SECOND DRAFT

A MACRO PREDICTION OF THE USE OF CARE PROVISIONS IN THE NETHERLANDS (2005-2020).

Jedid-Jah Jonker [a)]
Ingrid Ooms [a)]
Isolde Woittiez [a)]

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We analyse the use of long term care provisions in The Netherlands. The goal of the analysis is to provide insight into the (determinants of the) size of the use of the long term care provisions at a micro-level. Therefore, we build a micro-model for the private and public care provisions: nursing homes, residential care, various types of home care, professional care and informal care. A nested logit model is, just like the multinomial model, suited to analyse the choice process. The data are derived from a match of two surveys, one held among people living at home and one among people living in institutions (nursing homes and residential care). These surveys together provide a representative sample of the Dutch (elderly) population in 2000. The results show that health limitations, age, the number of persons in the household and income are important determinants of the use of long term care. The results also show that the decision to use care or not is made independent of the choice of care provision. We combine the estimated micro relations with macro-developments of the determinants to obtain macro predictions of the use for the period 2005-2020. These predictions indicate that especially the use of privately paid care at home will increase faster than the growth of the population. Also, the use of publicly paid household care decreases in the same period. This is an indication that people who need 'light' forms of care at home are becoming less inclined to rely on public care. This could be a result of the limited availability or the perceived lower quality of public care in comparison with privately paid care. The use of the 'moderately' publicly paid personal care at home will also increase, indicating that people will stay at home longer, needing relatively heavier forms of publicly paid care at home. The demand for residential care and nursing homes will also increase. This is probably a result of the fact that the elderly are getting older.

a) Social and Cultural Planning Office, P.O. Box 16164, 2500 BD The Hague, The Netherlands
e-mail: j.jonker@scp.nl.

1. Introduction

Like many other European politicians the Dutch worry about the increasing costs of long term care provisions during the last decade. With the share of the elderly population (older than 65) in The Netherlands expected to increase from 13.5% to 15% during the next ten years, the number of persons with chronic functional or cognitive impairments will also increase. This effect is reinforced by the expected growth of the eldest among the elderly. As a result, a continuing growth in the demand for long term care provisions is expected, leading to an increase in the costs.

To provide insight into the determinants of the expected growth in the use of care provisions the following research questions have been formulated:

1. which are the determinants of the use of care provisions?
2. to what extent are care provisions substitutes of each other?
3. what will the predictions of the demand for care provisions be for the next few years?

Long term care for the elderly in The Netherlands has traditionally been provided by residential homes. Residential care provides a supportive living environment to elderly persons combined with assistance and care if necessary. Public policy has led to a reduction in the use of residential care. Nursing homes provide care aimed at rehabilitation on the one hand and reducing the effects of impairments on the other. Capacity of the nursing homes has shown a steady increase in the last ten years. Publicly paid care at home has known a booming growth in the same period. Fifteen years ago home care was classified in district nursing (aimed at providing care) and home help (aimed at providing help with household work), both small-scale organized, mostly by associations or foundations. In 2005 publicly paid home care is a centrally organized provision, part of the AWBZ[1] (which means it falls under a compulsory insurance for all individuals) and consists of household care, personal care and nursing care provided at home.

The last couple of years there has been a growing tendency among persons who need care to stay at home as long as possible. As a consequence, paid care provided at home is now financially supported by the government, as they have extended various care arrangements. Examples are outpatients' treatment by nursing and residential homes. Also, informal care is stimulated by the introduction of the so-called 'individual budget', with which one can choose the person one wishes to buy care from (e.g. family members, neighbors or private nurses). Because the government wants to support people who provide informal support, arrangements have been made to subsidize working persons who take care-leave to look after someone. Therefore, an understanding of how different forms of care are interrelated, how persons move through the system and what the incentives are to encourage one or another provision, is required.

In this paper we focus on the relationship between the use of the several care provisions. In particular, we examine how health and personal characteristics affect decisions about whether to use care, and from whom care is obtained. We assume that the set of available alternatives are combinations of three underlying choice dimensions: the decision to use care or not, the decision to stay at home or not and the choice of provision. If the person decides to use care and stay at home, he can choose between non-public care at home and public home care. Non-public care can be either informal or privately paid. Public care can be household care, personal care or nursing care. If someone chooses for an institutional living, (s)he can choose between residential care and care in a nursing home. In such a choice setting, a nested multinomial logit model seems most appropriate. The underlying assumption is that residential care is more substitutable with care in a nursing home than with the (in)formal home care or no care alternative. A recursive decision making process is employed such that the expected utility of the preferred institution affects the decision about staying home or not. And likewise, the alternatives publicly paid care at home and non-public care at home are more substitutable with one another than with care in a rest or nursing home. This recursive model is described graphically in Figure 1.

