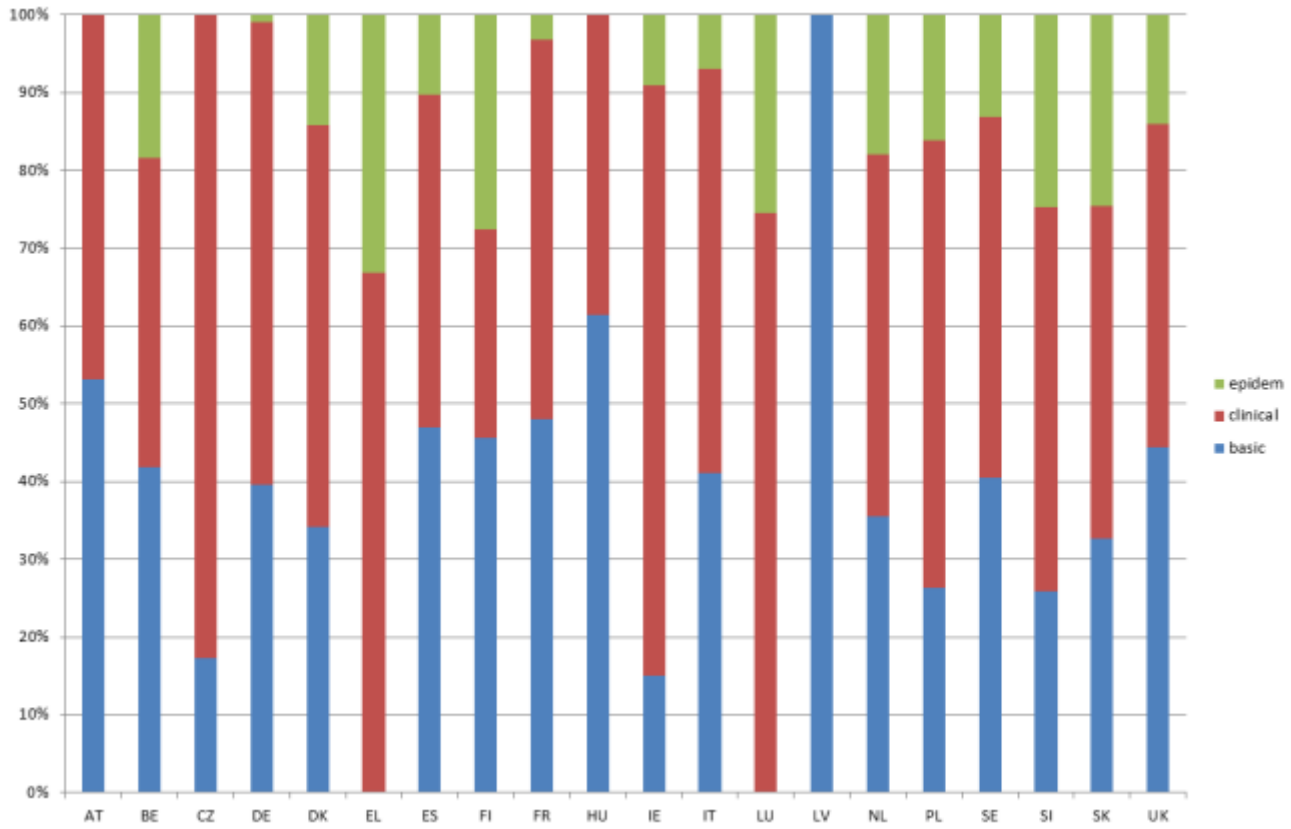

FIGURE 8: DISTRIBUTION OF CVD RESEARCH SPEND BY RESEARCH AREA IN THE EU IN % (2010-2012)

The distribution of CVD research projects by research area in each EU country varies widely and is highly dependent on the number of projects collected for each country. However, the European landscape country by country is dominated by human/clinical research.

In Romania and Malta, no funding organisations were identified by the experts nominated by the National Cardiac Societies. In Bulgaria, Cyprus, Croatia, Estonia, Lithuania and Portugal no funding > € 100 000 was available for CV research in the period 2010-2012. FP7 Projects funding is not included.

VIII. ORIGIN OF FUNDING

The CardioScape survey describes the origin of project funding and provides some understanding of who are the bigger funders of CVD research in Europe and what their research focus is.

Charitable funding dominates the picture of CVD research in the UK.

DISTRIBUTION OF FUNDING BETWEEN PRIVATE AND PUBLIC ORGANISATIONS

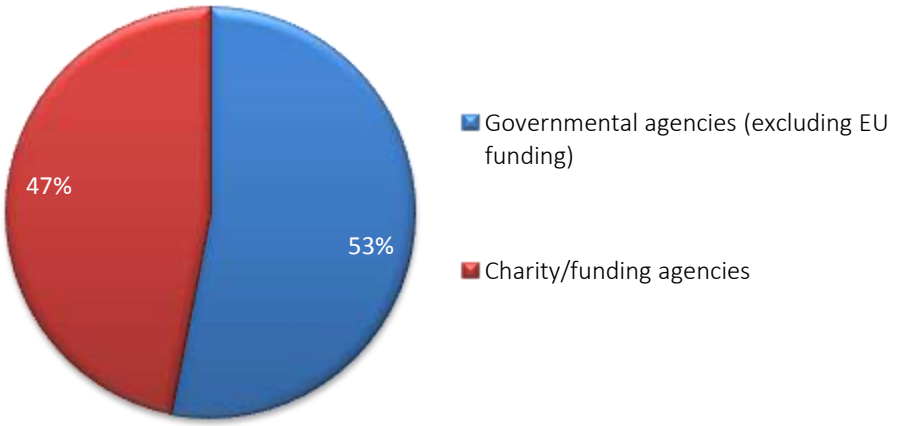

FIGURE 9: CVD RESEARCH SPEND PER TYPE OF FUNDING ORGANISATION (2010-2012)

IX. TOP 10 FUNDING ORGANISATIONS (PUBLIC & PRIVATE SEPARATED)

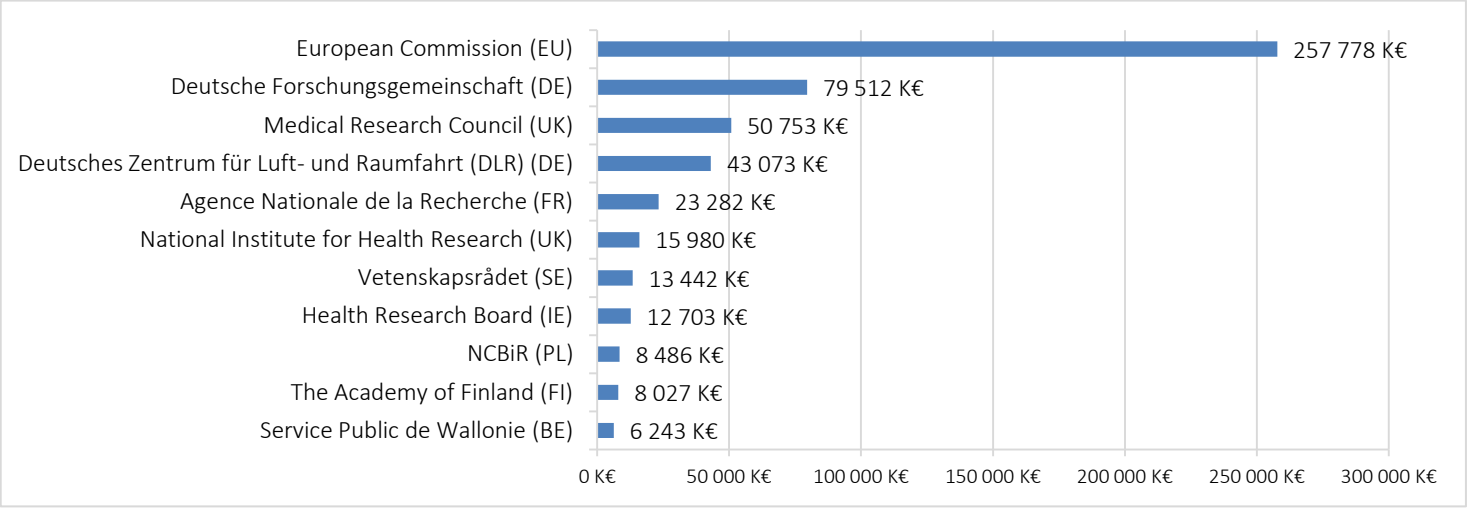

FIGURE 10: TOP 10 GOVERNMENT/PUBLIC FUNDING AGENCIES BY CVD RESEARCH SPEND (2010-2012)

