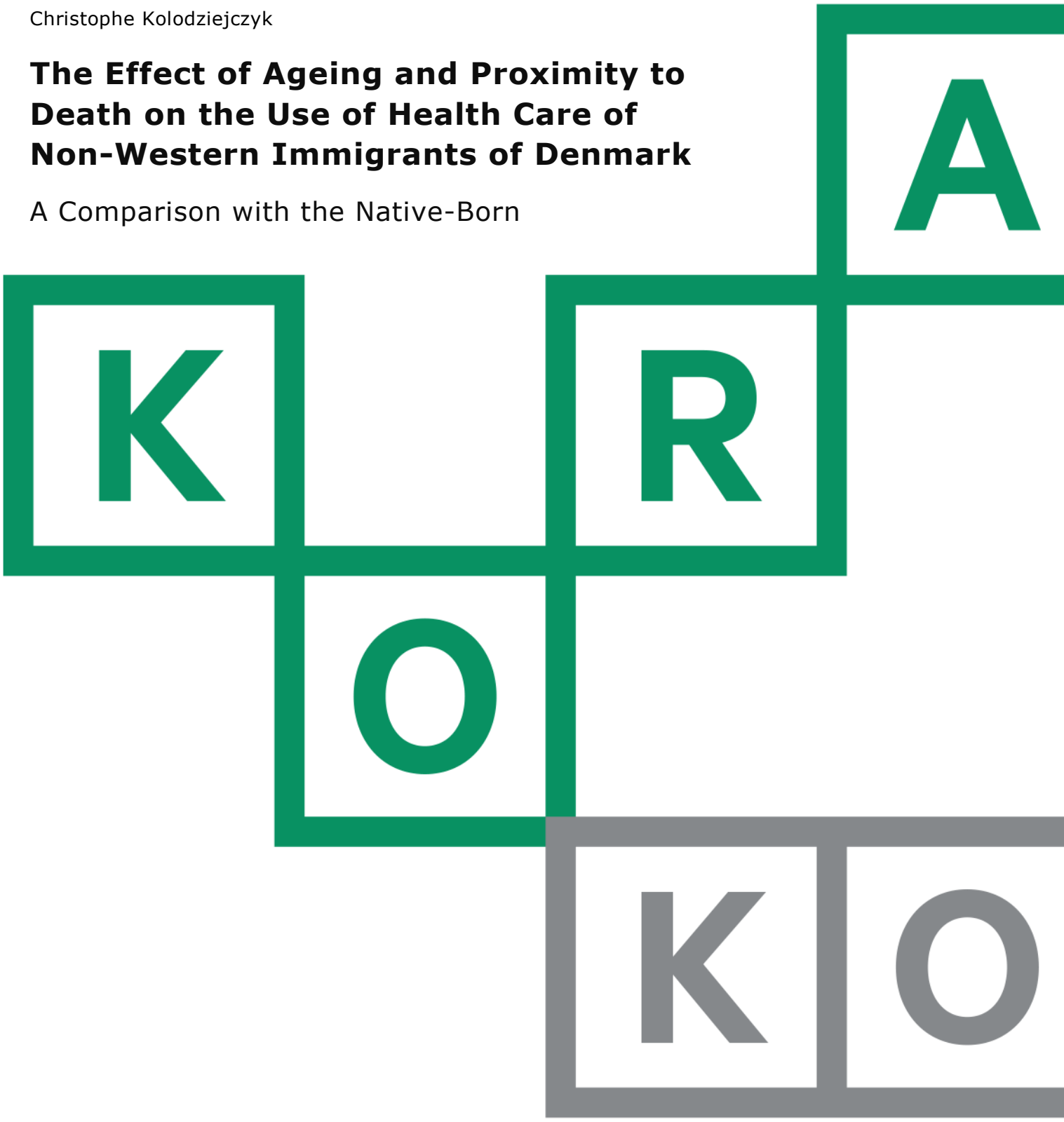
Christophe Kolodziejczyk

The Effect of Ageing and Proximity to Death on the Use of Health Care of Non-Western Immigrants of Denmark

A Comparison with the Native-Born



Danish Institute
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Preface

This working paper is part of a project financed by Sygekassernes Helsefond (the Health Insurance Foundation) on the impact of ageing and proximity to death on the use of the Health-care system by immigrants and native-born in Denmark.

The current part of the project investigates the differences between native-born Danes and non-Western immigrants in the evolution of health-care expenditures over the life cycle. A second part of the project, the results of which are reported in a working paper entitled "The Impact of an Increase in the Non-Western Immigrant Population of Denmark on Health-Care Expenditures: The Influence of Ageing and Mortality", investigates the likely impact on the health-care expenditures of demographic evolution of the Danish society in terms of its ethnic composition.

Christophe Kolodziejczyk has conducted the empirical analyses and written the present manuscript. The author would like to thank Kjeld Møller Pedersen, Michael Svarer and Jacob Nielsen Arendt for valuable comments.

Christophe Kolodziejczyk
December 2012

Contents

Summary

This paper investigates the effect of ageing and proximity to death on health-care expenditures of non-Western immigrants from Denmark. These effects are then compared to those of the native Danes. The data are register-based and include all the non-Western immigrants and a 10% sample of the Danes both over the age of 45. The age and proximity to death effects are estimated for health expenditure and its different components. The results show that the cost of dying is higher for immigrants, whereas age effects are lower or insignificant for immigrants compared to Danes. This result is valid for the different components of health-care expenditures. Moreover, duration analyses show that health expenditures do not have a positive impact on remigration.

1 Introduction

The structure of the population of Western societies is likely to change in the future due to changes in migration flows and the ageing of the current immigrant population. Governments from Western societies plan to increase the foreign population in order to increase labour supply and to attract high-skilled workers from Western and non-Western countries. Western societies will therefore experience a higher proportion of immigrants who will live a larger share of their lives in their welcoming country due to a higher effort in integrating immigrants. These changes in the demographic structure of Western societies pose challenges for the financing of the public sector. As immigrants are more likely to stay in their welcoming country, they are also more likely to consume health-care services over a longer period. As health expenditures are generally growing with age, it might put the financing of the health-care system under pressure. Therefore, age effects on health-care expenditures for the two populations are useful information in order to predict the future of the health-care system. Moreover, as the population of immigrants is going to represent a higher proportion of the total population in the coming years, because of an increase of the foreign population and differences in fertility, this will affect the age composition of the population. Since immigrants may have different habits in their use of the health-care system compared to native-born Danes (Solé-Auró & Crimmins 2008), the distribution of the health-care expenditures can be affected by an increase of the share of immigrants.

The literature on the impact of ageing on health-care expenditures has shown that it is important to control for time of death (Zweifel, Felder et al. 1999; Zweifel, Felder et al. 2004; Werblow, Felder et al. 2007). Because for a given cohort of individual the proportion of decedents is increasing with age and because health costs tend to be much higher in the last months of life, health-care expenditures are correlated with age. But an increase in longevity can lead to a postponing of the terminal expenditures, which could mitigate the effect of age. Omitting this variable from the analysis would lead to an overestimation of the effect of ageing. In an attempt to predict the evolution of health-care expenditures in the US Miller (2001) includes proximity to death in his model and argues for a delay in morbidity hypothesis. According to this hypothesis an increase in longevity will result in a postponing of diseases and gains in terms of life expectancy will not necessarily lead to an increase of disease prevalence or at least will moderate the effect of ageing. A more extreme version of this hypothesis is the compression of morbidity hypothesis, which postulates that with the increase of longevity the length of the sickness period before death will become shorter and shorter (Fries 1980; Breyer & Felder 2006; Breyer, Costa-Font et al. 2010). Therefore, when the use of the health-care system or the effect of ageing for immigrants and natives is compared it is important to take into account the cost of dying.

The aim of this paper is to investigate the differences between non-Western immigrants and Danes in terms of use of public health care, in particular health-care expenditures and the role of ageing and proximity to death. The paper presents estimates and comparisons of the effect of age and proximity to death on health-care expenditures for native-born and non-

Western immigrants from Denmark. Older individuals are defined by individuals over 45 years old. The data used are extracted from Danish administrative registers and two samples are constructed. The first sample includes all the non-Western immigrants in Denmark aged 45 and above who were in Denmark in 2003, whereas the second sample is a 10% sample of the population of ethnic Danes in the same age interval. The outcome of interest is the level of expenditures for health care and a regression model where age and proximity to death are used as covariates is estimated for both populations. Tests of equality of the parameters between the two populations are then performed. Age and proximity to death effects on the different components of the health-care expenditures are also estimated and compared for the two populations.

This main contribution of this paper is to provide the first estimates of age and proximity to death effects on health-care expenditure and its different components for the non-Western immigrant population of a given country and to compare these effects to those of the native-born population. This study therefore provides estimates of the public health-care cost of dying for non-Western immigrants, which can be compared to the cost of dying for native-born. The second contribution is to investigate whether there is evidence of healthy or unhealthy ageing for non-Western immigrants. The nature of the data gives the possibility to study the whole population of immigrants above 45 and compare it with a representative sample of the native-born population. These large population-based samples give the opportunity of constructing reliable measures of health-care expenditures. As a robustness check it is first tested whether the probability of remigration is affected by the level of health expenditures. This analysis is performed to support the validity of age effects of immigrants and to rule out selection effects in terms of health status. Second, it is investigated whether the country of origin constitutes a source of discrepancy in the age and proximity to death effects of non-Western immigrants.

This study does not provide evidence for non-Western immigrants that aging has an impact on health-care expenditures. The results show that the impact of aging is lower for immigrants compared to Danes and is actually eliminated once proximity to death is controlled for, where the effect of ageing subsists for Danes even when proximity to death is included in the regression model. There is, however, evidence for Danes that the effect of age decreases past the age of 80. Indeed, once the regression models take into account proximity to deaths, age effects for Danes tend to decrease in magnitude and become negative after the age of 80. These results suggest that an explosion of health costs in the future due to an increase of the immigrant population from non-Western countries is unlikely to happen. Therefore, an increase in life expectancy and an increase of the share of non-Western immigrants is not necessarily a problem for the health-care system. The results show, however, that the cost of dying tends to be higher for non-Western immigrants. No evidence has been found that the probability of remigration is significantly affected by health-care expenditures.

The paper is organised as follows. Section 2 gives an overview of the literature. Section 3 gives a description of the data. The source of the data and the construction of the measure of health-care expenditures are described. A descriptive statistics analysis of the use of the health-care system by immigrants in comparison with the native-born is provided as well as a

description of the differences in morbidity and mortality. Section 4 describes the econometric methodology used to estimate the impact of age and proximity to death. Section 5 presents the results of the econometric analysis. Section 6 provides a summary and a discussion of the results. Section 7 gives some concluding remarks.

2 Theory and models

In this section a brief review of existing theories and possible factors which can explain differences in health-care use between native-born and immigrants is given. Some of the literature on the impact of ageing and proximity to death is also reviewed.

2.1 Differences in the use of health-care services between non-Western immigrants and Danes

There is little theoretical work which tries to explain why there might be differences in the use of health-care services between non-Western immigrants and native-born. A few sources of discrepancies can be mentioned by referring to existing theories on the demand for health. Andersen (1968) and Andersen (1995) provide a behavioural model for the use of health care. This model is a general attempt to explain health-care use, but it has been used in particular to explain differences between immigrants and native-born use of the health-care system (Solé-Auró, Guillén et al. 2009). The first source which comes into mind is related to differences in health status, prevalence and type of the diseases of the two populations. This source of discrepancy can be the result of differences in lifestyle or genetic components. These two factors can be partly explained by the country of origin of the migrant. A second potential source is the cultural and socio-economic differences related to the determinants in use of the health-care system. Cultural factors could be explained by language barriers. Language barriers can be captured by the number of years the migrant has been in the country. Socio-economic differences can be related to differences in education and income (Grossman 1972; Grossman 2000). Note that the causality between income and health status goes both ways (Smith 1999). Obviously changes in health status can affect future income, whereas income or education can affect lifestyles as well as the propensity to use the health-care system. A third source of determinants would be the different types of economic incentives the potential and actual users of the health-care system are facing such as co-payments and the different types of health insurance, which might affect differently non-Western immigrants and native-born with similar levels of health in their use of health-care services.

Most of the studies on the use of the health care by immigrants are interested in documenting differences in health status and in the access and use of the health-care system. For example, using data from the Survey of Health, Ageing and Retirement in Europe (SHARE) which documents health status and health-care utilisation of people aged over 50 in 11 countries in Europe, Solé-Auró & Crimmins (2008) investigate differences in health status between immigrants and native-born. These differences are partly explained by the fact that in general immigrants have a poorer health than natives. Differences in the use of health care between immigrants and native-born for Europe are documented in Solé-Auró, Guillén et al. (2009). Hernández-Quevedo & Jiménez-Rubio (2009) also investigate for Spain the health status and health-care status of immigrants and health-care utilisation. They find that pat-

terns of health status and health-care use are related to nationality, but also that immigrants in general have difficulties to access specialised care. Bengtsson & Scott (2006) show for Sweden that differences in consumption for sickness benefits between foreign born and Swedes are large and persistent. There is also a large epidemiologic literature about the differences in use of the health-care system between ethnic groups in the USA (Mohanty, Woolhandler et al. 2005).

Several studies in Denmark have looked at differences in the use of the health-care system by immigrants. In general, these studies consist of comparisons of the use of the health-care system between immigrants and Danes (Holmberg, Ahlmark et al. 2009). They allow shedding lights on the differences in terms of access to the health-care system and morbidity patterns. The outcomes investigated are number of contacts to physicians or to hospitals rather than health-care expenditures per se. Furthermore, the focus is on broad age groups or specific countries. Singhammer, Storgaard et al. (2008) show for example that non-Western immigrants tend to self-report their health status as poorer compared to Danes. According to a study of the National Board of Health immigrants tend to use more health-care services especially with respect to hospital contacts. These studies use survey data or administrative registers, or a combination of the two. The Nordic countries have in general access to large and comprehensive datasets through the use of administrative registers which gives an advantage over other countries in terms of research in this area. Dinesen, Nielsen et al. (2011) investigate for Denmark differences in health status between non-Western immigrants and native Danes and find that immigrants report poorer health compared to Danes. It is partly explained by a lower socio-economic status.

