Who will become my co-residents? The role of attractiveness of institutional care in the changing demand for long-term care institutions

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A B S T R A C T

Background: In several OECD countries the percentage of people over 80 in LTC institutions has been declining for more than a decade, despite population ageing. The standard model to explain healthcare utilization, the Andersen model, cannot explain this trend. We extend the Andersen model by including proxies for the relative attractiveness of community living compared to institutional care. Using longitudinal data on long-term care use in the Netherlands from 1996 to 2012, we examine to what extent a decline in institutional care is associated with changes in perceived attractiveness of institutional LTC care compared to community living.
Methods: With a Blinder–Oaxaca decomposition regression, we decomposed the difference in admission to LTC institutions between the period 1996–1999 and 2009–2012 into a part that accounts for differences in predictors of the Andersen model and an "unexplained" part, and investigate whether the perceived attractiveness of institutional care reduces the size of the unexplained part.
Results: We find that factors related to the perceived attractiveness of institutional care compared to community living explains 12.8% of the unexplained negative time trend in admission rates over the total period (1996–2012), and 19.1–19.2% over shorter time frames.
Discussion: Our results show that changes in the perceived attractiveness of institutional LTC may explain part of the decline in demand for institutional care. Our findings imply that policies to encourage community living may have a self-reinforcing effect.

1. Introduction

In several OECD countries with relatively high levels of institutional long-term care (LTC) the percentage of people over 80 in LTC institutions has been declining for more than a decade, despite the ageing of the population (see Table 1).

The standard model to explain use of care is the Andersen healthcare utilization model (Andersen, 1995). According to this model, the use of health services is determined by three types of determinants: predisposing factors such as age and education, which relate to older people's attitudes and willingness to ask for care; enabling factors such as family support and income that stimulate or hamper the utilization of health care; and need factors such as poor physical or mental health and activity limitations which are primarily related to the physical and mental condition of older people.

Given the ageing of the population and the associated increasing need for care, the declining use of institutional care is puzzling. For

instance, in the Netherlands it was found that the demand for institutional LTC decreased over time, while indicators of need significantly increased (de Meijer, Bakx, van Doorslaer, & Koopmanschap, 2015; Alders, Comijs, & Deeg, 2017). The decline in demand for institutional LTC was due to a significant "time-effect", but what could explain this effect could not be examined. In this study we aim to open the black box of this unspecified time-effect, by investigating potentially underlying factors that may change over time.

A potential factor we examine is the perceived attractiveness of institutional LTC relative to home care and informal care. The perceived attractiveness of institutional LTC versus its potential substitutes may depend on who provides care, and when and where the care is provided. A long-term care institution is not only a place where care is delivered, but also a place for interaction with other residents and a place where one might feel safe because a nurse is always nearby when something happens.

Kane (2001) identifies 11 domains that are related to quality of life

Table 1
Share of 65 + population in care homes in various OECD countries (%) [OECD, 2017].

Country	Year 2000	Year 2015	% Change use 2000–2015 [f]
Netherlands	7.3[a]	4.6	− 37.0
Sweden	7.7	4.5	− 41.6
Switzerland	6.8	5.9	− 13.2
Norway	5.9[b]	4.6	− 22.0
Denmark	5.4[c]	3.9[d]	− 27.8
Canada	4.1	3.8	− 7.3
Germany	3.8	4.2	10.5
Japan	2.8[e]	2.7	− 3.6

[a] 2004; [b] 2001; [c] 2006; [d] 2014; [e] 2002; [f] or other years as specified in note a-e.

in the provision of long-term care: comfort, functional competence, autonomy, dignity, privacy, individuality, meaningful activity, relationships, enjoyment, security, and spiritual well-being. Many of these domains are related to the relationships people have in their place of living. Loneliness includes situations where the number of existing relationships is smaller than desirable or acceptable, as well as situations where the intimacy wished for has not been realized (de Jong-Gierveld, 1998). Being lonely might "push" and meaningful company and potential friendships might "pull" someone to institutional care. In a US context, higher levels of loneliness were found to increase the likelihood of nursing home admission and to decrease the time until nursing home admission (Russell, Cutrona, De La Mora, & Wallace, 1997). For several reasons, however, institutional care may become less attractive over time. First, when the nursing home population is becoming older and more disabled, the prospects of dignity, enjoyment and meaningful relationships may diminish, and thus the perceived quality of the company anticipated by people living in the community who might consider moving to a LTC facility. Second, the conditions of community living might have been improved. In Denmark, for instance, since 2001 the number of nursing home places has fallen quite dramatically because municipalities have developed a wide range of services to accommodate the preference of senior citizens to remain independent for as long as possible in their own homes (Olejaz et al., 2012).

Another time variant determinant of perceived attractiveness that may explain changes in institutional LTC utilization is the relative cost of institutional care versus possible alternatives. For instance, several studies find that differences in co-payments may have been an important factor in explaining differences in the use of formal and institutional LTC and between formal and informal care (Alders, Costa-Font, de Klerk, & Frank, 2015; Bakx, de Meijer, Schut, & van Doorslaer, 2015).

