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# PROJECTING HEALTHCARE EXPENDITURE IN SPAIN UNDER DIFFERENT SCENARIOS WITH “COST OF DEATH” APPROACH\*

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1. For years, **health expenditure rates of growth have been an issue of concern** in Spain as in other developed countries. Spanish expert working groups in both State and Regional Institutions have analyzed this topic and made recommendations leading to control expenditure growth and to pace the evolution of this expenditure to that of GDP.
2. Within this framework, studies focused on estimating projections of health expenditure may be useful to **value the depth of sustainability problems of health care systems**. It is also useful to develop these analyses **on the basis of a harmonized methodology** that allows for comparison within the European Union. For this reason the Spanish results are derived from the methodological framework applied by the AWG and the OECD.
3. This research has been developed within the **framework of the Ageing Working Group** analysis aimed at measuring the impact of ageing on public finances.



6. Initially, the health expenditure projections made by the European Union were mainly focused on the **impact of the expected demographic change**, although it pointed out the need to incorporate other factors.
7. In order to capture **the pure ageing or pure demographic effect**, the methodology employed by the AWG consists on computing, for a base year, the amount of per capita expenditure related to different age and gender groups of population. Then, the resulting expenditure profiles are applied to the foreseen demographic structure by assuming that patterns of use of healthcare services remain constant over time and unit costs evolve in line with GDP per capita.
8. **Alternative scenarios** can be foreseen under different hypothesis regarding the drivers underlying health expenditure, others than the demographic factor: health status, unit cost at constant prices (global volume) and prices. For all of them, we consider that the effect of proximity to death, the so called "**cost of death**" hypothesis, should be incorporated.



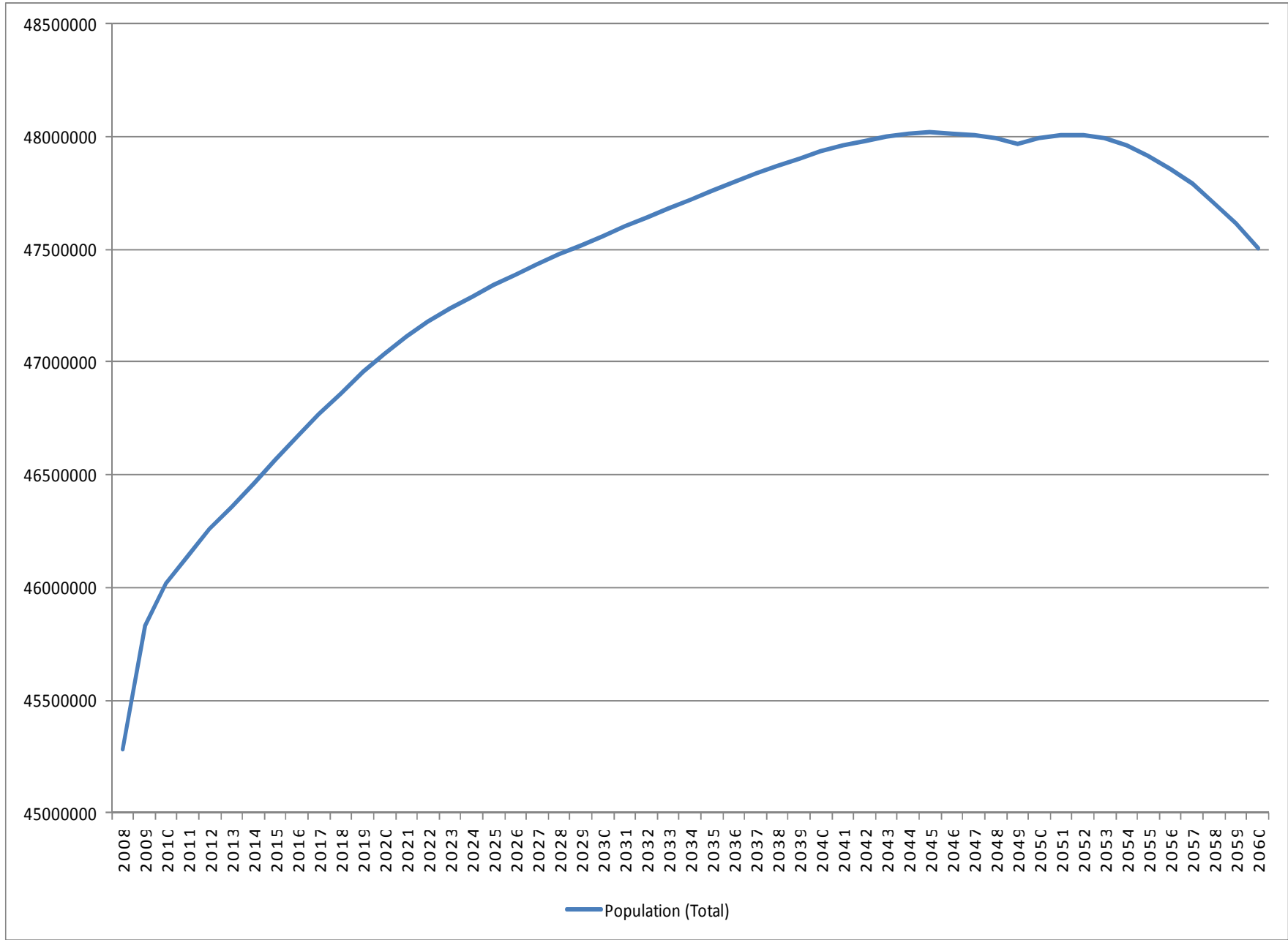
9. So that, in this research, we followed the AWG methodology to calculate projections of the Spanish public healthcare expenditure under different scenarios, which take into account the "cost of death" hypothesis.
10. The **base year** for the projections is **2008**
11. **Demographic and macroeconomic scenarios**, updated in 2010, have been provided by the Spanish delegates in the Aging Working Group (AWG)<sup>1</sup>. They are shown in the next Figures.

