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Why is health treatment for the elderly less expensive than for the rest of the population? Health care rationing in Germany

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Running Head: HEALTH TREATMENT FOR THE ELDERLY

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(4103 words)

Abstract

The consequences of population ageing for the health care system and health care costs may be less severe than is commonly assumed. Hospital discharge data from Germany's largest health insurer (AOK) show that the care of patients during their last year of life is less costly if they die at an advanced age. As a multivariate analysis reveals, oldest old patients receive less costly treatment for the same illness than younger patients. Health care is informally rationed according to the age of the patient. The data also indicate that age-related rationing may be more pronounced in Germany than in the United States. (102 words)

Introduction

It is commonly assumed that population aging will have serious repercussions for the health care system. As the number of older people increases, overall health expenditures are expected to increase as well (Verbrugge 1984; OECD 1988; Shoven, Topper, Wise 1994). Underlying this line of reasoning is the assumption that ageing leads to increased health care costs (i.e. Erbsland, Ried, Ulrich 1999, 174). This assumption appears to be consistent with empirical evidence. In recent decades life expectancy and health care costs have increased hand in hand in all developed countries (OECD 1998). Cross-sectional data exhibit a linear increase in health care demand with age (Koopmanschap et al. 1994, Harrison et al. 1997, Meerding et al. 1998), and a continuing increase in life expectancy is predicted for the near future (Lutz et al.1996; Vaupel, Lundström 1996; Höhn, Rohloff 1997).

Still, there is reason to believe that there may not be a direct causal relationship between ageing and health care costs. The explosion of health care costs at higher ages may be not a function of age per se but of individual proximity to death, since time measures, age, and death are highly correlated in cross-sectional studies. Following Fries‘ hypothesis of the compression of morbidity at the end of an increasingly rectangular surivival curve (Fries 1980), health economists have discovered a positive exponential pattern for medical demand over the life-course. The individual cost distribution over time was demonstrated to be primarily determined by the last year of life, not by chronological age (Turnball et al. 1979; Fuchs 1984; Scitovsky 1988; Lubitz, Beebe, Baker 1995).

Studies of the US medicare population suggest that 27 to 30 percent of all Medicare payments in any given year are spent on the 5 to 6 percent of patients who die during the course of that year (Lubitz, Prihoda 1984). Furthermore, the individual health care expenses of those who die are not evenly distributed over the year but tend to cumulate during the last two months of life. Lubitz and Riley (1993) estimate that about half of an individual’s total health care costs are incurred during the last 60 days of life and that 40 percent arise during the last month. Interestingly, however, payments are lower for older than for younger patients. In 1988, Medicare payments for decedents 65 to 69 years of age averaged $15,436, whereas payments for decedents 90 years of age or older averaged only $8,888 (Lubitz, Riley 1993, 1094). Both of these patterns – the distribution of health care costs over the individual life-course and the low level of health care spending on oldest old patients – did not change between 1976 and 1988 (Lubitz, Riley 1993).

Unfortunately, comparable evidence from outside the US is largely lacking, with the exception of one Canadian study (Demers 1998) and two small sample studies from Switzerland (Zweifel, Felder, Meier 1996) and Japan (Nakajoh et al. 1999), respectively. Hence, the question is, is the decrease in medical expenditures at higher ages a specifically

American pattern due, perhaps, to the specific feature of a private health insurance regime? To answer this question, I perform a similar analysis with German data in the present paper. The German health care system is often considered to be a classic example of a continental European public health care system (Esping-Andersen 1997). For this reason, it seems fair to assume that patterns observed here will also be found in other European countries as well. Furthermore, matching patterns in different health care regimes can help one to arrive at a more universal nexus of health expenses over the life course. The controversial problem of age rationing (Ayres 1996; Lomas 1997; Varekamp, Krol, Danse 1998) will be discussed as a plausible explanation for the decreasing health care costs of elderly deceased patients in the concluding part of this paper.

Data

The analysis is based on hospital claim files from Germany's largest public health insurer, the AOK (Allgemeine Ortskrankenkasse)[1]. The AOK is a union of 17 regional funds. In 1997, the regional fund of Westphalia-Lippe (West Germany) had 1,646,904 members and that of Thuringia (East Germany) 936,916 members. An insured member can be either an gainfully employed or a retired person. Other family dependents (housewives, children) are not listed in the data set.

[1] The German health care system is built on a highly decentralized, statutory health insurance. Another characteristic of the German system is the regional associations of physicians which receive money from the health insurers and reimburse physicians in private practice. The separation of the ambulatory and in-hospital care on the one hand and the decentral organization of the insurer on the other is the reason why there is no national or comprehensive health care claim file available. However, the great extent to which the German population is covered by health insurance is a big advantage. Law mandates that all persons (up to a certain income) have to have health insurance. Fewer then 0.5 percent of the population have no coverage – these are exclusively people with very high incomes who have opted out of the system. (Wahner-Roedler, Knuth, Juchem 1997, 1061ff.). The AOK insures primarily working-class people and people at the lower end of the pay scale.

The hospital claim files of both regions were linked with the membership files from Westphalia-Lippe and from Thuringia to identify deaths that occurred outside the hospital. The costs of each hospital stay were aggregated at the individual level. The date of last discharge in 1997 was defined as the endpoint of one individual year. All hospital costs that occurred during the previous 365 days were added up. If the same or an earlier hospital stay occurred around this cut-off point, only those days were added that also fell within this time frame. For those cases, costs were calculated on the basis of individual mean daily costs.

All AOK members were included in the analysis

- who were at least 20 years old[2],

- who stayed in a hospital in Westphalia-Lippe or Thuringia and,

- whose daily care costs amounted to 100 DM[3] or more.

Since underreporting is not in the interest of the hospitals and overreporting is not in the interest of the sickness fund, the data are fairly reliable. Westphalia-Lippe and Thuringia provide a representative sample of West and East Germany, respectively, which are subject to a proportionally different payment schedule.

Table 1

[2] This age limit was introduced to avoid selectivity.
[3] In 0.4 percent of all cases costs amounted to less than 100 DM per day. Most such cases had missing values. Misreporting, deletion due to incorrect billing or short-term treatments are responsible for those cases that were excluded from the analysis.

Measures and Models

My descriptive analyses reveal the total annual expenses for deceased and non-deceased patients and the age-specific distribution of diseases among the deceased patients. Multivariate regression models test the influence of age discrimination in the presence of factors determined by the disease. Direct measures of the severity of the illness are the length of stay during the observational time, the disease classification, and multi-morbidity[4]. The disease classification refers to the main disease the patient was treated for during his or her last hospital stay. Multiple diseases capture multi-morbidity. The use of high-tech medicine is another indicator of the severity of the disease. Moreover, it is a major factor in health care expenditures (McClellan, Kessler 1999; Fuchs 1999; Harrison et al. 1997). I operationalize this indicator by the department and the size of the hospital where the patient was mainly treated. Age and death within one individual year are also included in the model in order to disentangle confounding time measures. Age and sex variables test whether patients are treated differently because of ascribed characteristics. An ordinary least squares regression model fits the data well[5]. The models were successively extended to control for multicorrelation of certain interactions. Although some estimates deviate in such models, the general pattern remained stable.

