

Chapter 2

Bio- and Health Gerontology: How Ageing Changes Our Bodies

Joel Ankri and Bernard Cassou

2.1 Summary and Learning Goals

Bio- and health gerontology investigate physical change during the ageing process. While biogerontology focusses on the physical mechanisms of ageing, health gerontology discusses health status in old age and health care for older people. Among older Europeans, cardiovascular diseases, cancer, diabetes, and dementia are common ailments. Fortunately, most European countries have well-developed health and long-term care systems, that help families support care to frail older people.

After reading this chapter, you should be able to:

- Give two different definitions of health
- Name three strategies to facilitate healthy ageing
- Name the four most common diseases among older Europeans
- Give a short overview of formal and informal care arrangements for frail older Europeans

2.2 What are Bio- and Health Gerontology?

Ageing is a complex process involving biological, social, psychological, environmental and spiritual components. Gerontology is the study of these components and their interrelations, with the sub-disciplines bio- and health gerontology focusing on physical processes.

Biogerontology is the scientific field of biologists and biochemists who study the ageing process on a molecular level, and who explore how this process affects organs and consequently the entire body. Typical questions raised and answered by biogerontologists are how caloric restriction contributes to a longer life, why human cells die, how organs maintain homeostasis—that is the stabilization of health and function—and how free radicals affect our life-expectancy. Biological aging of the

J. Ankri · B. Cassou (✉)

Laboratoire Santé-Environnement-Vieillessement, Université Versailles St-Quentin,
Hôpital Sainte Péline, Paris, France
e-mail: bernard.cassou@spr.aphp.fr

body is seen as the result of the appearance and disappearance of the cells of all organs. Cells die and are replaced by new cells, which is part of the normal functioning of organs (Lafontaine 2009). Aubrey de Grey, a contemporary biogerontologist from Great Britain, conducted a series of studies on the free radical theory and the role of mitochondria and, based on his research, concludes that ageing should be seen as a disease. He states that "...as medicine becomes more and more powerful, we will inevitably be able to address ageing just as effectively as we address many diseases today" (De Grey 2006: 66). This might, according to De Grey, happen in the near future, because "the first person to live to 1.000 might be 60 already" (De Grey 2006: 67). However, this statement might be overly optimistic. Biogerontologists use animals such as flies, worms, or rats for their studies, and it is, consequently, unclear whether the study results can be generalized to humans. Some other gerontologists, therefore, remark that even though De Grey proposes different approaches to postpone ageing, "none of these approaches has ever been shown to extend the life span of any organism, let alone humans" (Warner et al. 2005: 1006).

Health gerontology is the scientific field of doctors, who do clinical research, and epidemiologists, who study populations either cross-sectionally or longitudinally. It is closely linked to the social and environmental aspects of human ageing. Health gerontology focuses on bodily changes with age, the consequences of this change for daily living, and the use of health care services. Some of its guiding questions are how one can increase the healthy life expectancy, and how one can help people to live longer and remain active. When studying these questions, health gerontology pays attention to social inequalities, for example between different income groups and between different educational levels. Moreover, it underlines two levels of health-related intervention. Intervention at the individual level might, for example, focus on health promotion and disease prevention. Intervention at the level of populations, in contrast, might e.g. focus on poverty prevention, housing conditions, and the organization of health and social care systems.

2.3 Central Theories and Concepts in Bio- and Health Gerontology

Europeans live longer than ever before. However, not all of the added live years are healthy ones. Indeed, old age often goes hand in hand with diseases and discomfort. But where does health end and disease start? This question is hard to answer, because health can be understood in different ways. The next paragraphs explain what health can mean and how one can promote it.

2.3.1 What Is Health in Old Age?

In its traditional understanding, health is the freedom from disease. As individuals age, their health deteriorates, and they develop diseases. In other words, old age and good health were traditionally seen as mutually exclusive states.

The perceived opposition between health and old age can be explained with the concept of senescence. The term “senescence” describes the process of biological ageing. With senescence, bodies react to changes more slowly and, consequently, recover from illnesses and accidents with more difficulty. Therefore, health declines in old age and diseases become more common (Ricklefs 2008). Brody and Schneider (1986) pointed out that there might be two different reasons why older people have more health problems. The first reason is that ageing itself causes health to decline. This is the case for e.g. coronary heart disease, which can lead to strokes. The second reason is that diseases are not caused by the ageing process itself, but simply require a longer period of time to develop, which means that they can only manifest in older ages. This mechanism is discussed for e.g. certain types of cancers (Masoro 2006). Brody and Schneider’s differentiation raises an important question: Which bodily changes in old age are normal processes and which ones signal diseases? Unfortunately, this question cannot be answered conclusively.

