

ISSN: 1576-0162

DOI: <http://dx.doi.org/10.33776/rem.v0i56.4854>

SOCIO-ECONOMIC FACTORS ON THE EVOLUTION
OF MORTALITY IN EUROPE IN THE XXI
CENTURY: POLICY PROPOSALS TO
FACE THE COVID-19 CRISIS

*FACTORES SOCIOECONÓMICOS SOBRE LA EVOLUCIÓN DE LA
MORTALIDAD EN EUROPA EN EL SIGLO XXI:
PROPUESTAS DE POLÍTICAS FRENTE A
LA CRISIS DEL COVID-19*

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Recibido: junio 2020; aceptado: octubre 2020

ABSTRACT

In the midst of adverse effects from the COVID-19 pandemic, the global economy has been confronted with new challenges, among which is an increase in mortality as a consequence of the virus. The main objective of this article is to examine the socio-economic factors influencing the evolution of mortality in Europe in the 21st century, using a panel data for a fixed effects model. The findings suggest that the determinants most strongly connected to the evolution of mortality in Europe include: inequality, the number of beds available in hospitals and the unemployment rate. These results further highlight the importance of developing specific strategies to control these factors, and to assist developed economies in order to face potential economic and health crises, like the current pandemic, more effectively in the future.

Key words: Socio-economic factors; COVID-19; Mortality; Panel Data; Europe.

RESUMEN

La economía mundial se enfrenta a nuevos retos después de experimentar los efectos adversos provocados por la COVID-19. En este contexto, se ha evidenciado un incremento de la mortalidad como consecuencia de la pandemia. Así, el principal objetivo de este trabajo es examinar qué factores socioeconómicos influyen sobre la evolución de la mortalidad en Europa en el Siglo XXI, empleando un panel de datos para un modelo de efectos fijos. Los hallazgos sugieren que los determinantes altamente conectados con la evolución de la mortalidad en Europa son: la desigualdad, el número de camas disponibles en hospitales y la tasa de desempleo, poniendo de manifiesto la importancia de desarrollar estrategias específicas que puedan controlar estos factores y permitan a las economías desarrolladas enfrentar posibles crisis económicas y de salud, como la pandemia actual, de manera más efectiva en los próximos años.

Palabras clave: Factores socioeconómicos; COVID-19; Mortalidad; Datos de Panel; Europa.

JEL Classification / Clasificación JEL: I14; G00; O50.

1. INTRODUCTION

Although it remains difficult to assess with much certainty the repercussions of the economic recession caused by COVID-19, each passing day reveals with increasing intensity the dark side of the situation, especially for those developed countries most affected by the pandemic. The economic consequences wreaked by the coronavirus have included very significant – even historic – declines in Gross Domestic Product (GDP), producing job destruction and the progressive worsening of unemployment, the growth of relative poverty, the intensification of social exclusion, the increase of social tensions, and other negative effects. Individuals and families alike are suffering the adverse impacts of the current health crisis, and in countries with an advanced welfare state, as is the case of many European countries, confinement measures have been the main response (with greater or lesser degrees of urgency, depending on the incidence of the virus). These measures are causing negative effects both domestically and in the economies of countries, with signs of recession already evident due to the fall in economic activity. In this context of global pandemic, the reduction of mortality rates in Europe now presents a particular challenge.

In addition to stalling the economies of the most-advanced countries in Europe and Asia, the effects of the coronavirus are being felt worldwide. If the effects of the ongoing economic crisis are serious in the most-advanced nations, they are no less pronounced in less-developed countries, where fewer economic and social resources are often compounded by the lack of adequate water and sanitation facilities essential to fight against any pandemic. Likewise, increases in unemployment and reductions in wages bring declines in family income, automatically reflected in reduced spending on food and health, both of which are necessary to address such crises satisfactorily.

The situation is particularly worrying in Latin America, where (as in other developed countries) the health systems have been threatened with collapse; Brazil, Mexico, and Peru have been especially hard-hit, and confinement has caused very damaging to their informal economies. In Peru, which has endured one of the strictest confinements in the region, the country's hospital capacity was rapidly overwhelmed by the virus, despite broad support from the population in the early weeks of implementation (see Blackman et al., 2020).