Although a change in the relative attractiveness of institutional care versus home care might contribute to explaining the black box of a downward trend, relative attractiveness is difficult to measure and longitudinal data on direct measures of attractiveness are absent. However, we do have longitudinal data on several crude indicators of relative attractiveness, such as changes in the age composition of the institutionalized population ("relative age"), changes in copayment levels for institutional care ("relative costs"), and changes in the degree of loneliness. With regard to relative age, we hypothesize that adults who are younger than the average institutionalized population prefer to stay living in the community with their age peers.

In this paper we examine whether changes in the demand for institutional care can be partly explained by changes in indicators of relative attractiveness of institutional care. To this end, we extend the three blocks of the Andersen model with a fourth block of variables indicating the relative attractiveness of institutional care.

The paper is organized as follows. Section 2 briefly describes the context of long-term provision in the Netherlands. In section 3 we explicate the extended Anderson model we estimate and the data set used

in our analysis. Results are presented in Section 4, and Section 5 concludes with a discussion.

2. The Dutch LTC context

The context of our study is the Dutch LTC system over the period 1996–2012. In 1968, the Netherlands was the first country to implement a universal public long-term care insurance scheme (abbreviated as AWBZ). In comparison to other countries, this scheme was very comprehensive and co-payments were relatively low (Colombo, Llena-Nozal, Mercier, & Tjadens, 2011). Citizens were admitted to institutional care when they needed permanent supervision or a sheltered residence (Centre for care assessment, 2013). Historically a relatively high share of the older population is receiving formal care in LTC institutions (residential care homes and nursing homes). However, the share of the population older than 80 years in institutional care strongly declined (Ministry of Health, Welfare & Sport, 2013).

In this section we describe the main features of this system in relation to potential determinants of this change in LTC utilization of older people. Whereas the most powerful predictors for admission to an LTC institution are need factors (Gaugler, Duval, Anderson, & Kane, 2007), these factors cannot explain the observed decline in institutional LTC use. In the period 1992–2009 the prevalence of mild activity limitations increased, although not in severe activity limitations, in the Dutch older population (Galenkamp, Braam, Huisman, & Deeg, 2013). In the period 2000–2008, older people with no or mild disability became far less likely to reside in a LTC institution, which accounts for most (67%) of the fall in institutional LTC use (de Meijer et al., 2015). Consequently, the average age of residents in institutional care increased from 84.0 in 1996 to 85.1 in 2012 (Statistics Netherlands, 2018).

Potentially important enabling factors that may change over time and therefore might explain changes in institutional LTC use, are a shortage of supply and financial accessibility to LTC facilities. Until 2000, access was restricted by strict supply regulation, resulting in increasing waiting times for formal LTC (Schut & van den Berg, 2010). However, in 1999 these supply restrictions were effectively challenged in a pivotal court ruling stating that people can exercise a right for publicly insured care when eligible. As a result, from 2000 to 2003 waiting lists for formal LTC substantially decreased at the expense of rapidly increasing public LTC expenditures: for home care by 64 percent, for nursing homes by 39 percent and for old-age homes by 23 percent (van Gameren, 2005). Hence, after the year 2000, a shortage of supply does not seem a likely candidate to explain a declining trend in LTC use; other things equal, given the waiting lists, the increased accessibility most likely should have increased the use of institutional LTC.

Financial access to formal LTC is another potentially important enabling factor. Because of the universal comprehensive public LTC insurance, income and assets do not affect the eligibility to formal care nor the level of the entitlements. This is corroborated by an empirical study that found no difference in LTC use between rich and poor in the Netherlands, in contrast to Germany where co-payments are higher and not related to income (Bakx et al., 2015). Therefore, we expect that in the Dutch context financial access does not play an important role in explaining changing patterns of LTC utilization. Nevertheless, up- and downswings in out-of-pocket payments for both institutional and home care did change the relative prices, which may have resulted in substitution between these types of care and between formal and informal care. The impact of these changes and of the adjustments of income brackets and of upper limits on co-payments on the use of institutional care are unclear.

In terms of attractiveness of institutional care versus care in the community, factors related to the housing quality and alternatives for care institutions are not likely candidates to explain the observed decline in the use of institutional LTC. First, assisted living has hardly

increased during the study period. Second, the quality of living in homes and institutional care facilities has increased during the last decades, which would likely have resulted in a positive time effect, all other things equal. For example, the living space for an individual in residential homes increased over time (Heinen, Sijsling, & Groen, 2012).

Balancing the improvements in housing quality and the increase in disability of its population, the relative attractiveness of institutional care might have decreased over time, because: (i) general housing quality have improved as well (Bijl, Boelhouwer, Cloïn, & Pommer, 2011), (ii) the prevalence of loneliness decreased from 32% in 1992 to 29% in 2012, reducing the need for company of residents in LTC institutions (van Tilburg, 2014); (iii) the general reputation of institutional care may have been downgraded during the past decades by recurrent disturbing media exposure about for instance shortage of personnel, fixation in bed, and full days in pyjamas (Bakens, 2007). (iv) the institutionalized population is becoming older and more physically and mentally disabled.

