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Public healthcare expenditure in Spain: Measuring the impact of driving factors

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ABSTRACT

Objectives: To assess the impact of demography, health status, death related costs and some macroeconomic variables on the evolution of health expenditure.
Methods: We follow the methodology used by the Ageing Working Group (AWG) of the European Union to simulate expenditure projections on the basis of healthcare expenditure profiles for age–sex population groups. We estimate the profiles using data from Hospital Discharges Statistics and the Spanish National Health Survey.
Results: The differences between the compression of morbidity scenario and the expansion of morbidity scenario range from 1.35 to 1.57 points of GDP in 2060. The overestimation of healthcare expenditure when death related costs are ignored ranges from 0.04 to 0.11 percentage points, depending on the health status hypothesis. Moreover, the effect of death related cost diminishes as health status improves.
Conclusions: Our results support the fact that intensity of healthcare use, instead of ageing, is the main driver of health expenditure. Thus, the concern of keeping expenditure under control should be focused on factors such as the population's health status, economic growth and development, new technologies and medical progress, and the organization and management of the healthcare system.

1. Introduction

Developed countries have achieved important improvements in life expectancy. Simultaneously, birth rates have notably decreased during recent decades. As a consequence, most modern societies have progressively changed their population structures, with significant increases in the volume and proportion of elderly people. The ageing phenomenon is a major challenge for public sectors linked to the sustainability of welfare states, particularly in the European Union [1–4].

For years, health expenditure growth rates have been an issue of concern in Spain, as in other developed countries. The Spanish National Health System (NHS) was created in 1986, when the transformation from a Social Security model was approved. From 1963 to 1986, the annual average real growth rate of public health expenditure reached 10.9%. As a consequence, the initial percentage of GDP corresponding to public health expenditure (0.9%) increased to 4.2%. From 1986 to 2008, the annual average rate in real terms fell to 4.9%, which was still high enough to increase

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the share of public health expenditure up to 6% of GDP in 2008. Long-term healthcare expenditure in social service institutions, which accounts for 0.5% of GDP in 2008 according to official estimations [5], is excluded.

Currently, as a result of the high rise in public deficit and debt payment interests from the beginning of the economic crisis, major reforms are being implemented in Spanish social policy. A wave of reforms was also implemented in the NHS from 2010 to 2012 to address the negative impact of the crisis in public finance, including salary cuts, the exclusion of public coverage for different population groups, the redefinition of covered benefits, and the increase of co-payments [6]. According to budgetary data, these reforms are curbing the trend of healthcare expenditure growth, although their medium and long effect on the health status of the population and on total expenditure is not easy to predict.

Studies estimating projections of health expenditure have proved to be a useful tool for evaluating the depth of sustainability problems in healthcare systems and, particularly, to test the sensitivity of expenditure to changes in driving factors. It is also useful to develop these analyses on the basis of a harmonized methodology that allows for comparison within the European Union and the OECD [7–10]. This methodology considers a projection model including the effect of what has been called the 'cost of death', death related costs or end-of-life costs. There is strong evidence that a large share of health spending consumed by a person is concentrated in his/her final years of life [3]. In fact, it is suggested that the demand for health services depends, ultimately, on health status and the proximity to death and not on age per se. Furthermore, it has also raised the question on whether age, once the effect of health status and the cost of death are controlled, is even a determinant of healthcare expenditure [3]. Although it is well known that projection models that do not include the 'cost of death' effect overestimate future healthcare expenditure, this effect has only occasionally been considered for some countries in the Ageing Working Group (AWG) projections. In previous estimation rounds [2], as well as in national studies [11], the cost of death effect was incorporated only for acute inpatient care expenditures in Spain.

In this paper we apply the methodology followed by the AWG of the European Union [7–9] to describe differences in future health spending trends – up to the year 2060 – due to different assumptions concerning morbidity, cost of death, income elasticity and productivity. Therefore, we present a wide set of scenarios that, in comparison to those considered by the AWG, include more combinations of the health status' basic assumptions and the healthcare expenditure's income elasticity. The cost of death effect has been incorporated into all these combinations by estimating the decedents/survivors cost ratio for the whole population, and not only for inpatients.