However, the impact of ageing on health-care expenditures for immigrant populations has not been documented. It is necessary to have information about how health-care expenditures evolve with age for immigrants in order to be able to project the futures' impact of the evolution of the immigrant population on the use of health-care services.

2.2 The impact of ageing and proximity to death on health-care expenditures

Recent literature on the impact of ageing has shown the importance of incorporating the cost of dying. Payne, Laporte et al. (2007) provide a review of this literature. Health-care costs are disproportionately high in the last months before dying and the proportion of decedents of a given age group is increasing with age. Therefore, if one wants to estimate the effect of ageing, it is important for a given age to distinguish between those who survive and those who are close to death. This literature is mostly empiricist, so it is worth mentioning one theoretical contribution which links the health-care expenditures to ageing and proximity to death (Felder, Meier et al. 2000). Chernichovsky & Markowitz (2004) discuss the implications of ageing on the evolution of health-care expenditures when proximity to death is taken into account. Zweifel, Felder et al. (1999) were among the first to conduct empirical analyses of the impact of proximity to death on health-care expenditures and found that for a group of decedents in their last two years of life, once proximity to death was included in the model

age effects on health-care expenditures were statistically insignificant. It has led these authors to call it a 'red-herring', meaning that the argument of a potential threat of ageing on the sustainability of the health-care system was used to divert the debate on the real determinants of the growth of health-care expenditures like technological progress, failures in insurance markets and wrong incentives on the health-care sector (Zweifel, Felder et al. 1999). Salas & Raftery (2001) and Seshamani & Gray (2004a) have criticised the methodological approach used in the study of Zweifel, Felder et al. and have cast some doubts on the robustness and the credibility of their results. The critics were targeting the use of a selection model instead of a two-part model to model the large fraction of zero expenditure in the sample as well as the fact that the sample only included decedents. Zweifel, Felder et al. (2004) in a study which takes into account these critics, especially the fact that they include survivors, conclude that age will not matter for decedents as in their study from 1999, but it may matter for survivors. Several other contributions which have refined the econometric techniques or which have used other data sources have confirmed that proximity to death plays an important role in the determination of health-care expenditures and omitting this variable overestimates the impact of age. Furthermore, taking into account proximity to death tends to decrease age effects, mitigating the threat of ageing. Seshamani & Gray (2004a) find that proximity to death can have an impact up to 17 years on hospital expenditures. Werblow, Felder et al. (2007) have tested the same hypotheses and have extended these results to other types of health-care expenditures than hospital expenditures. They also find that proximity to death is a determinant of the different components of health-care expenditures, which led them to say that there was a 'school of red herrings'. Dormont, Grignon et al. (2006) reach similar conclusions in terms of the impact of ageing on health-care expenditures. They show that changes in practice and morbidity more than compensate the effect of population ageing and conclude that the impact of ageing is rather small. In the Danish context Serup-Hansen, Wickstrom et al. (2002) and Arnberg & Bjørner (2010) have studied the impact of ageing and proximity to death on health expenditures. Taking into account ageing and proximity to death Kildemoes, Christiansen et al. (2006) have performed projections of drugs purchases for Denmark over the period 2003-2030. However, none of the cited studies have looked at the impact of ageing and proximity to death on health-care expenditures specifically for the population of non-Western immigrants.

3 Data

3.1 Source of the data

The data used in this study come from Danish administrative registers. All these registers are population based. The health-care expenditures (HCE) include four types of expenditures related to the use of the public health-care sector. These expenditures amount to around 80% of the health expenses in Denmark. The other 20% difference is explained by the fact that prices used to determine the individual hospital expenditures do not account for expenses related to the purchase of new equipment (Serup-Hansen, Wickstrom et al. 2002; Arnberg & Bjørner 2010). Furthermore, no data on long-term care were available. Health-care expenditures include hospital costs for ambulatory treatment and hospitalisations[1], visits to physicians, drugs prescriptions and psychiatric hospital stays (inpatient and outpatient). Hospital costs at the individual level are computed with the help of DRG/DAGS codes from the National Health Register. DRG and DAGS codes determine average prices for a defined procedure for respectively inpatient and outpatient care. These prices have been computed by the board of National Health[2]. DRGs have been used in other Danish studies on health-care expenditures to construct hospital expenditures (Serup-Hansen, Wickstrom et al. 2002; Arnberg & Bjørner 2010). A description of how these DRGs can be used in this context can be found in Serup-Hansen, Wickstrom et al. (2002). Information on drugs purchases is obtained through administrative registers from the Danish Medicines Agency. Expenditures on drugs purchase only include the part which is actually paid by the public sector. Information on visits to physicians is also extracted from a population-based register. HCE are computed on a yearly basis and measure the flow of medical expenses over the whole year. The time of death is obtained from the causes of deaths registry. Demographic information is obtained from other registers, such as age, marital status and income. From other registers we obtain demographic information, such as age, education, marital status and income. A more detailed description of the variables used in the econometric model is given in the section on the econometric results.

Strandberg-Larsen, Bernt Nielsen et al. (2007) provide a description of the Danish health system and its financing. Health care in Denmark is financed mainly by taxes. Most of the health-care services are therefore not subject to out-of-the pocket payments, except dental care and medicine purchases and some specialist care, like physiotherapy and chiropractic care if occurring as outpatient care. Medicine consumption provided at the hospital is entirely covered by the regional health authorities (Strandberg-Larsen, Bernt Nielsen et al. 2007). Even though there is an out-of-pocket payment, almost all use includes public co-payment and is therefore registered in the administrative data. Use with co-payments may deter especially some immigrants from use at all. Non-Western immigrants are to a lesser extent insured against private

1 The expenditures include emergency ward visits.

2 They are now computed by the Ministry of Health.

co-payments. No use may also come from other large private costs like waiting time/lists or lack of information or ability to communicate with health-care workers.

The data cover health expenditures for the year 2003 and HCE are computed as the sum of the expenditures for the whole year 2003. In this case remaining lifetime can be observed up to seven years, since information on time of death is extracted from the death causes registry up to 31st December 2010. For individuals who have survived up to this date or who died after this date, their time of death will be right censored. Remaining lifetime is computed in months. It takes the value of 84 months for survivors. The year 2003 has been chosen in order to limit the effect of censoring of proximity to death. The sample includes information on individuals aged over 45 in the same year. The limit of the age of 45 can be justified for two reasons. First, it is from the age of 45 that mortality starts to increase with age. Second, given that the population of non-Western immigrants is much younger compared to the Danes, this limitation allows constructing a sample with a sufficiently high number of older immigrants. The sample includes individuals who were living in Denmark at the beginning of the year 2003. It might therefore include immigrants who have left the country during the year 2003, which will result in some right-censoring of their health expenditures. Given that the lower bound for age is 45 and that most of the remigration happens mostly for immigrants aged less than forty, the probability of emigrating during the year in this sample is rather low. Hence, this issue should actually be limited.

Because the data originate from administrative registers, for a large part of the immigrants the education is not observed. If an immigrant has taken an education in Denmark, this will be registered. But for the most part of the immigrants it is very likely that the education is missing. Statistics Denmark – the Danish statistical office – has tried to recover some of this missing information by sending a questionnaire to all the immigrants who were living in Denmark in 1999. But the response rate was very low. This variable is therefore not exploited in the regression models. This could be a problem as health and education are generally linked and older generations of immigrants are probably different in terms of educational levels compared to the younger generations. Measures of income will be used instead to proxy this variable.

3.2 Definition of the immigrant status

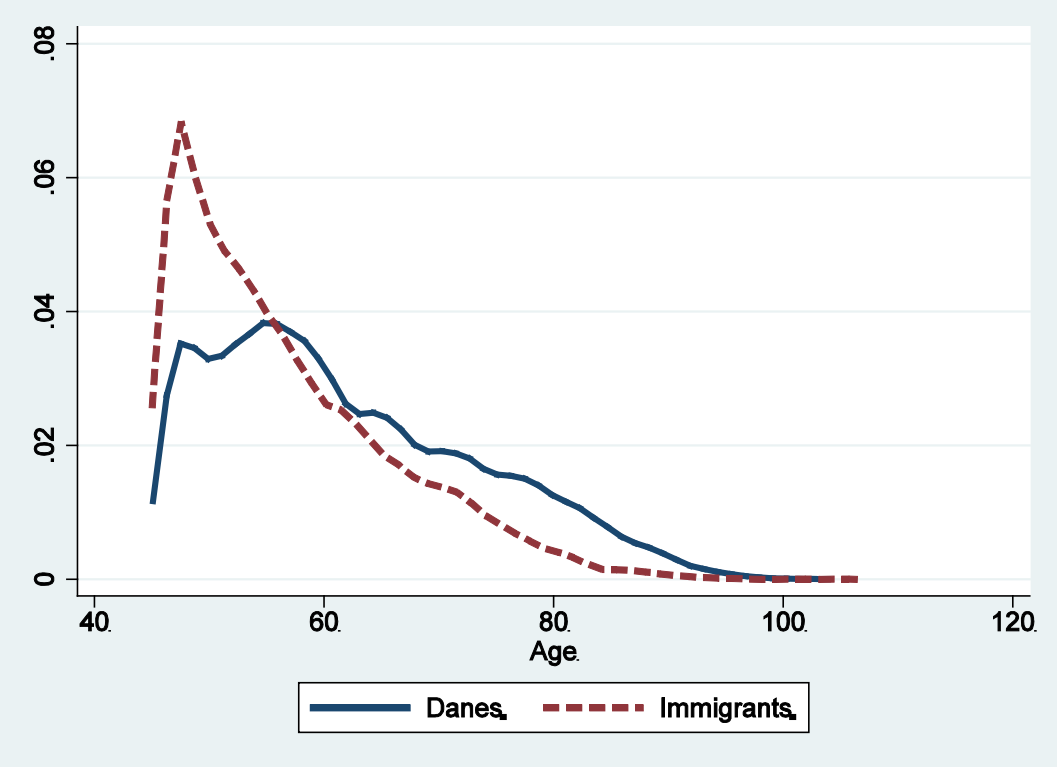
In this analysis immigrants are defined as the individuals who belong to the first and second generations of immigrants from non-Western countries. These definitions of immigrants are based on the definitions used by Statistics Denmark. An immigrant belongs to the first generation if the individual is not born in Denmark and both parents are not Danes. An immigrant belongs to the second generation if the individual is born in Denmark, but both parents are not Danes. The country of origin is defined as the country of origin of the parents and only immigrants with non-Western countries of origin are considered. Given that the data include individuals who are aged above 45, most of these immigrants are therefore from the first generation.

3.3 Description of the data

3.3.1 Differences in use of the health-care system by Danes and non-Western immigrants

This section is a descriptive analysis of the sample and reports some descriptive statistics of the sample used in this study presented for Danes and non-Western immigrants. The first thing to notice is the difference in the age distribution of the two populations as figure 3.1 shows; the population of immigrants is much younger.

Figure 3.1 Age distribution for Danes and immigrants



As health-care use is correlated with age it can be misleading to compare the health-care use of the two populations, if some form of correction for the age has not been applied. In the following tables the reported averages for health-care expenditures have been standardised by age and gender. The standardisation is performed such that the age distribution for the immigrants is close to the age distribution of the Danes[3]. Table 3.1 gives a summary of the different components of health-care expenditures and a comparison between Danes and immigrants. Both the unstandardised and standardised averages are presented for the immigrants.

[3] The standardisation is performed by taking weighted averages of the variables of interest. The weights are constructed such as to make the distribution of age and gender of one population look like the distribution of the other population. Technically, a binary regression model is run for the indicator for which population each individual belong to on flexible specification for age and gender. The weights are computed on the basis of the predicted probabilities obtained. This method is similar to propensity score weighting, see Wooldridge (2010).

The immigrant population has a higher proportion of men compared to Danes which also requires using gender when performing the standardisation. The table is divided by survival status. For decedents once the average level of health-care expenditures has been standardised immigrants show a higher level of HCE. The difference between Danes and non-Western immigrants is, however, not statistically different from zero at the 5 or 10 per cent level. Non-Western immigrants have a higher level of expenditures related to outpatient care, inpatient care and visits to physicians. On average they use services at the same or a marginally higher expenditure level, but the probability of having any expenditure related to physician visits is lower. Generally, immigrants over 45 use the health-care system (HCS) more than the native-born except in terms of the share with any use of physicians.