3. Research design and methods

3.1. Data

We use data from the Longitudinal Aging Study Amsterdam (LASA), an ongoing study on predictors and consequences of changes in physical, cognitive, emotional, and social functioning of older people. The original LASA cohort is based on a nationally representative sample of adults aged 55–85 years in 1992–1993 (years of birth: 1908–1937, n = 3107), recruited in three geographic regions in the Netherlands. These regions were selected to achieve an optimal representation of the older Dutch population. Follow-up cycles were carried out every 3–4 years. An additional cohort was recruited from the same sampling frame in 2002/2003 (year of birth 1938–1947, n = 1002).

Trained interviewers who visit respondents in their homes perform the measurements. Participants who were not able or refused to participate in the complete face-to-face interview were asked to participate in a 15-min telephone interview. For participants who were not able to do a telephone interview, a proxy respondent was asked – in a telephone interview – to answer a set of questions. The sampling and data collection procedures have been described in more detail elsewhere (Hoogendijk et al., 2016).

We restricted the study samples to people living in the community in 1996, 1999, 2006, and 2009 respectively (t = 1), and observed who were living in a long-term care institution after 3 years (t = 2, respectively in 1999, 2002, 2009 and 2012). The sample sizes were 2062 for the 1996 cohort, 1789 for the 1999 cohort, 1657 for the 2006 cohort and 1552 for the 2009 cohort. From the 1996 cohort, 74 persons were in institutional care in 1999; from the 1999 cohort 62 in 2002, from the 2006 cohort 46 persons and from the 2009 cohort 64 people were in institutional care in 2012 (see Table 2). Because the time between interviews in the period 2002–2006 was 4 years, we excluded this period from the analysis. The telephone interviews with (proxy) respondents were used to obtain information on the housing situation at t = 2. The age of the sample varied from 60 to 100 years. Attrition was primarily

caused by mortality and for a relatively small proportion to frailty of respondents and refusal to cooperate (Hoogendijk et al., 2016).

3.2. Measures

3.2.1. Dependent variable

The dependent variable is the use of institutional LTC after three years.

3.2.2. Explanatory variables

In our extended version of the Andersen model, we distinguish four blocks of explanatory variables: predisposing, enabling, need, and attractiveness variables.

Predisposing variables

As predisposing variables we use age, sex and education. Education was categorized into three levels: low (elementary school not completed, elementary school, lower vocational education), intermediate (general intermediate, intermediate vocational, general secondary education) and high level of education (higher vocational, college or university education).

Enabling variables

Enabling factors used were formal and informal care, living with a partner (yes/no) and income. Formal care is delivered by professionals who do not have a social relationship with the older person but who deliver care as part of their paid work. We distinguished two forms of informal care: informal care as provided by the partner or by the wider social network, i.e. child, other relative, neighbour or other non-kin. Two questions were asked on use of household and personal care: 'Do you receive help with household tasks (e.g. shopping, gardening, cooking, cleaning, taking garbage out and filling out forms), and if so, from whom?' The same question was asked for personal care (e.g. washing, bathing or showering, dressing, going to the toilet, getting up and sitting down). For each type of care, respondents were asked to report types of informal and formal care helpers (e.g. partner, relatives, domestic help, nurse).

A shortcoming of the income data in the surveys is that this information is difficult to compare over time. This is because up to 2006 the income class boundaries were not adjusted for the general wage (or price) inflation, resulting in an increasing proportion of respondents in higher income classes over time. Hence, we do not include income as a separate explanatory variable. However, since co-payments are income related up to a certain income level, we included income indirectly by including "difference in co-payments between institutional care and living independently" as an explanatory variable, reflecting the relative financial attractiveness of institutional care (see the description of the attractiveness variables below). This co-payment variable is highly correlated with income, but less likely to be biased because co-payments are constant above a certain income level (see below).

Need variables

The need variables that we used were self-reported chronic diseases, ADL-disability, cognitive functioning and depressive symptoms. Self-

Table 2
Number of older adults living independently at t = 1 and living at home or in institutional care after 3 years.

Start Cycle t = 1	Independent living at t = 1	Attrition	At home at t = 1	At home at t = 2	In institution at t = 2	%[*]	Conf. Interval %
1996	2062	305	1757	1683	74	4.2	3.3 – 5.2
1999	1780	247	1533	1471	62	3.4	2.5 – 4.4
2006	1657	208	1449	1403	46	3.2	2.1 – 4.2
2009	1552	167	1385	1321	64	4.3	3.0 – 5.5
Total	7051	**927**	6124	5878	**246**	3.8	3.2 – 4.3

[*] Weighted for age and gender.

reported variables included: incontinence and the chronic diseases chronic lung disease (COPD), heart disease, peripheral artery disease, diabetes mellitus, stroke, cancer, rheumatoid and osteo-arthritis or any other chronic disease, defined as a disease of which symptoms and/or treatment had been present for at least three months (Kriegsman, Penninx, Eijk, Boeke, & Deeg, 1996). Disability was assessed by asking whether respondents had difficulty performing six activities: getting up from a chair, dressing, walking down and up a staircase of 15 steps without resting, using one's own or public transportation, walking outside for five minutes without stopping, and cutting one's toenails (score is 0 to 6) (McWhinnie, 1980). As a further need factor we used admission to a hospital during the last 6 months. Cognitive impairments were ascertained using the Dutch translation of the MiniMental State Exam (MMSE) (Folstein, Folstein, & McHugh, 1975; Launer, Dinkgreve, Jonker, Hooijer, & Lindeboom, 1993). Scores range from 0 (all answers incorrect) to 30 (unimpaired). We used a score of 23 points as a cut-off point (yes/no). Depressive symptoms were ascertained using the Dutch translation of the 20-item Center for Epidemiologic Studies Depression scale (CES-D) (Beekman et al., 1997; Radloff, 1977). Respondents were asked to indicate how often during the preceding week they had experienced each symptom, with response categories 0 = (almost) never to 3 = (almost) always. The score range is 0 (no symptoms) to 60 (maximum number of symptoms).