In short, the economic consequences generated by the pandemic are both widespread and diverse, including economic and financial crises that are affecting the global economy and that may prove more intense than

the 2008 crisis, due to in large part to harsh measures established in many countries. Addressing these consequences has become a major challenge for national governments, for the European institutions, and for the international system overall. National governments have mostly committed themselves to protecting human lives from the spread of COVID-19, accepting responsibility for that commitment vis-à-vis the international community.

Thus, this paper examines the health and economic crises caused by the coronavirus, also giving special attention to social repercussions. In particular, this study determines which socio-economic factors are influencing the evolution of mortality in Europe in the 21st century, with the aim of highlighting specific measures in order to better address similar situations in the future. For this purpose, the work begins with a descriptive analysis of those European countries where COVID-19 has caused the greatest damage: Spain, France, Italy, and the United Kingdom. Subsequently, the main socio-economic factors that have influenced the evolution of mortality in European countries in the pre-pandemic period of 2000-2018 are empirically analysed through a panel data for a fixed effects model. The purpose is to verify any connections between mortality and socio-economic factors, in order to evaluate the challenges currently at hand and to present some reflections worth considering when confronting the economic crisis caused by the pandemic. The main findings suggest that the determinants most strongly connected to the evolution of mortality in Europe include: inequality; the number of beds available in hospitals; and the unemployment rate. These results further highlight the importance of developing specific strategies to control these factors, and to assist European economies in facing potential risks more effectively.

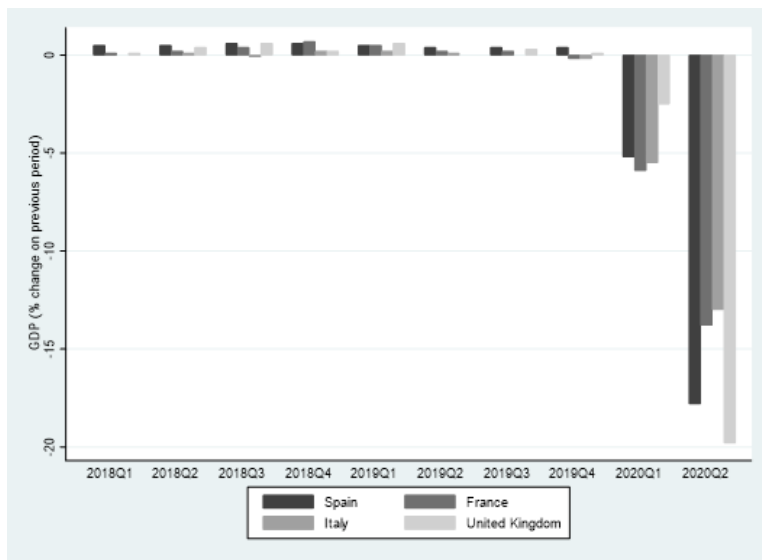
The remainder of this paper is as follows: Section 2 analyses the main socio-economic indicators of those European countries with the highest mortality rates. Section 3 reviews the relationship between mortality and socio-economic factors. Section 4 explains the data and methodology employed in this work. Section 5 presents the results of the analysis. Finally, section 6 provides some conclusions and final considerations.

2. THE SITUATION OF THE EUROPEAN COUNTRIES

The pandemic caused by the coronavirus has brought about a major economic crisis, according to the latest economic outlook from the Organisation for Economic Co-operation and Development (OECD, 2020), which projects that annual growth of world GDP in 2020 will fall to 2.4%. Figure 1 shows that the economy has already plummeted beyond projections in some European countries, marking quarter-on-quarter declines of more than 5% in Italy, Spain, and France during the first quarter of 2020, and of nearly 20% in the United Kingdom during the second quarter.