<sup>1</sup> We acknowledge Virginia Alonso for his cooperation

# 1. INTRODUCTION/4

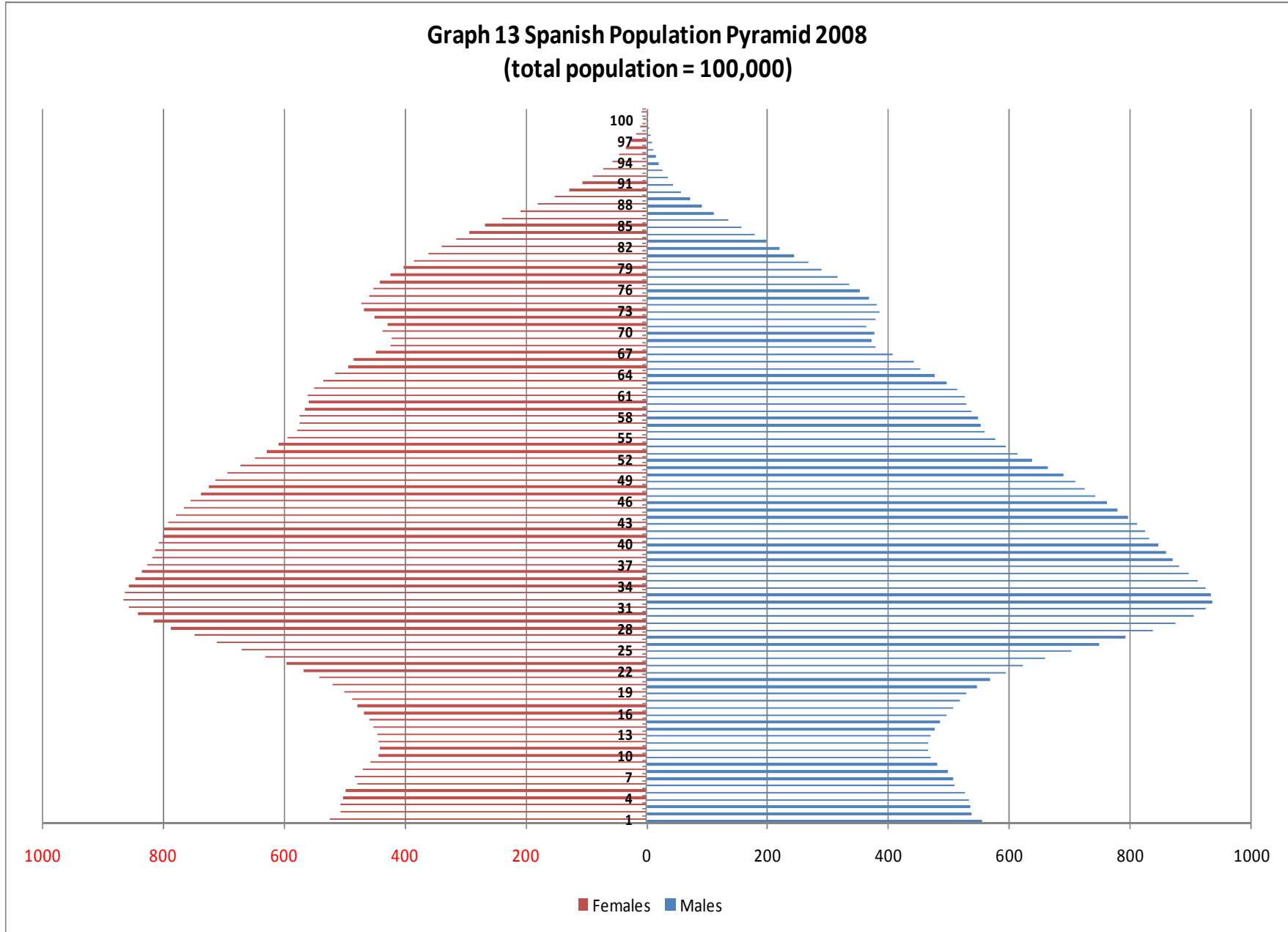


## PROJECTING HEALTHCARE EXPENDITURE IN SPAIN

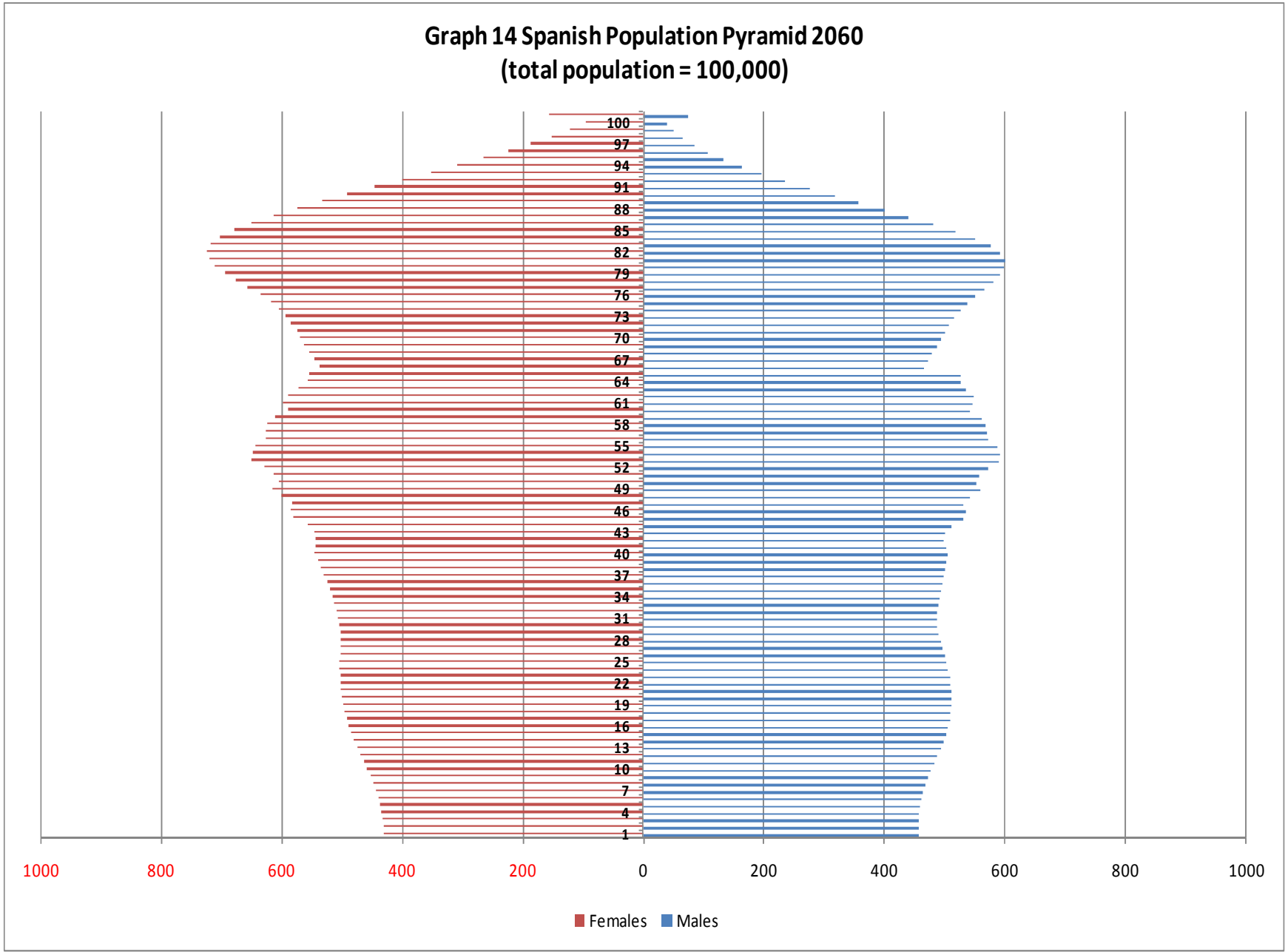




Graph 13 Spanish Population Pyramid 2008  
(total population = 100,000)