[4] In the present data-sets, multimorbidity correlates only weakly with age.

[5] Both regressing the same variables on the logarithm of the costs (Zweifel, Felder, Meier 1996, 34) and running a robust median regression confirm the OLS-models.

Findings

The unequal population of patients

One to two percent of all insured AOK members in Westphalia-Lippe and Thuringia who died in 1997 accounted for 10 to 12 percent of the total annual hospital expenses. This pattern is similar to the skewed distribution of medical costs in the US medicare population. Furthermore, a Lorenz curve reveals that 50 percent of the total hospital population in Westphalia-Lippe and Thuringia account for less than 15 percent of the expenses. And 40 percent of the total hospital expenditures go to the care of 10 percent of the patients.

Figure 1

However, the pattern turns out to be more complex when one breaks these expenses down according to age groups. Health care treatment for people who die between the ages of 20 and 49 costs, on average, 20,691 DM (Westphalia-Lippe) or 16,532 DM (Thuringia) more than the treatment for the non-decedent reference group of the same age. The cost difference between deceased and non-deceased 55 to 60 year-old patients in Thuringia is even slightly larger (16,700 DM). After that, the gap becomes gradually smaller in both populations as age increases. It finally disappears for patients of 85 years and older[6]. The decline in expenses for deceased patients both in Westphalia-Lippe and Thuringia seems to be steeper than in the US medicare population. The cost of treating patients 90 years and older is 53 percent (Westphalia-Lippe) or 57 percent (Thuringia) lower than for 65 to 69

[6] These differences are always larger when only patients who died in the hospital were considered.

year olds. The comparative figure for the US is 42 percent (1988) (Lubitz, Riley 1993, 1094).

Figure 2

Medical expenses for non-deceased patients show a non-linear pattern. They first increase slightly until the age of 75 before they start to decrease steadily and then converge with the expenses for deceased patients.

Why do costs drop at advanced ages?

Age-specific disease patterns

A comparison of ICD-9[7] classes by age group shows that most of the deceased patients were treated for cardio-vascular diseases and cancer, the two main causes of death. However, there are significant differences between the age groups.

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[7] INTERNATIONAL CLASSIFICATION OF DISEASES
ICD I = Infectious and parasitic diseases
ICD II = Malignant neoplasms
ICD III = Endocrine, dietary and metabolic diseases and immune disorders
ICD IV = Blood related diseases
ICD V = Psychiatric disorders
ICD VI = Diseases of the nervous system
ICD VII = Diseases of circulatory system
ICD VIII = Diseases of respiratory system
ICD IX = Diseases of digestive system
ICD X = Diseases of genitourinary system
ICD XI = Pregnancy and delivery related complications
ICD XII = Skin diseases
ICD XIII = Diseases of musculoskeletal system and connective tissue
ICD XIV = Congenital anomalies
ICD XV = Certain perinatal afflictions
ICD XVI = Symptoms and ill-defined afflictions
ICD XVII = Accidents and poisonings

Figure 3

The relative frequencies of the diseases within each age group show the age-specific risks of suffering and dying from specific diseases. Patients who die young are more likely to suffer from cancer than from cardio-vascular diseases. The relative frequency of cancer peaks in both parts of Germany between the ages of 55 and 69 at a level of approximately 30 percent and then decreases continuously among older patients. Only 5.5 percent of patients in Westphalia-Lippe and 4.8 percent in Thuringia who die at 95 or older suffer from cancer, but more than 30 percent suffer from cardio-vascular diseases. Psychiatric disorders are a comparatively 'young disease', while symptoms and ill-defined afflictions do not have a clear age-pattern. Accidents and poisonings occur more frequently among younger and older deceased patients and less frequently among the middle-aged.

Disease-specific cost patterns

Different diseases result in different costs. A comparison of the average costs of 17 ICD groups reveals great differences. Deceased cancer patients represent the highest cost group[8]. They received hospital treatment costing an average of 22,843 DM in Westphalia-Lippe and 24,767 DM in Thuringia during their last year of life. Patients who suffered from diseases of the circulatory system form the lowest cost group. The cost for their hospital stays averaged 14,929 DM in Westphalia-Lippe or 14,754 DM in Thuringia.

Cost differentials between the younger and the elderly population could result either from a shift in the incidence of diseases or from different average costs per ICD among younger and older patients. Two ratios capture this effect. The first compares the cumulated expenses of the younger and the older population by taking only the different frequencies of diseases in both populations into account. The average expenses per ICD class, however, are assumed to be the same in both populations. The second ratio relaxes this hypothetical assumption and compares the cumulated costs of the observed expenses per ICD class and the observed frequencies of each ICD class of the older and the younger population.

1. same average expenses – observed frequencies

$$\frac{\sum_{i=I}^{XVII} \overline{C}_i * P_{ij} \Big/ P_j}{\sum_{i=I}^{XVII} \overline{C}_i * P_{i20-65} \Big/ P_{20-65}},$$

2. observed average expenses – observed frequencies

$$\frac{\sum_{i=I}^{XVII} \overline{C}_{ij} * P_{ij} \Big/ P_j}{\sum_{i=I}^{XVII} \overline{C}_i * P_{i20-65} \Big/ P_{20-65}},$$

where $\overline{C}_i$ indicates the average costs per each ICD class i. P stands for the population, j for the population 20 to 65 years old, 80, 85, 90, and 95 years and older. The numerator is standardized to the 20 to 65 year-old population.

Figure 4

[8] The classes ICD XI (N=2 in Thuringia) and ICD XV (N=1 in Thuringia) were not considered.

The two ratios reveal that differences between the elderly and the younger population are not very substantial when the same expenses per ICD class are assumed. In contrast, relaxing the hypothetical assumption that diseases cause the same costs in different age groups and calculating the ratio with the observed mean costs for the older populations reveals a difference of nearly 60 percent. This difference indicates the presence of an age-specific cost pattern that can be explicitly analyzed in a multivariate model.

Same Disease – Lower Costs at Higher Ages

The first regression model includes all variables that capture the severity of the illness and the therapeutic effort. These variables explain 76.9 percent of the total variance in both Westphalia-Lippe and Thuringia. It is not surprising that the length of a hospital stay is the strongest determinant of the health expenses, and it is highly significant (ß = 0.89 in Westphalia-Lippe, ß = 0.87 in Thuringia). Each day in the hospital increases the costs by more than 425 DM in Westphalia-Lippe and 460 DM in Thuringia. Controlling for the length of stay makes psychiatric disorders the least expensive illness. All other diseases are significantly more costly. Cancer patients are the most expensive. Only the one patient who suffered from afflictions going back to the perinatal development stage exceeded the average costs of cancer treatments in Thuringia.