Attractiveness variables

As a first proxy, we used the variable "relative age". We hypothesize that adults who are younger than the average institutionalized population are likely to prefer to stay living in the community with their age peers. Statistics Netherlands provides the average age of institutional residents per year and the respective share of each age-group in the total institutional population (Statistics Netherlands, 2018). We hypothesize that the preferences for home care are relatively weak if people approach the average age of the institutionalized population but are progressively stronger when community living people are younger. Therefore, we proxy the attractiveness of home care versus institutional care by using a quadratic function for the age difference when a person is younger than the average age of residents of institutional care in the Netherlands. We further hypothesize that when someone is older than the average age of the institutionalized population, the age difference will not affect his or her decision for admission to institutional care.

As a second proxy for the attractiveness of LTC institutions we use an indicator of loneliness. We hypothesize that the degree of loneliness is positively related to the perceived attractiveness of LTC institutions because of the prospect of company by residents. The loneliness measure contains 11 statements without explicitly mentioning loneliness, with a scale from 0 (= no loneliness) to 11 (= severe loneliness) (de Jong-Gierveld & Kamphuis, 1985).

As a third proxy for the (financial) attractiveness of LTC institutions we use the "relative cost" of institutional care relative to that of ageing-in-place (the "difference in co-payments between institutional care and living independently"). For every individual we calculate the relative cost of institutional care as the difference in out-of-pocket payments for institutional care and living independently. Taking into account the marital status of the respondents, the out-of-pocket payments for institutional care are calculated as a percentage of the household income (as reported by the respondents) minus a pocket- and clothing allowance, the health care insurance premium and a general allowance institutionalized people receive. Home care recipients pay an out-of-pocket payment per hour. Various co-payments are required for different types of home care (i.e. nursing, personal assistance, daytime activities and household help). For calculating the number of hours of home care needed by persons who choose to stay in the community rather than being admitted to an institution, we used eligibility criteria for admission to institutional care.

Co-payments cannot exceed maximum levels set by the government for both institutional and home care, depending on the household income. To account for price inflation, co-payments in 1997, 1999, 2002 and 2006 are adjusted to the 2009 price levels.

3.3. Statistical analyses

The samples of all cycles were pooled. For descriptive analyses, weights were applied to bring the age-sex distribution of the 1999, 2006 and 2009 sample in accordance with the 1996 sample. Differences in characteristics between the two baseline years were examined using an age and gender adjusted Wald-Test. We estimate a logistic multivariable regression model to find the predictors of institutional care. Using the Andersen model, we tested per block of predisposing, enabling and need factors, which factors were significant predictors of admission to institutional care. A covariate was selected for inclusion in multivariable analyses when it was associated with use of institutional LTC ($p < .20$). Moreover, in the final model we removed variables with a significance level of $p >= .20$ to obtain a more parsimonious model. In the final model, a block was added that corresponds to the attractiveness of institutional care vs staying in the community. We included dummy variables for the respective measurement years, with the year 1996 as the reference year, to account for the potential impact of policy, societal and technological changes.

Because the respondents can be part of several cycles and the data on the errors of these respondents may not be mutually independent, standard errors were clustered at the respondent level. The regression was weighted for the number of respondents that was interviewed by phone, to account for the difference in the number of proxies that could be reached three years after the start of the cycle.

Furthermore, with the final model, we carried out a Blinder–Oaxaca decomposition regression according to the method of Yun (2004). Using this method, we decompose the difference in admission to an LTC institution between the period 1996–1999 and the periods 1999–2002, 2006–2009 and 2009–2012, respectively, into a part that is due to differences in the magnitudes of the determinants (hereafter "due to endowments"), and a part that is due to differences in the effects of these determinants (hereafter "due to effects"). For example, in the period 2009–2012, not only the disability level of older adults living independently might be different from the disability level of older adults in 1996–1999, but also the probability that disability will result in an admission to an LTC institution might have changed.

4. Results

4.1. Descriptive findings

The descriptive characteristics are weighted for age and gender to the first baseline year. After weighting, the average baseline age was 72.2 years and 55.2% was female. The (weighted) admission rate to institutional care declines from 4.2% in the period 1996–1999 to 3.2% in the period 2006–2009, but then increases again to 4.3% in 2009–2012 (see Table 2).