2. Material and methods

2.1. Estimating expenditure profiles

Future health expenditure is estimated on the basis of age and sex health expenditure profiles, which are a basic element for the projections. Health expenditure data for the chosen base year (2008) are taken from Eurostat and the Spanish Statistics of Public Expenditure on Health (EGSP) [5,12]. Expenditure profiles have been estimated for five-year-age population groups, distinguishing between men and women. Population data is provided by the Spanish Statistics Institute [13]. In order to calculate the above-mentioned profiles, public healthcare expenditure has been divided into seven groups: inpatient services, specialized outpatient services, primary care, prescription drugs, transport and emergency rescue, therapeutic appliances and other medical durables, and a final group including the rest of expenditure categories (public health, collective health services, capital expenditures, education and training of health personnel, and research and development in health). Data used to calculate inpatient expenditure profiles is taken from Hospital Discharges Statistics (CMBD) 2008 [14]. Individuals registered in the CMBD are classified into diagnosis-related groups (DRGs), and hospital costs are assigned to each DRG by the Spanish Ministry of Health [15]. On the basis of these data, we have distributed total inpatient expenditure across population according to the proportion that the cost of each age–sex group represents over CMBD total cost. Public expenditure on specialized outpatient services has been distributed across population groups according to the service utilization data provided by the Spanish National Health Survey (SNHS) 2006 [16]. The same procedure has been followed for primary care. Regarding expenditure on prescription drugs, we also use the SNHS to estimate the number of prescriptions written by NHS physicians for each population group. Individuals declare whether they have consumed prescription drugs in a reference period from a list of twenty groups of pharmaceutical products. Until July 2012, drugs prescribed by public sector GPs have been co-financed by users except in the case of pensioners. According to the Indicators of Pharmaceutical Benefit for the National Health System, in 2008 the cost per prescription was 1.46 times higher for a pensioner than for a working person [17]. Thus, the number of prescriptions consumed by pensioners has been weighted using that index. The distribution working/pensioners in each age-sex group is taken from official data provided by the Spanish Institute of Social Security [18]. Public expenditure on transport and emergency rescue is basically intended to finance the ambulance transport of patients to and from the hospital. For this reason it has been distributed across population groups according to the estimated percentages for inpatient services. Expenditure on therapeutic appliances and other medical durables has been distributed across population groups according to the percentages for specialized outpatient services, since it is mainly linked to this kind of care. Finally, the remaining expenditure categories are distributed according to the estimated percentages for the above-mentioned six categories of expenditure.

2.2. Projecting health care expenditure

Typically, health expenditure profiles have been kept constant during the projection period. This has been associated to the less favourable scenario of health status (the

Table 1
Population groups and unit costs considered to calculate the cost of death effect.

Population groups	Unit cost	Database
Decedents		
Decedents who have received inpatient care and have died in hospital	Data directly provided by CMBD	CMBD
Decedents who have received inpatient care and have been sent to home under palliative care	We assume the same per capita cost than for those who receive palliative care and die in hospital (for each age–sex group)	CMBD and meta-analysis to estimate the number of patients receiving palliative care
Decedents who have received inpatient care, have been sent to home as survivor discharges and have died at home with no use of palliative care	We assume that it equals the per capita cost for a survivor in each age–sex group	CMBD and own calculations on the basis of health statistics on use of healthcare services (SNHS and Statistic on Hospital Morbidity)
Decedents who have not received inpatient care	We assume that it equals the per capita cost for outpatient services in each age–sex group	Own calculations on the basis of health statistics use of healthcare services (SNHS and Statistic on Hospital Morbidity)
Survivors		
Survivors who have received inpatient care	Data directly provided by CMBD	CMBD
Survivors who have not received inpatient care	We assume that it equals the per capita cost for outpatient services in each age–sex group	Own calculations on the basis of health statistics on use of healthcare services (SNHS and Statistic on Hospital Morbidity)

so-called 'expansion of morbidity' scenario). Nevertheless, alternative scenarios have been put forward '*rejuvenating*' these profiles ('dynamic equilibrium' and 'compression of morbidity' scenarios). A linear association with slope -1 has been assumed between the proportion of years increased in life expectancy lived in bad health and the coefficient of horizontal displacement of the profiles curve beyond the age of 35. With this being a critical element for the projections, and having found that changes in these profiles have a significant effect in health expenditure sustainability, we have also considered the evolution for the Spanish expenditure profiles between 1998 and 2008.