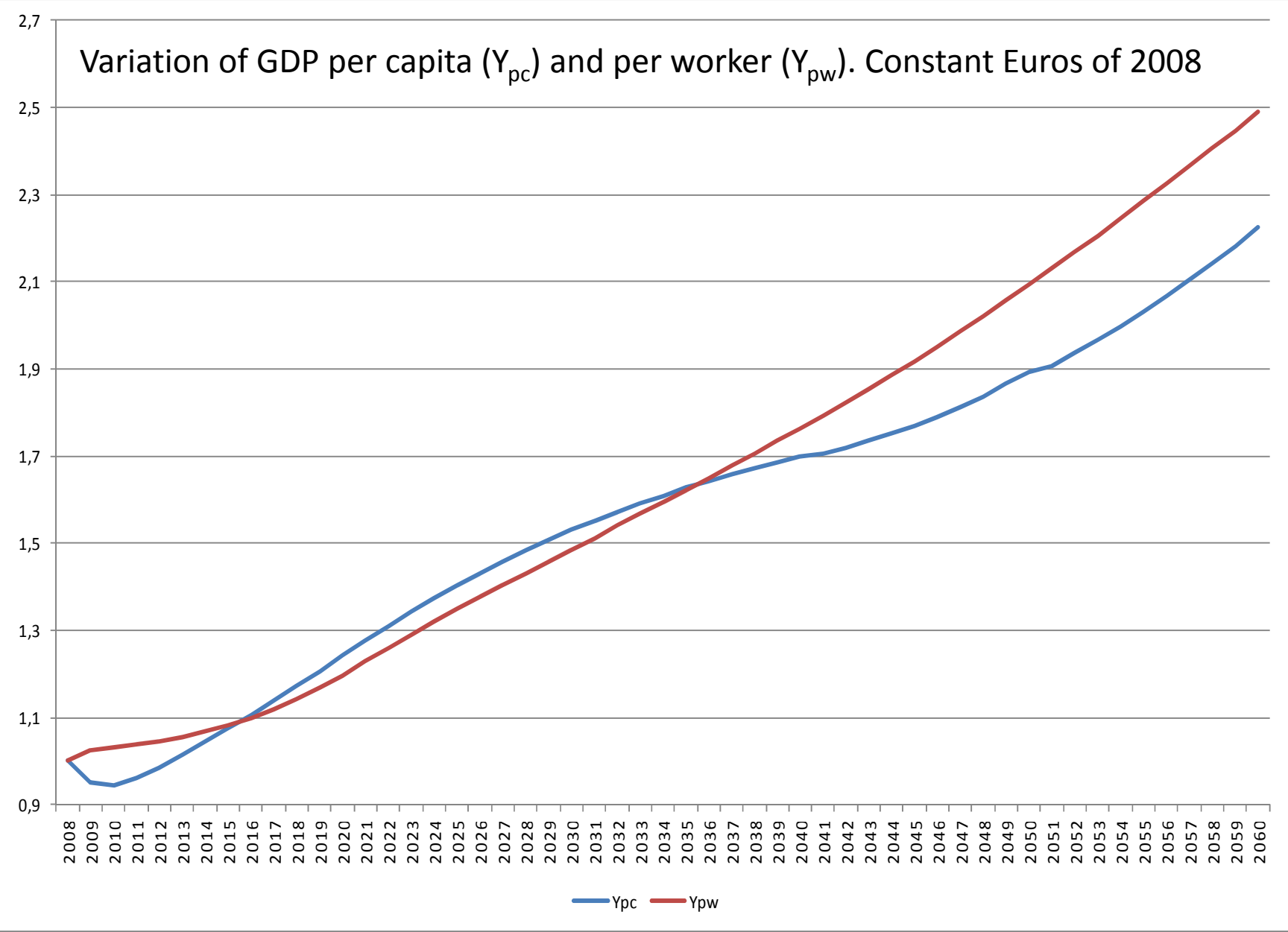
Graph 14 Spanish Population Pyramid 2060  
(total population = 100,000)



# 1. INTRODUCTION/7



## PROJECTING HEALTHCARE EXPENDITURE IN SPAIN





## 2. HEALTHCARE EXPENDITURE PROFILES/1

1. A **top-down approach** has been adopted, starting from total public health expenditure in 2008, by health care function.

SPANISH PUBLIC EXPENDITURE ON HEALTH (SERVICES OF CURATIVE AND REHABILITATIVE CARE)-THOUSAND EUROS 2008

SOURCE	Selected health care function	Thousand Euros
	<b>1-INPATIENT CURATIVE AND REHABILITATIVE SERVICES</b>	
SHA	Inpatient curative and rehabilitative care	19,991,240
	<b>2-OUTPATIENT CURATIVE AND REHABILITATIVE SERVICES</b>	
EGSP	Primary Health Care	10,443,678
SHA&EGSP	Specialized outpatient services	11,946,702
	<b>3- PHARMACEUTICALS AND OTHER MEDICAL NON-DURABLES</b>	
SHA	Pharmaceuticals and other medical non-durables	14,621,650
	<b>4- PATIENT TRANSPORT AND EMERGENCY RESCUE</b>	
SHA	Patient transport and emergency rescue	1,085,280
	<b>5-THERAPEUTIC APPLIANCES AND OTHER MEDICAL DURABLES</b>	
SHA	Therapeutic appliances and other medical durables	200,390
	<b>6-REST OF PUBLIC EXPENDITURE</b>	
SHA	Rest of public expenditure on health (services of curative and rehabilitative care)	6,810,410
	<b>7-TOTAL</b>	
SHA	Total	65,099,350

Sources: EGSP and own calculations on the basis of Eurostat Database.

