Predicting transitions in the use of informal and professional care by older adults

SANDRA W. GEERLINGS*†, ANNE MARGRIET POT**†,
JOS W. R. TWISK†‡ and DORLY J. H. DEEG*†

ABSTRACT

To prepare the care system for a rising population of older people, it is important to understand what factors predict the use of care. This paper reports a study of transitions in the use of informal and professional care using Andersen-Newman models of the predictive predisposing, enabling and need factors. The study has drawn on *Longitudinal Ageing Study Amsterdam* (LASA) data on the use of care and the contextual factors. The data were collected at three-yearly intervals from a random, sex- and age-stratified, population-based sample of adults aged 55–85 years. In summary, the findings for those who initially did not receive care were that almost one-third received some kind of care three years later, most of which was provided by informal care-givers. Need factors were important predictors of most transitions in care, and predisposing and enabling factors, such as age, partner status and income, also played a role. On the relationship between informal and professional care, evidence was found for both 'compensatory processes', *i.e.* informal care substitutes for professional care, and 'bridging processes', *i.e.* informal care facilitates professional care. In view of the increasing discrepancy between the demand for professional care and its supply, the significant impact of predisposing and enabling factors offers opportunities for intervention.

KEY WORDS – need for care, care transitions, professional care, subsidised care.

Introduction

As for most developed nations, the current demographic projections for The Netherlands indicate that approximately a quarter of the population will be 65 or more years of age by 2040 (Central Bureau of Statistics 1997).

* Department of Psychiatry, VU University Medical Center, Amsterdam.
† Institute for Research in Extramural Medicine, VU University Medical Centre, Amsterdam.
** Department of Nursing Home Medicine, VU University Medical Centre, Amsterdam.
‡ Department of Clinical Epidemiology and Biostatistics, VU University Medical Centre, Amsterdam.

The population at the oldest ages will increase most rapidly, and even if age-specific morbidity and dependency rates moderate, the requirement for long-term care will continue to increase. In order to prepare the care system, it is of great importance to understand what factors predict the use of care. Most studies on the predictors of care utilisation rely on cross-sectional data and therefore describe differences between users and non-users. To explain the use of care, however, it may be more useful to focus on the process of becoming a user. To construct a theory of the factors that influence the use of care, a longitudinal design is required, in which 'transitions in care' are the dependent or outcome variables; this enables the changing situation of the older person to be taken into account (Crets 1996).

It is also important in the study of care transitions to consider simultaneously informal and professional care. Informal care includes support from partners, adult children and other relatives, friends and neighbours, whereas professional care comprises institutional care and home-care provided by subsidised or fee-paid professionals. Theorists have not agreed on how to link the relationship between informal and professional care (Logan and Spitze 1994; Lyons and Zarit 1999). In the 'hierarchical compensatory model' (Cantor 1979), professional services are considered to be a substitute for informal care when the latter are not forthcoming, and informal support is also represented as a bridge between the older person and professional services, bringing the person into contact with professional service providers and thus facilitating professional care (George 1987; Sussman 1976).

To predict the use of care, Andersen and Newman's (1973) behavioural model of health services use has often been employed (Andersen 1995; Borrayo *et al.* 2002; Kempen and Suurmeijer 1991). It distinguishes 'predisposing', 'enabling' and 'need' factors. Predisposing factors reflect the propensity to use services independent of the personal circumstances and experiences that may cause the need for care, and typically are socio-demographic variables. Enabling characteristics relate to the variable care resources available to the individual, as exemplified by partner status (the availability of a partner), the level of urbanisation (the availability of formal services), and the availability of informal care. Need factors pertain to the needs of the person and represent the most immediate stimulus to obtain care: they include physical and mental health status.

The *Longitudinal Ageing Study Amsterdam* (LASA) has created good data resources with which to study care transitions among older people. First, the longitudinal population-based design with three-yearly data collection intervals permits the prediction of the 'onset' of care among initial non-users. Second, the presence of data on both informal and professional care

enables close examination of the relationships between the two sources. Third, information is available on the three types of influences in Andersen and Newman's model, and finally, the longitudinal design makes it possible to estimate the effects of changes over time in the predictor variables (particularly the need factors). The study reported in this paper had two aims: first, to describe transitions in the use of care, with a focus on the transitions from 'no care' to 'informal home-care', and from either 'no care' or 'only informal home-care' to 'professional home-care' or 'institutional care'; and secondly, to assess the explanatory value of (changes in) predisposing, enabling and need factors.

Methods

Sampling and procedures

LASA is an inter-disciplinary study of the predictors and consequences of changes in autonomy and wellbeing among older people (full details of the sampling procedures and response rates have been described elsewhere: Deeg and Westendorp-de Serière 1994; Deeg *et al.* 1998). The main points are that a representative random sample of older adults (aged 55–85 years), stratified for age and sex, was drawn from the population registries of 11 municipalities in three regions of The Netherlands and used in two studies. First, 3,805 respondents were interviewed for the NESTOR project on 'Living arrangements and social networks of older adults' (NESTOR-LSN) (response rate 62.3%) (Broese van Groenou *et al.* 1995). About ten months later, 3,107 (81.7%) of the original respondents took part in the LASA baseline interview.[1] Follow-up measurements using exactly the same instruments and procedures took place at three-yearly intervals (Smit, De Vries and Poppelaars 1998). This study has analysed data from the baseline (t_0) interview in 1992/93, from the first follow-up interview (t_1) in 1995/96, and the second follow-up interview (t_2) in 1998/99.