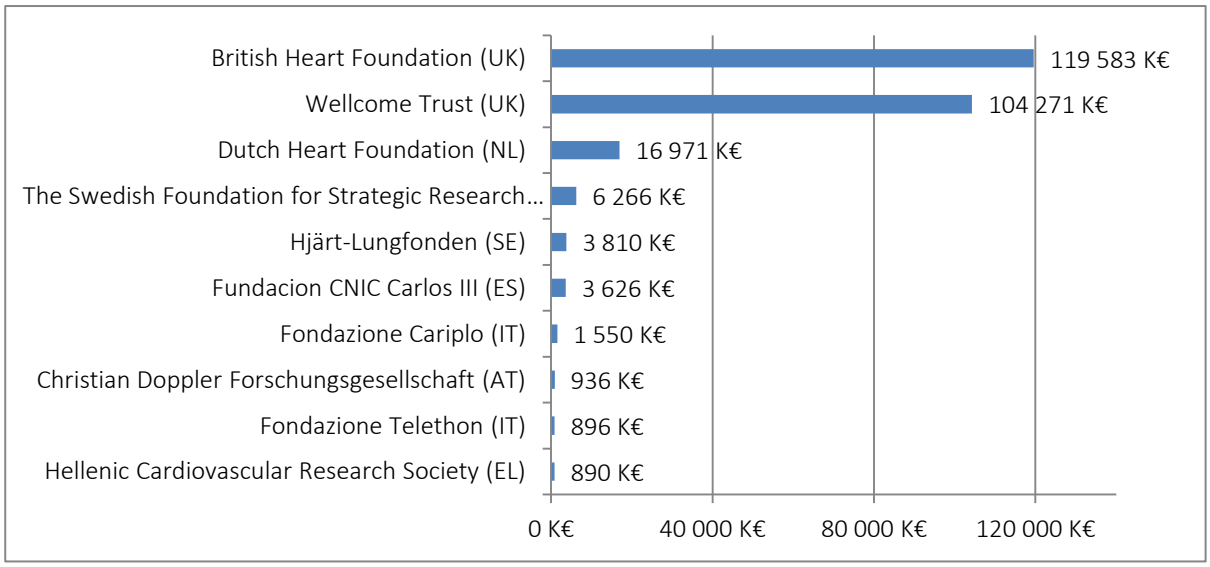

FIGURE 11: TOP 10 CHARITY/PRIVATE FUNDING AGENCIES BY CVD RESEARCH SPEND (2010-2012)

The CardioScape survey shows vast differences between budgets allocated to cardiovascular research funding by funding agencies, whether charity/private or government/public.

Only three private agencies have budgets higher than €10 million for CVD research in 2010-2011-2012, while seven government/public agencies have budgets above this threshold.

X. DISTRIBUTION OF FUNDING BY RESEARCH TOPIC

This section describes what topics are funded by CVD research in order of priority, with the objective of identifying areas of research that are less funded.

Topics and sub-topics are based on the CardioScape taxonomy. While projects usually have only one main/parent topic, they may have several sub-topics, e.g. atrial fibrillation, channelopathies and electrical cardioversion are some of the sub-topics of the main/parent topic arrhythmias. The automatic classification developed by the Berlin-based Charité University for CardioScape ensures that projects can be mapped back to one main topic based on a series of criteria.

Identified topics have also been classifies within three main areas of research: basic/preclinical research, human/clinical research, epidemiology/prevention/public health research.

› *Top 10 most funded topics by area of research*

The following figures show the top 10 topics funded across Europe, for each area of research.

BASIC/PRECLINICAL RESEARCH

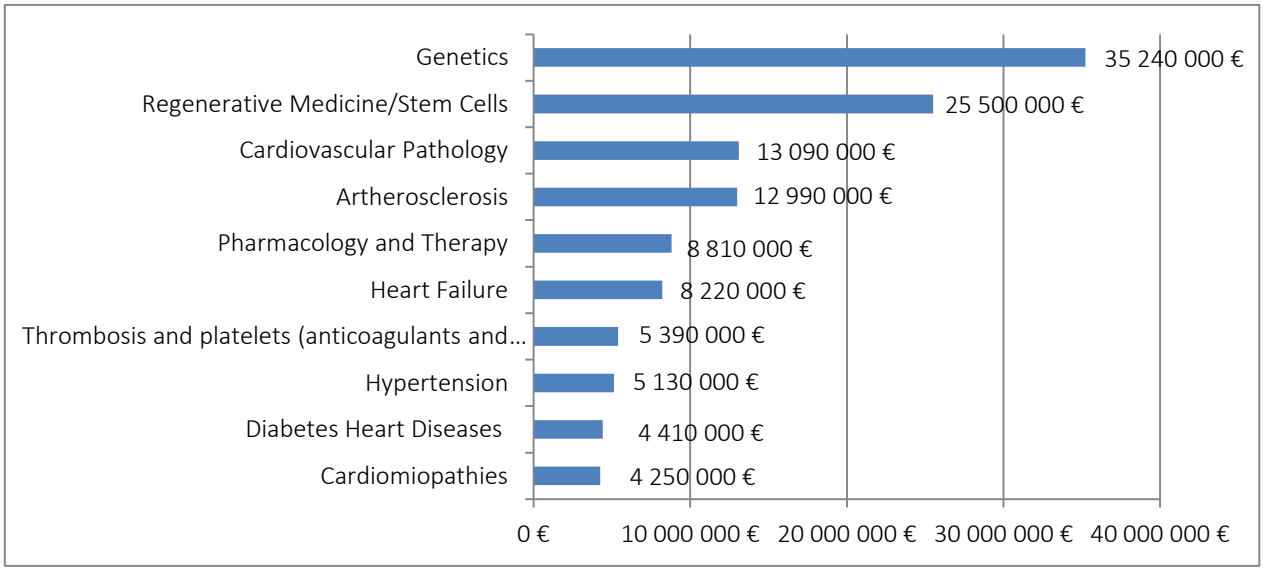

FIGURE 12: TOP 10 TOPICS FUNDED IN CVD BASIC/PRECLINICAL RESEARCH (2010-2012)

HUMAN/CLINICAL RESEARCH

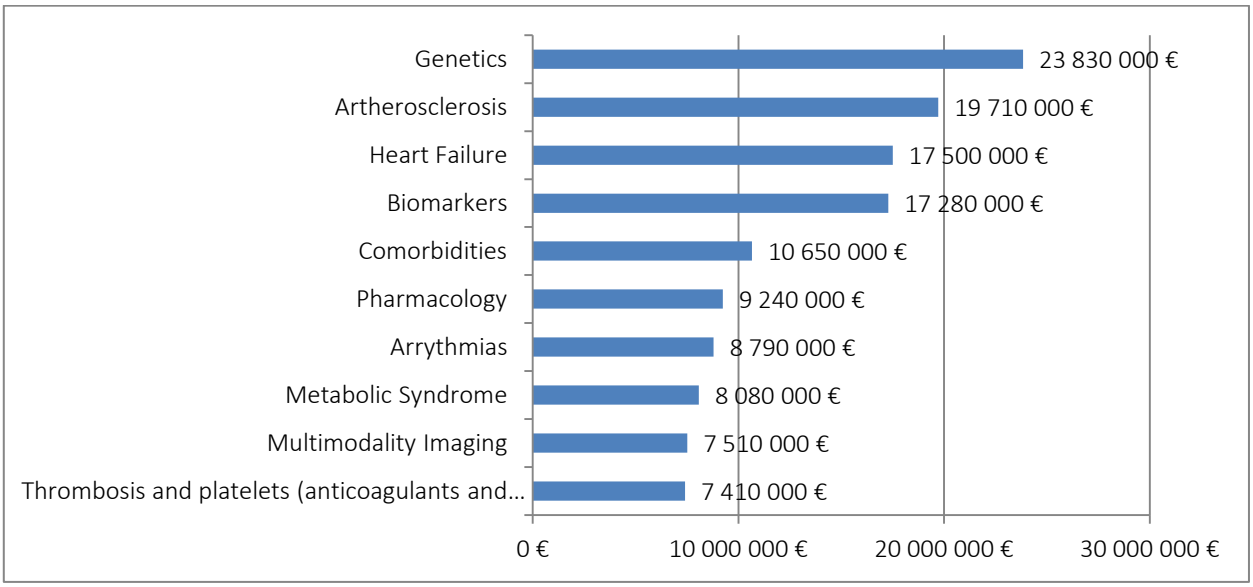

FIGURE 13: TOP 10 TOPICS FUNDED IN CVD HUMAN/CLINICAL RESEARCH (2010-2012)

EPIDEMIOLOGY / PREVENTION / PUBLIC HEALTH RESEARCH

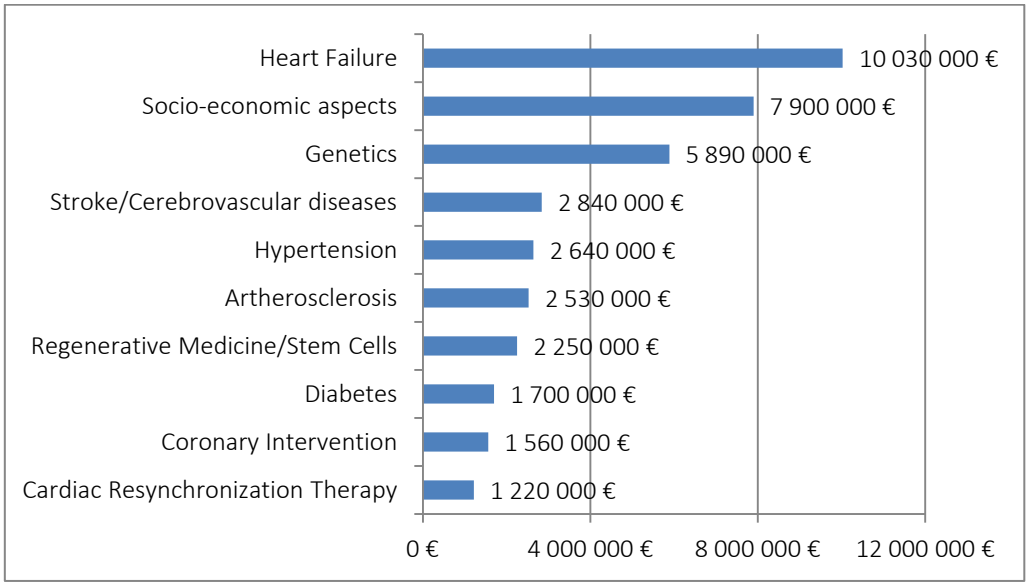

FIGURE 14: TOP 10 TOPICS FUNDED IN CVD EPIDEMIOLOGY / PREVENTION / PUBLIC HEALTH RESEARCH (2010-2012)

XI. COMPARISON WITH RESEARCH SPEND FOR OTHER NON-COMMUNICABLE DISEASES

Although CVD is the most common cause of death in EU, research spend is substantially larger for cancer research with €2.25 billion over 3 years (data 2002-2003)[13]. Of course, to make comparisons to other non-communicable diseases requires contemporary data of the same quality and this information is not readily available. Expanding the CardioScape approach (data gathering, data analysis, database access) to other fields would be a good option to obtain such data.

