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Title

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Well-being right before and after a permanent nursing home admission

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Abstract

Permanent nursing home admissions are a frequent and major life event aimed at maintaining quality of life in old age. Yet, insights into the impact of a nursing home admission on well-being are scarce and inconclusive. We evaluate the effect of a nursing home admission on domains of well-being among those who are admitted using event study methodology for cross-sections combined with inverse probability weighting. We apply this doubly robust approach to Dutch survey data on well-being linked to extensive administrative data on nursing home admissions, health, and socio-economic status. We find that a nursing home admission leads to a small, temporary increase in loneliness, the risk of anxiety and depression, and a loss of control over one's life. However, these scores revert to pre-admission levels after six months. These findings may contribute to better-informed individual-level and policy decisions about potential nursing home entry and aging-in-place policies.

Keywords

Nursing home admission; well-being; loneliness; anxiety and depression; control over one's life; ageing

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1. Introduction

A large share of older people spends their last years of life in a nursing home. For example, the life-time probability of being admitted to a nursing home is 56% for the US population aged 57-61 (Hurd et al., 2017) and 52% for the Dutch population aged 70 (Wouterse et al., 2021). The choice to permanently move to a nursing home is an important one. The motivation for moving to a nursing home (or for staying home) is often guided by concerns about the impact of the move on the resident's well-being. However, insight in the well-being of older people in these nursing homes is scarce and suffers from selection bias. This lack of evidence, combined with widespread apprehension about spending the last stage of life in the nursing home, means that heuristics and perceptions of the general public might not only affect the individual decision to move to a nursing home, but also policy measures regarding the financing and organization of nursing home care and substitute services such as home care and informal care. These heuristics may be shaped by what people know about nursing homes, but also by attributing problems that many older people face at the end of the life to the nursing home admission. Proper identification of the cause of problems may yield better-informed decisions, at both the individual and the societal level.

In this study we provide insight into several domains of well-being of older people in the months before and after a permanent nursing home admission. Thus, we seek empirical evidence that confirms – or contradicts – two of the most well-known but under-substantiated stylized facts about nursing homes and well-being: i) nursing home residents are worse off than the not-yet-admitted; ii) nursing home residents “give up” on life once admitted.

We seek evidence for these widely held beliefs by comparing aspects of well-being of comparable individuals who are either observed right before or after being admitted to a nursing home. Specifically, we estimate an event study model using Dutch survey data and extensive administrative data that is linked at the individual level for 10 cohorts of older people who were admitted to a nursing home permanently. By focusing on individuals who will enter or have entered a nursing home, we do not have to rely on a comparison with -often highly different- individuals who remain in the non-institutionalized population. To explore and ensure the comparability of the survey respondents (about to be) admitted to a nursing home, we estimate the impact of a nursing home admission using a combination of inverse probability weighting based on a wide range of health, socio-economic and demographic background information from administrative data and an event study method for repeated cross-sections (Callaway & Sant'Anna, 2020).

A nursing home admission may be related to changes in well-being in many ways. The admission itself may be highly stressful (Grenade & Boldy, 2008), and the move to a nursing home may for example lead

to a decrease in contact with friends and family members (Port et al., 2001). Moreover, a nursing home is a total institution (Goffman, 2009), which means that residents need to relinquish control of many aspects of their everyday lives and may thus experience – or at least perceive – a loss of control and of their identity. It may also lead to inactivity and passivity, as various tasks (e.g., cleaning, preparing meals) no longer have to be carried out. Dutch nursing home residents for example tend to spend their days inactive (Den Ouden et al., 2015), while participation in activities could aid in maintaining physical health (Grönstedt et al., 2013) and well-being (Buedo-Guirado et al., 2020). This may mean that the health or well-being of older people deteriorates faster after nursing home admission. However, nursing home admissions are also expected to have positive effects on dependent older people. Nursing homes provide individuals a safe environment, offering various types of care and social activities, which are valued by residents (van Campen & Verbeek-Oudijk, 2017). Moreover, a nursing home facilitates being in contact with peers. Because these positive effects might in part cancel out with the negative effects, the relation between a nursing home admission and well-being is an empirical question.

The decision to move to a nursing home permanently is even more important to study because it is a decision that is made under constraints, for example regarding the information available about one's options and their impact on the outcomes. Moreover, the decision may be constrained by the availability of and eligibility for public subsidies for nursing homes and substitute services such as home care and by constraints related to the amount of informal care that family members are able and willing to provide. Additionally, there may be time pressure. Hence, understanding the impact of the move is important.

Many older people have a choice to move to a nursing home – and decide about the timing of the move – or to stay home with the help of home care (and informal care from family members and others). In the Netherlands, both nursing homes and home care are funded through social insurance and accessible to everyone. The idea that many older people make a deliberate choice is reinforced by the observation that people do not move to a nursing home immediately after they become eligible, and some never move there at all (Bakx et al. 2020a, Tenand et al. 2020). Moreover, a sizeable share of people recovers at home using home care after a hospitalization for a severe health problem such as a stroke or a hip fracture (Van den Burg et al. 2020; Rellstab et al. 2020). This finding shows that even people with a sudden increase in their need for long-term care may choose to avoid a nursing home admission and use intensive home care instead.

The paper is related to two strands of the literature. First, it is related to studies on the association between a nursing home admission and elements related to well-being like loneliness or experienced happiness (e.g. Prieto-Flores et al., 2011; Böckerman et al., 2012; Kok et al. 2015; Olsen et al. 2016; Rapp et al., 2017; van

Campan et al., 2018). The results in this literature are mixed, and they are likely to suffer from selection bias. As Young et al. (2017) point out based on a systematic literature review, these studies rely on comparisons between nursing home residents and older people living in the community. Since individuals with poor health and limited social networks are more likely to move to a nursing home, these results do not represent causal effects.

The second group of studies examines how a nursing home admission affects health care use and mortality outcomes. Kim and Lim (2015) use South Korean data to study the impact of subsidies for long-term care on informal care and medical care expenditures and find that for highly disabled individuals, substituting home care for nursing home care increases medical expenditures. Werner et al. (2019) estimate the differences in health care expenditures and mortality among US individuals who opt for either home care or nursing home care after a hospital discharge. In contrast to Kim and Lim (2015), they find that nursing home admissions lower hospital readmissions and expenditures, increase total health expenditures and have no impact on mortality. Lastly, Bakx et al. (2020a) find that being eligible for a nursing home admission in the Netherlands does not affect total health and long-term care expenditures nor mortality but leads to a reduction in medical care expenditures.¹

This paper contributes to the literature in two ways. First, we compare the well-being of individuals about to be admitted to a nursing home to the well-being of nursing home residents, and we make individuals comparable before nursing home admission with inverse probability weighting on detailed health, socio-economic, and demographic dimensions using rich administrative data. This allows us to move closer to estimating causal effects of a nursing home admission on well-being than the first strand of the literature listed above. Second, by focusing on aspects of well-being, we examine a different outcome than previous studies on the effect of a nursing home admissions. As preserving quality of life is among the most important aims of long-term care, this is a relevant outcome that has been understudied so far.

We find that a nursing home admission leads to a temporary increase in loneliness and in the risk of experiencing anxiety or depression, and to a loss of control over one's life. But after 6 months, the scores on these aspects of mental well-being restore to pre-admission levels suggesting that, apart from a transitory adaptation period, they are not affected by a nursing home admission. These findings go against the commonly held beliefs that nursing home inhabitants are worse off than the not-yet admitted, and that nursing home residents give up on life. This may be because end-of-life problems are conflated with the

¹ In addition, several related studies from England examine the impact of long-term care expenditures on outcomes such as hospitalizations (Crawford et al. 2021) and quality of life (Forder et al. 2018).

effect of a nursing home entry: well-being declines towards the end of life and this decrease coincides with a nursing home stay for many. We show that several well-being related outcomes are already at a low level before entering a nursing home and therefore not caused by the nursing home entry. Our findings may be used for better-informed decisions about a potential nursing home entry on the individual level. We do not find evidence for the premise that well-being of older people is necessarily higher at home than in the nursing home. Hence, preserving the well-being of older people might not be a good argument for further aging in place policies that encourage older people to postpone an admission, at least not for the aspects of well-being this paper focused on and given the current Dutch eligibility rules.