[1] AWBZ is the Dutch General Exceptional Medical Expenses Act (Algemene Wet Bijzondere Ziektekosten).

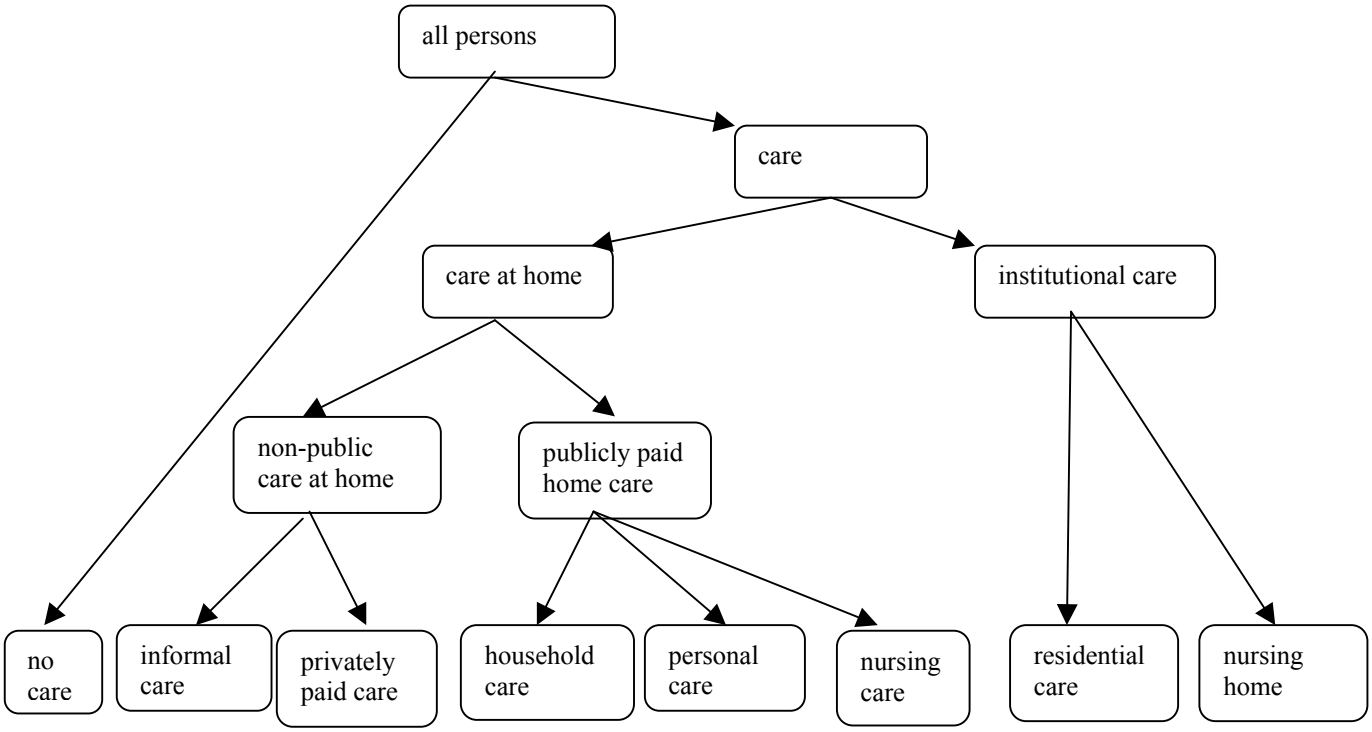

Figure 1: Model for the use of care provisions.

Because most care provisions fall under the public AWBZ insurance, there is no variety of out-of-pocket prices between different health insurance plans. Therefore, unlike Royalty and Solomon (1998) and Holly *et al.* (1998) we do not need to model health insurance choice. Neither do we allow for self-selection by controlling for endogenous health status, like Akin *et al.* (1998). Although we recognize the possible bias in parameter estimates due to neglecting endogeneity of health, we believe that in our model on care provisions the use of an objective health measure of health reduces the problem (De Wit (1997)).