[13] European Cancer Research Funding Survey, European Cancer Research Managers Forum, March 2005

3. CONCLUSIONS

The CardioScape database provides a unique snapshot of funding for cardiovascular research for the period 2010 – 2012.

The baseline data summarised in this report illustrate the extent and diversity of funding sources across the EU 28 devoted to cardiovascular research and show the wide disparity in the level of funding between different nations.

There is a difference in the scale of funding between Government/public organisations and Charity/private funders that is however variable between countries. In aggregate, Government/public organisations spend more money, and more per project, than Charity/private funders.

Though EU research funding represents a mere 5% of total investment by EU Member States in European R&D across all disciplines and taking into account all funding sources, the EU funding is a major partner in cardiovascular research project funding landscape in Europe examined in the current survey, accounting for 30% of total available funding. EU funding is essential for cardiovascular research projects because of the transnational needs in large collaborative studies, with regard to collective expertise, data collection across large patient populations and representative sampling in population studies. The EU funding responds to this need and is an important complement to the national funding sources that rarely support research in other countries[14].

CardioScape could be an incentive for researchers and funding bodies to include data in the database, in order to be part of a global picture. Overall, this would improve the extent and quality of knowledge on cardiovascular research funded and performed in the EU.

4. RECOMMENDATIONS

› *General Recommendations*

CardioScape's findings emphasize the importance of both national and transnational funding to address the pan-European burden of cardiovascular disease. The data provide strong incentives for continued investment in cardiovascular research.

Whereas some gaps in the focus of CV research funding were highlighted, major duplication could not be detected in the analysed period 2010-2012. Of course, gaps may have been filled in the following years, but their existence suggests that inequalities in research funding do exist and should not be disregarded. Duplication may also have arisen in the

[14] Exceptions are for instance the British Heart Foundation and the Wellcome Trust in the UK.

years following the analysed period: this recalls the importance of maintaining and further developing the CardioScape database to make it a useful resource for strategic research planning.

Further analysis is needed to understand whether the wide disparity in the level of funding between different nations reflects differences in the stages in the translational research pipeline supported by each type of funder.

Although industry funding for cardiovascular research represents an important share of the overall funding provided at a European and national level it was not possible to include such data in the CardioScape project. We recommend that this shortcoming is addressed in future by further dialogue with industry, so that non-confidential summary information (of the kind presented in this report) can be used to aid funders and researchers.

CardioScape's findings should be interpreted cautiously, because there is not necessarily a strong correlation between the level of funding for a specific topic and the impact this has on human health and the wealth of the economy.

Evaluation of the impact of research on health and wealth is complex, partly because of the time lag between scientific discovery and clinical benefit and needs different tools for analysis. A study performed by the MRC indicated that in particular in cardiovascular disease the return on investment is highly significant[15]. Methods for the evaluation of impact of research on health and wealth of EU population need to be further developed and applied to update these earlier observations.

The CardioScape database will increase in value substantially if it is maintained and developed further to become an essential and unavoidable EU cardiovascular research inventory, enabling improved decisions about research priorities and research funding both at the EU and national level. We propose that funders should co-operate to continue to populate this unique database with awarded research grants on an annual basis and to make this information freely available to all funding bodies, academic institutions and scientists. Additional information, such as the primary investigator of each research project, could be included.

The success of the CardioScape survey process indicates that this methodology could be used to gather similar data in other areas of medical research with high economic significance in the EU (e.g. cancer, neurodegenerative disease, metabolic syndrome, diabetes).

The use of CardioScape Taxonomy of Research, which has been developed based on the ESC Congress abstract topic list and the topic list of the ESC journals, could be extended for use by all CVD research funding agencies, with the objective of obtaining one single in-depth classification of CVD in Europe. This taxonomy would be updated on a regular basis, based on new discoveries and scientific developments.

[15] Medical Research Council, 2008. 'Medical Research: What's it worth? Estimating the economic benefits from medical research in the UK'.

CardioScape recommends to develop the relationship between the main cardiology-related publishers and online archives of medical papers, to encourage collaboration and allow users, of both CardioScape database and publishers database, to easily consult one from the others, and vice versa.

› *Research-specific Recommendations*

· AGEING - Based on the information contained in the CardioScape database, despite the current ageing of the population and the large changes that occur in the cardiovascular system with ageing, the amount of research efforts funded in Europe evaluating the prevention, causes, occurrence and treatment of cardiovascular disease in the elderly and their association with the ageing process is very limited (20 projects) and thus deserves further evaluation and consideration for funding. Within the H2020 calls, there is no disease pre-specification in this area and this requires attention to ensure including cardiovascular disease.

· CARDIOVASCULAR NURSING - Funding of research in the area of cardiovascular nursing was found to be scarce. In particular, no projects address nursing education neither in human/clinic nor in epidemiology/prevention research areas. The available funds are located on a national level and support relatively small projects. To deliver optimal patient care and to support healthcare staff of all disciplines in the decision-making process, evidence-based nursing practice is a prerequisite and support for research in cardiovascular nursing is needed.

· COMPUTER MODELLING & COMPUTERS IN CARDIOLOGY - In the two related areas 'Computer modelling' and 'Computers in cardiology' the CardioScape database reports a sizeable number of funded projects (22 and 128), evidencing broad and competitive scientific activity in the field. A main component of the computer / modelling approach to cardiovascular medicine or medicine as a whole is the development of a patient specific understanding of pathophysiological mechanisms and tailored treatment options. This approach was initiated by the EU in the STEP process in 2005 and is funded via the 'VPS' (virtual physiological human) programme. Despite the significant number of funded projects in the area, however, this approach has not entered the 'mainstream' of cardiovascular science or even practice. Thus, its potential is grossly underused. This is evident, e.g. by the low representation if related events at the ESC conferences. Here, a lack of structural and strategic funding is evident, which would be aimed at bringing the individual approaches together, increasing the scientific discussion and translating the results into clinically testable concepts. Such funding would have to be supranational and should not so much target individual research projects, but corroborate the strength, interaction and visibility of the field by supporting conferences, career options and translational efforts.

· GENDER – Only 20 projects in the CardioScape Database include gender as a keyword. This confirms that gender aspects are not a key priority in cardiovascular research projects. CardioScape thus recommends that gender aspects are systematically addressed in cardiovascular research.

· HEART FAILURE - In the field of heart failure (HF), there are 2 major unsolved issues: the classification and treatment of patients hospitalized for acute HF, and the classification and treatment of patients with chronic HF and preserved ejection fraction. Analyzing the CardioScape database, it seems that HF is a clinical area with lot of studies

(212), but just a minority of them are focused on the most relevant unmet needs: one study specifically focused on chronic HF with preserved EF and five studies on acute HF.

· METABOLOMICS - The application of systems biology could permit a better identification of the etiogenesis and pathological pathways leading to CVD. Such data could lead to a novel taxonomy of cardiovascular disease and support better directed treatment. In this regard metabolomics could play a role in improving the diagnostic and predictive capacity to detect CVD as well as provide information regarding potential etiological pathways that could be targeted for treatment. Overall, although there are not many funded projects on metabolomics (23 results), many of these received large amounts of funding, suggesting the presence of a few large collaborative projects in Europe focused on metabolomics. Further efforts are needed in maintaining the current projects focused on using OMICs technologies for CVD and on translating these findings to facilitate their incorporation in clinical practice

· PLATELET FUNCTION AND ANTI-PLATELET TREATMENT - In the area of research on platelets there is a need for a geographical widening of research activity as the CardioScape database only lists activities in seven EU countries. There is also very limited publicly funded clinically based research on healthy volunteers or patients exploring newer modes of platelet function testing or the use of new anti platelet treatment strategies.

· PREVENTION - The amount of projects funded and resources allocated specifically to research on primary prevention in Europe is scarce (only 16 projects, the largest grant being € 1.7 M). This finding is quite worrying considering that industry funding is generally not directed to epidemiology/prevention/public health research. Population based registers of major cardiovascular events are rare; after the experience in the MONICA register (MONItoring of trends and determinants of CArdiovascular disease) coordinated by WHO in the eighties and nineties, there have been no further attempts to describe the burden caused by acute myocardial infarction in terms of morbidity, mortality and case fatality, at the level of the European population. Hospital-based registers illustrate only the top of the iceberg. There is an urgent need for new population-based observational cohort studies in order to develop more accurate and up to date models to estimate the total CV risk in the apparently healthy population; community-based intervention trials regarding the efficacy and safety of lifestyle- and environment- related exposures are needed to develop evidence-based health policies in the field of preventive cardiology. There remain a lot of unresolved problems as to the most efficient strategy to prevent CVD at the level of the community. Research should be carried out on the implications of the changing CV mortality pattern and of changing the time course of CVD in order to plan health services. Such studies need collaborative research by networks of epidemiologists and public health workers with special interest in CVD. Further efforts are necessary to improve the amount of funding directed towards prevention of CVD.