Measurements

As the *dependent variable*, the use of care was measured by asking the respondents whether they received help for instrumental activities of daily living, such as cleaning the house and shopping (household care), and if so, from which sources. These questions were also asked about help received for the basic activities of daily living, such as bathing and dressing (personal care). Informal, subsidised and private home or domiciliary care, and institutional care were all distinguished. Informal home-care is unpaid, non-organised help offered by partners, adult children and other

relatives, friends and neighbours. A distinction was made between sub-
sidised and private home-care because the former is provided by pro-
fessional non-profit organisations and the government subsidises most of
the costs. Governmental committees organise the allocation and decide on
the eligibility of disabled older people for subsidised care. Private home-
care is provided by for-profit organisations. It has a growing role in the
support of older people (Portrait, Lindeboom and Deeg 2000). The bulk of
institutional care is provided in subsidised residential and nursing homes
(geriatric units in general and psychiatric hospitals provide the remainder).

Independent variables

The independent variables were divided into predisposing, enabling and
need factors (Anderson and Newman 1973). *Predisposing factors* included sex,
age and education. Education was measured on an eight-point ordinal
scale that ranged from 'uncompleted primary school' to 'completed uni-
versity education'. For the analysis reported in this paper, education was
dichotomised as 'low' (no more than completed primary school, ages 6 to
12 years), and 'middle to high' (some secondary education up to and
including university degree). *Enabling variables* were (changes in) partner
status, level of urbanisation, income and the presence of informal home-
care. *Need variables* included (changes in) chronic physical diseases, func-
tional limitations, depression, cognitive impairment, and self-rated health.
   The presence of chronic physical diseases was assessed by asking the
participants whether they had any of the following diseases: cardiac dis-
ease, peripheral atherosclerosis of the abdominal aorta or the arteries of
the lower limb, stroke, diabetes mellitus, lung disease (asthma or chronic
obstructive pulmonary disease), cancer or arthritis (rheumatoid arthritis or
osteoarthritis) (Kriegsman *et al.* 1996). Based on two consecutive measure-
ments, respondents were divided into four categories: 'no diseases at
successive measurements' (the reference category), 'a constant number (at
least one) of chronic diseases at successive measurements', 'incident co-
morbid disease(s)', and 'incident first disease(s)'. Functional limitations
were assessed by the following activities: climbing up and down a staircase
of 15 steps without stopping, cutting one's own toenails, and using one's
own or public transport (Kriegsman *et al.* 1997; Van Sonsbeek 1988). The
response categories were 'yes, without difficulty', 'yes, with difficulty', 'only
with help' and 'no, I cannot'. For this study, the presence of functional
limitations was dichotomised as follows: 'no difficulty with any functional
limitations' and 'have difficulty with one or more functional limitations'.
Based on two consecutive measurements, respondents were divided into
four categories: 'no functional limitations at successive measurements'

(the reference category), 'functional limitations at successive measurements' (has limitations, stable), 'functional limitations at t_x but not at t_{x+1}' (recovery from limitations), and 'functional limitations at t_{x+1} but not at t_x' (incidence of limitations).

Depressive symptoms were measured using the *Center for Epidemiologic Studies Depression Scale* (CES-D) (Radloff 1977), a 20-item self-report scale (range '0' to '60') designed to measure depressive symptomatology in the general population. To identify clinically relevant depressive syndromes, the generally accepted threshold of '16' was applied (Berkman *et al.* 1986). A clinically relevant change was defined as a decrease or an increase of at least five points on the CES-D that crossed the threshold of '16' (Jacobson and Truax 1991). Based on two consecutive measurements, respondents were divided into four categories: 'no depression at successive measurements' (the reference category), 'depression at successive measurements' (chronic depression), 'depression at t_x but not at t_{x+1}' (remission), and 'depression at t_{x+1} but not at t_x' (incidence of depression) (Geerlings, S. W. *et al.* 2000). Cognitive impairment was measured using the *Mini-Mental State Examination* (MMSE) which has a range from '0' to '30' and a threshold score of '24' (Folstein, Folstein and McHugh 1975; Tombaugh and McIntyre 1992). In line with previous research (Geerlings, M. I. *et al.* 2000), a critical change of the MMSE score was defined as a decrease of more than three points that crosses the threshold. Based on two consecutive measurements, respondents were divided into three categories: 'no cognitive impairment at successive measurements' (the reference category), 'cognitive impairment at successive measurements' (impaired, stable), and 'cognitive impairment at t_{x+1} but not at t_x' (incidence of impairment). Self-rated health was measured by asking respondents to evaluate their own health, and the response categories were 'excellent', 'good', 'fair', 'sometimes good/bad' and 'poor' (Central Bureau of Statistics 1989). For this study, self-rated health was dichotomised as follows: 'excellent or good' and 'fair to poor'; and change in self-rated health over two consecutive measurements into four categories: 'excellent or good at both' (the reference category), 'fair to poor' at both, 'fair to poor at t_x and excellent or good at t_{x+1}' (improvement), and 'excellent or good at t_x and fair to poor at t_{x+1}' (decline).