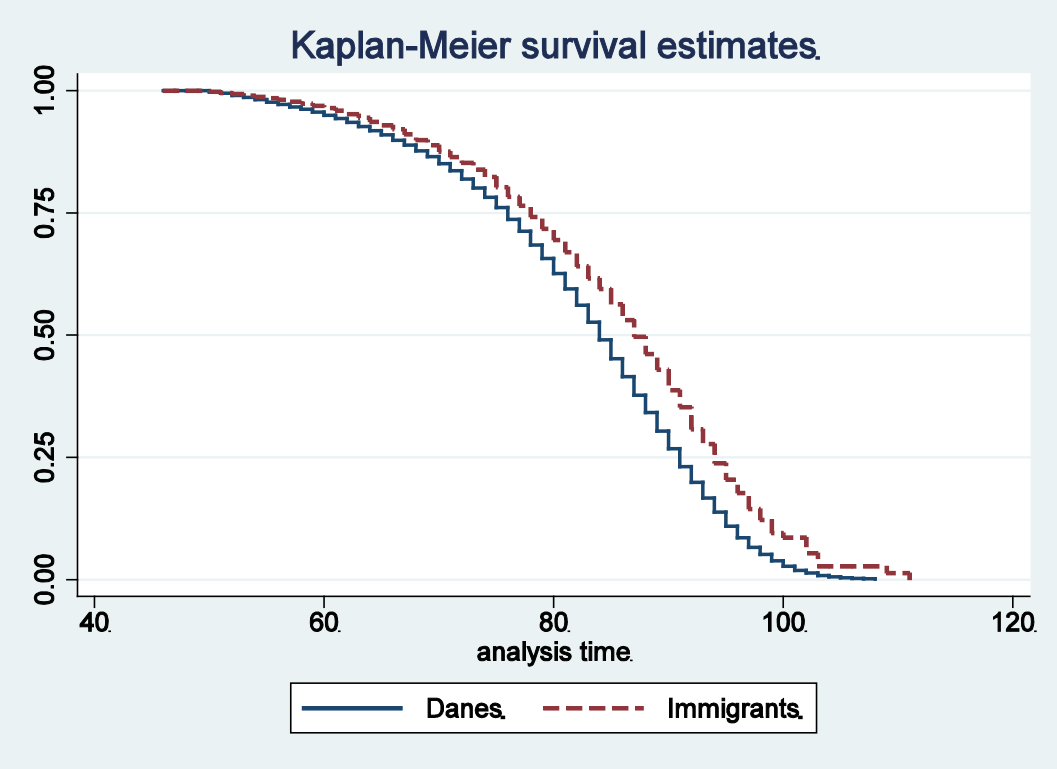
Table 3.1 Standardised averages of indicators of use of health care by survival status and two samples t-statistics for difference in HCE between non-Western Immigrants and Danes

Survivors	Unstandardised			Standardised	
	Danes	Immigrants		Immigrants	
	mean	mean	t-stat	mean	t-stat
Health-care expenditures	9493.30	10067.87	-2.63	10501.66	-4.91
Drugs expenses	1897.32	1835.37	2.51	2067.85	-6.82
Hospital stays expenses	3984.21	3982.67	0.01	4297.28	-2.74
Ambulatory expenses	1345.80	1527.75	-6.59	1564.04	-7.84
Physician expenses	1663.18	1910.53	-21.05	1902.09	-20.21
Psychiatric expenditures	599.03	819.36	-1.28	679.16	-0.52
1(HCE>0)	96.47	93.28	24.44	92.61	28.46
1(Drugs expenses>0)	52.51	53.36	-3.13	57.28	-17.59
1(Hospital stays expenses>0)	10.42	11.78	-7.76	12.22	-10.13
1(ambulatory expenses>0)	26.35	31.37	-19.95	31.19	-19.25
1(Physician expenses>0)	95.96	92.34	26.07	91.57	30.43
1(psychiatric expenditures>0)	0.74	1.15	-7.16	0.94	-3.80
Observations	162333	41873		41873	
Decedents	Unstandardized			Standardized	
	Danes	Immigrants		Immigrants	
	mean	mean	t-stat	mean	t-stat
Health-care expenditures	28720.55	32786.20	-2.26	30054.79	-0.98
Drugs expenses	5179.43	4958.70	1.72	5007.32	1.39
Hospital stays expenses	16570.43	18279.90	-2.14	16993.27	-0.58
Ambulatory expenses	3054.85	4392.03	-4.02	3738.15	-2.40
Physician expenses	2367.22	2267.29	1.98	2326.20	0.76
Psychiatric expenditures	1571.42	2912.15	-0.90	2014.00	-0.43
1(HCE>0)	97.43	95.98	4.31	96.16	3.86
1(Drugs expenses>0)	81.23	79.16	2.95	82.73	-2.28
1(Hospital stays expenses>0)	29.78	29.94	-0.20	31.24	-1.82
1(Ambulatory expenses>0)	42.14	44.69	-2.95	45.46	-3.84
1(Physician expenses>0)	96.67	95.03	4.42	95.15	4.15
1(Psychiatric expenditures>0)	2.61	2.19	1.66	1.96	2.68
Age	73.83	66.89	34.63	73.91	-0.38
Proximity to death in months	42.09	43.46	-3.29	41.66	1.03
Observations	34790	3661		3661	

Figure 3.2 shows the difference in survival rates between immigrants and ethnic Danes. The figure shows the survival curve computed by the Kaplan-Meier estimator. The age of death is obtained from the death causes registry which reports the date of death up to the 31st December 2010. The figure shows that the survival rate for immigrants lies above that of the Dane

and that the hazard function[4] is lower for immigrants. As pointed out by Zweifel (2009) since these survival curves are obtained by the Kaplan-Meier, the survival rate at age a is computed by multiplying the age-specific survival rates of the present period between ages 45 and ages a-1. They represent the survival rate over the lifetime of an artificial cohort which experiences the survival rate of the present period.

Figure 3.2 Survival function for Danes and Immigrants, year 2003



3.3.2 Differences in age profiles for health expenditures between Danes and immigrants

Figure 3.3 shows the age profile of the health-care expenditures for immigrants and ethnic Danes. This figure shows for each of the three components of the health expenditures a plot of these expenditures with respect to age for each group. These plots show the computed expected mean of health-care expenditures and their components given the age of the two populations. The conditional expectation is computed by the Nadaraya-Watson nonparametric regression estimator (Pagan & Ullah 1999). The three components considered are hospital expenditures, drugs expenditures and physician expenditures. Hospital expenditures are the sum of the expenses for outpatient and inpatient care. The first plot is the sum of the expenditures of the three components plus the expenditures related to inpatient and outpatient psychiatric care.

[4] The hazard function represents the instantaneous rate of mortality given a certain age and is also called the force of mortality in the context of mortality; see Alho & Spencer (2005).

The first plot shows that immigrants tend to have a higher level of expenditures under the age of 65. What is also striking is the flatter profile of expenditures for immigrants compared to Danes. The expected mean is higher for immigrants until the age of 67. For immigrants health-care expenditure increases sharply around the age of eighty and declines around the age of 90. This decline can be explained by the fact that there are not so many observations for immigrants around this age. The rise of HCE around the age of 80 could be explained by a higher proportion of people dying for both populations. For Danes HCE increase until the age of 75 and flattens afterwards. A similar pattern can be observed for the costs related to hospital visits. Generally, the expenses diminish after the age of 75 for Danes. For immigrants expenses related to visits to physicians vary over the life cycle, but do not show a trend until the age of 75.

Figure 3.3 Age profile of health-care expenditures for Danes and immigrants

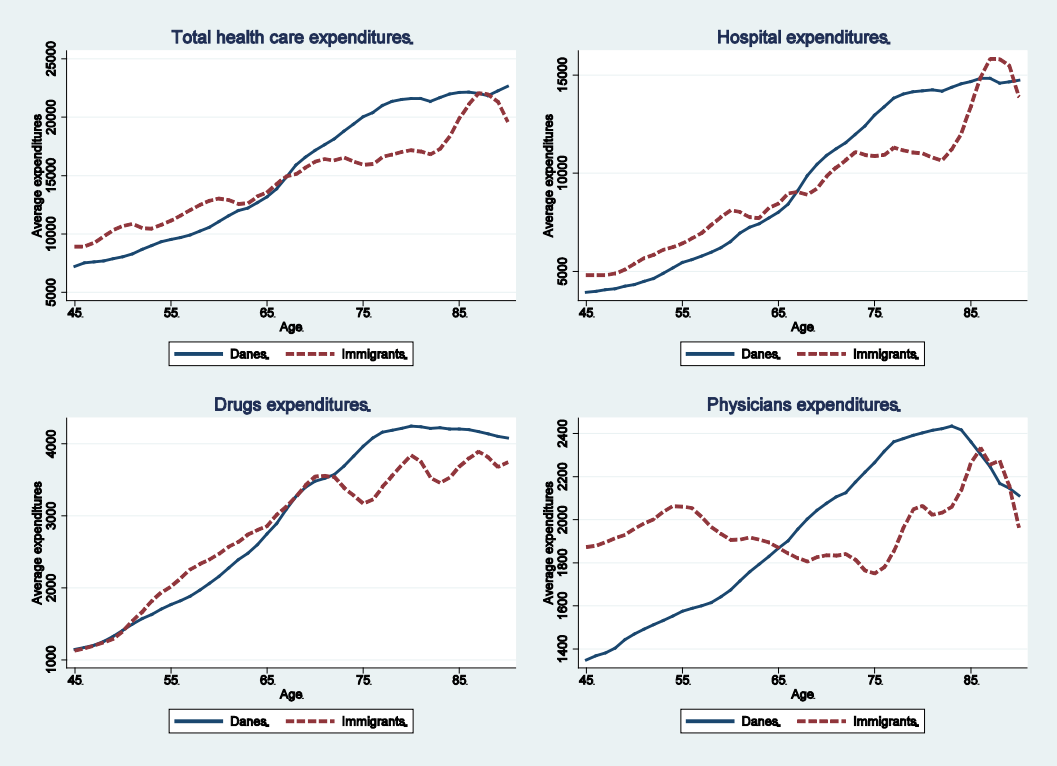
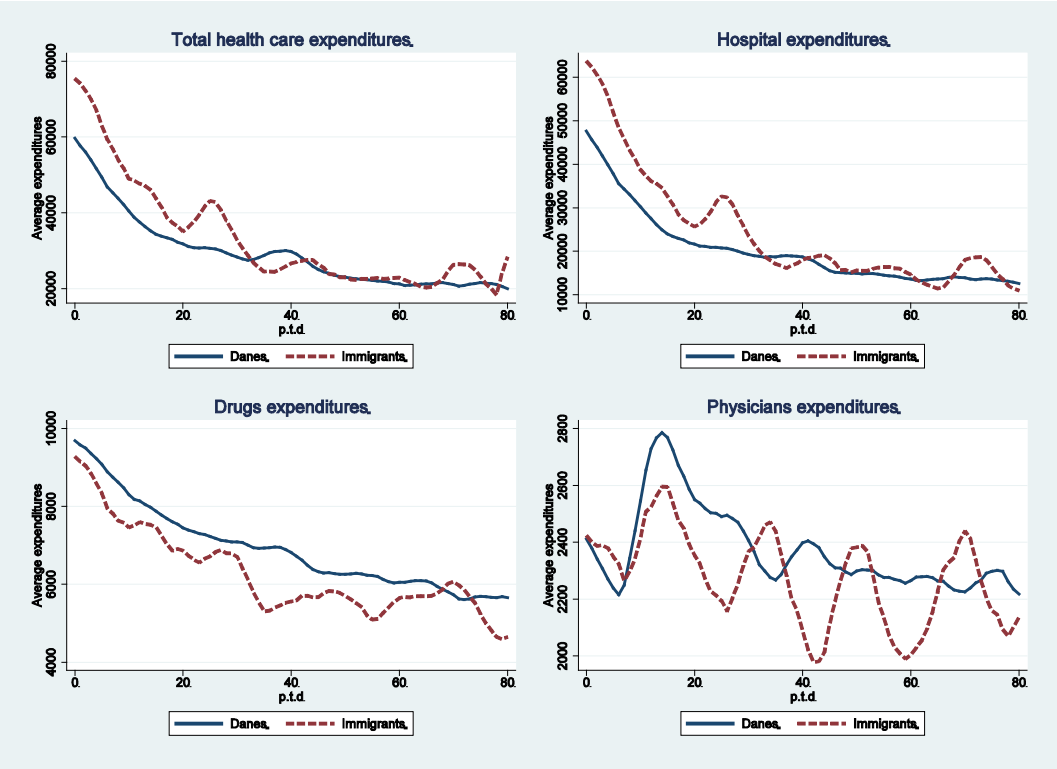


Figure 3.4 reports for the decedents line plots with HCE and their different components on the y-axis and proximity to death on the x-axis. Health-care expenditures are apparently higher for the non-Western immigrants. It is mainly due to the health-care expenditures related to visits at the hospital which are higher for immigrant decedents. The costs become higher for immigrants who have approximately less than three years to live. Drugs expenditures for immigrants are, however, lower and for almost all the value of proximity to death. It is clear from this figure that the main part of health costs for decedents is composed by hospital expenditures. The figure for expenditures related to visits to physicians does not show a clear pattern over the life cycle.

Figure 3.4 Proximity to death (p.t.d) profile of health-care expenditures for Danes and Immigrants



Note: Proximity to death is measured in months since the end of the year 2003.

3.3.3 Differences in morbidity and mortality

Table 3.2 and table 3.3 show the distribution of morbidity for the two populations. To some extent the two populations seem to suffer from different diseases. Table 3.2 shows for the two populations the proportion of individuals who have been treated at the hospital for a specific diagnosis. The classification of the diagnosis follows the ICD-10 classification of diseases of the World Health Organisation. The original codes are grouped into 22 categories. This grouping actually matches the first level of the ICD-10 classification. Averages are again standardised by age and gender. It is interesting to note that some diseases are more or less frequent for the immigrants compared to the Danes. Cancer (neoplasm), mental disorders, ear-related diseases, injury (which includes suicide and alcohol-related diseases) are more frequent for Danes. Infectious diseases, endocrine and metabolic diseases, diseases of the circulatory system, of the digestive system, of the respiratory system and musculoskeletal system, to name a few, are more prevalent for immigrants. These differences have been described elsewhere in Danish studies (Sundhedsstyrelsen 2005).

Table 3.2 Standardised averages of diagnosis prevalence in per cent – Danes vs. immigrants

	Unstandardised			Standardised	
	Danes	Immigrants		Immigrants	
	mean	mean	t-stat	mean	t-stat
Infectious diseases	0.74	1.12	-7.09	1.28	-9.56
Neoplasm	2.86	1.91	12.84	2.16	9.01
Disease of the blood	0.69	0.61	1.84	0.72	-0.62
Endocrine and metabolic	6.24	8.61	-16.66	9.26	-20.61
Mental disorders	1.10	0.65	10.02	0.78	6.75
Nervous system	1.38	1.25	2.16	1.29	1.46
Diseases of the eye	2.11	2.54	-5.42	3.43	-14.55
Diseases of the ear	2.25	1.59	9.75	2.02	3.00
Circulatory system	7.14	6.78	2.77	8.24	-7.74
Respiratory system	2.60	2.77	-2.03	3.15	-6.26
Digestive system	3.70	4.60	-8.42	4.81	-10.20
Diseases of the skin	0.80	0.95	-3.01	0.94	-2.73
Musculoskeletal system	5.32	6.32	-8.05	6.16	-6.81
Genitourinary system	3.21	3.79	-5.95	4.02	-8.07
Pregnancy and child birth	0.01	0.02	-1.78	0.01	-0.82
Conditions in the perinatal period	0.00	0.00	2.65	0.00	2.65
Congenital malformation	0.14	0.19	-1.99	0.17	-1.28
Disease not classified elsewhere	4.13	6.02	-15.71	6.38	-18.28
Injury and poisoning	7.75	6.67	8.22	6.81	7.04
External causes of morbidity and mortality	0.01	0.04	-3.32	0.03	-2.72
Other causes of injuries	0.00	0.00	.	0.00	.
Contacts with health system	10.25	10.91	-4.09	11.49	-7.55
Observations	197123	45534		45534	

Table 3.3 shows descriptive statistics for the use of drugs related to some specific diseases. Table 9.1 in the appendix gives the list of ATC codes related to the groups of drugs. These diseases are generally considered as chronic diseases. Here Danes seem to have a more frequent use of drugs than immigrants. Immigrants use more drugs related to heart diseases, diabetes, diseases related to the cardiovascular system, painkillers, arthritis and acid related orders. These are the prevalence of the use of drugs which are partially or completely refunded by the regional authorities, i.e. the individual is considered as using the drugs if the state has been paying part of or all the costs of the drugs. Danes consume for example more drugs related to blood pressure and blood cloth, antipsychotics, antidepressants, drugs against osteoporosis and anxiolytics. Mental disorders seem more frequent for Danes, at least for this population which is generally older than the total population. The interpretation with respect to underlying health conditions is limited by the fact that some drug use is not counted for immigrants because it is consumed in the hospital. Co-payment, other costs and information provide incentive structures that affect the place and type of use. This would probably tend to upward bias drug use differences (Dane-immigrants) and downward bias hospital differences. In section 9.1 of the appendix further descriptive statistics which link morbidity, ageing and health expenditures are reported.

