The health effects of a nursing home admission

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Abstract

Ageing in place policies encourage and facilitate that elderly postpone moving to a nursing home. These policies are considered a win-win: they keep public spending on long-term care for the elderly (LTC) in check and are in line with the preferences of the elderly. Moreover, they are assumed to have no effect on the health of the target population, but the absence of health effects has so far not been documented.

We evaluate the impact of a nursing home admission for the subpopulation using Dutch administrative data from the period 2009-2013. We exploit the unique situation that in the Netherlands virtually all LTC is publicly financed and that an individual's eligibility for these services is determined by a randomly assigned assessor who has substantial discretionary power. Using differences between assessors in the tendency to grant admission to a nursing home as a source of exogenous variation, we show that the impact of being eligible for nursing home care on mortality is zero on average, but with considerable effect heterogeneity. The costs of a nursing home admission are completely offset by lower spending on home care and medical care, which are in part driven by a sharp decrease in the probability of a hospital admission. These findings suggest that ageing in place policies are not a way to cut public spending. Moreover, if they are primarily a way of bringing the supply of LTC in line with preferences of the elderly for staying at home, this comes at the cost of an increase in health problems leading to hospital admissions.

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1. Introduction

The fiscal sustainability of public long-term care (LTC) expenditures is a major concern in many OECD countries. One of the most popular types of cost containment policies are "ageing in place" policies, which aim to enable elderly to live at home longer. Potentially, such "Ageing-in-place" policies are considered a win-win: they keep costs down by substituting cheaper home care for more expensive institutional care, and they are believed to be in line with the preferences of the elderly, who would rather live at home than in a nursing home (OECD 2011), and to preserve the independence and well-being of the elderly. However, admitting a frail elderly person to a nursing home affects her health in multiple, possibly offsetting ways. On the one hand, nursing homes provide a protective environment and are expected to have a positive influence on their residents' health and remaining life expectancy. On the other hand, a nursing home admission (NHA) may also be detrimental to one's health, e.g. because the transition itself is a major life event, because a nursing home may possibly provide a lower-quality life environment and because a nursing home is a "total institution" (Goffman 1961) which may lead to passivity and dependence, and a (perceived) partial loss of control and of one's identity.

The net health effect of a NHA has not been studied before, mainly because individuals self-select – patients who receive institutional care are usually in worse health than elderly who continue to live at home – and that therefore these groups cannot directly be compared. To deal with the selection problem, we exploit an institutional feature of LTC organization in the Netherlands. Virtually all LTC is paid for through the public LTC insurance scheme (94% of total public LTC expenditures, including all spending on nursing home care) or the Social Support Act (6%) (CBS 2016). To become eligible for publicly funded LTC, patients often need to request an assessment

from the independent assessment agency. While the eligibility criteria are determined at the national level, assessors have considerable discretionary power, which we exploit as a source of random variation in the probability of becoming eligible for a NHA (see Doyle 2007; Maestas et al. 2013; French and Song 2013; Dahl et al. 2014 for applications in other settings). Our instrumental variable analysis shows that a NHA decreases the probability of a hospital admission but has no effect on the mortality risk and health care spending for the group that is sufficiently close to being admitted that variation in the leniency of the assessor affects their eligibility. As this group is highly similar to the target group of ageing in place policies, the results indicate that aligning the supply of LTC is in line with preferences among the elderly to continue to live at home. Moreover, they show that ageing in place policies may not be a way to keep LTC expenditures in check, as had previously been hypothesized (OECD 2011, De Meijer et al. 2015)

The outline of this article is as follows. Section 2 discusses the institutional setting in more detail and zooms in on the assessment procedure. Section 3, 4 and 5 are about the data, the empirical strategy and the results, respectively. Section 6 discusses the main results, their interpretation and their implications for ageing in place policies.

2. LTC in the Netherlands

2.1. LTC

LTC helps individuals to cope with functional limitations. The focus here is on LTC for the elderly – about two-thirds of recipients[1] -- who may need help because of limitations caused by physical deterioration, which are often caused by chronic conditions, or psychogeriatric problems, e.g.

[1] The other groups receiving LTC are the mentally handicapped, the physically disabled and patients with chronic mental illnesses. Together, these groups account for about a third of all LTC users (CBS 2016).

dementia. There are two types of LTC: formal care, provided by paid professionals, and informal care, provided by family members, friends or neighbors. We concentrate here on formal care, which is provided at home or in a nursing home. In most countries, out-of-pocket expenditures on formal care are substantial (OECD 2011), but in the Netherlands virtually all formal care is paid for by social insurance that is mandatory for the entire population and financed from earmarked contributions, general taxes and co-payments. Co-payments are related to income, wealth (since 2013) and household composition, and are relatively low: only 8% of public expenditures on LTC provided in-kind was financed from co-payments in 2014 (CBS 2016).

An independent government agency decides on the level and types of care for which applicants are eligible (see section 2.2). Individuals who are eligible for public LTC may choose to receive this care in-kind or to receive a cash transfer amounting to about 75% of the value of the in-kind services. Cash benefits may be used to contract formal providers or informal caregivers such as neighbors or family members. In-kind care is provided by private not-for-profit or for-profit (home care only) providers, which are contracted by regional single payers. These single payers are allocated a budget that is based on past spending in the region. While this budget is often fully spent, waiting lists are virtually non-existent (Bakx et al. 2016a).

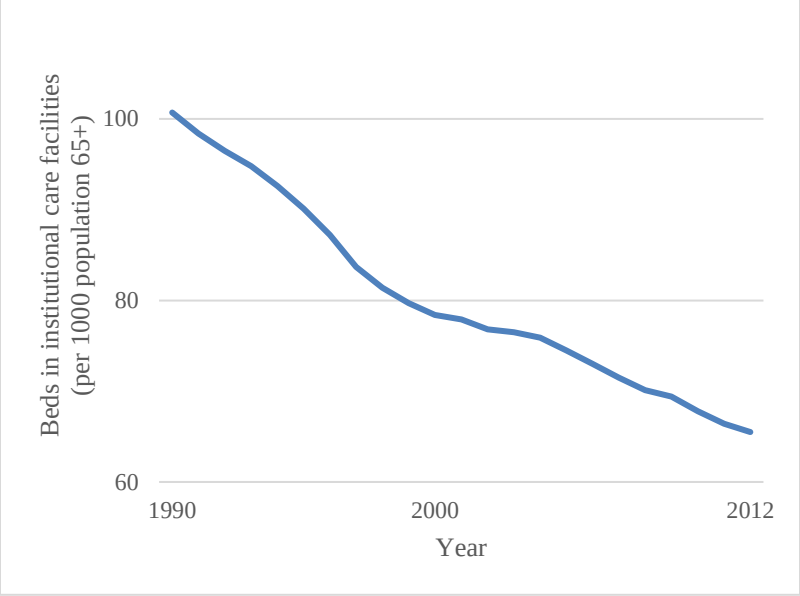
Total spending on formal care was 27 billion euro in 2014, which is 3.0% of the Gross Domestic Product – the highest percentage of all OECD countries (OECD 2017). Spending on care provided in an institution accounts for two-thirds of all LTC expenditures; one-third is spent on home care (CBS 2016). 7.1% of the adult population uses LTC in 2014; 2.3% lived in a nursing home (CBS 2016). The number of beds in nursing homes has declined by more than a third between 1990 and 2012 (figure 2), indicating that the drop in importance of nursing home care has been substantial and potentially affected a large group of elderly. Moreover, the figure highlights that the decline

in nursing home admissions is a gradual process rather than a one-time cut, which means that a regression discontinuity design or difference-in-differences approach comparing cohorts of elderly in subsequent years will lack power and generalizability.

This decline, which is also observed elsewhere, is most likely the result of changing preferences among the elderly and changes in LTC policy reflecting and reinforcing these changes (Alders et al. 2015; de Meijer et al. 2015; OECD 2011). To incentivize and facilitate the postponement of nursing home admissions, the government has taken a number of measures since 2000. It has increased the supply for home care (starting in 2000), has introduced the option to receive home care for those eligible for institutional care (2007), has increased co-payments for institutional care (2013)[2], and has tightened the eligibility criteria for institutional care (2014) (Alders et al. 2015; de Meijer et al. 2015). Simultaneously, deregulation made nursing home care more readily available. The government no longer regulates the number of beds since 2009 and no longer requires an assessment for individuals who are at least 80 years of age when they want to move to a nursing home since 2011 (CIZ 2011; WTZI 2016). However, the aggregate effect of all these reforms on the use of nursing home care is clearly negative, as figure 2 shows.

[2] Co-payments for home care increased as well, but less so in absolute terms (CBS 2016). Because home care is an important substitute for nursing home care, the net impact of the increases in the co-payments is unclear.

Figure 2: Number of beds in nursing homes in the Netherlands relative to the 65+ population



Source: OECD (2017)

2.2. The assessment procedure[3]

Individuals who may need LTC – or a health care provider or family member on their behalf – apply for an assessment to the LTC needs assessment agency (Centrum Indicatiestelling Zorg – CIZ) in their regional office. Assessors handle one of three types of applications – for elderly care, care for the disabled or long-term mental health care – but there is no further specialization. Applications are assigned to assessors by a planner taking into account only the priority status of the application[4] and assessor workload– but not any information about patient's health or care needs.

