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MASTER THESIS

DEVELOPING A PREDICTION MODEL FOR EXTRAMURAL ELDERLY CARE COSTS PER SMALL OR LARGE MUNICIPALITY IN THE NETHERLANDS

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menzis

Voorwoord

Meteen vanaf de start van het vak ´Healthcare Purchasing' heeft het onderwerp Zorginkoop mijn interesse gewekt. Het vak bood inzicht omtrent zorginkoop vanuit zowel het perspectief van een zorgaanbieder, een verzekeraar als een gemeente. Door het verkrijgen van inzicht in de financiële stroom tussen de verschillende betrokkenen in het inkoopproces van de zorg, werden ook de bijbehorende economische prikkels duidelijker. Door deze te combineren met de kwaliteit van zorg ontstaan er, mijn inziens, interessante vraagstukken, zoals; hoe stelt een zorgverzekeraar eisen aan de kwaliteit van zorg en houdt hij de zorgkosten zo laag mogelijk? Hier wilde ik graag meer over leren waardoor het idee ontstond om mijn afstudeeropdracht te wijden aan dit onderwerp. Daarnaast wilde ik graag extern afstuderen om zelf te ervaren hoe in de praktijk gewerkt wordt.

Mijn docent van het vak 'Health Purchasing', Fredo Schotanus, stelde een opdracht bij Menzis voor. Aangezien hij zelf de promovendus Olivier van Noort begeleidde bij een promotieonderzoek vanuit een samenwerking van Universiteit Twente en Menzis, bleek dit een ideale combinatie. Fredo bedank ik dan ook hartelijk voor deze mogelijkheid, het meedenken en de kritische vragen waardoor ik extra geholpen werd om nog dieper over het bijbehorende stuk na te denken. Olivier van Noort bedank ik voor de prettige introductie bij het Zorgkantoor bij Menzis, en het betrekken bij overleggen met verschillende instanties, die erg leerzaam waren.
Guus van Montfort bedank ik voor zijn inzichten in de veranderingen betreffende de ouderenzorgwereld en zijn enthousiasme omtrent de financiële en veranderende zorgwereld die mij hebben geprikkeld om me ook te gaan verdiepen in deze materie.

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Tot slot bedank ik mijn huisgenoten, vrienden en familie voor het vertrouwen dat zij in mij hebben.

Karen Ruijter
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Samenvatting

Doel: Dit artikel focust zich op de ontwikkeling van een model waarmee de hoogte van een zogeheten *lumpsum budget* voor een bepaalde populatie kan worden bepaald. Een dergelijk *lumpsum budget* wordt gebruikt bij populatiegebonden inkoop. Deze vorm van inkoop is een alternatief inkoop- en betaalovereenkomst tussen zorgaanbieders en zorgverzekeraars die in Nederland nog niet of nauwelijks wordt gebruikt. Verwacht wordt dat deze vorm de ouderenzorgkosten kan laten dalen in Nederland.
Literatuuronderzoek: Het gezondheidsgedragsmodel van Andersen (1995) wordt gebruikt om te onderzoeken welke factoren invloed hebben op de extramurale zorgkosten en de mate waarin dit het geval is. Er wordt een onderscheid gemaakt tussen socio-demografische variabelen ('predisposing factors') en de mogelijkheden ('enabling factors'). Daarnaast zijn bestaande voorspelmodellen onderzocht op hun geschiktheid voor het vaststellen van de hoogte van een *lumpsum budget* voor extramurale ouderenzorgkosten. Er is daarbij een onderscheid gemaakt tussen kleine en grote gemeenten, omdat blijkt dat de kenmerken van een gemeente zoals het aantal inwoners per vierkante kilometer invloed heeft op het zorggebruik.
Methoden: De gevonden bestaande modellen zijn getest op hun geschiktheid betreft de voorspelling van extramurale ouderenzorgkosten. Een multiple lineaire regressie analyse is uitgevoerd betreffende de 65 jaar en oudere inwoners en extramurale ouderenzorgkosten van 10 kleine (N=120) en 10 grote (N=120) gemeenten.
Resultaten: De extramurale ouderenzorgkosten zijn in kleine gemeenten hoger dan in grote gemeenten. De resultaten laten zien dat er significante relaties zijn tussen extramurale ouderenzorgkosten en de demografische variabelen. De hoogste zorgkosten worden veroorzaakt door verweduwden, alleenstaanden en ouderen met een hogere leeftijd. Geslacht blijkt minder toegevoegde waarde te hebben, alleen bij een leeftijd boven de 85 jaar blijken vrouwen hogere zorgkosten te hebben. Echter wanneer ouderen verweduwd zijn blijken de mannen meer kosten te veroorzaken. Opvallend is dat een hoger percentage immigranten in kleine gemeenten hogere extramurale ouderenzorgkosten met zich meebrengt, terwijl in grote gemeenten dit juist lagere kosten tot gevolg heeft. Het Risicovereveningsmodel en het ´Erasmus´ model vertonen relatief gezien dezelfde verschillen per gemeente maar zijn niet specifiek geschikt voor de berekening van extramurale ouderenzorgkosten.
Conclusie: Dit onderzoek laat zien dat demografische variabelen een belangrijke voorspeller zijn van extramurale ouderenzorgkosten. Zoals al verwacht werd vanuit de literatuur zijn leeftijd, huishoudsamenstelling en burgerlijke staat belangrijke voorspellers van ouderenzorgkosten, maar dit onderzoek laat wel duidelijk zien dat verweduwden hiervan de belangrijkste voorspeller is. Dit verschaft daardoor meer inzicht in de opbouw van de zorgkosten, wat relevant is voor beleidsmakers. Daarnaast is het een start van een voorspelmodel speciaal gericht op extramurale ouderenzorgkosten op basis van demografische kenmerken. Verder onderzoek kan dit voorspelmodel nauwkeuriger maken door de historische zorgkosten toe te voegen dit ook een belangrijke voorspeller is van toekomstige ouderenzorgkosten. Het is nog onvoldoende duidelijk welke factoren het gebruik van zorgkosten door immigranten beïnvloeden. Aangezien het aantal immigranten onder de ouderen in de toekomst alleen maar zal toenemen is verder onderzoek hiernaar gewenst om hierop een beleid te kunnen afstemmen. Daarnaast zal het lumpsum model in te toekomst aangepast moeten worden door politieke invloeden zoals de extramuralisering van de zorg.

Trefwoorden: Extramurale ouderenzorg kosten, voorspelmodel, lumpsum budget, demografische variabelen

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Developing a prediction model for extramural elderly care costs per small or large municipality in the Netherlands

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Abstract

The **Purpose** of this article is to develop a lump sum budget for a certain population which is needed for population based purchasing, an alternative purchasing and payment arrangement from which it is expected to quell the rising elderly care costs in the Netherlands. A practical prediction model is created on the basis of demographic variables.
A **Literature review** is performed to investigate which predisposing factors and enabling resources of the Andersen behavioral model influence the extramural elderly care costs and the extent to which. Furthermore, existing models which could be suitable are examined. A distinction is made between small and large municipals, since characteristics of a municipality like inhabitants per km² influence the use of health care.
In the **Methods** part the existing models are tested. A multiple linear regression analyses is carried out concerning the residents of 65 year and older with extramural elderly costs of 10 small (N=120) and 10 large municipals (N=120). The **Results** show that the extramural elderly care costs are higher in small municipals compared to the large municipals. Significant relations were found between elderly care costs with the demographic variables. The highest elderly care costs are caused by widowed, singles and elderly with the highest age. Above the age of 85 years, women have higher care costs. However, when persons are widowed, men have higher care costs regardless their age. Striking is that immigrants induce higher extramural health care costs in small municipals but lower costs in the large municipals. The Risk Adjustment Model and the Erasmus Model show relatively the same differences but are unsuitable for specific extramural elderly care costs. To **Conclude**, this research shows that demographic variables are important predictors for extramural elderly care costs. Literature already indicated predictors for elderly care costs like age, household composition, marital status, urbanity and SES and our regression analysis confirms this. However, marital status appeared to be the most important predictor. Furthermore it provides a deeper understanding of elderly care costs for policy makers and supplies a start concerning demographic variables for a elderly care costs prediction model.
Keywords: extramural elderly care costs, prediction model, lump sum budget, demographic variables

Introduction

Health care costs have increased strongly the past decades in the United States and Europe. This increase is caused by several factors such as new costly medical technology, aging of the population, variations in service delivery among providers, et cetera (Reinhardt, 2003; Woolf, Grol, Hutchinson, Eccles, & Grimshaw, 1999).

