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EDITORIAL

CardioScape-II: the need to map cardiovascular funding patterns in Europe

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Since 2014, CardioScape has been the most comprehensive database on cardiovascular research in Europe. The database aims to outline the current cardiovascular research and innovation landscape across Europe, providing information on the distribution and focus of funding in the cardiovascular field across Europe, and establishing the extent of duplication across national research programs and the existence of gaps that reduce opportunities for innovation.

In the CardioScape-I pilot study, run by the European Society of Cardiology (ESC) and supported by the European Commission (EC, 11/2012–09/2014, Grant No. 306086), ministries and major public funding agencies as well as private foundations in 28 EU countries were contacted to provide data. Only projects with a total budget above 100 k€ during the period 2010–12 have been listed in the CardioScape-I online data base. In 2018, the CardioScape team published its analysis of the database.[1]

All together 157 funding agencies were contacted, resulting in 2476 research projects with a total budget of €876 million. Overall EU grant funding alone accounts for 37% of cardiovascular research funding in Europe. Excluding EU grants, the funded amount in CardioScape-I is 53% from governmental and 47% from private sources. The results demonstrate strong geographical gradients with respect to the funding in relation to population size (*Figure 1*, top left) or gross national product.

They also show large differences between countries in the share of national, private, and European funding, with transnational funding overwhelmingly dependent on EU-programmes. The free online database allows ministries, political decision makers, funding agencies, learned societies, and researchers to perform queries according to their individual requirements. This may help in making informed decisions about the needs in cardiovascular science development.[2]

It is obvious that this pilot project requires a broader and sustained effort in order to strengthen the European cardiovascular research community and beyond. A continuing and successful database needs to have easy to handle tools and up-to-date information to support all relevant stakeholders in finding information to help them answer research specific and strategic questions including:

- How can the research programmes across different countries across be best harmonized?
- Are there complementary or competing initiatives for a given funding project?
- What is the amount of money allocated to support collective cardiovascular research through international consortia?
- Are there research areas that need more funding?
- Which funding initiatives are more likely have an impact on health outcomes?
- What are the future publication trends based on actual funding?

The overall aim must be to increase both the strength of European cardiovascular research[3] and the overall medical value achieved by this research.[4–7] The latter is of increasing importance in the context of restricted research budgets and initiatives for 'responsible research and innovation' (RRI) on the national as well as on the European level.

To be a relevant tool for RRI, CardioScape-II has been initiated by the European Society of Cardiology to extend the pilot study and provide a *dynamic and sustainable* database for the future. A necessary improvement pertains to data completeness and actuality by sampling defined information on all accessible European funding measures at least yearly. It must be stressed that standardized and comparable data of cardiovascular disease (CVD) research funding is presently not available in Europe, especially at a national level. Using projects like CardioScape-II with ERA-CVD (European Research Area Network on cardiovascular diseases) support, a unique European digital identifier for each research grant could be generated (in a similar way to the requirement for clinical trial registration). This would facilitate tracking of outputs and outcomes arising from grants.

As a test for such developments, automatic screening of public databases was used to analyse publication output of European authors in the

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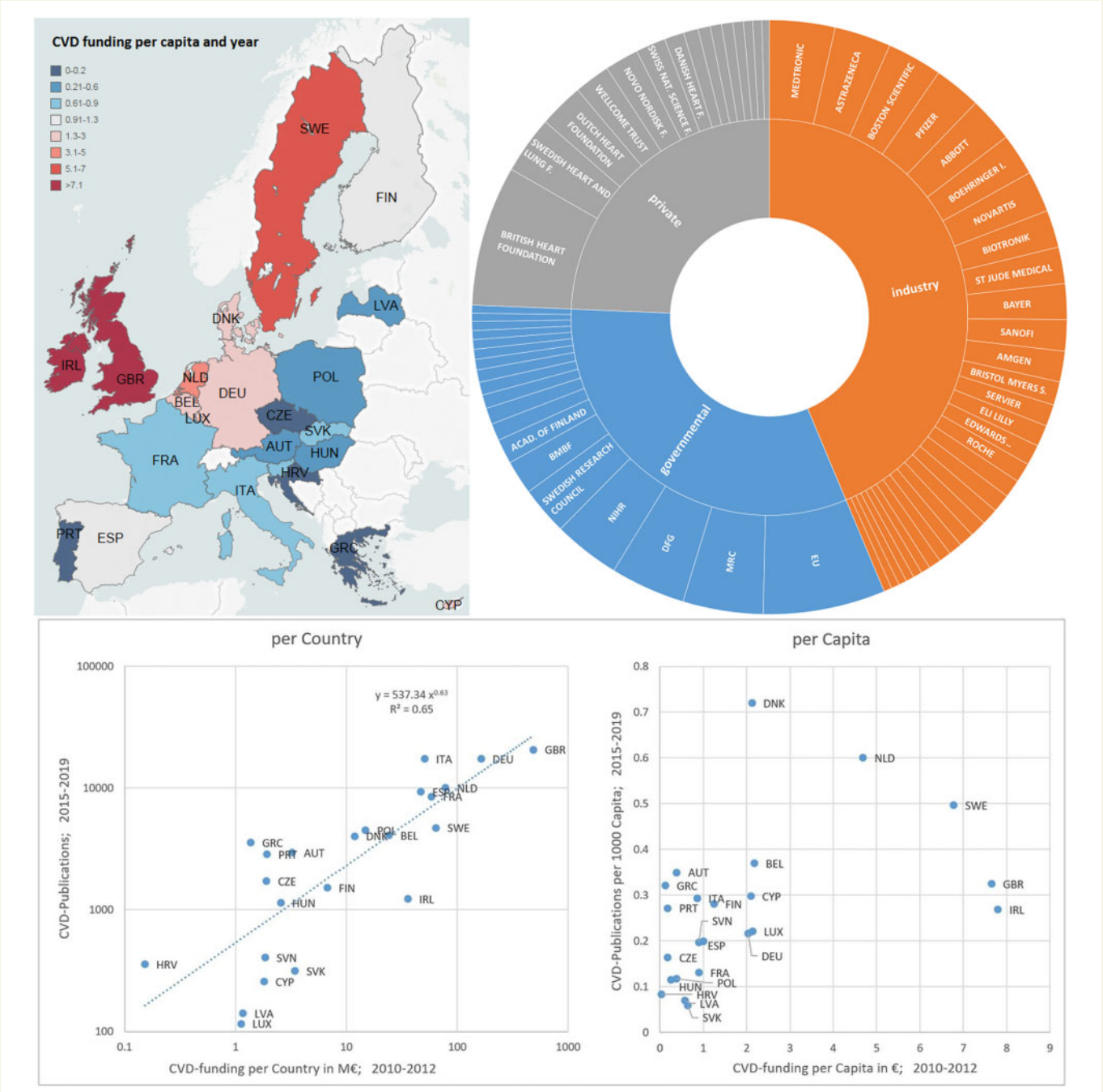