The relatively high admission rate of institutional care in the period 2009–2012 is unexpected, given the steady decline in institutional care of older people in the Netherlands over the period 1996–2012. A likely explanation for this unexpected observation is the increase in the oldest group of the sample (which is not fully correct by the weighing of the results) and, as a result, the relatively high number of proxy respondents in the period 2009–2012. In the period 1996–1999 only 41 of the 1757 respondents were answering the questions as a proxy respondent during the telephone interview. These proxy respondents were representing 21 persons who were admitted to institutional care (1.2% of the admissions of a total of 4.2%). In the period 2009–2012, a much larger share of respondents was acting as a proxy respondent (68 out of the 1385 respondents). These proxy respondents represented 32 persons who were admitted to institutional care (2.3% of the admissions of a total of 4.3%). Leaving out the telephone interviews with

Table 3
Descriptive Characteristics of Participants.

	Total N	Baseline 1996 N = 1715	Baseline 1999 N = 1506	Baseline 2006 N = 1405	Baseline 2009 N = 1344	Difference (p value)[4]
Predisposing factors						
Age	5970	72.2	72.2	72.2	72.2	
Female	5970	55.2	55.2	55.2	55.2	
Education[1]	5969	1.52 (0.02)	1.58 (0.04)	1.68 (0.02)	1.74 (0.03)	< .001
Enabling factors						
Co-residing partner, %	5970	60.5	61.9	65.1	66.8	.001
Informal care by partner (yes/no; %)	5963	13.1	18.5	9.2	6.4	< .001
Informal care by network (yes/no; %)	5946	10.8	11.1	9.6	8.4	.037
Formal care (yes/no; %)	5948	9.5	10.9	13.7	13.8	.002
Need factors						
Disability (#), mean (SD)	5895	1.20 (0.04)	1.29 (0.06)	1.41 (0.05)	1.34 (0.05)	.027
MMSE < 23 (%)	5963	7.8	6.1	6.4	5.3	.012
Depressive symptoms, mean (SD)	5937	1.17 (0.04)	1.16 (0.05)	1.10 (0.05)	1.03 (0.04)	.002
Chronic lung disease (%)	5969	12.5	13.6	13.8	12.6	.927
Heart disease (%)	5969	22.9	24.3	26.6	27.0	.005
Pheripheral artery disease (%)	5965	9.3	9.0	8.0	6.4	.004
Diabetes (%)	5969	6.8	7.9	11.2	12.9	< .001
Stroke (%)	5969	5.7	5.9	6.4	6.5	.346
Osteo-arthritis (%)	5969	43.5	43.7	45.9	52.5	< .001
Rheumatoid Arthritis (%)	5968	9.9	9.4	9.2	9.9	.997
Cancer (%)	5969	10.5	12.3	14.1	17.3	< .001
Other chronic diseases (%)	5969	25.5	27.7	25.7	29.6	.071
Incontinence (%)	5969	22.3	21.1	27.9	30.8	< .001
Hospital visit in last 6 months (yes/no; % yes)	5969	9.2	7.9	10.5	10.6	.254
Relative attractiveness institutional care						
Difference between age and average age residents institutional care (years)[2]	5,970	12.0	12.3	12.7	12.8	.030
Difference in co-payments for institutional care and home care (euro)	5970	1080	1135	1113	1058	.164
Lonely,[3] mean (SD)	5970	2.18 (0.06)	2.09 (0.10)	2.02 (0.07)	1.86 (0.08)	< .001

Percentages and means of 1999, 2006, and 2009 are weighted to 1996 by age and gender.

[1] Education categories: low (elementary school not completed, elementary school, lower vocational education) = 1, intermediate (general intermediate, intermediate vocational, general secondary education) = 2 and high level of education (higher vocational, college or university education) = 3.

[2] Difference is 0 when age > average age residents.

[3] The loneliness measure contains 11 statements without explicitly mentioning loneliness, with a scale from 0 (= no loneliness) to 11 (=severe loneliness).

[4] p value based on comparison of 1996 and 2009.

proxy respondents, the weighted average of use of institutional LTC declines (steadily) from 3.0% in the period 1996–1999 to 2.3% in the period 2009–2012.

The changes in the predisposing, enabling, need and attractiveness factors of the different baseline samples are described in Table 3.

4.2. Explanatory factors of propensity to use institutional LTC

We first test the significance of predictors of use of institutional care per block of factors of the standard Andersen model. We observe that of the predisposing variables, age, gender and education were significant predictors at p < 0.20; of the enabling variables, this was the case for having a co-residing partner, informal care by the partner, informal care by the social network and formal care; of the need variables disability, cognitive impairment, incontinence, recent hospital visit, rheumatoid arthritis and diabetes were significant predictors at p < 0.20. In the final model, we remove the variables gender, education, co-residing partner and informal care by the partner to make the model more parsimonious. These variables were not significant at a p = 0.20 level.

The multivariable regression model shows that the often reported factors such as age, disability, receiving formal care with household tasks or personal care, a hospital visit in the last 6 months, diabetes, incontinence and cognitive impairment were significant predictors of admission to a LTC institution (p < 0.05; Table 4, Model I). The time dummies for the period 2006–2009 and 2009–2012 have a negative effect on the admission rate and are significant at p < 0.05.

