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21 Multimorbidity, incentives and the use of health services in Europe

- The relation between multimorbidity and health care utilisation is positive and homogenous across Europe
- Countries with a higher density of hospital beds and physicians show higher rates of health service utilisation
- After the introduction of prospective inpatient payment, the length of stay decreases for multimorbid individuals more than for non-multimorbid

21.1 Introduction

As a result of improved medical care, the number of individuals surviving to old age with multiple coexisting chronic conditions (multimorbidity) is increasing. Multimorbidity entails a high burden on the older people. This is associated with multiple symptoms as well as disabilities such as cognitive impairments, limitations with activities of daily living or reduced mobility (Fortin et al. 2004, Boyed & Fortin 2010), and thus affects quality of life. Furthermore, multimorbidity is associated with a high economic burden because patients use health care services in a high frequency and have complex health care needs (Wolff et al. 2002, van den Bussche et al. 2011).

To deal with the economic burden of an ageing multimorbid population and to address the hazard of a fragmented, ineffective, inefficient and incomplete care (Boyed & Fortin 2010), recent health care reforms introduced regulation mechanisms (e.g. gatekeeping, copayment schemes, financing tools). These developments should be evaluated and require situation-specific permanent adjustment. Therefore the knowledge about the prevalence of multimorbidity, the implication of multiple conditions for the use of health services and the influence of various regulatory mechanisms on health care utilisation as well as on quality of care is becoming an increasingly important issue for clinicians, patients and policy makers.

Studies examining patterns of multimorbidity and health service utilisation have been conducted within many countries, but the absence of a uniform way of defining and measuring multimorbidity as well as differences in data collection methods are of special concern and do not allow the comparison of prevalence and consequences across different countries. Furthermore, evidence on the impact of different health care system components on health care utilisation is scarce.

In this chapter, we use SHARE data to provide evidence on the relationship between multimorbidity and the use of health services in different European countries within one dataset and the influence of country specific system characteristics on health care utilisation. Furthermore, we examine the impact of health care reforms on health service utilisation of multimorbid patients using as example the introduction of prospective inpatient payment in different European countries (so called diagnosis-related groups or DRGs).

21.2 Data and methods

Data: We use data from the first (2004/2005), second (2006/2007) and fourth wave (2010/2011) of the Survey of Health, Ageing and Retirement in Europe (SHARE) to analyse the influence of multimorbidity on the use of health services. We measure *outpatient health care utilisation* by the number of physician and specialist contacts as well as the probability to visit a general practitioner or specialist. For *inpatient care* we take into account the hospitalisation rate, the number of hospital visits and total length of stay. According to the behavioural model of health services utilisation by Anderson (1995) we include three sets of individual-specific covariates: needs, resources and predisposing circumstances. *Need* is specified by the number of chronic conditions. R*esources* are defined by education, household size, and marital status. *Predisposing circumstances* are described by the variables sex and age.

In addition to these individual characteristics we include health care system characteristics for both the outpatient and inpatient setting at the country level. We investigate for outpatient health service utilisation the influence of physician density and for the inpatient care setting the available number of hospital beds as well as the corresponding payment system in hospital (*Diagnosis Related Groups (DRGs)* vs. other financing scheme).

Methods: We estimate a sequence of models. First, we analyse specific influences of individual characteristics on outpatient and inpatient health care utilisation using probit analyses of the likelihood of physician visits and hospital stays as well as count data methods to estimate the number of physician contacts and times stayed in hospital.

Second, we add supply indicators at the country level (physician density, number of beds) to analyse the impact of country characteristics on the propensity to visit and the number of physician contacts (general practitioner (GP) and specialist) as well as inpatient care.

Third, we use a difference-in-difference approach to investigate the influence of the introduction of prospective payment as a new financing tool for hospitals (DRGs) on the use of inpatient care.

Definition of multimorbidity: In their literature review Fortin et al. (2006) found that most studies defined multimorbidity as the existence of two or more chronic diseases. We follow that practice and classify an individual suffering from at least two long-term diseases (out of 14 conditions available in all regular waves of SHARE) as multimorbid. We further distinguish among the multimorbid by patterns of conditions and the number of conditions.

