

## Extended Abstract – EPC 2024

### Trends in avoidable mortality in European cross-border regions between 1992-2020

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#### Introduction

European integration refers to the process of deepening the political, economic, legal, and cultural interdependence of the states in and around Europe. With the foundation of the European Union (EU) by the Treaty of Maastricht in 1992 and the resulting opening of the inner EU borders, these processes were reinforced. Because of these strong interdependences among the countries, cross-border regions are particularly interesting when investigating the effect of European Integration on regional differences in life expectancy. Cross-border regions are geographically close and often share similar cultural and historical backgrounds. However, they are exposed to different governmental and institutional settings [1,2], including the healthcare systems [3]. Since the opening of the intra-EU borders, cross-border regions have become increasingly attractive for new industries [4]. The subsequent increase in regional economic activity [5] stimulated new formations of local cross-border cooperation and fostered the harmonization of living conditions and the economic prosperity of the region.

In addition to the economic growth, the freedom to move without a visa within the EU has enabled residents, and especially those living in cross-border regions, to access infrastructure, including healthcare systems in neighbouring EU countries. Especially when health care systems are temporarily overburdened in one region or country, it can be of great benefit if health care is extended to the neighbouring country. For example, during the Covid pandemic, patients in critical condition in Spain were allocated to French hospitals to receive intensive care [6]. Nevertheless, healthcare systems across the member states differ significantly since they remain the political responsibility of the member states [7]. Those differences in health systems can be observed in the population health differences in cross-border regions. Although the prevalence of non-communicable diseases, such as heart diseases, strokes, or cancer, across different countries, might not differ, the course of diseases may alter due to variations in medical treatments or prevention programs across different national healthcare systems. Although the population's health might benefit from the cross-border utilization of the healthcare system, their often-peripheral location may create healthcare disadvantages due to the lack of local healthcare centres. In summary, the location in a cross-border region can either provide a health advantage to the local population through the availability of different healthcare systems, or a health disadvantage due to the peripheral location and remoteness

of national healthcare providers. This might also be reflected in mortality parameters such as avoidable mortality.

Avoidable mortality is used as an indicator to test the efficiency of healthcare systems. Therefore, the EU tries to establish it as a benchmark indicator for the member states [8]. The indicator is officially defined as causes of death that can be mainly avoided through timely and effective healthcare interventions (amenable mortality), including secondary prevention and treatment (preventable mortality) [8]. It was first conceptualized by Rutstein and colleagues in 1978 [9], suggesting that specific diseases at particular ages should not occur. Over the years the concept has been modified by several authors [10–14]. In 2004, Nolte and McKee presented a new perspective, demonstrating the influence of health services on survival, considering the advancements in medical knowledge and technology [15]. The latest version of the list of causes of death that is considered amenable or preventable is given by the OECD and Eurostat [8]. Several studies have focussed on mortality differences between EU countries finding decreases in amenable and preventable mortality in Europe in the past decades [16–18]. Regardless, regional inequalities persist within [16,17,19] and between [13,18,20] EU member states with Western European countries showing lower socio-spatial inequalities than Eastern European countries [21].

So far, existing research in the EU context has mostly focused on the state level of EU countries or regional differences within those countries. However, these comparisons rarely go beyond national borders. A few previous studies investigated specific causes of death finding higher rates of alcohol-related deaths and illnesses [22–24] and different outcomes in survival rates of colorectal and breast cancer [25,26] across different cross-border regions in Germany, Denmark, Poland and Lithuania. However, overall European cross-border comparison of all combined avoidable mortality as well as its changes over time is, to our knowledge, currently lacking. Researching trends on avoidable mortality in an EU cross-border region is particularly interesting since those regions exhibit unique characteristics due to their exposure to different healthcare systems on the one hand, but having local cross-border cooperations, and the potential utilization of healthcare services by individuals working across the border on the other hand. Cross-border regions can also serve as small-scale test laboratories to measure the success of two different health systems in preventing disease.

## **Research Objective**

Our project aims to understand how the mentioned characteristics, i.e., harmonization of living conditions and geographical proximity to ‘other’ infrastructures, impacted death rates of preventable and amenable mortality for all EU cross-border regions from 1992 (the year the Maastricht Treaty was endorsed) to 2020.

## **Data and Methods**

### *Data*

Our study uses data from the ‘Regional Disparities in Cause-Specific Mortality in Europe’ project (REDIM) [27]. REDIM is a project funded by the European Research Council (ERC) that develops a new data repository by collecting and harmonizing cause-specific mortality data and other contextual variables of more than 20 European countries from 1990 onwards. Mortality data are presented in 5-year intervals up to the age group 85+. Causes of death are

given in accordance with the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). It combines data from statistical authorities of the respective member states, the human mortality database, Eurostat and the ARDECO<sup>1</sup> Database. Moreover, the dataset entails information on mortality and socio-economic indicators of the respective population on a small-scale geography level. It, therefore, enables us to zoom in to NUTS-3 areas or equivalent and allows coherent comparisons between cross-border regions on a local scale.