Data analysis

Data were analysed in four stages. First, attrition to follow-up was studied using chi-squared tests and logistic regression. Secondly, transitions in care between t_0 and t_1 and between t_1 and t_2 were described and differences in

proportions tested by calculating confidence intervals. Thirdly, care transitions were predicted for respondents with valid data at t_0 and t_1. For the 983 respondents without care at t_0, logistic regression models were used to predict the transition to informal home-care at t_1. In the same way, for the 1,718 respondents with no care or informal home-care at t_0, multinomial regression models were used to predict the transition at t_1 to professional care (subsidised home-care, private home-care and institutional care) – informal home-care at t_0 was then an independent variable. Odds ratios and 95 per cent confidence intervals were calculated for the bivariate associations between the predisposing, enabling and need variables and the care transitions. The predisposing, enabling or need variables that were shown by the bivariate analyses to be significant predictors were then entered into regression models of the care transitions. Finally, other variables that were shown as significant predictors in the former analyses were entered into the final model that included all dimensions of the Andersen and Newman model (1973). Since the study sample was stratified for sex and age, these variables were entered in all models regardless of their significance. In the final stage of the analysis, to validate the models, all analyses were repeated for respondents with valid data at t_1 and at t_2.

Results

Sample characteristics and attrition analyses

The characteristics of the baseline or t_0 sample of 3,107 respondents are presented in Table 1. The relatively high proportions of men (49.5%) and of older-old adults (mean age 70.8 years) reflect the stratified sampling design. As a result of over-sampling of the more vulnerable groups, (physical) health problems are well represented in the baseline sample. A majority of the respondents at baseline received some kind of care: 84.9 per cent received only household care, one per cent received only personal care, and 14.1 per cent received both household and personal care. Since combinations of informal care and professional care were relatively rare (n = 172), and of these 49 per cent received both informal and professional home-care, these were categorised as receiving professional care only. Informal home-care was provided mostly by partners (69.2%).

Data on transitions in care between t_0 and t_1 and the required predictor variables were available from 2,259 respondents.[2] Attrition due to mortality was associated with nearly all baseline characteristics (with *p* values of < 0.01 or less): higher age, males, low education, not (or no longer) having a partner, highly urbanised localities, one or more chronic physical

TABLE 1. *Characteristics of the baseline sample*

Attribute	Percentage	Attribute	Percentage
Sex:		*Depression:*	
Female	51.5	No	84.0
Education:		Yes	14.4
Low	55.5	Unknown	1.6
Unknown	0.3	*Cognitive impairment:*	
Partner status:		No	88.5
Partner	66.5	Yes	11.0
No partner	33.3	Unknown	0.5
Unknown	0.2	*Self-rated health:*	
Urbanisation:		Excellent or good	62.0
High	27.6	Fair to poor	37.2
Income:		Unknown	0.8
High	26.1	*Care use:*	
Chronic physical diseases:		No care	46.7
No	25.7	Informal home-care	25.4
Yes	73.7	Subsidized home-care	10.0
Unknown	0.6	Private home-care	13.1
Functional limitations:		Institution	4.1
No	57.8	Unknown	0.7
Yes	40.8	*Average age*	70.8 yrs[1]
Unknown	1.4	*Sample size*	3,107

Note: 1. Standard deviation 8.8 years.

diseases, one or more functional limitations, impaired cognition, fair to poor self-rated health, and the use of care at t_0. Attrition through reasons other than mortality was associated at t_0 with higher age, low education, highly urbanised localities, one or more functional limitations, impaired cognition, depression, and the use of care, but was *not* associated with sex, not (or no longer) having a partner, higher income, one or more chronic physical diseases, and fair to poor self-rated health. Data on transitions in care between t_1 and t_2 and the required predictor variables were available for 1,780 respondents.[3] Essentially the same associations between attrition and baseline characteristics were found as for transitions from t_0 to t_1.

Transitions in care

The transitions in care between t_0 and t_1 and between t_1 and t_2 are presented in Table 2. A separate category has been included for those respondents who died before the follow-up. The upper section of Table 2 shows that among the initial non-users, 27.1 per cent received some kind

T A B L E 2. *Transitions in the use of care and mortality between t_0 and t_1 and between t_1 and t_2*

	Destination care-type						
Origin care-type	No care	Informal home-care	Subsidised home-care	Private home-care	Institutional care	Deceased	Total
At t_0	*Percentages by column at t_1*						
No care	68.6	14.2	4.1	8.3	0.5	4.2	(48.0)
Informal home-care	42.8	34.9	6.5	5.7	2.7	7.3	(25.4)
Subsidised home-care	4.5	2.7	55.9	5.5	10.0	21.4	(8.9)
Private home-care	9.0	5.8	6.7	66.6	2.9	9.0	(13.9)
Institutional care	0.0	0.0	1.1	0.0	59.3	39.6	(3.7)
Total (sample size)	1124	414	237	375	109	210	2,469
Total (column %)	45.5	16.8	9.6	15.2	4.4	8.5	100
At t_1	*Percentages by column at t_2*						
No care	64.2	17.9	6.3	6.1	0.9	4.7	(51.9)
Informal home-care	29.0	45.8	8.7	8.4	2.6	5.5	(17.9)
Subsidised home-care	4.3	2.2	62.0	2.7	9.8	19.0	(9.5)
Private home-care	10.5	4.6	7.7	68.0	3.1	6.2	(16.8)
Institutional care	–	–	1.3	–	58.7	40.0	(3.9)
Total (sample size)	785	356	233	316	90	151	1,931
Total (column %)	40.7	18.4	12.1	16.4	4.7	7.8	100