The Netherlands is confronted with rising healthcare costs as well. In 2000 only 11,2% of the Gross Domestic Product (GDP) was spent on health care. In 2009 this is already 14,7%. It is expected that total health care costs will rise further and in 2040 will cover around 19-31% of the GDP (van der Horst, 2011). After the Unites States, the Netherlands has got the highest health care spending in percentage of the GDP. An explanation is that the Netherlands spent a lot more on long-term care than other countries. In particular the elderly often brings increased health spending (RIVM, 2013), on which we focus in this paper. We define elderly costs as costs that are associated with home care, social assistance, assistance with activities of daily living and inpatient stays in either a residential home or a nursing home (based on Bakx, 2013). For the elderly care there was an expenditure increase of 12.9 billion to 16,4 billion euro between 2005 and 2011 (CBS, 2013). Expenditures for long-term care for elderly and disabled determine less than halve of these costs, but are increasing faster than the other costs (curative care costs). Among other things, this is due to increasing life expectancy and a rising percentage elderly (Garssen, 2011; van der Horst, 2011).

So, lowering health care costs in elderly care is an important item for the Dutch government. Partly they want to achieve this by transforming the Exceptional Medical Expenses Act (in Dutch abbreviated as AWBZ) by shifting milder forms of elderly care to the Health Insurance Act (in Dutch abbreviated as ZVW) (Samsom, 2012). In addition, counseling and Care are shifted from the AWBZ to the Social Support Act (in Dutch abbreviated as Wmo). Municipals are responsible for carrying out this act, whereby they can use local facilities and can be more responsive on the need for care of the present clients (Rijksoverheid, n.d.).

Policy makers also try to find alternative purchasing and payment arrangements. In the current variable system, there is a powerful link between the provider's income and his activity and therefore it is likely that caregivers have a strong incentive to increase production. Even though this may seem as a good outcome for the quality of care, providers might produce care which does not yield any health benefit or even does harm to the health of the patients (Jegers, Kesteloot, De Graeve, & Gilles, 2002). An alternative option is population based purchasing, a form in which caregivers receive a lump sum budget sufficient for a certain population. This is often consistent with the increasing regional vision that the government is stimulating. With population based purchasing the incentives to deliver health care change in contrast with a payment per service because there is no longer a stimulation to deliver care that is not necessarily needed. However it could be that therefore not enough care is delivered and therefore monitoring quality of care is needed (Jegers, et al., 2002).

For population based purchasing, the amount of the lump sum budget depends on the characteristics of a population, but

is also influenced by politics and historical health care costs for that population. The lump sum budget needs to be differentiated very accurate, otherwise care providers can predict profits by selecting relatively healthier patients. To avoid this risk selection by providers the lump sum budget needs to predict the health care costs of a certain elderly population (Jegers, et al., 2002). Furthermore, a model which can predict elderly care costs can be useful for a deeper understanding how the costs are composed. In addition the model can be used by health insurers and care providers in their negotiations concerning the financing agreements. When it appears that the health care costs of the population of a care provider are significantly higher or lower than normally is expected, adoptions can be made. Therefore a requirement of the model is that it should be practical for different stakeholders. By focusing only on the extramural costs disregarding intramural care, the model will be more specific and reliable, for example intramural costs can contain costs of elderly who move to another municipality for a nursing home with the result that the corresponding factors are not factual anymore.

Methodologies to achieve such a prediction model with relevant determinants, associated weight factors and appropriate for different kind of municipals are not available in literature specific for extramural elderly care. Expected relevant determinants for the lump sum budget are age, gender, social economic status and household. However, more research is needed to develop the most appropriate lump sum budget for extramural elderly care in the Netherlands.

Therefore this paper addresses the following main research question:

How can we determine an appropriate lump sum budget for elderly care in a certain region?

The following sub questions are posed:

1. What are the features of models that are currently used to compose a lump sum budget for other types of care than elderly care?
2. Which extant model reflects elderly care costs of a certain region best?
3. How can this model be adjusted in order to compose a lump sum budget as accurate as possible for elderly care?
4. How precise can this adjusted model predict the elderly care costs of a certain region?

Literature Review

Elderly care is concentrated among a limited group and the costs are high and stable over time (Bakx, 2013). Expenditures for elderly care are predictable at the individual level when information on prior expenditures is available (Bakx, 2013). Health care costs arise from health care utilization, which arise from the need for health caused by functional limitations and chronic conditions (Dunlop, Manheim, Song, & Chang, 2002). So determinants that influence the need for health can partly predict health care costs. To understand which determinants and their weigh factors predict health care costs, health care use is explained by both societal and individual determinants as shown in Figure 1 (Andersen & Newman, 2005).

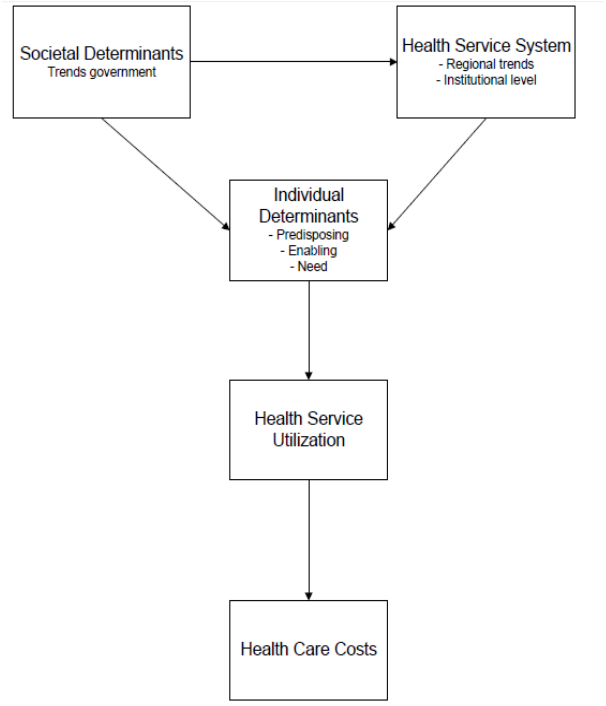

Figure 1. Framework health care use

Societal determinants affect the individual determinants directly and through the health service system (Andersen & Newman, 2005). Changing policy of the government ensures that health service systems change and therewith individual determinants and therewith health care costs. For example the government stimulates extramuralization and health service systems deliver more care at home, which can be cheaper compared to institutional care. The total amount of resources of the health care system, in other words the labor and capital devoted to health care, can also influence costs. As the resource/population ratio increases, the medical care consumed by the population will also increase (Andersen & Newman, 2005). Waiting lists have also influence on health care costs, one explanation for lower costs is that waiting lists for elective procedures hold down use and spending (Anderson, Hussey, Frogner, & Waters, 2005). An explanation for higher costs due to waiting lists is that the demand for care becomes higher since treatments are given too late and in that time health is deteriorated.

The utilization of health services can also be viewed as a type of individual behavior and can be explained as a function of characteristics of the individual himself, characteristics of the environment in which he lives, and/or some interaction of these individual and societal forces (Andersen & Newman, 2005). Many studies have found significant relations between elderly persons' use of health services and their physical characteristics (e.g., functional status), household characteristics (e.g., income level), ethnicity, and geographic location (Kashiwagi, Tamiya, Sato, & Yano, 2013).
The most widely employed behavioral model that predicts the use of health care, inter alia elderly care, is composed by Andersen and Newman (2005). Although the use and the need for care can differ, their model (as shown in Figure 2) can help to determine important factors that relate to elderly use of health care. It assumes that the use of health care is a function of their predisposition to use services, their ability to secure those services, and their state of illness (Miller & Weissert, 2000). It distinguishes predisposing, enabling, and need factors (Geerlings, Margriet Pot, Twisk, & Deeg, 2005).

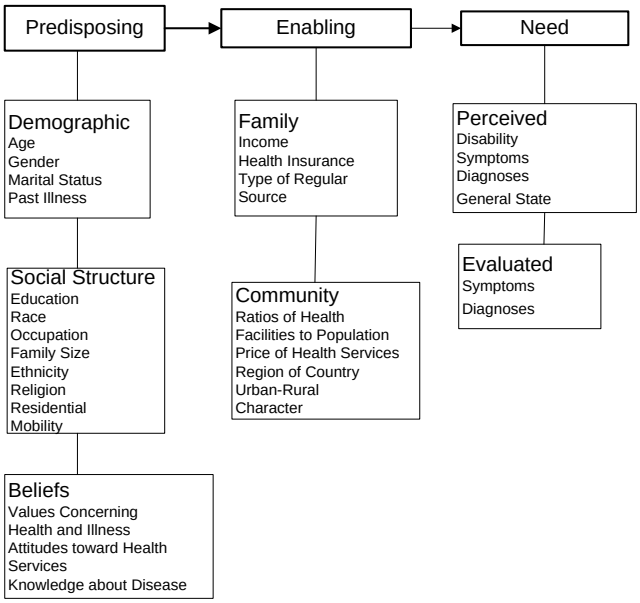

Figure 2. Individual Determinants of Health Care Use (Andersen & Newman, 2005)

Predisposing factors are typically socio-demographic variables as age and marital status that reflect the use of services which are independent of the personal circumstances and experiences that may cause the need for care. Additionally, there are variables concerning social structure and culture and health beliefs (Demaerschalk, Boer, Bronselaer, Molenberghs, & Declercq, 2012; Geerlings, et al., 2005; Upchurch & Rainisch, 2012). Below, we shortly describe predisposing factors which can, according to literature, help predicting the need for elderly care and the associated costs.