4.3. The role of changing attractiveness in quality of LTC institutional care

Of the block of factors that represent the attractiveness of institutional care compared to staying in the community, the relative age of the institutionalized population, difference in out-of-pocket co-payments and loneliness are significant factors at p < 0.20. Adding these variables to the base model, we observe that the relative age and relative cost have the expected sign and are significant a p < 0.05; loneliness has the expected sign at p < 0.10. Adding this block of attractiveness factors leads to a 11.4–12.2 % decrease of the effect of the time dummies for the period 2006–2009 and 2009–2012 (Table 4).

With a Blinder-Oaxaca decomposition, the time effect and the effects of including the block of attractiveness of institutional LTC in the Andersen model can be investigated further. When we investigate the two periods farthest apart in the model with the difference in out-of-pocket payments, we observe that the admission rate in the period 2009–2012 was 0.37% lower (CI -0.75 – 1.49%) than in the period 1996–1999 (2.90% vs 2.53%) (see Table 5). The Blinder–Oaxaca analysis decomposes this difference of 0.37% in an effect as a result of the difference in the prevalence of poor health and support between the two periods (in Table 5, difference "due to endowments") and an effect of change in effects of determinants ("due to time effect"). Hence, due to the fact that the sample in 2009 was relatively more disabled and sicker than in 1996, the probability of admission to an institution of the sample would have increased by 0.65% point (CI 0.29 to 1.01%) in the period 2009–2012 compared to the period 1996–1999 (see Model I, Table 5). The time effect of 1.02% point (CI 0.01 to 2.06%) indicates that at the same age, health situation and support level, 1.02% point fewer older people were admitted to an institution in the period

Table 4

Factors associated with admission to institution, ages 60–100 years (from multivariable logistic regression weighed for percentage of telephonic interviews).

	Model I [2]			Model II [3]		
	Odds Ratio	Conf. Interval %	P > |z|	Odds Ratio	Conf. Interval %	P > |z|
Age	1.13	1.11 – 1.16	< .001	1.06	1.01 – 1.12	.029
Formal care	2.32	1.52 – 3.53	< .001	2.01	1.33 – 3.05	.001
Hospital visit in last 6 months (yes/no; %)	1.82	1.13 – 2.93	.014	1.85	1.15 – 2.97	.011
Cognitive impairments (MMSE < 23 yes/no))	2.69	1.73 – 4.19	< .001	2.47	1.60 – 3.79	< .001
Disability	1.30	1.17 – 1.45	< .001	1.27	1.14 – 1.41	< .001
Rheumatoid-arthritis	.62	0.35 – 1.12	.115	.62	0.35 – 1.09	.096
Diabetes	1.56	0.94 – 2.59	.084	1.51	0.92–2.47	.100
Incontinence	1.49	1.02 – 2.18	.039	1.50	1.03 – 2.17	.035
Lonely				1.06	0.99 – 1.12	.079
Relative age [1]				.99	0.99 – 1.00	.030
Relative cost [1]				.53	0.31 –0 .90	.019
Year '99	.69	0.42 – 1.13	.138	.74	0.45 – 1.20	.221
Year '06	.47	0.28 – 0.80	.005	.53	0.31 – 0.91	.020
Year '09	.61	0.37 – 1.00	.049	.69	0.42 – 1.13	.138

N = 5865 N = 5865.

[1] Relative age = (Age - Average age residents institutional care)^2 if Age < Average age residents and 0 if Age > =Average age residents. Relative cost = difference in co-payments for institutional care and home care (euro/1,000).

[2] Model I: predictors of institutional care after testing blocks of predisposing, enabling and need factors of the Andersen model (without block attractiveness).

[3] Model II: predictors of institutional care after testing blocks of predisposing, enabling and need factors of the Andersen model (with block attractiveness).

2009–2012 than in 1996–1999. Adding the block with the attractiveness factors decreases the time effect from 1.02% to 0.89%, a reduction of 12.8%. When we compare 1996–1999 with 1999–2002, we find that the time-effect decreases from 0.76% to 0.61%, a reduction of 19.2%. Finally, when comparing 1996–1999 with 2006–2009, the time-effect decreases from 1.40% to 1.11%, a reduction of 19.1% (Table 5).

Note that the coefficient of the variable formal care is positive. One explanation can be that the caregivers bring the older people in contact with institutional care (George, 1987). A second explanation is that the variable might pick up the effect on use of institutional LTC of unobserved differences across individuals and families (Spillman & Long, 2009). The gold standard to deal with an endogenous variable like formal care is to use an instrumental variable (IVs). However, we did not find a good candidate for an IV, which might be partly the result of a lack of power. To test the sensitivity of the time effect we ran the logistic regression and Blinder–Oaxaca analysis without the variable formal care. The results were largely the same.

5. Implications and discussion

In this study we provide further empirical insight in the institutional and societal factors that may have caused changes in the use of institutional LTC over time. Use of the blocks of variables of the Andersen health care model (predisposing, enabling and need) leave a significant unexplained "time effect". Our study shows the importance of changing attractiveness of institutional LTC in explaining use of long-term care over time. This dynamic aspect is neglected in the Andersen healthcare utilization model.

We used three proxies for the attractiveness of institutional care. The first proxy is based on the relative age of a person compared to the average resident in a facility. Because the people in institutional care have become older, we hypothesize that part of the decline in the percentage of people admitted to institutional care may be attributed to a reduction in the perceived quality of company in LTC institutions. As second proxy we use a measure of loneliness, since we expect that

Table 5

Decomposition of difference in admission rate to institution between 1999–2002, 2006–2009, 2009–2012 and 1996–1999.