2. Nursing home care in the Netherlands

Nursing homes in the Netherlands provide around-the-clock support and care in an adapted and protective environment. In addition to permanent nursing home care, there are two types of short-term institutional care – post-acute care and hospice care – but these are targeted at other, well-defined groups of older people and are outside the scope of this study.² The main alternative to nursing home care is home care, which may enable older people to live at home and participate in society despite their limitations.

There are few financial or other barriers to access to long-term care in the Netherlands because virtually all long-term care – both home care and institutional care – is financed publicly through schemes that are universal and provide comprehensive coverage. The Netherlands is one of the largest public spenders on long-term care worldwide; in 2019 total long-term care spending accounted for 3.7% of the Dutch GDP (OECD, 2021). Public LTC insurance covers the costs of the care, the facilities, and room and board for nursing home residents. Co-payments for institutional care cover only 8 percent of total expenditures (2019 level, Rijksoverheid 2020), co-payments for home care are either zero or a flat-rate monthly fee of at most 17.50 euro (2019 level – Bakx et al., 2020b).

The use of publicly financed institutional care is rationed through an independent needs assessment. An independent agency assesses the eligibility for institutional care using centrally set, objective eligibility criteria (CIZ, 2018). Assessors decide which type and what volume of care one is entitled to receive. This care entitlement is expressed as a care package.³ Residents have the option to participate in recreative, social

² Furthermore, in the past there used to be a distinction between residential care homes and nursing homes, where residential care homes catered to older people with less severe limitations than nursing homes. This distinction disappeared after 2010. As the eligibility criteria became stricter many residential care homes closed or merged with nursing homes (Verbeek-Oudijk & Van Campen, 2017). In the study period, nursing homes accounted for the vast majority of the admissions.

³ There are ten different care packages: 1) sheltered living environment with support, 2) sheltered living environment with support and care, 3) sheltered living environment with support and comprehensive care, 4) sheltered living environment with intensive support and comprehensive care, 5) protected living environment with intensive dementia

and cultural activities if they are offered (Zorginstituut Nederland, 2020).⁴ These activities can, for example, be sports, singing, crafting or playing games (Thuis in het verpleeghuis, 2020), and may contribute to the well-being of the residents. Nursing homes are contracted through regional single payers who each have a budget based on historical use. While this budget is binding, waiting lists are virtually absent during the study period (see e.g. CVZ, 2013).

3. Data

3.1 Linked survey and administrative data

We use data from the Dutch Health Monitors of 2012 and 2016 about several outcomes related to health and well-being of older people. The Health Monitor is a nationally representative survey conducted every four years starting from 2012 and consists of repeated cross-sections of the 18+ population of the Netherlands. The surveys are self-reported, there is no separate module for proxy-interviews, but people may have received help with answering the questions from friends or family members.

The data from the Health Monitor is linked at the individual level by Statistics Netherlands to Dutch administrative data using pseudonymized individual identifiers. We use administrative data about demographics (age, gender, marital status and household size), household income and wealth from the prior calendar year and, if applicable, the date of death of the respondent. Additionally, we link health-related information on the type and duration of nursing home stays, the amount of home care use prior to the nursing home admission, type and duration of hospitalizations (by International Shortlist for Hospital Morbidity Tabulation (ISHMT) categories), use of pre-admission prescription drugs⁵ (by Anatomical Therapeutic Chemical (ATC) classification code) and expenditures on GP care, hospital care, pharmaceuticals and total health care expenditures covered by mandatory social health insurance. A detailed overview of the used variables and datasets can be found in Appendix 1.

For all individuals, we create a panel consisting of 5 observations covering a 6-month time period, spanning from two time periods before admission up to three periods after admission.⁶ The panel is balanced for every variable except for the outcome variables from the survey, which are only observed once for every

care, 7) protected living environment with very intensive care, because of specific health conditions, with an emphasis on support, 6) protected living environment with intensive personal care and nursing, 8) protected living environment with very intensive care, because of specific health conditions, with an emphasis on personal care and nursing, 9) rehabilitative care and 10) terminal palliative care. Care package 9 is only registered in our dataset in the beginning of the study period due to changes in the way this care type is financed.

⁴ Municipalities organize and finance similar activities for individuals living at home.

⁵ We use the information prior to admission since the data on prescription drugs is only available for out-patient prescriptions.

⁶ We use calendar year information in case information is not available on a daily level (i.e. for information from the Tax Office, health insurance and medication use).

individual – in September 2012 or September 2016. As individuals are admitted to the nursing home at different points in time, we observe the outcomes for some respondents before nursing home admission, and for some after the nursing home admission.

3.2 Outcome measures

We use five outcome measures representing different aspects of well-being that might be affected by a nursing home admission: loneliness, subdivided in social loneliness and emotional loneliness, the risk of experiencing depression and anxiety and experienced inadequate control over one's life (only available in the 2016 survey). Appendix 2 lists the exact definitions of these measures. While the measures do not capture overall well-being, they are related to certain dimensions of quality of life (Eurostat, 2017) and considered relevant by older people themselves (Hackert et al., 2019) and listed as outcomes in the Dutch national guideline for dementia care (Huijsman et al. 2020). Furthermore, they are likely to be affected directly by a “total institution” such as a nursing home (Goffman, 2009).

3.3 Sample selection

We restrict the sample to respondents aged 75 and over for whom information regarding at least one of the well-being measures is available. To observe well-being in the months before or after the nursing home admission in the Health Monitor, we focus on respondents who were interviewed in 2012 and admitted to a nursing home between March 2011 and September 2013 (referred to as the 2012 respondents) or interviewed in 2016 and admitted to a nursing home between March 2015 and September 2017 (the 2016 respondents).

We only include individuals whose nursing home stay lasted at least 365 days because this solves two issues. First, this restriction ensures that the respondents observed in the period after nursing home admission are still residing in a nursing home when answering the survey. Second, by restricting our sample to long-stay nursing home admissions we make the earlier groups (individuals observed before admission) more comparable to the later ones (individuals already residing in a nursing home for several months). Individuals who will only make use of nursing home care for a short period because of either very good or very poor health are excluded from the not-yet-admitted groups using this selection criteria. The restriction also implies that individuals who die within one year after admission are not considered. About 30% of the individuals who are admitted to a nursing home in the study period die within a year after the admission. This implies that the results are only valid for people who have a low probability of dying within a year. The reasons for and implications of this restriction are discussed in more detail in the methods section.

3.4 Descriptive statistics

Descriptive statistics reveal that the study sample is old (85 years on average) and that the large majority is female and living alone in the months preceding the nursing home admission (Table 1). Moreover, they are in poor health and frail: a large share of them had an inpatient hospitalization in the 6-month period prior to the nursing home admission and the majority uses medication to treat a chronic illness. Pre-admission levels in the outcome variables reveal that issues related to their well-being are common (Figure 2). Appendix 3 reveals that low scores on outcomes related to well-being occurs much more frequently among the old (aged 70+) than among younger population groups, but that these scores do not necessarily decrease in the months prior to death.

4. Methods

We use an event study framework for cross-sections to compare well-being of respondents who are interviewed up to 1 year before a nursing home admission to respondents who have lived in a nursing home for up to 1.5 years (Callaway & Sant'Anna, 2020). Our approach consists of two main steps. First, we take advantage of the administrative data to make groups of respondents that are admitted to a nursing home in five different periods of time comparable in health, socio-economic and demographic characteristics one period before their own nursing home admission with inverse probability weighting. Second, we use an event study model to determine the impact of a nursing home admission on several domains of well-being among these comparable individuals who have been admitted to a nursing home at different calendar times, and hence have filled out the survey on health and well-being measures in different event times.