Tables 2 and 3

The negative effect of multi-morbidity is counterintuitive at first glance. However, considering that physicians are only obliged to declare the major disease, it could be argued that their information regarding additional diseases is not reliable. Only when expenses are significantly higher than the ‘usual’ costs of the primary disease will physicians be more accurate in their diagnosis in order to justify their therapeutic decisions. This would mean that a patient suffering from 4 diseases to be a serious case, a patient with 2 or 3 light illnesses to be a less severe case.

Consider further how the different units of a hospital account for unequal expenses. The results confirm common knowledge. High-tech medicine is an important cost factor. The intensive care unit is the most expensive section of the hospital in Westphalia-Lippe as well as in Thuringia. Furthermore, the university hospital is the most technologically advanced and most expensive type of medical institution in both parts of Germany.

Models 2 and 3 in both tables include age and death as explanatory variables. A comparison of the models in each sample shows that age has a significant but non-linear effect on health expenses. The dominant cost factor, however, is the last year of life, which increases the hospital expenses by more than 6,500 DM in Westphalia-Lippe and more than 5,000 DM in Thuringia. At the same time, dying after the age 80 once again reduces health care costs significantly.

Finally, model 4 shows a set of negative interactions between age and disease-specific costs, most of them significant. The treatment of older patients results in significantly lower costs when they are sick, especially if they suffer from diseases of the blood, from cancer, or from cardiovascular diseases. This negative interaction is stable even if additional factors are taken into account. The model also reveals significant gender differences. The treatment of men costs in Westphalia-Lippe roughly 578 DM and in Thuringia 607 DM more than that of women.

Discussion and Conclusions

This paper has shown that population aging does not necessarily cause an increase in health care expenditures. Using an individual life-course perspective it has demonstrated that it is not chronological age but the proximity of death that determines the cost intensity of health care at higher ages. The health care costs of the last year of life exceed the costs of previous years many times over. Significantly, however, the health expenditures for the last year of life decrease with age in Germany as in the US. In part, this is due to the fact that elderly people suffer from less expensive diseases. However, as the multivariate analysis has shown, oldest old patients also receive less costly treatment for the same disease than younger patients. Health care treatment appears to be rationed for the elderly.

Neither in the American private health insurance system nor in the German public health care system is age rationing legal. Thus, any explanation of the age-discriminating cost pattern has to go beyond differences in institutional structures. I suspect that there are a number of fairly context-independent incentives for doctors to engage in age rationing. Two stick out particularly:

- professional incentives: age is a very visible indicator of probability of death, and a death that occurs during treatment may be considered a medical failure. Hence, physicians may be disinclined to apply ‘risky’ treatment to elderly patients.
- utilitarian considerations. It makes sense in terms of everyday utilitarianism to spend our limited health care resources on the treatment of younger patients, since this will maximize the number of quality life years that can be saved.

While patterns are quite similar in Germany and the US, there are large differences in the level of expenses per deceased patient. Institutions do make a difference. Expenses are higher and the pattern of decline is lower in the US than in Germany (Lubitz, Riley 1993, 1094). This may in part be due to a different health care billing regime, but it may also indicate that age rationing is stronger in the European welfare system than in the US. This could explain why older Americans have a higher life expectancy than older Europeans (Manton, Vaupel 1995).

An important criticism that has been leveled against Lubitz, Beebe and Baker (1995) could also apply to this paper. It does not consider long-term home care for elderly people or care in nursing and old people's homes. Meerding et al. (1998, 113) found that this is a crucial cost factor at higher ages. Unfortunately, German data protection law prohibits linking information from long-term care insurance with hospital discharge data (§ 35 SGB I). Even so, an analysis of German hospital cases before and after the introduction of long-term care insurance in 1995 does not show any change in hospital figures at higher ages (Robra, Swart 1999, 24). Nursing homes may have an incentive to send their clients to the hospital because they receive payments in any case. Furthermore, cross-sectional data show that German expenses for medicine for out-patients decrease after the age of 35 (Schwabe 1997, 613). Still, it will be necessary to trace people's health trajectories completely in the future in order to prove the compression of health care expenses at the end of life.

These limitations notwithstanding, the analysis confirms that health care expenses during the last year of life are not only biologically but also socially determined. My conclusion, then, is ambiguous. On the one hand, there is reason to believe that health care expenditures may actually decrease with the prolongation of life because age rationing is applied officially or inofficially. This is good news, given the usual gloom about exploding health care costs as a consequence of demographic aging. On the other hand, there is reason to believe that lives at advanced ages could be saved if age rationing were discontinued and maximum medical treatment applied to everybody irrespective of age. This is less good news. In fact, it is potentially very unsettling.

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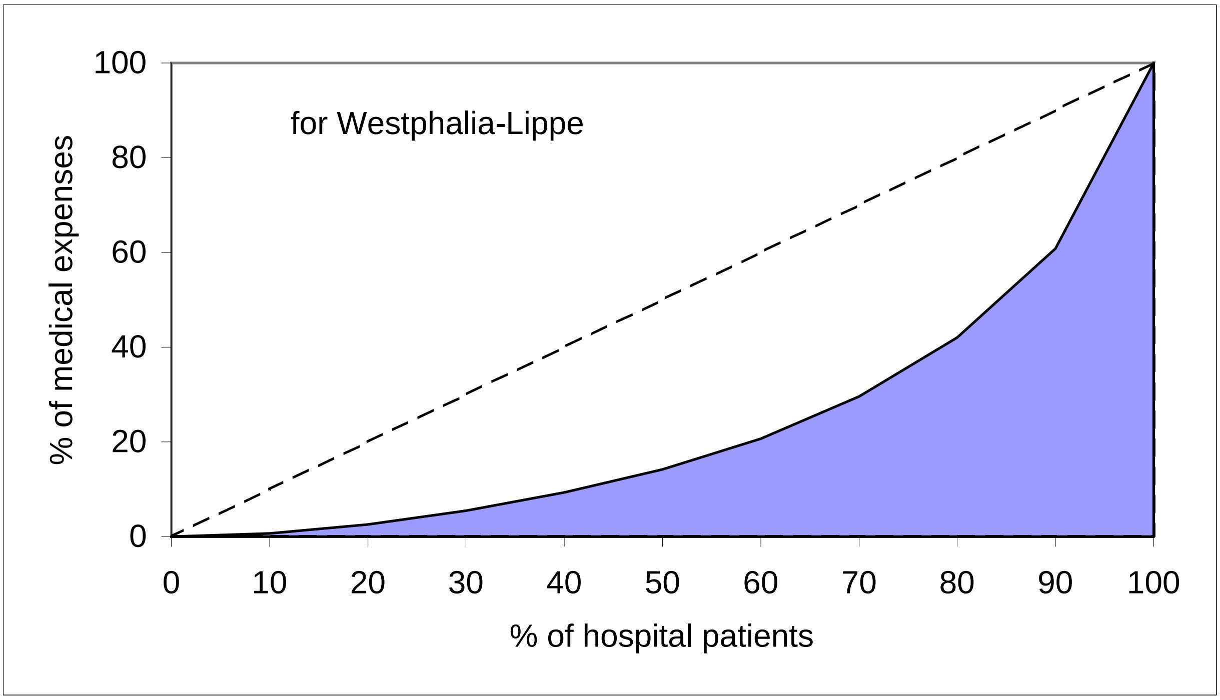
Table 1