At the start of the procedure, the assessor has access to (i) information filled out on the application form, (ii) information about prior LTC use and (iii) any information collected in previous

[3] The description of the assessment procedure is based on the rules described in CIZ (2013) and face-to-face interviews with a team coach (and former assessor) and data manager of CIZ. This is an abridged version, the full version may be found in appendix C.

[4] All applications must be handled within six weeks. However, some applications need to be handled within 24 or 48 hours.

applications. She subsequently decides which information needs to be verified or updated . The assessor may contact the patient, household and/or family members listed on the application form, the health insurer or health care providers (e.g. the GP or a LTC provider). The assessment framework requires the assessor to take into account the health, health-related limitations, living conditions, social environment, psychic and social functioning of the applicant and any other professional services and informal care the patient is currently receiving. The assessor is a street-level bureaucrat (Lipsky 2010) who applies general rules to specific cases. To do this in a sensible way, she has – and needs to have – considerable discretionary power. Assessors have the freedom to determine which of the abovementioned aspects are relevant, to determine which information is verified or collected and how this will be done.

The assessor then decides about both the types and amounts of LTC that the applicant is eligible for. An eligibility decision fully replaces the previous one. If the applicant does not agree with the decision, he may appeal and the decision is reconsidered.[5] When an initial decision is reversed, this often occurs because new or additional information regarding the patient's situation is uncovered.

3. Data

Study population and available information

The data set consists of all eligibility applications for the years 2009-2013 that were handled by the eligibility assessment agency (CIZ)[6] and for which we have full information on all covariates. To create a more homogenous sample, the sample is restricted to applicants of at least 65 years of

[5] In less than 1% of the cases, the applicant appeals. 25% of these appeals is approved (CIZ 2014).
[6] Thus excluding assessments done by mandated providers.

age, who applied for a permanent nursing home admission, who were not already eligible for institutional care when they applied, whose application is considered, and who are not mentally or sensory handicapped. Applications made by medical specialists or hospitals on behalf of a patient are removed because in these cases the type of care that was requested was usually granted. Finally, applications are removed from the sample when the assessor handling the application is unknown (14%) or handled fewer than 50 of these applications in all years combined.

These data are linked at the individual level to data on the use of LTC provided in kind (2008-2014), vital statistics, including death records (2009-2015), hospital discharge data (2008-2012), information on the household in which the applicant lives (2009-2014), and to annual claims data from mandatory public health insurance (2009-2014).[7]

The number of observations in the study population is 45,393 for 43,746 individuals; 3.5% of the individuals applies twice or more and the maximum number of applications for a nursing home admissions by an individual is 4.

Descriptive statistics

The applicants in the study population are mostly women, old and close to death (table 1, column 1): medical care expenditures in the next calendar year are close to 6000 euro, which is almost three times the population average (Bakx et al. 2016b) and 29.7% dies within two years after the application. Furthermore, the large majority of the applicants was already eligible for home care

[7] All these data are available for all applicants, with two exceptions. First, health care expenditures data are not available for individuals who are insured through a proxy holder (about 10% in this subpopulation); probability weights are used to correct for this. Second, discharge information is lacking for approximately 10% of all hospital admissions.

at the time of the application and used about 6 hours of home care per week in the year prior to the application[8].

Not all of the 83.5% of applicants are judged eligible for a nursing home admission, not all move there: after one year, only 64% of the eligible has done so, after two years 76% (column 2). By contrast, 27.9% of rejected applications are nonetheless admitted within a year and 45.3% within two years (column 3). Eligible applicants show higher mortality rates and lower health care spending (conditional on surviving until the start of the next calendar year) than non-eligible applicants. This may arise for three reasons: (i) it may reflect a true difference in health between both groups, (ii) nursing homes provide some of the care that would otherwise be provided by general practitioners and hospitals and pay for prescription drugs, (iii) selective mortality, i.e. those that have higher spending also have lower survival rates.

Table 1: descriptive statistics: group means

	Study population mean	Eligible for nursing home admission	
		No	Yes
Endogenous variable			
Eligible for a nursing home admission	0.835	0	1
Instrument			
Leniency of the evaluator	0.003	-0.029	0.009
Outcomes			
Mortality			
3-month	0.043	0.020	0.047
6-month	0.086	0.046	0.094
1-year	0.163	0.105	0.175
1.5-year	0.235	0.161	0.250
2-year	0.307	0.219	0.325
Admitted to a nursing home within:			

[8] This figure comes from a back-of-the-envelope calculation in which we round the cost of one hour of home care to 40 euro and use 12747 euro of home care spending in the year prior to the application.

3 months	0.291	0.059	0.337
6 months	0.426	0.143	0.482
1 year	0.580	0.279	0.640
1.5 years	0.657	0.379	0.711
2 years	0.712	0.453	0.762
Health care expenditures			
Medical care next calendar year	5947	7187	5694
Medical care 2 years from now	5368	6490	5113
Nursing home care next year	13753	4231	15636
Nursing home care 2 years from now	33053	15405	36496
Home care next year	14475	13924	14584
Home care 2 years from now	23093	26384	22451
Hospital care use			
≥ 1 hospital admission in the next year	0.332	0.371	0.324
≥ 1 emergency room admission in the next year	0.213	0.223	0.211
Charlson score next year	0.269	0.273	0.268
Covariates[a]			
Eligible for home care in the past 30 days	0.728	0.682	0.736
Applicant			
Patient	0.298	0.485	0.261
GP	0.026	0.027	0.026
LTC provider	0.297	0.181	0.319
Other[b]	0.379	0.307	0.394
Application type			
Regular	0.962	0.961	0.962
After emergency LTC	0.013	0.011	0.014
Other	0.025	0.028	0.024
Random sample getting full assessment	0.035	0.027	0.037
Age	83.12	82.25	83.30
Female	0.658	0.658	0.658
Household size	1.479	1.481	1.479
Number of children	2.297	2.289	2.299
Number of children in household	0.054	0.054	0.054
Number of children living < 10km	1.016	1.015	1.016
Number of children living < 40km	1.825	1.824	1.825
Widowed in last year	0.016	0.018	0.016
Widowed in last three months	0.008	0.010	0.008
Home owner	0.296	0.284	0.298
Value of home[d]	221,000		
Standardized household income[d]	19,954	19,325	20,079

Wealth	190,399	164,999	195,421
Spending on home care last year	12747	13856	7138
Spending on home care two years ago	17443	18842	10368
Spending on nursing home care two years ago	156	160	137
Number of observations	45,393	7,494	37,899

[a] Descriptive statistics on the period in which the application was filed, on the region of residence, migrant background and on prescription drug use are in appendix B. [b] Includes family members and client representatives; [c] Descent following Statistics Netherlands definition: applicants are classified as being of foreign descent if they or one of their parents is born abroad; [e] Household income divided by the square root of the number of household members.

4. Empirical strategy

4.1 Instrumental variable (IV) analysis

We estimate the effect of eligibility for a nursing home admission (*ENHA*) on an applicant's outcome *Y* (either survival, health or health care expenditures):

$$Y_i = X_i\beta + \gamma ENHA_i + v_i, \qquad (1)$$

where *X* is a vector containing observed characteristics, and *v* is the error term. *ENHA* might be correlated with unobserved individual characteristics also affecting the outcome, e.g. the health and disability of the applicant. Then, a direct estimation of Equation (1) using OLS provides a biased estimate of the effect γ of eligibility on the outcome *Y*. It is likely that the assessors have more information on an applicant's health than can be gathered from the data. Hence, for survival and health outcomes we expect a downward bias in the OLS estimates of γ: applicants in poor unobserved health are more likely to be deemed eligible for a NHA than individuals in better health. The direction of the bias for health care expenditures depends on the relative sizes of the direct effect of unobserved and the degree to which a NHA substitutes for other types of care.

To eliminate this bias, we exploit the fact that ENHA is partly random. The source of this randomness is that, as described above, i) an applicant's eligibility status is determined by an

employee of the needs assessment agency[9], ii) the allocation of cases to these assessors is arbitrary and iii) that these assessors have some discretionary power and some are more likely to judge the same applicants as eligible than others, i.e. be more lenient when judging applications than others.[10] Hence, whether the applicant is assessed by a more lenient assessor may be used as an instrument for ENHA in an instrumental variable analysis.

We summarize the leniency of evaluators in one measure to create a strong instrument[11]. Following Maestas et al. (2013), we define leniency for application *i* handled by assessor *j* by taking the share of the other cases for which the assessor considered a nursing home admission appropriate:

$$Leniency_i = \Big(Number\ of\ approvals_j - I_i(approved)\Big)/\big(Number\ of\ cases_j - 1\big) \qquad (2)$$

but we exclude case *i* itself to ensure that the instrument is exogenous. Assessors with greater approval shares are taken to be more lenient. Subsequently, we use a multivariate regression to adjust for region-specific differences and differences in the types of applications handled[12].

Using $Leniency_i$ as an instrument, we can obtain an unbiased estimate of γ using the following 2SLS regression:

$$P(ENHA_i) = X_i\beta + \lambda Leniency_i + \eta_i. \qquad (3)$$

[9] As explained in section 2, virtually all nursing home care is publicly financed.