To group respondents in our analysis, we rely on two different time dimensions: 1) calendar time T_k , or the k^{th} six-month period away from the survey;⁷ and 2) event time s_q , or the q^{th} six-month period away from a nursing home admission. Both calendar and event time are measured in six-month intervals. We assign the survey respondents into five groups⁸ based on the time since or until nursing home admission when answering the survey. Figure 1 provides a visual representation of the construction of the different groups based on the timing of the survey and the nursing home admission, and it shows how calendar time and event time relate in our set-up for the example of the 2012 survey. The same structure applies for the 2016 survey. The classification of respondents into groups is as follows: Group 1 contains respondents who were

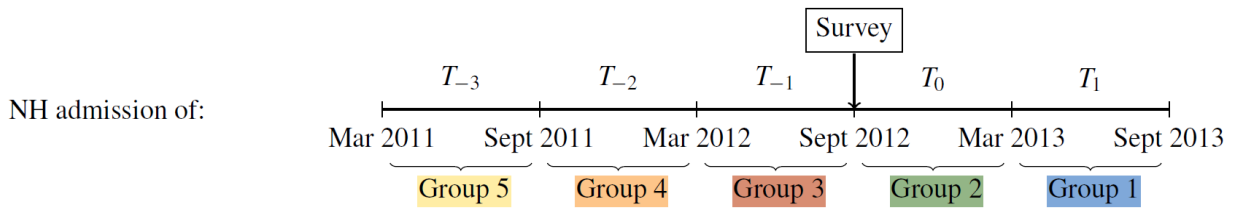
⁷ Invitations for the questionnaires were sent out by the Community Health Services in the fall of the interview year, not earlier than September 1st. Data was gathered between September and November in 2012 and September and December in 2016 (GGD, 2012; GGD-GHOR, 2016). We use 1 September as the reference date when calculating the time between the nursing home admission and finishing the survey.

⁸ We opt for five groups as a compromise between data points and observations: as few individuals are observed after nursing home admission, we are unable to focus on smaller time frames (e.g., 3 months periods).

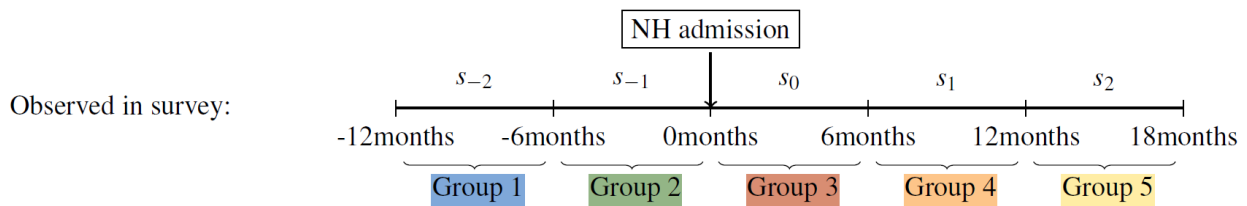
interviewed 6-12 months before their nursing home admission (in event time s_{-2}) and who are admitted to the nursing home 6-12 months after the survey has taken place (in calendar time T_1 , meaning between March and September 2013). Group 2 contains respondents interviewed 0-6 months before the nursing home admission (in s_{-1}) which means they are admitted to the nursing home 0-6 months after the survey (in T_0). The same approach is followed for the other groups.⁹

Figure 1: Data structure

Panel a) Calendar time: time away from the survey T_k



Panel b) Event time: time away from nursing home admission s_d



Note: Panel a) illustrates that observations are grouped by the timing of their nursing home (NH) admission relative to the timing of the survey. As the survey is conducted at one point in calendar time for everyone (September 2012), the grouping depends on the calendar time of the nursing home admission. For example, group 4 consists of all survey respondents who were admitted to a nursing home between September 2011 and February 2012. Panel b) illustrates at which event time the groups are observed in the survey, where event time is defined as time away from the nursing home admission. For example, group 4 is observed in the survey one period after the nursing home admission. One period corresponds to a six-month time span. The Figure depicts the situation for the respondents of the 2012 Health Monitor survey. The same structure applies for the 2016 respondents.

This classification of individuals in five groups based on the time relative to nursing home admission results in five cross sections. Since we do not observe the self-reported outcomes over time, one may be concerned that individuals admitted to a nursing home in the beginning of the time span may have different well-being levels before being admitted to a nursing home than individuals admitted at the very end. To address this concern, we use the extensive information available in the administrative data summarized in a propensity score that is aimed at making all individuals comparable one period before their respective nursing home

⁹ Appendix 4 provides the exact dates used for the classification of the groups of respondents.

admissions. To be able to use all relevant variables in the propensity score model and to make the groups comparable at admission on as many dimensions as possible, we estimate the propensity scores for the entire Dutch population that was admitted to a nursing home for at least 365 consecutive days in the period when the survey respondents we analyze were admitted to a nursing home (between T_{-3} and T_1).

For this population, we estimate the propensity of being admitted to a nursing home in the period when the first group, group 5, is admitted to a nursing home, in calendar time T_{-3} . Hence, we estimate the probability of belonging to group 5 using a logit model for both the 2012 and the 2016 survey separately (Equation 1):¹⁰

$$P(NH_{T_{-3},g}) = \Lambda(X_{T_{-4},g}\beta_g + \varepsilon_g), \text{ for } g \in \{2012, 2016\} \quad (1)$$

The control variables X contain information about health status and care need, availability of nursing home care substitutes, and socioeconomic status from the administrative data one period before the admission of the first group, T_{-4} . Appendix 5 lists all variables that are included in X . Thus, the propensity score model captures the probability of being admitted to a nursing home at the same time as group 5, given a complete set of time-variant determinants of nursing home care use (de Meijer et al. 2009, 2013) – the individual’s health status and care need, availability of care substitutes and socioeconomic status – in the six months preceding the admission of the first admitted group.

Subsequently, we use the coefficients of this propensity score model to predict the probability of being admitted *in event time* s_0 , the period of the own nursing home admission, for the subsample that answered to the Health Monitor surveys (Equation 2) using information from the 6 months prior to their actual nursing home admission (s_{-1}).

$$\hat{P}(NH_{s_0,g}) = \hat{p}(X_{s_{-1},g}) = \Lambda(X_{s_{-1},g}\widehat{\beta}_g), \text{ for } g \in \{2012, 2016\} \quad (2)$$

As the propensity score model is based on predictors from administrative data, we observe all the inputs into the propensity score models at different points in calendar and event time. This allows us to predict the propensity score for all individuals based on information 6 months prior to their actual nursing home admission (instead of their characteristics before group 5 was admitted in T_{-3}), implying that we make groups comparable one period before their own admissions. This procedure corrects for any underlying

¹⁰ We estimate separate propensity scores for the 2012 and 2016 samples, as a long-term care reform in 2015 may have changed the availability of home care, among other things; and because the reform changed the way the data is recorded.

health, socio-economic or demographic differences between the groups 1-5 at the same event time (instead of calendar time). Appendix Table A7.1 shows a comparison of the weighted and unweighted samples. At the same time, applying $\widehat{\beta}_g$, estimated when predicting the probability of being admitted in the first group, in the prediction of the propensity scores in (2) ensures that any policy changes between the admission of group 5 and 1 that would change the coefficients in Equation (1) do not influence the estimates as we apply the policy regime of T_{-3} to all groups.¹¹

In the final step, we use the propensity scores in a doubly robust approach: we regress the well-being scores Y_{i,T_0} on time away from the nursing home admission s_q while including control variables (Equation 3) and applying the inverse probability weights using the estimated propensity scores from Equation (2).

$$Y_{i,T_0} = \alpha + \sum_{q=-2}^2 \delta_q s_q + \gamma_1 age_{i,s_0} + \gamma_2 male_i + \gamma_3 married_{i,T_0} + \gamma_4 medication_{i,s_{-1}} + \gamma_5 eligibility_{i,s_0} + \gamma_6 hospitalization_{i,s_0} + v_{i,T_0} \quad (3)$$

We control for the following variables that may be correlated with both time away from nursing home admission and well-being: age at admission, gender, being married at the time of the survey T_0 , having been hospitalized at admission s_0 , the type of nursing home care that the person is eligible for at admission s_0 , and, to serve as a proxy for chronic health problems, indicators for taking antithrombotics (ATC B01), diabetes related drugs (ATC A10), drugs for obstructive airway diseases (ATC R03), and medication to treat acid-related disorders (ATC A02)¹² in the 6 months prior to admission s_{-1} .¹³ In this step, we pool the 2012 and 2016 survey samples, as both samples are highly comparable in terms of pre-admission characteristics after weighting. Appendix 11 shows the results separately by survey year.