Note: Figures in parentheses are row percentages.

of care three years later. More than half of them (14.2% of the total) received informal home-care. The instability of informal home-care over time is striking: only 34.9 per cent received informal home-care at both t_0 and t_1. There was however more stability in the receipt of the various types of professional care, for between 55.9 and 66.6 per cent were clients at both dates. The instability of informal home-care was mainly the result of a large number (42.8%) losing this support over time. Only a few respondents reported the transition from professional care to informal care.

Compared to the initial non-users, the respondents who received informal home-care or professional care were more likely to die between t_0 and t_1 ($p = <0.01$). Mortality was highest among the respondents in institutional care (39.6%), followed by those who received subsidised home-care (21.4%). The transitions between t_1 and t_2 are set out in the lower section of Table 2. They resembled those during the earlier period except that the transitions from 'no care' to 'informal home-care' or 'professional care' were more frequent (31.2% *versus* 27.1%, $p = <0.01$), and

TABLE 3. *Bivariate associations between predisposing, enabling and need variables and the transition from no care at t_0 to informal home-care at t_1*

Variables	OR (95% CI) [1,2]	Variables	OR (95% CI) [1,2]
Need variables		**Predisposing variables**	
Chronic physical diseases		Age	**1.04 (1.02–1.07)**
⩾1 diseases, stable	1.30 (0.86–1.96)	Sex	
Incident co-morbid disease(s)	**1.90 (1.13–3.17)**	Female	0.77 (0.55–1.08)
Incident first disease(s)	**2.15 (1.31–3.51)**		
Functional limitations		Education	
Limited, stable	**2.00 (1.32–3.03)**	Low	**1.55 (1.11–2.16)**
Recovery	1.15 (0.54–2.42)		
Incident limitations	1.19 (0.76–1.87)		
Depression		**Enabling variables**	
Chronic depression	0.44 (0.13–1.46)	Partner status	
Remission	0.81 (0.37–1.74)	No partner	**0.57 (0.37–0.87)**
Incident depression	1.04 (0.54–1.99)	Lost partner t_0–t_1	0.72 (0.33–1.57)
Cognitive impairment		Urbanisation	
Impaired, stable	1.75 (0.89–3.47)	High	**0.38 (0.25–0.56)**
Incident impairment	0.93 (0.43–2.01)		
Self-rated health		Income	
Fair to poor, stable	**1.91 (1.27–2.87)**	High	1.32 (0.92–1.90)
Improvement	1.46 (0.87–2.43)		
Decline	1.34 (0.76–2.34)	**Sample size**	983

Notes: 1. OR, odds ratio; CI, confidence interval. 2. Significant odds ratios are in bold.

there was greater continuity among those who received informal home-care (45.8% *versus* 34.9%, $p = <0.001$).

Predicting transitions in care

Transition from no care to informal care

Table 3 displays the bivariate associations between the predisposing, enabling and need variables and the transition from 'no care' at t_0 to 'informal home-care' at t_1. The significantly predictive factors were: among the *predisposing variables*, higher age and low education; among the *enabling variables*, having no partner and rural (little urbanised) localities; and among the *need variables*, the incidence of first and co-morbid diseases, stable functional limitations, and stable 'fair to poor' self-rated health. Additional analyses were performed to differentiate the relationships between seven chronic physical diseases and informal care. The transition to informal care at t_1 was predicted by the prevalence at t_0 of diabetes mellitus (odds ratio (OR) = 2.05, 95% confidence interval (c.i.) 1.02–4.15) and stroke (OR = 3.47, c.i. 1.50–8.04). Arthritis, cardiac disease, lung disease, cancer

T A B L E 4. *Multivariate associations between predisposing, enabling and need variables and the transition from no care at t_0 to informal home-care at t_1*

Independent variables	OR (95 % CI)[1,2]	OR (95 % CI)[1,2]
Predisposing variables	**Model IA[3]**	**Model II[3]**
Age	**1.04 (1.01–1.06)**	**1.05 (1.02–1.07)**
Education		
Low	**1.55 (1.09–2.21)**	
Enabling variables	**Model IB[3]**	
Partner status		
No partner	**0.59 (0.39–0.91)**	**0.50 (0.30–0.81)**
Lost partner t_0–t_1	0.71 (0.33–1.56)	0.54 (0.23–1.19)
Urbanisation		
High	**0.38 (0.26–0.57)**	**0.31 (0.20–0.48)**
Need variables	**Model IC[3]**	
Chronic physical diseases		
⩾1 diseases, stable	1.01 (0.64–1.60)	1.09 (0.70–1.72)
Incident co-morbid disease(s)	1.35 (0.76–2.40)	1.32 (0.74–2.35)
Incident first disease(s)	**1.86 (1.12–3.12)**	**2.01 (1.19–3.41)**
Functional limitations		
Limited, stable	**1.64 (1.02–2.64)**	**1.73 (1.05–2.86)**
Recovery	0.91 (0.41–2.04)	1.17 (0.53–2.61)
Incident limitations	1.06 (0.67–1.69)	1.07 (0.66–1.75)

Notes: 1. OR, odds ratio; CI, Confidence interval. 2. Results are printed for significant variables only and significant odds ratio's are in bold. 3. Model IA, only predisposing variables; Model IB, only enabling variables; Model IC, only need variables. Model II, model including predisposing, enabling and need variables. The sample size for all models was 983.

and peripheral arteriosclerosis were *not* associated with the transition to informal home-care.

