Cardiovascular Disease and Gross Domestic Product in Spain: Correlation Analysis by Autonomous Communities

Enfermedad cardiovascular y producto interior bruto en España: análisis de correlación por comunidades autónomas

To the Editor,

Although cardiovascular (CV) mortality has declined in recent years, it remains the leading cause of death and accounts for 29.66% of all mortality in Spain.[1] However, mortality rates are not the same in the different regions of Spain. For example, Andalusia has the highest mortality rate (33.16%) and the Canary Islands the lowest (24.34%). The differences in prevalence, degree of control and prevention of CV risk factors, and socioeconomic status are the proposed main drivers behind these differences.[2]

The objective of this study was to analyze CV mortality and other CV indicators and to establish their relationship with gross domestic product (GDP) per capita (indicator of wealth) in the different regions of Spain between 2005 and 2014. The variables collected are shown in Table 1, Table 2, and Table 3 of the supplementary material. The data were derived from the mean values for each year of the 10-year study period, expressed per million inhabitants and standardized by age and sex.

Mortality data and GDP *per Capita* were obtained from the Spanish National Statistics Institute. CV interventions were taken from the Spanish Society of Cardiology, the Andalusian Society of Cardiology, and the Spanish Society of Thoracic and Cardiovascular Surgery.

The GDP *per Capita* data can be found in Table 1 of the supplementary material. The analysis showed a significant correlation between lower GDP and higher CV mortality in general, mortality associated with ischemic heart disease, and mortality associated with cerebrovascular disease (Figure 1), and between lower GDP and a lower number of primary angioplasty procedures, major cardiac surgery, and pacemaker placement (Figure 2). The remaining variables were not significant.

It is known that the prevalence of the main CV risk factors differ from region to region within a country and between countries. The regions in the south of Spain have the highest prevalence. The prevalences of obesity and type 2 diabetes mellitus, among other conditions, appear to be the main drivers of these differences. Both these factors are closely associated