Age

In every model age is a returning determinant in a model for predicting the need for care and therewith the costs for health care. Literature confirmed the expectation that older persons make more use of health care like home care because they have more and more difficulty with everyday household tasks (Cebeon, 2005; Geerlings, et al., 2005). Furthermore it is a predictive determinant for all possible transitions (Geerlings, et al., 2005). The older the applicant, the greater the probability of being allocated a more intensive care package, hence there is a concentration of costs in the last year of a person's life (Seshamani & Gray, 2004; Van Campen & Van Gameren, 2005).

Gender

The influence of gender on elderly costs does not appear to be very clear in the literature. Women have a higher probability of being assessed for domestic help and social support, while men have a higher probability of being allocated physical care and nursing care (Van Campen & Van Gameren, 2005). Women are healthier than men at advanced age since the health deterioration rates of men are larger (Kerkhofs & Lindeboom, 1997). But Bakx (2013) found in his Erasmus model that from 65 years and older, women have higher elderly care costs.

Marital status

Health care use of women can be explained by marital status because a woman who has no income can profit of the income of their husband (Kunst et al., 2005). The loss of a spouse can have radical effects for the widowed and can lead to problems like self-neglect. Widowed make more use of every type of care with the exception of nursing compared to singles or cohabiting elderly (van den Berg Jeths, 2004).

Education

Higher educated persons are healthier compared to their low educated companions, especially for the elderly (Kunst, et al., 2005; Sadiraj & Groot, 2006). However, the kind of care differs between low and high educated people. Lower educated people have more often contact with a general practitioner and less often with a specialist physician compared to higher educated people. Furthermore, lower educational groups are related to higher unhealthy behavior which induce health problems (van Lenthe et al., 2004).

Ethnicity

Ethnicity is also part of the predisposing factors. Black people fare worse than white people on measures like life expectancy (Lillie-Blanton, Brodie, Rowland, Altman, & McIntosh, 2000). Ethnic utilization of health care services differed by the type of health care service (Dunlop, et al., 2002). However, it is not known to what extent ethnicity influence has effect on the elderly health care costs in the Netherlands.

Household

The type of household appeared to be of influence and particular the distinction between living alone or not (van den Berg

Jeths, 2004). Single elderly make plain more use of collective funded home care. Since they have no partner who can take care of the 'usual care', they throw oneself upon professional care (Cebeon, 2005; Geerlings, et al., 2005; Van Campen & Van Gameren, 2005).

Enabling factors facilitate or impede use of health services (Upchurch & Rainisch, 2012). So the means and know how to access health service, income, health insurance, a regular source of care, travel, extent, and quality of social relationships. Also the community has influence on the use of health care. Waiting time, available health personnel and facilities, genetic factors and psychological characteristics influence the use of health care also according this behavioral model (Geerlings, et al., 2005). Below, we shortly describe enabling factors which can, according to literature, help predicting the need for elderly care.

Social economic status

Individuals can be ranked on the basis of knowledge, power, possessions and status. This ranking is also known as social economic status (SES). Persons with a low SES are generally more unhealthy compared with people with a higher SES (Sadiraj & Groot, 2006). To measure the SES several indicators can be used; education-, income- and professional level, homeownership and house value. Since every indicator has an independent relation compared to health, the indicators correlate only partly (Kunst, et al., 2005; Sadiraj & Groot, 2006). A combination of these indicators shows large health inequalities, in particular persons with a low to moderate income in combination with a cheap rental home turn out to have more health problems (Kunst, et al., 2005).

Income

People with a higher income live longer and their well-being in their live is also longer. Especially in the older age poorer health is reflected (Cebeon, 2005; Sadiraj & Groot, 2006). Furthermore, lower income groups make more use of collective financed home care (Cebeon, 2005). In general, higher levels of income are associated with increased complementary and alternative medicine use. Furthermore the household income is of influence for the level of own contributions. Hence it is explainable that municipals with a high level of low income households have relatively more expenditures for home care (Cebeon, 2010)

Profession and labor

There is also a relation between the level of labor and health. Unskilled manual workers relate to higher mortality rates for men. For women, the occupational status appeared not to be related to mortality (van Rossum, van de Mheen, Mackenbach, & Grobbee, 2000). There is also a clear positive relation between the presence of incapacitated and disabled persons and the use of collective funded household care (Cebeon, 2005).

Childhood

Childhood circumstances partially influenced adult health through adult health-related behavior (alcohol consumption, leisure time physical activity and body mass index) and partly through adult psychological attributes (personality characteristics and coping styles) (van Lenthe, et al., 2004).

Urbanity

In urban areas there is less use of collective funded household care. In this area facilities are more easily accessible (Cebeon, 2005). A higher all-cause mortality and higher prevalence of obesity was found in more deprived

neighborhoods, even after taking into account the socio-economic position of the neighborhood residents (van Lenthe, et al., 2004). There is also regional variation in use with those living in the West having the highest use (Upchurch & Rainisch, 2012). However, elderly people who have similar needs can have very different care if they live in different municipals (Demaerschalk, et al., 2012).

The need factor includes perceived needs, how individuals view their own general functional health and how they experience symptoms. Furthermore it includes evaluated needs which represents health professionals' assessment and diagnosis regarding health status (Upchurch & Rainisch, 2012). It includes physical and mental health status and relates to the needs of people, like help in activities of daily living (ADL) and therefore the most immediate stimulus to obtain care (Geerlings, et al., 2005; Van Campen & Van Gameren, 2005). Those who report a greater number of diagnosed health conditions are more likely to use complementary and alternative medicine (Upchurch & Rainisch, 2012). However, to include the need factor a survey needs to be performed to examine how elderly persons perceive their health which is time-consuming. Since we want to create a practical and feasible model we exclude the need factors.

The extent to which these factors (combined or not) have influence on health care costs use is not known accurately. Therefore a number of existing distribution models shall be tested. There are some models available as can be seen in Appendix II. Depending on the purpose of the study, different determinants are used. Table 1 shows the models which are seems to be most appropriate and shell be further investigated.

Table 1. Testing models

Testing Models	*Aims*	*Determinants*	*Sources*
Can risk adjustment prevent risk selection in a competitive long-term insurance market?	To examine how and to what extent a system of ex-ante risk adjustment subsidies can reduce the scope for risk selection in long term care insurance.	-Age - Gender -Co-residence	Erasmus Universi-teit Rotterdam
Ex Ante Risk Adjustment 2012 (in Dutch Ex-ante Risicovereven ing 2012)	Gain insight in the stability in outcomes by comparison with previously research, the effect of model improvements of 2012 and the development of incentives to risk selection, indirect premium differentiation and product differentiation.	-Age x Sex (20x2 classes) -Region ranking (percentage non-Western immigrants, singles, degree of urbanization, proximity to hospitals and GPs, number of beds in a nursing home) - Nature of income (5 classes) - Pharmacy Costs Groups (in Dutch abbreviated as FKG's) , 25 categories) - Diagnostic Cost Groups (in Dutch abbreviated as DKG's) , 13 clusters--Social Economic Status (Sociaal Economische Status, SES, 4 main clusters) -Multiannual High Costs (Meerjarig Hoge Kosten, MHK, 7 classes)	Van Kleef, van Vliet, van de Ven; Erasmus Universitei t Rotterdam

Ex-ante Risk Adjustment Model
This model, developed by the Dutch government, compensates for predictable, health-related cost differences between insured (Stam, 2011) within the Dutch Health Insurance Act . Since it is partially based on general insured characteristics like age, gender, SES and health characteristics, it seems a useful model. However, whether this model is also usable for extramural elderly care costs is not known because in the AWBZ the degree of independent functioning, the situation at home and the context of a person in particular has an impact and this model does not take this into account (Stam, 2011).

Erasmus Model
In this model long term care expenditures are being explored. They focus also only on elderly care, though they also look at intramural costs next to extramural costs unlike our model. Demographics as age, gender, living alone or not and prior health care expenditures in the Netherlands are taken into account and that makes this model useful for this study.

Methods

Selection and description of participants
To identify the extent to which different factors influence health care costs of elderly, several steps will be taken on twenty municipals in the Netherlands. All these municipals are located in areas where Menzis is active, so they are all covered by the same procurement policy. A distinction is made between small (below 25,000 residents (SZW, n.d.)) and large municipals (more than 40.000 residents (SZW, n.d.)), disregarding medium municipals to obtain a larger difference, since the use of (informal) home care services is influenced by municipal characteristics like density and inhabitants per 100 km² (Demaerschalk, Boer, Bronselaer, Molenberghs, & Declercq, 2013). Only people aged over 65 years were selected. For all data the year 2012 is chosen because it is the most complete and recent data concerning health care costs there is available.