In order to avoid overestimating the future evolution of health expenditure, death related costs have been incorporated into the projections. It implies that age and sex unit cost profiles must be calculated by distinguishing between decedents and survivors. However, that kind of information in Spain is available only for inpatient care but not for the rest of provided healthcare. To estimate global unit costs broken down by survival status we have classified survivors and decedents according to their pattern of use of health services (including palliative care) on the basis of data from the Spanish Statistics Institute [13] and the Ministry of Health, Social Services and Equality [16,19]. We have estimated the distribution of palliative care expenditure across age–sex groups to improve the imputation of healthcare costs to the group of decedents, as official statistics provide costs only for people who die in a hospital, and not for those who die at home. Thereby, we try to correct the underestimation of cost that would result if palliative care provided out of hospitals were ignored. With this aim, we have revised the Spanish studies that include estimates of the population percentage in need of palliative care, the percentage receiving palliative care, and the coverage of hospital palliative care. The range of ages for people receiving this type of care has been calculated on the basis of confidence intervals for average ages of people in palliative care, which was also reported in available studies [20–29]. Table 1 summarizes the different groups of decedents and survivors that have been considered in the analysis, along with the assumptions of unit cost corresponding to each group and the information sources used to assign the population to each category.

Future health expenditure is estimated in real terms on the basis of age and sex health expenditure profiles and the evolution of the following driving factors: demography, health status and non-demographic drivers which include income, technological change, health policies, institutional settings and productivity. Details on the method used are described in the technical appendix. We estimate future health expenditures for 18 scenarios consisting of different combinations of assumptions for health status development, cost of death and per capita health expenditure, which are described in Table 2.

3. Results

3.1. Expenditure profiles

Fig. 1 shows the profiles of healthcare expenditure for the base year 2008, distinguishing between age, sex and type of care. We find a J-shaped profile, consistent with other studies for Spain [11,30–32].

The expenditure profiles show a high total cost of healthcare services for children aged less than five years, as well as a high unit cost associated to inpatient treatments for this age group, especially for children aged less than one year. From five to forty-five years the data shows an almost constant unit cost, although with a slightly increasing trend. It is after the age of forty-five years when the rhythm of increase of the per capita health expenditure starts to grow at a significant rate, and after the age of fifty-five when it ranges above the average (partially due to the appearance of chronic diseases). For the age group of 55–59, per capita health expenditure is approximately 1.3 times the average and this ratio increases with the age reaching 2.6 for the group of 80+. As from the age of fifteen until the age of sixty, per capita health expenditure for women is higher than for men (even if treatments derived from accidents at young ages are more frequent for men, access to

Table 2
Description of projection scenarios.

Evolution of health status[a]	Evolution of per capita health expenditure					
	As GDP per capita		As GDP per capita with income elasticity for healthcare demand 1.1 converging to 1 in 2060		As GDP per worker	
	Cost of death		Cost of death		Cost of death	
	Excluded	Included	Excluded	Included	Excluded	Included
Expansion of Morbidity	Scenario #1	Scenario #4	Scenario #7	Scenario #10	Scenario #13	Scenario #16
Dynamic Equilibrium	Scenario #2	Scenario #5	Scenario #8	Scenario #11	Scenario #14	Scenario #17
Compression of Morbidity	Scenario #3	Scenario #6	Scenario #9	Scenario #12	Scenario #15	Scenario #18

[a] Detailed description of health status' scenarios is provided in the technical appendix of the paper.

maternity related treatments hold this relative position in the unit cost). After the age of sixty, males spending exceeds that of females due to their higher spending in inpatient care. It is usual to find that rising healthcare expenditure with age tends to dip for the very oldest [31,32]. However, as the age groups we used are not disaggregated beyond the 80+ group, this effect is not fully observed.