· REGENERATIVE MEDICINE/STEM CELLS - In general, this field was well funded with more than 200 projects and € 25 M of funding over 3 years. However, some aspects in this field have not been adequately addressed and should receive more funding in the future. This includes: 1) Stem cells (iPS) as models for cardiac development, because these cells undergo all steps from pluripotency to cardiac myocytes. 2) Tissue engineering for myocardial regeneration is a promising field because the effects of cells can be controlled ex vivo. 3) Finally, since no clinically applicable strategy of stem cell transplantation for cardiac regeneration has been established yet, more focus should be directed towards

endogenous regeneration through cell cycle activation strategies of myocytes or transdifferentiation strategies of nonmyocytes.

· STEMI - Exploring the data base on the topic "ST-segment-elevation acute coronary syndrome (STEMI)" nine projects funded for a total of >2 700 000 EUR were identified. In 2010-2012 most of the funding in STEMI seems to go to studies on ischaemia/reperfusion injury. None of these studies has resulted in a guidelines recommended treatment. Collaboration among institutes with a common interest in ischaemia/reperfusion injury would results in a more cost-effective approach and hopefully an effective treatment.

5. CARDIOSCAPE SPIN OFF

The CardioScape database already generated or contributed to initiatives of relevance for the cardiology community.

› The Structural Bioinformatics Group of the Charité Medicine University in Berlin (DE) used data collected in the CardioScape database to develop a test version of an online interactive map, showing CVD research centres in Europe with their contact details. Such interactive map could be of interest to scientists to easily find research partners and/or funding sources in a given geographical area in Europe.

› CardioScape is currently used as a potential source of data to inform and undertake a case study linking funding to the publication output of cardiovascular research in Europe. This research on the global evolution of cardiovascular disease research is led by "Cardiovascular Research", the international basic science journal of the European Society of Cardiology.

› Mapping NCD. The CardioScape secretariat has been repeatedly collaborating with the Mapping NCD project partner in charge of collecting data on CVD research projects in Germany, Austria and Switzerland, Technische Universität Berlin, in an effort to avoid duplication by sharing information collected by CardioScape and likely to be of interest to the Mapping NCD project.

› ERA-CVD application. The CardioScape leaders have been in contact with the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung, www.gesundheitsforschung-bmbf.de), to explore possibilities to apply for an ERA-NET on CVD in 2015 as part of the Horizon 2020. The CardioScape database and recommendations could be both of interest to support the development of the ERA-NET.

6. ANNEXES

ANNEX 1: CARDIOSCAPE COMMITTEES COMPOSITION

CARDIOSCAPE STEERING COMMITEE

CardioScape Steering Committee Chair
Prof. Frans Van de Werf, MD, PHD, FESC
Professor of Cardiology
University of Leuven (BE)

CardioScape Scientific Coordinator
Prof. David Wood
Imperial College London (UK)

CardioScape Project Coordinator
Ms. Sophie O'Kelly
European Affairs Department
European Society of Cardiology (FR)

CardioScape Project Partner
Mr. James Craven
PNO Consultants (UK)

Prof. Andrew Coats
Academic Vice-President
Monash University (Australia)
University of Warwick (UK)

Prof. Karin Sipido
Department of Cardiocascular Sciences
KU Leuven, University Of Leuven (BE)

Prof. Em. Dr.G. De Backer, MD, PhD, EFESC
Ghent University
Ghent (BE)

Lars Wallentin, MD, PhD, Senior Professor Cardiology
Uppsala Clinical Research Center and Department of Medical Sciences
Uppsala University (SE)

Prof. Gerd Hasenfuss
Georg-August-Universitat Gottingen (DE)

CardioScape Project Manager
Luigi della Sala

CardioScape Project Manager
Ilaria Leggeri
Senior Policy Advisor European Affairs
European Society of Cardiology (ESC)

CARDIOSCAPE SCIENTIFIC COMMITTEE

CardioScape Scientific Coordinator
Prof. David A Wood, MD, PHD, FESC
Garfield Weston Professor of Cardiovascular Medicine
NIHR Senior Investigator
International Centre for Circulatory Health
Imperial College London (UK)

CardioScape Steering Committee Chair
Prof. Frans Van de Werf, MD, PHD, FESC
Professor of Cardiology
University of Leuven (BE)

Prof. dr. Tiny Jaarsma
Department of Social and Wellfare studies
Faculty of Health Sciences
Linkoping University (SE)

Prof. Perry Elliott
Inherited Cardiac Disease Unit
The Heart Hospital
London (UK)

Prof. Dr. Axel R. Pries, MD

Rosalinda Madonna, MD PhD, Assistant Professor

Dept. of Physiology and CCR
Charité - Universitätsmedizin Berlin, CCM (DE)

Department of Neurosciences and Imaging, Institute of Cardiology, Center of Excellence on Aging
University of Chieti, Chieti (IT)
University of Texas Medical School in Houston
Texas Heart Institute, Houston TX (USA)

Prof. D.Sc. Keld Kjeldsen
Laboratory for Molecular Cardiology, The Heart Centre
Copenhagen University Hospital (Rigshospitalet), Copenhagen (DK)
Department of Health Sciences and Technology
Faculty of Medicine
Aalborg University, Aalborg (DK)

Dr. Aldo P Maggioni, MD, FESC
EURObservational Research Programme (EORP) Scientific Coordinator
European Society of Cardiology (FR)

Prof. Dr. Oscar H. Franco, MD, PhD, FESC, FFPH
Professor of Preventive Medicine
PI Cardiovascular Epidemiology group
Director ErasmusAGE
Department of Epidemiology
Erasmus MC, University Medical Center Rotterdam (NL)

Sarah Hills
Executive Director
Alliance for European Diabetes Research (EURADIA)

Dr Francesca Pugliese, MD PhD
Senior Clinical Lecturer and Consultant in Cardiovascular Imaging
Centre for Advanced Cardiovascular Imaging
William Harvey Research Institute
Queen Mary University of London
London (UK)

Prof. Dr. Dirk De Bacquer, PhD, FESC
Department of Public Health - Head
Faculty of Medicine and Health Sciences
Ghent University (BE)

CARDIOSCAPE STAKEHOLDERS GROUP

CardioScape Scientific Coordinator
Prof. David A Wood, MD, PHD, FESC
Garfield Weston Professor of Cardiovascular Medicine
NIHR Senior Investigator
International Centre for Circulatory Health
Imperial College London (UK)

CardioScape Steering Committee Chair
Prof. Frans Van de Werf, MD, PHD, FESC
Professor of Cardiology
University of Leuven (BE)

Anders Himmelmann
Senior Research Physician - Clinical Development - Global Medicines Development
AstraZeneca

Angelo de Rosa
Head of Strategy & Business Development
Medtronic

Okan Ekinci
Vice-President Healthcare
Siemens

Rebecca Pruss
Chief Scientific Officer
Trophos

Imo Hoefer
Cavadis

Heico Breek
CEO

ACS Biomarker

Jeremy Pearson
Associate Medical Director
British Heart Foundation

Marina Senten
Hartstichting (Dutch Heart Foundation)

Tobias Grimm
Programme Director
Deutsche Forshungsgemeinschaft (DFG)

Jan Nilsson
Swedish Heart & Lung Foundation

Hans Willmes
Director Research Affairs
Research Foundation - Flanders (FWO)

Luzma García Piqueres
Head of Project Office and Technology Transfer
Fundación Centro Nacional de Investigaciones Cardiovasculares Carlos III (CNIC)

Adam Torbicki
National Science Center Poland

Angeles Alonso
Spanish Society of Cardiology and ESC European Affairs Committee

AD-HOC WORKING GROUP FOR THE DEVELOPMENT OF CARDIOSCAPE TAXONOMY

Dr Francesco Orso
Azienda Ospedaliero-Universitaria Careggi
Department of Heart and Vessel, Section of Geriatric Medicine and Cardiology
Florence (IT)
ANMCO Research Center
Florence (IT)

Dr Ana Tornada Md MSc
Medicine Department
Hospital de Cascais Dr José de Almeida
Cascais (PT)

Dr Caroline Coats
Institute of Cardiovascular Science
University College London (UK)

CARDIOSCAPE DATABASE CLASSIFICATION

Dr Mathias Dunkel
Structural bioinformatics group
Charité - Universitätsmedizin Berlin
Berlin (DE)

Dr Robert Preissner
Structural bioinformatics group
Charité - Universitätsmedizin Berlin
Berlin (DE)

ANNEX 2: CARDIOSCAPE QUESTIONNAIRE

Dear Madam / Sir,

We need your help to obtain valuable information on funding of cardiovascular diseases research in Europe.

The European Commission has funded the European Society of Cardiology to survey the European cardiovascular research landscape (CardioScape). The project is led by Professor Van de Werf, Scientific Committee Chair and Professor Wood, Scientific Coordinator, together with different actors from academia, patients, industry, SMEs and large companies.

The outcome of the project will help to guide the future of CVD research in Europe, and in particular will encourage synergies and cooperation, will reduce duplication of efforts and will identify gaps and priorities that need attention from funding organisations.