Thanks to medical progress, many health problems can nowadays be cured. Especially acute health problems, e.g. in the aftermaths of accidents or infections, can often be treated to recovery. Chronic health problems, such as rheumatism and diabetes, on the other hand, cannot be treated to recovery. Only the symptoms of these health problems can be managed, which can allow the affected individuals to lead a normal life in spite of the chronic disease (Clark 2003). Due to senescence, especially older people are prone to suffer from chronic diseases, often even from multiple ones at the same time. Older people might, therefore, find it difficult to carry out everyday activities.

The crucial question, however, is how older people think about their health status. The mere presence of diseases or disabilities does not necessarily mean that older people consider themselves in poor health. In fact, older people sometimes describe their own health status as good, even when they were diagnosed with several diseases (Kelley-Moore et al. 2006). This fact suggests that we need to also pay attention to older people’s perceptions and self-assessments when we discuss health in old age.

2.3.2 A More Positive Approach

The World Health Organization (WHO) recognized that health is more than just a physical state, and therefore suggested a broader understanding of this term. In its constitution of 1948, the WHO defined health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO 1946). The important difference to previous definitions of health is that the WHO also includes the subjective aspect of social well-being in its considerations.

But what exactly is social well-being? Gerontologists equate it to a good quality of life, and therefore consider health in old age as a question of quality of life. They, moreover, argue that quality of life has two dimensions. The first dimension is health-related, referring to e.g. discomfort, pain, and energy level. The

second dimension is not health-related, and it refers to personal resources such as the capability to form friendships, appreciate nature and find spiritual satisfaction (Albert 2004). The dual nature of well-being suggests that there also are two ways to maintain good health in old age: preventing diseases and enhancing personal resources. If strategies promoting healthy ageing want to be successful, then they need to consider both ways to main good health.

The expanding healthy life-expectancy further contributes to give old age a positive image. This positive image led to the development of new concepts of old age, most notably the concepts of “active ageing” and of “successful ageing”. According to the WHO (2002: 12), “active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. It allows people to realize their potential for [...] well being throughout the life course and to participate in society according to their needs, desires and capacities, while providing them with adequate protection, security and care when they require assistance”. This idea about ageing currently receives broad attention in the media and in political debates, and the European Commission even named 2012 the “European Year of Active Ageing and Solidarity between Generations” (see the chapter on political gerontology in this volume).

Even though “successful ageing” resembles the concept of “active ageing” in some respects, it received a much more critical reception. Rowe and Kahn (1997) described successful ageing as a combination of three elements: absence of disease and of risk factors for disease, maintenance of physical and cognitive abilities, and engagement in productive activities. Like active ageing, also successful ageing underlines the activities of older people. Unlike active ageing, however, it does not draw attention to quality of life. Instead, it gives the discussion on how to age a normative undertone: If people can age successfully, then they can just as well age unsuccessfully. But what exactly does it mean to age unsuccessfully? Does it mean that people can fail in the process of ageing? And what are the criteria to determine whether one succeeds or fails in the process of ageing? Baltes (1996) suggested that the concept “successful ageing” might even be an oxymoron, because it implies that people age successfully if they do not age at all. For these reasons, discussions on healthy ageing preferably focus on active ageing and quality of life.

2.3.3 How Can We Facilitate Healthy Ageing?

The previous explanations showed that individuals who want to age healthily have many possibilities to reach this goal. The three most important approaches for them are: attempting to slow down the ageing process, learning from health promotion strategies, and utilizing the potentials of preventive medicine.

The first approach to facilitate healthy ageing is to slow down the ageing process. Ageing is a life-long process that starts at birth, and possibly even earlier during the gestational age, in a developmental approach. Likewise, healthy ageing is a life-long process for which the foundations are laid during ones childhood

and youth (Ferraro and Shippee 2009). Adopting a healthy life-style at a young age, therefore, is a central component of strategies that try to slow down the ageing process. Besides life-style changes, also anti-ageing medicines are considered a potential means for slowing down ageing. These medicines can be very different in nature, because they can be based on e.g. vitamins, hormones, or herbal components (Stuckelberger 2008). However, there is no convincing evidence that the administration of any anti-ageing medicine actually slows down the ageing process. It, therefore, seems advisable to focus on maintaining a healthy life-style, which e.g. comprises sufficient physical activity.