Our estimation results are based on surveys among people living at home and among people living in an institution (residential care or nursing home). That is, the choice is modeled on a random sample of individuals. In this respect it differs from O'Shea and Corcoran (1990) who use data of elderly on the margin of domiciliary and institutional care. The model developed is similar to many models used in studies examining the different determinants of demand for health services (Mariko (2003), Coffey (1982), Spector, Selden and Cohen (1998), Fortney, Rost and Zhang (1998), Pezzin, Kemper and Reschovsky (1995), Timmermans *et al.* (1997)). The main difference with most of these studies is the recognition of informal care as a provision and the recognition that some care provisions are more substitutable with each other than with others. Two similar studies, also using a nested logit model, are about health care in Mali (Mariko (2003)) and about depression treatment (Fortney *et al.* (1998)). The first study mainly focuses on the quality of care aspect and taking account of this, finds consistent effects of the determinants of the demand for care. The second focuses on the measure of substitutability between the choice to seek treatment and the choice of provider sector. Our paper does not take account of quality aspects but extends the aforementioned papers in another way. It combines the estimated coefficients and a population simulation model to obtain predictions of the demand for care provisions on a macro level.

After having obtained estimates of the influence of the determinants on the use of the care provisions, we combine the estimated micro relations with macro-numbers of the determinants to obtain macro predictions of the use of provisions for several years. To this end, a population simulation model has been constructed by the SCP to represent the size and composition of the Dutch population for the next coming fifteen years. The population simulation model has already been used in several studies (e.g. Timmermans et al. (1997), CPB/SCP (1999), Timmermans and Woittiez (2004)).

The remainder of this paper is divided into three sections. Section 2 presents the conceptual framework underlying the discrete choice model. Section 3 describes the data and the empirical specification. The

estimation results are presented and discussed. Section 4 describes the use of the population simulation model to obtain macro-predictions of the demand for care. The final section summarizes the findings and provides some discussions for further research.

2. The conceptual framework of the model

People face a probability of becoming unable to care for themselves due to gradual deterioration with age or sudden health shocks. Some primarily need help with household work such as shopping and cooking or personal care such as bathing and dressing. Others need nursing care, such as bandaging a wound. A typical characteristic of the long term care is that it almost always can be provided at home by informal care givers such as family members, neighbours or acquaintances and by professional care givers (either public or privately financed). But care can also be provided institutionally (residential care or in a nursing home). A person is assumed to have preferences defined over the set of alternatives no care (alternative 1), informal care (alternative 2), privately paid care at home (alternative 3), public household care (alternative 4), public personal care (alternative 5), public nursing care at home (alternative 6) residential care (alternative 7) and care in a nursing home (alternative 8). We assume that the alternatives are mutually exclusive[2]. The eight alternatives are influenced by the personal characteristics, X_i (such as income, age, gender) of person i. We recognize the existence of subgroups or clusters within the eight alternatives. The clusters we distinguish are indicated in Figure 1. The choice j within cluster k by individual i is defined as:

$$(6.1) \qquad V_{jk}^{\ i} = \alpha_j X_i + \varepsilon_{ijk}$$

where X_i is a vector of individual specific characteristics and α_j is a vector of parameters to be estimated. ε_{ijk} is the random error term reflecting unobserved personal characteristics and unobserved taste variation. There are I individuals (i=1,...,I), K clusters (k=1,...,K) and N_k possible choices within a cluster (j=1,…,N_k). The probability $P_{jk}^{\ i}$ that the choice j,k is made by individual i, can be written as the product of a conditional probability of choice $P_{j|k}^{\ i}$ given the cluster k and a marginal probability $P_k^{\ i}$ for the cluster:

$$(6.2) \qquad P_{jk}^{\ i} = P_{j|k}^{\ i} * P_k^{\ i}$$

The conditional probability can be written as

$$(6.3) \qquad P_{j|k}^{\ i} = \exp(\beta_j X_{j|k}^{\ i})/(\Sigma_m \exp(\beta_j X_{j|m}^{\ i})) \ (m=1 \text{ to } N_k) = \exp(\beta_j X_{j|k}^{\ i})/\exp(J_k)$$

where $X_{j|k}^{\ i}$ denotes the variables that have explanatory value for the choice j within cluster k (k = 1 to N_k) by individual i. J_k is called the inclusive value and it captures the differences in the variances of the error terms of $V_{jk}^{\ i}$ between each cluster (see Amemiya (1985) and Maddala (1983)). The marginal probability can be written as

$$(6.4) \qquad P_k^{\ i} = \exp(\gamma X_k^{\ i} + \tau_k J_k)/ \Sigma_g \ \exp(\gamma X_g^{\ i} + \tau_g J_g) \ (g=1 \text{ to } K)$$

where $X_k^{\ i}$ denotes the variables that explain the choice of the cluster k.