[http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth\\_sha3m&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_sha3m&lang=en)



## 2. HEALTHCARE EXPENDITURE PROFILES/2

2. **We have allocated total health expenditure** to age and gender groups according to the following criteria:
  1. **Inpatient services:** on the basis of the Minimum Data Set database for hospital discharges, we have distributed total inpatient expenditure (19,991 million Euros in 2008) across population according to the proportion that cost of each age-gender group represents over hospital discharges total cost.



## 2. HEALTHCARE EXPENDITURE PROFILES/3

2. **Specialized outpatient services:** expenditure on specialized outpatient services (11,947 million Euros in 2008) has been distributed across population according to the proportion that visits of each age-gender group represents over total number of visits (estimated with the NHS of 2006).
3. **Primary healthcare:** expenditure on primary healthcare (10,444 million Euros in 2008) has been distributed across population according to the proportion that visits of each age-gender group represents over total number of visits (estimated with the NHS of 2006).
4. **Pharmaceutical expenditure:** expenditure on pharmaceutical expenditure (14,622 million Euros in 2008) has been distributed across population according to the proportion that drugs prescriptions written by NHS physicians for each age-gender group represents over total number of visits (estimated with the NHS of 2006). In 2008 the cost per prescription was 1.46 higher for pensioners compared to active people. Therefore, the number of prescriptions consumed by pensioners is weighted by using that index.



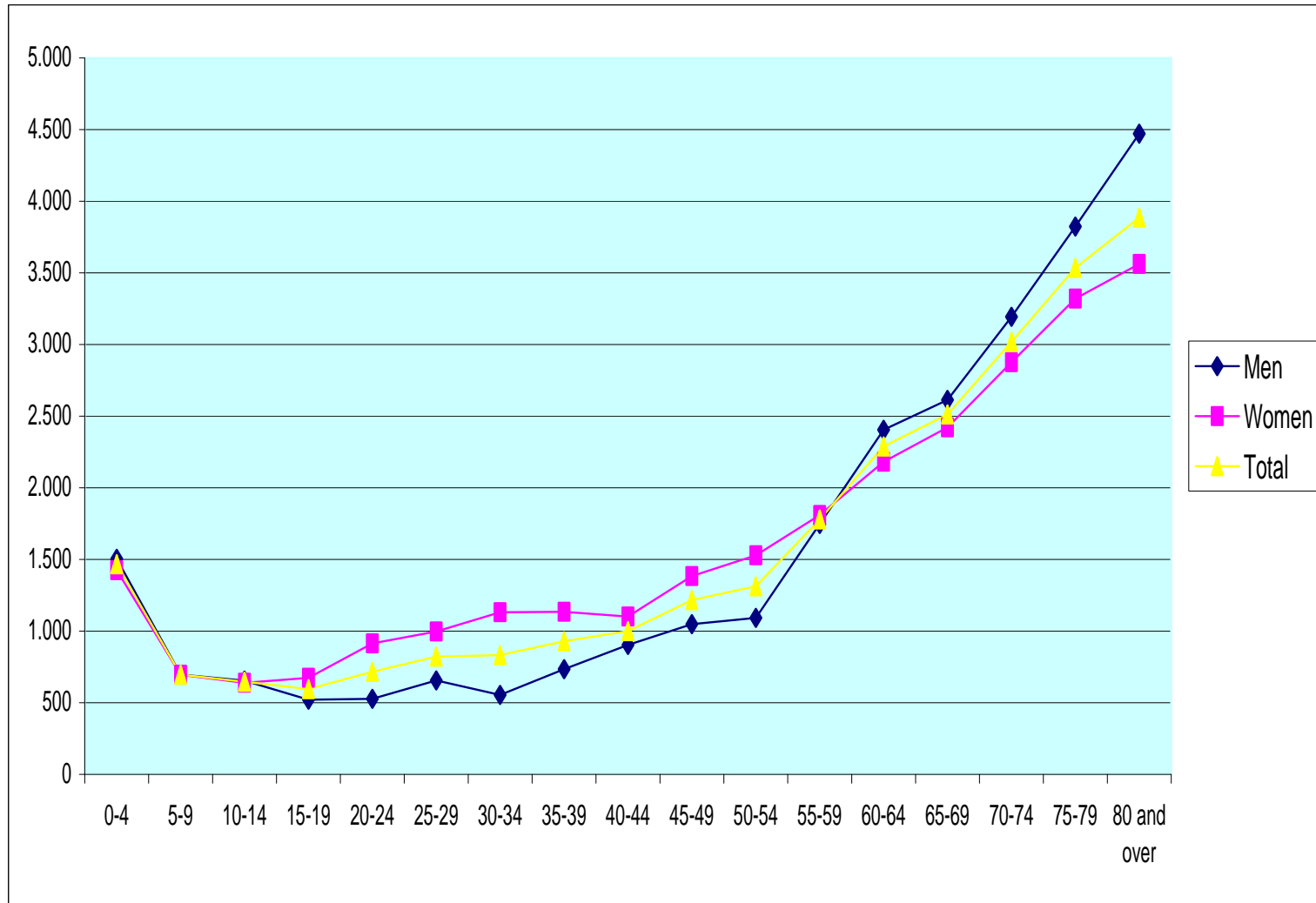
## 2. HEALTHCARE EXPENDITURE PROFILES/6

5. **Patient transport and emergency rescue:** this category of expenditure 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.
6. **Therapeutic appliances and other medical durables:** this component of expenditure has been distributed across population groups according to the percentages for specialized outpatient services, since it is mainly linked to this kind of attention.
7. **Other concepts:** here we include public health, collective health services, capital expenditures, education and training of health personnel and research and development in health. The corresponding amount is distributed according to the estimated percentages for the six categories of expenditure above mentioned.



## 2. HEALTHCARE EXPENDITURE PROFILES/7

Public expenditure on health. Euros per capita (2008).