[10] Differences in decision making between street-level bureaucrats – including possibly in leniency between assessors – may arise because of the discretionary power that they have combined with a lack of "(…) time, information or other resources necessary to respond properly to the individual case" which means that they can typically not perform their job "according to the highest standards of decision making" (Lipsky 2010). Underlying causes of structural differences in decisions between street-level bureaucrats, including assessors, include personality traits, organizational culture and circumstances.

[11] The most straightforward way to exploit the differences between assessors would be to generate an indicator variable for each assessor and using this set of indicator variables as instruments. But this strategy would yield a large number of instruments for just one endogenous regressor. Furthermore, each of these assessor dummies separately would have a small impact on the overall probability of a nursing home admission. As a result, this approach is expected to yield biased estimates (Wooldridge 2010, French and Song 2013, Maestas et al. 2013).

[12] More specifically, we correct for information about the applications, i.e. whether the application was filed by the patient, by his family doctor, by his long-term care provider or by someone else (e.g. a family member), whether it was a regular application, an application that followed after a temporarily valid emergency application or another type of application.

$$Y_i = X_i\beta + \gamma\hat{P}(ENHA_i) + \varepsilon_i, \qquad (4)$$

where $\hat{P}(ENHA_i)$ in Equation (4) is the predicted probability of ENHA from Equation (3).

4.2 Interpretation

The interpretation of the results is affected by two aspects of this analysis. First, we estimate the causal effect of *eligibility* for a nursing home admission, not the effect of an admission itself. Eligble applicants may choose to postpone admission or not use nursing home care at all, while applicants who are currently ineligible for a nursing home admission may reapply and become eligible and be admitted later: about half of the control group is admitted at some point in the future[13]. These dynamics means that we cannot use the current setup to study the effects of a NHA on the outcomes: even if the assignment of the eligibility decision is compeletely randomized, the uptake and timing of nursing home care will still be correlated with unobserved (changes in) health (cf. Abbring and Van den Berg 2005; Eberwein et al. 1997; Cellini et al. 2010). However, at the same time we expect differences between eligible and non-eligible applicants to be solely caused by differences in the use of nursing home care[14]. Thus, another way of framing our analysis is that we are estimating an intention to treat effect[15] for nursing home care: the effect of offering individuals access to the treatment (a nursing home admission).

[13] This leads to multiple observations when applicants whose application is rejected re-apply.

[14] In theory, eligibility could have a direct effect on the outcomes, for instance through anticipatory behavior, but this seems unlikely.

[15] Note that our approach differs from a commonly used design where the intention to treat is used as an instrument for the treatment. In an experiment, there might be non-compliance: some individuals in the treatment group may end up foregoing treatment or individuals from the control group may get the treatment themselves. A comparison of the outcomes between the treatment and the control group then gives the intention to treat effect: the effect of offering the treatment. By using whether someone is in the treatment or control group as an instrument for actual treatment, one can obtain the average treatment effect for the compliers. In our case, this would mean using eligibility as an instrument for actual admission. This is not what we do: we use leniency as an instrument for eligibility to obtain an unbiased estimate of the effect of eligibility not of nursing home admission.

Second, the IV analysis provides an estimate of the local average treatment effect (LATE): the average effect of eligibility for compliers, i.e. those applicants who are at the margin of eligibility and for whom the eligibility decision is affected by the leniency of the assessor. Some applicants are never eligible for nursing home care, regardless of the leniency of the assessor: the never takers or, more accurately in our case, the never eligible. Others – the always takers – are always eligible for nursing home care. For instance, some applicants might have such severe health limitations that all assessors, no matter how strict, will grant them access to a nursing home. Such differences in characteristics between compliers and the always eligible may also lead effects heterogeneity of a NHA and hence the LATE applies to the compliers only.

We cannot identify the compliers at the individual level, but we can examine their characteristics as a group by looking at the relative likelihood of a marginal applicant having a particular characteristic relative to the full population of applicants. We do this by dividing subgroup-specific first stage coefficients for the leniency measure by the first-stage coefficient for leniency for the full population (Angrist and Pischke 2009).

What we are estimating is thus the effect of access to nursing home care for individuals who are at the margin of eligibility. This seems to be the most policy relevant effect. First, the way that policy makers generally try to influence the use of nursing home care is through the eligibility decision. In the Netherlands and a number of other countries, the needs assessment procedure is one of the most important policy instruments to regulate access to care (OECD 2011; Bakx et al. 2015). Second, the compliers are likely to be affected by policy changes. Ageing in place policies often entail marginal shifts in the rate at which the elderly move to a nursing home. These changes will most likely affect the access to nursing home care for applicants at the margin of eligibility, and not for applicants with very severe health problems.

4.3 Outcomes and selection of covariates

We consider five outcomes. First and second, we look at the effect of eligibility on nursing home admissions and on long-term care expenditures, which consist of spending on home care and nursing home care. Third and fourth, we look at spending on medical care and the probability of having at least one hospital admission. A nursing home admission may affect these two outcomes by affecting the health and survival of the admitted and through substitution: nursing homes pay for some of the medical care that would have been covered through and a nursing home might substitute for hospital care. Fifth, we estimate the impact on all-cause mortality.

We control for all information available when the application was assigned to an assessor, i.e. the information (i) on the application form, (ii) on prior long-term care and health care use and (iii) from other sources (appendix B contains a full list of covariates).[16]

As a robustness check, we use the Least Absolute Shrinkage and Selection Operator (Lasso) developed by Tibshirani (1996) to select the relevant covariates in a data driven way. The Lasso allows us to consider a much larger set of covariates than we could do otherwise. Specifically, we add very detailed information on medicine use and diagnosis information from hospital admissions to the set of covariates used in the main analyses. The Lasso is a shrinkage method, where coefficients are set to minimize the sum of the squared residuals plus a penalty term on the sum of the absolute values of the coefficients:

$$\hat{\beta} = \arg\min_{\beta} \left\{ \left(y - X\beta \right)^2 + \lambda \| \beta \|_1 \right\}. \quad (5)$$

[16] We do not include the information on the health status and functional limitations that is collected by the assessor. Assessors decide themselves which (additional) information they gather and may interpret situations differently. Analyses (not shown) using detailed information on functional limitations from the Health Care Monitor survey of 2% of the population in 2012 show that more lenient assessors are more likely to overreport limitations and disabilities. Hence, including the information reported by the assessor would lead to an underestimation of the effect of assessor leniency on the probability of being eligible for a nursing home admission and hence to overestimation of the health effects of an admission.

The penalty term restricts the size of the model. The parameter λ determines the severity of the penalization. A relevant property of the Lasso is that it can be used for variable selection as it sets many coefficients exactly to zero.

We follow the approach discussed by Belloni et al. (2014) to use the Lasso in a 2SLS context. We run the Lasso algorithm separately for three equations: first to select the variables correlated to the leniency score, second the eligibility decision, and third the outcome variable. We then run a 2SLS regression using all variables with nonzero coefficients in at least one of these equations as covariates. To estimate the Lasso equations we use the procedure of Belloni et al. (2012), which sets the penalty parameter in a data-driven way.

4.4 Appraisal of assessor leniency as instrumental variable

To be a good instrument, this measure of the assessors' relative leniency needs to fulfill three requirements: it needs to be relevant, it needs to be valid and it needs to affect the probability of an admission monotonically.

Assumption 1: relevance

The variation in the leniency of assessors that handle more than 50 cases (n = 448)[17] is considerable: the share of patients that is rated as eligible for nursing home care ranges from 0.51 to 1.0 (standard deviation = 0.08) across assessors (figure 4). After adjusting for differences in types of applications handled and regions, the variation is reduced (standard deviation = 0.07) but between-assessor differences remain substantial

[17] Appendix A contains histograms detailing the distribution of the caseload across the assessors.

The first stage estimates presented in column 6 of table 2 confirm the relevance of the leniency instrument: the significance of the coefficient for leniency, the F-statistic and the partial R^2-statistic show that the assessor's leniency has a strong effect on the probability of being considered eligible for a nursing home admission. Being assigned to a one standard deviation more lenient assessor increases the probability of receiving nursing home care by 6.8 percentage point.