Table 3.3 Standardised averages of indicators of use of medicine in per cent with two sample t-statistic for differences in averages – Danes vs. immigrants

	Unstandardised			Standardised	
	Danes	Immigrants		Immigrants	
	mean	mean	t-stat	mean	t-stat
Blood pressure, blood cloth	13.81	9.66	26.10	12.44	7.89
Heart medicine	6.24	5.92	2.54	8.34	-14.99
Arthritis	23.61	31.30	-32.39	30.99	-31.19
Hormonal treatment	5.48	4.64	7.61	4.88	5.38
Diabetes	4.54	12.07	-47.11	13.44	-53.41
Antipsychotics	3.30	3.13	1.91	3.13	1.91
Antidepressant	10.31	9.28	6.80	9.05	8.38
Painkillers	9.99	11.06	-6.64	11.86	-11.26
Cardiovascular system	34.36	26.91	31.90	33.32	4.25
Dementia	0.39	0.09	15.45	0.21	6.89
Parkinson	0.86	0.65	4.99	0.75	2.39
Osteoporosis	1.73	0.63	23.35	1.09	11.14
Asthma	6.96	6.46	3.87	6.88	0.55
Bronchitis	4.83	3.91	8.95	4.29	5.15
Glaucoma	2.07	1.26	13.18	2.10	-0.44
Thyroid	2.92	2.33	7.41	2.64	3.36
Antithyroid	0.95	0.60	8.30	0.64	7.20
Antiepileptics	2.26	1.72	7.65	1.76	7.11
Anxiolytics	10.56	6.79	27.58	7.14	24.57
Acid related disorders	11.20	18.65	-38.03	20.05	-44.11
Antimigraine	1.95	1.55	5.96	1.24	11.67
Headaches	15.64	18.36	-13.63	22.58	-32.68
Observations	197123	45534		45534	

3.4 Differences in use of health-care system by country of origin

Table 3.4 investigates to what extent health-care expenditures differ across countries of origin. In this analysis the largest groups of immigrants have been taken into consideration. Results from table 3.4 report the average expenditures and the proportion of individuals having a positive expenditure by country of origin and type of expenditures. These figures are again standardised by age and gender. There are some discrepancies across country of origin and type of expenditures. People from Pakistan are the highest consumer and consume more than Danes. However, the difference is not statistically different from zero. People from Somalia and Sri Lanka are also among the highest consumers and lie actually close to the average level of Danes. Among all the countries of origin shown in table 3.4 individuals from Vietnam consume the least on average. These differences might reflect different health conditions and lifestyles specific to immigrants' home country. Another interesting piece of information to notice from this table is the difference in the use of the different part of the health-care system compared to the Danes. People from Somalia, Pakistan and Sri Lanka visit less often a physician, and tend to consume less medicine. At the same time they go more often to the hospital. The largest group of immigrants, which comes from Turkey, has a level of health-care expenditures which is actually below those of the Danes', although the difference is not statistically different from zero. The country of origin can therefore have an influence on health-care expenditures. It is also noteworthy that "old" immigrant countries seem to be at the top of the table, whereas more recent ones are lower. This has at least two potential explanations. First, immigrants from "old countries" are older and the standardisation does not fully account for this, and second year since migration may play a role for knowing and using health care.

Table 3.4 The use of the Danish health-care system by Danes and immigrants – selected countries

Country	N	HCE		Drugs		Inpatient		Outpatient		Physician	
		DKK	Per cent	DKK	Per cent	DKK	Per cent	DKK	Per cent	DKK	Per cent
Denmark	197123	12886.70	0.97	2476.58	0.58	6205.53	0.14	1647.43	0.29	1787.43	0.96
Turkey	6568	12359.33	0.96	2190.84	0.61	5588.78	0.15	1989.86	0.37	1987.50	0.95
		(1.06)	(3.75)	(5.26)	(-6.37)	(2.26)	(-3.47)	(-3.41)	(-13.27)	(-7.72)	(3.34)
Pakistan	3304	14269.68	0.95	2503.81	0.59	6782.68	0.15	2093.68	0.36	2360.79	0.95
		(-2.04)	(3.60)	(-0.28)	(-1.78)	(-1.04)	(-1.64)	(-3.18)	(-8.08)	(-13.54)	(3.52)
Lebanon	1507	13752.66	0.95	2987.84	0.63	5383.80	0.16	2110.59	0.35	2142.29	0.94
		(-0.87)	(2.68)	(-2.69)	(-4.05)	(1.56)	(-2.07)	(-1.99)	(-4.79)	(-6.64)	(3.36)
Iran	2436	13792.19	0.94	2424.69	0.55	4513.75	0.13	1636.81	0.36	2174.87	0.92
		(-0.40)	(6.06)	(0.44)	(2.49)	(3.55)	(1.58)	(0.14)	(-6.78)	(-7.81)	(7.01)
Yugoslavia	4096	11130.15	0.91	2046.48	0.56	4924.20	0.13	1567.20	0.32	1855.81	0.89
		(3.32)	(12.74)	(6.14)	(1.97)	(3.76)	(2.46)	(0.94)	(-4.52)	(-1.77)	(13.83)
Bosnia	4952	11628.22	0.94	2469.86	0.65	4951.85	0.13	1615.93	0.28	1738.01	0.92
		(2.48)	(8.83)	(0.10)	(-11.18)	(3.66)	(1.85)	(0.26)	(1.08)	(1.74)	(9.70)
Vietnam	2006	8148.26	0.92	1635.37	0.53	3423.22	0.10	1444.47	0.26	1354.44	0.91
		(9.88)	(7.62)	(10.05)	(4.23)	(7.85)	(5.74)	(1.85)	(3.63)	(11.90)	(8.02)
Iraq	2659	11661.39	0.95	2190.27	0.55	4640.27	0.15	1967.02	0.37	2307.60	0.95
		(2.29)	(3.02)	(2.52)	(3.05)	(4.13)	(-1.78)	(-3.10)	(-7.97)	(-11.22)	(3.55)
Morocco	1287	10602.88	0.94	1914.76	0.53	4532.48	0.13	1456.07	0.31	2053.74	0.93
		(2.66)	(4.33)	(3.75)	(3.39)	(2.89)	(0.83)	(1.58)	(-1.50)	(-4.13)	(4.66)
Sri Lanka	1381	12495.06	0.95	1831.11	0.55	6447.33	0.15	2205.60	0.31	1878.60	0.95
		(0.41)	(2.47)	(6.07)	(1.73)	(-0.33)	(-0.83)	(-1.52)	(-1.89)	(-1.56)	(2.05)
Somalia	826	12654.40	0.92	1237.43	0.50	6730.50	0.12	2489.78	0.39	1797.51	0.91
		(0.16)	(4.81)	(11.08)	(4.20)	(-0.49)	(1.19)	(-1.80)	(-5.72)	(-0.14)	(5.16)
Afghanistan	798	11842.48	0.97	1559.07	0.54	5113.68	0.16	2092.86	0.38	2309.26	0.97
		(1.11)	(-0.58)	(7.66)	(2.23)	(1.67)	(-1.96)	(-2.94)	(-5.13)	(-6.69)	(-0.83)

t statistics in parentheses.

4 Methods

4.1 Econometric model

This section presents the econometric model used to estimate the impact of age and proximity to death on health-care expenditures. Health-care expenditures, which are denoted *HCE,* are modelled with the help of a two-part model (Cameron & Trivedi 2005; Cameron & Trivedi 2010). The probability of having a positive level of HCE is modelled separately from the level of expenditures given that the amount is positive. The two equations are assumed independent. The probability of having a positive level of HCE is given by

$$P(HCE > 0|x) = F(x\gamma)$$

where x is a set of covariates and γ is the vector of parameters associated with the regression model and $F(\cdot)$ is a probability distribution. The model for positive expenditures is written as

$$E(HCE|HCE > 0, x) = g(x\beta)$$

where $g(.)$ is some monotonically increasing function and β a parameter vector.

The conditional expectation function (CEF) for HCE is equal to

$$E(HCE|x) = E(HCE|HCE > 0, x) \cdot P(HCE > 0|x)$$

It is necessary to apply a model which takes into account that health-care expenditures cannot be negative, that its distribution is generally highly skewed to the left and has fat tails. Indeed, most of the patients have low or zero expenditures, but a non-negligible part of the patients can have very high expenditures. To ensure that the HCEs are positive, it is possible to retransform the dependent variable by taking its log and estimating the following linear model:

$$E(ln(HCE)|HCE > 0, x) = x\beta$$

The model can be estimated by OLS separately for the two groups. Once the model is estimated it is, however, necessary to retransform the conditional expectation in order to obtain measures in levels. Because $\exp\big(E(\ln(HCE)\,|x)\big) \neq E(HCE|x)$, it is necessary to apply a smearing factor when taking the exponential of y and if the error term is homoscedastic it is possible to apply a simple smearing factor (Manning & Mullahy 2001). When the model is heteroscedastic, it is needed to model the heteroscedasticity (Manning 1998; Manning & Mullahy 2001). Neglecting this issue can lead to large biases in the prediction of the conditional mean function. In previous literature these issues have led to the use of generalised linear models (GLM) (Nelder & Wedderburn 1972) with a link function to ensure that health-care expendi-

tures are always positive and avoid the retransformation problem previously mentioned (Manning & Mullahy 2001). One popular formulation is the log-link, i.e.

$$E(HCE|HCE > 0, x) = \exp(x\beta)$$

One advantage of the GLM model is that it is not necessary to apply a smearing factor when retransforming the log-expenditures. This method is therefore more robust to heteroscedasticity concerning predictions of the outcome. The distribution assumptions are merely here to help specify the form of the variance function. If for example we assume that errors are Gaussian then the conditional variance will be proportional to the conditional expectation. If we assume a gamma distribution then the variance will be proportional to the square of the expectation. Once the model is estimated a covariance matrix of the parameters which is robust to the presence of unknown heteroscedasticity is estimated. Note that the marginal effects on the health-care expenditures of covariates x_k are equal to

$$\frac{\partial E(HCE|HCE > 0, x)}{\partial x_k} = \exp(x\beta)\beta_k$$

The parameter β_k can be interpreted as the change in per cent of the conditional expectation function of y given y is positive and a set of covariates x when x_k changes by an infinitesimal amount. The partial effect of x_k on $E(y|x)$ is equal to

$$\frac{\partial E(HCE|x)}{\partial x_k} = P(HCE > 0|, x)\frac{\partial E(HCE|HCE > 0, x)}{\partial x_k} + \frac{\partial P(HCE > 0|, x)}{\partial x_k} E(HCE|HCE > 0, x)$$

Assuming a probit model for the first part and a log-link for the second part of the model the partial effect is equal to

$$\frac{\partial E(HCE|x)}{\partial x_k} = \Phi(x\gamma)\exp(x\beta)\,\beta_k + \varphi(x\gamma)\exp(x\beta)\gamma_k$$

The function $\Phi(\cdot)$ is the standard normal distribution and $\varphi(\cdot)$ is the standard normal density function. The variance of the estimates of these partial effects can be obtained by applying the delta method (Wooldridge 2010). These partial effects can also be expressed in terms of semi-elasticity which will give the rate of change of HCE due to a change of a covariate. In this case the partial effect is equal to

$$\frac{\partial E(HCE|x)}{\partial x_k}\frac{1}{E(HCE|x)} = \beta_k + \frac{\varphi(x\gamma)}{\Phi(x\gamma)}\gamma_k$$

To compute partial effects of discrete variables, like dummies, it is preferable to compute first-differences (Wooldridge 2010). The delta-method can also be used to compute the variance of the estimates of these partial effects. As an alternative to the two-part model it is also possible to estimate the GLM model on the whole sample including the zero expenditure to obtain directly the marginal effects model, if the proportion of zeros is not too high.

The model is estimated separately for the two groups. The index g=0,1 indicates which group the model refers to, where 0 denotes native Danes and 1 non-Western immigrants. The set $x^g = (A^g, M^g, W^g)$ includes variables related to age (A), proximity to death and survival status (M) and other covariates (W) for group g. The specification of the model for A can be a linear function of age, a linear spline or a polynomial in age. The set W can include in particular variables related to socio-demographic characteristics which might affect health-care expenditures such as gender, marital status, income etc. The set of parameters is equal to

$$\gamma^g = \left(\gamma_A^g, \gamma_M^g, \gamma_W^g\right)' \text{ and } \beta^g = \left(\beta_A^g, \beta_M^g, \beta_W^g\right)'.$$

The first part of the model is estimated with a probit model, whereas the second part is estimated with a GLM model with a log-link function. In the latter case a Poisson or gamma specification is used.

5 Results

5.1 Estimates of the model

In this section the results of the estimates of the effect of age and proximity to death on health-care expenditures are presented. The model has been estimated separately for Danes and for non-Western immigrants. Health-care expenditures are modelled with the help of a two-part model. A probit model is used to estimate the event of observing positive expenses. Then a generalised linear model (GLM) with a log-link function is used to estimate the conditional mean function for HCE given positive expenditures. It has been experimented with a gamma and a Poisson distribution, and it happened that the Poisson distribution gave marginally better results in terms of mean-squared error.