Table 4 shows the multivariate associations between the predisposing, enabling and need variables and the transition from no care at t_0 to informal home-care at t_1. The results from the first two models resemble those from the bivariate analyses. In the model that included only *predisposing variables* (IA), both higher age and low education were predictive. In the model that included only *enabling variables* (IB), having no partner as well as the locality being little urbanised were significantly associated. The model of *need variables* (IC) identified the incidence of first chronic physical diseases and stable functional limitations as predictive while, contrary to the bivariate analyses, the incidence of co-morbid diseases and stable 'fair to poor' self-rated health were insignificant. All statistically significant predictors in these three models were entered into the final model (II), which found that the transition was best predicted by higher age, having no partner, the locality being little urbanised, the incidence of first chronic physical diseases, and stable functional limitations. To validate the models, the analyses were repeated for the respondents with valid data at t_1 and t_2. The results

were very similar, but the transition to informal home-care was no longer predicted by higher age (OR=0.99, c.i. 0.97–1.02), while the incidence of functional limitations (OR=1.68, c.i. 1.06–2.67) and a decline in self-rated health (OR=1.65, c.i. 1.04–2.65) entered as significant predictors.

The transition from 'no care' or 'informal care' to 'professional care'

Table 5 shows the bivariate results of the multinomial regression analyses of the transition between t_0 and t_1 from 'no care' or 'informal home-care' to 'professional care' (subsidised home-care, private home-care or institutional care). From the predisposing variables, higher age was pre-dictive for all possible transitions, while low education predicted the transitions to subsidised home-care and institutional care, and high edu-cation predicted the transition to privately purchased home-care. The transition to subsidised home-care was predicted by almost all enabling variables: having no partner or losing a partner, a highly urbanised lo-cality, and informal home-care at t_0. The transitions to private home-care and institutional care were both predicted by having no partner. Fur-thermore, an association was found between higher income and the transition to privately purchased home-care and between informal home-care at t_0 and institutional care at t_1. All 'disabling' need variables were associated with receiving subsidised home-care at t_1, but conversely, the remission of depression, recovery from functional limitations and im-provement in self-rated health were insignificant. The transition to pri-vately purchased home-care was predicted only by chronic physical diseases (whether stable or incident co-morbid diseases). Stable functional limitations, incident functional limitations, incident depression and stable or incident cognitive impairment were associated with the transition to institutional care.[4]

The results of the multivariate multinomial regression analyses are presented in Table 6. Because of the few (23) respondents, those in in-stitutional care were excluded. In Model IA (predisposing variables only), higher age was associated with the transition to subsidised home-care as well as the transition to private home-care. The transition to private home-care was also predicted by being female and having high education. Model IB (enabling variables only) shows that having no partner or losing a partner and being in receipt of informal home-care at t_0 predicted the transition to subsidised home-care, and that having no partner and higher income predicted the transition to private home-care. In Model IC (need variables only), the transition to subsidised home-care was predicted by the onset of co-morbid chronic physical diseases, stable functional limita-tions, stable cognitive impairment and a decline in self-rated health. In

T A B L E 5. *Bivariate associations between predisposing, enabling and need variables and the transition from no care or informal care at t_0 to subsidised home-care, private home-care or institutional care at t_1*