### 3. INCORPORATING COST OF DEATH/1

In order to incorporate the so called “**cost of death**” to the projections of public expenditure on healthcare, age and gender unit cost profiles must distinguish between decedents and survivors.

$$D = \text{DINP} + \text{DOUT}$$

$$\text{DINP} = \text{DINP1} + \text{DINP2} + \text{DINP3}$$

Where

D= total decedents (321,458 people)

DINP= decedents that have been inpatients during the year (192,211)

DINP1= decedents that have been inpatients during the year and have died in hospital (152,946 people)

DINP2= decedents that have been inpatients during the year and have been sent home under palliative care (12,406 people)

DINP3= decedents that have been inpatients during the year, have been sent home as survival discharges and died at home with no intensive use of health resources (26,859 people)

DOUT= decedents that have only been outpatients during the year (129,247 people)



### 3. INCORPORATING COST OF DEATH/2

Decedent group	Unit cost for inpatient care
DINP1= decedents that have been inpatients during the year and have died in hospital (152,946 people)	Inpatient care: according to data from CMBD
DINP2= decedents that have been inpatients during the year and have been sent home under palliative care (12,406 people)	Inpatient care: assuming a unit cost by age and gender identical to that of people dying at hospital
DINP3= decedents that have been inpatients during the year, have been sent home as survival discharges and died at home with no intensive use of health resources (26,859 people)	Inpatient care: assuming a unit cost equal to that for inpatient survivors

Note: please notice that each decedent bear a uniform cost for outpatients services

Decedent group	Unit cost for outpatient care
DOOUT= decedents that have only been outpatients during the year (129,247 people)	Outpatient care: unit cost equals to per capita expenditure on outpatient specialized services, primary healthcare, prescription drugs and the rest of expenditure categories (except inpatient care)



### 3. INCORPORATING COST OF DEATH/3

$$S = \text{SINP} + \text{SOUT}$$

S= total survivors

SINP= survivors that have been inpatients during the year

SOUT= survivors that have only been outpatients during the year

Survivor group	Unit cost for inpatient care
SINP= survivors that have been inpatients during the year	Inpatient care: according to data from CMBD

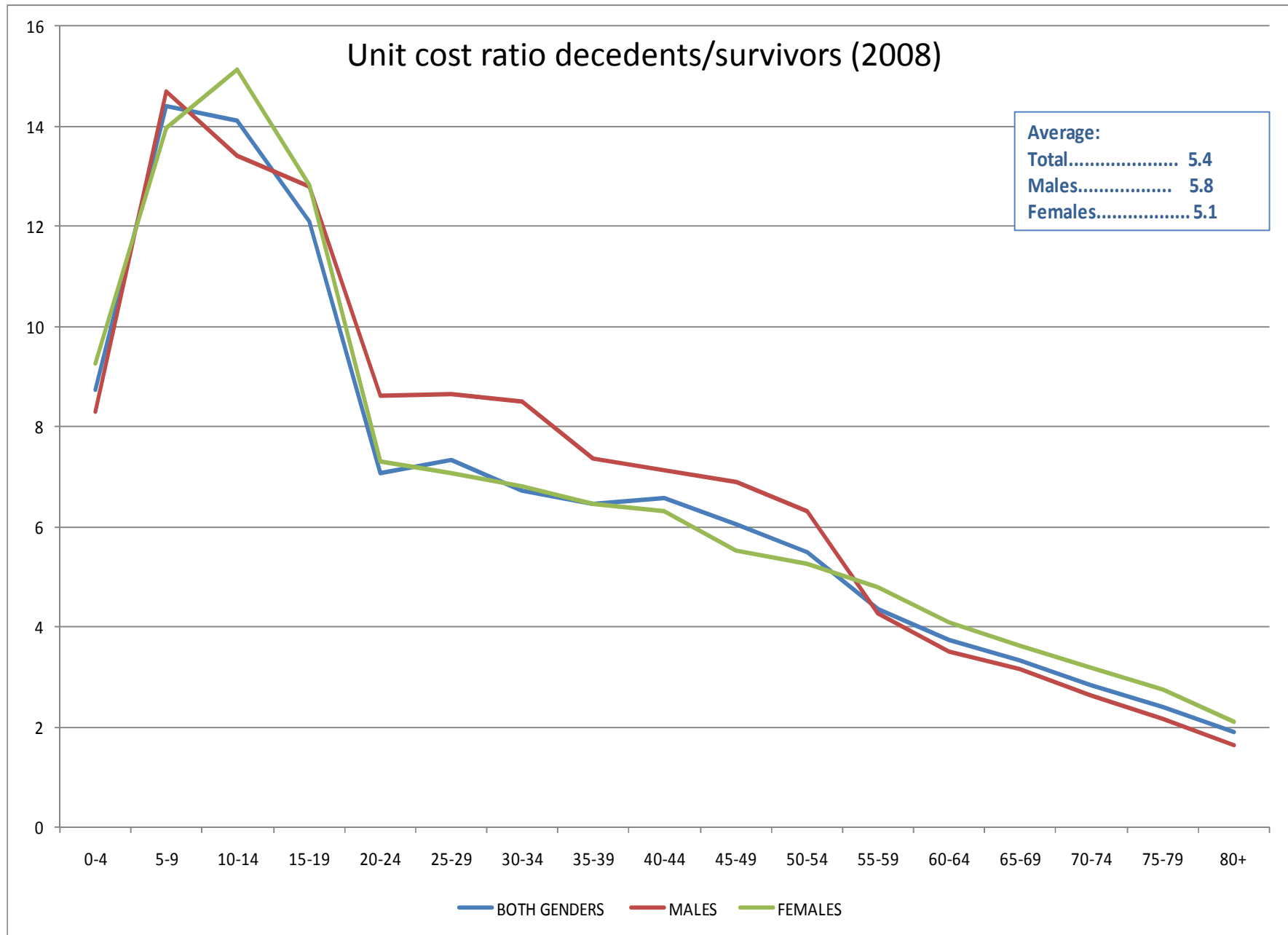
Note: please notice that each decedent borne a uniform cost for outpatients services

Decedent group	Unit cost for outpatient care
SOUT= survivors that have only been outpatients during the year	Outpatient care: unit cost equals to per capita expenditure on outpatient specialized services, primary healthcare, prescription drugs and the rest of expenditure categories (except inpatient care)

### 3. INCORPORATING COST OF DEATH/4



PROJECTING HEALTHCARE EXPENDITURE IN SPAIN





## 4. METHOD AND DESCRIPTION OF SCENARIOS/1

For a given year  $t$  ( $t=2008\dots2060$ ):

$$HE_t = \sum_i \sum_g \sum_l c_{iglt} \cdot P_{iglt} = \sum_i \sum_g \sum_l \tilde{c}_{iglt} \cdot \Delta q_t \cdot \Delta p_t \cdot P_{iglt} \quad (4)$$

where:

$HE_t$  = total health expenditure

$c_{iglt}$  = unit cost (per capita health expenditure) at current prices for each age(i), gender(g) and survival status(l) group

$P_{iglt}$  = population in each igl group

$\tilde{c}_{iglt}$  = unit cost at 2008 prices for each age(i), gender(g) and survival status(l) group, after the marginal effect of changes in health status

$q_t$  = volume of health care services consumed by each group

$p_t$  = implicit price of public healthcare services

$$\Delta q_t = \frac{q_t}{q_{2008}}$$

$$\Delta p_t = \frac{p_t}{p_{2008}}$$



## 4. METHOD AND DESCRIPTION OF SCENARIOS/2

### DRIVERS OF HEALTH CARE EXPENDITURE

1. **Demographic effect:** due to changes in the volume and age-gender distribution of population.
2. **Cost of death effect:** related to the cost ratio decedents/survivors for healthcare.
3. **Health status effect:** expenditure profiles are considered as a proxy of morbidity distribution. Therefore, expected changes in morbidity will have impact on health care expenditure.
4. **Global volume effect:** it includes the variation in quantity and quality of care, caused by changes in technology or in medical practice. This effect is assumed to be the same across population groups.
5. **Price effect:** due to variations in prices of public healthcare.