If we (restrictively) assume that ε_{ijk} are independently and identically distributed with the type I extreme-value distribution, the model is a multinomial logit model. The independence between the error terms is an unreasonable assumption because a high chance of becoming institutionalized in a nursing home due to severe impairments should generally imply a high chance of receiving residential care. Therefore, we assume that nursing home and residential care together form a cluster and so do private informal and private home care and also public household care, public personal care and public nursing care. Assuming that ε_{ijk} within a cluster k are jointly distributed with the Gumbel's type B bivariate extreme-value distribution, the model becomes a nested logit model. The correlation coefficient between the disturbances within a cluster is $1-\rho^2$. ρ equals one corresponds to independent utilities as in the usual multinomial logit. As for the disturbances between the clusters, we assume that they are independently and identically distributed with the type I extreme-value distribution, as is the case in the multinomial logit model. Technically speaking, we specify a joint choice model with three underlying dimensions. The first is to use care or not, the second is to stay at home or not and the third is the choice of provider of the care (informal home care versus publicly paid care at home, public household

[2] Of course, individuals can receive more than one provision. We therefore assume a hierarchical ordening of the provisions (from low (informal) to high (care in a nursing home)) and classify the person according to the provision with the highest weight.

care versus public personal care versus public nursing care and residential care versus nursing home).

3. Data and empirical specification.

The data for this analysis are taken from a survey among persons living at home (AVO) and a survey among people living in institutions (OII).[3] The AVO survey was held among independently living persons. Data were collected on personal characteristics (such as household composition, health status) and the use of care provisions. The OII contains people receiving residential care and residents of nursing homes. In total, we have observations on 9,455 individuals. Several persons were excluded from the analysis because of non-response on one or more items. Table 1 provides some summary statistics of the data actually used in the estimation. The dependent variable measures eight alternatives of care. Of the individuals in the sample 79% chooses the no care option, 8% the private informal care option, 7% private home care, 3% public household care, 1% public personal care, 1% public nursing care, 1% residential care and 0.5% live in a nursing home.

Table 1 Summary statistics (percentages)

	No care	Informal care	Privately paid care at home	Household care	Personal care	Nursing care	Residential care	Nursing home	Total
Gender									
Male	50.2	52.0	46.5	27.0	20.6	23.4	23.0	29.7	48.5
Female	49.8	48.0	53.5	73.0	79.4	76.6	77.0	70.3	51.5
Age class									
65 years of age or younger	83.4	73.0	69.5	41.7	20.9	50.4	0.0	0.0	78.2
65 – 69 years of age	7.0	4.8	5.6	4.7	3.0	4.3	1.9	8.0	6.6
70 – 74 years of age	4.9	5.8	7.9	9.8	14.9	13.0	3.7	12.0	5.5
75 - 79 years of age	3.0	6.4	8.0	17.3	11.9	12.2	13.9	22.0	4.4
80 - 84 years of age	1.2	4.7	5.6	18.0	16.4	11.3	24.1	20.0	2.8
85 years of age or older	0.5	5.3	3.3	8.6	32.8	8.7	56.5	38.0	2.5
Type of household									
Living together	85.3	78.2	77.5	46.8	33.1	54.2	10.8	3.1	81.2
Widow(er)	3.9	10.7	11.0	36.8	54.5	24.2	76.3	58.5	7.5
Other single	10.7	11.1	11.5	16.4	12.4	21.6	12.9	38.4	11.3
Number of cases	7,475	729	659	254	67	115	107	49	9,455

Explanatory variables are demographic variables, health variables and a financial variable (income). Some of the demographic variables that are used, are presented in Table 1 to provide an impression of the data. The total data-set consists of a lot more variables, as can be seen in Table 2. From Table 1, it is clear that there is a distinct pattern of care use between men and women. Men make less use of care than do women. Age seems to be an important determinant for care use. The eldest individuals are over represented in personal care, residential care and nursing homes. Household care, personal care and rest and nursing homes seem to have an over-representation of singles.

As demographic variables we use age (in five dummies: under 69, 70-74, 75-79, 80-84 and 85 and older), gender (1 is female), education (in four dummies: primary education, low secondary education, secondary education, bachelor degree or higher), household composition (living together, widow(er) and other single) and degree of urbanisation (very high, high, moderate, low, very low). Also included is the households net monthly income (in nine dummies).

For health we have several dummy variables. The first group ("diseases") indicates which disorders someone has. The second group ("limitations") indicates which mental or physical restrictions someone faces. The next group indicates the reason someone needs care (short illness, aftercare, decreased ability to manage for oneself

[3] OII is an abbreviation of Survey of Elderly in Institutions (Onderzoek naar Ouderen in Instellingen in Dutch). AVO is an abbreviation of Survey of the Use of Supplemental Provisions (Aanvullend Voorzieningengebruik Onderzoek in Dutch).

and chronic disease). The fourth group indicates whether someone uses special aid or resources. The final group consists of inclusive values, which are included to take underlying decisions within clusters into account. For instance, when modeling the decision between non-public care at home and publicly paid home care, inclusive values are included for the choice between informal care and privately paid care ("Non-public care at home") and for the choice between the three different types of publicly paid care at home ("Public care at home").