	Model without attractiveness variables *			Model with attractiveness variables		
	Adimission rate %	Conf. Interval %	P > |z|	Admission rate %	Conf. Interval %	P > |z|
To institution 1996-1999	2.90	2.11 – 3.69	< .001	2.90	2.11 – 3.70	< .001
To institution 1999-2002	2.44	1.66 – 3.21	< .001	2.44	1.65 – 3.23	< .001
Difference to 1996-1999	0.46	− 0.64 – 1.56	.412	0.46	− 0.66 – 1.58	.418
- Due to endowments	− 0.29	− 0.56 – 0.02	.034	− 0.15	− 0.50 – 0.21	.415
- Due to time effects*	0.76	− 0.29 – 1.81	.160	0.61	− 0.47 – 1.69	.268
		N = 3162			N = 3162	
To institution 2006-2009	2.01	1.31 – 2.71	< .001	2.01	1.32 – 2.70	< .001
Difference to 1996-1999	0.89	− 0.16 – 1.95	.098	0.89	− 0.16 – 1.95	.098
- Due to endowments	− 0.51	− 0.77 to − 0.25	< .001	− 0.24	− 0.61 – 0.13	.198
- Due to time effects*	1.40	0.42 – 2.38	.005	1.11	0.09 – 2.17	.033
		N = 3,065			N = 3,065	
To institution 2009-2012	2.53	1.73 – 3.33	< .001	2.53	1.74 – 3.32	< .001
Difference to 1996-1999	0.37	− 0.75 – 1.49	.516	0.37	− 0.75 – 1.49	.518
- Due to endowments	− 0.65	− 1.01 to − 0.29	< .001	− 0.52	− 0.97 to − 0.07	.024
- Due to time effects*	1.02	0.01 – 2.06	.053	0.89	0.16 – 1.94	.097
		N = 3,006			N = 3,006	

Model I includes age, formal care, disability, co-residing partner, hospital visit in last 6 months, cognitive impairment, diabetes, rheumatoid arthritis and incontinence.

Model II includes variables of Model I and "relative age", "relative cost" and loneliness.

Key variable of interest is the difference in time effects on the admission rates between model 1 (2nd column) and model 2 (5th column).

residential facilities are more attractive for lonely older people because of the company of other residents. A third proxy is the difference between co-payments for institutional care and staying in the community, reflecting the relative financial attractiveness of LTC institutions. Comparing the period 1996–1999 with the period 2009–2012, the Blinder-Oaxaca analysis is in line with the potential effect of the relative attractiveness of institutional LTC compared to home care on the demand for institutional care. Although results should be interpreted with caution given the rather large confidence intervals, inclusion of the block of factors related to the relative attractiveness of institutional care to ageing-in-place may explain 12.8%–19.2% of the time-effect depending on which periods are compared.

This study is based on the assumption that the perceived interaction with other residents in a facility has an effect on one's preference for staying in the community versus living in a long-term care institution. Although we find indications that the relative age of a person compared to the average resident in a facility affects the admission rate, more research is necessary on how people in need of care actually value the perceived interaction with other residents. First, a qualitative study could give more insight in the role of the perceived interaction with other residents in the demand for institutional care. Second, qualitative studies might shed more light on the question how the quality of perceived interaction with other residents has changed over time, although the feasibility of such studies depend highly on the availability of comparable qualitative data over time. Qualitative research might also provide more direct measures for the relative attractiveness of institutional care that can be used for longitudinal studies.

Furthermore, although we were able to partly open the black box of the declining demand for institutional care, still a substantial unexplained time effect remains. Factors on a macro-level might have affected admission rates as well. For instance, we cannot rule out that assessors' evaluations of the need for institutional care have changed over time. Hence, more research is needed to identify additional explanations.

An implication of our findings is that policies to encourage ageing-in-place may have a self-reinforcing effect because these policies will further increase the age and level of impairment of the institutionalized population, thereby reducing the perceived quality of living in LTC institutions. Policymakers should be aware that policies to encourage ageing-in-place are likely to increase the average age and disability level of the institutionalized population, thereby further reducing the attractiveness of institutional care. Therefore, their policies encouraging ageing-in-place should include investments in (or support of) innovative concepts of assisted living to prevent that people keep on living in their home for too long in order to avoid traditional institutional care facilities.

Disclosure statement

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References

Alders, P., Comijs, H., & Deeg, D. (2017). Changes in admission to long-term care institutions in the Netherlands: Comparing two cohorts over the period 1996–1999 and 2006–2009. *European Journal of Ageing, 14*, 123–131.

Alders, P., Costa-Font, J., de Klerk, M., & Frank, R. (2015). What is the impact of policy differences on nursing home utilization? The cases of Germany and the Netherlands. *Health Policy, 119*(6), 814–820.

Andersen, R. (1995). Revisiting the behavioral model and acccess to medical care: does it matter? *Journal of Health and Social Behavior,* 1–10.

Bakens, P. (2007). Over alarmbellen, pyjamadagen en het inzetten van het leger. *Denkbeeld, 18*, 179–181.