	Westphalia-Lippe	Thuringia
Members in 1997	1,646,904	936,916
from them		
Deceased	22,873	17,073
Members linked with hospital claim files 1996/97, 20 years and older, daily costs >= 100 DM	279,854	161,061
from them		
Female deceased	9,973	7,597
Male deceased	8,013	5,740

Figure 1

Unevenly distributed expenses amongst patients:

The Lorenz-Curve



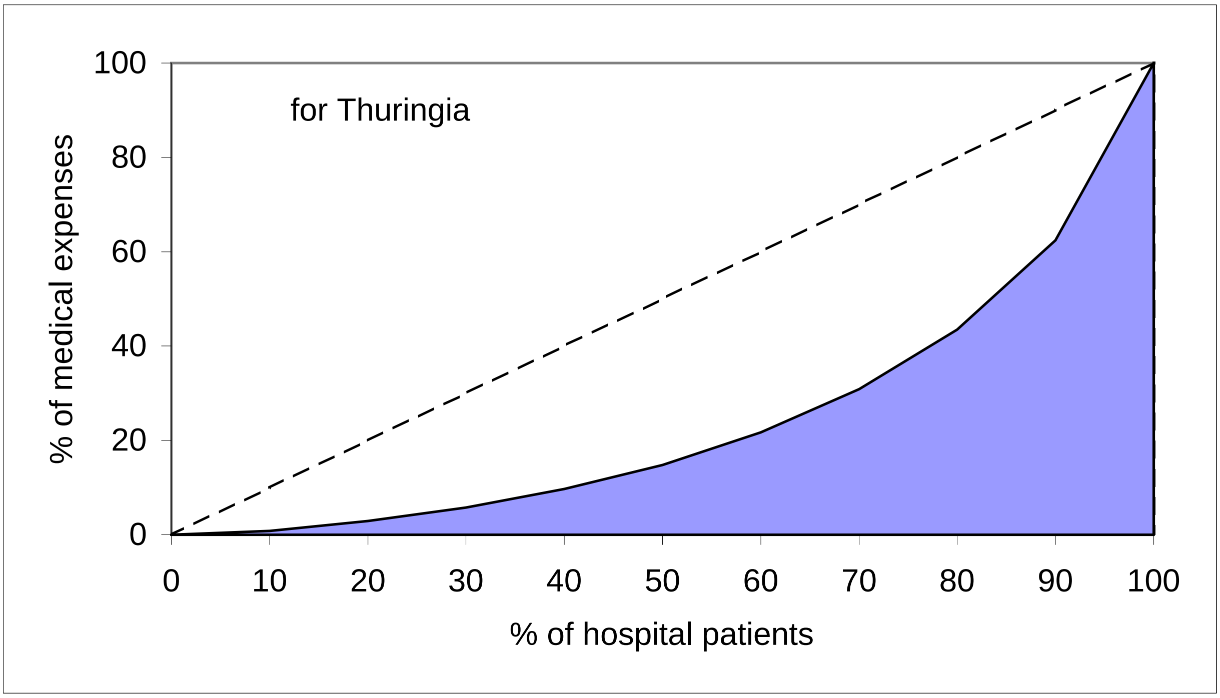
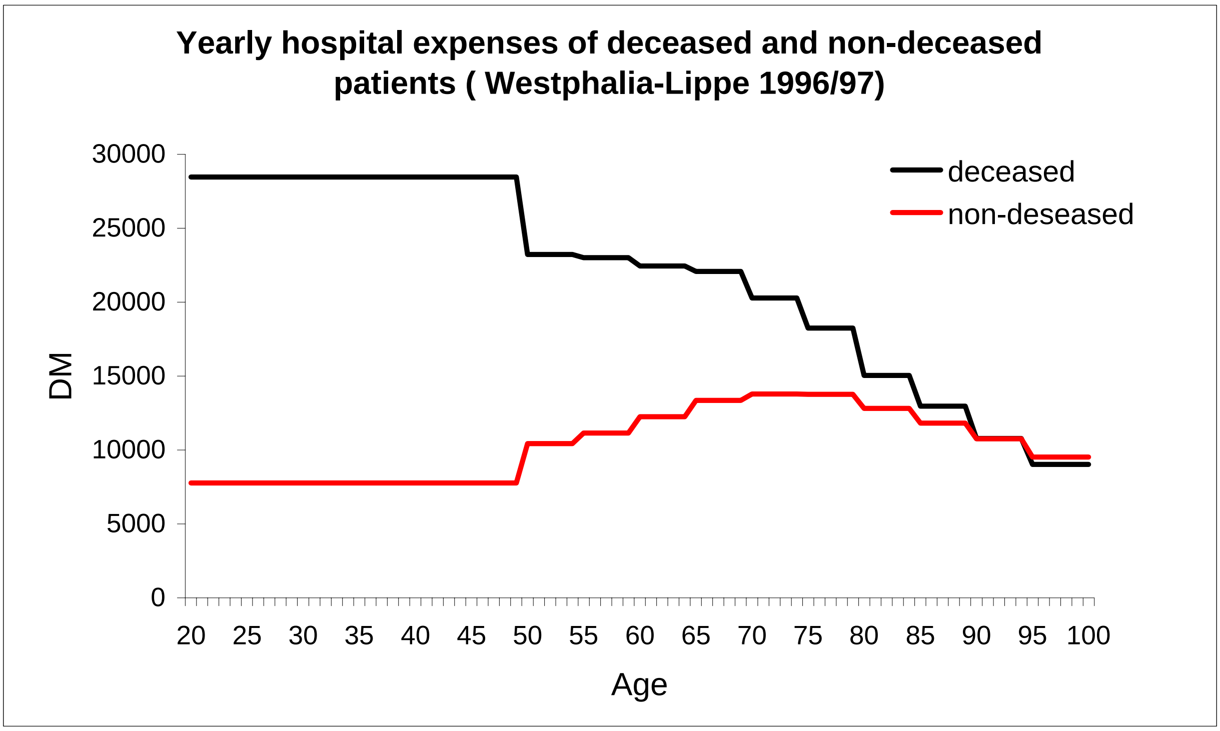
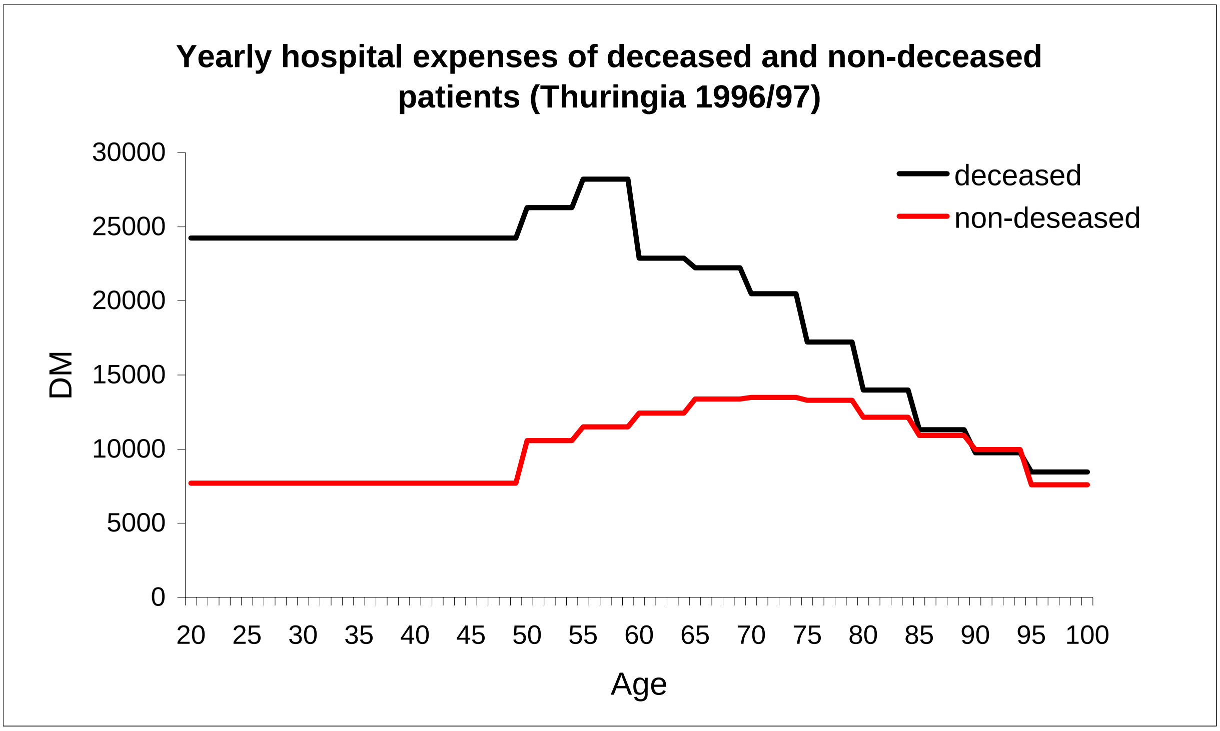