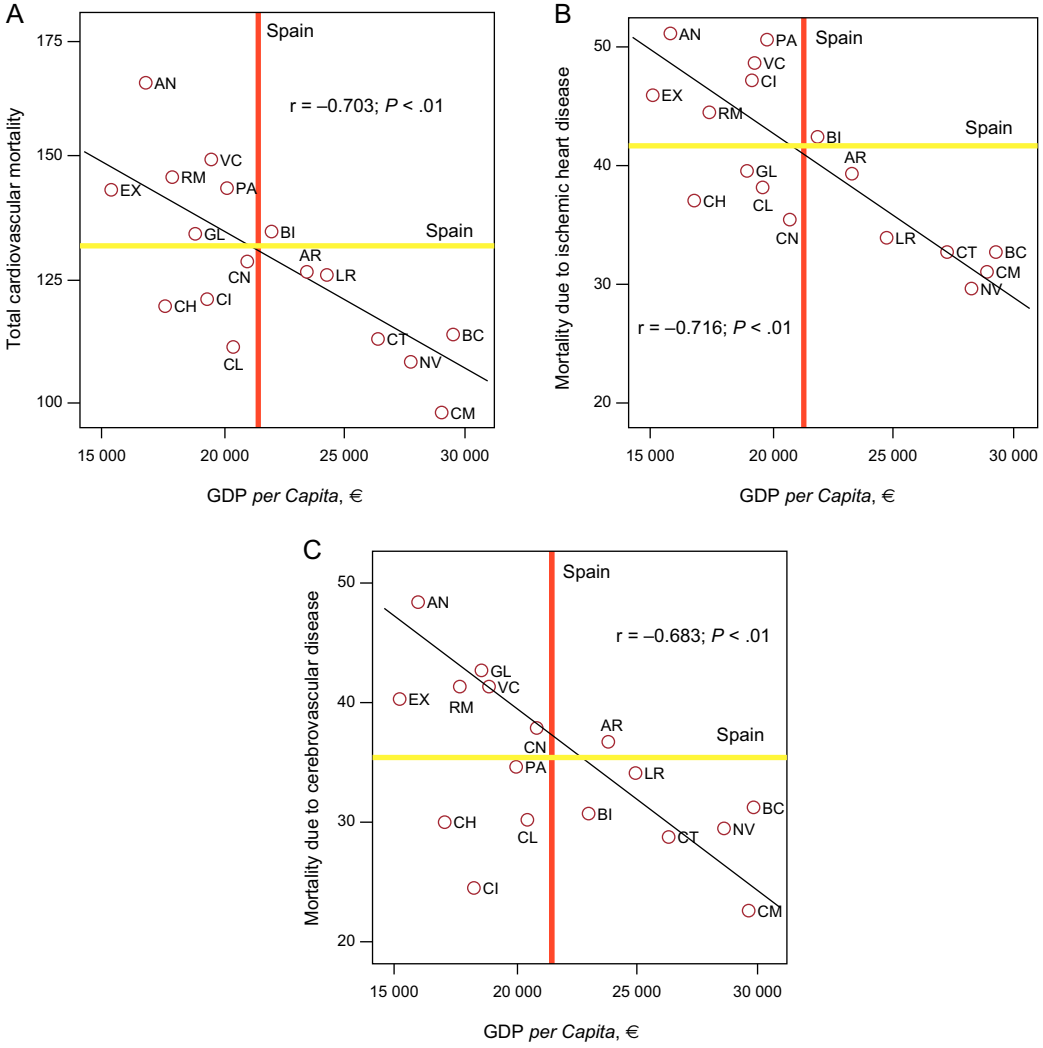

Figure 1. Correlation between gross domestic product per capita of the different regions of Spain and overall cardiovascular mortality (A), ischemic heart disease (B), and stroke (C). The regions are identified with initials and mortality data are expressed as the number of deaths and gross domestic product per capita in € (mean data from 2005 to 2014 per million inhabitants and standardized for age and sex). AN, Andalusia; AR, Aragon; BC, Basque Country; BI, Balearic Islands; CI, Canary Islands; CH, Castile-La Mancha; CL, Castile and Léon; CM, Community of Madrid; CN, Cantabria; CT, Catalonia; EX, Extremadura; GDP, gross domestic product; GL, Galicia; LR, La Rioja; NV, Navarre; PA, Principality of Asturias; RM, Region of Murcia; VC, Valencian Community.