The following variables have been included in the regression model. Obviously age and proximity to death, and survival status in 2010 are included as they are the main variables of interest to this study. Second demand for health care is dependent on income and the type of insurance contracts that the individual has. The data do not include information at the individual level on the type of insurance contracts. The Danish health-care system is mainly financed by taxes, and access to the health-care system related to the public sector is not subject to acquiring a health insurance. It is, however, possible to buy private health insurances which give access to the health-care units run by the private sector. The majority of Danish citizens do not have a private health insurance although it has been observed during the 2000s that an increasing share of people have private insurances. These are mainly financed by employment based and financed by firms. Denmark use co-payments for drugs purchases, so there might be an interaction between the level of income and the degree of co-payment in the decision to buy medicine. Income can affect both the decisions of buying both insurance specific types of medicine.

Cultural differences and language barriers will affect the level of health-care expenditures through the decision of using the health-care system as well as the type of treatment received if the patient has difficulties in explaining the symptoms or in understanding the recommendations of the medical personal in general. For non-Western immigrants, the number of years since migration and the country of origin are used as proxies for cultural differences among immigrants. The countries of origin can also proxy genetic and lifestyle differences and will also affect the level of expenditure. The civil status and the region of residence are further included in the regression model. The civil status can capture the fact that marriage can have a protective effect on health. There might also be regional differences in terms of health status and patterns of use of health-care services.

The effect of age is modelled with the help of a linear spline. The parameters of the linear spline can be interpreted as the growth rate of health-care expenditures specific to each age interval defined by the spline. Proximity to death is modelled with a quadratic polynomial. The true proximity to death for survivors is not observed since it is right censored. In order to control for people who survived after 2010, a dummy for surviving status after 2010 is in-

cluded in the regression model. Proximity to death is measured in months and for survivors the value of proximity to death is therefore 84 months. This variable is scaled in the regression models by a factor of 1/10. Other covariates include log-disposable income of the household, gender and marital status. Strictly speaking the disposable income of the household is measured as the sum of disposable income of the individual and its potential partner. Furthermore, this measure of income is corrected by the size of the household by using the OECD measure of equivalence of scale. With respect to immigrants, variables measuring the number of years since immigration[5], dummies for country of origin and a dummy for whether the individual came to Denmark as asylum seeker are further included in the model. Summary statistics of the explanatory variables are provided in table 9.2 in the appendix.

The results of the regression model are presented in table 5.1. Age and proximity to death effects appear to differ between the two populations. Actually, the effect of proximity to death is steeper for immigrants than for Danes, implying a higher cost of dying for immigrants. The results suggest that after the age of 70 Danes' health-care expenditures are decreasing with age once proximity to death is included in the model. For immigrants such a result is not present. At least health-care expenditures are not increasing with age once the model includes proximity to death since the age effects are not. The impact of including proximity to death on the estimates of the age effects is substantial when people are aged over 55. Compared to Danes, immigrants seem to experience a lower growth rate of HCE. Up to the age of 70 the growth rate is around half of the growth rate of the Danes. After 70, immigrants experience a higher decrease in their health-care expenditures compared to Danes. After 85 the effect of age is not statistically significant for immigrants, whereas it is strongly significant for Danes. This result could be due to a low number of observations of immigrants after that age.

For the group of decedents the growth rate of HCE with respect to proximity to death is higher for immigrants. Having survived in 2010 is associated with a higher coefficient for immigrants, which could be interpreted as a higher cost of dying for this group. Note that gender has no significant impact on the effect of proximity to death

5 This variable could be problematic for immigrants who came to Denmark prior to 1980.

Table 5.1 The effect of ageing and proximity to death on HCE: Danes and immigrant – partial effects

	Danes			Immigrants		
	Probit	E(y|x,y>0)	E(y|x)	Probit	E(y|x,y>0)	E(y|x)
Main						
age < 55	-0.0010***	0.024***	0.023***	0.0008	0.014	0.015
	(0.00)	(0.005)	(0.006)	(0.00)	(0.008)	(0.008)
55 <= age < 70	-0.0001	0.020***	0.020***	-0.0020***	0.010	0.008
	(0.00)	(0.003)	(0.003)	(0.00)	(0.007)	(0.007)
70 <= age < 85	0.0014***	-0.017***	-0.016***	-0.0001	-0.018	-0.018
	(0.00)	(0.002)	(0.002)	(0.00)	(0.010)	(0.010)
age >= 85	-0.0010	-0.056***	-0.057***	-0.0061	-0.038	-0.045
	(0.00)	(0.007)	(0.007)	(0.00)	(0.054)	(0.055)
(age < 55)*Man	0.0013***	0.001	0.003	0.0009	-0.001	0.000
	(0.00)	(0.010)	(0.010)	(0.00)	(0.013)	(0.013)
(55 <= age < 70)*Man	0.0009***	0.010**	0.011**	0.0010	0.001	0.003
	(0.00)	(0.003)	(0.004)	(0.00)	(0.008)	(0.008)
(70 <= age < 85)*Man	0.0008*	-0.003	-0.002	-0.0001	-0.005	-0.005
	(0.00)	(0.003)	(0.003)	(0.00)	(0.013)	(0.013)
(age >= 85)*Man	0.0010	0.008	0.009	0.0070	-0.012	-0.004
	(0.00)	(0.012)	(0.012)	(0.01)	(0.061)	(0.062)
Proximity to death/10	-0.0042*	-0.261***	-0.266***	-0.0127	-0.449***	-0.465***
	(0.00)	(0.019)	(0.019)	(0.01)	(0.107)	(0.108)
P.T.D./10 squared	0.0187	1.764***	1.785***	0.0891	4.077*	4.187*
	(0.02)	(0.220)	(0.221)	(0.08)	(1.637)	(1.654)
Survivor	0.0048	-0.636***	-0.631***	-0.0267**	-1.115**	-1.156**
	(0.00)	(0.037)	(0.037)	(0.01)	(0.412)	(0.416)
Years since migration				0.0021***	0.009**	0.012***
				(0.00)	(0.003)	(0.003)
Refugee/asylum seeker				0.0292***	0.192*	0.240**
				(0.00)	(0.077)	(0.083)
Demographics (i)	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	Yes	Yes	Yes
Log. lik.	-27734.7	-70346.1		-9895.2	-15716.1	
AIC	55527.3	140750.1	.	19876.4	31518.2	.
Root MSE		0.4110	0.4049		0.5114	0.4954
MAPE		0.1485	0.1453		0.1415	0.1352
Observations	197123	190505	197123	45534	42574	45534

(i) includes log-income, marital status and ownership status.

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

With the estimates available in table 5.1 it is possible to test the equality of the parameters for the two populations. In particular, it is tested successively whether the age effects are the same between the two populations, whether the age and the proximity to death parameters are equal. Finally, the equality of the whole vector of parameters between Danes and the non-Western immigrants is tested. The test is almost equivalent to a Wald test of equality of parameters of a regression model where the two samples are pooled and each parameter is interacted with a dummy variable for being a Dane or an immigrant. Note that the model is heteroskedastic since it uses the Poisson model where the standard errors are robust to an unknown form of heteroskedasticity. The results of these tests are summarised in table 5.2. As expected the test of equality of parameters is rejected in each case. Both tests of equality of age effects and proximity to death are for example rejected.

Table 5.2 Tests of equality of parameters – Danes and Immigrants

Dependent variable	Model/Specification	Covariates	X^2	p.v.
1(HCE>0)	probit	Age	137.78	0.0000
1(HCE>0)	probit	Proximity to death	54.84	0.0000
1(HCE>0)	probit	Age and proximity to death	156.73	0.0000
1(HCE>0)	probit	All	354.51	0.0000
HCE	GLM Poisson	Age	16.04	0.0417
HCE	GLM Poisson	Proximity to death	13.49	0.0037
HCE	GLM Poisson	Age and proximity to death	27.36	0.0041
HCE	GLM Poisson	All	79.75	0.0000

For each group two regression models have been estimated. One model includes age and proximity to death, whereas the other omits the latter variable. Table 5.3 reports the estimates of partial effects obtained from the estimates of these two models. Partial effects are computed for survivors and decedents. The results in table 5.3 show that controlling for proximity to death has implications for the estimates of the effect of age. Once proximity to death is included in the model, the magnitude of the age effects becomes lower and even negative past a certain age. This kind of result has been found in other studies (Zweifel, Felder et al. 1999; Arnberg & Bjørner 2010). The cost of dying represented by the partial effect of proximity to death is higher for immigrants. The estimated effect on the total yearly expenditures is -400 DKK per month left to live for a Dane, where it is about -500 DKK for an immigrant.

The estimates of the parameters of these models are reported in table 9.3 in the appendix. These estimates show for example that for ethnic Danes aged less than 55 the growth rate is about 2.4% with the model including proximity to death against 2.7% for the model with only age effects. For people aged between 55 and 70, the increase in HCE is about 2.6% per year when controlling for proximity to death, whereas it is about 3.9% when only age is included. Past 70 including proximity to death gives negative age effects. These results show the importance of controlling for proximity to death. For Danes under the age of 70 HCE increase with age even when proximity to death is included in the model. After this age HCE tend to decrease. For immigrants age has no impact when proximity to death is included.

Table 5.3 The effect of ageing and proximity to death on HCE: Danes and immigrants – comparison of age effects when omitting proximity to death

	Danes				Immigrants			
	With ptd		Without ptd		With ptd		Without ptd	
	Decedents	Survivors	Decedents	Survivors	Decedents	Survivors	Decedents	Survivors
age < 55	658.2***	214.5***	488.1***	301.8***	482.4	152.1	262.8*	200.5*
	(156.8)	(52.29)	(103.3)	(64.67)	(270.9)	(82.76)	(127.2)	(97.37)
55 <= age < 70	573.3***	189.3***	552.9***	345.0***	298.2	81.90	293.3**	228.0**
	(74.72)	(24.24)	(49.73)	(30.55)	(236.3)	(73.54)	(109.9)	(83.28)
70 <= age < 85	-458.0***	-147.1***	256.0***	164.2***	-590.1	-181.9	261.6	199.8
	(68.93)	(22.52)	(43.52)	(26.90)	(318.8)	(97.64)	(148.5)	(113.5)
age >= 85	-1637.1***	-544.3***	-333.3**	-209.5**	-1379.8	-454.1	247.2	194.5
	(195.6)	(65.50)	(125.1)	(78.79)	(1765.1)	(544.2)	(825.7)	(632.0)
(age < 55)*Man	62.87	24.84	56.94	39.39	-15.08	-0.0295	39.87	29.17
	(292.7)	(96.71)	(191.2)	(119.3)	(427.2)	(131.5)	(198.7)	(152.3)
(55 <= age < 70)*Man	311.9**	105.8**	309.1***	195.6***	69.28	26.25	118.2	88.99
	(100.4)	(33.49)	(66.63)	(41.64)	(266.6)	(82.19)	(128.2)	(98.24)
(70 <= age < 85)*Man	-54.85	-15.61	41.51	28.46	-151.5	-47.18	4.688	3.550
	(99.09)	(32.88)	(65.42)	(40.92)	(435.5)	(134.0)	(205.6)	(157.7)
(age >= 85)*Man	247.8	84.96	-98.68	-58.73	-240.8	-39.81	-291.1	-232.0
	(334.8)	(111.4)	(217.5)	(136.2)	(2008.6)	(619.1)	(922.4)	(705.8)
1. Man	-8143.3	-3005.5	-5590.4	-3755.0	-217.3	-547.0	-2246.9	-1634.8
	(14121.7)	(4521.4)	(9198.5)	(5619.2)	(21599.2)	(6609.2)	(10190.1)	(7767.3)
Proximity to death in months/10	-399.4***				-505.8***			
	(17.12)				(109.3)			
Years since migration					354.0***	118.9***	204.5***	153.8***
					(104.3)	(31.59)	(47.37)	(37.17)
1. Refugee/asylum seeker					7708.0*	2548.8**	4134.8**	3106.9**
					(3197.1)	(964.4)	(1490.0)	(1141.4)
Observations	197123	197123	197123	197123	45534	45534	45534	45534

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5.4 reports the partial effects computed from the results of the estimation of the model performed separately for men and women[6]. Comparing the results between men and women for each group it appears that Danish men and women have actually very similar parameter estimates. Age effects are lower for women between 50 and 70, whereas the effects of proximity to death and survival status are very similar. For immigrants age effects are lower in magnitude and are not statistically significant compared to Danes. The cost of dying is higher for immigrant men, as shown by the parameters of proximity to death and survival status. It is worth noticing that the number of years since migration have a positive impact for women, but is not statistically significant for men at the 5% level. Years since migration tend to be correlated with age, but leaving out this variable from the regression model does not change the results much. Surprisingly, people who have come as refugees do not have a significantly higher level of HCE.

6 These results are reported in table 9.4 in the appendix.

Table 5.4 The effect of ageing and proximity to death on HCE: Danes and immigrants. Marginal effects for women and men

	DK				Immigrants			
	Men		Women		Men		Women	
	Decedents	Survivors	Decedents	Survivors	Decedents	Survivors	Decedents	Survivors
age < 55	674.7***	238.1***	710.2**	216.7**	345.5	108.1	540.9	177.0
	(160.8)	(57.85)	(240.5)	(71.48)	(272.5)	(84.12)	(382.7)	(116.4)
55 <= age < 70	600.9***	213.2***	850.6***	261.8***	297.7	84.54	473.4**	139.6*
	(76.08)	(26.01)	(71.94)	(22.41)	(249.0)	(77.91)	(163.6)	(55.26)
70 <= age < 85	-413.4***	-144.6***	-573.5***	-163.4***	-554.9	-173.8	-771.0*	-237.5*
	(74.15)	(25.70)	(83.65)	(25.59)	(306.5)	(93.96)	(337.7)	(97.81)
age >= 85	-1587.3***	-565.0***	-1447.9***	-439.8***	-1249.0	-414.4	-1634.9	-493.1
	(193.5)	(69.85)	(278.5)	(84.89)	(1712.7)	(536.2)	(992.8)	(307.2)
Proximity to death in months/10	-386.0***		-414.5***		-542.1***		-444.2*	
	(23.92)		(24.56)		(85.65)		(219.2)	
Years since migration					418.7***	140.2***	298.0	100.9
					(112.2)	(35.63)	(182.3)	(54.13)
1.Refugee/asylum seeker					3959.4	1382.6	11212.4	3605.1*
					(3288.4)	(1036.7)	(5776.7)	(1697.1)
Observations	104490	104490	92633	92633	22017	22017	23517	23517

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

For each component of the health-care expenditures, the same two-part model has been estimated for each sample. The results of these regressions are reported in table 5.5. It is interesting to notice that the age and proximity to death effects differ across the components of health-care expenditures. For drugs expenditures age effects are significant at the 5% level for both Danes and immigrants even if proximity to death is controlled for. Looking at expenditures related to inpatient and outpatient care the effect of age is mostly significant for Danes. Proximity to death and survival status have a large effect and the effect is largest for immigrants. It is actually consistent with the red-herring literature, which postulates that most the effect of aging on HCE is actually captured by proximity to death. It is also consistent with the fact that costly diseases with fatal issues are treated at the hospital. Differences in the effect of proximity to death between inpatient and outpatient care are also consistent with the fact that decedents tend to be treated at the inpatient care units. The column labelled 'Hospital' reports the results of the regression model estimated for the sum of inpatient and outpatient care expenditures. Regarding visits to physicians, survival status is statistically significant at the 5% level whereas proximity to death does not seem to play a role for neither Danes nor immigrants. It is finally interesting to see that the effect of years of migration is mostly significant for drugs and physicians expenditures. Individuals who have come to Denmark as refugees experience higher expenditures for all the components except for drugs, where the difference is negative but not statistically significant at the 5% level. The estimates are strongly statistically different from zero at the 0.1% level for physician contacts.

