

Original article

Age, Period, and Cohort Effects on Mortality From Ischemic Heart Disease in Southern Spain

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ABSTRACT

Introduction and objectives: Ischemic heart disease is the leading cause of death and one of the top 4 causes of burden of disease worldwide. The aim of this study was to evaluate age-period-cohort effects on mortality from ischemic heart disease in Andalusia (southern Spain) and in each of its 8 provinces during the period 1981–2008.

Methods: A population-based ecological study was conducted. In all, 145 539 deaths from ischemic heart disease were analyzed for individuals aged between 30 and 84 years who died in Andalusia in the study period. A nonlinear regression model was estimated for each sex and geographical area using spline functions.

Results: There was an upward trend in male and female mortality rate by age from the age of 30 years. The risk of death for men and women showed a downward trend for cohorts born after 1920, decreasing after 1960 with a steep slope among men. Analysis of the period effect showed that male and female death risk first remained steady from 1981 to 1990 and then increased between 1990 and 2000, only to decrease again until 2008.

Conclusions: There were similar age-period-cohort effects on mortality in all the provinces of Andalusia and for Andalusia as a whole. If the observed cohort and period effects persist, male and female mortality from ischemic heart disease will continue to decline.

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Efectos de la edad, el periodo de defunción y la cohorte de nacimiento en la mortalidad por enfermedad isquémica del corazón en el sur de España

RESUMEN

Introducción y objetivos: La cardiopatía isquémica es la primera causa de muerte y una de las cuatro principales causas de carga de enfermedad en el mundo. El objetivo de este trabajo es evaluar los efectos edad-periodo-cohorte en la mortalidad por cardiopatía isquémica en Andalucía (sur de España) y en cada una de sus provincias durante el periodo 1981–2008.

Métodos: Se realizó un estudio ecológico poblacional. Se analizaron las 145.539 defunciones por cardiopatía isquémica ocurridas en Andalucía durante el periodo de estudio a edades comprendidas entre 30 y 84 años. Se estimó un modelo de regresión no lineal con funciones *spline* para cada sexo y área geográfica.

Resultados: En la tasa de mortalidad masculina y femenina a partir de 30 años de edad se observa tendencia a aumentar. El riesgo de muerte para varones y mujeres fue descendiente para las cohortes nacidas después de 1920 y con una pendiente más pronunciada después de 1960 entre los varones. El análisis del efecto periodo mostró que el riesgo de mortalidad masculina y femenina se mantuvo estable desde 1981 hasta 1990, aumentó entre 1990 y 2000 y volvió a disminuir desde 2000 hasta 2008.

Palabras clave:

Enfermedad isquémica del corazón

Mortalidad

Modelos edad-periodo-cohorte

Regresión de Poisson

Funciones *spline*

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Conclusiones: Los efectos edad-periodo-cohorte en la mortalidad fueron similares en todas las provincias de Andalucía y el conjunto de la comunidad autónoma. Si los efectos cohorte y periodo persisten, la mortalidad masculina y femenina por enfermedad isquémica cardiaca continuará disminuyendo.

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INTRODUCTION

Ischemic heart disease is the leading cause of death and is one of the top 4 causes of burden of disease worldwide. More than 7 millions deaths are produced annually, accounting for around 13% of all deaths.^{1,2} Additionally, ischemic heart disease is now responsible for 5.8% of years of life lost due to premature mortality.^{3–5}

Death rates from ischemic heart disease have diminished considerably over the last few decades in Europe and other continents in response to improvements in health promotion policies, health care, and treatments.^{6–8} As in other European Union countries, the trend in Spain is toward declining male and female mortality. The crude rate was 7.5 deaths per 10 000 population in 2011 (8.6 for men and 6.3 for women), making ischemic heart disease the first cause of death among men and the second among women.^{9,10} These figures mean that Spain is currently one of the European Union countries with the lowest mortality from ischemic

heart disease.⁸ However, as Spanish statistics tend to vary by region, proper health planning requires analysis of regional mortality patterns.¹¹

Andalusia (southern Spain) accounts for 18% of the Spanish population.^{9,12} It is the most highly populated autonomous community in Spain. Administratively it is divided into the 8 provinces of Almeria, Cadiz, Cordoba, Granada, Huelva, Jaen, Malaga, and Seville (Figure 1). According to the latest official figures, the crude death rate from ischemic heart disease in Andalusia was 7.9 per 10 000 population in 2011 (8.9 for males and 6.9 for females).^{10,13}

The Interactive Mortality Atlas for Andalusia was implemented in Andalusia for epidemiological surveillance purposes.¹⁴ Analyses of the annually updated Interactive Mortality Atlas for Andalusia data provide insights into the geographical distribution of mortality from ischemic heart disease over time in southern Spain. Recent studies based on these data show that currently, in over 95% of the Andalusian municipalities, male and female



Figure 1. Andalusia (southern Spain) and its administrative division into 8 provinces.

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