### *Identifying cross-border regions*

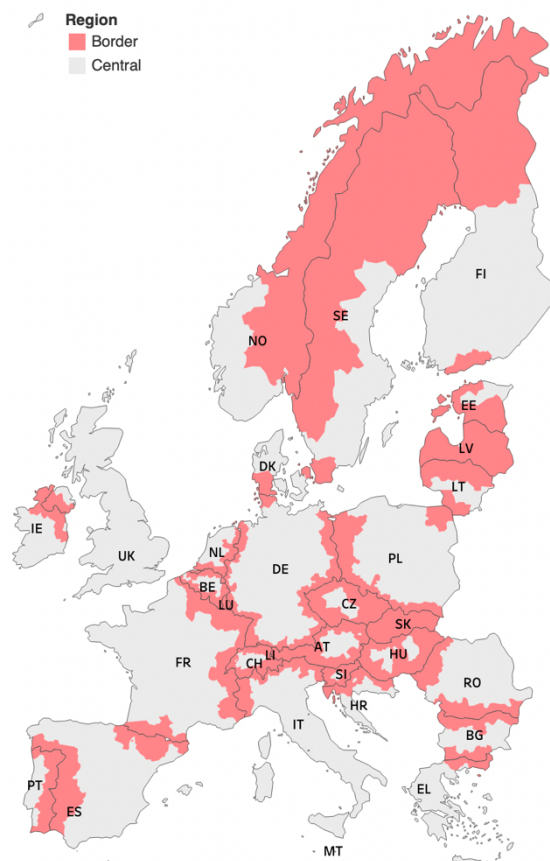
Using the Nomenclature of Territorial Units for Statistics (NUTS) by Eurostat, we identify the EU cross-border regions. Our regions of interest are NUTS-3 areas of member states that are located at the border of one or more adjacent member states. Since we want to investigate the effect of European integration and consider the free movement of the population, we are only interested in the inner border regions of the European Union, as presented in *Figure 1*.

### *Applying Avoidable mortality*

To investigate avoidable mortality in those regions, we will use cause-specific mortality data by sex and age for the same period to estimate age-standardised death rates for specific disease types. We will only calculate death rates below the age of 75, as avoidable mortality is not identified for older age groups due to the high degree of uncertainty [15]. To identify the avoidable causes of death, we will use the joint OECD/Eurostat [8] list of preventable and amenable causes of death. Estimating life expectancies on such a small-scale district level may also come along with concerns regarding missing data or too few cases in smaller and less-populated areas. We consider smoothing techniques for mortality forecasting by using a Bayesian or frequentist approach to tackle these problems [28].

## **Expected Results**

We expect different trends of avoidable mortality across different cross-border regions and nations over time. This would align with our previous research, where we investigated the trends of life expectancy in European cross-border regions and observed dissimilar trends



*Figure 1. Inner-EU border regions on NUTS-3 level. Areas that are marked transparent are excluded from our studies. Source: Eurostat, 2022. Own illustration*

<sup>1</sup> Annual Regional Database of the European Commission's Directorate General for Regional and Urban Policy (ARDECO)

across various countries and regions. Cross-border regions within the European Union exhibit significant heterogeneity themselves, with varying levels of cross-border mobility and collaboration among them. Supranational regions, exemplified by BENELUX (comprising Belgium, the Netherlands, and Luxembourg) or DACH (encompassing Germany, Austria, and Switzerland), not only share common cultural and linguistic affinities but also boast a longstanding history of economic and political collaboration that predates the formation of the European Union and the Schengen Area. In contrast, border regions in Eastern European member states that acceded to the European Union in 2004 may have a shorter history of comprehensive cross-border cooperation. Moreover, cross-border regions display disparities in terms of their urban and rural dynamics. For instance, areas known as *Eurodistricts* are characterised by high cross-border mobility, such as the border triangle connecting Germany, France, and Switzerland with its urban agglomeration of Basel-Lörrach-St. Louis-Weil am Rhein, or the border region linking Denmark's Copenhagen and Sweden's Malmö via the Öresund bridge are expected to yield distinct mortality outcomes in contrast to more peripheral regions like the northern border area of Sweden and Finland. In the latter regions, challenges relating to accessing healthcare or fulfilling medical requirements may be more intricate.

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