Data collection dependent variables
For the data collection, Zorgprisma is used. Zorgprisma is created by Vektis and provides health insurers and care providers information concerning health care costs, care providers and insured persons. This data is based on actual costs and is provided by care providers themselves, itemized by age and gender. It can be sorted out on performance and on municipality. A downside of this information is that it also includes mental health care besides elderly care. It is not possible in this system to make a distinction between this on municipality level. Zorgprisma can distinguish the extramural costs on performance, like additional nursing. These performances can be divided in mental care, disabled care and elderly care. Hereby the proportion elderly care can be determined and likewise only residents of 65 year and older are taken into account. After adapting the Zorgprisma data for elderly care and age, the reliability of these costs can be tested with municipality cards, composed by Menzis. The municipality cards are based on indications set by the Center Assessment Care (CIZ, Centrum Indicatiestelling Zorg). Appendix III shows the comparison between these two sources. There are some differences between them because municipals cards only concern elderly care and it also takes into account some people who are younger than 65,which probably induce the higher costs found by the municipality cards. However it is useful to check whether the Zorgprisma data is reliable and the figure

in the appendix confirms this. Nevertheless the Zorgprisma is preferred for our study since it is based on actual cost, it is sustainable for the future because care providers are required to provide the data and it is a national database. In figure 3, the steps are shown in a study flow chart.

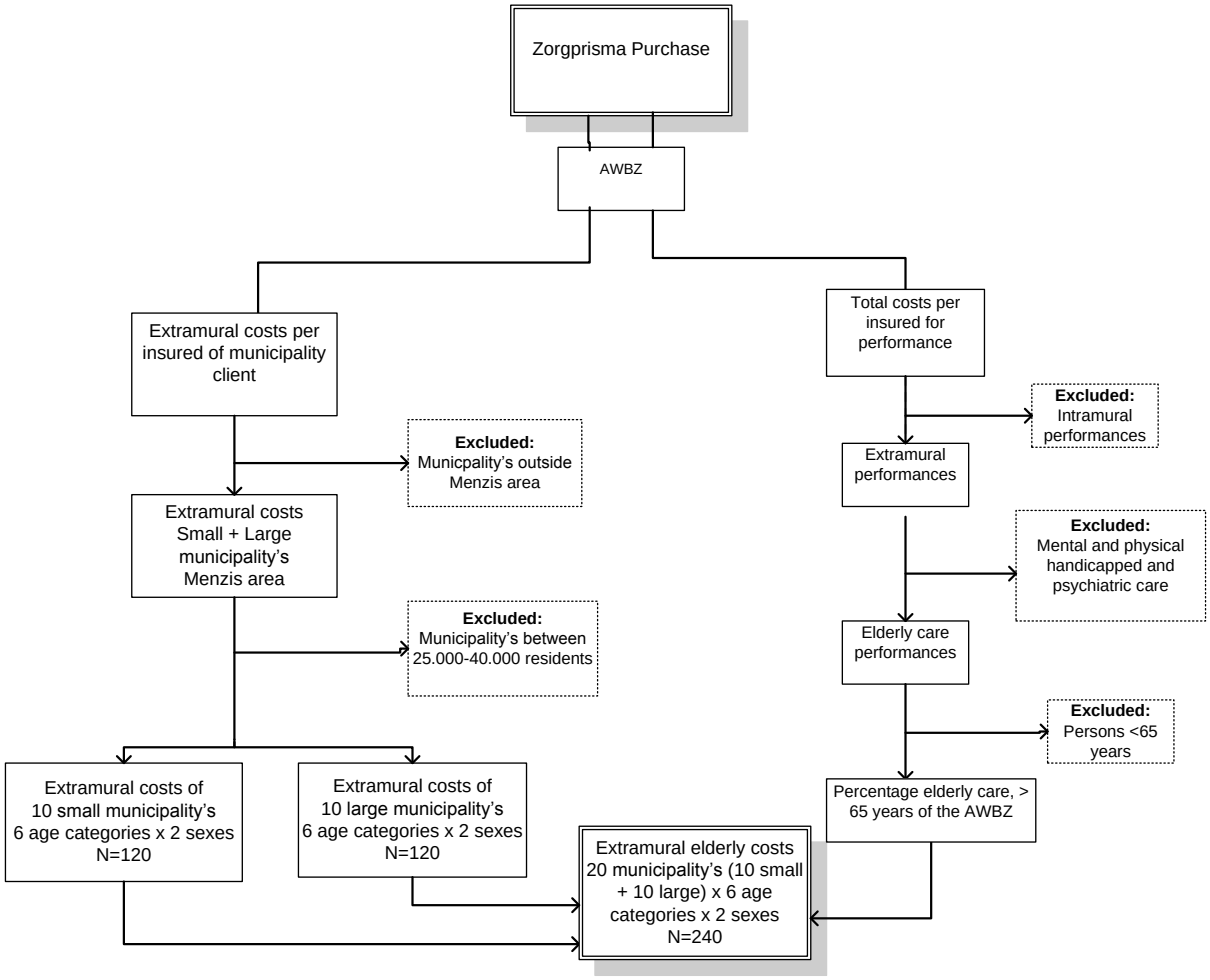

Figure 3. Study flowchart

Data collection independent variables

The independent variables are selected on the basis of the literature review. Zorgprisma cannot provide other demographic data than health care costs, municipality, age and gender level. We use Statline, offered by Central Bureau of Statistics Centraal Bureau voor de Statistiek (in Dutch abbreviated as CBS), for demographic data. Furthermore, considering the elderly target aged 65 and over, education and childhood is not available. This also applies for profession and labor, since this demographic variable refers to the labor force in the age between the ages of 15 to 65. The CBS data is like the Zorgprisma data sorted out on age category, gender and municipality. A proportion of the variable singles, widowed and immigrants compared with the total residents of the municipality is taken, to be able to relate this data with the Zorgprisma data. Other variables which are taken into account are proportion low incomes and the number of inhabitants per km² of the municipality.

Testing models

Given the dependency of available data, only age, gender and SES can be tested of the Ex-ante Risk adjustment Model (see Table 1). The weight factors of these determinants are multiplied with the total of inhabitants of ten municipals. In a similar manner the Erasmus model is tested on the determinants age, gender and living alone or not.

Statistical methodology

In SPSS a multiple linear regression analysis is performed to estimate a linear relation between the dependent variable extramural health care costs (y_1); and the independent variables age ($ß_{1xi1}$), gender ($ß_{2xi2}$), proportion widowed ($ß_{3xi3}$), proportion singles, proportion immigrants, proportion low incomes and inhabitants per km² (Geerlings, et al., 2005; Huizingh & Inleiding, 2004). Herewith a model is created;

$y_1 = ß_0 + ß_{1xi1} + ß_{2xi2} + ß_{pxip} + Ɛ_i$ for $i = 1,2, \ldots n$.

To be able to create a model with a set of possible variables which can predict health care costs as accurately as possible a forward stepwise regression method is used. Based on pure mathematical criteria this method decides which predictors are entered into the model (Field, 2009). The variable which can predict the best (P<0,001 and the biggest T-value) comes into the model. This process repeats until there are no variables with a p-value below 10% anymore (Twisk, 2007).

Age groups of five years were included in the model as dummy variables, while for all age groups the youngest age group (65 to 70 years) was used as the reference group.

We examined collinearity with the Pearson correlation test. When this value is above .7 one of the variables will be removed. Multiple regression can be very sensitive to just one or two outliers and affect the results and the subsequent interpretation. To determine which outliers are influential, cases with Cook's distances >1 were examined carefully to determine whether they should be deleted from the analysis (Stevens, 1984).

Results

Descriptive analysis of the variables

Table 2 shows the main characteristics of the small and large municipals. On average the elderly care costs are higher in small municipals (M=5870.73, SD=2775.83) compared to the large municipals (M=5300.02, SD=1668.40) and also the variance is larger. Concerning the demographic variables the variation between large and small municipals is not major although there are clearly more inhabitants per square kilometers, more immigrants and a little more singles in the large municipals. Since the data is constructed with mean values of categories of five years age groups combined with gender, the mean and standard deviation of gender and age are all equal. So half (50%) of the sample is woman and one-sixth (17%) of every five year age group since 65 year is present.

Table 2. Characteristics of the research population

	Large municipals[1]	Small Municipals[1]
Characteristics	***Estimate, Mean ± SD***	***Estimate, Mean ± SD***
Costs per insured	5300.02 ± 1668.40	5870.73 ± 2775.83
Gender	50% man + 50% woman	50% man + 50% woman
Proportion Widowed	35% ± 25%	36% ± 26%
Proportion Singles	37% ± 18%	33% ± 17%
Proportion immigrants	12% ± 6%	8% ± 5%
Proportion low income households	3% ± 0%	3% ± 0%
Inhabitants/km²	1.08 ± 0.62	0.53 ± 0.61
Dummy variable 70-75 years	0.17 ± 0.38	0.17 ± 0.38
Dummy variable 75-80 years	0.17 ± 0.38	0.17 ± 0.38
Dummy variable 80-85 years	0.17 ± 0.38	0.17 ± 0.38
Dummy variable 85-90 years	0.17 ± 0.38	0.17 ± 0.38
Dummy variable > 90 years	0.15 ± 0.35	0.15 ± 0.35

[1] N=120

Checking assumptions

There is evidence for multicollinearity; among the variables proportion singles and proportion widowed with a Pearson correlation of .877 (large municipals) and .889 (small municipals) and between the variables age and proportion widowed (large: .807 and small: .795) in both analyses. Although the variable proportion widowed has the strongest impact on the equation in both analyses like in the large municipals; [R^2=.586, F(1, 118)=61.63, p<.001] compared to the variable singles [R^2=.392, F(1, 118)=21.42, p<.001] or age; [R^2=.566, F(1, 118)=55,55, p<.001] the variable proportion widowed is removed as it is correlating too much with both variables which causes spurious outcomes. In both models there are no outliers detected by using Cook´s distance. With the aid of scatterplots the linearity of the bivariate analysis are checked for every independent variable and the dependent variable. By studying the plots of the residuals and the actual scores, the assumptions; normally distributed, linear and homoscedastic, are met (Foster, Barkus, & Yavorsky, 2006).