Multimorbidity rates among European older people: Our descriptive results show a multimorbidity rate of 44.3 per cent across all available waves. On average, multimorbid individuals suffer from at least three long-term diseases. Cardiovascular diseases (87.7 %), metabolic disorders (62.2 %), and arthritis (40.2 %) are the most common medical conditions.

Country specific multimorbidity rates are presented in Figure 21.1. Switzerland and the Netherlands have the lowest multimorbidity rates across SHARE countries. When adjusting for age this result remains. At more than 55 per cent, Hungary, Estonia, Poland and Portugal show the largest age-adjusted multimorbidity rates.

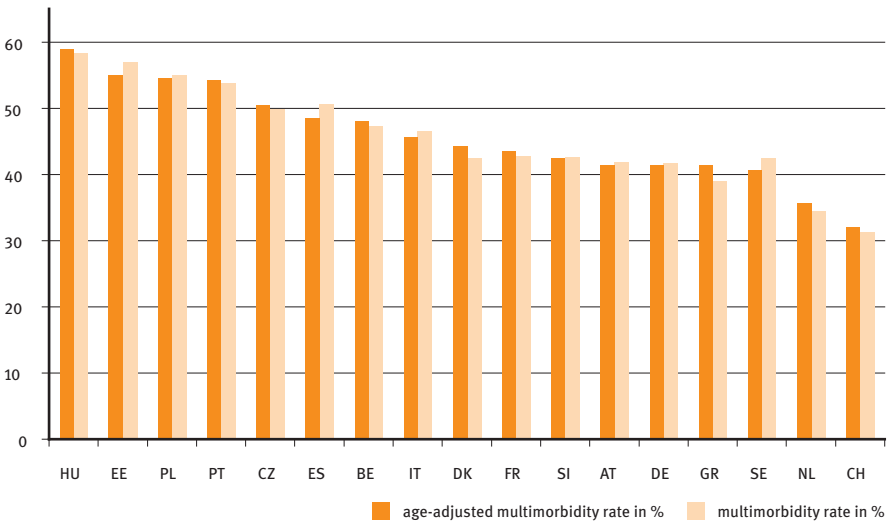

Figure 21.1: Country-specific rates of multimorbidity in Europe (n = 116,797)
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1

Multimorbid patients are on average older than the non-multimorbid (68.4 years versus 62.6 years), there is a higher percentage of females among them (58.5% versus 54.1%), they are less educated and live in smaller households. Moreover multimorbid individuals are at higher risk to suffer from functional limitations and limitations with activities of daily living (analyses not shown).

21.3 Multimorbidity and health services utilisation

We find a significant relation between multimorbidity and the use of health services. Multimorbidity is positively related to ambulatory care and hospitalisation. The average number of physician contacts per individual is two times higher than the contact rate of non-multimorbid patients (9.5 (SD ± 11.4) contacts vs. 4.3 (SD ± 7.1)). Hospitalisation rates among multimorbid patients are increased by a factor of three.

Table 21.1 shows the results of count data models estimating the link between multimorbidity and health services utilisation, controlling for a number of individual covariates. For general practitioner visits and specialist visits, we use hurdle models with a first stage probit for participation and a second stage truncated negative binominal regression for usage. For hospital visits, we use a zero-inflated negative binominal regression model. Count data models are appropriate for the analysis of health care utilisation because the distribution of the dependent variables, number of physician contacts and hospital visits, is not continuous, non-negative, skewed to the right and contains a large proportion of zeros.

Results indicate that multimorbid persons have a 15 percentage point (pp.) higher chance of visiting a GP, a 22 pp. higher chance of visiting a specialist and an 8.6 pp. higher chance of staying at a hospital than non-multimorbid persons. Conditional on visiting at all, the multimorbid have two more GP and one more specialist visit. Hence, multimorbid individuals use specialists more often and have a higher number of hospitals stays.

Among multimorbid respondents, relationships between individual characteristics and health care utilisation (analyses not shown) are as follows: older people have higher levels of resource usage. Gender is a significant determinant only for inpatient services, with males having a higher level of health service utilisation than females. Moreover, the degree of education is negatively related to the use of health care. The higher the educations level the lower health services utilisation was.