Regarding death related costs, our data reveals that decedents in 2008 (0.7% of total population) show a higher rate of use of inpatient care than survivors: 60% of decedents were admitted to hospital, while this percentage was 6% for survivors. The cost of inpatient care delivered to decedents was, on average, 1.5 times higher than that provided to survivors (1.3 for males and 1.6 for females). Fig. 2 shows that, on average, in 2008 decedents had a unit cost 5.4 times higher than survivors. As a consequence of the assumptions shown in Table 1, this ratio does not capture the differences in the cost of death for those decedents who did not receive inpatient care and, therefore, it may be underestimated. The decedents/survivors cost ratio varies depending on age and sex. It shows similar values and a rising trend for males and females until the groups of 5–9-year-olds and 10–14-year-olds, respectively. As of these ages, the ratio shows a decreasing trend, the minimum value corresponding to those aged 80 or over: 1.6 for males and 2.1 for females.

It is worth noting that the above-mentioned profiles have changed in recent years, as it is shown in Table 3. Between 1998 and 2008 per capita healthcare expenditure, at constant prices, has increased for all the age groups, the rise being particularly high for the working-age population, followed by that for the elderly (65 years or more). These results contrast with those obtained in other countries, where per person spending appears to grow more slowly as age increases [33]. Our data reveals that people aged 65 or over show the highest increase in inpatient care expenditure. Moreover, outpatients' data reflects a significant growing trend in spending per person in all ages except the

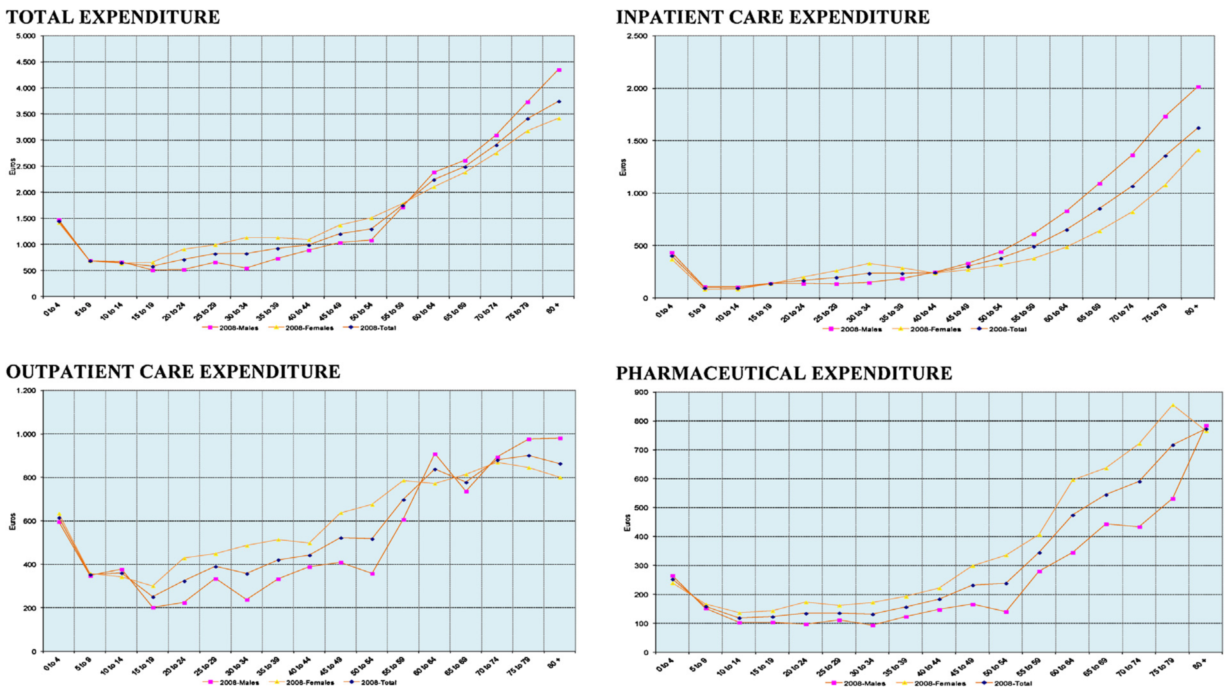

Fig. 1. Profiles of healthcare expenditure in the base year (2008).