Testing models

The ratio differences between the two tested models and the adapted elderly care costs of the specific municipals are compared and showed in Figure 4 and Appendix I. The dotted lines are results of the ten large municipals and the uninterrupted lines are the ten small municipals. As can be seen the Risk Adjustment Model estimates the costs higher in comparison with the Erasmus Model. However the differences between the models are approximately equal to each municipality.

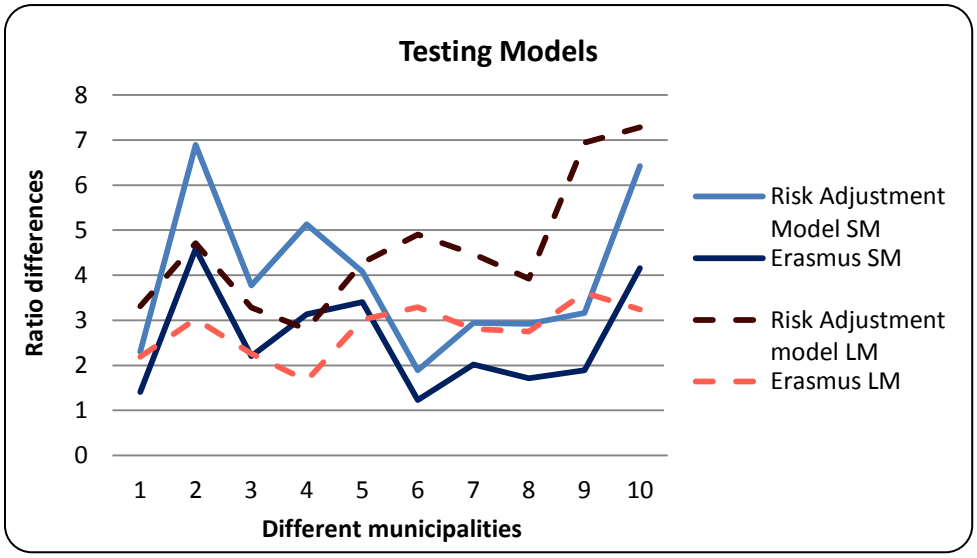

Figure 4: Ratio differences small municipals (SM) and large municipals (LM) with actual costs

Table 3. Bivariate linear regression: Dependent variable: Elderly Care costs

	Large municipals			Small municipals		
	t	***p***	***R***	***t***	***p***	***R***
Age	7.453***	<.001	.566	6.808***	<.001	.531
Gender	1.638	.104	.029	.917	.361	.084
Proportion Widowed	7.850***	<.001	.095	7.127***	<.001	.549
Proportion Singles	4.628	<.001	.392	4.991	<.001	.418
Inhabitants/km²	-2.621*	.010	.208	1.104	.272	.101
Proportion immigrants	-5.076***	<.001	.071	-.107	.915	.010
Proportion low income	.403	.688	.037	-1.151	.252	.105

*p<.05 **p<.01 ***p<.001

Analysis of the bivariate relations

In Table 3 the analysis of the demographic variables with the elderly care costs are shown per small and large municipality. There are some notable differences between the two municipals like the significant positive relation between inhabitants per km² and the elderly care costs, and a negative relation between them in the large municipals. In Appendix IV this is graphically displayed. Also figured is the relation for proportion immigrants. There is no influence for small municipals but a strongly negative relation between the proportion immigrants and elderly care costs.

A further notice is that in both kind of municipals age, proportion widowed and proportion singles are strongly and significantly related to elderly care costs.

Table 3 shows that gender does not have a strong relation with costs. In Appendix IV these variables are further examined. When this is graphically displayed however, it appears that elderly health costs between men and women begin to differ when people become above the age of 85, as women have more care costs. Remarkably, when men are widower they have higher elderly health costs regardless their age. So, what Table 3 already indicates, the effect of being widowed is stronger related to elderly care costs than age or gender.

Analysis of the multiple regression results

With aid of the forward stepwise regression method the variables which are significantly (α=10%) (Twisk, 2007) related to the dependent variable elderly care costs are included in the models presented in Tables 4a and 4b. The large municipals model lacks the variable proportion low income households, inhabitants/km² and gender. In the small municipals model the variables proportion low income households, proportion immigrants, gender, and inhabitants/km² are not included. The regression analysis reveals that a large share of the elderly care costs can be explained by the demographic variables; the large municipals model contribute to an R^2 of .47 and the small municipals model to an R^2 of .39. These R^2-statistics (Tables 4a and 4b) are generally higher than those obtained in similar studies on medical care and mental health care (Bakx, 2013; Culyer & Newhouse, 2000). In the large municipality model most of the explanatory power (Table 4a) derives from the dummy variable 90 years and older [b = .204, $t(119)$ = 5.26, p<0.001] and inhabitants per km² [b = -.29, $t(119)$ = -4.08, p<0.001]. In the small municipality model also the dummy variable 90 years and older provides the strongest contribution to the model [b =.53, $t(119)$ = 4.652, p<.001] and thereafter the variable proportion immigrants [b =.16, $t(119)$ = 2.052, p=.042]. Tables 4a and 4b show the overall results of the multiple regression analysis across twenty municipals.

When the bivariate regression of all the predictor variables with the outcome variable (Table 3) are compared with the two models, there are differences between positive and negative relations concerning dummy variable 75-80 in the large municipality model and proportion immigrants in the small municipality model which indicates that the dataset is not rich enough or there is evidence for a strong suppression effect. Thus, the magnitude of the relationship between a predictor variable and the outcome variable, elderly care costs, increases when more predictor variables are included (MacKinnon, Krull, & Lockwood, 2000). The multiple regression analysis can factor those covariance's into account and the part correlations (Table 4) represent the unique relationship between each predictor and the outcome, controlling for the effect that the other variables have on the outcome (Field, 2009).

The only demographic variables which are in both models positively related with elderly care costs are the proportion singles and persons from the age of 80 years. This indicates that high elderly health care costs are induced by living alone and the oldest persons. Striking is the positive relation between the variable proportion immigrants and the outcome variable elderly care costs in the small municipals model while this relation is negative in the large municipals model.
Appendix III graphically shows that there is only a small difference between the actual Zorgprisma costs and the developed Lumpsum Model.

Tabel 4a. Results multiple regression analysis Large municipals: Dependent Variable: Elderly Care costs

	Unstandardized Coefficients		Standardized Coefficients			*Part correlation*
	B	**Std. Error**	**Beta**	***t***	***p***	
Constant	4968.537	348.671		14.250	<.001	
Inhabitants/km²	-769.915	188.889	-.287	-4.076	<.001	-.271***
Dummy variable 70-75 years	-250.239	384.935	-.056	-.650	.517	-.043**
Dummy variable 75-80 years	-168.218	394.792	-.038	-.426	.671	-.028*
Dummy variable 80-85 years	160.681	417.051	.036	.385	.701	.026
Dummy variable 85-90 years	616.884	442.490	.138	1.394	.166	.093
Dummy variable > 90 years	2410.775	458.301	.541	5.260	<.001	.350***
Proportion singles	1855.082	812.560	.204	2.283	.024	.152**
R²	**.473**					
R	**.710**					
F	**16.281**					

*p<.05 **p<.01 ***p<.001

Tabel 4b. Results multiple regression analysis Small municipals: Dependent Variable: Elderly Care costs

	Unstandardized Coefficients		Standardized Coefficients			*Part correlation*
	B	**Std. Error**	**Beta**	***t***	***p***	
Constant	3313.949	681.038		4.866	<.001	
Dummy variable 70-75 years	-834.553	714.147	-.113	-1.169	.245	-.086*
Dummy variable 75-80 years	92.797	737.495	.013	.126	.900	.009**
Dummy variable 80-85 years	947.782	787.709	.128	1.203	.231	.089
Dummy variable 85-90 years	1222.420	849.262	.165	1.439	.153	.106
Dummy variable > 90 years	3945.534	848.052	.532	4.652	<.001	.344
Proportion immigrants	9073.140	4421.165	.161	2.052	.042	.152
Proportion singles	2683.894	1573.720	.165	1.705	.091	.126
R²	**.388**					
R	**.623**					
F	**10.145**					

*p<.05 **p<.01 ***p<.001

Discussion

Influencing variables

The regression analysis confirms and rejects findings from the literature review concerning the influence of different variables on elderly care costs. Literature stated the importance of the predictor *age* and the rising care costs combined with an higher age (Cebeon, 2005; Geerlings, et al., 2005). Literature already was not consistent concerning the influence of gender for elderly care costs (van den Berg Jeths, 2004) and our analysis confirms this. Only above the age of 80; women become more expensive than men. Nevertheless, remarkable was the finding that when a person is widowed, men make higher costs. This can be explained because men of the older generation are often not used to take care of their own. Literature already indicated that the variable *widowed* is a important predictor for elderly care (van den Berg Jeths, 2004), but not that this variable *widowed* appears to be a even stronger than the variable age. However, widowed is not a basic variable for prediction models in contrast to age and gender (Bakx, 2013). So this is especially for policy makers a relevant finding. A widower can be more supported in an early stage with practical and psychological problems in order to reduce costs in the long run. In most municipals in the Netherlands there is attention for loneliness but mostly a systematic and consistent policy is lacking (Xanten, 2013).