The second approach to facilitate healthy ageing is to learn from health promotion strategies. The goal of health promotion strategies is to reduce the risks leading to four diseases in particular: cardiovascular disease (including stroke), lung diseases, diabetes and cancer. These diseases are currently the most common ones among older Europeans (Niederlaender 2006). To prevent these diseases, a combined strategy of not smoking, moderating alcohol intake, maintaining a responsible diet, and engaging in physical activities seems promising (WHO 2011a). Additionally, a stable psychological and social situation seem important, because such a situation helps people cope with the challenges of old age, such as the loss of loved ones (Baltes 1996).

The third approach to promote healthy ageing is to utilize the potentials of preventive medicine. Preventive medicine targets healthy individuals who did not yet fall ill. It strives to avoid that these healthy individuals develop diseases, which would make curative medicine dispensable (Rose 1992). In its efforts to prevent diseases, preventive medicine makes use of the two approaches to healthy ageing just described: slowing down the ageing process, and learning from health promotion strategies. In addition to these approaches, preventive medicine also places great importance on an early diagnosis of diseases, because early diagnosis allows for more effective treatments and higher chances of recovery. Early diagnoses can, therefore, help to ensure good health in old age.

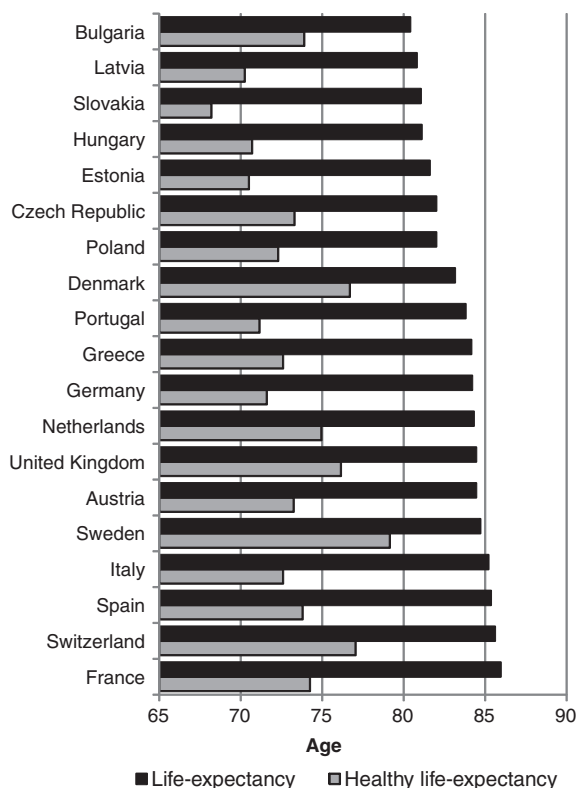
2.4 What Do Bio- and Health Gerontology Tell Us about the Current State of Europe?

Health-related information gives us important insight into the current state of Europe. It allows us to grasp the living situation of older Europeans, and it gives us an impression of families and governments might react to population ageing.

2.4.1 The Health Status of Older Europeans

The health status of older people differs widely across Europe. Figure 2.1 illustrates this fact by displaying information on the life expectancy and healthy life expectancy across Europe. Europeans who had reached the age of 65 years in 2009 could

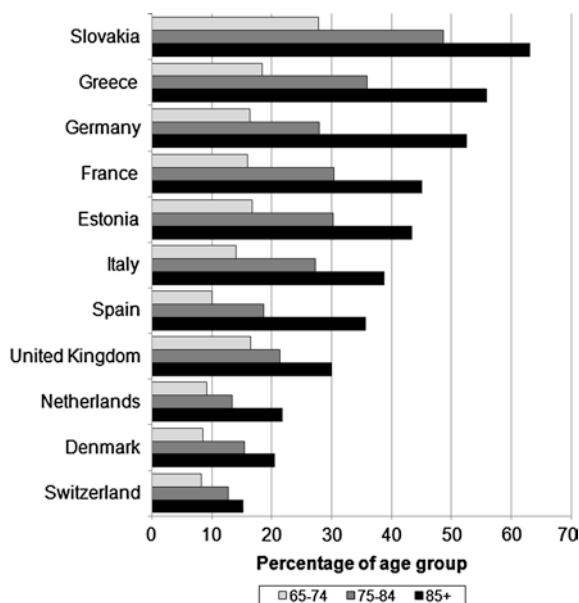
Fig. 2.1 Life-expectancy and healthy life-expectancy at age 65, 2009 (based on Eurostat 2012a)