Table 5.5 The effect of ageing and proximity to death on the components of HCE: Danes and immigrants

Decedents	Drugs		Inpatient		Outpatient		Hospital		Physicians	
	Danes	Immigrant	Danes	Immigrant	Danes	Immigrant	Danes	Immigrant	Danes	Immigrant
age < 55	73.79***	204.7***	376.7***	477.1**	64.53***	130.0***	525.3***	669.7***	29.05***	16.78***
	(18.41)	(26.65)	(92.03)	(146.1)	(14.58)	(33.96)	(95.36)	(162.7)	(3.151)	(4.667)
55 <= age < 70	78.52***	77.85***	436.9***	217.7**	58.49***	5.410	507.3***	246.2*	40.12***	-16.13***
	(6.585)	(13.32)	(37.28)	(83.88)	(6.506)	(26.18)	(39.54)	(97.12)	(1.699)	(3.446)
70 <= age < 85	-99.16***	-86.15***	-218.4***	-207.1	-50.79***	-102.9*	-279.4***	-365.5	5.820*	25.85**
	(7.344)	(23.63)	(39.43)	(155.2)	(8.851)	(49.80)	(43.23)	(200.9)	(2.373)	(8.864)
age >= 85	-265.9***	-214.0*	-773.9***	-1635.8**	-275.5***	-385.4**	-1058.1***	-1859.6**	-115.1***	-74.97*
	(20.37)	(86.65)	(106.0)	(538.7)	(30.82)	(146.9)	(118.1)	(610.6)	(7.249)	(34.96)
1.Man	-109.3	257.8*	1537.8***	1523.1*	-81.81	-217.1	1478.0***	1156.3	-526.7***	-677.3***
	(56.14)	(117.8)	(285.8)	(745.6)	(53.39)	(179.4)	(308.5)	(809.7)	(14.00)	(29.25)
Proximity to death/10	-34.58***	-34.24***	-285.2***	-406.1***	-43.02***	-84.35***	-337.3***	-506.4***	-3.939***	-3.329
	(2.200)	(5.925)	(12.46)	(42.97)	(4.230)	(18.86)	(14.60)	(124.9)	(0.656)	(1.983)
Years since migration		36.66***		106.5		17.16		129.1*		20.40***
		(8.574)		(54.78)		(11.93)		(62.11)		(1.964)
1.Refugee/asylum seeker		-693.2*		3728.8		581.3		3789.4		452.1***
		(344.7)		(2246.9)		(337.1)		(2332.4)		(73.06)
Observations	197123	45534	197123	45534	197123	45534	197123	45534	197123	45534
Survivors	Drugs		Inpatient		Outpatient		Hospital		Physicians	
	Danes	Immigrant	Danes	Immigrant	Danes	Immigrant	Danes	Immigrant	Danes	Immigrant
age < 55	44.63***	107.0***	110.8***	118.5***	30.43***	47.45***	151.9***	173.6***	20.34***	15.12***
	(8.881)	(12.73)	(24.23)	(35.30)	(6.674)	(11.31)	(26.83)	(39.89)	(2.220)	(3.973)
55 <= age < 70	50.18***	40.56***	145.8***	74.53***	31.24***	1.640	166.3***	62.27*	28.35***	-14.78***
	(3.200)	(6.541)	(10.12)	(21.24)	(3.021)	(9.380)	(11.32)	(25.18)	(1.184)	(2.911)
70 <= age < 85	-33.82***	-41.76***	-36.86**	-31.37	-18.18***	-32.13	-47.29***	-67.20	4.629**	21.61**
	(3.714)	(11.71)	(11.43)	(39.60)	(3.982)	(17.08)	(12.71)	(46.56)	(1.681)	(7.467)
age >= 85	-137.8***	-105.8*	-250.1***	-454.0**	-138.2***	-142.2**	-360.6***	-495.4**	-81.28***	-65.60*
	(11.04)	(44.30)	(32.52)	(147.6)	(13.99)	(52.52)	(36.17)	(162.4)	(5.055)	(29.66)
1.Man	-257.9***	-15.44	445.4***	252.5	-42.06	-103.1	385.4***	156.2	-376.5***	-595.3***
	(27.11)	(57.56)	(80.74)	(183.2)	(24.75)	(62.33)	(89.82)	(208.0)	(9.613)	(21.48)
Years since migration		22.26***		28.55*		7.286		36.97*		18.70***
		(4.189)		(13.26)		(4.210)		(15.05)		(1.666)
1.Refugee/asylum seeker		-271.8		1402.5*		293.1*		1370.2*		408.6***
		(172.4)		(607.6)		(131.9)		(628.6)		(62.12)
Observations	197123	45534	197123	45534	197123	45534	197123	45534	197123	45534

Note: Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5.2 Effect of ageing and proximity to death for different subpopulations of immigrants

In this section it is investigated to what extent estimates of the age effects and proximity to death effects on health-care expenditures differ for the different groups of non-Western immigrants in Denmark. A regression analysis of the impact of age and proximity to death is performed for selected countries. The non-Western countries with the largest groups of immigrants have been considered. The results of this analysis are reported in table 5.6. The following countries have been selected: Turkey, Pakistan, Lebanon, Iran, Yugoslavia, Bosnia, Vietnam, Iraq, Morocco, Sri Lanka, Somalia and Afghanistan. The other countries are grouped under the label other. For each country two regressions have been performed. The first regression is the regression where HCE is a linear function of age. The second regression includes further proximity to death and the survival status in 2010.

When age is the only explanatory variable, age effects are statistically significant at the 1% level except for Lebanon, Iran, Morocco, Somalia and Afghanistan. When proximity to death is included, age becomes insignificant for all countries except for Turkey and Pakistan. Furthermore, the effect of proximity to death is statistically significant at the 5% level except for Lebanon, Iran and Afghanistan. This analysis also reveals that individuals from Turkey and Pakistan actually have age and proximity to death effects which are similar to those of the Danes. The other countries tend to have insignificant age effects and a higher cost of dying.

Table 5.6 The effect of age and proximity to death on HCE for selected countries

	Denmark	Immigrants	Turkey	Pakistan	Lebanon	Iran	Yugoslavia	Bosnia	Vietnam	Iraq	Morocco	Sri Lanka	Somalia	Afghanistan	Other
Age	0.030***	0.020***	0.031***	0.026***	0.014	-0.001	0.012**	0.021***	0.025***	0.016***	0.016	0.015**	-0.003	0.014	0.026***
	(0.001)	(0.002)	(0.005)	(0.006)	(0.007)	(0.011)	(0.005)	(0.004)	(0.004)	(0.004)	(0.010)	(0.005)	(0.009)	(0.007)	(0.004)
Observations	197123	45534	6568	3304	1507	2436	4092	4952	2006	2659	1287	1381	826	798	13699

	Denmark	Immigrants	Turkey	Pakistan	Lebanon	Iran	Yugoslavia	Bosnia	Vietnam	Iraq	Morocco	Sri Lanka	Somalia	Afghanistan	Other
Age	0.009***	0.003	0.019**	0.012*	0.002	-0.025	-0.002	0.003	0.012*	0.007	0.001	0.000	-0.012	0.004	0.005
	(0.001)	(0.002)	(0.006)	(0.006)	(0.008)	(0.022)	(0.005)	(0.005)	(0.005)	(0.005)	(0.010)	(0.006)	(0.009)	(0.008)	(0.004)
Proximity to death	-0.011***	-0.012**	-0.011**	-0.011**	-0.005	0.042	-0.020***	-0.019***	-0.016*	-0.016**	-0.023**	-0.022**	-0.022*	-0.006	-0.015***
	(0.000)	(0.004)	(0.004)	(0.004)	(0.008)	(0.033)	(0.004)	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)	(0.009)	(0.011)	(0.002)
Survived after 2010	-0.441***	-0.611*	-0.349	-0.608*	-0.771	-3.388*	0.009	-0.115	-0.357	-0.100	-0.262	-0.169	-0.721	-0.585	-0.498***
	(0.027)	(0.247)	(0.198)	(0.238)	(0.401)	-1.441	(0.206)	(0.264)	(0.333)	(0.273)	(0.406)	(0.393)	(0.517)	(0.602)	(0.139)
Observations	197123	45534	6568	3304	1507	2436	4092	4952	2006	2659	1287	1381	826	798	13699

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5.3 Is the probability of remigration correlated with health expenditures?

In this section it is investigated for immigrants whether the probability of leaving Denmark is correlated with the level of health expenditures. The descriptive analysis has shown that the age profile of immigrants lies above that of Danes before the age of 65. One explanation could be that the sickest immigrants leave Denmark to return in their country of origin or that non-Western immigrants are more dependent on their children. In this case the group of immigrants above the age of 65 constitutes a selected group with respect to their health status and the estimates of the effect of age and proximity to death would be biased.

In order to check this hypothesis duration models for the event of leaving Denmark have been estimated with the sample of immigrants and where health-care expenditures is used as an explanatory variable in the model. More specifically Cox proportional hazard regression models are estimated. This type of model does not require modelling the baseline hazard. The fraction of immigrants in this sample, i.e. non-Western immigrants over the age of 45, who leave the country after the 31st December 2003 are about 1% (453 individuals). The point of right censoring is the 31st December 2010 or death. It is further investigated in a duration analysis of whether health-care expenditures have an influence on the event of emigrating out of Denmark.

The results of a duration analysis for the event of emigrating out of Denmark are reported in table 5.7. A Cox proportional hazard model has been estimated for the event of emigrating for immigrants only. A non-negligible portion of the sample actually dies and the two events should be considered as competing risks. The duration is therefore computed up to the point where one of the two events between emigrating and dying actually occurs and the event of dying is considered as right censored. The following covariates have been included: age, age squared, log-income, regional dummies, marital status, ownership status and whether the individual came to Denmark as an asylum seeker. Finally, health-care expenditures have been included in the model. The results of three specifications are reported here. The first one is a quadratic specification in HCE, whereas the second one includes the logarithm of HCE together with a dummy for whether the individual has zero expenditure. The last specification includes dummy variables for which quintile of the HCE distribution the individual belongs to. The general picture emerging from these regression results is actually that the immigrants with low HCE have a higher risk of emigrating out of the country. In column 2 of table 5.7 people with zero expenditure are at a higher risk of leaving Denmark. Whereas results in column 3 show that those who belong to the first quintile are also at a higher risk of leaving the country. Therefore, the results do not show any evidence that there is a selection mechanism which could explain why the age profile of HCE for immigrants lies below and is flatter compared to the age profile of the Danes after the age of 65. For that to be the case the opposite would be expected, i.e. immigrants with high expenditures have a higher risk of leaving the country. Actually, the results do suggest the opposite, i.e. that there is a selection effect which might upward bias the results.

Table 5.7 Cox proportional hazard model for time until emigration out of Denmark for immigrants in the year 2003, hazard ratios

	(1) Time	(2) Time	(3) Time
Age	0.320*	0.355*	0.352*
	(-2.57)	(-2.32)	(-2.35)
Age squared	1.104**	1.095**	1.097**
	(2.84)	(2.59)	(2.68)
Man	1.295*	1.185	1.195
	(2.57)	(1.68)	(1.76)
log(Income/ES)	0.823***	0.864***	0.844***
	(-13.68)	(-9.44)	(-11.35)
Refugee or asylum seeker	1.504	1.506	1.512
	(1.39)	(1.40)	(1.41)
HCE	0.859		
	(-0.85)		
HCE squared	1.002		
	(0.23)		
1(HCE = 0)		2.502**	
		(3.18)	
ln(HCE)		0.958	
		(-1.29)	
2nd quantile HCE			0.541***
			(-4.38)
3rd quantile HCE			0.486***
			(-4.93)
4th quantile HCE			0.440***
			(-5.44)
5th quantile HCE			0.493***
			(-4.89)
Demographics (i)	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes
AIC	9166.1	9080.2	9125.2
Log. lik.	-4549.0	-4506.1	-4526.6
Observations	45534	45534	45534

(i) includes log-income, regional dummies, marital status and ownership status.

t-statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6 Summary of the results and discussion

The results obtained in this paper show that on average non-Western immigrants incur higher health expenses. This is both true for survivors and decedents. This, however, can mask differences in the age distribution of the non-Western immigrants, as they are generally younger than Danes. Once the average expenditures are standardised by age and gender, the difference between Danes' and immigrants' health expenditures becomes actually more negative for survivors but not for decedents, where the difference is not statistically significant. This pattern tends to apply to the other different components of health-care expenditures and the probability to use health-care services at all. The descriptive analyses also show different patterns in terms of morbidity for the two groups, where some diseases are more prevalent for one group but not for the other. Age profiles of health-care expenditures exhibit a particular pattern. Conditional on age the average expenses for immigrants are above those of the ethnic Danes until around the age of 65. This pattern can be observed for the different components of the health-care expenditures. Past this age the pattern is reversed for all the components of HCE.