We have approached all the Presidents of National Cardiac Societies in Europe asking them to provide us with the names of leading experts in CVD basic, clinical and population research. We have then asked these experts to help us construct a list of the major CVD research funding organisations directly to request information on funded research projects over the last three years. These data will help us to build up a picture of cardiovascular research funding across Europe.

Your input will give us invaluable insight into the funding your organisation provides for cardiovascular diseases and in turn we hope that your organisation will benefit from the CardioScape project.

With our sincere thanks for your help,

Professor David Wood, CardioScape Scientific Coordinator

Professor Frans Van de Werf, CardioScape Scientific Committee Chair

- Please consider the projects awarded in 2010, 2011 and 2012
- Please consider the projects awarded with an amount pair or superior to 100 000 EUR
- We will make this information available to the scientific community through the CardioScape website (www.cardioscape.eu).

A. General information on your organisation (VISIBLE TO RESPONDENT FOR VERIFICATION)

1. Full name of organisation and acronym
2. The legal entity (or name) under which your organisation is registered
3. Type of
   - › Profit
   - › No-Profit
   - › Other
4. Please specify if other
5. Street address
6. Postcode
7. City
8. Country
9. Tel number (include country code and prefix)
10. E-mail

11. Organisation web link

Contact person within your organisation who may we contact for obtaining funding information (TO BE FILLED IN BY RESPONDENT)

12. Title
13. First name
14. Family name
15. Position/role of contact person within organisation

B. List of Projects awarded in 2010, 2011 and 2012 (TO BE FILLED IN BY RESPONDENT, with possibility to include an infinite number of projects)

Information requested for each project:

- Project Title
- Research Area (TICK BOX with possibility to tick as many boxes as necessary among the following choices:
  - Basic
  - Human/Clinical
  - Epidemiological/Prevention/Public Health
- Geographic coverage (TICK BOX among Transnational and National. In case the answer is transnational, another choice has to be made among the following different options: EU countries, Europe but outside EU countries, United States, Other North American countries, South America, Asia, Africa, Oceania)
- Partners type (TICK BOX with possibility to tick as many boxes as necessary among the following choices):
  - University/Research Centre/Foundations
  - Public organisation
  - Industry
  - SME
- Total granted in EUR
- Duration (starting date and end date)
- Link to the project website
- Link to attach several documents (abstract, executive summary, report, etc.)

C. Information on your funding practices (NOT OBLIGATORY)

1. Can you estimate which proportion of funding within your organisation goes to CVD research?

ANNEX 3: LIST OF CONTACTED FUNDING ORGANISATIONS

COUNTRY	ORGANIZATION	WEBSITE
AUSTRIA	Fund for Scientific Research (FWF)	http://www.fwf.ac.at/
	Christian Doppler Forschungsgesellschaft (Christian Doppler Research Society)	http://www.cdg.ac.at/en/funding-models/the-cd-model/application-for-a-cd-laboratory/
	Special promotion of women in research and technology (Wf-Forte, Spezielle Frauenförderung für Forschung und Technologie)	http://www.w-fforte.at/at.html
	The Vienna Science and Technology Fund (Wiener Wissenschafts-, Forschungs- und Technologiefonds)	http://www.wwtf.at/
BELGIUM	FWO - Fonds Wetenschappelijk Onderzoek Vlaanderen (Research Foundation Flanders)	http://www.fwo.be/default.aspx
	IWT - Agentschap voor Innovatie door Wetenschap en Technologie (Agency for Innovation by Science and Technology)	http://www.iwt.be/
	FNRS - Fonds de la Recherche Scientifique (Funds for Scientific Research)	http://www.frs-fnrs.be/fr/contacts.html
	SPW - Service Publique de Wallonie	http://recherche-technologie.wallonie.be/
	VIB - Vlaams Instituut voor Biotechnologie (Flemish Institute for Biotechnology)	http://www.vib.be/en/about-vib/organization/Pages/Contact.aspx
	VITO - Vlaamse instelling voor technologisch onderzoek (Flemish Institute for Technological Research)	http://www.vito.be/VITO/EN/HomepageAdmin/Home/home/
	KCE - Federaal Kenniscentrum voor de Gezondheidszorg (The Belgian Federal Health Care Knowledge Centre)	https://kce.fgov.be/
	WIW/ISP - Wetenschappelijk Instituut Volksgezondheid/Institut Scientifique la Santé Publique (Scientific Institute of Public Health)	https://www.wiv-isp.be/Pages/EN-Home.aspx
	Koning Boudewijnstichting (King Baudouin Foundation)	http://www.kbs-frb.be/index.aspx?langtype=1033

COUNTRY	ORGANIZATION	WEBSITE
	Fonds pour la Chirurgie Cardiaque (Fund for Cardiac Surgery)	http://www.hart-chirurgie-cardiaque.org/FrameSet/PortraitFrameset.html
	BioWin - The Health Cluster of Wallonia	http://www.biowin.org/biowin/fr/5408-home.html
BULGARIA	Bulgarian Science Fund	http://www.bulfund.com/?lang=en
CROATIA	Croatian Science Foundation	http://www.hrzz.hr/
	Ministry of Science, Education and Sport	http://public.mzos.hr/Default.aspx?sec=2428
	Unity through Knowledge Fund	http://www.ukf.hr/
CYPRUS	Cyprus Society of Cardiology	http://cycardio.com/
	Ministry of Health of Cyprus	http://www.moh.gov.cy/moh/moh.nsf/index_en/index_en
	Research Promotion Foundation	http://www.research.org.cy/EN/index.html/
CZECH REPUBLIC	Ministry of Health of the Czech Republic (MZCR), Internal Grants on CVD research	http://www.mzcr.cz/Cizinci/
	Grant Agency of Academy of Czech Sciences (GACR)	http://www.gacr.cz/en/
	Technology Agency of the Czech Republic (TACR)	http://www.tacr.cz/index.php/en/
	Ministry of Education, Youth and Sports (MSMT)	
DENMARK	Ministry of Science, Innovation and Higher Education - The Danish Council for Independent Research and the Danish Council for Strategic Research	http://fivu.dk/en/research-and-innovation/councils-and-commissions/the-danish-council-for-independent-research
	The Danish Heart Foundation	http://www.hjerteforeningen.dk/om_os/in_english/
	The Danish Foundation TrygFonden	http://www.trygfonden.dk/Om-TrygFonden/In-English
DENMARK	The Lundbeck Foundation	http://www.lundbeckfoundation.com/
	The Nordea Foundation	https://www.nordeafonden.dk/english
	The Health Foundation	http://www.helsefonden.dk/pages.asp?id=63
	The Ministry of Social Affairs and Integration - Satspuljen	http://english.sm.dk/Sider/Velkommen.aspx
	The Obel Family Foundation	http://www.obel.com/en

COUNTRY	ORGANIZATION	WEBSITE
	The Danish National Research Foundation	http://dg.dk/
	The Danish National Advanced Technology Foundation	http://hoejteknologifonden.dk/en/
	Vækstfonden	http://www.vf.dk/
	The Novo Nordisk Foundation	http://www.novonordiskfonden.dk/en
	The Maersk - Moller Foundation	http://www.apmollerfonde.dk/
	The Carlsberg Foundation	http://www.carlsbergfondet.dk/?sc_lang=en
ESTONIA	Estonian Research Council	www.etag.ee
	Estonian Science Foundation (ETF)	http://www.etf.ee
FINLAND	The Academy of Finland (AKA), Research Council for Health	http://www.aka.fi/en-GB/A/Academy-of-Finland/Who-we-are/Research-Councils/Research-Council-for-Health/
FINLAND	Finnish Foundation for Cardiovascular Research	http://www.sydantutkimussaatio.fi/apurahat/
	Sigrid Juselius Foundation	http://www.sigridjuselius.fi/foundation
	Emil Aaltonen Foundation	http://www.emilaaltonen.fi/yht.htm
	Finnish Cultural Foundation	http://www.skr.fi/en/welcome-finnish-cultural-foundation
	Wihuri Foundation	http://www.wihurinrahasto.fi/inenglish.html
	Jane and Aatos Erkko Foundation	http://www.jaes.fi/en/
	Juho Vainio Foundation	http://www.juhovainionsaatio.fi/pages/in-english/home.php?lang=EN
	The Finnish Funding Agency for Technology and Innovation (TEKES)	http://www.tekes.fi/en/community/Home/351/Home/473
	Paulon Saatio Foundation	http://www.paulo.fi/in-english
	ORION	http://www.orion.fi/en/
FRANCE	INSERM (Institut National de la Santé et de la Recherche Médicale, National Institute of Health and Medical Research)	http://www.inserm.fr/

