

Editorial

Financial Crisis, Drug Compliance and Cardiovascular Health-the GREECS Case?

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The world economic crisis that has spread through Europe since 2008 has changed ordinary people's health as well as their access to - and availability of - health care systems. *In lieu* of increased national health expenditure to tackle the epidemics of obesity, diabetes, cardiovascular disease (CVD), budget cuts and austerity measures have been implemented. This will further limit access to health. Greece is perhaps a notable example of a European country with a deteriorating population health due to the sustained financial crisis [1, 2]. Similar reports have also been published for Italy [3, 4] and Spain [5].

CVD poses one of the greatest disease burdens globally and with an ageing European population depending more and more on national health systems, any changes in mortality and incidence due to the financial crisis should be monitored. Regional findings from Greece had recently suggested that the prolonged financial crisis could have led to a higher incidence of acute myocardial infarcts (AMI) in Messinia (Southwestern Greece) [6]. There was a significant interaction between age and sex leading to a higher effect in women in the older age groups compared with the younger [6]. Although older individuals seemed to have been afflicted the most, with regards to the prolonged financial crisis and risk of AMI, national data were needed before reaching relevant conclusions.

The study by Notara *et al.*, published in the current issue of *Current Vascular Pharmacology*, presents the results from the 10-year follow-up (2004-2014) of a nationally representative study in Greece on Acute Coronary Syndrome (ACS) incidence and all-cause mortality in cardiac patients (the GREECS study) [7]. They report that baseline financial status was associated with an increase in all-cause mortality, with men in the "low" financial status group having 1.7 times the risk for all-cause mortality compared with the "very good" financial group. Furthermore, after adjustment for a number of CVD risk factors, patients (men and women) in the "higher" financial group had a 24% lower risk for recurrent CVD event compared with those in the "lowest" (95%CI: 0.60 to 0.95). What is especially interesting is that when adherence to medication was further adjusted, financial status was no longer associated with recurrent CVD. This indicates that some (or most) of the effects of financial status on CVD in this Greek population is through medical adherence. More importantly, non-adherence to medication may have an even bigger effect on CVD in those with low financial status. In accordance with the sex-interaction reported for Messinia [6], data from the GREECS study also suggest that women may already be facing a higher burden of CVD than men in the lowest income groups, highlighting a (perhaps neglected?) gender dimension of the economic crisis.

One explanation for the higher CVD risk in those more deprived is a lower prevalence of healthy habits. However, 3 waves of the national "Hellas Health" survey (2006-2011), show that during the financial crisis (2008-2011), smoking prevalence actually decreased by 4.5% overall with similar changes in the higher and lower socioeconomic status groups [8]. A positive change for high physical activity levels was also reported (9.8% overall), with the highest change seen in the lower socioeconomic group; however, no change was reported in obesity prevalence. What had significantly worsened in the lower socioeconomic group was consumption of fruit and vegetables [8], showing a differential impact of the financial crisis on risk factors for CVD in different socioeconomic groups. In addition, a more recent report from the "Hellas Health V" national survey (2013), showed that $\approx 40\%$ of those taking medication on a regular basis for a chronic non-communicable disease, either take less than the recommended dose or delay refilling their prescriptions, while 25% of those had cut back on food and electricity to pay for medication [9]. The same trends were reported by the World Health Organisation (WHO), with sales volumes of best-selling drugs such as angiotensin-converting enzyme (ACE) inhibitors and statins dropping drastically in Greece in 2010 [10]. Despite implementation of a number of measures on pharmaceutical sales since 2008 [10], including a switch to generics -and the resulting decrease in drug prices-, the same drugs continue to cost more in Greece vs the UK [11, 12]. Such variations in pricing could affect adherence to treatment even further and should be taken under consideration. Given the existing issues of not reaching target values for cholesterol and blood pressure [13], an even lower adherence to prescribed drugs due to the financial crisis and increased out of pocket spending is expected to pose an even greater burden on already over-stretched health systems in European countries.

An alternative, explanation for higher CVD risk, is that recession may additionally increase stress, with direct influences on health. This was addressed by a study measuring both levels of self-reported stress and cortisol in young adults from Greece and Sweden [14]. The latter country is much less affected by the financial crisis and with a much more resilient health system. The study showed that although Greeks reported significantly higher levels of perceived stress, serious life-events, widespread

depression and anxiety and lower hope for the future than the Swedes, they had lower levels of cortisol, even after multivariate adjustment including medication use [14]. The authors suggest that the explanation for these findings could be a down-regulation of the hypothalamic pituitary adrenal axis after living in a stressful environment created by the financial crisis.

Given the link between low financial status and drug adherence reported for Greece [7], further research should explore this relationship as similar effects may be expected in other European countries in recession.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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