Another major concern exacerbated by this crisis is the labour market. Due to confinement measures and work stoppages implemented to confront

FIGURE 1. QUARTERLY GDP PER CAPITA GROWTH



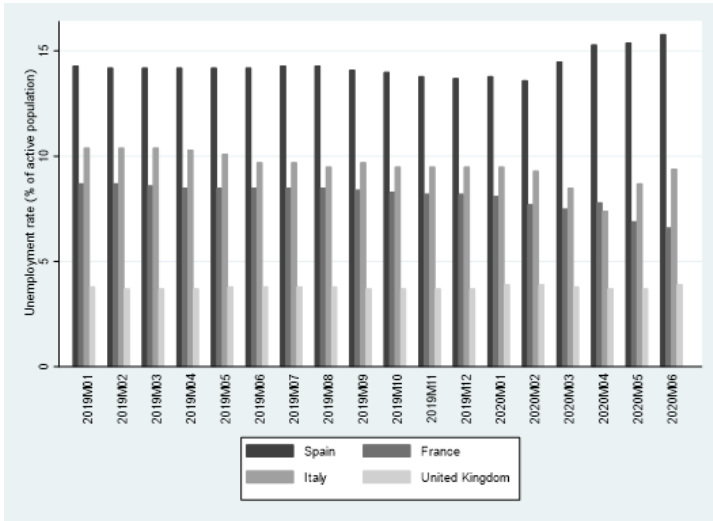
Source: Eurostat (2020).

COVID-19, countries have seen their unemployment rates rise, as shown in Figure 1, with Italy (for example) experiencing an increase of 0.7 percentage points in the last month.

In terms of production, construction levels (Figure 3) fell drastically, mainly in Italy, France, and the United Kingdom, thanks to precautionary actions taken to protect the population in the first months of the pandemic. While decreases in industrial production (Figure 4) in March and April compared to the previous month were more pronounced, these were not as severe as the decline in construction; thus the measures initially taken gradually affected all activity in terms of industrial labour, but they immediately paralyzed most activity in terms of construction. Following those early, drastic measures of confinement and consequent economic paralysis, a gradual recovery of both these work activities was seen to resume in May.

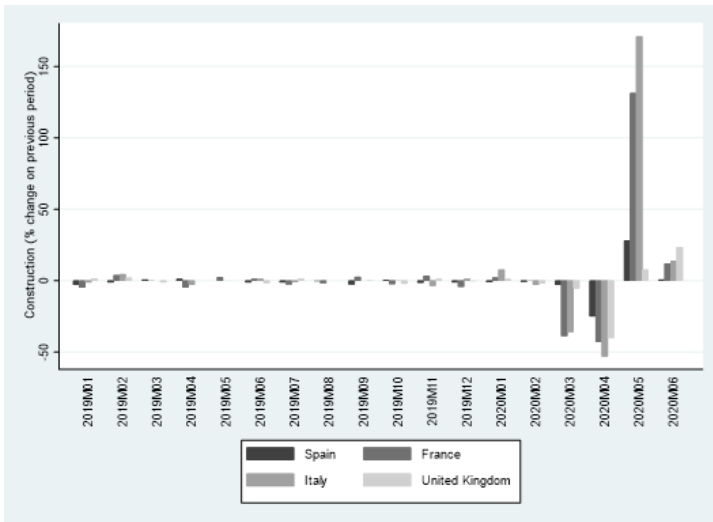
Regarding the number of available beds in hospitals – a fundamental variable in the current context – in those European countries where COVID-19 has had the greatest impact in terms of mortality, the data since 2000 reveal that, until the pandemic, the number of hospital beds had been decreasing significantly (Figure 5). This indicates a lower investment in health infrastructures throughout first two decades of the present century, and this lack of basic medical resources has had a crucial impact on strategies to deal with the crisis.

FIGURE 2. UNEMPLOYMENT RATES BY COUNTRY (% OF ACTIVE POPULATION)



Source: Eurostat (2020).

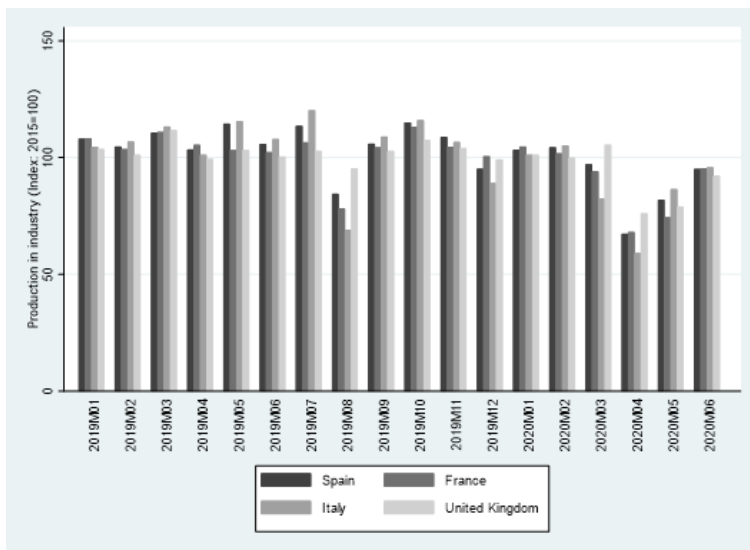
FIGURE 3. CONSTRUCTION ACTIVITY, BY MONTH