COUNTRY	ORGANIZATION	WEBSITE
	ANR (Agence nationale de la Recherche, National Agency of Research)	http://www.agence-nationale-recherche.fr/
	CORDDIM (Domaine d'intérêt Majeur en Cardiovasculaire-Obésité-Diabète-Rein)	http://www.coddim.fr/
	FRM (Fondation de la Recherche Médicale, Foundation of Medical Research)	http://www.frm.org/index.html
	Fondation Lefoulon Delalande (Grand Prix Scientifique)	http://lefoulon-delalande.institut-de-france.fr/presentation-du-grand-prix-scientifique
	Fondation Cœur & Recherche	http://www.coeur-recherche.fr/index.php/appel-a-projets-en-cours/dotation-de-80-000
	Fondation de France	http://www.fondationdefrance.org/Nos-Aides/Vous-etes-un-organisme/Developpement-de-la-connaissance/Recherche-medicale/Recherche-sur-les-maladies-majeures/Maladies-cardiovasculaires
	Fédération Française de Cardiologie	http://fedecardio.com/asso/iz6vp7gn/financer-la-recherche/les-prix-et-bourses-de-la-ffc
GERMANY	The German Research Foundation (Deutsche Forschungsgemeinschaft, DFG)	http://www.dfg.de/en/index.jsp
	German Foundation for Heart Research (Deutsche Stiftung für Herzforschung)	http://www.herzstiftung.de/
	Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung BMBF)	http://www.bmbf.de/en/index.php
	Volkswagen Foundation	http://www.volkswagenstiftung.de/foerderung/herausforderung/experiment.html
	WFB	http://www.wfb-bremen.de/de/Zuschüsse-bei-Forschungs-und-Entwicklungsverbundprojekt-(FuEVerbund)/193983
	Helmholtz Association	http://www.helmholtz.de/jobs_talente
	German Cardiovascular Research Center (Deutsche Zentrum für Herz- Kreislaufforschung, DZHK)	http://dzhk.de/
	Fritz Thyssen Foundation	http://www.fritz-thyssen-stiftung.de/funding/promotion-areas/medicine-and-natural-sciences/?L=1
	German Cardiac Society (Deutsche Gesellschaft für Kardiologie – Herz- und Kreislaufforschung,	http://dgk.org/

COUNTRY	ORGANIZATION	WEBSITE
	DGK)	
GREECE	General Secretary of Research and Technology	http://www.gsrt.gr/central.aspx?sId=119I428I1089I646I488772
	Ministry of Development and Competitiveness, National Strategic Reference Framework (NSRF)	http://www.ygeia-pronoia.gr/
	Hellenic Society of Cardiology	http://www.hcs.gr/
	Onassis Foundation	http://www.onassis.gr/en/
	Latsis Foundation	http://www.latsis-foundation.org/en/1/homepage.html
	Hellenic Cardiology Foundation (ELIKAR)	www.elikar.gr
	Hellenic Atherosclerosis Society	http://www.atherosclerosis-gr.org/
	Hellenic Cardiovascular Research Society	http://www.cardioresearch.net/
HUNGARY	The Hungarian Scientific Research Fund (OTKA)	http://www.otka.hu/en
	National Development Agency (through Social Services Nonprofit Limited Liability Company - ESZA)	http://esza.hu/
	National Innovation Office	http://www.nih.gov.hu/office
	Egészségügyi Tudományos Tanács - Medical Research Council (ETT)	http://www.ett.hu/
	Magyar Tudományos Akadémia - Hungarian Academy of Sciences (MTA)	http://mta.hu/english/
	National Public Health and Medical Officer Service (ANTSZ)	https://www.antsz.hu/
IRELAND	Science Foundation Ireland (SFI)	http://www.sfi.ie/
	Health Research Board (HRB)	http://www.hrb.ie/
	Enterprise Ireland	http://www.enterprise-ireland.com/en/
	The Irish Heart Foundation	http://www.irishheart.ie/iopen24/index.php
	Diabetes Federation of Ireland	http://www.diabetes.ie/
ITALY	Ministry of Education, University and Research (MIUR)	http://www.istruzione.it/

COUNTRY	ORGANIZATION	WEBSITE
	Fondazione Umberto Veronesi (FUV)	https://www.fondazioneveronesi.it/
	Fondazione Cariplo	http://www.fondazionecariplo.it/en/index.html
	Ministero della Salute (Health Ministry)	http://www.archeo.salute.gov.it/indexEnglish.jsp
	Telethon Foundation	http://www.telethon.it/en
	AIFA	http://www.agenziafarmaco.gov.it/en
	Foundation for the advanced biomedical research (Fondazione per la ricerca biomedica avanzata - Padova)	http://www.fondbiomed.it/
	ALT-ONLUS (Association for the fight against thrombosis and cardiovascular diseases)	http://www.trombosi.org/
	CRT Foundation (Fondazione CRT)	http://www.fondazionecrt.it/en/fondazione-crt.html
	Compagnia di San Paolo	http://www.compagnia.torino.it/eng
	Italian Foundation Heart and Circulation (Fondazione italiana cuore e circolazione ONLUS)	http://www.fondazioneitalianacuorecircolazione.it/
	Heart Foundation (Fondazione cuore)	http://www.fondazionecuore.it/index.asp
	Foundation for your heart (Fondazione Per il Tuo Cuore)	http://www.5permilleperiltuocuore.it/
	Roche diagnostics	-
	National Research Council (CNR)	http://www.cnr.it/sitocnr/Englishversion/Englishversion.html
	European Molecular Biology Organization (EMBO)	http://www.embo.org/
	International centre for genetic engineering and biotechnology (ICGEB)	http://www.icgeb.org
	Fondazione Cassa di Risparmio di Chieti	http://www.fondazionecarichieti.it
	Istituto italiano ricerca cardiovascolare (INRC)	http://www.inrc.it/
LATVIA	SEDA	http://sf.viaa.gov.lv/lat/zinatne/zinatnes_apakshsad/?tl_id=13944&tls_id=11481
	Ministry of Education and Science	http://izm.izm.gov.lv/58.html
LITHUANIA	Research Council of Lithuania	http://www.lmt.lt/en/en.html

COUNTRY	ORGANIZATION	WEBSITE
	MITA (Agency of Science and Technology)	http://www.mita.lt/en/
LUXEMBOURG	National Research Fund (Fonds National de la Recherche, FNRlu)	http://www.fnr.lu/
	Ministry of Higher Education and Research	http://www.mesr.public.lu/
	Ministry of Health - National institute of Cardiac Surgery and Interventional Cardiology (Institut National de Chirurgie cardiaque et de de Cardiologie Interventionnelle)	http://www.incci.lu/
NETHERLANDS	Dutch Heart Foundation	http://www.hartstichting.nl/
	Diabetes Fund	www.diabetesfonds.nl
	Kidney Foundation	http://www.nierstichting.nl/
	The Netherlands Organisation for Scientific Research	http://www.nwo.nl
	The Netherlands Organisation for Health Research and Development (ZonMW, first leg of NWO)	www.zonmw.nl
	Technology Foundation (STW, second leg of NWO)	http://www.stw.nl/en/
	The Netherlands Federation of Universities	http://www.nfu.nl
	The Interuniversity Cardiology Institute of the Netherlands	http://www.icin.nl
POLAND	National Center for Research and Development (NCBiR)	http://www.ncbir.pl/en/
	National Science Center (NCN)	http://www.ncn.gov.pl/?language=en
	Polpharma Scientific Foundation	http://www.polpharma.pl/en/foundation/the-competition/
	Foundation for Polish Science (FNP)	http://www.fnp.org.pl/en/
PORTUGAL	Portuguese Foundation for Science and Technology	http://www.fct.pt/index.phtml.pt
	COMPETE-QREN	http://www.pofc.qren.pt/
	Foundation Calouste Gulbenkian	http://www.gulbenkian.pt/
	Fundação MSD	http://www.msd.pt/Paginas/home.aspx
SLOVAKIA	Scientific Grant Agency of the Ministry of Education (VEGA)	http://evega.minedu.sk/e-vega/(S(tnhoek55r3ycxfbqbkjouo45))/Default.aspx

COUNTRY	ORGANIZATION	WEBSITE
	Slovak Research and Development Agency (APVV)	http://www.apvv.sk/agentura
	Ministry of Health (MinHE)	http://www.health.gov.sk/Index.aspx
SLOVENIA	ARRS - Slovenian Research Agency	http://www.arrs.gov.si/sl/
SPAIN	Ministerio de Economia i Competitividad - Articulación e Internacionalización del Sistema, Área de SG de Proyectos Internacionales and Plan Estatal de Investigación Científica y Técnica y de Innovación 2013-2016 - State Plan for Scientific and Technical Research 2013-2016	http://www.idi.mineco.gob.es/
	Fundación CNIC Carlos III - Centro Nacional de Investigaciones Cardiovasculares	http://www.cnic.es/es/index.php
	Fundación Mutua Madrileña	http://www.fundacionmutua.es/Ayudas-a-la-Investigacion.html
	Xunta de Galicia - Consellería de Economía e Industria - Axencia Galega de Innovación and Consellería de cultura, educación e ordenación universitaria	
	Instituto de Salud Carlos III (ISCiii)	www.isciii.es
	Marato' TV3	http://www.tv3.cat/marato/es/recerca_biomedica
SWEDEN	Swedish Research Council Medicine	http://www.vr.se/
	Swedish Heart and Lung Foundation	http://www.hjart-lungfonden.se/
	Swedish Foundation for Strategic Research, SSF	http://www.stratresearch.se/en/
	KK- Stiftelsen – the Knowledge Foundation	http://www.kks.se/medel/Utlysningar/Strategiska%20rekryteringar%202013.aspx
	AFA Insurance	www.afaforsakring.se
	Swedish Council for Working Life and Social Research (FAS)	http://www.fas.se/en/
	Ragnar Söderberg Foundation	www.ragnarsoderbergsstiftelse.se
	Torsten Söderberg Foundation	www.torstensoderbergsstiftelse.se
UK	Wellcome Trust	http://www.wellcome.ac.uk/index.htm
	Medical Research Council	http://www.mrc.ac.uk/index.htm
	British Heart Foundation	http://www.bhf.org.uk/#&panel1-1