## 4. METHOD AND DESCRIPTION OF SCENARIOS/3

### DRIVERS OF HEALTH CARE EXPENDITURE

1. **Estimations of population** (volume and age-gender structure) for the period 2009 to 2060 are taken from the demographic scenario of the AWG for Spain , updated in 2010 . According to these estimations, the Spanish population will grow from 45,283,259 in 2008 to 47,507,846 in 2060.
2. **The highest healthcare costs associated with those who die** is captured by considering the number of decedents and survivors in each age and gender group and differentiating their respective average unit costs in the base year. We will calculate each scenario with and without the “cost of death” assumption.



## 4. METHOD AND DESCRIPTION OF SCENARIOS/4

### DRIVERS OF HEALTH CARE EXPENDITURE

3. Regarding the **health status**, we consider the scenarios followed by the AWG:
  1. **Expansion of morbidity hypothesis (EoM)**: the gains in life expectancy up to 2060 are assumed to be lived in bad health;
  2. **Dynamic equilibrium hypothesis (DE)**: healthy life expectancy grows at the same rate as total life expectancy; thus, the number of years lived in bad health remains constant over time.
  3. **Compression of morbidity hypothesis (CoM)**: healthy life expectancy grows at a higher rate than total life expectancy; therefore, the number of years lived with diseases or disabilities will decrease.



## 4. METHOD AND DESCRIPTION OF SCENARIOS/4

### DRIVERS OF HEALTH CARE EXPENDITURE

4. The **global volume effect** can be thought of as implicitly encapsulating the impact of all non-demographic drivers of expenditure affecting uniformly quantity and quality of care consumed by each inhabitant. We elaborate projections under three different cost scenarios:
  1. Unit cost evolves at the same rate as **GDP per capita (Ypc)**.
  2. Unit cost evolves at the same rate as **GDP per worker (Ypw)**.
  3. **Income elasticity** of healthcare demand is equal to 1 in 2008 to 2010 and that it will grow to 1.1 in the year 2011, converging since then in a linear manner to 1 by the end of projection horizon in 2060.



## 4. METHOD AND DESCRIPTION OF SCENARIOS/5

## EXAMPLE

*Scenario # 9.*

CoM(GDPpc)e: healthy life expectancy grows at a higher rate than total life expectancy; unit cost evolves according to GDPpc, but assuming that income elasticity for healthcare demand equals to 1.1 in the base year and converges in a linear manner to 1 by the end of projection horizon in 2060; cost of death is ignored.

*Health expenditure projection formula:*

$$HE_t = \sum_i \sum_g \tilde{c}_{igt} \cdot \left[ \frac{c_{t-1}}{c_{2008}} \left[ 1 + \varepsilon_t \left( \frac{Ypc_t}{Ypc_{t-1}} - 1 \right) \right] \right] \cdot P_{igt}, \forall t \geq 2009$$

$$\tilde{c}_{igt} = c_{(i-2\Delta e_{igt})g2008} \quad \text{for } i \geq 35$$



## 4. METHOD AND DESCRIPTION OF SCENARIOS/6

### EXAMPLE

*Scenario # 12:*

CoM&CoD(GDPpc)e: healthy life expectancy grows at a higher rate than total life expectancy; unit cost evolves according to GDPpc, but assuming that income elasticity for healthcare demand equals to 1.1 in the base year and converges in a linear manner to 1 by the end of projection horizon in 2060; cost of death is included (the cost ratio decedents/survivors remains constant over time).

*Health expenditure projection formula:*

$$HE_t = \sum_i \sum_g \sum_l \tilde{c}_{iglt} \cdot \left[ \frac{c_{t-1}}{c_{2008}} \left[ 1 + \varepsilon_t \left( \frac{Ypc_t}{Ypc_{t-1}} - 1 \right) \right] \right] \cdot P_{iglt}, \forall t \geq 2009$$

$$\tilde{c}_{igst} = c_{(i-2\Delta e_{igt})gs} 2008 \quad \text{for } i \geq 35$$