¹¹ For example, if a person had to have a greater need for care to be eligible for a nursing home in 2013 than in 2011 and we compare well-being after admission for both groups, the well-being of the 2011 group may be higher because they are on average in better health. The inverse probability weights will correct for this policy-induced well-being differences by giving more weight to people who are admitted in 2013 who are similar to the people who were admitted in 2011.

¹² These are among the most used prescription drugs among Dutch older people and are for treatment of chronic illnesses. Hence, people who use one of these drugs have usually used them over a longer period.

¹³ Since the survey sample is relatively small, we do not include all variables from the propensity score estimation in the main analysis.

4.1 Identifying assumptions

To understand to what extent coefficients δ_q from Equation 3 measure the causal effect of a nursing home admission and what are the threats to this interpretation, we discuss five identifying assumptions (Callaway & Sant'Anna 2020).¹⁴

A1: Irreversibility of the treatment. This assumption implies that once an individual is admitted, the individual will continue to live in the nursing home. The intuition behind this assumption is that otherwise, the impact of the admission may be conflated with the impact of the nursing home discharge or differences in composition between the groups because of selective mortality. In our analysis, we ensure that this assumption is satisfied by limiting our sample to people who are (about to be) admitted for a permanent nursing home stay rather than short stays in nursing homes for rehabilitative purposes. That is, we only select people whose stay lasts at least one year. This restriction, which here means having a balanced panel in the panel event study case, and is commonly imposed, comes at an obvious cost: it means that we are presenting results for the selected group of older people who are about to move to a nursing home and who do not die until a year after. Therefore, the relationship we find in this sample may not be generalized to those for whom it is highly unlikely to ever move to a nursing home, e.g. because of their preferences or their health status; or for the very sick who have a very limited life expectancy at the time of admission. In a robustness test, we limit the study sample further by excluding all long-term admissions that started for rehabilitation purposes¹⁵ and by focusing on those respondents staying for at least 180 days.

A2: No compositional changes over time. This assumption applies to the case of repeated cross-sections only. It ensures that observed changes in well-being are driven by time away from the nursing home admission rather than group composition. The differences in observable characteristics between the groups at admission are small in the unweighted sample, and even smaller after the propensity scores weighting (Table 1 & Appendix 7). While the sample selection and the inverse probability weighting do not fully rule out that there may be differences in unobservables, we believe that the set of observable characteristics in the administrative data covers all relevant domains. Nursing home care use is determined by a combination of characteristics related to health, functional limitations, demographics, socio-economic status, the availability of alternatives (de Meijer et al. 2009, 2013) and all these are covered.¹⁶ Moreover, we have

¹⁴ Note that the numbering of assumptions does not coincide entirely with the numbering in Callaway and Sant'Anna (2020), as their assumptions cover more than one possible empirical set-up.

¹⁵ Our preferred specification is to only restrict on length of stay, as there may also be other nursing home residents whose purpose of stay is not rehabilitative but who expect to stay in the nursing home only for a very short period.

¹⁶ Time-invariant characteristics such as preferences regarding home care versus nursing home care are taken care of by the selection of the study population, who eventually all move to a nursing home.

arguably reduced differences in preferences considerably by only selecting people who end up being admitted within the same 2.5-year time frame.

A3: Limited treatment anticipation. This assumption implies that respondents do not have complete control over when they are admitted to the nursing home. Most individuals in our sample are probably aware of the approaching nursing home admission and the fact that it is likely permanent. Indeed, many of them have applied for nursing home eligibility. However, while people in our sample do anticipate a nursing home admission, it is unlikely that they are able to anticipate – let alone determine – the exact timing of the admission. In the Netherlands, eligibility for nursing home care does not imply immediate admission, because of a combination of demand-side factors and supply-side factors. For instance, while waiting lists are virtually non-existent at the regional level, a place in the preferred nursing home may not be available right away. There is quite some variation in the time between the eligibility decision and the admission within groups with similar health, limitations, and other characteristics (Bakx et al. 2020a, Tenand et al. 2020).¹⁷

A4: Conditional parallel trends based on not-yet treated groups. The intuition behind this assumption is that individuals in each of the groups are on similar well-being trajectories in the periods before the admission. In most event study frameworks, evidence for the common trend assumption is provided by showing that pre-trends are zero. Since the parallel trend assumption relies on non-realized potential outcomes, this procedure is no formal evidence for parallel trends but rather an indication that the assumption is plausible. With cross-sectional data, it is even more difficult to provide evidence on the plausibility of this assumption than with panel data, as we only observe outcomes of all groups once. Hence, we cannot show levels or trends in outcomes before the nursing home admission for all groups. The usual test of zero pre-trends is therefore less informative with cross-sectional data, as it only implies that the level in well-being of group 1 in period s_2 is similar to the level of well-being of group 2 in period s_1 , but it does not convey any information on whether the groups have parallel trends in outcomes before the treatment. Conversely, a non-zero pre-trend may still be compatible with A4 if all groups experience a similar non-zero pre-trend in the (unobserved) outcome. Instead, we take advantage of the rich administrative data to show trends in care use before nursing home admission. Trends in home care use, hours of home care use, health care expenditures and

¹⁷ Furthermore, the group of nursing home residents who were admitted for post-acute rehabilitative care may not have anticipated the admission as much as the rest of the sample. In addition, they may not have anticipated that the admission ended up being permanent. While this group is too small to study it separately, we have excluded it from the sample in a robustness check that is presented in Section 6.1.

hospitalizations before a nursing home admission are similar for each of the groups (Figure 2 and Appendix 8). These may be indicative of underlying trends in related domains of health and well-being.

A5: Common support for propensity scores. To ensure that the groups are comparable, we exclude people whose propensity score is outside the common support. That is, we exclude 120 observations from the 2012 sample and 61 observations from the 2016 sample for whom the probability of an admission is so high or so low that there are no comparable people in the other groups.

5. Results

5.1 The propensity of a long-stay nursing home admission

Being eligible for LTC is the strongest predictor for a long-stay nursing home admission, according to the propensity score models (Table A6.1). Additionally, higher age and intensity of home care receipt predict an admission. After excluding the observations outside the common support of the propensity scores, our final sample consists of 2,255 respondents. For these observations, the propensity score distributions of the different groups largely overlap (see Figure A6.1). The overlap implies that – within this population and given the control variables – it is ‘as good as randomized’ who enters the nursing in the first six-month period and who enters later.

5.2 Stability of group composition and parallel trends

The propensity scores are used to make our sample of health-survey respondents comparable to each other. Table 1 presents a subset of pre-admission characteristics for all five groups after weighting our data. The full balancing tables before and after weighting of our data can be found in Appendix 7. The five groups are largely comparable in demographics, health, and care need. The only meaningful difference detected is that Group 1 is less likely to be eligible for nursing home care from care package 9 than Group 5.¹⁸ We test the robustness of our results to excluding this group in one of our robustness checks. This high comparability between the groups is evidence that we are likely to satisfy assumption 2, no compositional changes across groups.