expect to live for 15–21 more years, depending on the country in which they saw the light of day. They, therewith, reach an age of 80–86 years. The countries with the highest remaining life expectancies at age 65 are geographically dispersed, lying in Continental, Northern and Southern Europe. The countries with the lowest life-expectancies at birth, in contrast, are geographically concentrated in Eastern Europe. Like the life-expectancy, also the healthy life expectancy at age 65 varies considerably between countries. The lowest remaining healthy life expectancy is 3 years in Slovakia, the highest one 14 years in Sweden. The countries with the lower healthy life expectancies are concentrated in Eastern and Southern Europe, the ones with the higher healthy life expectancies in Continental and Northern Europe.

Like the life expectancy, also the capabilities of older people vary across Europe. When older Europeans were asked whether they were severely limited in their everyday activities, several of them confirmed. Generally speaking, the number of people with limitations in their activities increases with age. Figure 2.2 shows that this increase is common in all countries. How many people are limited and how quickly the limitations progress with age, however, is country-specific. In Switzerland, Denmark, and the Netherlands, for example, comparatively few older

Fig. 2.2 Share of people with activity limitations, by age group, in 2009 (Eurostat 2012b)



people are limited in their everyday activities. Moreover, the age-differences in the limitations are comparatively small in these countries. In Slovakia, Greece, and Germany, on the other hand, comparatively many older people are limited in their everyday activities, and the numbers of people with limitations increase quickly with age. However, when it comes to capabilities, there is no clear geographical pattern like the one in life expectancies.

The country-differences in life expectancies and in older people's capabilities are caused by a combination of many health problems and diseases. The corresponding state in which older people are especially vulnerable to have accidents, fall ill, or even die prematurely, is called "frailty" (Fried et al. 2001). They stated that frailty should be considered a disease in three or more of the following criteria are present: unintentional weight loss (4.5 kg in the past year), self-reported exhaustion, weakness (grip strength), slow walking speed, and low physical activity. In 2004, seven per cent of female and three per cent of male Western Europeans aged 50 years and over were frail (Romero-Ortuno et al. 2010). Two important life-style factors are often held responsible for frailty, diseases, and premature death: smoking and a lack of physical activity. Smoking is particularly common among European men with low income, while a lack of physical activity is particularly common among European women with a low educational level. Moreover, the further north older European live, the more physically active they are (Börsch-Supan et al. 2008).

Diseases related to the heart and blood vessels ("cardiovascular diseases"), cancer, and diabetes, play particularly important roles in older age. Cardiovascular diseases have been the leading cause of deaths in developed countries for several

decades, with them being responsible for almost every second death in Europe in 2008 (WHO 2011b). Among Europeans aged 65 years and older, ischaemic heart diseases, such as heart attacks, and cerebrovascular diseases, such as strokes, are the most common cardiovascular diseases. The second most important cause of death in Europe is cancer. Europeans aged 65 years and older are particularly affected by cancer of the lungs, breasts, prostate glands, and the colon (Buchow et al. 2012). Another common disease in Europe is diabetes. In 2010, around 7 % of the Europeans suffered from this disease. Because diabetes is a chronic disease, its prevalence will probably increase as populations age. In Europe, the number of individuals aged 60 years and over with diabetes will probably increase by one third within the next two decades (Shaw et al. 2009).

In addition to physical ailments, older people often also suffer from mental health problems. Late-life depression, for example, is common among older Europeans (Reker 1997). In 2004, every third to every fifth older European was depressed. This share increases from Northern to Southern Europe (Ladin 2008). Possible causes are social isolation, the death of loved ones, health problems, and financial problems (Cole et al. 1999). A second common mental health problem in later life is the decline in cognitive function, e.g. because of dementia. Individuals who are affected by dementia lose several of their cognitive capabilities, e.g. the ones responsible for memory, language, and problem solving (Launer et al. 1999). In 2010, about 7 % of Europeans aged 65 years and older suffered from dementia (Mura et al. 2010). This share will probably increase as the European population ages.