COUNTRY	ORGANIZATION	WEBSITE
	Chest Heart & Stroke Scotland (CHSS)	http://www.chss.org.uk/research/research_applications.php
	Dunhill Medical Trust	http://www.dunhillmedical.org.uk/page_viewer.asp?page=research+grants&pid=12
	Technology Strategy Board	https://www.innovateuk.org/
	Heart Research UK	http://www.heartresearch.org.uk/

ANNEX 4: CARDIOSCAPE TAXONOMY

1	**Acute Coronary Syndromes (ACS)**
1	Acute PCI (Percutaneous coronary intervention)
2	Antithrombotic treatment
3	Biomarkers
5	Fibrinolysis
6	Inflammation
7	Ischemia
8	Non-ST-segment elevation myocardial infarction (Non-STEMI)
9	Remodeling
10	Reperfusion injury
12	Secondary prevention
13	Shock
14	ST-segment elevation myocardial infarction (STEMI)
15	Stunning
16	Takatsubo (apical ballooning)
18	Vulnerable plaque
19	Unstable angina
2	**Alcohol**
3	**Aortic disease**
1	Abdominal aortic aneurysm (AAA)
2	Acute aortic syndrome
3	Aortic aneurysm
4	Aortic coarctation
5	Aortic dissection
6	Aortic ectasia
7	Aortitis
4	**Arrhythmias**
1	Ablation therapy
2	Ablation AF
3	Ablation other SVT
4	Ablation ventricular tachycardia
5	Ambulatory monitoring
6	Atrial fibrillation
7	AV-block
8	AV-re-entry
9	Basic electrophysiology
10	Brugada syndrome
11	Bundle branch block
12	Cardiac resynchronization therapy
13	Cardioversion
14	Catecholaminergic polymorphic ventricular tachycardia
15	Channelopathies
16	Conduction disease
17	Early repolarization
18	EP mapping
19	Event recorder
20	Implantable cardioverter defibrillator (ICD)
21	Long/short QT-syndrome
22	Loop recorder
23	Non-invasive risk stratification
24	Pacemaker
25	Pharmacotherapy
26	Sinus node dysfunction
27	Sudden cardiac death
28	Supraventricular tachycardia
29	Syncope
30	Ventricular fibrillation
31	Ventricular tachycardia
32	Wolf-Parkinson-White syndrome
5	**Atherosclerosis**
1	Adhesion molecules
2	Aging
3	Chemokines
4	Cytokines
5	Endothelial dysfunction
6	Foam cells
7	Imaging in atherosclerosis
8	Inflammation
9	Innate immunity
10	Lipids
11	Macrophages
12	Oxidative stress
13	Plaque biology
14	T-cells
6	**Basic Science**
1	Animal experiments

2	Biological pacemakers
3	Calcium transport
4	Cardiac anatomy
5	Cardiac metabolysm
6	Cell culture/isolation
7	Cell signalling
8	Cellular electrophysiology
9	Computer modeling
10	Connexins
11	Cyclooxygenases
12	Developmental biology
13	Endothelins
14	Energetics
15	Enzyme (kinetics)
16	G-proteins
17	Gap junctions
18	Glycolysis
19	Growth factors
20	Immune system
21	Infection/Inflammation
22	Ion channels
23	Leukocytes
24	Lipid metabolism
25	Membrane permeability
26	Metabolomics
27	Molecular biology
28	Monoclonal antibodies
29	Myocyte
30	Neurotransmitters
31	Phospholipases
32	Pre/Post conditioning
33	Proteomics
34	Renin angiotensin system
35	Second messengers
36	Sequence (DNA / RNA / protein)
37	Shear stress
38	Transcription factors
39	Transgenic animal models
40	Vasoactive agents
41	Receptors
7	**Biomarkers**
1	Adiponectin
2	Biomarker discovery techniques
3	Cardiac troponins
4	C-reactive protein
5	Creatinine kinase
6	Cystatin c
7	Cytokines
8	Leptin
9	Matrix metalloproteinases
10	Natriuretic peptides
11	Novel biomarkers
12	TNF alfa
8	**Cardiac Magnetic Resonance (CMR)**
1	Cardiac Morphology
2	Contrast Enhanced MRI
3	High Field MRI
4	Interventional CMR
5	Molecular imaging
6	MR Angiography
7	MR Spectroscopy
8	Real Time MRI
9	Stress Imaging
10	Strain/Deformation/Tagging
11	Tissue Characterisation
12	Velocity encoded MRI
9	**Cardiac Masses**
1	Cardiac tumors
10	**Cardiac rehabilitation**
1	Exercise training
2	Patient education
11	**Cardiac Resynchronization Therapy**
1	Assessment of ventricular dyssynchrony
2	Bi-ventricular device follow-up
5	Hemodynamic monitoring
6	Implantation techniques
7	Left ventricular leads
8	Remote monitoring
9	Technological aspects
12	**Cardiopulmonary Resuscitation (CPR)**
1	Automatic external defibrillator (AED)
13	**Cardiovascular nursing**
1	Heart failure nursing
14	**Cardiovascular Pathology**
1	Apoptosis
2	Capillaries
3	Coronary anomalies

4	Coronary plaque
5	Fibrosis
6	Hibernation
7	Hypertrophy
8	Hypoxia/Anoxia
9	Inflammation
10	Mitocondria
11	Necrosis
13	Remodelling
15	**Cardiovascular Physiology**
1	Aging
2	Autonomic nervous system
3	Baroreflex function
4	Blood pressure regulation
5	Carotid sinus massage
6	Conduction system
7	e-c coupling
8	Electrolyte disturbances
9	Endothelium
10	Hemodynamics
11	Ischemia reperfusion injury
12	Ischemic preconditioning
13	Muscle sympathetic activity
14	Nitric oxide
15	Orthostasis
16	Sympathetic nervous system
17	Tilt testing
18	Vagus nerve
16	**Cardiovascular Surgery**
1	Anesthesia
2	Aortic surgery
3	Aortic valve repair
4	Aortic valve replacement
5	Arterial grafting
6	Cardioplegia
7	Congenital heart surgery
8	Coronary bypass grafting (CABG)/surgery
9	Endoscopic cardiac surgery
10	Endovascular surgery
11	Extracorporeal circulation
12	GUCH surgery
13	Heart transplantation
14	Mechanical ventricular assist device
15	Mitral valve repair
16	Mitral valve replacement
17	Off-pump bypass surgery
18	Robotic cardiac surgery
19	Ross operation
20	Tricuspid valve repair
21	Tricuspid valve replacement
22	Vein graft disease
23	Ventricular restoration therapy
17	**Cellular Biology**
1	Angiogenesis
2	Cell repair therapy
3	Gene expression
4	microRNA
5	Migration
6	Proliferation
7	siRNA
18	**Clinical Electrophysiology**
1	Atrial arrhythmias
2	Atrial fibrillation
3	Conduction disorders
4	Electrophysiological testing - diagnostic
5	Pre-excitation syndrome
6	RF ablation
7	Sinus node dysfunction
8	Supraventricular tachycardias
9	Ventricular arrhythmias
10	Technology Development
19	**Comorbidities and systemic diseases**
1	AIDS HIV and the cardiovascular system
2	Chronic Kidney Disease (CKD)
3	Chronic Obstructive Pulmonary Diseases (COPD)
4	Cocaine
5	Contrast induced nephropathy
6	Depression
7	Erectile dysfunction
8	Gout disease
9	Infection/sepsis
10	Inflammatory diseases
11	Pregnancy
12	Thyroid disease
13	Cancer
20	**Computers in Cardiology**

1	Telemedicine
21	**Computer Tomography (CT), cardiac**
1	Calcium Scoring
2	Cardiac Morphology
3	CT coronary angiography
4	Dual Energy Imaging
5	Electron Beam Computed Tomography (EBCT)
6	Hybrid imaging
7	Perfusion Imaging
8	Radiation exposure
22	**Congenital Heart Disease**
1	Atrial septal defect
2	Bicuspid aortic valve
3	Ebstein's disease
4	Eisenmenger's syndrome
5	Fallot's tetralogy
6	Grownup Congenital Heart Disease (GUCH)
7	Marfan syndrome
8	Pulmonary hypertension
9	Transposition of the great arteries
10	Truncus arteriosus
11	Ventricular Septum Defect (VSD)
23	**Coronary Circulation**
1	Angina pectoris
2	Chronic coronary artery disease
3	Coronary blood flow
4	Coronary flow reserve
5	Coronary microcirculation
6	Endothelial function
7	Ischemia
8	Hibernation
9	Optical coherence tomography
10	Prinzmetal angina
11	Quantitative coronary angiography
12	Vasospasm
13	Vulnerable plaque
24	**Coronary Intervention**
1	Bare metal stent
2	Bifurcation lesions
3	Chronic total occlusion
5	Drug Eluting Stent
6	Fractional flow reserve
7	Intravascular ultrasound Imaging
8	Main stem intervention
9	Percutaneous coronary intervention (PCI)
10	Restenosis
11	Risk stratification
12	Shock
13	Stents
14	Stent thrombosis
15	Thrombectomy
25	**Diabetes Heart Diseases**
1	Hyperglycemia
2	Hypoglycemia
3	Insulin
4	Insulin Resistance
5	Oral antidiabetics
26	**Echocardiography**
1	Contrast Echocardiography
2	Doppler Echocardiography
3	Dyssynchrony
4	Fetal Echocardiography
5	Intracardiac Echocardiography
6	Procedure Monitoring
7	Strain/Deformation Imaging
8	Stress Echocardiography
9	Tissue Doppler
10	Transesophageal Ecocardiography
11	Transthoracic Ecocardiography
12	3D Echocardiography
27	**Electrocardiography**
1	Ambulatory electrocardiography
2	Baroreflex sensitivity
3	Exercise stress test
4	Heart rate turbulence
5	Heart rate variability
6	Non-invasive risk stratification
8	QT interval and QT dynamics
9	Signal-averaged electrocardiography
10	Telemetry
11	T wave alternans
28	**Epidemiology/Study design**
1	Children
2	Cohort study
3	Elderly