¹⁸ This difference can be explained by a minor change in the long-term care system for the small group of people eligible for care package 9.

Table 1: Balancing table pooled sample before nursing home admission (weighted)

Health Monitor 2012+2016, weighted	Group 1	Group 2	Group 3	Group 4	Group 5
	Mean	Mean	Mean	Mean	Mean
Age in s_0	85.9	85.6	85.6	85.2	84.9
Male	0.33	0.32	0.30	0.27	0.33
Living with partner in s_{-1}	0.32	0.35	0.38	0.34	0.29
Eligible for care packages 1-4 in s_0	0.33	0.35	0.32	0.32	0.35
Eligible for care packages 5&7 in s_0	0.39	0.39	0.29	0.35	0.29
Eligible for care packages 6&8 in s_0	0.24	0.17	0.21	0.14	0.20
Eligible for care package 9 in s_0	0.04*	0.09	0.18	0.20	0.16
Hospitalization in s_0	0.39	0.43	0.51	0.38	0.34
Antithrombotics in s_{-1}	0.58	0.57	0.54	0.58	0.58
Drugs for acid-related disorders in s_{-1}	0.52	0.51	0.56	0.52	0.57
Drugs for obstructive airway diseases in s_{-1}	0.18	0.15	0.18	0.19	0.11
Drugs for diabetes in s_{-1}	0.20	0.19	0.25	0.26	0.26
<i>Observations</i>	1,048	729	187	168	123

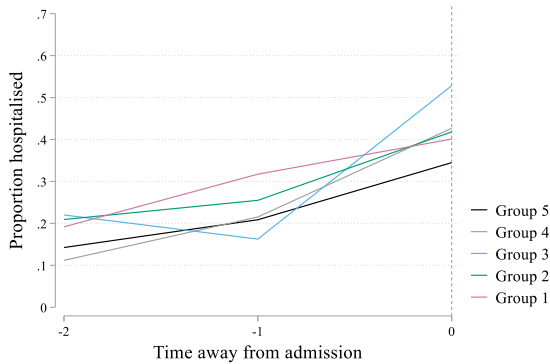
Note: Differences between groups are calculated using standardized differences between group 5 and one of the other groups, * standardized difference > 0.25 following the threshold of Stuart et al (2013). Event time s_0 refers to the period of the nursing home admission, and s_{-1} to the six-month period before nursing home admission. We distinguish between four types of nursing home care eligibility grouping similar care packages. The care packages are explained in Footnote 3.

To inspect the plausibility of assumption 4, conditional parallel trends of the not-yet-treated, we plot for all groups pre-admission trends of health care use which are indicative of how respondents' health changed during this period. Figure 2 shows the pre-admission average shares of hospitalization for each of the groups. Before nursing home admission, the groups follow similar trends in terms of hospitalizations. Pre-admission trends concerning home care use and health care expenditures are reported in Appendix 8. These analyses indicate that all groups follow similar trends in terms of health care expenditures. Moreover, for the 2012 Health Monitor sample, the proportion of home care users before admission is roughly similar among the five groups of respondents, although average home care hours slightly increase for every subsequent group.¹⁹ Finding parallel trends in health care use before nursing home admissions provides evidence for the assumption that the groups follow similar health and well-being trajectories.

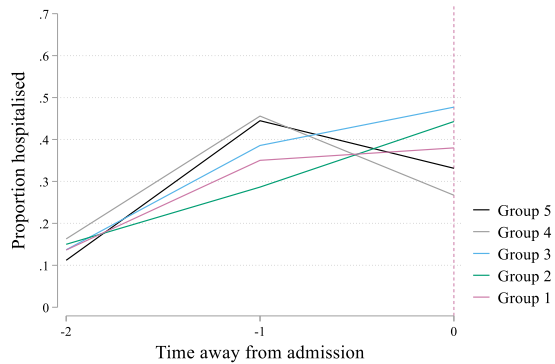
¹⁹ We do not report home care trends for the 2016 sample. In 2015 the organization of home care (and hence the data collection) changed as a result of a large LTC reform, which limits the comparability of home care data in different pre-admission years for this subsample.

Figure 2: Proportion of individuals within cohort making use of hospital care within 6-month intervals before nursing home admission

Panel A: 2012 sample



Panel B: 2016 sample

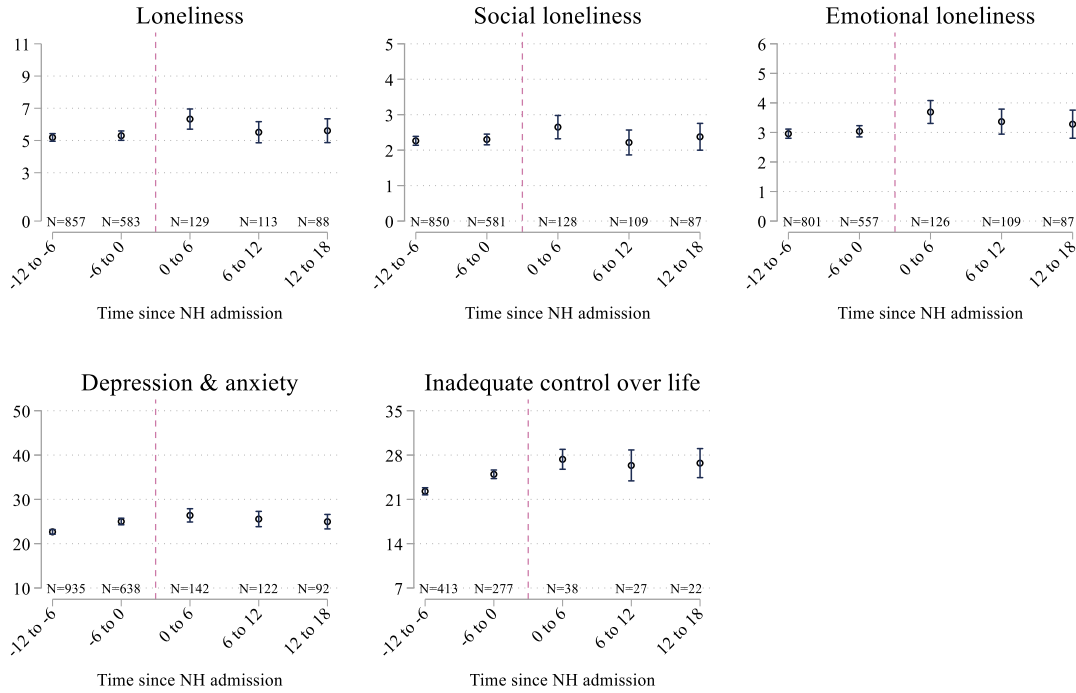


5.3 Raw differences in domains of well-being before and after nursing home admission

To explore how nursing home entry is associated with different domains of well-being, we plot the weighted scores for the respondents in Figure 3. The levels indicate that many respondents are dealing with well-being issues. Focusing on loneliness, individuals are considered lonely in case they score at least a 3 on the (emotional or social) loneliness scale. The general loneliness score can be further disentangled into moderate loneliness (score 3-8) and severe loneliness (9-11) (van Tilburg & de Jong Gierveld, 1999). The average loneliness score is above 5 in all groups, suggesting many of the observed individuals are experiencing loneliness, both before and after nursing home admission. Moreover, respondents on average score above the cut-off of >22 indicating inadequate control over one's life (Pearlin & Schooler 1978; RIVM, 2021a). For the depression and anxiety scores, cut-offs are defined at >15 for moderate risk and >30 for high risk (Kessler et al., 2002; RIVM, 2021b). The average respondent in our sample, falls within the range of experiencing moderate risk.

The differences in the scores across the five groups indicate that the changes in the aspects of well-being measured by these indicators are limited for all outcomes except for inadequate control of one's life, which shows an increased sense of loss of control for cohorts in the nursing home. For the other outcomes, all scores are slightly higher among the group that is just admitted to a nursing home compared to the group interviewed in the months before the admission. However, for respondents who have been in the nursing home for a longer time, scores are on average slightly lower again. The scores hence seem to gradually restore to the pre-admission levels.