2.4.2 Care for Frail Older Europeans

The previous explanations show that the health profile of Europe changes as the European population ages. As a consequence, care arrangements also need to change. Older people benefit from two kinds of care arrangements: informal and formal ones.

Informal care arrangements are situations in which individuals habitually provide unpaid care to friends or kin. Usually, it is women who provide this care to their partners, parents, in-laws, or children. As populations age, the share of older family members increases. Consequently, women might have to provide care to a higher number of parents and in-laws. This increasing need for care to older persons might be hard to juggle with labour force participation and with child-care. However, population ageing also entails that the share of children in families decreases. This lowers the amount of childcare that needs to be provided, which might ease the situation of informal care-providers. Finally, individuals stay healthy until a later age, which means that older family members might also provide informal care. They, for example, care for their frail spouses, and sometimes they also look after their grandchildren. These activities of older people can further ease the situation of middle-aged women in informal care arrangements (Hinterlong 2008; Komp and Van Tilburg 2010).

Table 2.1 The informal help and care arrangements of older Europeans, 2004

Country	Older person...	
	Received help or care (in %)	Gave help or care (in %)
Spain	15	14
Italy	17	23
Switzerland	19	38
France	20	33
Netherlands	24	41
Greece	25	20
Austria	27	25
Germany	28	33
Sweden	28	42
Denmark	28	48

(Attias-Donfut et al. 2005)

Table 2.1 gives an overview of the informal care arrangements of older Europeans. On the one hand, it shows us how many older Europeans receive informal help or care. This percentage ranged from about 15 % in Spain to 28 % in Sweden, Denmark, and Germany. Generally speaking, the percentage increases the further north an older person lives. On the other hand, Table 2.1 also shows us how many older Europeans provide informal help or care. This percentage ranges from 15 in Spain to 48 in Denmark. Also here we can roughly identify an increase from the South to the North of Europe. When comparing the receipt and the provision of informal help and care, one interesting fact becomes obvious: in many countries, older Europeans help out more than they receive help. This finding underlines that old age nowadays indeed becomes a time of good health and activity for many people.

European policy-makers are aware of the prevalence and importance of informal caregiving, and they, therefore, try to support caregiver in informal care arrangements. For example, they introduced financial incentives in France and Sweden, advisory services for informal carers in the United Kingdom, and they enabled caregivers to become employees of home help services in Sweden (OECD 2011b). These and similar support efforts might make it easier for families to cope with the health-related challenged of population ageing.

The second kind of care arrangement for frail older people is the formal one. Formal care arrangements are situations where paid professionals provide care either in institutions, such as nursing homes, or in the homes of frail persons (OECD 2011a). These professionals sometimes belong to the health care sector, sometimes to the social care sector. In a few European countries, such as Germany, Luxembourg, and the Netherlands, these professionals might even belong to a separate long-term care sector (OECD 2011b). This sector specializes in the provision of care over longer periods of time, which is often necessary with older service users whose health has deteriorated beyond recovery. These older users usually suffer from several health problems, and their care needs change over time. Consequently, they need services from different health and social care providers.

Guaranteeing a suitable combination of care services is another challenge that social and health care services in ageing populations have to meet (Billings and Leichsenring 2005; Hofmarcher et al. 2007).

Table 2.2 presents information on formal care arrangements for older people in Europe. First, this table shows how much different European countries spend on health care and on long-term care. The public health care expenditure in 2009 ranged from 4,500 to 1,000 purchasing power parities (PPP) per capita. Countries with high public health care expenditures are located in Northern and Continental Europe, whereas the countries with the lower public health care expenditures are the Eastern European ones. A similar geographical pattern emerges when we look at public long-term care expenditures. Here, the expenditures range from 4 to 0 % of the gross domestic product (GDP). Second, the table presents information on long-term care facilities. The number of beds for long-term care increases from the South to the North of Europe. In Sweden, there are 81 beds per 1,000 individuals aged 65 years and over. In Spain, in contrast, there are only 31 beds for the same amount of older people. Concerning long-term care workers, the North of Europe has much higher numbers than the rest of the continent. In Norway and Sweden, for example, there are 13 long-term care workers per 1,000 individuals aged 65 years and over. At the other end of the scale are France, the Slovak Republic, the Czech Republic, and Hungary. In these countries, there are only 2 long-term care workers per 1,000 individuals aged 65 years and over. For more information on the long-term care system, see the chapter on political gerontology in this volume.