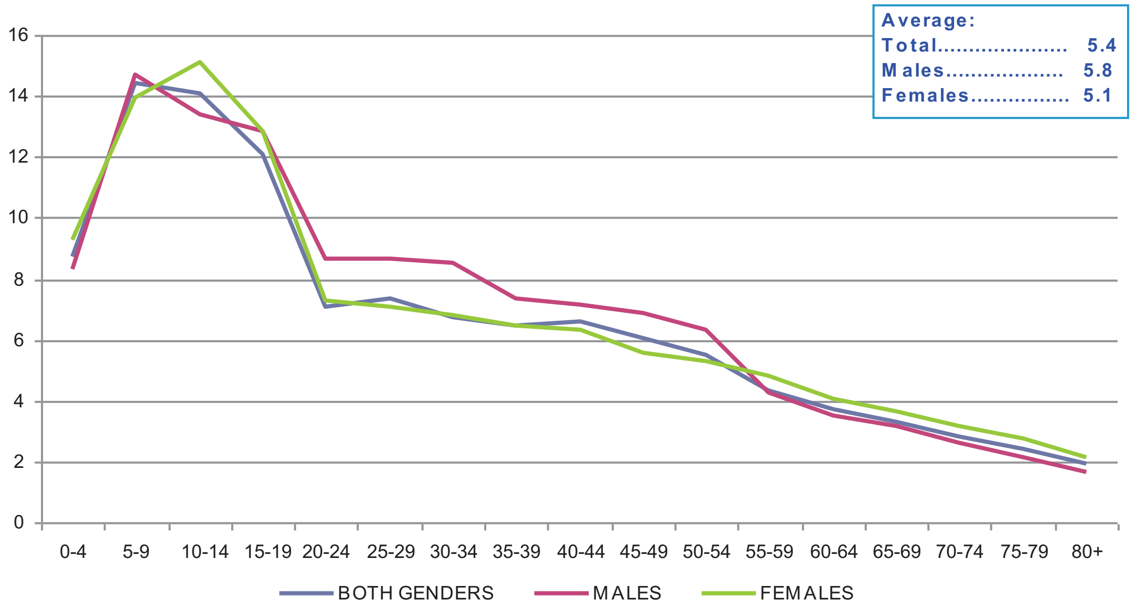

Fig. 2. Decedents/survivors cost ratio in the base year.

youngest. Finally, although all age groups show an increase in pharmaceutical expenditure (linked to drugs prescribed by the general practitioner) between 1998 and 2008, the growth is much more intense in the youngest population. This fact could be reflecting that the oldest population groups have partially substituted prescriptions by pharmaceutical care provided at hospital. According to Table 3, the growth of per capita healthcare expenditure between 1998 and 2008, at constant prices, reached 36.6% (3.2% if expressed as average annual rate, which is well above the GDP rate of growth – 1.9%). These data suggests that the increase in healthcare expenditure is only partially due to the evolution of clinical needs.

3.2. Expenditure projections

Table 4 compares the share of public healthcare expenditure over GDP at the base year with that obtained by the projection exercise for 2060 in all the employed scenarios. Starting at 6.0% of GDP in 2008, health expenditure other than long-term care would grow in real terms to reach, in 2060, between 6.4% and 8.8% of GDP, depending on the scenario used to calculate projections. Therefore, public health expenditure would grow at an average annual rate ranging from 1.8% to 2.4%. The estimated rates of growth under the alternative scenarios are moderate compared to those registered in Spain in the past [11,32,34].

Table 3
Spanish per capita health expenditure, by age groups and type of care, selected years 1998–2008.