Figure 4: distribution of the raw (left) and adjusted (right) leniency measure

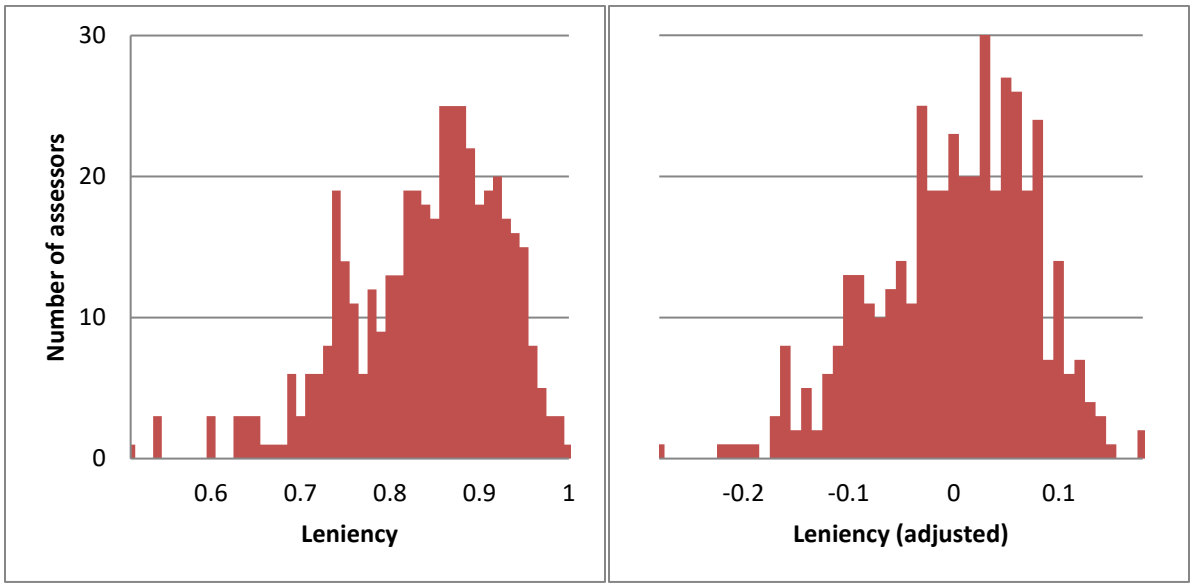


Table 2: First stage estimation results

	Nursing home admission advised					
	(1)	(2)	(3)	(4)	(5)	(6)
$b_{leniency}$	1.053 (0.024)***	1.051 (0.024)***	1.031 (0.024)***	1.035 (0.024)***	1.035 (0.024)***	1.023 (0.024)***
Controlling for:						
Period		X	X	X	X	X
Region			X	X	X	X
Type of application				X	X	X
Demographics and household characteristics					X	X
Health care use						X
Number of observations	45,393	45,393	45,393	45,393	45,393	45,393
Adjusted R^2	0.039	0.045	0.053	0.087	0.094	0.107
F-statistic leniency (p-value)						
Partial R^2 leniency						
Number of independent variables	1	10	19	26	111	170

Note: Standard errors in parentheses; *** p<0.001, ** p < 0.01, * p < 0.05.

Assumption 2: validity

As explained in section 3, assessors are assigned to applications by a planner and this planner's main goals are to ensure that every application is reviewed on time and that the assessors have an even workload. Applicants cannot pick an assessor themselves and assessors cannot select which types of applications they would like to review, meaning that the instrument cannot be correlated with any characteristics of the applicant and thus that the instrument is valid.

While this claim cannot directly be verified empirically, we may examine whether the instrument is correlated to *unobserved* characteristics of the applicant – which would mean that the validity assumption is violated – by testing if it is correlated with *observed* characteristics. It is more likely that none of the subgroups based on unobserved characteristics is being assessed by more lenient

assessors, if none of the observed subgroups of applicants on average is assessed by a more lenient assessor[18].

The first test is whether the IV coefficient in the first-stage regression changes when additional covariates are included. This would signal that some observed subgroups of applicants are more likely to be assigned to a lenient assessor and hence that this may be the case for some unobserved subgroups too (cf. Maestas et al. 2013). When indicators for regions and periods are included, the coefficient for leniency changes, but it is insensitive to subsequent additions of covariates (table 1) which indicates that the leniency measure is not correlated to these observed characteristics of the applicants.

Second, we inspect more closely which characteristics are correlated with assessor leniency r by regressing it on the observed characteristics of the applicant (cf. French and Song 2013). A difference between observable subgroups of applicants in the average leniency of their assessors is likely to be caused by non-random assignment. This regression reveals that when correcting for all other characteristics (and correcting for multiple testing using the method developed by Benjamini and Hochberg (1995)), two groups of applicants on average have a more lenient assessor (appendix A1.2). First, assessors at some regional offices are more lenient than at other regional offices. These differences are likely to be the result of differences in the organizational culture between these regional offices rather than unobserved differences for a number of reasons. As in French and Song (2013) and Maestas et al. (2013), applicants are required to apply at the office in their region of residence; they cannot choose to apply at an office with more lenient assessors. Moreover, any differences in leniency are unlikely to reflect supply constraints as

[18] The crucial assumption is that the observed and the unobserved characteristics are correlated, which is highly likely in this case because of the availability of information on all aspects influencing the health of the applicant and the probability of a nursing home admission, including past health status, socio-economic status, informal care availability and demographic background characteristics.

waiting lists were virtually non-existent, assessors were unlikely to have detailed information about these types of constraints and they were not supposed to take them into account. Finally, although limited regional differences in the health and need for LTC are known to exist (Algemene Rekenkamer 2015; CPB 2015), the regional differences in leniency do not change when information on the health care use of the applicants is included in the regression.[19] If differences between offices only reflect differences in organizational culture, it suffices to control for differences in the average leniency across regional offices in the regression analysis. Second, living in a home with a higher value is associated with being assessed by a more lenient assessor.

Third, we let the lasso algorithm (Belloni et al. (2012)) select the covariates for three equations: in the first and second stage equation of the 2SLS estimation and in the equation explaining the leniency score. We use this method as a robustness check for the main result (see section 5.3) but the estimation results for the leniency score equation also provides further insight into the validity of the IV. Only three of the 170 variables – three region indicators – are selected for the equation explaining the leniency score, indicating that these are the sole variables that are correlated with leniency. This largely reconfirms the findings presented above. As explained there, the region dummies are unlikely to be correlated with any unobserved characteristics, and a similar logic applies to the period indicator that has been selected.

Assumption 3: monotonicity

The monotonicity assumption means that assessors who are stricter for one group of applicants are also stricter for all other subgroups in the population. It implies that the relationship between

[19] Aforementioned studies (Algemene Rekenkamer 2015, CPB 2015) conclude that most of the differences in the number of individuals who are eligible for LTC between regions cannot be explained by differences in the prevalence of health and disability.

assessor leniency and the probability of being rated eligible to move to a nursing home is positive for all observable subgroups (French and Song 2013; Dahl et al. 2014). If this assumption holds, the leniency measure coefficient will always be nonnegative in subgroup-specific first stage regressions. We find that, for all age-gender groups, and all subgroups based on health care spending in the previous calendar year and prior use of home care, the first stage coefficients are positive and close to the estimate for the entire population (table 3).[20]

Furthermore, a survival analysis of the population that was eligible for nursing home care demonstrates that individuals who were assessed by a more lenient assessor move to a nursing home at a slower rate (results available upon request). This implies that individuals who are granted an NHA by a stricter assessor are on average less healthy than those who were granted it by a more lenient assessor. Thus, also this finding confirms the monotonicity assumption is likely to hold (cf. Maestas et al. 2013).

[20] In a similar test, we follow Maestas et al. (2013) and leave out all observation of individuals to calculate the leniency of the assessor (rather than just the observation for which we calculate the leniency measure). The results from the subgroup-specific first stage analyses (not shown) are all nonnegative, reconfirming that the monotonicity assumption holds.

Table 3: First stage estimation results by subgroup

	Woman	Health care spending last year:			
		1st quartile	2nd quartile	3rd quartile	4th quartile
$b_{leniency}$	1.067	1.045	1.016	0.990	0.968
	(0.029)***	(0.050)***	(0.049)***	(0.050)***	(0.050)***
Relative likelihood	1.04	1.02	.99	.97	.95
Number of observations	29,672	10149	10123	10129	10115
Adjusted R^2	0.104	0.099	0.103	0.107	0.106

	Age: 60-69	Age: 70-79	Age: 80-89	Age: 90 and over	Home care user
$b_{leniency}$	0.823	0.959	1.104	0.884	0.962
	(0.141)***	(0.046)***	(0.033)***	(0.054)***	(0.027)***
Relative likelihood	.80	.94	1.08	.86	.94
Number of observations	1436	12067	24808	7082	33026
Adjusted R^2	0.181	0.121	0.102	0.082	0.109

	Not a home care user	Prior nursing home admission	No prior nursing home admission	Application by patient	Application by LTC provider
$b_{leniency}$	1.179	0.988	1.025	1.487	0.776
	(0.050)***	(0.093)***	(0.025)***	(0.050)***	(0.036)***
Relative likelihood	1.15	1.00	0.97	1.45	0.76
Number of observations	12367	2727	42666	13507	13460
Adjusted R^2	0.093	0.108	0.101	0.117	0.062

	Standardized household income			
	1st quartile	2nd quartile	3rd quartile	4th quartile
$b_{leniency}$	1.070	.995 (.048)***	1.093	.921
	(.049)***		(0.048)***	(.045)***
Relative likelihood				
Number of observations	11,348	11,348	11,348	11,349
Adjusted R^2	.041	.037	.044	.035

Note: Standard errors in parentheses; *** p<0.001, ** p < 0.01, * p < 0.05. In all regressions we control for period, region, type of application, demographics and household characteristics and health care spending in the previous calendar year.

5. Results

5.1 Main analyses

As expected, being assessed as eligible for a nursing home admission increases the probability of moving there (table 4)[21]. The effect peaks after 6 months, when the impact is 23.9 percentage points, and decreases to 13 percentage points after two years: as the descriptive statistics show, a large share of the applicants who were turned down eventually become eligible for a nursing home admission. From these results we conclude (i) that there is a strong relationship between being eligible for a nursing home admission and being admitted and (ii) that it is therefore likely that any health effects that we observe are the result of a nursing home admission. As a consequence of the higher share of patients that is admitted to a nursing home among the eligibles, their spending on nursing home care is 9,132 euro higher after a year (13,849 after two years), while their home care expenditures are 7,539 euro lower (12,969 after two years).