Table 2.2 Formal health and long-term care in Europe, 2009

Country	Public expenditures per capita		Long-term care facilities (per 1,000 individuals aged 65 years and older)	
	... on health care (in PPP)	... on long-term care (as share of GDP)	... beds	... workers
Norway	4,500	2	63	13
Netherlands	3,900	4	69	8
Denmark	3,700	3	51	9
Austria	3,300	1	41	3
Germany	3,200	1	50	4
France	3,100	2	73	2
Sweden	3,000	4	81	13
Finland	2,400	2	75	3
Spain	2,300	1	31	4
Czech Republic	1,800	0	48	2
Slovak Republic	1,400	0	54	2
Hungary	1,000	0	57	2
Estonia	1,000	0	42	8

(OECD 2011b)

Note PPP = purchasing power parities; GDP = gross domestic product

2.5 Current Debate in Bio- and Health Gerontology: Is a Longer Life Desirable?

Europeans live longer than ever before, and their life-expectancy will probably continue to increase in the future. Policy-makers and health care professionals celebrate this development as a success and they intend to push it even further. But putting the medical possibilities aside—is it even desirable to live longer?

To decide whether longer lives are desirable, we cannot only look at the number of life years gained. Instead, we also need to focus on the quality of these additional life years. A central question in this context is whether the newly gained life years are healthy or disease-ridden ones. Scholars discuss two competing hypotheses about the relation between health problems (“morbidity”) and longer lives: one of these hypotheses describes a compression, the other one an expansion of morbidity. The “compression of morbidity” hypothesis states that the most severe health problems are concentrated in the last years of life. In other words, if we live longer, then we experience more years in good health, and health problems are postponed until a higher chronological age. The “expansion of morbidity” hypothesis, in contrast, states that the number of life years in poor health increases with an increasing life-span. Phrased differently, if we live longer, then we also spend more years battling health problems (Fries 1980; Nusselder 2003).

Empirical evidence shows that both hypotheses might be partly accurate. The most severe health problems indeed seem to be concentrated in the last years of life, while the years before that seem to be characterized by chronic diseases which do not necessarily need to lead to disability (Parker and Thorslund 2007). People who can cope with chronic diseases can, therefore, have a pleasant and satisfying old age, even when the life expectancy continues to expand. Policy-makers and health care professionals should, consequently, consider attitudes and social factors in addition to medical progress when they strive to prolong lives. With suitable medical care, a well-developed social network, and the right attitude, longer lives can indeed be something to look forward to.

Check Your Progress: A Quiz on Bio- and Health Gerontology

Question 2.1: What are definitions of *health*? (multiple answers possible)

- (a) When you did not visit a doctor for at least 8 months
- (b) When you do not have any diseases
- (c) When you experience physical, mental, and social well-being
- (d) When your breathing is normal and you can sleep through the night
- (e) When your body mass index is below 25

Question 2.2: What are strategies to facilitate healthy ageing? (multiple answers possible)

- (a) Make sure diseases do not even start
- (b) Slow down the ageing process
- (c) Move to a big city, so that you have access to many hospitals and doctors
- (d) Learn from health promotion strategies
- (e) All of the above

Question 2.3: What is the main criticism of biogerontology?

- (a) It focusses on biology only and does not pay enough attention to the social aspects of ageing
- (b) It makes absolute statements about ageing, but ageing is subjective
- (c) It mainly studies animals, but it is not clear whether we can generalize the results of such studies to humans
- (d) It is a young discipline and, therefore, still needs a few more decades to develop
- (e) It mainly works with quantitative studies, but we also need qualitative studies to properly understand ageing

Question 2.4: In which part of Europe do governments spend the least amount of money of health care?

- (a) Southern Europe
- (b) Northern Europe
- (c) Continental Europe
- (d) Eastern Europe
- (e) There are hardly any differences within Europe

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Recommended Readings

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This publication gives an overview of the health status of older Europeans, among other topics.
- Organisation for Economic Co-operation and Development. (2011). *Help wanted? Providing and paying for long-term care*. Paris: Organisation for Economic Co-operation and Development.
This book describes long-term care provisions in Europe and beyond.

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