

# Associations between multimorbidity, healthcare utilisation and health status: evidence from 16 European countries

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## Abstract

**Background:** with ageing populations and increasing exposure to risk factors for chronic diseases, the prevalence of chronic disease multimorbidity is rising globally. There is little evidence on the determinants of multimorbidity and its impact on healthcare utilisation and health status in Europe.

**Methods:** we used cross-sectional data from the Survey of Health, Ageing and Retirement in Europe (SHARE) in 2011–12, which included nationally representative samples of persons aged 50 and older from 16 European nations. Negative binomial and logistic regression models were used to assess the association between number of chronic diseases and healthcare utilisation, self-perceived health, depression and reduction of functional capacity.

**Results:** overall, 37.3% of participants reported multimorbidity; the lowest prevalence was in Switzerland (24.7%), the highest in Hungary (51.0%). The likelihood of having multimorbidity increased substantially with age. Number of chronic conditions was associated with greater healthcare utilisation in both primary (regression coefficient for medical doctor visits = 0.29, 95% CI = 0.27–0.30) and secondary setting (adjusted odds ratio (AOR) for having any hospitalisation in the last year = 1.49, 95% CI = 1.42–1.55) in all countries analysed. Number of chronic diseases was associated with fair/poor health status (AOR 2.13, 95% CI = 2.03–2.24), being depressed (AOR 1.48, 95% CI = 1.42–1.54) and reduced functional capacity (AOR 2.12, 95% CI = 2.02–2.22).

**Conclusion:** multimorbidity is associated with greater healthcare utilisation, worse self-reported health status, depression and reduced functional capacity in European countries. European health systems should prioritise improving the management of patients with multimorbidity to improve their health status and increase healthcare efficiency.

**Keywords:** *multimorbidity, chronic disease, healthcare utilisation, older people, health status*

## Introduction

Chronic conditions are the leading cause of global disease burden worldwide [1]. With population ageing and increasing exposure to risk factors, the prevalence of multimorbidity, defined as persons with two or more co-existing chronic conditions [2, 3], is likely to grow in many settings.

Emerging evidence has found that patients with multimorbidity have higher health service utilisation, healthcare expenditure and poorer health outcomes [4–7]. Multimorbidity might be considered as major source of healthcare inefficiency

with higher risk of avoidable inpatient admission, suboptimal disease management, inadequate treatment and communication barriers [2, 7–11].

Despite the growing prevalence of multimorbidity in Europe, few published studies have examined its impact in European health systems [8, 12–14], and none of these studies have undertaken cross-country comparisons. The aim of this study is to examine correlates of multimorbidity and its impact on healthcare utilisation, self-reported health status, mental health and functional capacity using nationally representative samples from multiple countries in Europe.

## Methods

### Sample and data

We used cross-sectional data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which was conducted during 2011–12 (Wave 4). The data collected national representative samples of individuals aged 50 and over in 16 European countries: Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Italy, Netherlands, Sweden, Czech Republic, Poland, Estonia, Hungary, Portugal and Slovenia. The data contain individuals' information on their socio-demographic characteristics, health status and healthcare utilisation.

### Variables

Our main variable of interest was the number of coexistent chronic diseases (CDs) reported by each respondent. We counted the number of CDs for each respondent and defined those with multimorbidity as the presence of two or more of chronic diseases.

Respondents were asked about their healthcare utilisation in both primary and secondary care, including (i) number of medical doctor visits, defined as the sum of general practitioner (GP), emergency room and outpatient visits during the last year, (ii) whether or not been hospitalised in the past year, (iii) the number of hospitalisations in the past year and (iv) total nights at the hospital in the past year.

We also considered the following outcomes: (i) self-rated health coded in two groups (a) 'excellent', 'very good' and 'good' health and (b) 'fair' or 'poor' health; (ii) depression, measured through the Euro-D classification [15] and (iii) reduction of functional capacity, categorised as reduced/not reduced, through the GALL scale [16]. Definition of each of

the outcome variables can be found in the Supplementary data, Appendix S2, available in *Age and Ageing* online.

We included the following covariates in the analyses: age, gender, whether the respondents lived alone, education, household income and employment status.