Figure 2



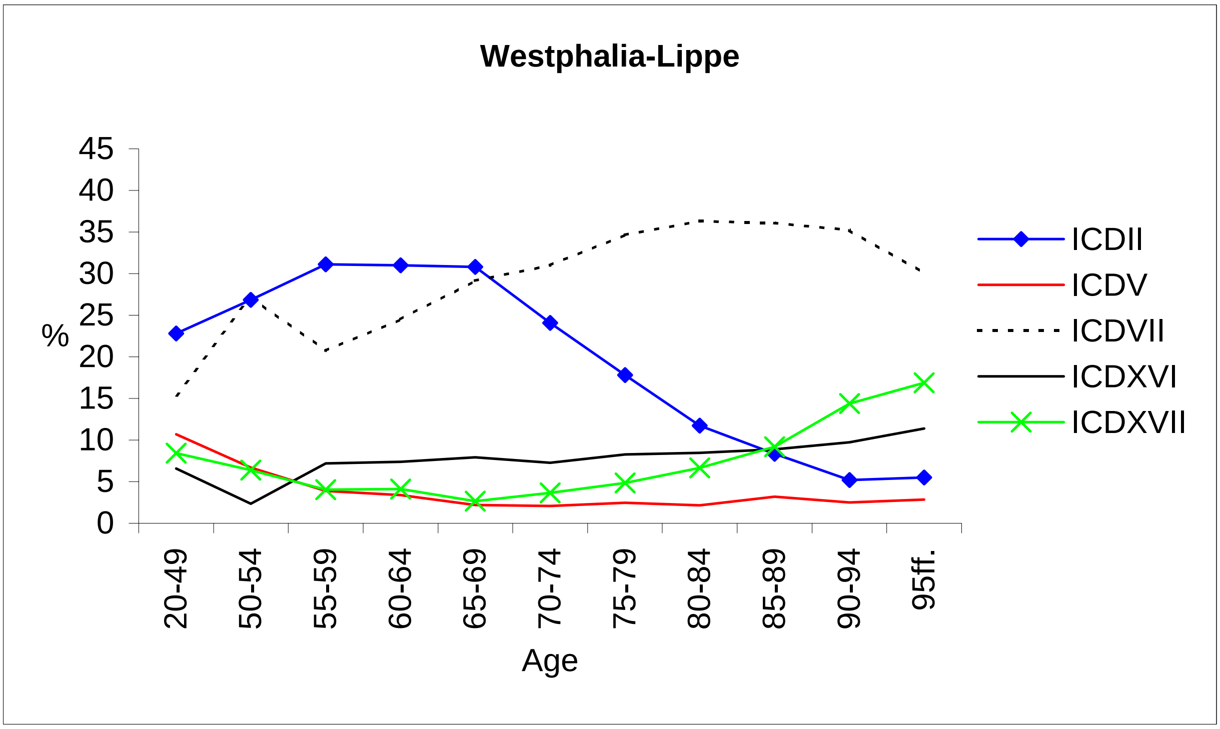
Yearly hospital expenses of deceased and non-deceased patients (Westphalia-Lippe 1996/97)
DM
30000
25000
20000
15000
10000
5000
0
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Age
deceased
non-deseased



Yearly hospital expenses of deceased and non-deceased patients (Thuringia 1996/97)
DM
30000
25000
20000
15000
10000
5000
0
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Age
deceased
non-deseased