$$\tilde{c}_{igdt} = \frac{c_{igd} 2008}{c_{igs} 2008} \cdot \tilde{c}_{igst}$$



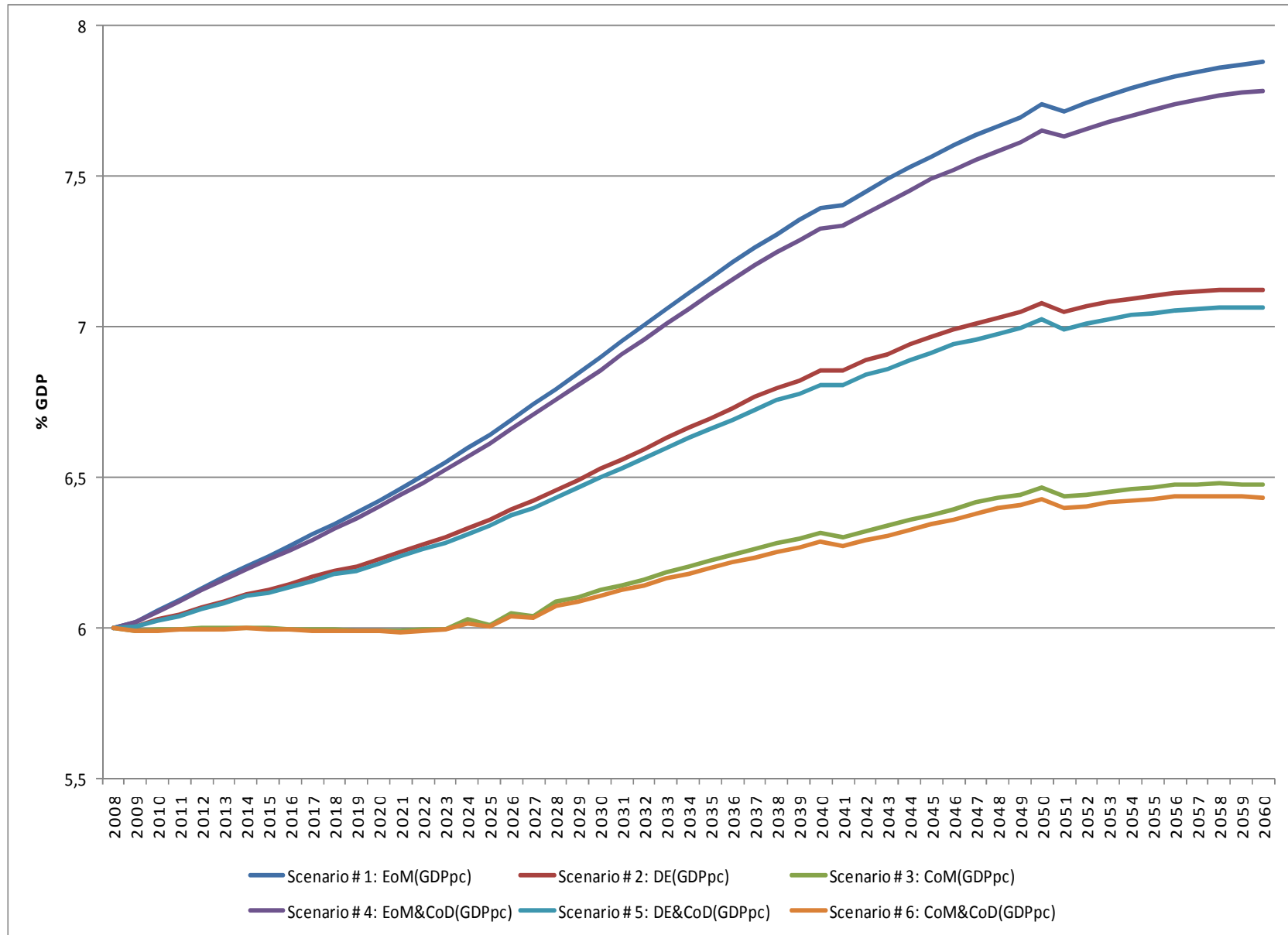
## 5. RESULTS: PROJECTIONS OF SPANISH HEALTHCARE EXPENDITURE/1

Health expenditure as a share of GDP (%) in 2008 and 2060.

<b>SCENARIOS</b>	<b>2008</b>	<b>2060</b>	<b>DIFFERENCE</b>
Scenario # 1: EoM(GDPpc)	6.00	7.88	1.88
Scenario # 2: DE(GDPpc)	6.00	7.12	1.12
Scenario # 3: CoM(GDPpc)	6.00	6.48	0.47
Scenario # 4: EoM&CoD(GDPpc)	6.00	7.79	1.78
Scenario # 5: DE&CoD(GDPpc)	6.00	7.06	1.06
Scenario # 6: CoM&CoD(GDPpc)	6.00	6.44	0.43
<b>SCENARIOS</b>	<b>2008</b>	<b>2060</b>	<b>DIFFERENCE</b>
Scenario # 7: EoM(GDPpce)	6.00	8.27	2.27
Scenario # 8: DE(GDPpce)	6.00	7.48	1.48
Scenario # 9: CoM(GDPpce)	6.00	6.80	0.80
Scenario # 10: EoM&CoD(GDPpce)	6.00	8.17	2.17
Scenario # 11: DE&CoD(GDPpce)	6.00	7.42	1.41
Scenario # 12: CoM&CoD(GDPpce)	6.00	6.76	0.75
<b>SCENARIOS</b>	<b>2008</b>	<b>2060</b>	<b>DIFFERENCE</b>
Scenario # 13: EoM(GDPpw)	6.00	8.82	2.82
Scenario # 14: DE(GDPpw)	6.00	7.97	1.97
Scenario # 15: CoM(GDPpw)	6.00	7.25	1.25
Scenario # 16: EoM&CoD(GDPpw)	6.00	8.72	2.71
Scenario # 17: DE&CoD(GDPpw)	6.00	7.91	1.91
Scenario # 18: CoM&CoD(GDPpw)	6.00	7.20	1.20