	Current Euros			%	Constant Euros			%
	1998	2003	2008	Δ 98–08	1998	2003	2008	Δ 98–08
All types of health care	719	982	1410	96.11%	719	817	982	36.58%
0–19	480	587	847	76.46%	481	489	590	22.66%
20–64	562	748	1131	101.25%	562	622	787	40.04%
65+	1636	2312	3153	92.73%	1636	1923	2196	34.23%
Inpatient care	235	284	433	84.26%	235	236	302	28.51%
0–19	109	132	185	69.72%	109	109	129	18.35%
20–64	178	201	301	69.10%	178	167	210	17.98%
65+	622	768	1235	98.55%	622	639	860	38.26%
Outpatient care	244	352	526	115.57%	244	293	366	50.00%
0–19	253	301	396	56.52%	253	251	276	9.09%
20–64	205	305	480	134.15%	205	254	335	63.41%
65+	378	586	856	126.46%	378	488	596	57.67%
Prescription drugs	155	225	276	78.06%	155	187	192	23.87%
0–19	62	82	164	164.52%	62	69	114	83.87%
20–64	112	150	210	87.50%	112	125	147	31.25%
65+	443	670	659	48.76%	443	557	459	3.61%

Source: own elaboration.

Table 4
Public healthcare expenditure at the beginning and the end of the period (% GDP).

Scenarios	2008	2060	Difference
Scenario #1	6.00	7.88	1.88
Scenario #2	6.00	7.12	1.12
Scenario #3	6.00	6.48	0.47
Scenario #4	6.00	7.79	1.78
Scenario #5	6.00	7.06	1.06
Scenario #6	6.00	6.44	0.43
Scenario #7	6.00	8.27	2.27
Scenario #8	6.00	7.48	1.48
Scenario #9	6.00	6.80	0.80
Scenario #10	6.00	8.17	2.17
Scenario #11	6.00	7.42	1.41
Scenario #12	6.00	6.76	0.75
Scenario #13	6.00	8.82	2.82
Scenario #14	6.00	7.97	1.97
Scenario #15	6.00	7.25	1.25
Scenario #16	6.00	8.72	2.71
Scenario #17	6.00	7.91	1.91
Scenario #18	6.00	7.20	1.20

Nevertheless, they reveal a similar change in the share of public expenditure on health over GDP as that calculated by the AWG in 2009 [3] and are slightly higher than those obtained by previous Spanish studies [30].

All the scenarios include a homogenous global volume effect across population groups plus the differential effects derived from the assumptions. Holding the remaining factors constant except demography (scenario #1), we estimate that the share of the demographic effect in the real rate of increase of health expenditure between 2008 and 2060 accounts for a 25%. Moreover, the impact of different health status evolution assumptions on the projected share of public healthcare expenditure over GDP is quite significant. For instance, in the group of scenarios where per capita health expenditure evolves at the same pace as per capita GDP, the rate of growth of public health expenditure as a share of GDP (which is the sustainability indicator used in this type of exercise) for the whole period ranges from 7.9% – when the compression of morbidity is assumed – to 31.3% – when the expansion of morbidity scenario is considered. If cost of death is included, those percentages range from 7.2% to 29.7%.

Therefore, if gains in life expectancy are to be lived in bad health (as assumed by the expansion of morbidity scenario, which means that per capita expenditure profiles remain constant over time in relative terms), then health expenditure will reach its highest value. By contrast, if gains in life expectancy are to be lived in good health, or even if it is assumed that we will live in good health more years than those gained in life expectancy (compression of morbidity scenario) there will be a significant reduction in health expenditure growth. It is worth noting that when dynamic equilibrium or compression of morbidity scenarios are applied, the implicit assumption is that people age more slowly. The differences between the compression of morbidity scenario and the expansion of morbidity hypothesis range from 1.35 to 1.57 points of GDP in 2060, depending on the final scenario used.

If elasticity of healthcare expenditure with respect to national income is assumed to be 1.1 at the beginning of the projection period (although converging to 1.0 in 2060), the estimates obtained increase with respect to those linked to a constant elasticity of 1.0. Differences in 2060 range from 0.32 to 0.39 points of GDP, depending on the health status hypothesis considered. Again, as health status improves, the difference between projections is reduced.