The association between a NHA and mortality is strongly positive for all time horizons up to two years after becoming eligible for nursing home care: the OLS estimates show that the two-year mortality rate is 6.9 percentage points higher among those who are admitted to a nursing home than among those who continue to live in the community. As explained above, this association may be caused by self-selection: elderly move to a nursing home because they have worse health prognosis and they may die from these health problems (table 4). Indeed, the comparison between 2SLS and OLS regressions[22] suggest that this is the case: the 2SLS coefficients are closer to zero than the OLS coefficients, have larger standard errors and are all insignificant (table 4). Hence, the higher mortality rates for the eligible compared to the ineligible in table 1 appear to be the result of selection rather than the nursing home admission itself.

[21] Appendix B contains graphical summaries of the 2SLS results.
[22] We can rule out the OLS estimate for two-year mortality, but not for the shorter time periods.

The eligible are estimated to spend 2,209 euro *less* on medical care than the ineligible in the calendar year after the eligibility decision (table 4). This difference fully offsets the difference in LTC spending, meaning that the total effect of becoming eligible for a nursing home admission on health care spending is close to zero (-616 euro) and insignificant. Furthermore, the NHA also makes them 10 percentage points (30 percent) less likely to have a hospital admission. As explained in section 4, these differences may have three causes: i) selective mortality, ii) a true difference in health between both groups, and iii) the limiting effect of nursing homes on the use of medical care. The 2SLS estimates of the mortality effect rule out that selective mortality plays a role, while the 2SLS regression itself mitigates the impact of underlying differences in health status of the elderly on health care spending. Hence, the 2SLS estimate suggests that a NHA limits the need to seek medical help and thus medical care spending, because the nursing home provides this care itself, because living in a nursing home improves the health of the residents, or because the nursing home staff is able to improve timeliness of medical care.

5.2 Characteristics of compliers

The 2SLS and the OLS results are not directly comparable because the 2SLS results apply to the compliers, while the OLS results apply to the full population. The size of the group of compliers is equal to the first stage coefficient multiplied by the difference between the mean eligibility rates of the least lenient and the most lenient assessors (Maestas et al. 2013). This means that 46% is at the margin. The group of "always takers" (i.e. those who are always considered eligible) is equal to the share of considered eligible by the strictest assessor, while the group of never takers is equal to the share that is considered ineligible by the most lenient assessor. In our case, a large share (54%) will always be considered eligible, while there a no never takers.

The composition of the compliers group is somewhat different from the full population: the relative likelihood estimates deviate from 1 for some of the subgroups for which they are calculated (table 3). Compliers are substantially less likely to be aged 65-79 or aged 90 and over and to have their application submitted by an LTC provider than the full population; compliers are also more likely to be applying for a nursing home admission themselves and are more likely not to have been eligible for home care in the 30 days before the application. These findings show that marginal shifts in the eligibility for NHA would affect a large share of the study population, but that some subgroups in the population would be affected more than others. They also show that the difference between the OLS estimates and the 2SLS is likely the result of both differences between the compliers and the full population and of the impact that self-selection has on the OLS estimates (Dahl et al. 2015).

5.3 Subgroup analysis and robustness checks

Table 4 shows that assessor leniency has a larger impact on the probability to be eligible for a NHA for some groups: applicants of 80-90 years of age, applicants who filed the application themselves and applicants who were not eligible for home care at the time of the application. For the three subgroups for which the effect of assessor leniency was largest, we re-estimate the 2SLS regressions for the one-year and two-year impact on the probability of a nursing home admission and the impact on one-year and two-year mortality. For the former two subgroups, the results are very similar to the overall result, while the latter group experiences a drop of 9.6 percentage point in the one-year mortality because of a nursing home admission (table 5). This finding indicates that the marginal applicant in this subpopulation, which appears to experience a shock that has a

large effect on their demand for LTC, is likely to experience greater survival benefits from moving to a nursing home.

We perform four sets of robustness checks to verify whether the main results are sensitive to (i) decisions made regarding the definition of the leniency measure, (ii) decisions about the selection of control variables for applicant health , iii) a test of the linearity assumption underlying the 2SLS regression models and iv) time trends in the strictness of applications.[23] The first set of tests reveals that the results are largely insensitive to decreasing (to 20 or 40 handled applications) or increasing (to 60, 80 or 100 applications) the threshold used to select assessors with sufficient numbers of observations to reliably calculate their leniency: only after raising the threshold to 80 applications, the estimate of the one-year mortality effect becomes large and significant at the $p < 0.05$ level (table 6). Further, using a version of the leniency measure that has not been corrected for characteristics of the application reconfirms the main analysis, except for the one-year mortality estimate, which is significant at the $p < 0.05$ level (table 6). Finally, we test if inexperienced assessors may receive an easier caseload (which would bias their leniency scores downward) by leaving out the 3.5% of applications handled by an assessor with fewer than 100 applications in the prior year.[24] Leaving out these applications does not alter the main result: there is a positive effect of being eligible for a nursing home admission on the probability but not on mortality (table 6).

Second, to gauge whether there is omitted variable bias related to the health of the applicants, as a first step we include information on spending on five categories of medical care – hospital care,

[23] To keep the number of analyses traceable, we focus on the one-year and two-year estimates for nursing home admissions and mortality. All estimates discussed here are available upon request.

[24] To measure the experience of the assessor, all types of application are taken into account, not just the type of applications that is used in the main analysis.

paramedical care, medical devices, medical transport and all other medical care – in the calendar year prior to the application.[25] For all outcomes, results are identical to those in section 5.

To further verify if we select the correct covariates we let the lasso algorithm (Belloni et al. 2012) select the covariates that are associated with the endogenous variable, the instrument or the probability of a nursing home admission. This algorithm allows us to consider a much larger set of covariates in a structured way than we could do otherwise. More specifically, we add very detailed information on medicine use and diagnosis information from hospital admissions to the set of covariates used in the main analyses. The lasso algorithm selects only a small share of the covariates that are included in the main analyses, and only ten of the hospital diagnoses groups that were not included. The 2SLS results are not affected by the covariate selection.

Third, we verify whether the assumption that the effect of the instrument on eligibility for a nursing home admission is linear by using dummy variables for ten leniency deciles as instruments rather than the continuous measure (cf. Dahl et al. 2015). As the dummies indeed reveal a linear effect and the estimates for the probability of a nursing home admission and for mortality are very similar to the results with the continuous l measure, the assumption of a linear treatment effect appears to have no effect on the estimates.

[25] This information is not available for patients applying in 2009 and hence these observations (n = 3,696) are removed.

Table 4: The impact of a NHA on mortality and expenditures

	Nursing home admission within									
	3 months		6 months		1 year		1.5 year		2 year	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
$b_{\text{eligibility for NHA}}$	0.258 (0.006)***	0.193 (0.028)***	0.304 (0.006)***	0.239 (0.031)***	0.320 (0.006)***	0.222 (0.031)***	0.293 (0.006)***	0.169 (0.032)***	0.272 (0.006)***	0.130 (0.031)***
Number of observations	45,393	45,393	45,393	45,393	45,393	45,393	39,352	39,352	39,352	39,352
F-statistic leniency (p-value)		1,864 (0.000)***		1,864 (0.000)***		1,864 (0.000)***		1,617 (0.000)***		1,617 (0.000)***
Partial R^2 leniency		0.040		0.040		0.040		0.040		0.040

	Mortality									
	3-month		6-month		1-year		1.5 year		2 year	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
$b_{\text{eligibility for NHA}}$	0.022 (0.003)***	0.015 (0.013)	0.037 (0.004)***	0.016 (0.018)	0.051 (0.005)***	0.034 (0.023)	0.062 (0.005)***	0.020 (0.026)	0.073 (0.006)***	0.001 (0.029)
Number of observations	45,393	45,393	45,393	45,393	45,393	45,393	45,393	45,393	45,393	45,393
F-statistic leniency (p-value)		1,864 (0.000)***		1,864 (0.000)***		1,864 (0.000)***		1,864 (0.000)***		1,864 (0.000)***
Partial R^2 leniency		0.040		0.040		0.040		0.040		0.040

Table 4 (continued)

	Medical care expenditures				Nursing home care expenditures				Home care expenditures			
	Next calendar year		2 years later		Next year		2 years later		Next year		2 years later	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
$b_{\text{nursing home care}}$	-669 (130)***	-2209 (640)***	-659 (149)***	-1266 (720)	9146 (221)***	9132 (1106)***	16514 (480)***	13849 (2410)***	-3177 (245)***	-7539 (1234)***	-7991 (458)***	-12969 (2300)***
Number of observations	35,285	35,285	21,760	21,760	45,393	45,393	39,352	39,352	45,393	45,393	39,352	39,352
F-statistic leniency (p-value)		1,519 (.000)***		954 (.000)***		1864 (.000)***		1617 (.000)***		1864 (.000)***		1617 (.000)***
Partial R^2 leniency		.041		.042		.040		.040		.040		.040

	Charlson score		Having ≥ 1 hospital admission		Having ≥ 1 emergency room visit	
	Next year		Next year		Next year	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
$b_{\text{nursing home care}}$	.013 (.013)	-.059 (.066)	-.026 (.008)***	-.107 (.038)**	-.008 (.007)	-.031 (.033)
Number of observations	28,319	28,319	28,319	28,319	28,319	28,319
F-statistic leniency (p-value)		1140 (.000)****		1140 (.000)****		1140 (.000)****
Partial R^2 leniency		.039		.039		.039

Note: Standard errors in parentheses; *** p<0.001, ** p < 0.01, * p < 0.05. In all regressions we control for period, region, type of application, demographics and household characteristics and health care spending in the previous calendar year.