Figure 1 Top left: Funding in € per capita and year for cardiovascular research projects as gathered in the CardioScape-1 database (from reference 1) Right: Funding–acknowledgements in CVD related publications of European authors for the period 2014–19. Data are given for private, governmental, and industry funding. The width of the respective sectors gives the relative share of the contributions by the major funders in each category. Bottom: Relation of publication acknowledgements in CVD-related publications of European authors for the period 2014–19 to the CardioScape-I funding data for European countries in the period 2010–2012. Left: Raw data on log-scales. Right: Results per capita of the respective populations.

cardiovascular field. (*Publications were retrieved from Web of Science. The search was restricted to the cardiovascular journals, cardiovascular topics and authors affiliated in Europe.*) The upper right panel in the figure shows that in the acknowledgments of published articles, the ratio of governmental and private funding is comparable to the ratio of funded amounts in CardioScape-I. However, EU funding is acknowledged at a considerably lower proportion (12%) compared to CardioScape-I data (37%). A major advantage of this approach is the possible inclusion of industry funding, for which no direct funding data were gathered for CardioScape-I but which accounts for a large share in cardiovascular research funding. As a further option, it is possible to link the two initial steps of the translational value chain, i.e., the funding and the publications arising. The analysis in the lower panels of the figure shows that data collected by CardioScape-I allowed an insight into future publications as

there is a considerable time lag between funding (CardioScape-I period 2010–12) and publication (2015–19). The raw data show an approximately log–log relation between CVD funding and publication frequency per country (central panel). When data are normalized with respect to population size (right panel), five countries with a specifically high publication output and/or given funding level stand out. CardioScape-II aims to enable such analyses on a much more detailed level, e.g., for individual research topics, funding schemes, or institutions.

A publicly available transparent and comprehensive database of this type available online for flexible query and reporting will be of high value to societies, funding agencies, and researchers, and thus promote improved quality and quantity of cardiovascular research. CardioScape-II, supported by the ERA-CVD consortium and led by the European Society of Cardiology, aims to achieve this.

Researchers can identify potential partners for their work in Europe, can explore whether similar research projects are already funded by any other agency in Europe, and can investigate the typical amounts of funding for similar projects. This is essential for ensuring increased impact of European Science.[8]

Funding agencies can share with other funding bodies across Europe their funding decisions and project monitoring processes. Sharing of best practice in these areas would be of benefit in respect to the return on investments and to increase the likelihood of high impact research results.

Policymakers can examine regional funding gradients and detect the urgent funding needs and gaps. In respect of those countries with the least robust funding landscape, the information obtained from CardioScape-II will help the national heart associations and other national contact points to make a concerted effort to engage academic cardiovascular researchers and relevant companies in EC funded collaborative projects, or in those national funding schemes of other member states that allow the participation of cross-border partners. The governmental funding bodies in these countries should be lobbied to prioritize funding for cardiovascular research, given the pan-European importance of CVD as the major cause of morbidity and mortality. Such tools become very valuable for volunteer organizations such as the ESC in their activities on advocacy for European Cardiology, which extends from research to patient benefits.[9]

The long-term commitment of Cardioscape-II towards society is to strengthen national and international coordination and collaborations, harmonizing research activities and collectively pooling resources to fund multidisciplinary projects. This is paramount to achieve future growth and prosperity, to shape more effective research strategies and consequently to lead to better health care services and improved outcomes for patients and populations. This is also essential taking into account current need for patient engagement and public outreach in medical research.[10]

Cardioscape-II is currently collecting data to update the Cardioscape database and working to generate a sustainable resource to achieve the aims described above. The authors would welcome comments and proposals to enhance CardioScape-II from any interested party, and strongly encourage participation of all organizations funding cardiovascular research across Europe to ensure that the database is as complete as possible and therefore of the greatest value.

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