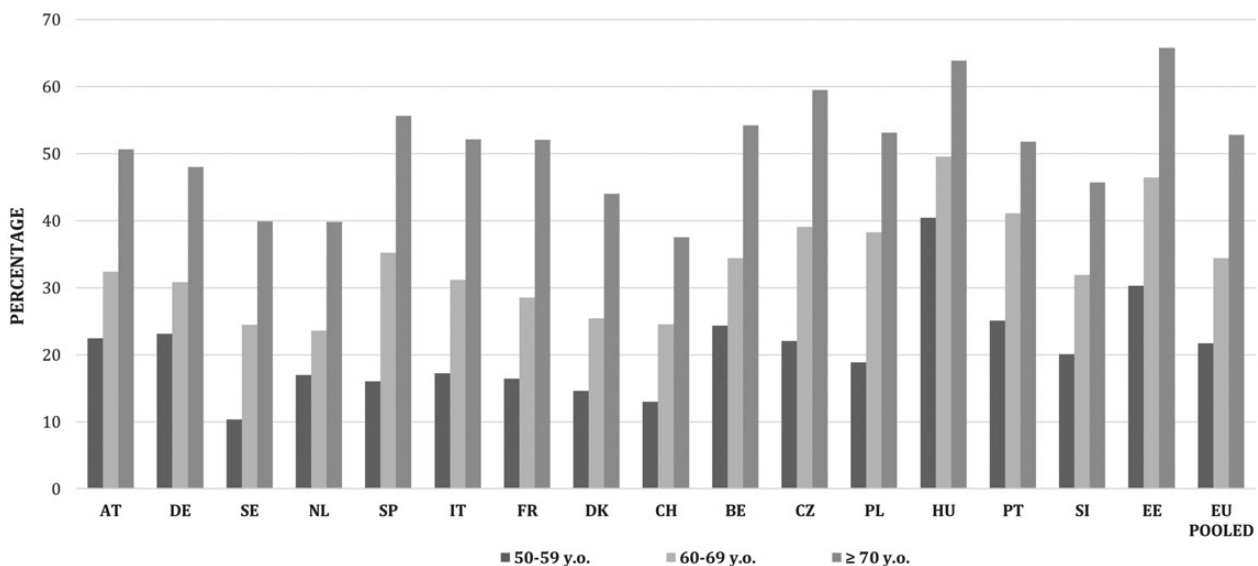
### Statistical analysis

We used multiple logistic regression analysis to determine socioeconomic and demographic correlates of multimorbidity (binary variable). We assessed the association between number of CDs (count variable) and binary outcomes using logistic regression models. These binary outcomes included any hospitalisation, fair/poor self-perceived health status, depression and reduction of functional capacity. We ran negative binomial models to assess the association between number of CDs and number of medical doctor visits, number and length of hospitalisations. All the models adjusted for covariates listed above. A detailed version of the research methods is available online (Supplementary data, Appendix S1, available in *Age and Ageing* online).

## Results

We analysed information from 56,427 respondents (Supplementary data, Appendix S2, available in *Age and Ageing* online). The median age was 66 years (IQR 58–73), 55.9% were female, 84.1% had at least secondary level or above of education and 57.6% were retired.

The mean number of CDs was 1.37 (95% CI = 1.35–1.38, Supplementary data, Appendix S4, available in *Age and Ageing* online). The crude prevalence of multimorbidity was 37.3%, and this percentage increased from 22.7% for persons aged 50–59 to 52.8% for persons aged 70 and over (Figure 1). Respondents from Switzerland had the



**Figure 1.** Prevalence of multimorbidity by age category in 16 European countries. AT, Austria; DE, Germany; SE, Sweden; NL, Netherlands; SP, Spain; IT, Italy; FR, France; DK, Denmark; CH, Switzerland; BE, Belgium; CZ, Czech Republic; PL, Poland; HU, Hungary; PT, Portugal; SI, Slovenia; EE, Estonia; EU POOLED, Europe.

lowest number of CDs (mean = 1.2, 95% CI = 1.2–1.3) with those from Hungary having the highest (mean = 2.2, 95% CI = 2.1–2.2). The prevalence of multimorbidity ranged from 24.7% in Switzerland to 51.0% in Hungary. High blood pressure was the most prevalent condition (42.8%), followed by arthritis/rheumatism (26.4%) and heart problems (15.0%).