Table 5: Subgroup-specific 2SLS estimates

	Not a home care user	Applicant is patient	Age: 80-90
First stage			
$b_{leniency}$	1.179	1.487	1.104
	(0.050)***	(0.050)***	(0.033)***
F-statistic leniency	551	879	1,142
(p-value)	(0.000)***	(0.000)***	(0.000)***
Partial R^2 leniency	0.043	0.062	0.044
Second stage			
1-year mortality	-0.096	0.018	0.040
	(0.035)**	(0.026)	(0.029)
2-year mortality	-.105	.006 (.034)	-.012
	(.046)*		(.036)
1-year nursing home admission	0.164	0.199	0.191
	(0.053)***	(0.038)***	(0.039)***
2-year nursing home admission	.096 (.053)	.129	.112
		(.040)**	(.039)**
Number of observations	12,367	13,507	24,808

Note: Standard errors in parentheses; *** p<0.001, ** p < 0.01, * p < 0.05. In all regressions we control for period, region, type of application, demographics and household characteristics and health care spending in the previous calendar year.

Table 6: Robustness checks

	Experienced assessors only	Excluding all applications of the same type when calculating leniency	Using leniency decile indicators as instruments	Using the unadjusted leniency measure as the instrument
First stage[a]				
$b_{leniency}$	.999	.631	[c]	.757
	(0.025)***	(.025)***		(.023)***
F-statistic leniency	1,646	616	208	1089
(p-value)	(0.000)***	(.000)***	(.000)***	(.000)***
Partial R^2 leniency	0.039	.017	.040	.024
Second stage				
1-year mortality	0.041	.009	.035	.064
	(0.026)	(.040)	(.023)	(.030)*
2-year mortality	.013	-.043	.004	.007
	(.032)	(.050)	(.029)	(.037)
1-year nursing home admission	0.219	.080	.209	.250
	(0.033)***	(.054)	(.031)***	(.040)***
2-year nursing home admission	.113	.017	.129	.119
	(.033)***	(.054)	(.031)***	(.040)**
Number of observations	40,875	36,052	45,393	45,393

Table 6 (continued)

	Controlling for confounding through additional health information	Using Belloni et al. (2012) lasso algorithm to pick covariates[d]
First stage[a]		
$b_{leniency}$	.990 (.029)***	1.033 (.026)***
F-statistic leniency (p-value)	1195 (.000)***	1606 (.000)***
Partial R^2 leniency	.039	.040
Second stage		
1-year mortality	.033 (.028)	.020 (.025)
2-year mortality	.015 (.034)	-.005 (.032)
1-year nursing home admission	.192 (.036)***	.198 (.033)***
2-year nursing home admission	.117 (.033)***	.140 (.031)***
Number of observations	34,654	38,940

	Lower bound on the number of observations needed to the calculate leniency of an assessor					
	20	40	50 (main analysis)	60	80	100
First stage						
$b_{leniency}$	1.060 (.021)***	1.024 (.023)***	1.023 (0.024)***	1.013 (.024)***	1.006 (.027)***	1.017 (.033)***
F-statistic leniency (p-value)	2651 (.000)***	2020 (.000)***		1756 (.000)***	1360 (.000)***	962 (.000)***
Partial R^2 leniency	.050	.041		.039	.035	.031
Second stage						
1-year mortality	.030 (.019)	.036 (.022)	.034 (.023)	.026 (.024)	.061 (.028)*	.086 (.033)**
2-year mortality	-.005 (0.024)	.005 (.027)	.001 (.029)	-.013 (.030)	.022 (.034)	.025 (.041)
1-year nursing home admission	.262 (.025)***	.218 (.029)***	.222 (.031)***	.181 (.032)***	.172 (.036)***	.199 (.044)***
2-year nursing home admission	.155 (.025)***	.126 (.029)***	.130 (.031)***	.097 (.032)**	.071 (.037)	.085 (.044)
Number of observations	50,150	47,072	45,393	43,419	32,126	25,984

[a]For the population for which there is at least one year of data available. [b]Value in brackets for analysis for the 2-year nursing home admission probability. [c] Coefficients for the nine decile dummies range from .065 (.007)*** for the second decile to .247 (.007)*** for the tenth. The covariates selected by the lasso algorithm are: an indicator for an application in the second half of 2009, three age-gender dummy variables, an indicator for being from Netherlands Antillean descent, ATC codes A05, M02 and M03, ISHMT codes 402, 506, 601, 902, 909, 1007, 1203, 1302, 1308, 1309, 1902, 1903, four region dummies and whether the application was filed by the patient herself.

6. Conclusion and discussion

The share of the elderly living in a nursing home has steadily been declining in recent decades. This is one of the most striking trends in LTC, with potentially large consequences for the health and well-being of the elderly as well as on (public financed) expenditures: But how large are these effects? This article is the first to shed light on the answer to this question using a quasi-experimental approach.

In order to obtain a causal estimate of these effects, we exploit two unique features of the Dutch institutional context. First, patients need to apply for eligibility for a nursing home admission and these applications are reviewed by assessors who are arbitrarily assigned to the applications and who differ in their leniency to grant eligibility. Second, virtually all LTC is publicly funded (CBS 2017), meaning that there are almost no options to bypass the public system – and hence the eligibility application procedure – and that there are few other barriers to LTC use.

The two main findings from our analysis are as follows. First, a nursing home admission reduces the probability of having at least one hospital admission in the year following the eligibility decision, but it does not affect the health of the patient as measured by the Charlson index nor the mortality risk.

Second, nursing home admissions have no impact on total health care spending for the group at the margin of a nursing home admission. While nursing home care is expensive, this group would have absorbed an amount of home care that is almost equally expensive as a nursing home stay if they had continued to live at home. Moreover, a nursing home admission leads to cost savings through a substantial reduction in spending on medical care.

These are important new findings that can also be used to estimate the effects of more restrictive NHA policies. If ageing in place policies manage to rearrange the provision of LTC in line with elderly's preferences for postponing NHAs, they will do so at the cost of an increased risk of a hospital admission. Moreover, postponing NHAs did not lead to any cost savings, which have

often been cited as a main health care policy goal in general and of ageing in place policies in particular (OECD 2011).

While these estimates are highly relevant to inform LTC policy, we cannot use them to compare the cost effectiveness of a nursing home admission to other health care interventions (e.g. by calculating the cost per quality adjusted life-year gained) as we by no means estimate the full non-monetary benefits and costs of a nursing home admission. Such a full comparison is inhibited by a lack of information on a number of important outcomes, e.g. the well-being of the elderly and the health, well-being and labor supply of their relatives, whose informal care provision may also be affected by a nursing home admission.

The generalizability of the results to other settings very much depends on the share of elderly living in a nursing home. Compared to other countries, the Netherlands still has a very large proportion of its population residing in nursing home (OECD 2017). This is likely to mean that relatively healthier patients are admitted to nursing homes, implying that the marginal patient in the Netherlands may need less home care when staying at home than the marginal patient elsewhere and hence NHA restriction policies may have higher opportunity costs and thus be financially less attractive in other countries.[26]

The difference between the IV estimates and the OLS estimates highlights that there is a clear selection on health status into NHAs; patients who are identified as eligible for NHA are likely to die sooner, indicating that they have lower health prospects. This suggests that the system does a good job in allocating the scarce nursing home resources according to need. The results presented in this article highlight that whether the allocation of resources spent on LTC between nursing home care and home should be reconsidered is a matter of preferences, as it

[26] If patients in a worse condition benefit more from an admission and if the marginal patients in other countries are in a worse condition than the marginal patient in the Netherlands, this suggests the expected benefits from a nursing home admission may be higher too.

is likely to involve a trade-off between the multiple goals that LTC policy – including ageing in place policies – aims to achieve.

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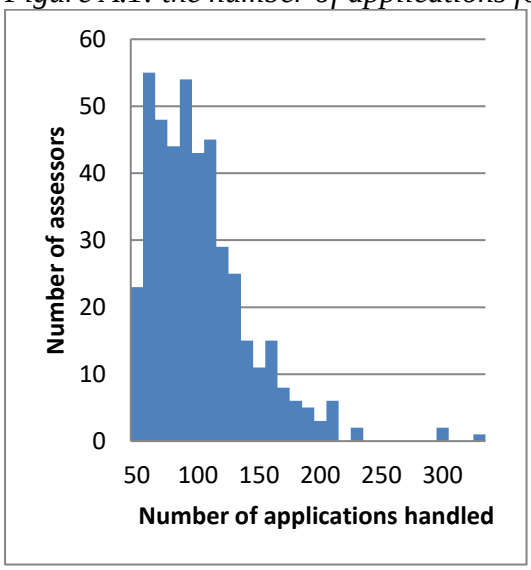
Appendix A: Distribution of the case load

Figure A.1: the number of applications for a nursing home admission per assessor



Note: assessors who handled fewer than 50 applications for a nursing home admission are removed.