Figure 3

The age-specific disease patterns



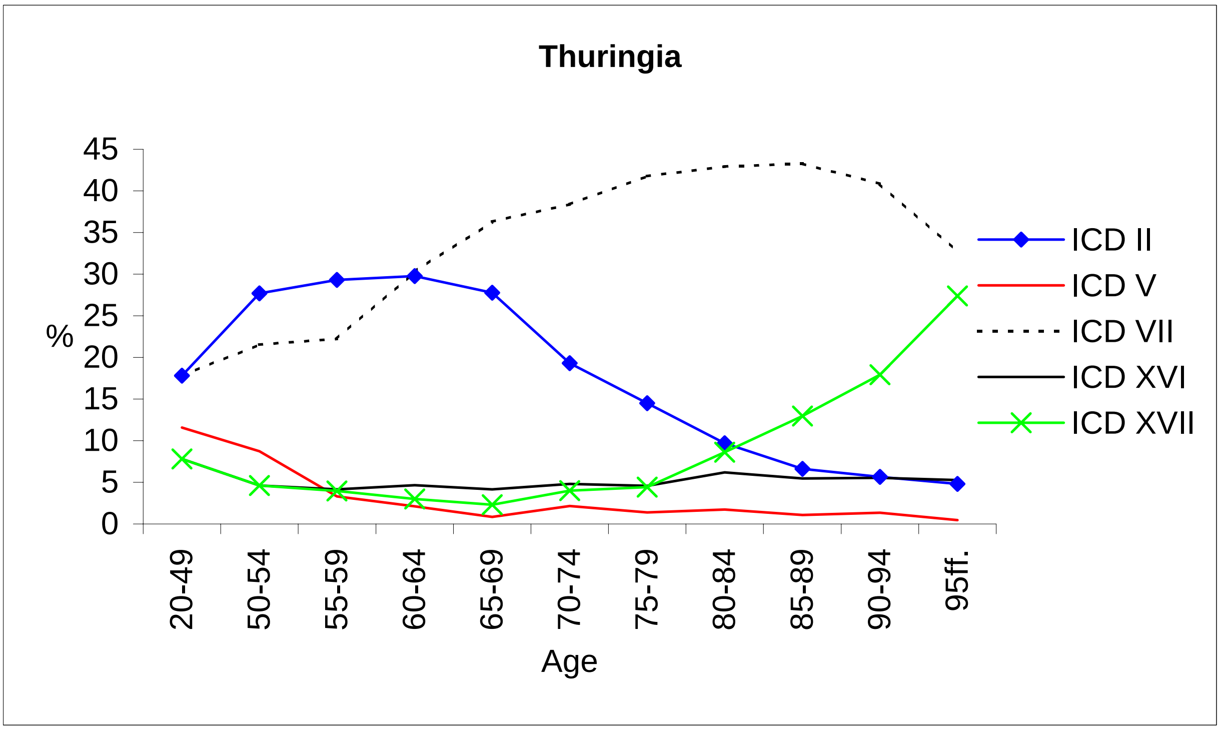


Figure 4

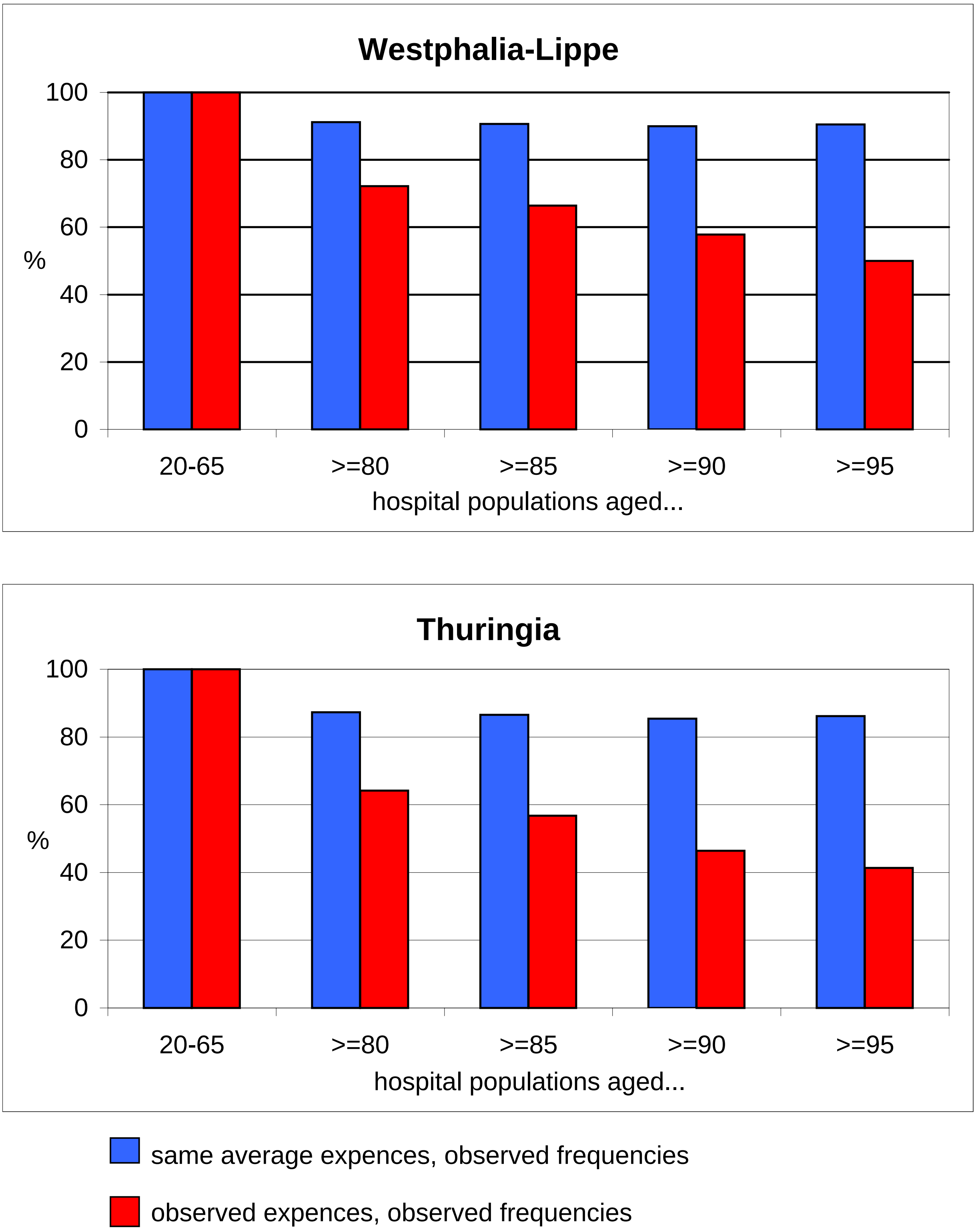

Westphalia-Lippe
100
80
60
40
20
0
%
20-65
>=80
>=85
>=90
>=95
hospital populations aged...
Thuringia
100
80
60
40
20
0
%
20-65
>=80
>=85
>=90
>=95
hospital populations aged...
same average expences, observed frequencies
observed expences, observed frequencies

Table 2. OLS-REGRESSION: The costs of one individual or the last year of life (Source: AOK-Westphalia-Lippe, N=251,810)