Figure 3: Outcomes by time since nursing home entry (2012 & 2016 pooled¹)



Notes: Bars indicate 95% confidence intervals. Results are weighted such that the cohorts are comparable at nursing home (NH) admission. The underlying values are presented in Appendix 9.
 1. For inadequate control over life data relies on 2016 sample only.

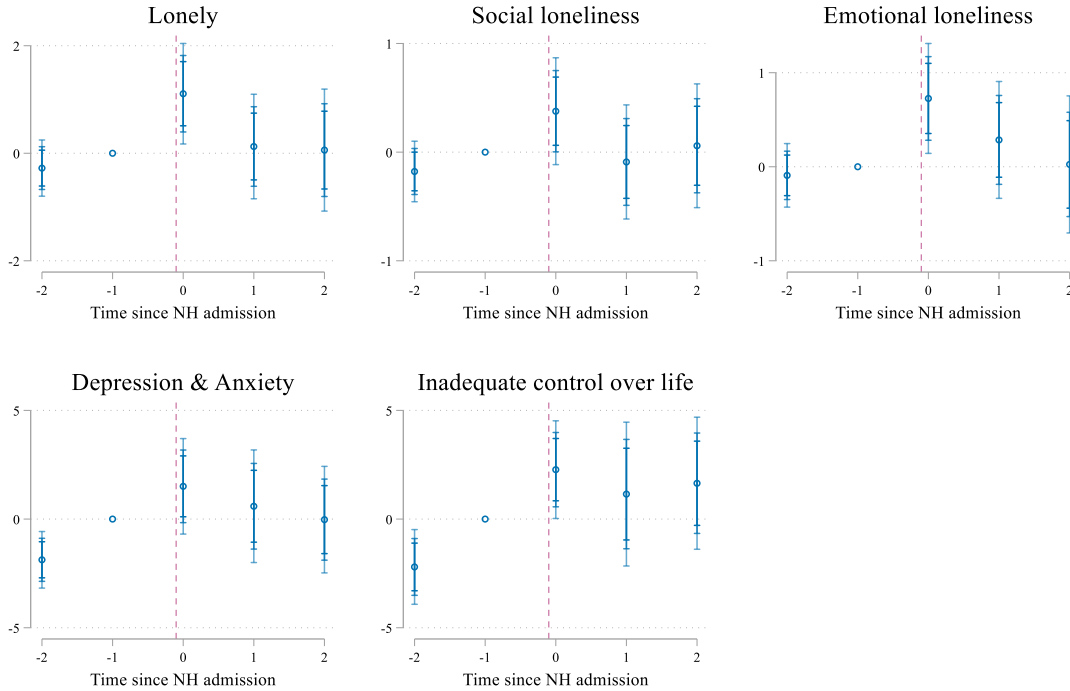
5.4 Doubly robust approach

Figure 4 presents $\widehat{\delta}_q$, the coefficients for the indicator for the time relative to the nursing home admission (with event time -1, or group 2, as the reference category) for the pooled sample. The regression analyses confirm the results from the descriptive analysis. Before the nursing home admission, we find stable scores for the different measures of loneliness. By contrast, we observe a small increase in the risk of anxiety and depression and an increased loss of control before the admission. While these scores represent deteriorating well-being before the nursing home admission, they do not necessarily invalidate assumption 3 of limited treatment anticipation. Experiencing increasing levels of anxiety and loss of control at home does not necessarily mean that one can anticipate the exact timing of the admission or know whether the move will be permanent. It may also have other causes, including concerns about one's health or cognition. Additionally, as discussed in the methods-section, observing pre-trends does not necessarily invalidate assumption 4 of conditional parallel trends as long as all groups follow a similar trajectory.

The observed deteriorations in the estimates for the pre-treatment period do however suggest that if we would observe a further decline, this could not be ascribed to the nursing home admission. However, if anything, the results for the post-admission periods show that loss of control and the increase in anxiety

and depression, do not continue on the same trend as before, indicating that the deterioration in the outcomes stops around 6 months after someone is admitted to a nursing home.

Figure 4: Effect of a nursing home admission on aspects of mental well-being (pooled sample¹)



Note: Estimates of $\widehat{\delta}_q$ and their 90, 95, and 99 confidence intervals. Underlying estimates are presented in Appendix 10. ¹ For inadequate control over life, data is only available for the 2016 sample.

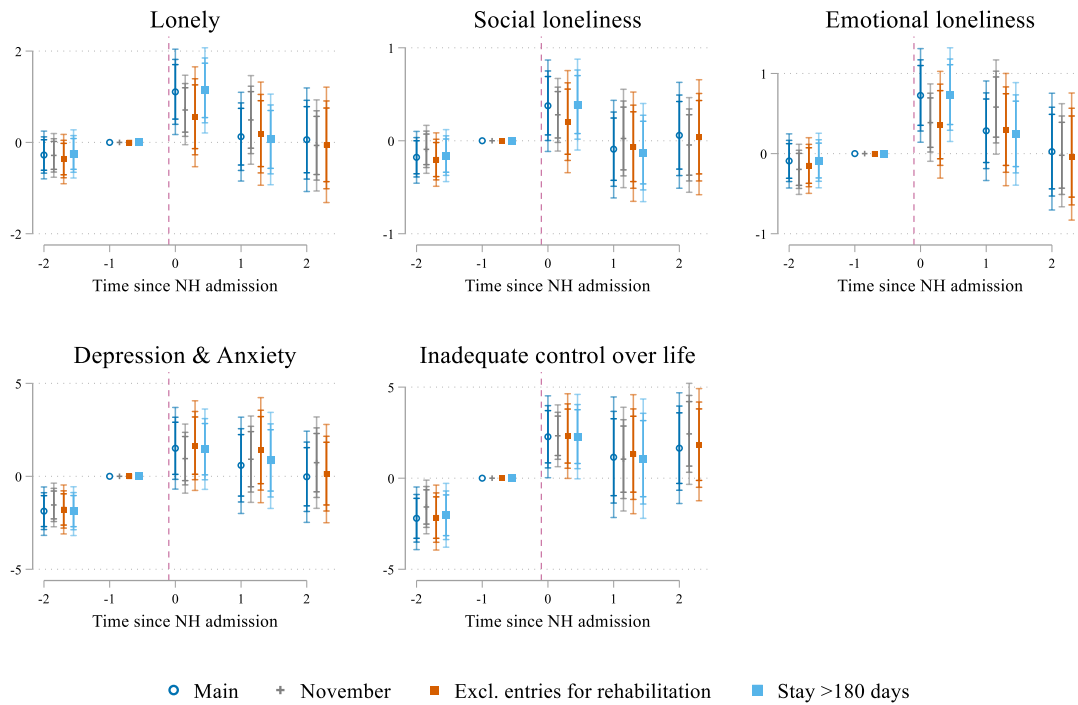
The increased scores after nursing home admission are often transient and small in magnitude. For example, while we observe increases in loneliness scores, the maximum increase of 1.1 in the period right after admission does not push the average individual over the threshold of experiencing severe loneliness. Similar results are present when considering risk of anxiety and depression and experienced control. The increase of 1.5 points pushes the average respondent slightly further above the threshold of inadequate control, but on average this threshold was already passed before the admission. The increase of 2.3 points in the risk of anxiety and depression similarly does not push the average individual into the high-risk category. Furthermore, the increasing trend for both the risk of anxiety and depression and loss of control stagnates once respondents are admitted to the nursing home for six months. While based on the used instruments there would still be room for further deteriorations, the admission seems to halt this process.

6. Robustness checks

6.1 Robustness to data and modeling choices

To test the robustness of our results to data and modeling choices, we have performed several checks. Figure 5 presents the results. First, we explore how the uncertainty regarding the exact moment that the survey was filled out affects the results by shifting the interview date from 1 September (the first date that the survey was sent out) to 1 November. This means that we change the assignment of the respondents to the five groups based on the timing of the survey relative to their interview. The results suggest that the uncertainty about the exact date the survey was filled out does not affect the interpretation of the results.