Independent variables	Subsidised home-care OR (95% CI)[1,2]	Private home-care OR (95% CI)[1,2]	Institutional care OR (95% CI)[1,2]
Predisposing variables			
Age	**1.13 (1.09–1.16)**	**1.06 (1.04–1.09)**	**1.29 (1.19–1.41)**
Sex			
Female	1.34 (0.87–2.05)	1.15 (0.81–1.64)	1.91 (0.81–4.54)
Education			
Low	**1.75 (1.14–2.69)**	**0.52 (0.35–0.77)**	**3.86 (1.51–9.85)**
Enabling variables			
Partner status			
No partner	**3.09 (1.95–4.90)**	**1.78 (1.22–2.62)**	**11.05 (4.05–30.20)**
Lost partner t_0–t_1	**3.88 (1.96–7.68)**	1.10 (0.49–2.47)	2.59 (0.30–22.29)
Urbanisation			
High	**1.55 (1.01–2.39)**	1.12 (0.78–1.62)	0.85 (0.35–2.08)
Income			
High	0.66 (0.39–1.14)	**1.64 (1.14–2.30)**	0.79 (0.29–2.15)
Informal home-care t_0			
Yes	**1.69 (1.10–2.59)**	0.74 (0.50–1.10)	**5.71 (2.34–14.57)**
Need variables			
Chronic physical diseases			
⩾1 diseases, stable	**3.78 (1.87–7.65)**	**2.04 (1.30–3.19)**	1.11 (0.40–3.08)
Incident co-morbid disease(s)	**7.82 (3.71–16.47)**	**2.70 (1.57–4.65)**	2.07 (0.65–6.60)
Incident first disease(s)	**3.62 (1.58–8.28)**	1.03 (0.52–2.06)	1.11 (0.28–4.33)
Functional limitations			
Limited, stable	**9.90 (5.43–18.05)**	1.45 (0.95–2.21)	**32.75 (4.27–251.39)**
Recovery	1.43 (0.32–6.41)	0.30 (0.07–1.26)	10.01 (0.62–161.63)
Incident limitations	**2.97 (1.40–6.32)**	1.17 (0.73–1.88)	**14.87 (1.73–127.84)**
Depression			
Chronic depression	**2.36 (1.03–5.39)**	0.36 (0.09–1.47)	2.84 (0.63–12.78)
Remission	0.97 (0.35–2.75)	0.77 (0.33–1.80)	1.14 (0.41–9.88)
Incident depression	**3.24 (1.80–5.83)**	1.28 (0.68–2.40)	**3.41 (1.10–10.55)**
Cognitive impairment			
Impaired, stable	**3.88 (2.12–7.11)**	0.82 (0.35–1.92)	**23.54 (7.30–75.83)**
Incident impairment	**2.80 (1.38–5.68)**	0.74 (0.29–1.87)	**36.42 (12.13–109.34)**
Self-rated health			
Fair to poor, stable	**3.71 (1.99–6.93)**	1.17 (0.74–1.84)	2.00 (0.76–5.31)
Improvement	1.84 (0.87–3.88)	0.81 (0.43–1.52)	0.96 (0.21–4.40)
Decline	**3.96 (2.35–6.67)**	1.58 (0.95–2.65)	2.14 (0.66–6.92)

Notes: 1. OR, odds ratio; CI, confidence interval. 2. Significant odds ratios are in bold. Sample size in all models is 1,718.

addition, stable chronic diseases and incident co-morbid diseases predicted the transition to privately purchased home-care.

The final model (II) included all the statistically significant variables in the first three models, among which the following predicted the transition

T A B L E 6. *Multivariate associations between predisposing, enabling and need variables and the transition from no care or informal care at t_0 to subsidised home-care or private home-care at t_1*

	Subsidised home-care		Private home-care	
Independent variables	OR (95% CI)[1,2]	OR (95% CI)[1,2]	OR (95% CI)[1,2]	OR (95% CI)[1,2]
Predisposing variables	**Model IA[3]**	**Model II[3]**	**Model IA[3]**	**Model II[3]**
Age	**1.13 (1.09–1.16)**	**1.08 (1.05–1.12)**	**1.08 (1.05–1.10)**	**1.08 (1.05–1.11)**
Sex				
Female	–	–	**1.59 (1.09–2.32)**	–
Education				
Low	–	–	**0.37 (0.24–0.56)**	**0.39 (0.25–0.61)**
Enabling variables	**Model IB[3]**		**Model IB[3]**	
Partner status				
No partner	**3.24 (2.03–5.18)**	**1.85 (1.04–3.32)**	**1.78 (1.21–2.63)**	–
Lost partner t_0–t_1	**3.97 (2.00–7.92)**	**3.14 (1.42–6.95)**	1.10 (0.49–2.45)	–
Income				
High	–	–	**1.81 (1.23–2.68)**	**1.82 (1.23–2.67)**
Informal home-care t_0				
Yes	**1.99 (1.28–3.09)**	–	–	–
Need variables	**Model IC[3]**		**Model IC[3]**	
Chronic physical diseases				
$\geqslant 1$ diseases, stable	2.26 (0.98–5.20)	2.09 (0.90–4.83)	**2.49 (1.51–4.10)**	**2.32 (1.41–3.82)**
Incident co-morbid disease(s)	**3.68 (1.51–8.98)**	**4.00 (1.64–9.79)**	**3.10 (1.71–5.64)**	**2.75 (1.50–5.03)**
Incident first disease(s)	2.41 (0.94–6.18)	1.96 (0.75–5.12)	1.10 (0.54–2.25)	1.04 (0.51–2.14)
Functional limitations				
Limited, stable	**5.30 (2.73–10.29)**	**2.77 (1.37–5.62)**	–	0.78 (0.46–1.32)
Recovery	1.06 (0.23–4.87)	0.81 (0.17–3.78)	–	**0.20 (0.05–0.86)**
Incident limitations	1.89 (0.86–4.17)	1.26 (0.56–2.84)	–	0.78 (0.46–1.32)
Cognitive impairment				
Impaired, stable	**2.46 (1.20–5.03)**	–	–	–
Incident impairment	1.90 (0.84–4.30)	–	–	–
Self-rated health				
Fair to poor, stable	1.53 (0.80–2.90)	**2.11 (1.04–4.19)**	–	–
Improvement	1.26 (0.56–2.84)	1.51 (0.67–3.43)	–	–
Decline	**2.15 (1.07–4.32)**	**2.53 (1.26–5.07)**	–	–