	I	II	III	IV
CONSTANT	-6,264.91[1] ***	-5,931.18 ***	-7,539.70 ***	-8,461.97 ***
LENGTH OF STAY (in days)	426.28 ***	427.01 ***	425.85 ***	426.03 ***
ICD I[2]	1,070.87 ***	1,114.94 ***	1,157.49 ***	2,565.24 ***
ICD II	3,097.45 ***	3,242.55 ***	3,045.05 ***	6,679.28 ***
ICD III	1,232.70 ***	1,354.37 ***	1,305.57 ***	2,771.66 ***
ICD IV	2,567.53 ***	2,710.09 ***	2,718.37 ***	9,573.33 ***
ICD VI	1,543.33 ***	1,634.62 ***	1,578.75 ***	1,808.89 ***
ICD VII	2,478.06 ***	2,621.26 ***	2,564.43 ***	6,080.69 ***
ICD VIII	1,298.65 ***	1,381.60 ***	1,380.74 ***	3,129.63 ***
ICD IX	1,184.64 ***	1,255.50 ***	1,220.61 ***	2,374.40 ***
ICD X	2,311.66 ***	2,398.29 ***	2,319.78 ***	4,017.02 ***
ICD XI	2,699.27 ***	2,635.70 ***	2,828.20 ***	5,100.60 ***
ICD XII	1,206.47 ***	1,239.53 ***	1,268.04 ***	1,834.86 ***
ICD XIII	1,115.67 ***	1,179.75 ***	1,113.89 ***	1,256.83 ***
ICD XIV	2,026.31 ***	2,045.52 ***	2,066.24 ***	2,687.26 **
ICD XV	2,219.44 **	2,217.23 *	2,335.93 *	4,039.00
ICD XVI	1,374.82 ***	1,466.33 ***	1,447.61 ***	2,814.72 ***
ICD XVII	1,050.15 ***	1,138.79 ***	1,181.18 ***	1,984.59 ***
Multimorbidity 2 Diseases[3]	-196.48 ***	-205.10 ***	-195.22 ***	-191.24 ***
3 Diseases	-98.57 *	-105.05 *	-92.47 *	-93.83 *
4 Diseases	549.37 ***	532.88 ***	520.29 ***	497.53 ***
Depart. of Internal Medicine[4]	4,041.78 ***	4,127.03 ***	4,057.10 ***	3,936.89 ***
of Paediatrics	4,243.35 ***	4,117.15 ***	4,230.50 ***	3,991.09 ***
of Surgery	4,935.60 ***	4,981.31 ***	4,925.52 ***	4,747.55 ***
of Orthopaedics	3,922.59 ***	3,963.05 ***	3,887.50 ***	3,770.42 ***
of Urology	3,521.92 ***	3,577.32 ***	3,558.25 ***	3,268.73 ***
of Neurosurgery	6,218.50 ***	6,219.10 ***	6,129.03 ***	6,045.37 ***
of Facial Surgery	4,413.54 ***	4,402.03 ***	4,408.06 ***	4,268.38 ***
of Gynaecology	3,548.04 ***	3,507.57 ***	3,556.46 ***	3,607.37 ***
for Ear, Nose, & Throat	3,339.63 ***	3,302.28 ***	3,290.41 ***	3,116.59 ***
of Ophthamology	3,467.27 ***	3,655.64 ***	3,599.24 ***	3,167.40 ***
of Dermatology	1,973.83 ***	2,035.82 ***	2,010.88 ***	1,901.39 ***
of Radiology	6,586.43 ***	6,620.88 ***	6,398.19 ***	6,292.87 ***
of Nuclear Medicine	2,140.83 ***	2,244.70 ***	2,139.88 ***	2,088.56 ***
of Neurology	3,027.77 ***	3,070.83 ***	3,015.43 ***	2,917.66 ***
of Lung Diseases	3,086.12 ***	3,112.26 ***	2,844.75 ***	2,638.63 ***
Intensive Care Unit	5,668.18 ***	5,734.35 ***	5,551.17 ***	5,409.52 ***
of Geriatrics	2,930.23 ***	3,116.52 ***	3,228.04 ***	3,103.09 ***
Hospital 2 D.[5]	274.44 **	293.74 **	324.66 ***	336.99 ***
3 D.	359.68 ***	378.11 ***	385.22 ***	392.74 ***
4 D.	1,022.15 ***	1,033.86 ***	1,042.05 ***	1,054.98 ***
5 D.	1,360.62 ***	1,364.52 ***	1,366.07 ***	1,367.99 ***
6 D.	1,331.56 ***	1,345.30 ***	1,346.12 ***	1,357.84 ***
7 D.	1,061.69 ***	1,072.66 ***	1,054.39 ***	1,062.86 ***
8 D.	2,053.94 ***	2,063.60 ***	2,043.95 ***	2,032.15 ***
9 D.	1,859.77 ***	1,862.05 ***	1,848.90 ***	1,850.11 ***
10 D.	1,079.13 ***	1,092.44 ***	1,094.82 ***	1,106.09 ***
11 D.	706.49 ***	716.81 ***	702.54 ***	700.60 ***
At least 12 D.	3,525.70 ***	3,519.66 ***	3,489.77 ***	3,480.94 ***
University Hospitals	9,584.76 ***	9,225.54 ***	9,493.63 ***	9,473.50 ***
Attending Physician Hospital	-1,900.16 ***	-1,895.00 ***	-1,874.74 ***	-1,891.07 ***
Day and Night Clinic	-20,305.35 ***	-20,424.48 ***	-20,238.59 ***	-19,974.26 ***
Psychiatric & Neurol.Clinic	859.77 ***	864.19 ***	876.69 ***	849.23 ***

[1] Non-standardized b-coefficients; *** indicate p<0.001, ** p<0.01, * p<0.05
[2] Reference category is ICDV
[3] Reference category is 1 Disease
[4] Reference category are Psychiatric departments
[5] Reference category are hospitals with 1 department

AGE		-8.58 ***	55.21 ***	50.58 ***
DEATH within one year		81.44 ***	7,203.77 ***	6,762.38 ***
AGE^2			-0.53 ***	-0.22 ***
DEATH after the age of 80			-91.01 ***	-85.09 ***
ICD I x AGE				-27.36 **
ICD II x AGE				-61.18 ***
ICD III x AGE				-26.66 ***
ICD IV x AGE				-106.33 ***
ICD VI x AGE				-5.85
ICD VII x AGE				-58.19 ***
ICD VIII x AGE				-33.94 ***
ICD IX x AGE				-22.43 ***
ICD X x AGE				-30.83 ***
ICD XI x AGE				-53.51 ***
ICD XII x AGE				-10.62
ICD XIII x AGE				-2.65
ICD XIV x AGE				-9.13
ICD XV x AGE				-33.02
ICD XVI x AGE				-26.33 ***
ICD XVII x AGE				-16.41 ***
SEX (men=1)				577.83 ***
Adjusted R^2	76.9%	76.9%	77.0%	77.1%

Table 3. OLS-REGRESSION: The costs of one individual or the last year of life (Source: AOK-Thuringia, N=139,591)