The likelihood of having multimorbidity increased substantially with age (AOR = 1.36, 95% CI = 1.17–1.59 for 60–69 years group; AOR = 2.79, 95% CI = 2.34–3.32 for the 70+ years group, compared with 50–59 years group), and this association was found to be statistically significant in all countries except in Hungary and Denmark. Participants with higher levels of education were less likely to have multimorbidity (primary completed: AOR = 1.52, 95% CI = 1.32–1.75; no formal education: AOR = 1.55, 95% CI = 1.26–1.91, compared with those who completed at least a second level of education). Those in the most affluent quintile (fifth quintile) were less likely to have multimorbidity (fifth quintile: AOR = 0.64, 95% CI = 0.54–0.75, compared with first quintile), a finding that was consistent within countries (Supplementary data, Appendix S5, available in *Age and Ageing* online).

Increasing number of CDs was associated with a higher number of medical doctor visits (coeff = 0.29, 95% CI = 0.27–0.30, Figure 2). The mean number of medical doctor visits annually increased from 4.8 in persons without any CD to 9.9 for persons with multimorbidity. The positive association between increasing number of CDs and primary

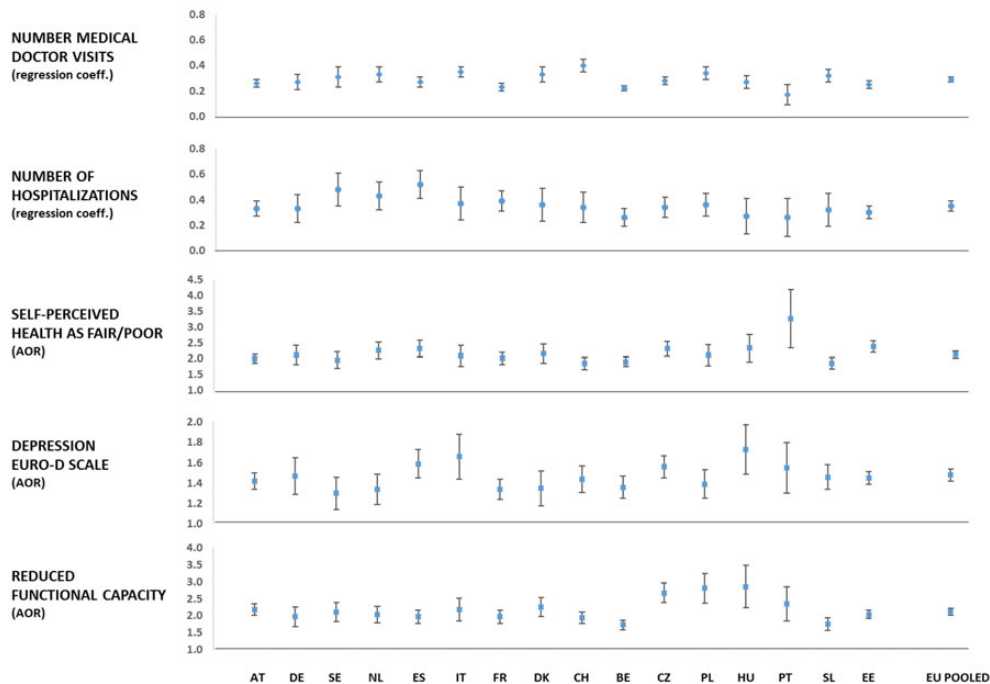
care utilisation was found in all countries, and this association was found to be the strongest in Italy (coeff = 0.35, 95% CI = 0.31–0.40).

Increasing number of CDs was also associated with higher secondary care utilisation (Figure 2, Supplementary data, Appendix S6, available in *Age and Ageing* online). Increasing number of CDs was significantly associated with a higher likelihood of being hospitalised (AOR = 1.49, 95% CI = 1.42–1.55), increased number of hospitalisations (coeff = 0.35, 95% CI = 0.31–0.40) and a longer length of stay (coeff = 0.49, 95% CI = 0.43–0.55). The association between increasing number of CDs and secondary care utilisation was found consistently across all countries.

Increasing number of CDs was associated with a higher likelihood of reporting self-perceived fair/poor health status (AOR = 2.13, 95% CI = 2.03–2.24), feeling depressed (AOR = 1.48, 95% CI = 1.42–1.54) and to have reduced functional capacity (AOR = 2.12, 95% CI = 2.02–2.22). This association was found consistently across all countries and was strongest in countries such as Portugal and Hungary and weakest in countries such as Belgium and Switzerland (Figure 2).