The parameter estimates of the nested logit model are provided in Table 2. Column 1 (care/no care) shows that the use of care (versus no care) is mostly influenced by income, education, age, limitation in performing daily household tasks, mental limitations and living in more urban areas.

In column 2 we see that the 'choice' of receiving care at home or receiving care in an institution is influenced by a large number of variables. High income lowers the probability of receiving care in an institution, just as limitations with sitting and standing and problems with the locomotor apparatus. Single individuals and men have a higher probability of receiving care in an institution, just as elder elderly, persons with limitations in performing daily household tasks and mental limitations.

If one receives care in an institution (column 3), the choice between residential care or a nursing home is influenced by age, gender, urbanisation, limitations, composition of the household and income. Severe limitations in performing common daily tasks, limitations with sitting and standing and metal limitations increase the probability of receiving care in nursing home. Women and elderly have a higher probability of receiving residential care than men and younger individuals with the same characteristics.

Column 4 described the choice between AWBZ (or public) home care and private home care. The most important factors are the reason for need of care, age, income and (to a lesser extent) limitations. All these factors increase the probability that people receive public home care, except for income where it is the opposite. Problems with the locomotor apparatus or the nervous system lower the probability of receiving public home care.

Within the public home care, there are only a few characteristics that determine the kind of provision that is used (see columns 5 and 6). Having cancer increases the probability of receiving nursing care at home, having kidney, bile, liver or thyroid diseases increase the probability of receiving household care. Experiencing limitations in performing common daily tasks increases both the probability of receiving personal care as well as nursing care. The same goes for if short illness, aftercare or a chronic disease is the reason for needing care.

Column 7 describes the choice between informal and privately paid care at home. Six characteristics are important: education, household income, make-up of the household, gender, age and reason for need of care. A high level of education and a high income increase the probability of receiving private home care. The same goes for high age. Women, widow(er)s and other single persons also have a higher chance of receiving private home care than men and couples with the same characteristics. The probability of receiving private care is smaller if the reason for need of care is a short illness, aftercare or decreased ability to manage for oneself. It is surprising that neither diseases not limitations seem to have an effect.

The parameter estimate for the inclusive value 'Non-public care at home' indicates that persons who, by certain unmeasured characteristics, have a higher probability of using private home care, have a smaller probability of receiving public home care. A similar conclusion can be drawn for 'Public care at home' and 'Care at home'. When these inclusive values would be equal to 1, that would indicate that the utilities are independent as the case in the standard multinomial logit with the IIA property. However, from Table 2 it is clear that all these inclusive values are unequal to 1. The fact that 'Care' is equal to 0, indicates that the decisions are sequential and that the decision whether to use care or not, is independent of the choice of a care provision.

Table 2. Determinant of the use of elderly care provisions (marginal effects of the nested logit model), 2000 [a,b,c,d]

	1 care/ no care	2 institutional care / care at home	3 nursing home / residential care	4 public care at home/ non-public care at home	5 nursing care/ household care	6 personal care / household care	7 private / informal care
Diseases							
Cancer	0	0	0	+	+++	0	0
Kidney, bile, liver or thyroid	0	+	0	0	0	- -	0
Diabetes	0	0	0	0	0	0	0
Mental diseases	0	0	0	0	0	0	0
Migraine or diseases of nervous system	0	0	0	- - -	0	0	0
Epilepsy	0	0	0	0	0	0	0
Myocardial infarction, severe heart disease	- -	0	0	0	0	0	0
Cerebral infarction	0	++	0	0	0	-	0
Respiratory tract problems	0	0	0	0	0	0	0
Locomotor apparatus	0	- -	0	- -	-	0	0
Disorders caused by an accident	0	+	0	0	+	0	0
Other disorders	0	++	+	+++	0	0	0
Limitations							
Visual disabilities	0	-	-	0	0	-	0
Light mobility disabilities	+	+	0	0	0	0	- -
Moderate-severe mobility disab	0	+	0	0	0	0	0
Slight limitation common daily needs	0	- -	0	0	0	0	0
Moderate to severe limitation common daily needs	+	0	+++	0	++	++	0
Slight limitation sitting and standing	+	- -	0	0	0	0	0
Moderate to severe limitation sitting and standing	0	- - -	+++	0	0	0	0
Slight limitation in performing daily household tasks	+++	+	0	0	0	0	0
Moderate to severe limitation in performing daily household tasks	+++	++	0	0	0	0	0
Mental (other)	+++	+++	+++	+++	0	0	0
Loneliness	na	na	- -	na	na	na	na
Depression/well-being	na	na	- -	na	na	na	na
Reason for need of care							
Short illness	na	na	na	++	++	++	- - -
After care	na	na	na	++	++	++	- - -
Decreased ability to manage for oneself	na	na	na	++	0	0	- - -
Chronic disease	na	na	na	+++	+	++	0
Age class							
under 69 (reference)							
70-74	+++	++	0	+++	0	0	+++
75-79	+++	++	-	++	0	0	+++
80-84	+++	++	- - -	++	0	0	+++
Over 85	+++	++	- - -	0	++	++	0
Gender							
Male (reference)							
Female	0	-	- -	++	0	0	++
Make-up of household							
Living together (reference)							