Source: Eurostat (2020).

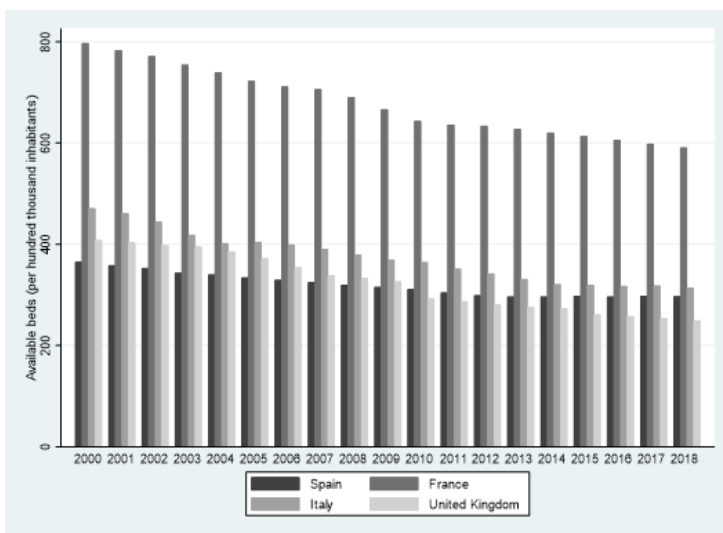


FIGURE 4. INDUSTRIAL PRODUCTION, BY MONTH (INDEX: 2015 = 100)



Source: Eurostat (2020).

FIGURE 5. NUMBER OF AVAILABLE HOSPITAL BEDS



Source: Eurostat (2020)

3. LITERATURE REVIEW: THE RELATIONSHIP BETWEEN MORTALITY AND SOCIO-ECONOMIC FACTORS

Mortality and socio-economic factors are clearly associated, and thus economic crises and health crises are likewise closely linked, as both will impact variables related to the well-being of the general population and especially those most vulnerable. The latest report published by the OECD in 2020 underlines that, with resources diminished, the foreseeable effects of the current global economic deterioration are extremely worrying, particularly for the most vulnerable social classes.

When a health crisis on this scale occurs, it will entail declines in GDP, thus forcing a decrease in real average income, a notable increase in unemployment, and lower availability of health services. Indeed, the crisis brought about by COVID-19 is now manifesting such effects on economies; measures implemented by governments in the most-affected countries have meant a reduction in family income, and a consequent reduction in consumption capacity, alongside increased vulnerability to the pandemic.

Globally, generalizations are difficult to make on changes to the distribution of income. However, it can be said that investments in health tend to be directed at the needs of privileged elites, and not at the general population (Makhoul, 1984; Mobarak et al., 2011), who are also more vulnerable in health terms to economic crises (Shkolnikov et al., 1998; Pradhan et al., 2007). Public programs that improve access to health services can reduce such inequalities and have a significant impact on the most vulnerable populations (Van de Gaer et al., 2013; Bagnoli, 2019).

The relationship between inequalities and health has been analysed by considering different social and professional conditions in several countries (Costa et al., 2003; Wilkinson and Pickett, 2008), revealing that mortality rates increase in proportion to economic and social difficulties, lower income, lower education, and lower social class. Therefore, reductions in economic inequalities would make possible a reduction in health disparities. At the same time, greater and equal universal health protections would significantly reduce the costs of public health, helping the well-being of citizens in the face of crises such as that caused by COVID-19.