Moreover, when unit costs evolve at the same rate as GDP per worker, the projections are higher than those obtained when unit costs evolve at the same rate as GDP per capita. These scenarios estimate the evolution in healthcare expenditure under the assumption that healthcare is a highly labour-intensive sector and, consequently, unit costs are driven by changes in labour productivity rather than by growth in national income. As wages are projected to grow in line with productivity and thus generally faster than GDP per capita, this scenario provides an insight into the effects of unit costs in the healthcare sector being driven mostly by increases in wages and salaries.

The growth of health expenditure is reduced, as expected, when the effect of proximity to death is included. This effect diminishes as health status improves. It is important to point out that the overestimation of public expenditure on health when the cost of death is ignored is much lower than that obtained for other countries [35–37]. In our case, the overestimation ranges from 0.04 to 0.11 percentage points (pp), depending on the health status hypothesis, which is also lower than that calculated for Spain by the AWG in previous projections (0.4 pp in the round projections for 2004–2050, and 0.3 pp for 2007–2060). This is due to the fact that, for the Spanish case, the AWG restricted the analysis of the cost of death effect to inpatient care.

4. Discussion

Caution must be exercised in drawing conclusions from this data. First, the impact of the economic crisis on the evolution of demography is uncertain. The significant flow of migrants to Spain in recent years may be affected by this phenomenon, as will the volume and structure of population in the near future. Second, the evolution of economic values outlined in the scenarios has been different in the short-term due to the effect of the economic crisis. Moreover, important health reforms have been implemented in Spain since 2010, curving the growth rate of public health expenditure. Budgetary information available for 2010 and 2011 [38,39] points out that health expenditure showed a low rate of increase in 2010 and decreased in 2011. However, as we stated in the introduction, our analysis focuses on the differences between the results obtained in the sensitivity analysis rather than on the estimated absolute values for future expenditure.

In this paper, we have followed the assumptions made by the AWG for the sake of comparability. However, at least two of the employed assumptions could be highly discussed: firstly, income elasticity is considered as capturing most non-demographic driving factors of expenditure; secondly, productivity in the health sector is assumed to equal productivity in the general economy. With respect to the first assumption, it is derived from the design of the projection model: the evolution of non-demographic drivers, which may be also referred to as 'excess cost growth' [40], is linked to GDP. 'Excess cost growth' is the amount by which per capita health spending is growing faster than per capita GDP growth after controlling for the effect of demographic change, under the assumption of an income elasticity equal to 1. This concept is not defined exactly in the same way as the income elasticity. Whereas the income elasticity should only reflect changes in health care expenditure due to changes in income, the 'excess cost growth' captures other factors than age, health status and income, such as technological change, health policies, institutional settings and productivity. Nevertheless, 'excess cost growth' estimates may be transformed into a measure with a similar interpretation as the income elasticity [4].

The second assumption is based on the fact that the healthcare services production is intensive in human resources. However, it is plausible that global productivity of the economy differs from that corresponding to the healthcare sector. Nevertheless, checking this hypothesis would lead to analyses that are beyond the scope of this work.

The time horizon used (2060) is also the same as the one used by the AWG. It is certainly a long period for projecting health expenditure due to important uncertainties in the evolution of health technologies and in morbidity trends, among other factors. Nevertheless, these projections are developed within a broader exercise regarding other public spending such as pensions, which need wide periods of projection. In any case, on the basis of a ceteris paribus hypothesis, the simulations here shown allowed us to see the effect of improving the population's health status, the importance of non-demographic drivers and the convenience of preventing an overestimation of health expenditure growth by including the cost of death effect.

We also have assumed that the evolution of the per capita health spending is driven by a homogenous global volume effect across population groups, plus a linear displacement effect derived from changes in health status. However, use patterns of healthcare services may also vary across age and sex groups over time due to NHS endogenous decisions, as suggested by our analysis of the evolution of the health expenditure profiles for the period 1998–2008. Finally, further improvements of Spanish data sources are needed in order to obtain more accurate estimates of expenditure profiles and the cost of death effect.