Widow(er)	+++	++	0	+	0	0	+++
Other single	+++	0	++	0	0	0	+++
Degree of urbanisation							
Very high (ref.)							
High	++	+++	- -	0	0	0	0
Moderate	++	0	0	0	0	0	0
Low	++	0	- - -	0	0	0	0
Very low	+++	- -	- - -	0	0	0	0
Education							
Primary education							
Low secondary education	0	++	0	0	0	0	+++
Secondary education	++	0	0	0	0	0	+++
Bachelor degree or higher	+++	0	0	0	0	0	+++
Net montly household income							
< 675 euro (ref.)							
675-935 euro	+	0	0	0	++	++	++
935-1.090 euro	0	0	0	0	0	0	++
1.090-1.215 euro	0	- -	0	-	0	0	++
1.215-1.350 euro	-	- -	- -	- -	0	0	++
1.350-1.485 euro	0	- -	0	0	0	0	+++
1.485-1.800 euro	++	- -	+++	- -	0	0	+++
1.800-2.700 euro	+++	- -	0	- - -	0	0	+++
> 2.700 euro	+++	- -	++	-	0	0	+++
Missing	0	- -	0	- -	+	+	+++
Use of special aid or resources							
Mobility-aid	+++	+++	0	+++	+	+	- -
Aid for daily common tasks	na	na	na	0	0	0	++
Dwelling for seniors	na	na	na	+++	-	-	0
Use medical specialist or hospital	+++	- -	+++	0	0	0	0
Use of GP	na	na	na	0	0	0	0
Inclusive values							
Non-public care at home	ni	ni	ni	- -	ni	ni	ni
Public care at home	ni	ni	ni	- - -	ni	ni	ni
Care at home	ni	- -	ni	ni	ni	ni	ni
Care in an institution	ni	0	ni	ni	ni	ni	ni
Care	0	ni	ni	ni	ni	ni	ni
Number of observations	9,455	1,980	156	1,824	436	436	1,388
pseudo-R^2	0.23	0.68	0.44	0.41	0.46	0.46	0.26

[a] The reference group is the estimation consists of people who only demand household care. We present marginal effects in order to give outcomes for all eight provisions.
[b] Marginal effects indicate the change in probability of receiving a certain care provision as a result of a slight change of a explanatory variable .
[c] Non-significant is indicated by a 0 (p>0.1); moderately significant is indicated with a + or – (p<0.1); significant is indicated with ++ or - - (p<0.05); strongly significant is indicated by +++ or - - - (p<0.01).
[d] n.i. = not included, n.a.=not available.

Alternatively, we have also estimated the multinomial model (see Table A in Appendix A for the results). The presumption of the multinomial model is that all provisions are equal substitutes. The results and the goodness of fit of both models are comparable. It can be seen as a sign of the robustness that both models, using the same explanatory variables, lead to the same results. The nested logit model is intuitively more appealing and provides more insight in the choice process made by individuals. However, empirical analysis showed that the nested logit model is less suitable for forecasting. In a nested logit model, a forecast has to be made for each cluster. Combining the forecasts for each cluster into a total forecast, leads to an accumulation of forecast errors. In the multinomial model, there is only one cluster so this "piling up" problem does not occur. In the next section, the

multinomial model is used to calculate the predictions for the demand of care between 2005 and 2020.

4. The macro-use of care provisions

In the previous section, the relation between use of care provisions and financial, demographic and health determinants are examined by means of two logit analyses. This provides us with estimated probabilities of the use of each of the care provisions for each individual. The estimated probabilities depend upon the estimated parameters and upon the value of the determinants. Using forecasts of the various determinants thus allows us to obtain a forecast of the probability of the use of the various alternatives. To that end, a population simulation model is constructed simulating the size and composition of the Dutch population for the next twenty years. This population simulation model is an expected classification of the population. It provides information on the size and the composition (classified according to age, gender, income, education level and household composition) of the Dutch population. Starting point of the population simulation model is the combined AVO and OII-sample. Together they form a representative sample of the Dutch population. The information on the size and the composition of the Dutch population is stored as a weight factor for each person. An increase in the number of old persons comes down to an increase in the weights of all the persons in the sample that are old.