Notes: 1. OR, odds ratio; CI, Confidence interval. 2. Results are presented for significant variables only and significant odds ratios are in bold. 3. Model IA, only predisposing variables; Model IB, only enabling variables; Model IC, only need variables. Model II, model including predisposing, enabling and need variables. Sample size in all models is 1,695.

to subsidised home-care at t_1: higher age, having no partner or losing a partner, incident co-morbid diseases, stable functional limitations, stable 'fair to poor' self-rated health, and a decline in self-rated health. Closer

inspection of the model coefficients showed that the association between informal home-care at t_0 and, after inclusion of the need variables, the transition to subsidised home-care was no longer statistically significant, and that the odds ratio reduced to 1.39 ($p=0.18$). The transition to privately-purchased home-care was associated with higher age, high education, high income, stable chronic diseases and incident co-morbid diseases. Recovery from functional limitations was negatively associated with the transition to private home-care. To validate the models, the analyses were repeated for the respondents with valid data at t_1 and t_2. There was no change in the included predisposing variables, but for the enabling variables, an additional association ($p=0.08$) was found between informal home-care at t_1 and private home-care at t_2 (OR$=1.52$, c.i. 0.95–2.41). The included need variables also changed in the model of the transition to privately purchased home-care.[5]

Discussion

This study has modelled transitions over two successive three-year intervals during the 1990s in the use of informal and professional care in a representative sample of Dutch older people, and has examined the influence of both the starting values of and changes in various predisposing, enabling and need factors. Various transitions between no care, informal home-care, subsidised home-care, privately purchased home-care and institutional care were observed. It has been shown that among those who were initially non-users, 27 to 31 per cent used some kind of care three years later. Consistent with much previous research in other developed nations, most of the care was provided by informal care-givers (Roe *et al.* 2001; Tennstedt *et al.* 1990), but unlike professional care, its receipt showed little stability over time, mostly because a sizable minority experienced the transition from 'informal home-care' to 'no care'. Additional analyses (not reported here) have shown that this retraction occurred most often among people with relatively favourable predisposing, enabling and need factors. Jette, Tennstedt and Branch's (1992) longitudinal study found informal care to be much more stable than in the LASA sample, which may be explained by the higher average age and greater frailty of their sample – they would have been more dependent upon prolonged care. Mortality within three years was associated with the use of care, and was highest among the respondents in institutional settings followed by those receiving subsidised home-care.

   On the prediction of the transition to informal home-care, both the immediate need for care, associated with chronic physical diseases and

functional limitations and certain predisposing and enabling factors (such as advanced age and having no partner), were shown to be necessary conditions. Turning to the transition from 'no' or 'informal' home-care to 'professional' care, the findings revealed the importance of distinguishing various sources of such care. There were differential effects of (changes in) the predisposing, enabling and need factors for subsidised and private home-care and for institutional care. Some variables (such as age) consistently affected all measures of care, while others (such as education) affected one measure in one direction and another in the opposite direction, and some (such as sex) had no effect at all. The need factors were especially important in predicting subsidised home-care and institutional care, while higher education and higher income were strong predictors of the transition to private home-care.

The finding that need factors were strongly associated with the transitions both to subsidised home-care and to institutional care was strengthened by the evidence that these sources of care positively associated with mortality. These interlinked associations support the notion that where professional care is provided, it is needed, which evinces the effectiveness of the governmental need-assessment committees that allocate subsidised care. Given the significant influence of predisposing and enabling factors, it cannot further be concluded, however, that care is provided to *all* those who need it. Several explanations have been offered for *not* receiving professional care given a demonstrable need: some people may have been declined care by the assessment committee, others may have been on a waiting list because of supply constraints, and others may not have asked for it (Portrait, Lindeboom and Deeg 2000). 'Unexpressed demand' may arise through unfamiliarity with care services or negative attitudes and beliefs about the quality of professional care (MaloneBeach, Zarit and Spore 1992; Zarit, Gaugler and Jarrott 1999); or because informal care-givers withhold an application to prevent feelings of guilt (Pot, Deeg and Knipscheer 2001); or because it is impossible for need-assessment committees repeatedly to re-assess people's care needs – mental health status, for instance, can be highly variable over time (Geerling, S. W. *et al.* 2000).

It was broadly found that informal and professional care operated independently, not complementarily, which supports the proposition that their receipt is dependent upon the tasks involved. Professional service providers may be less suited to unskilled home-care, for which the motivation of a partner or other close relative is especially advantageous. For other care tasks, particularly those which require specialised training or facilities, professional services may be more appropriate (Litwak 1985). Combinations of types of care generally reflect multiple needs. In the last

phase of life, combinations of informal and professional care have been found to be rather common, especially for those with more severe and protracted illness (Klinkenberg 2004).