Figure 5: Robustness checks (pooled sample¹)



Note: Estimates of $\widehat{\delta}_q$ and their 90, 95, and 99 confidence intervals. The following results are presented: “Main” corresponding to the main results using the pooled sample, “November” when shifting the interview date from September 1st to November 1st, “Excl. entries for rehabilitation” pooled sample where individuals who entered the nursing home for rehabilitative purposes (care package 9) are excluded and “Stay >180 days” the pooled sample where all nursing home admissions lasting at least 180 days are kept. Underlying estimates are presented in Appendix 11. ¹ For inadequate control over life data relies on 2016 sample only.

Second, we exclude all individuals who entered a nursing home for rehabilitative stays (care package 9) to evaluate whether a stricter definition of a permanent nursing home stay affects our results. Moreover, due to a changing LTC regime, the share of individuals making use of this type of care differs between our groups. The results reveal that excluding this group, which is rather small, does not affect the results.

Third, we run our analyses when considering nursing home stays of at least 180 days instead of our restriction to 365 days. For this analysis we exclude individuals observed when already living for at least 12 months in a nursing home (Group 5), as we cannot ensure comparability of this group with the others anymore. Again, results look similar to the main outcomes.

Lastly, in Appendix 11 we present estimates (1) when running the analyses separately for the 2012 and 2016 sample and (2) when using logit models (with binary outcomes) instead of the OLS models used in the main analyses. For both checks the models yield results that are comparable to the results from the main analyses.

6.2 Physical health

As a second set of robustness tests, we investigate how physical health indicators change around a nursing home admission. Whereas it is not clear how the aspects of well-being studied in this article change around a nursing home admission, physical health is expected to continuously decline around a nursing home admission: the goal of an admission is not to improve a patient's health or their functioning but instead help them to cope with these limitations. The identification strategy makes individuals comparable in physical health in the six-month period before nursing home admission, and hence the decline in physical health should still be observable when applying the same methods. Analyzing changes in physical health is therefore a robustness test that shows if the model picks up an effect in a case when we would be fairly certain that there is one.

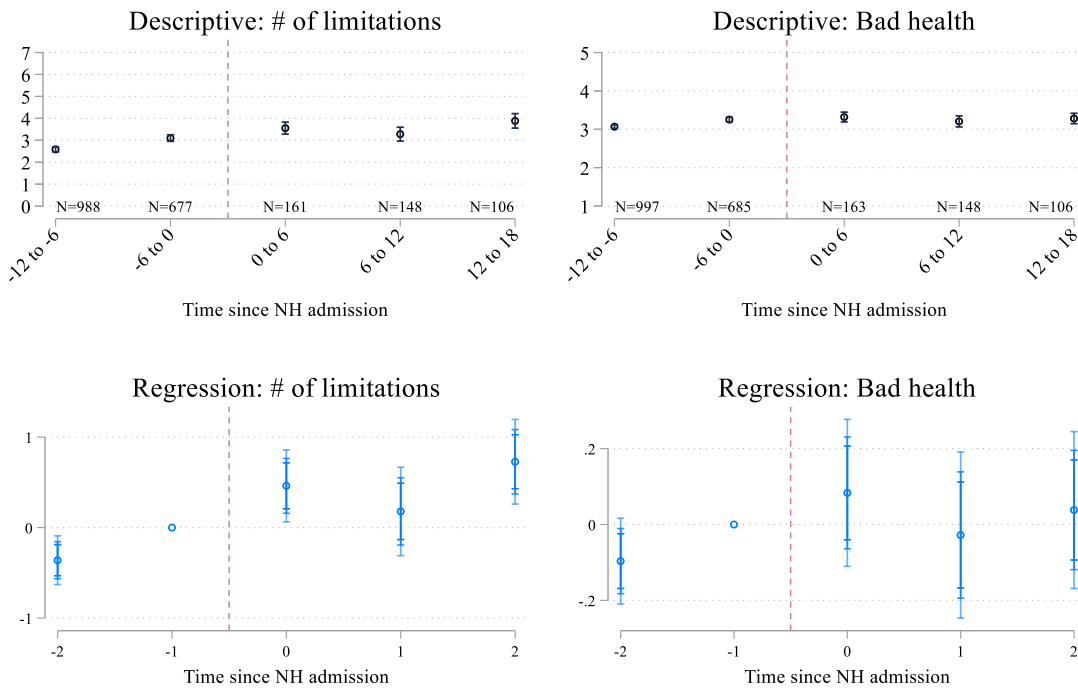
We test this using two measures of physical health: the number of functional limitations and self-reported health. The number of functional limitations is based on a 7-item list²⁰ of everyday life actions. For every action that the respondent is severely limited in or unable to perform, one point is added to the functional limitation score. The second measure consists of self-reported health, ranging from (1) very good to (5) very poor on a five-point scale.

We apply the same method as for the mental health measures and show descriptive and regression results in Figure 6. As expected, the number of functional limitations grows before and after a nursing home admission. Respondents have on average one additional limitation 1-1.5 years after the nursing home

²⁰ Listening to a conversation with 3 or more persons; having a conversation with one person; reading the small print of a newspaper; recognizing someone's face at a distance of 4 meters; carrying an item of 5kg for 10 meters; reaching for something on the ground; walking for 400 meters without standing still.

admission compared to the period before the admission. Self-reported health declines when approaching the nursing home admission and stays constant once admitted to the nursing home. It is unclear whether nursing home care offsets declines in self-reported health (despite increasing functional limitations), or whether this result is due to an adjustment in the anchoring scale of respondents once admitted.

Figure 6 Physical health changes around a nursing home admission



Note: The top shows descriptive statistics where the Y-axis of the figures represent the full range of the specific physical health scale. Bars indicate 95% confidence intervals. Results are weighted such that the cohorts are comparable at nursing home admission. The underlying values are presented in Appendix 9. The bottom shows estimates of $\widehat{\delta}_q$ and their 90, 95, and 99 confidence intervals. Underlying estimates are presented in Appendix 10.

It is reassuring that we find declines in physical health with our more objective measure indicating the number of physical limitations. This indicates that our identification strategy only makes individuals comparable right before admission (at event time s_{-1}), but it does not remove a physical health decline between cohorts. Moreover, these findings do not provide evidence for the commonly held belief that nursing home admissions are triggered by large health shocks, which may have an impact on the domains of well-being that we include as outcomes that is independent from the effect through a nursing home admission.

7. Discussion and conclusion

A nursing home admission is a major life event and preventing nursing home admissions is an important policy goal in many countries. Moreover, nursing homes are generally aimed at preserving the well-being of residents despite their functional limitations. Perceptions about quality of life in a nursing home by the general population may have a large effect on private decisions and on public policy, for example about long-term care financing. Hence, understanding the relationship between a nursing home admission and well-being of older people is crucial for improving nursing home policy. Yet, this evidence is thus far limited.

This paper compares outcomes on several measures related to well-being of people just before nursing home entry to those just after a permanent nursing home entry. We use the Dutch Health Monitor combined with Dutch administrative data on nursing home admissions and background characteristics to identify the timing of the survey interview compared to the nursing home admission. We make survey respondents comparable at the time of their nursing home admission following the approach proposed by Callaway and Sant’Anna (2020), thereby eliminating selection bias arising in studies that compare all nursing home residents to all older people in the community.

We find no changes in loneliness before the nursing home admission and only small, transient differences among respondents who have recently been admitted to a nursing home compared to those who have not yet been admitted. Furthermore, we find that the perceived control over one’s life and feelings of anxiety or depression were already on a decline. This decline continues in the period right after the admission but stabilizes thereafter. Together, these findings mean that we do not find evidence for the belief that nursing homes have a large negative effect on one’s well-being or that longer-term nursing home residents “give up” after the admission.