Combining this population simulation model with the estimated relation between the use of care provisions and its determinants yields demand orientated forecasts of the use of care provisions. For each individual in the population simulation model, the probability of using some care provision is calculated. This is a number between 0 and 1. These numbers are summed over the total population and thus a macro probability is calculated. In this way, the problem observed by Cramer (1999) of obtaining good predictions of rare outcomes in unbalanced samples is circumvented. We interpret the forecasts as demand orientated forecasts because the determinants are typical demand determinants. Usually demand is not observed and one always has to find estimates of future demand in a roundabout way. In this case, where demand has been greater than supply along the period, we have implicitly assumed that the supply filter reducing demand to actual use is the same for all years and for all type of individuals (where type is defined in terms of the determinants in the model). In that case demand is proportional with actual use and the increase in demand equals the increase in supply. But when for example in the course of time relatively more severely impaired individuals are allowed into a provision, predicted demand will depart from actual but unobserved demand.

Table 3 and 4 show the predicted demand for the eight care provisions between 2005 and 2020. In Table 4, also the growth of the total population is indicated. Comparing the growth indices for the care provisions with the population index shows whether the growth of the use of a provision goes faster or slower than the growth of the total population.

Table 3. Use of long-term care 2005-2020 (absolute figures, in thousands of persons)

		Non-public care at home		Public home care			Institutional care	
Year	No care	Informal	Privately paid	Household care	Personal care	Nursing care	Residential care	Nursing homes
2005	8,399	661	739	225	61	101	112	55
2010	8,581	685	842	228	65	104	122	60
2015	8,708	706	953	232	70	108	130	65
2020	8,785	739	1,078	240	77	116	137	71

Table 4. Use of long-term care 2005-2020 (indices)

			Non-public care at home		Public home care			Institutional care	
Year	Total popul.	No care	Informal	Privately paid	Household care	Personal care	Nursing care	Residential care	Nursing homes
2005	100	100	100	100	100	100	100	100	100
2010	106	102	104	114	101	107	103	109	109
2015	112	104	107	129	103	115	107	116	118
2020	115	105	112	146	107	126	115	122	129

The group that does not use care in the future is expected to become relatively smaller than the group that does use care. Hence, people are expected to use more care in the future. Especially the use of privately paid care at home will see a very strong increase. People will rely less on publicly paid care, and are more likely to choose privately paid care at home. Surprisingly, this trend is not seen in the use of informal care. Asking for help from family or friends is not viewed as an alternative for public home care or privately paid care at home. It might

also be that family and friends are too busy to provide care and that they stimulate people to ask for private care. The growth of the demand for privately paid care at home might be a result of an insufficient supply of public home care, a dissatisfaction with the quality of public home care or a combination of both.

In the publicly paid care at home, especially the use of personal care is expected to increase in the coming years. This confirms the trend that people will stay at home longer, needing relatively more care. Nursing care stays at approximately the same (relative) level, whereas household care becomes relatively less popular. If a person needs relatively 'light' home care, it is more likely (s)he will use privately paid care at home in stead of publicly paid household care. People who need nursing home care do not stay at home longer: the demand for this form of care does not become (relatively) higher. Staying at home is not a long term alternative for people who demand nursing care: they are better of in an institution.

The use of care in an institution (residential care and nursing homes) will also become relatively more important. This is in line with the fact that the number of people over 65 will grow in the coming years, and that the population of people over 65 becomes older (the so-called "double ageing effect").

5. Conclusions and future research

We have estimated a nested logit model and a multinomial logit model for the use of care provisions in The Netherlands. We have distinguished eight different care alternatives (no care, informal home care, privately paid care at home, publicly paid household care, publicly paid personal care, publicly paid nursing care, residential care and care in a nursing home).

The use of care is mostly influenced by income, age, make-up of the household, reason for need of care and limitations. Also, the different decisions to use care seem to be made sequential and not at the same time. The estimated micro-relations are combined with macro predictions of the determinants. Thus, macro predictions for the several provisions are constructed.

Our predictions of the demand for care provisions for the next fifteen years show an increase in (relative) use of privately paid care at home, publicly paid personal care and institutional care. This shows that people are becoming less inclined to rely on public care and are willing to pay for private care. Two possible explanations for the increase in demand for privately paid care at home are: (1) public care is not available or (2) the quality of public care is not adequate. A more detailed analysis of the phenomena is an interesting area for future research. We also see that informal care does not become relatively more important. People prefer to pay for care rather than ask friends or family. Informal care might also be supplementary to public care. Family and friends might also be becoming less inclined to help. This also is interesting an area for future research.