Greater equality in the distribution of national wealth also appears to be important in improving the health of the average population, especially in the reduction of health inequalities (Subramanian, et al. 2002). It is not unusual for health care services to worsen in periods of economic recession, which can translate into increases in mortality (Blanco-Arana, 2019).

Apart from that, as relates to the labour market, unemployment and mortality rate are closely connected. In fact, during economic recessions, experience shows that in developed countries exist high probability of jobs losses and the lower fulfilment of the population's basic needs (Nieto, 2011; Blanco-Arana, 2019). Thus the increase in unemployment, together with a reduction in wages, leads to declines in household income; in some countries,

household consumption levels may be maintained for a certain time, while in others, drops in family income can drive higher national mortality rates (Bender, et al. 2013).

Thus, as can be seen, in the analysis of national mortality rates it becomes essential to pay special attention to the following key factors: GDP; inequality; healthcare; and the labour market. In this way, connections may be recognized between socio-economic factors and mortality in order to verify which aspects most affect the evolution of the latter. Verification of these factors will then allow the development of measures adequate to address critical situations such as the present pandemic.

4. DATA AND METHODOLOGY

This section describes the database and methodology used in the analysis of the impact of socio-economic factors on the evolution of mortality in European countries during the period 2000-2018¹.

4.1 .DATA

This research has been undertaken using the database from the Statistical Office of the European Union (Eurostat, 2020), responsible for producing data on Europe and using statistics from the different member countries, as well as those around them. In making this information available, Eurostat plays a fundamental role, allowing for the monitoring of European countries in aspects such as economic growth and current social or demographic situation.

The crude mortality rate [MORTALITY] is considered as dependent variable, defined by the proportion of people who die in a given year with respect to the total population.

According to the existing literature, several socio-economic factors are highly influential in the evolution of mortality. In developed countries, these are mainly related to the economy, healthcare, and work. As regards the economy, mortality rates are expected to increase in proportion with economic and social difficulties (Costa et al., 2003; Wilkinson and Pickett, 2008; among others). In terms of health, the absence of healthcare services can translate into an increase in mortality (Subramanian, et al. 2002; Blanco-Arana, 2019). In relation to the labour market, declines in employment may lead to increases in national mortality rates (Nieto, 2011; Bender, et al. 2013).

The connection between mortality and socio-economic factors having been verified, the following explanatory variables of the evolution of mortality were selected for study. These were distributed into three different groups: economy, health, and work.

¹ The latest year available in the database is 2018.

- Economy:
 - GDP growth [GDP]: per capita GDP growth over the previous year, expressed as a percentage.
 - The GINI coefficient [GINI]: measure of income inequality of the population, taking values between 0 (maximum equality) and 100 (maximum inequality).
- Health:
 - Hospital beds [HOSPITAL BEDS]: the number of beds available in hospitals per 100,000 inhabitants.
 - Spending on health [HEALTH]: public spending on health as a percentage of GDP.
- Work:
 - Unemployment rate [UNEMPLOYMENT]: the percentage of the active population currently unemployed.
 - For the years 2000 to 2018, a dataset is available for the member nations of the European Union-28. Despite the fact that Eurostat offers a rich source of data, in some countries the 20 observations corresponding to the stated years were not available, so analysis was carried out with a total of 246 observations.

4.2. METHODOLOGY

For this study, a panel data model was estimated to show the effects of socio-economic variables on the evolution of mortality rates in European countries. Firstly, it could be considered the basic approach to regression analysis with panel data such as pooled regression. The advantage of estimation through Ordinary Least Squares (OLS) lies in the simplification that results from being able to determine the value of a certain endogenous variable through a linear relationship with all the exogenous variables that participate in the system. In contrast, the main drawback of this method lies precisely in that simplification of the model, which does not correct the correlation of individual errors with observations and, therefore, the estimates will be biased. In this direction, the null hypothesis of no country effects is rejected², implying that a pooled regression model is inappropriate, as estimates made with pooled OLS would be biased (Breusch and Pagan, 1980). Thus, the use of panel data is fundamental, as it permits controlling for the existence of individual effects not controlled by the explanatory variables observed in the model (Hausman and Taylor, 1986); moreover, it allows controlling for variables that change over time. There are advantages to using panel data, as indicated by Hsiao (2003) and Klevmarcken (1989), and among these are the following: it allows to control for individual

² For a deeper discussion of this test, see Breusch and Pagan (1980).

heterogeneity; it introduces more variability and less collinearity between variables; it offers a greater degree of freedom by permitting more data and allowing for the monitoring of distinct countries; it shows greater efficiency, allowing better adaptation to the study of adjustment dynamics; it improves the ability to identify and measure effects that are not detectable in pure cross-section or time-series data; and it enables better analytical skills in more complicated behaviours.