Our regression analysis confirms the uncertainty concerning *ethnicity* which is also found in the literature review; it is unclear to what extent ethnicity influences the use of elderly health care (Dunlop, et al., 2002). An explanation for the positive relation for proportion immigrants and elderly care costs in the small municipality model and the negative relation for them in the large municipality model could be that immigrants in small municipals have less relatives and health care facilities nearby compared to immigrants in larger municipals. A consequence of this could be that these rural immigrants make more use of collective elderly health care as they cannot support themselves. However, there are many different potential barriers to health care for immigrants which are all tied to the particular situation of the individual patient (Scheppers, Van Dongen, Dekker, Geertzen, & Dekker, 2006). Another explanation for the changing relationship between immigrants and elderly care costs is that age and proportion singles are such a strong predictor that other variables add less to the model and show weaker relations.

Similar to findings in the literature (van den Berg Jeths, 2004) and the Erasmus model, the *type of household* appeared to be of influence on elderly care costs since there is a significant relation found between this outcome variable and the proportion of singles. Like widowed persons, also single elderly can receive more personal attention in learning how to deal with the associated problems of being single and becoming older.

Social economic status is tested in the Risk Adjustment Model and confirms the assumption claimed in literature (Sadiraj & Groot, 2006; van den Berg Jeths, 2004) that persons with a low SES are generally less healthy which indicates higher health care costs. The variable *low income household*, a section of SES, was not significantly related with more use of elderly care costs despite the findings in the literature review. However, this is probably due to the fact that data of this variable is of inferior quality. There was no data of low income household available per five year age category or gender, thus the same proportion is taken into account for the whole municipality.

Our regression analysis confirms the literature findings (Cebeon, 2005) concerning less collective use in more *urban areas* since on average, more is spent in the small municipals. In addition the variable *habitants per km²* has a negative significant relationship with elderly care costs indicating that more inhabitants per km² cause less elderly care costs in the large municipals. However, in the small municipals model there is no significant relation between these variables and moreover this relation is positive. This is explainable since in the small model there are small municipals included which are located directly to a large city. So these inhabitants can use the facilities of the city and mislead the image of a rural municipality which often has less health care related facilities nearby. However above findings are indicating that more facilities nearby are lowering health costs. By the stimulating regional vision which is stimulated by the government in combination with population based purchasing, care providers can work together to improve the accessibility of facilities in rural areas.

Limitations

Except gender and age there was no data available of individual patients, therefore we worked with proportions. Therefore the analyses are less generalizable. Also it would be better if our sample was larger. This both could also be a reason for the changing relation in the multiple regression compared to the bivariate analysis. If Menzis can compile more demographic variables of individual patients like marital status, household composition, income et cetera, then the reliability and the generalization of the regression analyzes can be improved. The means of the elderly care costs which are used in the small municipality model are based on less patients and therefore the used averages are less reliable compared to the large municipality model. This could be an explanation for the less significant relations in the small municipals model and the changing relation of immigrants from bivariate to the multivariate analysis. The tested models are based on different kinds of health care costs, the Risk Adjustment Model, for example, is created for standard care and is not specifically developed for elderly care. Therefore also there is less generalization possible from these models. However they do provide an extra confirmation concerning the influence of the tested variables low income households and proportion singles. Waiting lists can influence elderly care costs. Since it is unclear to what extent this is the case we did not apply a correction for this fact. Furthermore, there are different definitions for the 'need for care'. We used the use of care combined with the accomplishing costs. Whether this care was actually necessary is not certain. Also the switch to another payment system, from paying for every procedure to population based purchasing, should influence our amount of 'need for care'.

Further research

Earlier research reveals that by including prior long term care use, demographic models will be improved substantially and will be comparable to the predictive power achieved by diagnosis/based models or models that use self/reported health status measures (Culyer & Newhouse, 2000). Further research could find out, with the use of longitudinal data, how to implement this import variable into the model. It should be stressed that our model is based on cross sectional data, so on the impact of the variables in 2012. It does not include longitudinal data, since Zorgprisma data before 2012 was not available, neither the important effect of future changes in political and population behavior. Therefore, in addition to the points mentioned before, it is more difficult to

generalize this model to other sets of data for the coming years. To check the cross-validation of the model, a new sample of respondents should be obtained and tested if the model produces a similar outcome (Foster, et al., 2006). The high correlation between proportion singles and proportion widowed is logical since widowers become single if their partner dies. Yet there are also differences between these variables since the proportion unmarried cohabiting elderly is rising. Therefore in the future the correlation between these two variables could reduce to such an extent that the variable proportion singles possibly needs to be entered in the model again (van den Berg Jeths, 2004). The number of immigrants among the elderly will rise so this group will create a larger share of the elderly care costs. Further research is needed to find out which factors influence the use of elderly care for immigrants in small and large municipals. Policy makers can adjust their policy to support these elderly immigrants more efficient and the lump sum budget can be adapted more accurately. Concerning income, the current elderly is relatively rich. They saved money and receive a proper retirement. Because of the euro crisis and budget cuts of the government future elderly might have less to spend and therefore the influence of the low-income per household variable can become higher. Besides, also the elderly population behavior is changing. The expectation is that the elderly are going to finance more privately rather than collectively since health care costs are rising, support will decrease and there will be more use of personal contributions. Therefore these elderly will become more empowered for the care they receive, in comparison with the current elderly. A possible consequence of this movement is that there is less use of the lump sum budget. The lump sum budget needs to be adapted and might be reduced. Another movement concerning extramural elderly care is that the government is stimulating this movement by submitting more responsibility to municipals, citizens and organizations (TNO, n.d.). Inter alia they want to introduce separation of living and care also called extramuralisation of care (Zorgautoriteit, 2013). Less elderly will receive an indication for living in a care facility but will receive the care they need at their home. With this trend the extramural elderly care cost will rise. The extent to which the rising and declining effects have on the prediction model is unsure and are subject for further research. Therefore a distinction must be made between a prediction model and an explanation model. An explanation model takes only the influence of different demographic factors into account and a prediction model also takes into account future movements. Finally, changes in technology can have an important effect on health care costs, for example improved surgical techniques now permit more varied surgeries at older ages (Seshamani & Gray, 2004). Future research can take this interaction into consideration and thereby expand our model.

Conclusion

The analyses described here strongly confirm that elderly care costs are influenced by demographic variables. The strongest predictor of elderly care costs is being a widower, followed by age and being single. Gender has less added value. We believe that our model provides more insight in elderly care costs which can be used by policy makers. Furthermore, it is a start for calculating an accurate lump sum budget. Next to the demographic factors, historical health care costs also are a strong predictor for the upcoming elderly care costs and can be a useful addition for this model. In addition, to create a prediction model which is more sustainable for the future, more trends could be taken into account like technological innovations, political influences and elderly behavior. Than it is possible to create a lump sum model which can be used for population based purchasing.