Support was found for both the 'hierarchical compensatory model' and the 'bridging hypothesis'. In general, older people with a partner were less likely to receive professional care, which is in line both with the view that informal care substitutes for professional services and with the hierarchical compensatory model. Conversely, the respondents who initially had informal home-care, three years later were more likely than others to receive professional care (particularly subsidised home-care and institutional care) because of their relatively poor health status. This finding supports the contention that informal care brings the person into contact with professional service providers and facilitates rather than substitutes for professional care, in line with the bridging hypothesis. Probably, the closeness or strength of an informal tie determines whether informal care has substitutive or bridging effects. It has been argued that the effect of informal care depends on the composition of the network: close relatives tend simply to substitute their own help for professional services, whereas friends and neighbours are more apt to perform complementary tasks (Logan and Spitze 1994; Ward, Sherman and LaGory 1984). Additional analyses (results not shown) showed a further differentiation of the relationship between informal care and professional care: the complementary relationship was clearest when non-partners were involved. As found in previous research (Tennstedt, Harrow and Sullivan 1996), the transition from professional care to informal care occurred only seldom and was therefore impossible to analyse statistically.

The transitions and their determinants for the first and second time intervals were quite similar (demonstrating the robustness of the models) but some differences were found. Stability in receiving informal home-care was noticeably higher during the second period, which might be partly explained by the need for care to become more intense, and by the strengthened motivation, skills and support of informal care providers (Hanson *et al.* 2002). Furthermore, the need factors became more important in predicting the transition to private home-care, which may be explained by changes in the availability, allocation and supply of subsidised care services in The Netherlands during the study period. In general, the reduction of the number of beds in hospitals and residential homes has increased the pressure on professional home-care services and resulted in longer waiting lists (Prismant 2000). Such supply restrictions may have necessitated the increased use of private resources.

Some limitations of the present study have to be acknowledged. The over-sampling of men and older-old subjects produced considerable

non-response through mortality and a higher attrition rate in the subjects with the worst health. As attrition was associated with the use of care as well as practically all predisposing, enabling and need factors, the strength of the associations between predictor variables and transitions in care is likely to have been under-estimated. A second limitation may be the relatively long period of three years between the measurements. Although stability was high for most sources of care, shorter intervals between the measurements are recommended in future studies, especially those pertaining to informal care, which was most variable. A third concern may be that chronic physical diseases and functional limitations were measured by self-report. In a validation study, however, respondents' self-reports on chronic diseases were compared to information obtained from their GPs and proved reliable (Kriegsman *et al.* 1996). With respect to functional limitations, more objective measures such as performance tests in a more experimental setting have not been found to be superior to self-reports. Considerable discordance has even been reported between performance in a test and actual functioning at home (Glass 1998). Finally, no differentiation could be made between the different care tasks, particularly for personal and household care, partly because very few respondents received personal care. In future research that analyses more selected samples with a higher prevalence of medical problems and consequently a higher need for personal care, task differentiation will need further attention.

The findings suggest a sequence in transitions from 'no care' through 'informal care' to 'professional care'. Given the presence of a partner and a need for care, a transition to informal care seems most likely. This demands attention to the growing number of single people who will have to turn to professional care. As this may create a widening gap between the demand for professional care and its supply, the significant influence of the predisposing and enabling factors requires continued attention. Some of these factors may be amenable to interventions, not least improved communication of transparent information on care arrangements and effective individual coaching to compensate for low education. Furthermore, to achieve patterns of care delivery that are well tailored to the needs of all older people, more government financial support should be allocated to private-sector help to improve its availability.

Acknowledgements

NOTES

1   Of the 698 respondents who were lost, 18.1 per cent died before being interviewed, 56.4 per cent refused to participate, 19.2 per cent were too ill or cognitively impaired to participate, and 6.3 per cent could not be contacted. Non-response was related to age ($p < 0.001$) but not to sex (as was true for the non-responders at the three-yearly follow-ups).

2   Of the 848 respondents with incomplete data, 24.8 per cent died before t_1, 49.3 per cent refused to participate, 19.3 per cent were interviewed by telephone using a much shortened instrument, 4.5 per cent were too ill or cognitively impaired to participate, and 2.1 per cent could not be contacted.

3   Of the 479 persons who were lost, 31.5 per cent died before t_2, 49.7 per cent refused to participate, 11.1 per cent were interviewed by telephone with the shorter instrument, 5.6 per cent were too ill or cognitively impaired to participate, and 2.1 per cent could not be contacted.

4   In further analyses, the prevalence at t_0 of cardiac disease (OR $= 1.79$, c.i. $1.07–2.98$), peripheral arteriosclerosis (OR $= 1.95$, c.i. $1.04–3.63$), diabetes mellitus (OR $= 2.79$, c.i. $1.43–5.44$) and arthritis (OR $= 1.72$, c.i. $1.10–2.68$) was associated with the transition to subsidised home-care. The transition to privately purchased home-care was associated only with the prevalence or arthritis (OR $= 1.49$, c.i. $1.03–2.16$).

5   Stable functional limitations (OR $= 1.92$, c.i. $1.16–3.18$), incident functional limitations (OR $= 1.99$, c.i. $1.11–3.58$), incident depression (OR $= 2.22$, c.i. $1.15–4.28$) and stable fair to poor self-rated health (OR $= 1.71$, c.i. $1.03–2.85$) all entered as predictive of the transition to private home-care.

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Address for correspondence:
Sandra W. Geerlings, Longitudinal Ageing Study Amsterdam,
Van der Boechorststraat 7, 1081 BT Amsterdam,
The Netherlands.

e-mail: sw.geerlings@vumc.nl