However, panel data can require an effort in the collection of data of sufficient dimension in terms of time. Thus, the estimation based on panel data is chosen since the considered series is sufficiently long (from 2000 to 2018, for 28 European countries).

The corresponding Hausman test³ have been carried out to test the hypothesis of whether or not the individual effects are correlated with the regressors of the models; that is, to determine whether effects are fixed or random. The fixed effects estimator allows for the correlation of individual effects with the explanatory variables of the model, assuming that the differences between countries (in this case) are constant, while the random effects estimator does not permit this, considering the differences between countries to be random. Then, the Hausman test indicates that the use of a fixed effects model would be more pertinent for this study (see Table 1 for results).

Finally, the following econometric model is proposed:

$$\text{MORTALITY}_{it} = \alpha + \beta X_{it} + v_i + u_{it} \quad (1)$$

MORTALITY_{it} refers to the mortality rate in each country i in time t ; X_{it} refers to the set of explanatory variables for each country i in the same time t ; α is the intercept for each country i ; and v_i and u_{it} are the individual residuals, in which the existence of serial correlation will be taken into account for the correct estimate. To contrast the existence of time correlation in the errors of the mortality rate, the Wooldridge's (2002) serial autocorrelation test of errors for panel data models is used⁴.

5. RESULTS

According to the methodology presented in the previous section, the results of the estimation of the fixed effects model are shown in Table 1.

³ For more information, see Hausman (1978).

⁴ For a more extensive discussion of this test, see Wooldridge (2002).

TABLE 1. MORTALITY

Variables	(1)
GDP	0.000 [0.001]
GINI	0.015** [0.006]
HEALTH	0.012 [0.017]
HOSPITAL BEDS	-0.006*** [0.001]
UNEMPLOYMENT	0.048*** [0.015]
Constant	7.287*** [0.0766]
Number of countries	28
Observations	246
Log-likelihood	-100.634***
var[ϵ]	0.391***
Wooldridge test	0.1290

Note: standard errors are shown in brackets.

Significance level: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Given the results shown in Table 1, the following variables appear highly significant for mortality in Europe: the GINI coefficient, the number of available beds in hospitals, and the unemployment rate, highlighting the importance of policy proposals that can assist developed economies in order to face potential economic and health crises, like the current pandemic.

With regard to the variables related to the economic levels of the countries observed, it is verified by way of the GINI variable that the greater the inequality, the higher the mortality rate in the period analysed. These findings are in line with other authors (Makhoul, 1984 and Mobarak et al., 2011) who have argued that investments in health are directed more to privileged elites than to general populations. However, per capita GDP growth does not significantly influence the evolution of the mortality rate in European countries.

Regarding the health variables, a greater number of available beds in hospitals significantly reduces mortality in the countries analysed, so it is no surprise that in countries such as Spain, France, Italy, and the United Kingdom, where this number has been decreasing in hospital infrastructures since 2000, the COVID-19 pandemic has had a greater impact in terms of mortality. However, the health variable is determined to be not significant, which suggests that health spending is insufficient and varies little from one year to another.

Finally, in terms of labour market, the unemployment rate significantly affects mortality in the countries analysed, establishing a positive relationship between an increase in the mortality rate and an increase in unemployment. In times of crisis, families tend to cut their spending on basic necessities, thereby

undermining the health of the weakest; this, together with unemployment, can lead to extreme situations.

The results presented in Table 1 related to the Woolridge test show no serial correlation problems in the errors; therefore, the estimates are consistent. Similarly, in Table A.1, the correlation matrix of the variables is observed, verifying a scarce correlation between the variables under study in the period analysed.