Table 21.1: Estimates for the probability of resource utilisation and the amount of health services use

Model	Probit models probability of:		Count data models number of:	
	Marginal effects	SE	Marginal effects	SE
General practitioner visits (n = 116,071)				
Multimorbidity	0.149***	0.003	2.019***	0.044
Specialist visits (n = 116,062)				
Multimorbidity	0.220***	0.003	0.981***	0.054
Number of hospital visits (n = 116,797)				
Multimorbidity	0.086***	0.002	0.097***	0.004

Significance: *** = 1 %; ** = 5 %; * = 10 %
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1

Likewise the number of chronic diseases drives the number of outpatient consultations and hospital stays. Figure 21.2 demonstrates that the number of chronic conditions almost linearly increases the number of GP visits, specialist visits, and hospital stays. The trend becomes somewhat unstable for very large numbers of conditions due to a small number of observations.

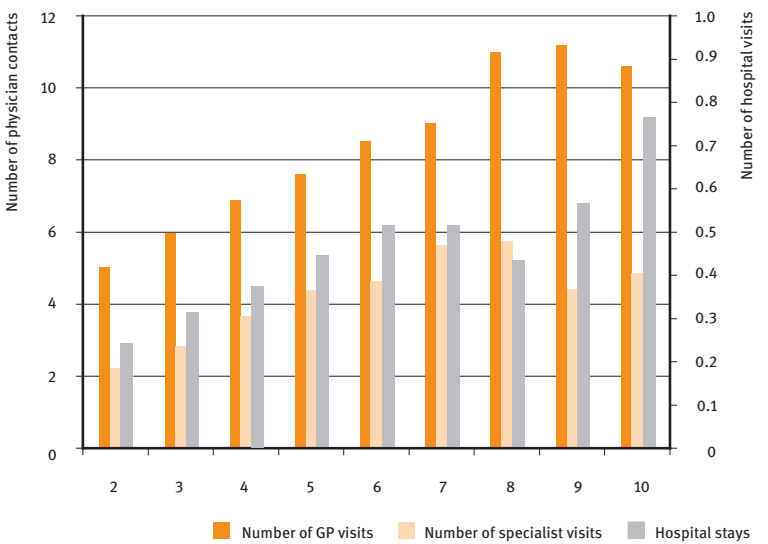

Figure 21.2: Number of chronic conditions and predicted number of events (n= 51,741)
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1

Furthermore, health services utilisation differs between combinations of diseases. In Figure 21.3 we summarise different complexity levels of chronic conditions and the number of physician contacts. Complexity level 1 is defined as suffering from diseases of one organ system whereas level 2 includes patients presenting chronic conditions of two systems and so forth. The results demonstrate significant associations for both: the number of general physician contact and the number of specialist visits.

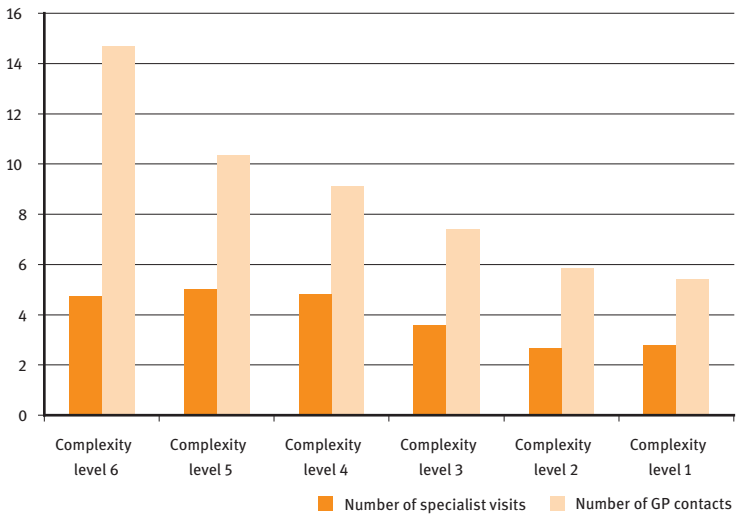

Figure 21.3: Differences in outpatient resource utilisation of different disease complexity levels (n= 51,741)
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1

21.4 Health care systems and health care utilisation among the multimorbid

Physician density and number of hospital beds: Health care system characteristics may have an important influence on resource utilisation especially in vulnerable patient groups. We used two OECD indicators describing the national availability of health services to investigate their impact on the probability and number of physician contacts as well as hospital stays. Therefore we include physician density and the number of available hospital beds in our probit and count data models. The OECD provides this information for all countries of our analysis for the years 2004–2011.