Bakx, P., de Meijer, C., Schut, F., & van Doorslaer, E. (2015). Going formal or informal: Who cares? The influence of public long-term care insurance. *Health Economics, 24*, 631–643.

Beekman, A., Deeg, D., van Limbeek, J., Braam, A., de Vries, M., & van Tilburg, W. (1997). Criterion validity of the center for epidemiologic depression scale (CES-D) based. *Psychological Medicine, 27*, 231–235.

Bijl, R., Boelhouwer, J., Cloïn, M., & Pommer, E. (2011). *De sociale staat van Nederland 2011*. Den Haag: SCP.

Centre for care assessment (2013). *Indicatiewijzer 2013*.

Colombo, F., Llena-Nozal, A., Mercier, J., & Tjadens, F. (2011). *Help wanted? Providing and paying for long-term care*. OECD Publishing.

de Jong-Gierveld, J., & Kamphuis, F. (1985). The development of a Rasch-type loneliness scale. *Applied Psychological Measurement, 9*(3), 289–299.

de Jong-Gierveld, J. (1998). A review of loneliness: Concept and definitions, determinants and consequences. *Reviews in Clinical Gerontology, 8*, 73–80.

de Meijer, C., Bakx, P., van Doorslaer, E., & Koopmanschap, M. (2015). Explaining declining rates of institutional LTC use in the Netherlands: A decomposition approach. *Health Economics, 24*(S1), 18–31.

Folstein, M., Folstein, S., & McHugh, P. (1975). Mini-mental state": Practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*(3), 189–198.

Galenkamp, H., Braam, A. W., Huisman, M., & Deeg, D. J. H. (2013). Seventeen year time trend in poor self-rated health in older adults: Changing contributions of chronic diseases and disability. *European Journal of Public Health, 23*(3), 511–517.

Gaugler, J. E., Duval, S., Anderson, K. A., & Kane, R. L. (2007). Predicting nursing home admission in the US: A meta-analysis. *BMC Geriatrics, 7*(1), 13.

George, L. K. (1987). Easing caregiver burden: The role of informal and formal supports. In R. Ward, & S. Tobin (Eds.). *Health in aging: Sociological issues and policy directions* (pp. 133–152). New York: Springer.

Heinen, J., Sijsling, H., & Groen, M. (2012). *Zorgarchitectuur zorgvastgoed*. The Hague: Sdu.

Hoogendijk, E., Deeg, D., Poppelaars, J., van der Horst, M., Broese van Groenou, M., Comijs, H., et al. (2016). The longitudinal aging study Amsterdam: Cohort 2016 and major findings. *European Journal of Epidemiology, 31*(9), 927–945.

Kane, R. (2001). Long-term care and quality of life: Bringing them closer together. *The Gerontologist, 41*(3), 293–304.

Kriegsman, D., Penninx, B., Eijk, J., Boeke, A., & Deeg, D. (1996). Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly: a study on the accuracy of patients' self reports and on determinants of inaccuracy. *Journal of Clininal Epidemiology, 49*(12), 1407–1417.

Launer, L. J., Dinkgreve, M., Jonker, C., Hooijer, C., & Lindeboom, J. (1993). Are age and education independent correlates of the mini-mental state exam performance of community-dwelling elderly? *Journal of Gerontology,* 271–277.

McWhinnie, J. R. (1980). Disability assessment in population surveys: results of the OECD common development. *Revue D'epidemiologie et de Sante Publique, 29*(4), 413–419.

Ministry of Health, Welfare and Sport (2013). *Hervorming van de langdurige ondersteuning en zorg. Letter to the Parliament*.

OECD. (2017). Available from: http://www.oecd-ilibrary.org/social-issues-migration-health/data/oecd-health-statistics/oecd-health-data-long-term-care-resources-and-utilisation_data-00543-en. Accessed: July 25, 2017.

Olejaz, M., Juul Nielsen, A., Rudkjøbing, A., Okkels Birk, H., Krasnik, A., & Hernandez-Quevedo, C. (2012). *Health systems in transition Denmark, 14* (2).

Radloff, L. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385–401.

Russell, D. W., Cutrona, C. E., De La Mora, A., & Wallace, R. B. (1997). Loneliness and nursing home admission among rural older adults. *Psychology and Aging, 12*(4), 574.

Schut, F., & van den Berg, B. (2010). Sustainability of comprehensive universal long-term care insurance in the Netherlands. *Social Policy & Administration, 44*(4), 411–435.

Spillman, B., & Long, S. (2009). Does high caregiver stress predict nursing home entry? *Inquiry: The Journal of Health Care Organization, Provision and Financing,* 140–161.

Statistics Netherlands (2018). *Personen in institutionele huishoudens 1995-2013*. Accessed: April 20.

van Gameren, E. (2005). *Regionale verschillen in de wachtlijsten verpleging en verzorging*. SCP.

van Tilburg, T. G. (2014). Over toe- en afname van eenzaamheid onder ouderen. *Gerōn, Tijdschrift over ouder worden en maatschappij, 16*(2), 46–49.

Yun, M.-S. (2004). Decomposing differences in the first moment. *Economic Letters, 82*(2), 275–280.