	I	II	III	IV
CONSTANT	-7,039.87[6] ***	-6,260.62 ***	-8,063.62 ***	-8,860.77 ***
LENGTH OF STAY (in days)	462.90 ***	463.99 ***	462.46 ***	462.39 ***
ICD I[7]	1,138.94 ***	1,233.21 ***	1,287.07 ***	1,715.64 *
ICD II	2,750.15 ***	2,994.72 ***	2,851.70 ***	5,658.76 ***
ICD III	1,213.99 ***	1,443.58 ***	1,384.17 ***	2,399.81 ***
ICD IV	1,799.28 ***	2,050.99 ***	2,052.14 ***	4,029.07 ***
ICD VI	1,806.68 ***	1,965.13 ***	1,927.72 ***	1,691.02 ***
ICD VII	2,726.38 ***	3,008.70 ***	2,980.46 ***	6,226.15 ***
ICD VIII	1,715.26 ***	1,871.11 ***	1,900.13 ***	2,798.80 ***
ICD IX	1,585.97 ***	1,754.50 ***	1,729.44 ***	2,594.55 ***
ICD X	2,352.18 ***	2,537.88 ***	2,484.57 ***	4,342.35 ***
ICD XI	2,284.77 ***	2,112.96 ***	2,385.66 ***	3,274.47 ***
ICD XII	1,332.99 ***	1,463.24 ***	1,461.27 ***	1,867.58 ***
ICD XIII	2,110.68 ***	2,262.60 ***	2,210.05 ***	1,202.73 **
ICD XIV	2,674.27 ***	2,595.33 ***	2,756.21 ***	3,859.94 ***
ICD XV	8,081.63 ***	7,974.00 ***	8,259.63 *	8,790.43 *
ICD XVI	1,645.91 ***	1,829.55 ***	1,822.93 ***	2,482.29 ***
ICD XVII	1,161.83 ***	1,337.06 ***	1,420.69 ***	2.152.50 ***
Multimorbidity 2 Diseases[8]	-179.41 ***	-196.88 ***	-185.06 ***	-170.74 ***
3 Diseases	-222.33 ***	-222.97 ***	-205.90 **	-190.12 **
4 Diseases	292.31 ***	299.41 ***	313.09 ***	331.01 ***
Depart. of Internal Medicine[9]	2,578.88 ***	2,655.51 ***	2,611.74 ***	2,609.51 ***
of Paediatrics	2,894.78 ***	2,290.06 ***	3,122.64 ***	3,073.23 ***
of Surgery	3,706.60 ***	3,718.20 ***	3,694.17 ***	3,677.29 ***
of Orthopaedics	3,525.33 ***	3,612.58 ***	3,556.52 ***	3,475.78 ***
of Urology	2,583.51 ***	2,662.24 ***	2,642.17 ***	2,493.97 ***
of Neurosurgery	4,210.02 ***	4,121.82 ***	4,057.46 ***	4,173.24 ***
of Facial Surgery	1,934.07 ***	1,833.59 ***	1,928.41 ***	1,923.38 ***
of Gynaecology	2,199.90 ***	2,100.78 ***	2,108.36 ***	2,264.28 ***
for Ear, Nose, & Throat	1,897.72 ***	1,810.20 ***	1,814.91 ***	1,831.13 ***
of Ophthamology	1,925.40 ***	2,230.81 ***	2,214.08 ***	1,904.54 ***
of Dermatology	218.98	260.69	281.44	330.25
of Radiology	2,690.71 ***	2,722.51 ***	2,615.24 ***	2,671.02 ***
of Nuclear Medicine	1,495.12 ***	1,619.46 ***	1,517.67 ***	1,665.23 ***
of Neurology	1,534.05 ***	1,504.56 ***	1,467.07 ***	1,505.56 ***
of Lung Diseases	-189.76	-156.96	-318.62	-348.96
Intensive Care Unit	6,862.51 ***	6,813.98 ***	6,649.26 ***	6,606.76 ***
of Geriatrics	423.50	633.62 **	709.25 **	750.85 **
Hospital 2 D.[10]	2,613.96 ***	2,607.08 ***	2,593.81 ***	2,596.32 ***
3 D.	722.25 ***	712.22 ***	714.11 ***	721.83 ***
4 D.	1,709.95 ***	1,709.74 ***	1,713.68 ***	1,709.83 ***
5 D.	1,484.61 ***	1,488.15 ***	1,482.07 ***	1,486.79 ***
6 D.	2,098.61 ***	2,112.18 ***	2,111.70 ***	2,118.25 ***
7 D.	1,185.26 ***	1,164.95 ***	1,142.37 ***	1,130.91 ***
8 D.	2,654.19 ***	2,624.89 ***	2,611.55 ***	2,639.94 ***
9 D.	2,630.35 ***	2,614.89 ***	2,595.77 ***	2,600.54 ***
10 D.	2,422.92 ***	2,394.99 ***	2,345.61 ***	2,336.97 ***
11 D.	2,631.05 ***	2,618.68 ***	2,586.55 ***	2,573.06 ***
At least 12 D.	4,370.44 ***	4,346.95 ***	4,315.13 ***	4,282.40 ***
University Hospitals	8,090.19 ***	8,045.15 ***	8,023.76 ***	8,008.75 ***
Attending Physician Hospital	2,228.99	2,133.66	2,146.81	2,284.05
Psychiatric & Neurol.Clinic	1,330.55 **	1,252.67 *	1,251.09 *	1,257.22 *

[6] Non-standardized b-coefficients; *** indicate p<0.001, ** p<0.01, * p<0.05
[7] Reference category is ICDV
[8] Reference category is 1 Disease
[9] Reference category are Psychiatric departments
[10] Reference category are hospitals with 1 department

AGE		**-17.16 *****	**53.92 *****	**48.75 *****
DEATH within one year		**409.49 *****	**5,630.33 *****	**5,097.83 *****
AGE^2			**-0.60 *****	**-0.34 *****
DEATH after the age of 80			**-67.09 *****	**-59.95 *****
ICD I x AGE				**-10.10**
ICD II x AGE				**-47.66 *****
ICD III x AGE				**-19.01 ****
ICD IV x AGE				**-34.31 ***
ICD VI x AGE				**1.87**
ICD VII x AGE				**-52.77 *****
ICD VIII x AGE				**-19.73 ****
ICD IX x AGE				**-18.04 ****
ICD X x AGE				**-33.84 *****
ICD XI x AGE				**-11.23**
ICD XII x AGE				**-9.81**
ICD XIII x AGE				**15.87 ***
ICD XIV x AGE				**-22.20**
ICD XV x AGE				**-4.55**
ICD XVI x AGE				**-14.71 ***
ICD XVII x AGE				**-15.82 ****
SEX (men=1)				**607.71 *****
Adjusted R^2	**76.9%**	**77.0%**	**77.0%**	**77.1%**