In Figures 21.4 and 21.5 we look at cross-national differences in health care utilisation net of the influence of differences in individual characteristics across countries. We plot country-fixed effects obtained from utilisation regressions (see 21.3) against the described health care system characteristics. These fixed effects contain the country-differences in utilisations net of country differences in individual patient characteristics. For both, the probability of visiting a specialist and the probability of hospital stays, we find a significant positive relationship with the availability of the respective service. Furthermore, the number of hospital visits is positively and significantly correlated to the amount of available hospital beds (analysis not shown).

We did not find significant relations for the *number* of physician contacts (both GP and specialist, analyses not shown). These results could be explained by access mechanisms and their level of application (e.g. skip and pay, referral, free access), which mainly drive outpatient care utilisation and thus have more impact on patients' behaviour than structural characteristics.

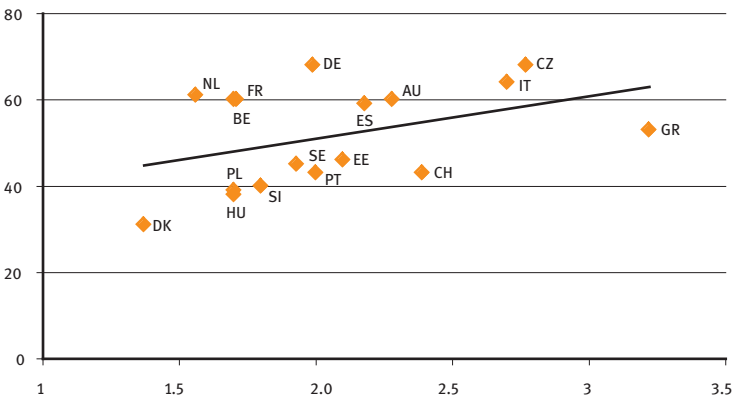

Figure 21.4: Relation between specialist's density per 1,000 population and the probability of a specialist's consultation (net of the influence of individual characteristics) (n=17)
Notes: Control variables: gender, age, marital status, education, household size, resource utilisation within other health care sectors.
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1 and OECD (average over available data from 2004–2011)

Remuneration: Beside structural characteristics that determine access to care, patients' health services utilisation may be related to the remuneration of health care providers. In this section we study the impact of health care reforms using as example the introduction of prospective inpatient payment in different European countries (so called diagnosis-related groups or DRGs). By paying a fixed

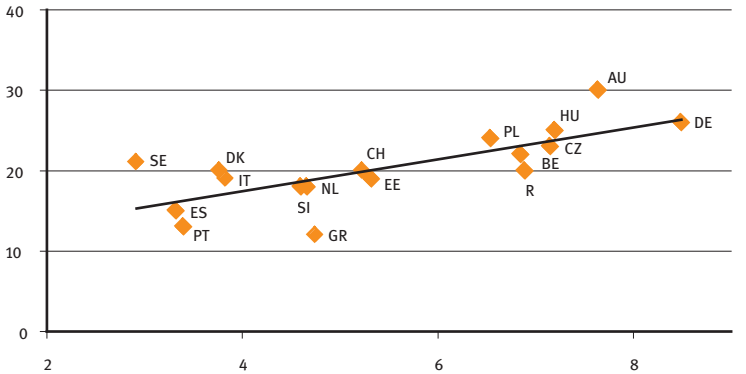

Figure 21.5: Relation between the number of hospital beds available per 1,000 population and the probability of hospital visits (net of the influence of individual characteristics) (n=17)
Notes: Control variables: gender, age, marital status, education, household size, resource utilisation within other health care sectors.
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1 and OECD (average over available data from 2004–2011)

payment rate conditional on patient characteristics to hospitals, DRGs aim at a more efficient allocation of resources. As previous payment systems gave an incentive to inefficient extensions of patients' length of stay beyond the regular duration of treatment especially within care intensive populations, DRGs should induce more efficient resource utilisation. However, hospitals may have an incentive for an inappropriate early discharge of patients.