The regression analysis has shown that age effects for immigrants are lower compared to those for ethnic Danes and that they tend to become insignificant when proximity to death is included in the model. However, it is found that the cost of dying is higher for immigrants. Regressions performed for men and women have also shown some differences in the age effects. In particular for female immigrants only the effect of proximity to death is significant. For ethnic Danes the age and proximity to death effects are similar for men and women. The results show therefore that the impact of ageing and proximity to death are different between immigrants and ethnic Danes. The first implication of these results indicates a postponing of mortality (Miller 2001), which means that gains in longevity for immigrants will not necessarily be translated in higher health costs ceteris paribus. The second implication is that if one wants to make projections of the evolution of the health-care expenditures in the future it is important to take into account the demographic evolution of the population in terms of the ethnic composition. The second conclusion from this analysis is that immigrants from non-Western countries tend to cost more below the age of 65, but this tendency is reversed past this age. Therefore, there is no clear evidence that the health-care system is threatened by immigrants staying and getting older in Denmark. One explanation is probably to be found in the types of disease immigrants tend to have and the costs related to them, as well as their timing during the life cycle and their impact on the risk of dying. For example, Danes are more likely to develop cancer, whereas immigrants are more likely to suffer from heart diseases and diabetes. One explanation could be that immigrants suffer from chronic diseases which cost of dying is higher. This explanation is actually consistent with the fact that the estimates of the age effects for immigrants are less affected by the inclusion of proximity to death into the regression model.

A separate analysis of the impact of age and proximity to death on each type of health-care expenditure shows that the effect of ageing is markedly higher for individuals aged less

than 55. This is observed for both survivors and decedents. The difference in the impact of proximity to death between Danes and non-Western immigrants is particularly higher for inpatient and outpatient care, whereas the difference for drugs purchases and expenditures related to visits to physicians are similar for both populations. It could suggest differences between the two populations in the types of diseases which are lethal and how costly they are. The effect of years since migration is strongly significant in the regression model for drugs purchases and expenditures related to visits to physicians. It suggests that knowledge of the health-care system, as well as the general functioning of the administrative system, and language barriers are determinants of the use of health-care services. This is rather striking when one considers that drugs purchases are subject to co-payments and that general practitioners dispatch patients further in the health-care system.

It has also been investigated whether the probability of migrating to the country of origin is a source of selection bias in relation to the health status. First, no evidence has been found that immigrants with higher health-care expenditures have a higher probability of leaving the country, which would imply that only the older immigrants in good health stay in Denmark. Secondly, most of the migration out of Denmark of immigrants, most likely back to their country of origin, happens around the age of 40. The probability of leaving the country for older immigrants (over 45) is actually very low. Therefore, it seems unlikely that the decrease in health-care expenditures for non-Western immigrants past the age of 65 can be explained by a selection effect, where only the fittest would stay in the country. It seems that it is quite the opposite which happens.

There are some limitations to this study. The concept of immigrant covers different populations. The country of origin could be an important factor in determining the effect of age and proximity to death. Therefore, the results presented here represent an average across countries of origin of these effects which are dependent of the between-country composition. Therefore, a change in the composition of the origin of the immigrants is likely to influence these effects in the future. A robustness analysis of this issue shows, however, that although there are discrepancies between countries of origin, the effects for immigrants tend to be close to each other. Furthermore, age effects tend to be low or insignificant, while at the same time proximity to death effects are close. A second limitation is related to the assumption that proximity to death is assumed exogenous. Salas & Raftery (2001) have criticised this assumption used in the first studies from the 'Red-Herring' literature. This issue is difficult to address with instrumental variables since good instruments for proximity to death are difficult to find. To identify the model an instrument should affect health care only through its effect on proximity to death. It is rather difficult to imagine such a variable in this context. Felder, Werblow et al. (2010) have tried to address this issue with instrumental variables techniques, but they had to conclude that the validity of their instruments was not fulfilled.

7 Conclusion

This paper has investigated and compared the effect of ageing and proximity to death on the health-care expenditures of native-born and non-Western immigrants in Denmark. Using a large sample of native Danes and non-Western immigrants observed in the year 2003 and aged over 45, health-care expenditures are computed from data extracted from administrative registers. The dataset of non-Western immigrants includes all the immigrants aged over 45 in 2003, whereas the dataset for native-born is a 10% sample of the Danish population aged over 45 in 2003. Regression models for health expenditures and their different components have been performed to estimate the impact of ageing and proximity to death.

The results do not show evidence that health-care expenditures increase with age for non-Western immigrants once proximity to death is included in the regression model. Furthermore, taking into account proximity to death mitigates the effect of ageing on health-care expenditures both for Danes and for non-Western immigrants. Although ageing is going to put the health-care system under pressure (Arnberg & Bjørner 2010), it is difficult to conclude that the ageing of the non-Western immigrant population is going to put the health-care system under pressure in the future more than the ageing of the Danes. Moreover, other factors such as technological progress and growth in income are more likely to be the drivers of health-care expenditures.

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9 Appendix

9.1 Differences in morbidity and mortality and their impact on health expenditures

Table 9.1 reports standardised average expenditures for medicine purchases, ambulatory contacts and inpatient care divided by type of expenditures. The expenditures are in DKK (1 $=5.6 DKK in 2003). The figures in this table show some strong differences. Regarding medicine purchases the biggest difference is for medications for the nervous system and for alimentary tract and metabolism (which include medicine for diabetes treatments), with a difference between Danes and immigrants of respectively of -188 DKK and 225 DKK. There is also a negative difference between immigrants and native Danes for medicine for the respiratory system (-88 DKK) and a positive difference for drugs for the cardiovascular system (37 DKK). Looking at the expenditure related to inpatient care (DRG) there is a large positive difference of 310 DKK for procedures related to the circulatory system and a negative difference of 432 DKK for those procedures related to the musculoskeletal system. Concerning hospital outpatient contacts there is a positive difference for treatments related to the digestive system and other treatments which cannot be classified according to specific parts of the body.

Table 9.1 Standardised averages of medicine purchases and hospital expenditures in DKK with two sample t-statistics for differences in averages–- Danes vs. immigrants

		Unstandardised immigrants		Standardised immigrants	
	Danes mean	Dif.	t-stat	Dif.	t-stat
Drugs purchases – ATC					
Alimentary tract and metabolism	292.72	-147.37	-20.05	-224.76	-28.90
Blood and blood-forming organs	65.67	12.64	6.40	-3.14	-1.47
Cardiovascular system	668.90	98.27	11.68	-37.37	-4.14
Dermatologicals	31.79	-7.22	-5.18	-11.05	-7.75
Genitourinary system/sex hormones	111.73	29.62	6.78	14.09	3.45
Systemic hormonal preparations	17.83	6.05	8.58	2.73	3.52
Antiinfectives for systemic use	44.30	4.30	2.64	-1.13	-0.77
Antineoplastic and immunomodulating agents	12.08	2.61	1.59	1.15	0.68
Musculoskeletal system	128.09	8.67	2.87	-29.56	-8.58
Nervous system	610.91	226.01	16.69	187.74	14.00
Antiparasitic products	5.71	2.68	12.76	1.41	5.87
Respiratory system	315.30	122.31	18.13	87.62	12.21
Sensory organs	46.84	6.98	4.05	-14.69	-7.07
Various	2.98	0.41	0.68	1.15	2.13
Inpatient care					
Nervous system	482.29	199.94	8.40	99.69	3.74
Eye diseases	29.45	-0.11	-0.02	-9.32	-1.58
Ears, nose, throat diseases	81.65	-9.35	-1.19	-8.48	-1.04
Respiratory system	617.10	141.35	4.38	-2.44	-0.07
Circulatory system	1347.33	-76.52	-1.04	-310.34	-4.08
Digestive system	631.63	105.89	3.53	12.57	0.38
Liver diseases	228.75	-77.54	-3.21	-86.85	-3.61
Musculoskeletal system	1179.53	616.45	17.76	432.15	11.06
Skin diseases	254.99	100.54	5.89	81.37	4.57
Endocrinal diseases	150.18	-58.12	-4.17	-109.65	-7.21
Urinary system	423.65	-51.61	-1.55	-112.94	-3.29
Masculine genital system	12.82	1.21	0.25	3.81	0.96
Feminine genital system	136.50	18.39	1.80	31.76	3.20
Blood and blood-forming organs	70.22	-2.33	-0.15	-11.80	-0.79
Cancer lymphatic system	168.74	23.03	0.93	19.51	0.83
Infectious diseases	104.10	-12.16	-0.87	-37.59	-2.54
Psychiatric diseases	31.29	16.64	4.13	-2.86	-0.51
Addictions	25.02	20.80	9.74	21.06	9.88
Accidents and poisoning	43.73	11.61	1.92	6.60	1.04
Burns	11.23	7.76	1.42	9.49	1.95
Diverse	373.61	108.65	4.50	2.51	0.09
Multi-trauma	16.36	6.15	0.93	10.06	1.82
HIV infections	0.95	-25.60	-2.18	-17.10	-1.80
Outside classification	262.68	85.75	2.35	61.82	1.83
Cancer therapies	101.55	20.98	1.15	25.03	1.36
Outpatient care					
Skin system	111.32	42.37	5.00	29.35	2.92
Muscle system	26.64	7.81	3.99	6.87	3.46
Respiratory system	13.13	-5.87	-3.26	-7.52	-3.92
Cardiovascular system	5.49	2.15	2.42	1.97	2.22
Digestive system	125.33	-34.80	-6.02	-29.82	-5.24
Urinary system	35.01	-4.23	-1.76	-7.09	-2.86
Masculine genital system	3.17	1.26	2.18	1.47	2.64
Feminine genital system	2.81	0.24	0.37	1.02	1.80
Nervous system	1.76	1.37	3.47	1.39	3.56
Ears, nose and throat	28.19	-8.12	-2.38	-10.32	-2.94
Other procedures	0.49	0.02	0.09	0.07	0.35
Diverse treatments	171.79	-24.67	-0.77	-38.72	-1.14
Diverse examination	82.71	-13.22	-3.86	-17.62	-5.10
Radiological procedures	173.43	-15.16	-2.79	-17.85	-3.24
Outside classification	1022.08	-70.28	-4.35	-155.17	-9.26
Observations	197123	45534		45534	

Standardised average expenditures by type and by age groups for the two populations are reported in table 9.2. The different types of drugs are also grouped according to the ATC classification, inpatient expenditures according to their DRG group and the ambulatory expenditures are divided by their outpatient care group. Results from table 9.2 show averages for individuals aged under and above 65. The interesting element to note at first sight is the proportions of the two age groups for the two populations. Danes aged over 65 represent 34.3 per cent of the total population of Danes, where non-Western immigrants aged over 65 only represent 17.9 per cent of the total population of non-Western immigrants.

Figures from table 9.2 also show that the difference between Danes and non-Western immigrants in health-care expenditures for some diseases which was statistically significant before the age of 65 becomes statistically insignificant after the age of 65. For some diseases the difference becomes higher after the age of 65. It is also noticeable that for some groups of diseases the difference becomes bigger, but the difference is not statistically different from zero. It may indicate that the variance of expenditures tends to grow with age. A similar pattern can be observed, when considering the costs related to ambulatory treatments. Concerning the purchase of medicine, most of the differences are positive for the group aged over 65.

Table 9.2 Standardised averages of drugs purchases and hospital expenditures by age with two sample t-statistics for differences in averages – Danes vs. immigrants, year 2003

	Age≤65			Age>65		
	Danes mean	Immigrants dif.	t-stat	Danes mean	Immigrants dif.	t-stat
Drugs – ATC						
Alimentary tract and metabolism	213.67	-214.31	-26.23	443.80	-242.77	-12.39
Blood and blood-forming organs	33.74	-12.87	-6.26	126.69	14.75	2.45
Cardiovascular system	456.17	-95.33	-10.36	1075.48	74.16	3.19
Dermatologicals	28.69	-9.38	-6.02	37.71	-14.73	-4.26
Genitourinary system/sex hormones	78.31	0.31	0.07	175.61	37.81	4.52
Systemic hormonal preparations	11.37	0.66	0.96	30.19	7.41	3.28
Antiinfectives for systemic use	32.30	-6.85	-3.74	67.24	9.85	3.66
Antineoplastic and immune-modulating agents	10.51	2.47	1.46	15.08	-2.10	-0.45
Musculoskeletal system	80.22	-30.29	-9.74	219.58	-22.88	-2.30
Nervous system	512.78	143.30	9.19	798.46	284.31	10.06
Antiparasitic products	2.67	-0.09	-0.43	11.53	4.52	6.48
Respiratory system	226.12	43.18	6.08	485.74	170.93	9.00
Sensory organs	17.47	-12.41	-8.72	102.96	-17.84	-2.57
Various	3.58	0.82	1.35	1.85	1.72	1.79
Inpatient care						
Nervous system	308.83	73.84	3.00	813.83	151.68	2.00
Eye diseases	20.81	-4.15	-0.93	45.98	-17.57	-0.89
Ears, nose, throat diseases	71.22	-16.21	-1.89	101.59	4.87	0.23
Respiratory system	363.97	-2.35	-0.07	1100.90	-6.33	-0.06
Circulatory system	860.98	-509.37	-6.15	2276.87	59.71	0.34
Digestive system	429.97	-63.70	-2.03	1017.06	154.02	1.69
Liver diseases	203.16	-95.08	-3.48	277.67	-71.23	-1.34
Musculoskeletal system	702.26	193.67	5.68	2091.72	919.73	8.10
Skin diseases	213.15	50.45	2.34	334.96	129.10	3.60
Endocrinal diseases	99.62	-95.61	-6.14	246.81	-136.47	-3.45
Urinary system	251.68	-188.19	-5.11	752.33	11.74	0.14
Masculine genital system	12.16	0.13	0.03	14.08	10.83	3.80
Feminine genital system	147.37	28.61	2.43	115.72	36.29	1.82
Blood and blood-forming organs	31.87	-38.45	-2.01	143.52	35.26	1.70
Cancer lymphatic system	148.30	1.46	0.05	207.80	59.12	1.68
Infectious diseases	75.12	-27.27	-1.85	159.51	-55.90	-1.37
Psychiatric diseases	10.03	1.72	0.52	71.90	-6.73	-0.35
Addictions	32.21	28.17	10.28	11.30	7.61	2.09
Accidents and poisoning	42.33	12.15	1.57	46.42	-3.76	-0.30
Burns	15.64	13.00	1.83	2.81	2.81	1.18
Diverse	188.39	-46.97	-1.92	727.61	122.45	1.55
Multi-trauma	17.48	8.03	1.13	14.21	14.21	1.96
HIV infections	1.45	-26.69	-2.04	0.00	0.00	.
Outside classification	175.56	0.33	0.01	429.20	185.63	3.10
Cancer therapies	92.25	-5.37	-0.24	119.32	84.39	2.84
Outpatient care						
Skin system	87.22	20.04	2.47	157.38	44.29	1.41
Muscle system	27.66	7.86	3.44	24.68	4.45	1.02
Respiratory system	12.48	-5.83	-3.07	14.37	-10.06	-1.95
Cardiovascular system	5.15	1.21	1.14	6.13	3.79	2.42
Digestive system	112.13	-43.96	-6.91	150.56	-4.55	-0.35
Urinary system	21.68	-16.45	-6.30	60.49	8.46	1.36
Masculine genital system	3.80	1.79	2.58	1.97	0.76	0.75
Feminine genital system	3.95	1.45	1.89	0.62	0.14	0.22
Nervous system	2.06	1.46	2.75	1.18	1.18	3.00
Ears, nose and throat	21.99	-10.55	-3.11	40.04	-11.42	-1.13
Other procedures	0.46	-0.02	-0.10	0.56	0.16	0.39
Diverse treatments	165.47	-44.25	-1.20	183.88	-35.87	-0.43
Diverse examination	63.89	-34.23	-8.91	118.68	11.73	1.49
Radiological procedures	152.26	-39.39	-6.47	213.89	20.11	1.53
Outside classification	806.35	-253.93	-14.48	1434.40	30.10	0.72
Observations	129412	37377		67711	8157	