5. Conclusions

In conclusion, expenditure projections are strongly influenced by the choice of health status' hypothesis (compression of morbidity versus expansion of morbidity scenario). The compression of morbidity scenario estimates that expenditures grow more slowly because people is assumed to age more slowly (or to exhibit the patterns of use of younger people). However, our analysis suggests that the use of health services (and therefore the expenditures) depends also on other factors, such as social preferences for health care (related to confidence in what the health system can do for people's health), the supply of care (rapid incorporation of new technologies, organization of healthcare network), professionals' behaviour (defensive medicine), etc. Consequently, in order to keep spending under control – which is a major challenge for the Spanish government at the present time – the concern should focus on those factors mainly affecting intensity of use: health status, economic growth and development, new technologies and medical progress, and the organization and management of the healthcare system.

Conflict of interest

None.

Financial support

No financial support has been provided.

Appendix A. Technical appendix

Description of the projection methodology used by the AWG:

According to the AWG methodology, total health expenditure (*HE*) for a given year t (t = 2008, . . ., 2060) may be calculated by using expression (1):

$$\mathrm{HE}_t = \sum_i \sum_g \sum_l c_{iglt} \cdot P_{iglt} = \sum_i \sum_g \sum_l \tilde{c}_{iglt} \cdot \Delta q_t \cdot \Delta p_t \cdot P_{iglt} \tag{1}$$

where c_{iglt}, unit cost at current prices for each age (i), sex (g), and survival status (l) group, which is approximated by per capita public healthcare expenditure; P_{iglt}, population in each *igl* group; $\tilde{c}_{iglt}$, unit cost at 2008 prices for each *igl* group, after the marginal effect of changes in health status; q_t, volume of healthcare services consumed by each group; p_t, implicit price of public healthcare services; $\Delta q_t = q_t/q_{2008}$, $\Delta p_t = p_t/p_{2008}$.

Demographic variables evolve according to the updated scenarios provided by the AWG in 2010. To simulate the effect of health status variations on healthcare expenditure, we use the three scenarios designed by the AWG: (a) the expansion of morbidity or pure demographic scenario (EoM), which assumes that the gains in life expectancy up to 2060 will be lived in bad health; thus, the age and sex profiles keep constant over time: $\tilde{c}_{iglt} = c_{igl2008} \quad \forall \ i, g, l$; (b) the dynamic equilibrium scenario (DE), which assumes that healthy life expectancy grows at the same rate as total life expectancy; therefore, the number of years lived in bad health remains constant over time. This hypothesis is modelled by shifting the age and sex profiles as follows: $\tilde{c}_{igt} = c_{(i-\Delta e_{igt})g\,2008} \quad \text{for} \quad i \geq 35$, where $\Delta e_{igt} = e_{igt} - e_{ig2008}$, being e_{igt} life expectancy at age i for sex g in year t; and (c) the compression of morbidity scenario (CoM), which assumes that healthy life expectancy grows at a higher rate than total life expectancy; therefore, the number of years lived with diseases or disabilities will decrease. This assumption is modelled by shifting the age and sex profiles as a function of life expectancy as follows: $\tilde{c}_{igt} = c_{(i-2\Delta e_{igt})g2008} \quad \text{for} \quad i \geq 35$.

The evolution of non-demographic drivers is linked to real per capita (or per worker) GDP. It evolves as outlined in the macroeconomic scenarios provided by the AWG and by the Spanish Stability Programme. With respect to income elasticity of healthcare expenditure, which captures most non-demographic driving factors of expenditure, we work with the two core assumptions of the AWG projections: first, we assume that income elasticity equals 1 and remains constant over time; second, we include an alternative hypothesis by assuming that elasticity equals 1.1 in 2008 and converges to 1.0 in 2060. Health expenditure is estimated in real terms, and the price index of public healthcare services is assumed to be equal to that of GDP, according to the AWG methodology.

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