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Appendix I

Table I.1 Testing models ratio differences

Municipalities	*Small municipals Ratio Difference*		*Large municipals Ratio Difference*	
	Risicoverevenings model	**Erasmus**	**Risicoverevenings model**	**Erasmus**
1.	2,30	1,41	3,31	2,19
2.	6,89	4,58	4,71	3,03
3.	3,77	2,20	3,28	2,26
4.	5,13	3,13	2,80	1,66
5.	4,08	3,40	4,28	3,01
6.	1,89	1,23	4,90	3,29
7.	2,94	2,02	4,47	2,81
8.	2,92	1,71	3,92	2,75
9.	3,16	1,89	4,21	2,73
10.	6,42	4,16	6,94	3,61
Average:	**3,95**	**2,57**	**4,55**	**2,78**

Appendix II

Table II.1 Existing testing models

Models	*Aims*	*Determinants*	*Bronnen*
Gezonder ouder worden (In English: Healthier aging)	Understand the health status and the determinants of the elderly that affect them.	-Gender -Age -Education -Perceived health -Diseases and limitations -Loneliness -Overweight -Sexuality -Alcohol use -Smoking	GGD Regio Twente
Ex-ante Risicoverevening 2012 (In English: Ex Ante Risk Adjustment 2012)	Gain insight in the stability in outcomes by comparison with previously research, the effect of model improvements of 2012 and the development of incentives to risk selection, indirect premium differentiation and product differentiation.	-Age x Sex (20x2 classes) -Region ranking (percentage non-Western immigrants, singles, degree of urbanization, proximity to hospitals and GPs, number of beds in a nursing home) - Nature of income (5 classes) - Farmacie Kosten Groepen (FKG's, 25 categories) - Diagnose Kosten Groepen (DKG's, 13 clusters) -Social Economic Status (Sociaal Economische Status, SES, 4 main clusters) -Multiannual High Costs (Meerjarig Hoge Kosten, MHK, 7 classes)	Van Kleef, van Vliet, van de Ven; Erasmus Universiteit Rotterdam
Vraag aanbod Analyse Monitor (In English: Demand supply Analysis Monitor)	To be able to discuss informed about the desired direction of primary care in a region and as a justification for the updated and extended version of the VAAM 3.0.	-Age class - Sex -Ethnicity - Net income - Urbanity - Type of household	Nederlandse Patiënten Consumenten Federatie
Can risk adjustment prevent risk selection in a competitive long-term insurance market?	To examine how and to what extent a system of ex-ante risk adjustment subsidies can reduce the scope for risk selection in long term care insurance.	-Age - Gender -Co-residence	Erasmus Universiteit Rotterdam
Eligility for long term care in the Netherlands	We examine which personal characteristics predict the type of care for which applicant are eligible.	-Gender -Age -Living arrangements -Housing type -Disabilities	13 out of 80 regional needs assessment agencies

		-Medical diagnosis -Use of aids -Formal care -Informal care	(RIO) in the Netherlands
Predicting transitions in the use of informal and professional care by older adults	To describe transitions in the use of care, with a focus on the transitions from 'no care' or 'only informal home-care', to 'professional home-care' or 'institutional care'. To assess the explanatory value of (changes in) predisposing, enabling and need factors.	-Age -Gender -Living conditions -Disabilities -Diseases -Care received -Reasons for application	Geerlings, Pot, Twisk, Deeg
Horizon model	(Future) demand forecasting to the various living and residential facilities. Provides support institutions in taking long term decisions elnclusion construction and renovation	-Age -Gender -Social Economic Status - Emigration -Immigration -New building -Establishment -Households -owner-occupied/rental house -stock -demand -tensity	TNO rapport

Appendix III

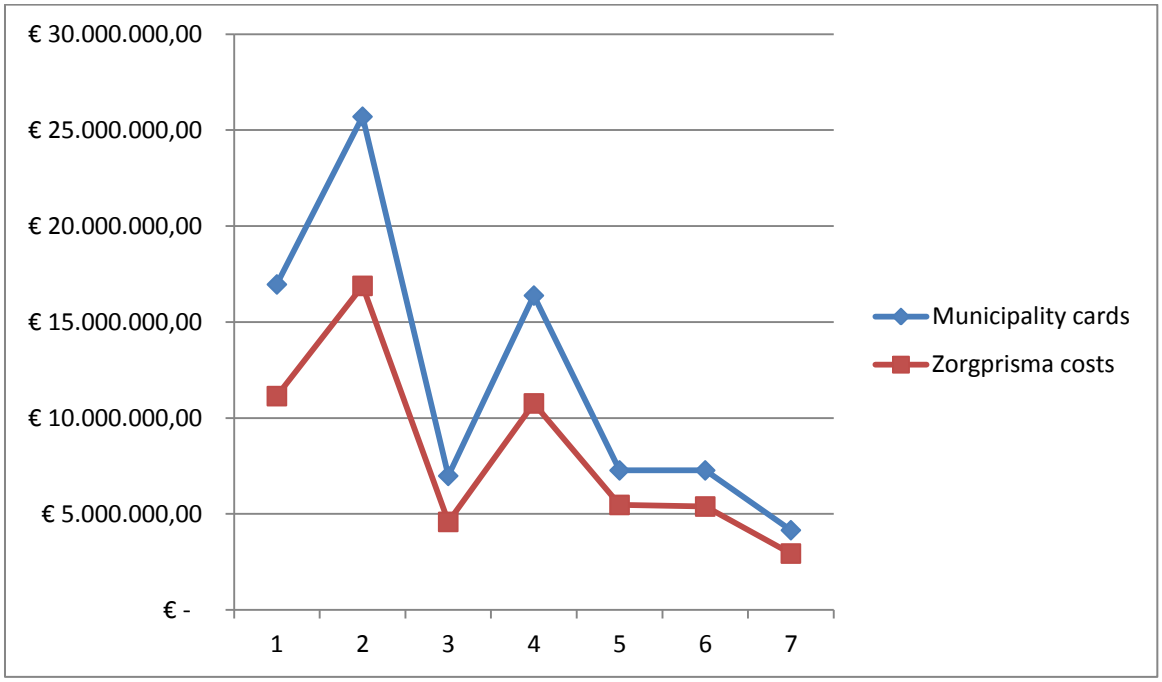

Figure III.1 Comparison Municipality cards and Zorgprisma costs

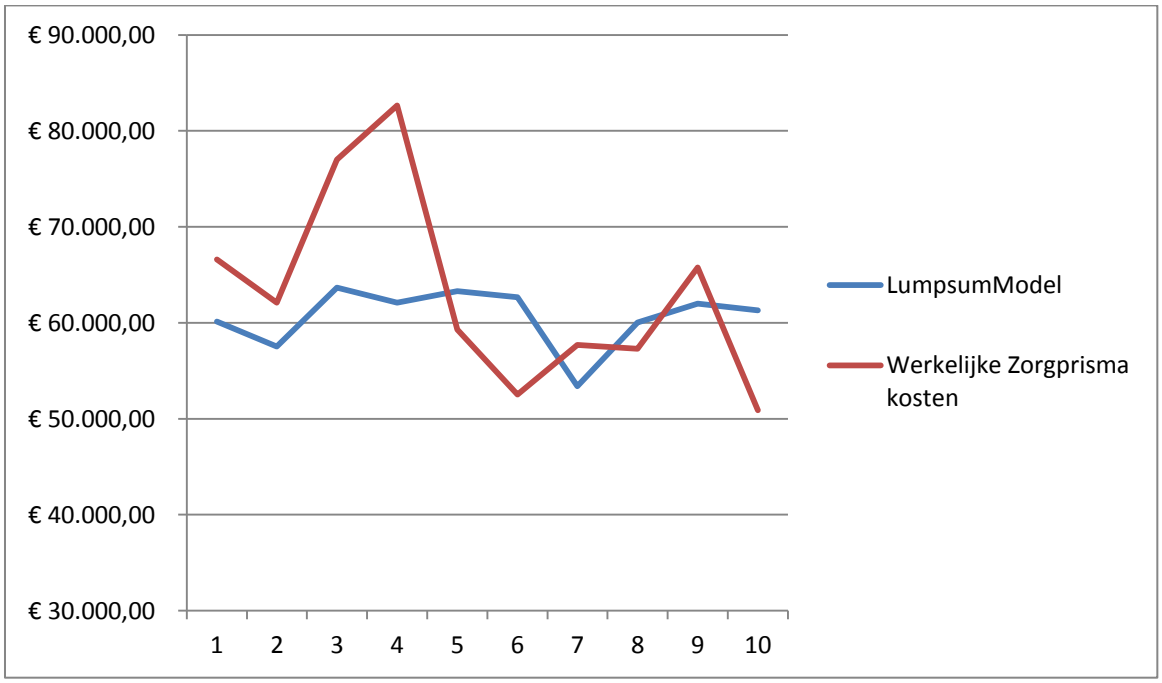

Figure III.2 Comparison LumpsumModel and Zorgprisma costs

Appendix IV

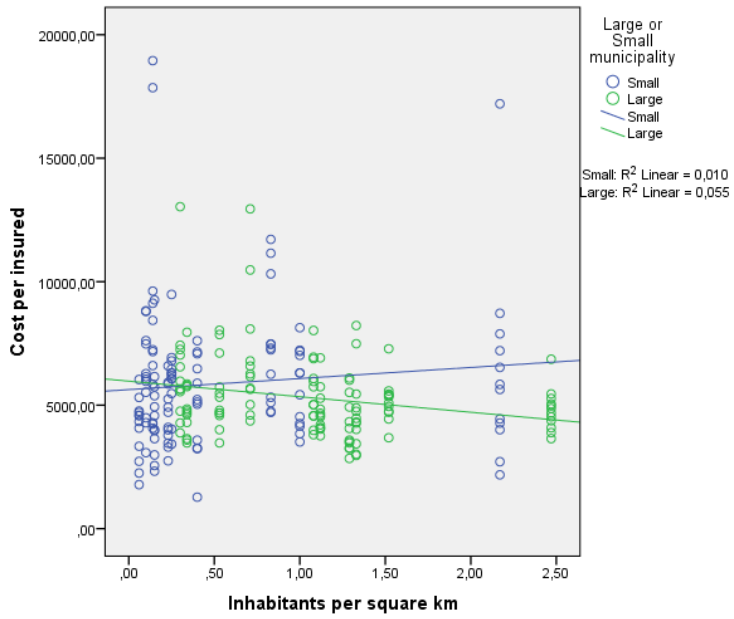

Figure IV.1 Scatterplot: Amount of inhabitants per square kilometer combined with elderly care costs set markers by small and large municipals.