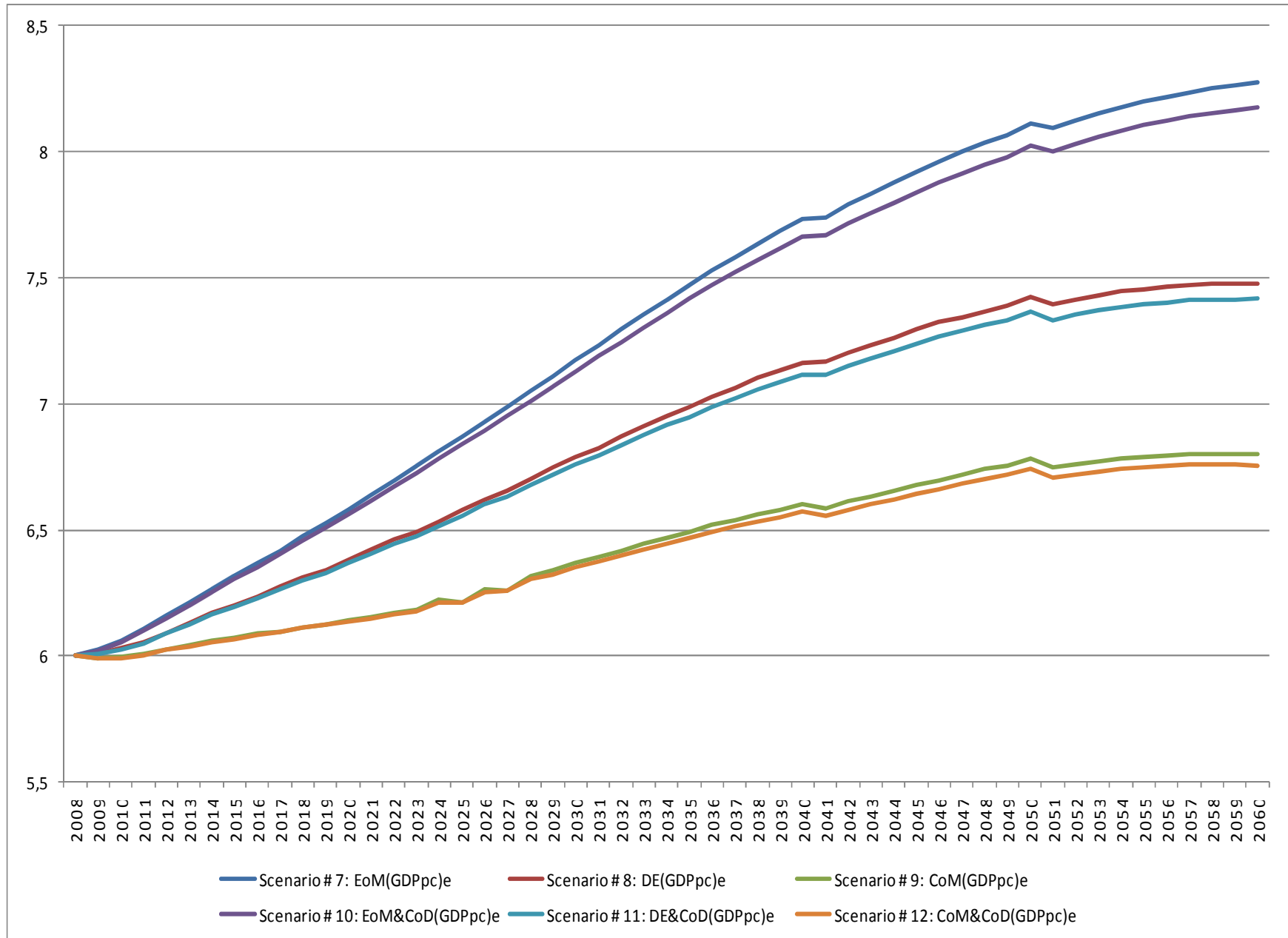


## 5. RESULTS: PROJECTIONS OF SPANISH HEALTHCARE EXPENDITURE/2





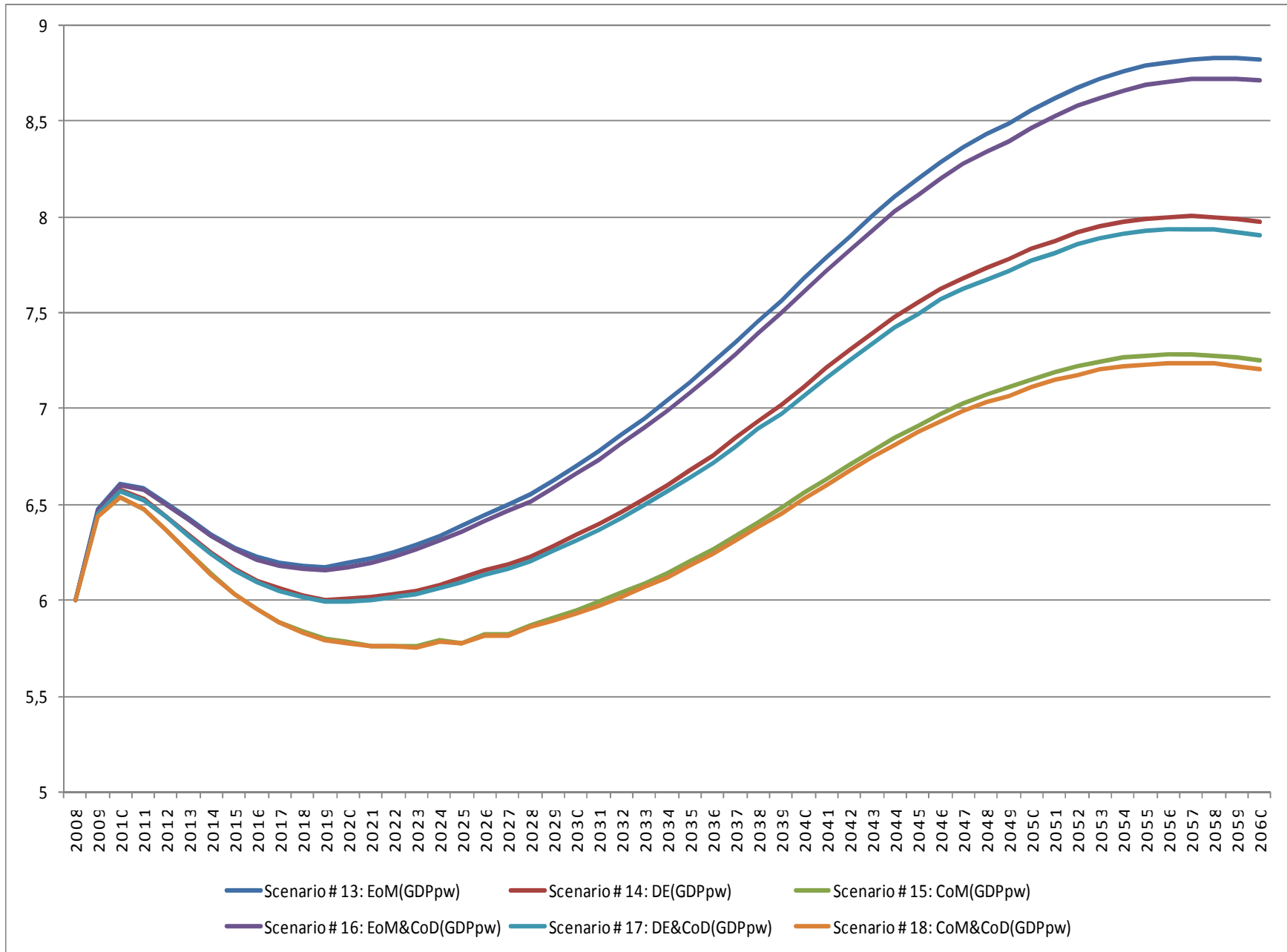
## 5. RESULTS: PROJECTIONS OF SPANISH HEALTHCARE EXPENDITURE/3





# PROJECTING HEALTHCARE EXPENDITURE IN SPAIN

## 5. RESULTS: PROJECTIONS OF SPANISH HEALTHCARE EXPENDITURE/4



## 6. CONCLUSIONS/1



1. Our results further support the fact that the demographic effect is not the main driver of health expenditure, shifting the focus of concern to other factors.
2. As expected, the results point to a more temperate pressure of demography when considering the "cost of death" hypothesis. These estimations, nevertheless show a lower intensity of the proximity to death effect that previous estimations carried out for the 2005 AWG round of projections.
3. We also found that the improvements in health status will moderate the effect of cost of death hypothesis. Improving health status has a significant impact in reducing health expending.
4. Increasing the quantity of health services consumed at a higher rate than GDP per capita has also significant impact. We could not disentangle from this global effect that of endogenous factors related to the health system's response to new patterns of morbidity arising from ageing. More research is needed on this field.



THANK YOU FOR YOUR ATTENTION

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