Table A1: Additional descriptive statistics

Period	Study population mean	Eligible for nursing home admission	
		No	Yes
2009, first half year	0.033	0.052	0.030
2009, second half year	0.048	0.066	0.045
2010, first half year	0.064	0.081	0.061
2010, second half year	0.118	0.119	0.118
2011, first half year	0.195	0.181	0.198
2011, second half year	0.165	0.138	0.171
2012, first half year	0.139	0.125	0.142
2012, second half year	0.104	0.095	0.105
2013, first half year	0.082	0.091	0.081
2013, second half year	0.051	0.052	0.050
Region 1	0.158	0.122	0.165
Region 2	0.037	0.061	0.032
Region 3	0.075	0.113	0.067
Region 4	0.109	0.099	0.111
Region 5	0.076	0.090	0.074
Region 6	0.134	0.133	0.135
Region 7	0.117	0.108	0.119
Region 8	0.115	0.096	0.119
Region 9	0.128	0.133	0.127
Region 10	0.049	0.045	0.050
Not of foreign descent[c]	0.897	0.885	0.899
Foreign descent: Turkey	0.004	0.009	0.003
Foreign descent: Morocco	0.001	0.002	0.001

Foreign descent: Suriname	0.008	0.011	0.007
Foreign descent: Netherlands Antilles	0.001	0.001	0.002
Foreign descent: Western	0.085	0.088	0.084
Foreign descent: Other non-Western	0.004	0.004	0.004
Used medicine from ATC category A02	0.432	0.478	0.423
Used medicine from ATC category A03	0.054	0.06	0.053
Used medicine from ATC category A06	0.23	0.242	0.228
Used medicine from ATC category A07	0.032	0.033	0.031
Used medicine from ATC category A10	0.211	0.238	0.205
Used medicine from ATC category A11	0.044	0.045	0.043
Used medicine from ATC category A12	0.16	0.155	0.161
Used medicine from ATC category B01	0.562	0.573	0.559
Used medicine from ATC category B02	0.008	0.008	0.008
Used medicine from ATC category B03	0.135	0.135	0.135
Used medicine from ATC category B05	0.007	0.007	0.007
Used medicine from ATC category C01	0.202	0.215	0.200
Used medicine from ATC category C02	0.014	0.015	0.014
Used medicine from ATC category C03	0.395	0.434	0.388
Used medicine from ATC category C05	0.017	0.017	0.017
Used medicine from ATC category C07	0.407	0.433	0.402
Used medicine from ATC category C08	0.207	0.229	0.203
Used medicine from ATC category C09	0.448	0.487	0.440
Used medicine from ATC category C10	0.362	0.387	0.357
Used medicine from ATC category D01	0.052	0.055	0.051
Used medicine from ATC category D02	0.142	0.142	0.142
Used medicine from ATC category D04	0.007	0.006	0.007
Used medicine from ATC category D05	0.008	0.010	0.008
Used medicine from ATC category D06	0.078	0.082	0.077
Used medicine from ATC category D07	0.215	0.237	0.211
Used medicine from ATC category D11	0.011	0.012	0.011
Used medicine from ATC category G01	0.007	0.007	0.007
Used medicine from ATC category G03	0.025	0.025	0.025
Used medicine from ATC category G04	0.117	0.119	0.116
Used medicine from ATC category H02	0.141	0.175	0.134
Used medicine from ATC category H03	0.076	0.078	0.075
Used medicine from ATC category J01	0.392	0.416	0.387
Used medicine from ATC category J02	0.009	0.011	0.009
Used medicine from ATC category J05	0.009	0.01	0.009
Used medicine from ATC category J07	0.013	0.014	0.013
Used medicine from ATC category L01	0.013	0.013	0.013
Used medicine from ATC category L02	0.025	0.025	0.025
Used medicine from ATC category L04	0.012	0.015	0.011
Used medicine from ATC category M01	0.177	0.209	0.170
Used medicine from ATC category M04	0.035	0.041	0.034
Used medicine from ATC category M05	0.11	0.119	0.108
Used medicine from ATC category N01	0.02	0.022	0.020

Used medicine from ATC category N02	0.196	0.224	0.191
Used medicine from ATC category N03	0.046	0.053	0.044
Used medicine from ATC category N04	0.028	0.028	0.029
Used medicine from ATC category N05	0.158	0.139	0.162
Used medicine from ATC category N06	0.250	0.186	0.262
Used medicine from ATC category N07	0.048	0.056	0.047
Used medicine from ATC category P01	0.007	0.009	0.007
Used medicine from ATC category R01	0.056	0.065	0.054
Used medicine from ATC category R03	0.185	0.223	0.177
Used medicine from ATC category R05	0.052	0.064	0.049
Used medicine from ATC category R06	0.058	0.067	0.057
Used medicine from ATC category S01	0.270	0.295	0.265
Used medicine from ATC category S02	0.038	0.046	0.037
Used medicine from ATC category V03	0.005	0.006	0.005
Used medicine from ATC category Y	0.043	0.041	0.044

Table A1.2: Test for random assignment

	Coefficient
2009, second half year	.000
2010, first half year	.000
2010, second half year	.001
2011, first half year	.001
2011, second half year	.002
2012, first half year	.001
2012, second half year	.000
2013, first half year	.001
2013, second half year	.001
Region 2	-.008***
Region 3	-.009***
Region 4	-.002
Region 5	-.010***
Region 6	-.007***
Region 7	.003
Region 8	-.003
Region 9	-.008***
Region 10	-.002
Eligible for home care in the past 30 days	-.002
Application by patient	.001
GP applied on behalf of patient	.003
LTC provider applied on behalf of patient	.000
Applicant: other[b]	.000
Regular application	-.001
Application after emergency LTC	.002
Other type of application	-.007
Random sample getting full assessment	-.005

Foreign descent: Turkey	-.005
Foreign descent: Morocco	.021
Foreign descent: Suriname	-.002
Foreign descent: Netherlands Antilles	.010
Foreign descent: Western	.000
Foreign descent: Other non-Western	-.001
Household size	.001
Number of children	.000
Number of children in household	-.001
Number of children living < 10km	.000
Number of children living < 40km	.000
Widowed in last year	-.008
Widowed in last three months	.012
Value of the home[d]	.000***
Homeowner	.000
Standardized household income[e]	.000
Wealth	.000
Used medicine from ATC category A02	-.001
Used medicine from ATC category A03	.001
Used medicine from ATC category A06	-.002
Used medicine from ATC category A07	-.003
Used medicine from ATC category A10	-.001
Used medicine from ATC category A11	.003
Used medicine from ATC category A12	-.001
Used medicine from ATC category B01	.000
Used medicine from ATC category B02	-.004
Used medicine from ATC category B03	.000
Used medicine from ATC category B05	.000
Used medicine from ATC category C01	.002
Used medicine from ATC category C02	.002
Used medicine from ATC category C03	-.001
Used medicine from ATC category C05	.002
Used medicine from ATC category C07	.000
Used medicine from ATC category C08	.000
Used medicine from ATC category C09	.000
Used medicine from ATC category C10	.000
Used medicine from ATC category D01	-.001
Used medicine from ATC category D02	.002
Used medicine from ATC category D04	-.010
Used medicine from ATC category D05	.004
Used medicine from ATC category D06	.001
Used medicine from ATC category D07	-.001
Used medicine from ATC category D11	-.004
Used medicine from ATC category G01	-.005
Used medicine from ATC category G03	-.001
Used medicine from ATC category G04	.000

Used medicine from ATC category H02	.000
Used medicine from ATC category H03	.000
Used medicine from ATC category J01	-.001
Used medicine from ATC category J02	-.001
Used medicine from ATC category J05	-.007
Used medicine from ATC category J07	.001
Used medicine from ATC category L01	.001
Used medicine from ATC category L02	.000
Used medicine from ATC category L04	-.001
Used medicine from ATC category M01	.000
Used medicine from ATC category M04	-.002
Used medicine from ATC category M05	.000
Used medicine from ATC category N01	-.001
Used medicine from ATC category N02	-.001
Used medicine from ATC category N03	-.002
Used medicine from ATC category N04	-.004
Used medicine from ATC category N05	.000
Used medicine from ATC category N06	.003
Used medicine from ATC category N07	.000
Used medicine from ATC category P01	-.004
Used medicine from ATC category R01	.000
Used medicine from ATC category R03	.001
Used medicine from ATC category R05	.000
Used medicine from ATC category R06	.000
Used medicine from ATC category S01	.001
Used medicine from ATC category S02	-.001
Used medicine from ATC category V03	.002
Used medicine from ATC category Y	-.001
Spending on home care last year	.000
Spending on home care two years ago	.000
Spending on nursing home care two years ago	.000
Number of observations	45,393

Note: Standard errors in parentheses; *** p<0.001, ** p < 0.01, * p < 0.05. Reported p-values are not adjusted for multiple testing. The regression also contained 69 indicators for all combinations of age and gender, but the coefficients for these indicators were insignificant.