TABLE A.1. CORRELATION MATRIX

VARIABLES	MORTALITY	GDP	GINI	HEALTH	HOSPITAL BEDS	UNEMPLOYMENT
MORTALITY	1					
GDP	0.111	1				
GINI	0.043	0.033	1			
HEALTH	-0.010	-0.290	-0.312	1		
HOSPITAL BEDS	-0.450	-0.142	0.016	0.021	1	
UNEMPLOYMENT	0.174	0.177	0.0262	-0.038	0.005	1

6. CONCLUSIONS AND FINAL CONSIDERATIONS

Starting from the study of the evolution of the socio-economic determinants in the countries most affected by the coronavirus in terms of mortality, as well as their relationships as indicated by the literature, this work undertakes an empirical analysis of the relationship between the evolution of mortality and certain socio-economic factors in European nations during the period 2000-2018. Once results have been obtained to indicate some explanatory determinants of mortality in Europe, measures can be established that allow for alleviating the effect on mortality in future economic and health crises.

To this purpose, a panel data has been used which enables controlling for the specific individual effects of each country, in the event that these can be correlated with other variables (Hausman and Taylor, 1986). This methodology allows an empirical analysis to be carried out based on a fixed effects model, to assess whether the evolution of the mortality rate in the observed European countries can be determined by the socio-economic differences chosen during the period 2000-2018. It is concluded that variables highly connected to the evolution of mortality include: the GINI coefficient, the number of beds available in hospitals, and the unemployment rate, highlighting the importance

of developing specific strategies that can control the effects of these determinants in a welfare state.

Some considerations can be highlighted that would permit developed economies to face potential risks such as coronavirus more effectively. In the first place, the important role played by economic policies to reduce inequality in developed countries is crucial, underlining how the correct implementation of such policies can lead to improvements in the well-being of families living with scarce economic resources, meanwhile reducing the inequalities in health systems. Second, it is found that certain aspects related to health systems are closely connected to the high mortality rates being suffered in some countries in the present pandemic. Increased investments in health infrastructures, and specifically increases in the number of hospital beds would prove beneficial in confronting unexpected threats such as COVID-19. Finally, in terms of aspects related to the labour market, the need to introduce improvements in job stability is emphasized, particularly in times of economic recession, along with support for those households in which no member is gainfully employed. In this sense, it should be noted that inequality in some countries is associated with social welfare and labour market policies (Sánchez-López and de Paz Báñez, 2016).

Thus, to improve health systems globally and to face unforeseen factors such as pandemic, policy-makers from both governments and international organizations must develop new approaches and strategies to control these potential risks. Developed economies will likely prove able to cope more effectively, since socio-economic factors such as economic resources, inequality, and investments in health and employment are all essential to improving health systems (Braveman et al., 2005; Clark, 2011; Brunello et al., 2016; Lundborg et al., 2016).

Along these lines, and particularly in crisis situations, the importance of channelling resources to impoverished segments of the population in a preferential manner must be underlined. Other vital measures include the promotion of job creation and business initiatives among these same segments of the population, as through microcredit policies, low interest rates, etc., as well as increases in employment opportunities for the most disadvantaged populations and territorial policies specifically oriented toward areas where levels of concentrated inequality are highest. At the same time, healthcare that guarantees the right to a hospital bed, among other priorities, also clearly deserves public attention, so as to contribute to improving the overall well-being of the population.

Faced with a worldwide crisis affecting both economies and public health, and within a globalized environment, it seems reasonable to consider the need to undertake a truly global and coordinated reaction from all the world's countries, beyond the specific national measures adopted by governments. Such a reaction could avoid foreseeable and devastating effects on the most-disadvantaged sectors of population worldwide, bearing in mind that many countries lack the resources sufficient to adopt measures of both social protection and economic stimulus. And while all of the above could easily be argued on an ethical basis alone, we must also consider the possible contributions of such concerted action to a solid and stable economic recovery,

given the currently high interdependence between national economies. The extent to which developing countries are able to stimulate their growth potential and purchasing power will also affect their ability to play a greater role in the global economy in coming decades, so that their progress may contribute positively to global development, assisting developed countries in moving forward together on a new path to prosperity.

ACKNOWLEDGEMENTS

The author is grateful for the helpful comments and suggestions offered by Professor Julio Sequeiros Tizón, which have contributed to enriching the quality of this work. In addition, the author thanks two anonymous referees for their useful comments.

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