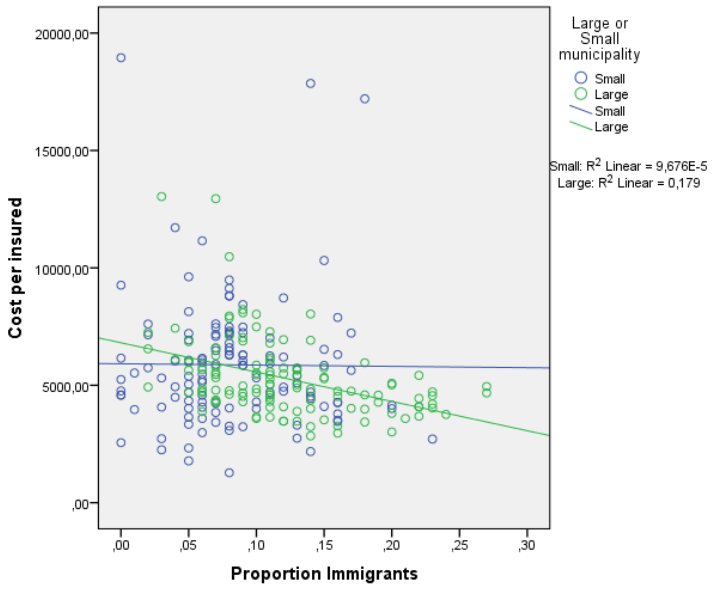

Figure IV.2 Scatterplot: Proportion immigrants combined with elderly care costs set markers by small and large municipals.

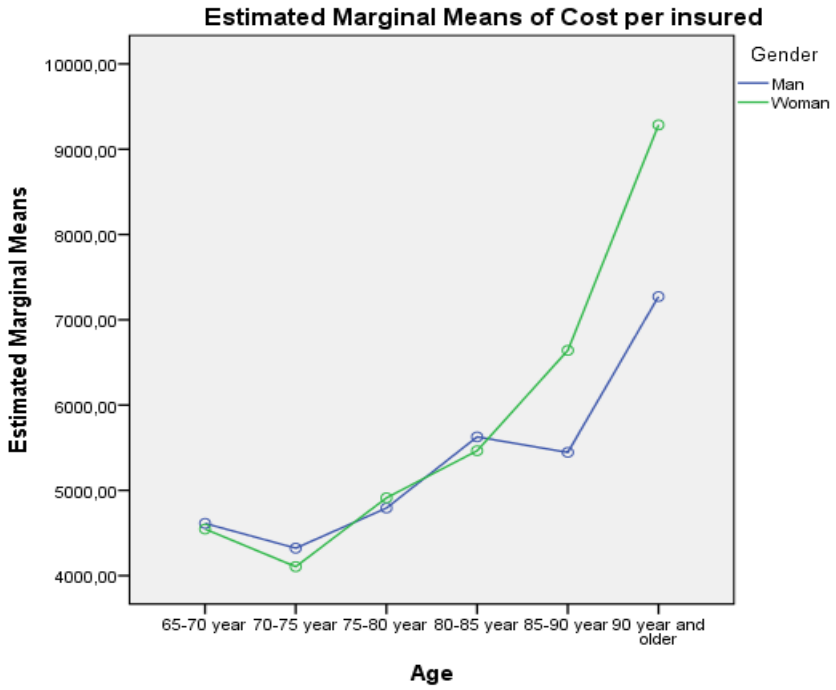

Figure IV.3 General Linear Model: Age combined with elderly care costs set markers by gender.

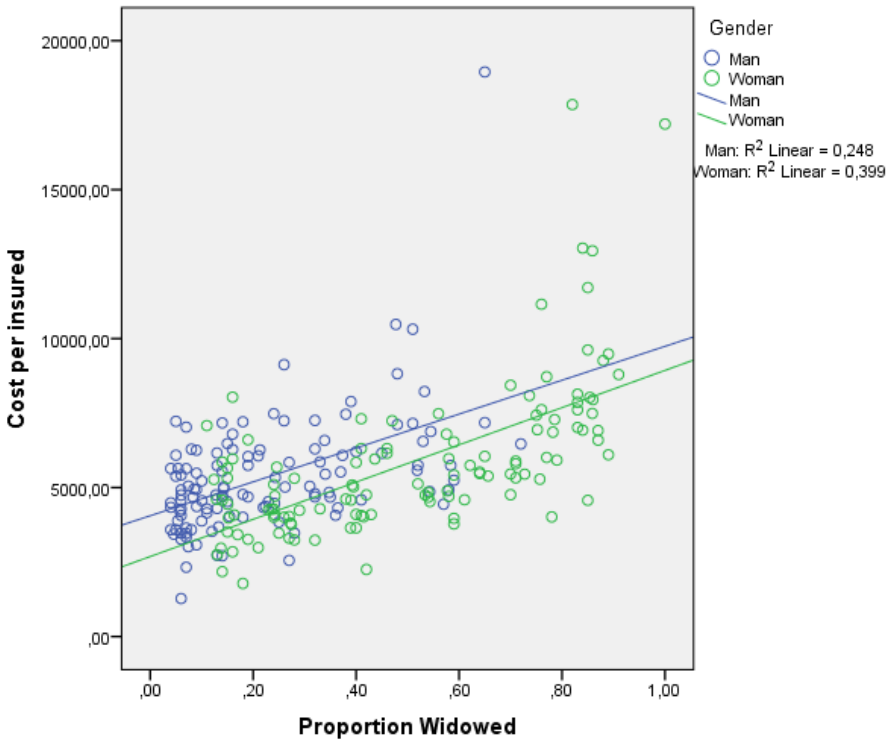

Figure IV.4 Scatterplot: Proportion widowed combined with elderly care costs set markers by gender.

Appendix V

Table V.1 Explanatory power of variables

	20 Municipals		
	t	***p***	***R***
Age	9.488***	<.001	.524
Gender	1.621	.106	.104
Proportion Widowed	10.107***	<.001	.548
Proportion singles	6.223***	<.001	.374
Inhabitants/km²	-1.093	.276	.071
Proportion immigrants	-3.164**	.002	.201
Proportion low income	-1.257	.210	.081

*p<.05 **p<.01 ***p<.001

Tabel V.2 Univariate Linear regression analyze large municipality

Dependent Variable: Cost per insured	*Unstandardized Coefficients*	*Constant*	*t*	*Sig.*	*R²*
Gender	495,55	4556,69	1,64	0,104	0,022
Inhabitants/km²	-629,77	5973,25	-2,62	0,01*	0,055
Proportion singles	3558,52	3970,91	4,63	0,000**	0,154
Proportion widowed	3878,09	3910,92	7,85	0,000**	0,343
Proportion immigrants	-12489,70	6812,31	-5,076	0,000**	0,179
Proportion low income	13593,52	4920,76	0,403	0,688	0,001
LC 1 65-70 jaar (constante)	4543,41		15,74	0,000**	0,493
LC 2 70-75 jaar	-159,34	4543,41	-0,390	0,697	0,426
LC 3 75-80 jaar	51,61	4543,41	0,126	0,900	0,426
LC 4 80-85 jaar	538,19	4543,41	1,32	0,19	0,426
LC5 85-90 jaar	1123,32	4543,41	2,75	0,007**	0,426
LC6 90 jaar en ouder	2985,85	4543,41	7,31	0,000**	0,426

*.Significant relation with costs at the 0,05 level
**.Significant relation with costs at the 0,01 level

Tabel V.3 Univariate Linear regression analyze small municipality

Dependent Variable: Cost per insured	*Unstandardized Coefficients*	*Constant*	*t*	*Sig.*	*R square*
Gender	465.10	5173.09	0.917	0.361	0.007
Inhabitants/km²	448.33	5631.77	1.104	.272	.010
Proportion singles	6803.28	3568.96	4.99	0.000**	0.174
Proportion widowed	5664.61	3770.11	7.13	0.000**	0.301
Proportion immigrants	-555.50	5916.84	-0.107	0.915	0.000
Proportion low income	-77844.57	7832.42	-1.268	0.207	0.013
LC 1 65-70 jaar (constante)	4615.49		8.9897	0.000**	0.344
LC 2 70-75 jaar	-571.99	4615.49	-0.788	0.433	0.344
LC 3 75-80 jaar	493.78	4615.49	0.680	0.498	0.344
LC 4 80-85 jaar	1394.28	4615.49	1.920	0.057	0.344
LC5 85-90 jaar	1804.01	4615.49	2.484	0.014*	0.344
LC6 90 jaar en ouder	4411.41	4615.49	6.074	0.000**	0.344

*Significant relation with costs at the 0,05 level
**Significant relation with costs at the 0,01 level