9.2 Tables

Table 9.3 ATC codes used for the grouping of drugs

Type of drugs	ATC codes
Blood pressure, blood cloth	B01,B02
Heart Medicine	C01
Arthritis	M01,M02,M03,M04
Hormonal treatment	H01,H02,H04,H03C
Diabetes	A10
Antipsychotics	N05A
Antidepressant	N06A
Painkillers	N02A
Cardiovascular system (hypertensive)	C02,C03,C04,C07,C08,C09
Dementia	N06D
Parkinson	N04
Osteoporosis	M05
Asthma	R03A
Bronchitis	R03B
Glaucoma	S01E
Eye blood cloth	S01L
Thyroid	H03A
Antithyroid	H03B
Antiepileptics	N03
Anxiolytics	N05B
Sedatives	N05C
ADHD	N06B
Acid related disorders	A02
Antimigraine	N02C
Headaches	N02B

Table 9.4 Summary statistics

	Danes		Immigrants	
	Mean	sd	Mean	sd
Age	62.014	11.442	56.702	9.320
Proximity to death	7.743	1.924	8.166	1.318
Survivor	0.824	0.381	0.920	0.272
Man	0.470	0.499	0.516	0.500
log(Income/ES)	11.866	0.840	11.359	1.808
Bornholm	0.010	0.100	0.003	0.051
Fyn	0.094	0.291	0.076	0.265
Copenhagen suburbs	0.093	0.291	0.179	0.383
North Jutland	0.114	0.318	0.048	0.214
North Zealand	0.084	0.277	0.089	0.284
South Jutland	0.132	0.339	0.082	0.274
South-West Jutland	0.119	0.324	0.067	0.249
West Jutland	0.080	0.271	0.038	0.191
East Jutland	0.139	0.346	0.119	0.323
East Zealand	0.043	0.202	0.036	0.185
Married	0.630	0.483	0.745	0.436
Widowed	0.150	0.357	0.089	0.285
Divorced	0.128	0.334	0.121	0.327
Cohabitation	0.060	0.237	0.029	0.168
Owner	0.656	0.475	0.235	0.424
Years since migration			18.329	9.904
Refugee/asylum seeker			0.044	0.204
Turkey			0.144	0.351
Pakistan			0.073	0.259
Lebanon			0.033	0.179
Iran			0.053	0.225
Yugoslavia			0.090	0.286
Bosnia			0.109	0.311
Vietnam			0.044	0.205
Iraq			0.058	0.234
Morocco			0.028	0.166
Sri Lanka			0.030	0.171
Somalia			0.018	0.133
Afghanistan			0.018	0.131
Other countries			0.301	0.459
Observations	197123		45534	

Table 9.5 The effect of ageing and proximity to death on HCE: Danes and immigrants. Comparison of age effects when omitting proximity to death

	Danes		Immigrants	
	Without ptd	With ptd	Without ptd	With ptd
age < 55	0.026***	0.023***	0.017*	0.015
	(4.64)	(4.10)	(2.06)	(1.84)
55 <= age < 70	0.030***	0.020***	0.019**	0.008
	(11.18)	(7.71)	(2.68)	(1.08)
70 <= age < 85	0.014***	-0.016***	0.017	-0.018
	(5.76)	(-6.32)	(1.74)	(-1.87)
age >= 85	-0.018**	-0.057***	0.017	-0.045
	(-2.67)	(-8.35)	(0.30)	(-0.83)
(age < 55)*Man	0.003	0.003	0.003	0.000
	(0.33)	(0.25)	(0.19)	(0.00)
(55 <= age < 70)*Man	0.017***	0.011**	0.008	0.003
	(4.69)	(3.15)	(0.91)	(0.32)
(70 <= age < 85)*Man	0.002	-0.002	0.000	-0.005
	(0.69)	(-0.48)	(0.02)	(-0.35)
(age >= 85)*Man	-0.005	0.009	-0.020	-0.004
	(-0.44)	(0.76)	(-0.32)	(-0.06)
Proximity to death		-0.266***		-0.465***
		(-14.18)		(-4.29)
P.T.D. squared		1.785***		4.187*
		(8.08)		(2.53)
Survivor		-0.631***		-1.156**
		(-16.86)		(-2.78)
Years since migration			0.013***	0.012***
			(3.80)	(3.41)
Refugee/asylum seeker			0.252**	0.240**
			(3.00)	(2.88)
Demographics (i)	Yes	Yes	Yes	Yes
Country dummies	No	No	Yes	Yes
Root MSE	0.4102	0.4049	0.5000	0.4954
MAPE	0.1502	0.1453	0.1391	0.1352
Observations	197123	197123	45534	45534

(i) Demographics include log-income, marital status and ownership status.

t statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.6 The effect of ageing and proximity to death on HCE: Danes and immigrants. Regressions for women and men

	Danes		Immigrants	
Health-care expenditures	Men	Women	Men	Women
age < 55	0.024**	0.024***	0.018	0.011
	(0.008)	(0.006)	(0.012)	(0.008)
55 <= age < 70	0.030***	0.021***	0.015**	0.009
	(0.002)	(0.003)	(0.005)	(0.008)
70 <= age < 85	-0.021***	-0.014***	-0.023*	-0.017
	(0.003)	(0.003)	(0.010)	(0.009)
age >= 85	-0.050***	-0.055***	-0.050	-0.041
	(0.009)	(0.007)	(0.030)	(0.054)
Proximity to death	-0.269***	-0.260***	-0.561***	-0.288***
	(0.027)	(0.026)	(0.156)	(0.072)
P.T.D. squared	1.786***	1.766***	5.653*	1.701*
	(0.322)	(0.302)	(2.404)	(0.851)
Survivor	-0.668***	-0.603***	-1.426*	-0.693***
	(0.057)	(0.049)	(0.602)	(0.150)
Years since migration			0.009	0.014***
			(0.005)	(0.003)
Refugee/asylum seeker			0.258	0.169
			(0.132)	(0.107)
Demographics (i)	Yes	Yes	Yes	Yes
Country dummies	No	No	Yes	Yes
Log. lik.	-32558.1	-38569.3	-8540.6	-7461.7
AIC	65164.1	77186.6	17157.2	14999.3
RMSE	0.405	0.405	0.595	0.359
MAPE	0.145	0.146	0.144	0.125
Observations	92633	104490	23517	22017

(i) includes log-income, marital status and ownership status.

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9.7 The effect of ageing and proximity to death on the components of HCE: Danes and immigrants

	Drugs		Inpatient		Outpatient		Hospital		Physicians	
	DK	IM	DK	IM	DK	IM	DK	IM	DK	IM
#1										
age < 55	0.044***	0.077***	0.018*	0.013	0.016**	0.018	0.019**	0.015	0.008***	-0.000
	(9.39)	(10.90)	(2.46)	(0.96)	(2.98)	(1.74)	(3.21)	(1.47)	(4.00)	(-0.04)
55 <= age < 70	0.030***	0.035***	0.033***	0.022*	0.019***	-0.008	0.028***	0.012	0.010***	-0.014***
	(11.80)	(6.49)	(7.80)	(2.58)	(6.11)	(-1.01)	(9.04)	(1.76)	(10.54)	(-5.39)
70 <= age < 85	-0.003	-0.016**	-0.003	0.003	-0.013***	-0.013	-0.004	-0.001	0.001	0.012*
	(-1.44)	(-2.59)	(-0.94)	(0.20)	(-3.79)	(-1.15)	(-1.32)	(-0.13)	(0.56)	(2.49)
age >= 85	-0.066***	-0.042	-0.069***	-0.167**	-0.104***	-0.138**	-0.074***	-0.134***	-0.046***	-0.032
	(-11.82)	(-1.61)	(-7.08)	(-3.18)	(-7.68)	(-2.96)	(-8.93)	(-3.32)	(-13.09)	(-1.63)
(age < 55)*Man	-0.014*	-0.023*	0.018	0.032	0.014	0.026	0.018	0.030*	0.011***	0.018***
	(-2.19)	(-2.40)	(1.44)	(1.68)	(1.35)	(1.68)	(1.76)	(2.08)	(3.76)	(4.22)
(55 <= age < 70)*Man	0.007**	0.002	0.006	-0.005	0.007	0.016	0.006	0.000	0.015***	0.011***
	(2.84)	(0.32)	(1.34)	(-0.48)	(1.59)	(1.44)	(1.54)	(0.01)	(10.47)	(3.53)
(70 <= age < 85)*Man	-0.005	0.002	-0.014**	-0.026	-0.000	-0.011	-0.011*	-0.023	0.007***	0.003
	(-1.72)	(0.25)	(-2.60)	(-1.32)	(-0.07)	(-0.53)	(-2.55)	(-1.41)	(3.37)	(0.34)
(age >= 85)*Man	0.001	-0.035	0.023	0.113	0.016	0.086	0.027	0.092	0.003	-0.006
	(0.13)	(-0.85)	(1.30)	(1.57)	(0.83)	(1.29)	(1.77)	(1.59)	(0.51)	(-0.18)
Proximity to death	-0.183***	-0.232***	-0.458***	-0.639***	-0.389***	-0.371***	-0.401***	-0.514***	-0.012	-0.040
	(-9.48)	(-4.22)	(-12.75)	(-5.98)	(-9.68)	(-3.53)	(-15.36)	(-6.56)	(-1.12)	(-1.06)
P.T.D. squared	1.125***	1.790**	3.252***	4.716***	3.170***	2.158	2.897***	3.660***	-0.044	0.273
	(5.40)	(3.05)	(9.24)	(4.33)	(7.07)	(1.85)	(10.37)	(4.29)	(-0.35)	(0.67)
Survivor	-0.598***	-0.760***	-0.883***	-1.066***	-0.631***	-0.543**	-0.803***	-0.919***	-0.144***	-0.182**
	(-14.24)	(-6.97)	(-12.36)	(-5.70)	(-8.21)	(-2.99)	(-15.22)	(-6.20)	(-6.48)	(-2.80)
Years since migration		0.013***		0.007*		0.005		0.006*		0.010***
		(5.91)		(2.07)		(1.71)		(2.35)		(6.06)
Refugee/Asylum seeker		-0.168*		0.316*		0.189*		0.236*		0.209***
		(-2.24)		(2.52)		(2.36)		(2.39)		(5.36)
Demographics (i)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Root MSE	0.0519	0.0470	0.2479	0.2347	0.0642	0.0741	0.2729	0.2651	0.0221	0.0218
MAPE	0.0280	0.0252	0.0992	0.0845	0.0239	0.0250	0.1153	0.1013	0.0129	0.0143
Observations	197123	45534	197123	45534	197123	45534	197123	45534	197123	45534

(i) includes log-income, marital status and ownership status.

t statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Dansk sammenfatning

Christophe Kolodziejczyk

Effekten af alder og nærhed til død på brugen af sundheds-ydelser af ikke-vestlige indvandrere fra Danmark

En sammenligning med etniske danskere

Dette papir undersøger effekten af aldring og nærhed til død på ikke-vestlige indvandreres sundhedsudgifter i Danmark. Disse effekter er derefter sammenlignet med dem for etniske danskere. Datamaterialet er registerbaseret og indeholder alle ikke-vestlige indvandrere og et 10 procents udsnit af etniske danskere, begge grupper ældre end 45. Effekten af nærhed til død og aldring er estimeret for sundhedsudgifter og forskellige komponenter. Resultaterne viser, at terminaludgifter er højere for indvandrere, hvor effekten af aldring er lavere eller insignifikant for indvandrere sammenlignet med etniske danskere. Dette resultat er validt for de forskellige komponenter af sundhedsudgifter. En varighedsanalyse for udvandring viser desuden, at sundhedsudgifter ikke øger sandsynligheden for udvandring.

The Effect of Ageing and Proximity to Death on the Use of Health Care of Non-Western Immigrants of Denmark

The purpose is to analyse the effect of age and proximity to death on health-care expenditures for non-Western immigrants of Denmark and compare them with those of the Danes. The main conclusions are:

1 The cost of dying is higher for immigrants, whereas the effect of age is lower or insignificant in some cases compared to the Danes.

2 These results are also valid for the other components of health-care expenditures.

3 As ageing has not a strong effect on non-Western immigrants' health-care expenditures, an increase in life expectancy will not necessarily be a problem for the future of the health-care expenditures.

This study uses data from administrative registers for all the non-Western immigrants and a 10% sample of Danes over the age of 45. Regression analysis is used to investigate the effect of ageing and proximity to death.

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