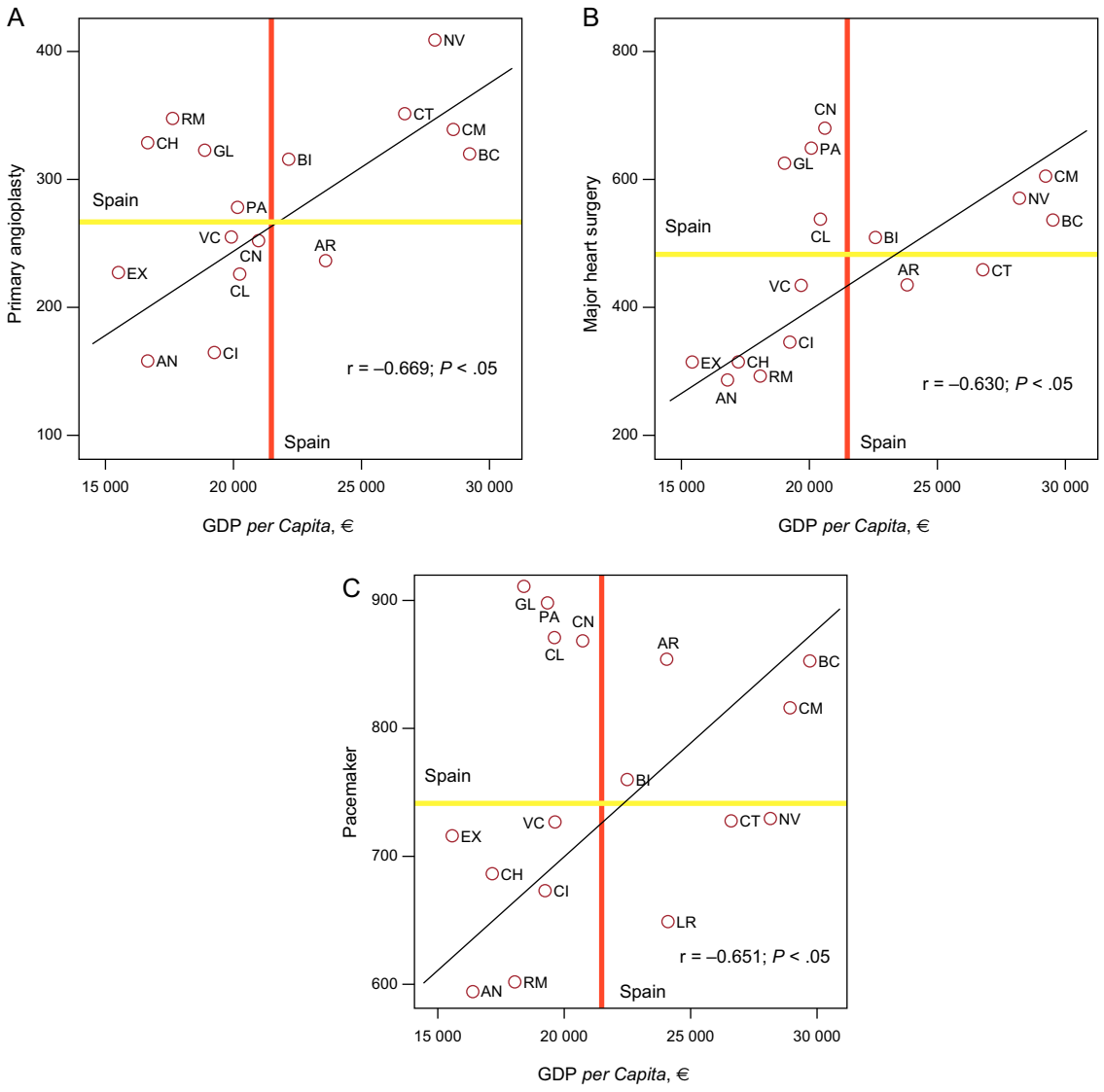

Figure 2. Correlation between gross domestic product *per Capita* of the different regions of Spain and rate of primary angioplasty (A), major cardiac surgery (B), and pacemakers (C). The regions are identified with initials. The gross domestic product per capita is expressed in €. The data were derived from the mean values for each year of the period 2005 to 2014, expressed per million inhabitants and standardized by age and sex. AN, Andalusia; AR, Aragon; BC, Basque Country; BI, Balearic Islands; CI, Canary Islands; CH, Castile-La Mancha; CL, Castile and Léon; CM, Community of Madrid; CN, Cantabria; CT, Catalonia; EX, Extremadura; GDP, gross domestic product; GL, Galicia; LR, La Rioja; NV, Navarre; PA, Principality of Asturias; RM, Region of Murcia; VC, Valencian Community.

with lifestyle and socioeconomic factors.[1,3] This suggests that regions with a lower socioeconomic status may be at greater CV risk, not only because of higher prevalence of CV risk factors but also because of a lower degree of control and prevention of these factors and greater barriers to accessing the health system.[4] In this study, Andalusia is particularly noteworthy. This is one of the poorest regions and has the highest rates of mortality and, paradoxically, the highest rates of CV procedures. There are other regions with the same unfavorable factors as Andalusia in terms of the deviation from the national means (Figure 1 and Figure 2).