We also see an increase in demand for nursing homes and residential care. The strong increase of the ageing population, combined with the increased life expectancy of elderly leads to an increased demand.

Our results illustrate that in the next decade, people will stay at home longer, relying more on privately paid care at home when they need relatively "light" home care. As their need for care increases, they will rely more on the "heavier" form of public personal home care and also on public care in an institution.

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Appendix A

Results of the multinomial model.

Table A. Determinants of the use of elderly care provisions (marginal effects based on the multinomial logit model)

	No care	Informal care	Formal care	Household care	Personal care	Nursing care	Residential care	Nursing home
Diseases								
Cancer	0	0	0	0	0	++	0	0
Kidney, bile, liver or thyroid	0	0	0	0	0	+++	+	0
Diabetes	0	0	0	0	0	0	0	0
Mental diseases	0	0	0	0	0	0	0	0
Migraine or diseases of nervous system	0	++	-	0	0	0	0	0
Epilepsy	0	0	0	0	0	0	0	0
Myocardial infarction, severe heart disease	0	0	- -	0	0	0	0	0
Cerebral infarction	0	0	0	0	0	0	++	+
Respiratory tract problems	0	0	0	0	0	0	0	0
Locomotor apparatus	0	0	++	- -	0	- -	- -	-
Disorders caused by an accident	0	0	0	0	0	0	0	0
Other disorders	0	0	0	++	0	0	++	+
Limitations								
Visual disabilities	0	0	0	0	0	0	0	-
Light mobility disabilities	0	+	0	+	0	0	++	0
Moderate-severe mobility disab	0	0	0	++	+	0	++	+
Slight limitation common daily needs	0	0	0	0	0	0	- -	0
Moderate to severe limitation common daily needs	0	0	0	0	++	+	+	++
Slight limitation sitting and standing	0	0	+	0	0	0	- -	-
Moderate to severe limitation sitting and standing	- - -	0	+++	0	0	0	- -	0
Slight limitation in performing daily household tasks	- - -	+++	++	+++	0	+++	++	0
Moderate to severe limitation in performing daily household tasks	- - -	+++	+++	+++	++	+++	+++	++
Mental (other)	- - -	+++	0	+++	+++	+++	+++	++
Age class								
under 69 (reference)								
70-74	- - -	0	+++	++	++	++	+++	++
75-79	- - -	++	+++	+++	++	++	+++	++
80-84	- - -	+++	+++	+++	++	+++	+++	++
Over 85	- - -	+++	+++	++	+++	++	+++	++
Gender								
Male (reference)								
Female	++	- - -	+	0	0	++	- -	- -
Make-up of household								
Living together (reference)								
Widow(er)	- - -	+++	+++	+++	++	0	+++	++
Other single	- - -	0	+++	+++	0	0	++	++
Degree of urbanisation								
Very high (ref.)								

High	-	0	0	0	0	+++	+	0
Moderate	- -	++	0	0	0	++	0	0
Low	-	0	0	0	0	++	0	0
Very low	- - -	+++	+++	0	0	+	0	-
Education								
Primary education								
Low secondary education	0	0	+++	0	+	0	0	0
Secondary education	- -	0	+++	0	0	0	0	0
Bachelor degree or higher	- - -	0	+++	0	0	0	0	0
Net monthly household income								
< 675 euro (ref.)								
675-935 euro	- -	0	+++	0	+	0	0	0
935-1.090 euro	0	0	++	0	0	-	-	0
1.090-1.215 euro	0	0	++	0	0	-	- -	0
1.215-1.350 euro	0	0	++	0	0	- -	- -	-
1.350-1.485 euro	- -	0	+++	0	0	- -	- -	-
1.485-1.800 euro	- -	0	+++	0	0	- -	- -	0
1.800-2.700 euro	- - -	0	+++	0	0	- - -	- -	-
> 2.700 euro	- - -	0	+++	0	0	-	- -	0
Missing	- -	0	+++	- -	0	- -	0	0
Use of special aid or resources								
Mobility-aid	- - -	+++	0	+++	+++	+++	+++	++
Use medical specialist or hospital	- - -	+++	0	+++	++	+++	0	0
Number of observations	9,455							
pseudo-R^2	0.50							

No care is the reference group. As should be the case there is much resemblance between the parameter estimates of Table 2 and Table A. The parameter estimates of the last two columns in Table A refer to the probability of being in a nursing home or receiving residential care with reference to no care.