4	End points
5	Ethnicity
6	Gender
7	Meta-analysis
8	Outcomes
9	Registries
10	Risk scores
11	Clinical Trial
13	Environmental exposure
29	**Exercise testing**
1	Cardiopulmonary exercise testing
3	ECG
4	Imaging techniques
30	**Genetics**
2	Gene therapy
3	Genetics cardiomiopathy
4	Genetics counselling
5	Genome–wide association studies
6	Inherited Metabolic Disorders
7	Monogenetic disease
9	Pharmacogenetics
10	Population genetics and genomics
11	Single nucleotide polymorphism
12	Next general sequency
31	**Heart failure**
1	Acute heart failure
2	Anemia
3	Animal models of heart failure
5	Biventricular Pacemaker
6	BNP (brain natriuretic peptide)
7	Cachexia
8	Cardiac resynchronization therapy
9	Cardiopulmonary exercise testing
10	Chronic Ischaemic Heart Disease
11	Community medicine
12	Devices
13	Diastolic function
14	End stage heart failure
15	Heart failure with preserved ejection fraction
16	Heart failure with reduced ejection fraction
18	Mechanical circulatory support
19	Pharmacotherapy
20	Rehabilitation
21	Remodeling
22	Right heart disease
23	Systolic Function
24	Transplantation
25	Ultrafiltration
32	**Health Services research**
33	**Hypertension**
1	Ambulatory blood pressure measurement (ABPM)
2	Angiotensin
3	Coarctation of aorta
4	Conn's Syndrome
6	Endocrine hypertension
8	Left ventricular hypertrophy
10	Renal artery ablation / Denervation
11	Renal artery stenosis
12	Renal artery stenting
13	Renin
34	**ICD**
1	Primary prevention
2	Secondary prevention
4	Implantation techniques
5	Lead extraction
6	Leads
7	Programming
8	Remote monitoring
9	Technological aspects
35	**Interventional Cardiology**
1	Alcohol septal ablation
2	Devices for stroke prevention
3	Endomyocardial biopsy
4	Intra aortic balloon pump
5	Mitraclip
6	Percutaneous ASD closure
7	Percutaneous pulmonary valve
8	Percutaneous PFO closure
9	Percutaneous valve techniques
10	Radiation exposure
11	Percutaneous Aortic Valve
12	Ventricular assist devices
13	Mitral valvuloplasty
36	**Magnetic Resonance Imaging (MRI)**
1	Gadolinium MRI

2	Molecular imaging
3	Myocardial viability
4	Stress imaging
37	**Mapping**
1	Contact mapping
2	Non-contact mapping
3	Electroanatomic image integration
4	Cardiac anatomy
38	**Medical Education**
1	Core competencies
2	Guidelines
3	Nursing education
4	Patient education
39	**Metabolic Syndrome**
2	Insulin Resistance
3	Obesity
40	**Cardiomiopathies**
1	Alcohol cardiomyopathy
2	Amyloid heart disease
3	Arrhythmogenic right ventricular cardiomyopathy/-dysplasia
4	Cardiotoxicity (anthracycline, iron, drus°)
5	Dilated cardiomyopathy
6	Inherited Metabolic Disorders
7	Hypertensive cardiomyopathy
8	Hypertrophic cardiomyopathy
9	Hypereosinophic syndrome
10	Myocarditis
11	Non-compaction cardiomiopathy
12	Peripartum cardiomyopathy
13	Restrictive cardiomyopathy
41	**Nuclear Cardiology**
1	Experimental and Preclinical
2	Molecular imaging
3	New Tracers
4	Perfusion Imaging
5	Positron emission tomography (PET)
6	Single photon emission tomography (SPECT)
42	**Occupational Health**
43	**Pacing**
1	Atrial fibrillation prevention algorithms
2	Bi-ventricular pacing
5	Implantation techniques
6	Indications and mode selection
7	Lead extraction
8	Leads
9	Pacemaker diagnostics
10	Pacemaker follow-up
11	Pacemaker studies - miscellaneous
12	Programming
13	Remote monitoring
14	Technological aspects
44	**Palliative Cardiology**
45	**Pediatric cardiology**
46	**Pericardial Disease**
1	Constrictive pericarditis
2	Acute pericarditis
3	Pericardial effusion
4	Cardiac Tamponade
5	Pericardiocentesis
6	Viral pericarditis
47	**Peripheral Circulation**
1	Ankle-Brachial pressure index
2	Carotid stenosis
3	Carotid stenting
4	Critical limb ischemia
5	Percutaneous arterial intervention/-stenting
6	Peripheral arterial disease
7	Vascular surgery
8	Venous disease
9	Venous thrombosis
48	**Pharmacology and Therapy**
1	ACE-inhibitor
2	Ivabradine
3	Aldosterone antagonists
4	Aliskiren
5	Amiodarone
6	Antiarrhythmic drugs
7	Anticoagulants
8	Antiplatelet drugs
9	AT2-receptor antagonist
10	Betablocker
11	Calcium antagonists
12	Compliance
13	Diuretics
14	Digoxin
15	Fibrates

16	Fibrinolitycs
17	Inotropes
18	Lipid lowering drugs
19	Metabolic modulators
20	Nitrate/Nitrovasodilator
21	Novel pharmacological agents
22	Oestrogen
23	Omega-3 and 6 fatty acids
24	Ranolazine
25	Sotalol
26	Statins
28	Transfusion
49	**Pre-Hospital Care**
50	**Prevention**
1	Air Pollution
2	Alcohol
3	Cardiovascular risk assessment
4	Compliance
5	Dietary factors
6	Exercise
7	High-density lipoprotein
8	Hypolipidemic drugs
9	Life style
10	Low-density lipoprotein
11	Mental stress
12	Novel risk factors
13	Nutrition
14	Obesity
15	Physical activity
16	Primary prevention
17	Psychosocial stress
18	Smoking
19	Statins
20	Secondary prevention
51	**Pulmonary Circulation**
1	Endothelin antagonists
2	Lysis in venous thromboembolic disease
3	Pharmacotherapy
4	Phosphodiesterase inhibitors
5	Prostaglandins
6	Pulmonary embolism
7	Pulmonary hypertension
8	Pulmonary venous occlusive disease
9	Thrombolysis
10	VTE prevention
53	**Regenerative Medicine/Stem Cells**
1	Biomaterials
2	Bone marrow-derived stem cells
3	Cardiac Stem Cells
4	Circulating progenitor cells
6	Embryonic stem cells
7	Endothelial progenitor Cells
8	Ethical and social issues
9	Fibroblast
10	Genetic modification
11	Induced Pluripotent Stem Cells
12	Mesenchymal stem cells
13	Myoblasts
14	Stem cell function
15	Storage and harvesting
16	Tissue engineering
54	**Sleep disorders**
1	Nocturnal hypertension
2	Sleep apnoea
55	**Socio-economic aspects**
1	Cost-benefit analysis
3	Public health
4	Socio-demographic aspects
56	**Sports medicine**
1	Exercise physiology
2	Preparticipation screening
3	Sudden death in athletes
57	**Statistical methods**
1	Meta-analysis
2	Qualitative Methods
3	Quantitative Methods
4	Survival analysis
58	**Stroke/Cerebrovascular diseases**
1	Amaurosis fugax
2	Aortic plaques
3	Carotid stenosis
4	Cerebral hemorrhage
5	Cerebral infarction
6	Cerebral ischemia
7	Cryptogenic stroke
8	Embolic stroke
9	Patent foramen ovale (PFO)

10	TIA (transient ischemic attack)
59	**Thrombosis and platelets (anticoagulants and antiplatelets)**
1	Antiplatelet drugs
2	Antithrombotics
3	Aspirin
4	Bleeding
5	Coagulation
6	Heparin
7	Oral direct Factor Xa inhibitors
8	Oral direct thrombin inhibitors
9	Platelet function
10	Prostaglandins
11	Venous thromboembolic disease
12	Vitamin K antagonists
60	**Valvulopaties**
1	Aortic insufficiency
2	Aortic stenosis
4	Bicuspid aortic valve
5	Endocarditis
6	Low flow/low gradient stenosis
7	Mitral regurgitation
8	Mitral stenosis
10	Percutaneous aortic stenting
11	Pulmonary stenosis
13	Rheumatic heart disease
14	Tricuspid insufficiency
61	**Vascular biology**
62	**Multimodality Imaging**
1	Molecular Imaging

ANNEX 5: WWW.CARDIOSCAPE.EU WEBSITE SNAPSHOT

ANNEX 6: COUNTRY CODES

Austria	AT	Ireland	IE
Belgium	BE	Italy	IT
Bulgaria	BG	Latvia	LV
Czech Republic	CZ	Lithuania	LT
Cyprus	CY	Luxembourg	LU
Denmark	DK	Malta	MT
Germany	DE	Netherlands	NL
Estonia	EE	Poland	PL
Greece	EL	Portugal	PT
Spain	ES	Romania	RO
Finland	FI	Slovenia	SI
France	FR	Slovakia	SK
Croatia	HR	Sweden	SE
Hungary	HU	United Kingdom	UK