Because of their larger number of diagnoses and worse overall health, multimorbid individuals are more care and cost intensive. Furthermore, the longer the stay of these individuals, the higher their probability to die in hospital or to develop severe complications, for example nosocomial infections that require further intensive care. Therefore under prospective payment, hospitals should be particularly interested in shorter lengths of stay of multimorbid patients compared to non-multimorbid patients. However this can lead to a "revolving door" phenomenon, i.e. a higher rate of readmission.

We used a difference-in-difference approach to assess the influence of DRG introduction on the average length of stay of multimorbid versus non-multimorbid individuals by exploiting cross-national variation in terms of the introduction date of DRGs (see Figure 21.6) and to generate control und treatment groups.

We find that hospital remuneration has significant relation to the average length of stay in hospital (see Table 21.2). After the introduction of DRGs, the average length of stay decreases for multimorbid individuals 1.46 days more than for non-multimorbid. Including individual characteristic into the model, regres-

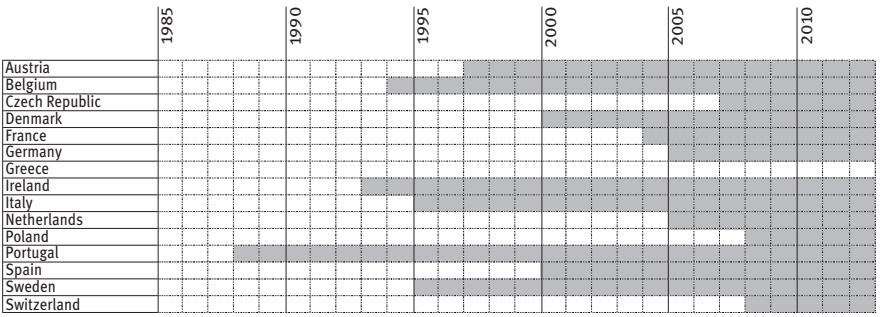

Figure 21.6: Year of DRG introduction as payment system in hospitals
Source: European Observatory on Health Systems and Policy Series (all available reports per country)

sion results remain significant ($p < 0.1$) and demonstrate that multimorbid hospitalised individuals experience an additional reduction in length of stays of about 1,4 days (see Table 21.2).

Table 21.2: Difference-in-difference estimates of the effect of DRGs on hospitalisation

	Model 1	**Model 2**
DRG	−0.05	0.16
	(0.55)	(0.61)
DRG*Multimorbid	−1.46**	−1.40*
	(0.71)	(0.74)
country fixed effects	*yes*	*yes*
year fixed effects	*yes*	*yes*
individual controls	*no*	*yes*
linear country trends	*yes*	*yes*
N	17,048	17,043

Significance: *** = 1 %; ** = 5 %; * = 10 %
Source: SHARE Wave 1 release 2.5.0, Wave 2 release 2.5.0, Wave 4 release 1

21.5 Conclusion

Our findings show that the relation between multimorbidity and health care utilisation is positive and homogeneous across Europe: people with more illnesses make more use of the health care system. Furthermore, we find evidence for people with multiple conditions to have a higher probability of general practitioner and

specialist contacts and we observe a significant relationship between multimorbidity and the number of general practitioner as well as specialist contacts.

Including health care system characteristics demonstrated that multimorbid individuals living in countries with a higher physician density visited doctors more often than people in countries with a lower density. Likewise countries with a higher density of hospital beds showed a higher number of hospital visits.

The results of a difference-in-difference approach show a significant reduction of the average length of stay after the introduction of the DRGs. This effect is consistent with our expectations, because one possible consequence of those prospective payments discussed in the literature is a reduction of the lengths of stay. In contrast to previous payments schemes like per diems or fee-for-service, DRGs seem to successfully create incentives for more efficient health care supply and avoid an expansion of treatment of individual cases. However, reducing their length of stay can lead to a "revolving door" phenomenon in vulnerable patient groups like multimorbid individuals or may cause a cost shift to other sectors (e.g. long-term care). The international literature gives no clear evidence in that case, therefore further research is highly requested.

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