### Discussion

We found that multimorbidity was highly prevalent (37%) among older people in European countries. The variation in prevalence within countries might reflect undiagnosed CDs



**Figure 2.** Association between number of CDs and healthcare utilisation, self-perceived health, depression and functional capacity. Primary care utilisation defined by the number of medical doctor visits, and secondary care utilisation defined by the number of hospitalisations. Regression coefficients and AOR are adjusted for age, gender, number of people living in the same household, residence, educational level and employment status. All the regression coefficients and AOR values were found statistically significant. AT, Austria; DE, Germany; SE, Sweden; NL, Netherlands; SP, Spain; IT, Italy; FR, France; DK, Denmark; CH, Switzerland; BE, Belgium; CZ, Czech Republic; PL, Poland; HU, Hungary; PT, Portugal; SL, Slovenia; EE, Estonia; EU, Pooled data.

and underlying population characteristics of each country. We found a strong association between multimorbidity and increasing age as well as level of education, employment status and household income. An increasing number of CDs was associated with higher healthcare utilisation in both primary and secondary care settings. An increasing number of CDs was also associated with worse self-perceived health, reduced functional capacity and depression.

The strong association between increasing number of CDs and increasing levels of healthcare utilisation in European countries is consistent with recent studies conducted in both developed and developing countries [6, 8, 12, 17–20] which have highlighted the impact on secondary care utilisation predominantly. Patients with multimorbidity can often have complications during a hospital stay, and the subsequent intensification of care and coordinated approach needed might impact the length of stay substantially.

Our findings showing that people with physical multimorbidity are more likely to be depressed in European countries are in line with a recent Scottish study [4]. The strong association between multimorbidity and reduced functional capacity is also in line with findings from a recent Canadian study highlighting that these two conditions are strongly interrelated [21].

### Strength and limitations

According to our knowledge, this is the first study to examine the prevalence, correlates and impacts of chronic disease multimorbidity using a large and nationally representative data in Europe. Limitations of the study include the use of self-reported measures of chronic disease and healthcare utilisation which may underestimate their prevalence, particularly for older persons and those from lower socio-economic and educational background who may be more likely to under-report [22, 23]. Prevalence of the study outcomes might also be underestimated, because patients admitted to the hospital or with severe illness by the time the survey was conducted might not have been able to participate. Furthermore, the SHARE questionnaire did not ask about all diseases typically included in clinical database studies [24]. By defining multimorbidity as simple count of CDs, our analysis weighted all diseases equally, although the effect of multimorbidity on individuals can vary with combination and severity of CDs [14]. Further studies looking at the impact of CD co-morbidity among some of the most common chronic conditions are warranted.

### Policy implications

Our findings provide further evidence for policies and targeted interventions to tackle the growing burden of multimorbidity in Europe. The strong association between healthcare utilisation and number of chronic diseases can be used to populate forecasting models to predict future burden of the CDs. The forecasting models can further assess the potential impact of preventive policies on CDs and the economic consequences of these policies [25].

Furthermore, considering that clinical management is still largely focused on single diseases, our findings support the idea that more focus should be placed on how to best treat patients with multimorbidity who need a continuous, coordinated and comprehensive approaches to their care [24, 26]. Improvement of the primary care system would contribute to reductions in population risk factors for multimorbidity and may contribute to reduce avoidable hospital admissions [8–11, 27]. European health systems should prioritise improving the management of patients with multimorbidity to improve health outcomes, increase healthcare efficiency and contain costs.

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### Key points

- First cross-national study to examine the prevalence, correlates and impact of chronic disease multimorbidity in Europe.
  - Multimorbidity is highly prevalent and consistently associated with increased primary and secondary care utilisation.
  - People with multimorbidity are more likely to have worse self-perceived health, depression and reduced functional capacity.
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### Acknowledgements

This paper uses data from SHARE wave 4 release 1.1.1, as of 28 March 2013 (doi: 10.6103/SHARE.w4.111). The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life), through the 6th Framework Programme (projects SHARE-I3, RII-CT-2006-062193, COMPARE, CIT5-CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Programme (SHARE-PREP, No 211909, SHARE-LEAP, No 227822 and SHARE M4, No 261982). Additional funding from the US National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources is gratefully acknowledged (see [www.share-project.org](http://www.share-project.org) for a full list of funding institutions).

### Funding

This article presents independent research in part funded by the National Institute for Health Research (NIHR) under the Collaborations for Leadership in Applied Health Research and Care (CLAHRC) programme for North West London. The views expressed in this publication are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health. C.M. is funded by an NIHR Research Professorship award.

## Conflicts of interest

None declared.

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Received 16 June 2015; accepted in revised form 11 January 2016