Appendix B: Graphical summary of the main results

Figure B1: the impact on nursing home admissions (top) and mortality (bottom)

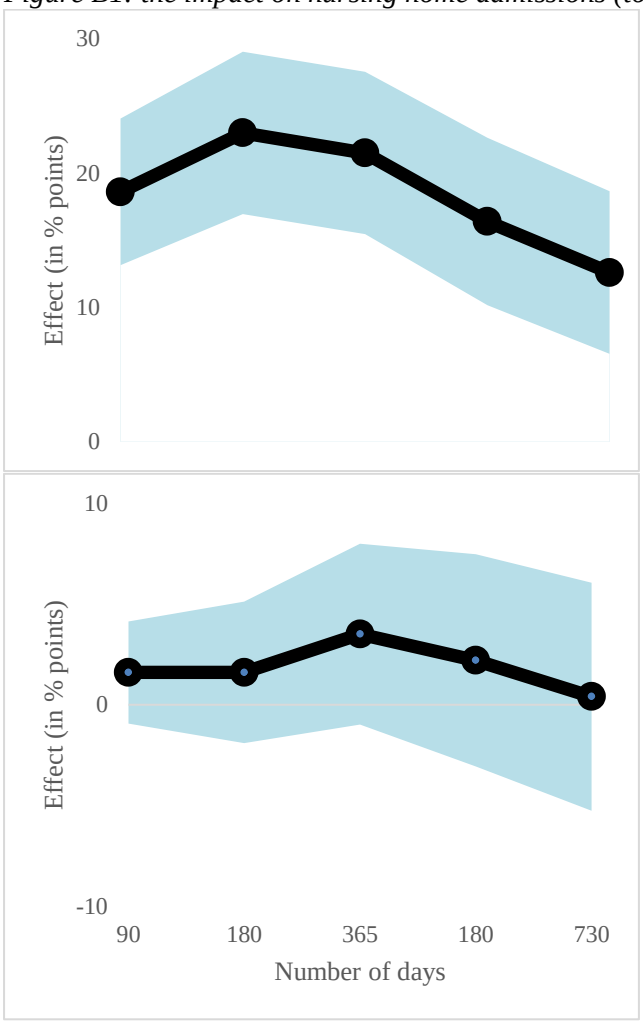
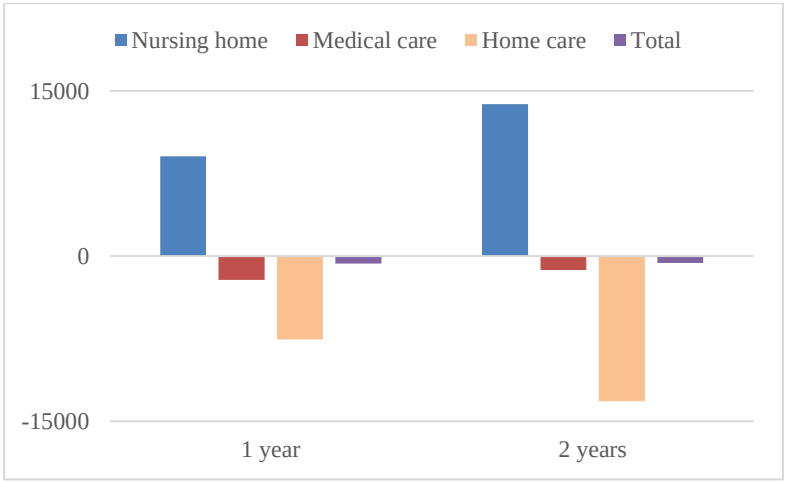


Figure B2: the impact on health care spending



Appendix C: The assessment procedure

The application

Individuals who may need LTC – or a health care provider or family member on their behalf – apply for an assessment by filling out a printed or online form and sending it to the LTC needs assessment agency (Centrum Indicatiestelling Zorg – CIZ) in their region[27]. This form contains information on i) the patient's health problems, ii) the patient's functional limitations, iii) the care that the patients would like to receive and iv) some of the patient's background characteristics, including the applicant's marital status and the composition of the applicant's household. Subsequently, the application is reviewed by a screener, who determines if the application is valid and if so, whether it may be approved by a back office employee[28] or if it should be reviewed by an assessor. In the latter case, the screener also determines the review procedure that is to be followed: the abridged procedure (the majority – desk research and phone interviews), the standard procedure (face-to-face interview, if needed with a translator – always required in case of a forced admission (wet Bijzondere Opname Psychiatrisch Ziekenhuis)[29]) or the expanded procedure (face-to-face interview and review by a multidisciplinary team, which includes medical staff).

Applications are assigned randomly to assessors

The planner assigns the applications to assessors. An assessor evaluates roughly three standard-procedure applications or seven abridged-procedure applications per day and the vast majority of the assessors does both types of assessments. Assessors handle one of the three types of

[27] We use data from 2009 through 2013. The number of regions decreased from 36 in 2008 to 10 in 2012 (RIVM 2008, 2012).

[28] Back office employees handle delegated reassessments (Herindicatie via taakmandaat – HIT)[28], applications for types of care for which a standard procedure is available (Standaard Indicatieprotocol – SIP) and applications of elderly of 80 years and older who move to a nursing home (Indicatiemeldingen – since 2012)). These types of applications are often directly approved. However, a small share of the applications are checked by an assessor (Lindeboom et al. 2016). HITs are checked occurs before the decision is made; SIPs are checked afterwards.

[29] Applications for which the provider indicated that there may be a need for a forced admission are not in the data.

applications – for elderly care, care for the disabled or long-term mental health care – but there is no further specialization. When assigning the cases to assessors, the planner does not take information about the patient's health or care needs into account. The planner assigns the applications taking into account the priority status of the application[30] and the workload of the assessors.

There are a few exceptions to the random assignment of assessors. First, novice assessors get a reduced load of about five applications per day and may start by assessing relatively straightforward applications, e.g. applications of individuals with only a few limitations and no other complicating factors. Second, some characteristics of the assessors, which are most likely unrelated to patient's health or care needs, may play a role in the assignment of cases to assessors. For instance, when planning home visits, which are often part of the standard-procedure assessments, the travel time of assessors is taken into account and hence assessors are more likely to assess individuals who live close to the assessor's home town.[31] Third, incidentally, assessors who are fluent in a foreign language may be assigned more applicants who are fluent in the same language but not fluent in Dutch[32].

Assessors handle applications on their own, but may discuss difficult cases with other – possibly more experienced – assessors if the application is considered difficult. This implies that these other assessors may have an influence on the decision. Finally, screeners may handle the simplest cases themselves. The data show that it is unlikely that this applied to any of the applications in the study population.

[30] All applications must be handled within six weeks. However, some applications need to be handled within 24 or 48 hours.
[31] The share of the assessment procedures in our study population that includes a home visit is only 14%.
[32] Applicants who were not fluent in Dutch were often invited for consultation hours, when an interpreter would be available.

The assessment

At the start of the assessment, the assessor has access to i) information that is filled out on the application form, ii) information about prior LTC use and iii) the information that was collected when previous applications were assessed[33]. She subsequently decides which information needs to be verified or updated and which information is missing. To verify what is known or to obtain new information, the assessor may contact the patient, household and/or family members listed on the application form, the health insurer and health care providers (e.g. the GP or a LTC provider), which provide much of the information that the assessor uses and are often involved in filling out the application. Most of the information is gathered or verified by making semi-structured phone calls. The time it takes to complete an assessment depends strongly on how much information needs to be verified or updated. If most of the information is already available from previous applications, the assessor often only needs to check for any changes in the patient's situation.

According to the assessment framework, the assessor takes into account the health, health-related limitations, living conditions, social environment, psychic and social functioning of the applicant and any other professional services and informal care the patient is currently receiving. Yet, the assessor has the freedom to determine which of these aspects are relevant and therefore determines which information is verified or collected.[34,35] A random 5% sample of the applications[36] gets a full review.

[33] Reassessments are not done by the same assessor.
[34] Any preferences indicated on the application form do not play a role, according to the documentation about the assessment procedure (CIZ 2013). According to the assessor that we interviewed, these preferences only incidentally play a role when making the eligibility decision.
[35] Availability of sufficient capacity to deliver the care that the applicant is eligible for is *not* taken into account by the assessor; assessors have no information on the availability of LTC supply.
[36] With the exception of HITs and SIPs.

The eligibility decision and follow-up

The assessor decides about the types and amounts of LTC that the applicant is eligible for. For some situations that can easily be defined, as there are guidelines to recommend a certain level or type of care as a function of needs. Applications for which it is not clear a priori whether home care or institutional is the most appropriate are considered to be among the most difficult. When an applicant is considered eligible for institutional care, the assessor is supported by an automatically generated recommendation when deciding about the types and level of institutional care. This recommendation is based on the information on the functional limitations that were registered. The assessors have the discretionary power to deviate from the amount of care suggested in the guidelines and from the recommendations made by the algorithm. They do not need to motivate their decisions, though they may explain their decisions to the applicants and their families to improve their understanding of the process and the outcome.

A new eligibility decision fully replaces the previous one. If the applicant does not agree with the decision, he may appeal and the decision is reconsidered.[37] When the initial decision is reversed, this often occurs because new or additional information regarding the patient's situation is uncovered.

[37] In less than 1% of the cases, the applicant appeals. 25% of these appeals is approved (CIZ 2014).