The CV health of a region does not just depend on socioeconomic status, given that unmodifiable factors also have an impact. However, this factor does appear to play a major role in the presence of CV risk factors and their degree of control and prevention. Wealthy societies with well-developed health services have extensive health coverage and ready access to all levels of health care. This favors the development of policies aimed at lifestyle interventions that can impact the cardiometabolic risk of the population.[4]

The results of this study, although subject to certain limitations given that data collection was voluntary in the centers, show that the wealth of a region should be taken into account when estimating CV risk because a correlation was found between lower GDP of a Spanish region and higher CV mortality with a lower number of procedures. These indicators could be used to help ensure appropriate resource assignment and to evaluate the success or failure of health policies.

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SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found in the online version available at doi:10.1016/j.rec.2016.09.018.

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Selection of the Best of 2016 in Echocardiography in Heart Valve Disease

Selección de lo mejor del año 2016 en ecocardiografía para la valoración de las valvulopatías

To the Editor,

As a diagnostic modality, echocardiography is not only the cornerstone of the entire clinical management of patients with valvular heart disease, but is also a guide to all current nosological perspectives on valve diseases. Although the echocardiography corpus in this field might seem complete, the technique is constantly being updated due to technological advances and the continual transformation of health care practice, making it an active field of research, development, and innovation. Various areas have produced notable advances in the last year.

Ultrasound is spreading at such a rate that ultrasound equipment may one day be available in almost all health care centers. The opportunities for patients to benefit in this setting are indisputable but neither the equipment nor the training and experience required for a reliable echocardiographic study are universally available.[1] An important problem concerns the use of portable ultrasound equipment by noncardiac physicians within a structured health care system: the ideal situation would be to take advantage of this new resource without depriving patients of an exhaustive, recorded and recoverable, measured and informed cardiac ultrasound study that counts on the support of an appropriately trained operator. To examine this issue, a prospective study evaluated the usefulness of hand-held cardiac ultrasound performed by primary care physicians with the remote support of cardiology imaging specialists. This strategy reduced cardiac ultrasound requests by a third but showed considerable discrepancy in the evaluation of mitral stenosis,[2] supporting the belief that valve disease grading is one of the technically most demanding clinical situations. Because of the difficulty of evaluating valvular heart disease, the implementation of quality assurance programs is essential, even in echocardiography laboratories of excellence. A study of an internationally renowned university echocardiography laboratory showed that simple measures such as the systematic use of nonstandard echocardiographic windows can improve the reliability of measurement of aortic stenosis mean gradient, an established but highly critical technique in clinical practice.[3] Valvular heart diseases pose a major challenge to all health care systems, in both their echocardiographic evaluation and their clinical management. Clinics specializing in valvular heart disease managed by a cardiac imaging specialist are being popularized as a useful way to achieve close patient follow-up of patients and optimize treatment. An example of the benefits of this strategy is provided by a study of patients with hemodynamically severe but asymptomatic aortic valve stenosis who underwent close, twice-yearly, clinical follow-up. At the 6-monthly scheduled visits, the patients' symptom status was verified, a complete physical examination was carried out and blood pressure was measured, and an electrocardiogram, blood analysis, and complete echocardiogram were conducted; the latter was performed by an experienced operator. The patients attending this specialized clinic benefited from early identification of the criteria for surgical treatment and could undergo valve replacement with a lower degree of deterioration and better survival.[4] Thus, both the patients and the system benefit from the versatility of echocardiography; in the first example, hand-held cardiac ultrasound is conducted at the point of care by family physicians to reduce the number of unnecessary ultrasound examinations[2] and, in the second example, an echocardiographer performs a comprehensive echocardiographic examination in the clinic to avoid delays and optimize results.[4]

In the field of cardiac imaging, there is exponential technological development, and the new tools run the risk of becoming obsolete even before they are clinically validated and widely used. However, this situation is not an issue for real-time 3-dimensional echocardiography (3D echo), which has two main advantages: first, it allows the cardiac anatomy to be seen from a new perspective, storing and reconstructing datasets that help to better understand the classic tomographic ultrasound and second, it also permits the study of morphological features that could not