This study uses unique linked survey and administrative data from the Netherlands. When considering how the results can be generalized to other settings, two institutional characteristics may matter. First, the group for which a nursing home admission is a relevant alternative as well as the timing of such an admission may be different across countries. Access to nursing home care in the Netherlands is equitable for everyone because of the combination of comprehensive, universal public coverage, income-dependent co-payments, objective needs-based eligibility criteria, and sufficient supply. At the same time, extensive public subsidies for home care mean that people with functional limitations may postpone an admission longer than if such subsidies were not available. Second, the nursing home characteristics may shape the influence a nursing home has on the well-being of residents. In the Netherlands, nursing home quality is arguably fairly uniform

because the access and provider payments are not linked to the income or wealth of residents meaning that rich residents get the same services as others.

Our findings mean that there is no evidence for permanent changes in aspects related to well-being due to a nursing home admission. Although this might be counterintuitive, a potential explanation for this is that many attribute end-of-life problems that older people face to the nursing home admission. Many older people in a nursing home report high levels of loneliness and anxiety and low levels of control over one's life. However, these scores are similar among individuals who will be admitted to a nursing home soon. Thus, the nursing home admission does not seem to be an important reason for these low levels of reported well-being. Our findings may contribute to better-informed decisions about a potential nursing home entry at the individual level.

At the societal level, the findings may be used to inform policy decisions, regarding aging in place and how the budget is allocated between nursing home residents and frail older people living at home. First, the descriptives presented in the paper show that the oldest old not only face physical and cognitive problems, but that their well-being is also poor, as many report loneliness, inadequate control over life and they are more often at risk for anxiety and depression. Hence, public policy should also be targeted at preventing and reducing these problems rather than at physical and cognitive problems alone.

Furthermore, the Netherlands and other countries encourage older people to live at home as long as they can and support them intensively through aging in place policies. One of the premises of these policies is that the well-being of older people is higher at home than in the nursing home. While there may be other good reasons to facilitate aging in place, this study shows that protecting the well-being of the oldest old may not be one of them (at least not for the outcomes considered in this study).

Finally, the Dutch government has in recent years increased long-term care spending by 10% to improve the well-being of nursing home residents (Rijksoverheid, 2017). While this study shows that well-being issues are indeed common in this population, we also find that on average the loneliness, risk of anxiety and depression and control over one's life of older people living in the community is equally poor. Hence the well-being of older people living at home warrants as much attention as the well-being of nursing homes residents.

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Appendix 1 – Overview used variables and datasets

A1.1 Survey data

We use data from the Dutch Health Monitors of 2012 and 2016 about the mental well-being of older people. The Health Monitor is a nationally representative survey conducted every four years starting from 2012 and consists of repeated cross-sections of the 18+ population of the Netherlands. Individuals were invited by a letter to respond to an online survey. Depending on the region, a paper questionnaire was either sent along with the initial request or sent later in case of nonresponse. Surveys via telephone or in person were rare: 0.5% in 2012 and 0.1% in 2016 (CBS, 2015, 2017). In 2012, about 700.000 individuals were invited to participate to any of the Health Monitors, 387.195 individuals responded to the questionnaire. In 2016, about 460.000 of the roughly 1.15 million approached individuals responded. Separate versions of the survey either target the total Dutch population, youth, or older people. As we focus on older people, we limit our sample to the data collected by the Community Health Services via the survey specifically aimed at the 65+ population.

Although the general health survey (that is conducted among the total population) also samples older people, we do not make use of this survey for two reasons: (i) It is a shortened version of the survey that the community health services distribute to older people, thereby missing information on all but one health outcome measure of interest; (ii) Our research design requires information regarding the date of data collection, which is not recorded for the general health survey that it was sampled throughout the year (CBS, 2019a)

The target population of the Health Monitor consisted of everyone who lives in a private household, i.e. excluding those living in a nursing home or another type of institutional setting. In the end, however, nursing home residents were nevertheless sampled, most likely because they are registered at their municipality as living in the community: the vast majority of the respondents who live in a nursing home and who answered the survey were registered in the Municipal Register as living in a private household. This may be because they never notified the municipality that they moved to the nursing home, or because the nursing home is registered as (a set of) private households at the municipality.

A competing explanation would be that we misclassify these respondents as living in a nursing home, while they receive nursing home care at their own home through the Volledig Pakket Thuis option. In the 2012 data, users who chose this option are recorded as if they are admitted to a nursing home. However, this

option accounted for merely 1.3% of all nursing home care provided in 2012 (CBS, 2019b), and hence it is unlikely that our sample consists to a large part of misclassifications.

A1.2 Overview of the used administrative data

Table A1 provides an overview of the administrative data that are used in this article.

Table A1: Overview used variables

Variable	Measurement	Time	Source data, CBS code
Age	Classified into age groups: -75-80 years old 80-85 years old -85-90 years old -90+ years old Highest category used in category changed within time period.	Per 6-month period	Municipal register, GBAPERSOONTAB
Gender	1=Male	-	Municipal register, GBAPERSOONTAB
Living together with partner	1=Yes (Unmarried couple; Married couple; Couple with children) Latest status used in case status changed within time period.	Per 6-month period	Municipal register, GBAHUISHOUDENS2018BUSV1
Living alone	1=Yes (Alone living) Latest status used in case status changed within time period.	Per 6-month period	Municipal register, GBAHUISHOUDENS2018BUSV1
Widowed	1= (Partner at t-1, alone in t0) Latest status used in case status changed within time period.	Per 6-month period	Municipal register, GBAHUISHOUDENS2018BUSV1
Married	1=Married or registered partnership Latest status used in case status changed within time period.	Per 6-month period	VERBINTENISPARTNERBUS
Foreign descent	0=No 1=Yes, 1 st or 2 nd generation	-	Municipal register, GBAPERSOONTAB
Household income	In quintiles	Per calendar year	Tax records, INHATAB
Household wealth	In quintiles	Per calendar year	Tax records, VEHTAB
Home care & Home care hours	-Any - Total number of hours of homecare received	Per 6-month period	LTC Administration Office (CAK), GEBZZVTAB
Spending on nursing + personal care	Total value of use * tariff for personal or nursing home received at home	Per 6-month period	LTC Administration Office (CAK), GEBZZVTAB
Hospitalization & Length of Stay Hospitalization	<ul style="list-style-type: none"> Any Total length of stay for all hospital admissions within 6 month period 	Per 6-month period	Dutch Hospital data, LMR_BASIS
Diagnosis hospitalization	By ISHTM (in case of hospitalization)	Per 6-month period	Dutch Hospital data, LMR_BASIS

Drug use	<ul style="list-style-type: none"> • Any • By ATC 	Per 6-month period	Zorginstituut, MEDICIJNTAB
Health care expenditures	<ul style="list-style-type: none"> • Total expenditures • Expenditures GP • Expenditure hospital • Expenditures pharmaceuticals 	Per calendar year	VEKTIS, ZVWZORGKOSTENTAB
Short-term nursing home admission	Admitted for <365 days	Per 6-month period	LTC Administration Office (CIZ), INDICAWBZTAB
Length of stay short term nursing home admission	Total number of days in nursing home during this 6 month period	Per 6-month period	LTC Administration Office (CIZ), INDICAWBZTAB
Long-term nursing home admission	In case admitted for at least 365 days	Per 6-month period	LTC Administration Office (CIZ), INDICAWBZTAB
Type of nursing home admission	Highest care package score within 6 month period	Per 6-month period	LTC Administration Office (CIZ), INDICAWBZTAB
Type of nursing home admission at admission	Care package score assigned closest to admission	-	LTC Administration Office (CIZ), INDICAWBZTAB
Dementia	1 if individual received indication for nursing home admission based on psychogeriatric problems	Per 6-month period	LTC Administration Office (CIZ), INDICAWBZTAB

Appendix 2 – Definition of well-being measures

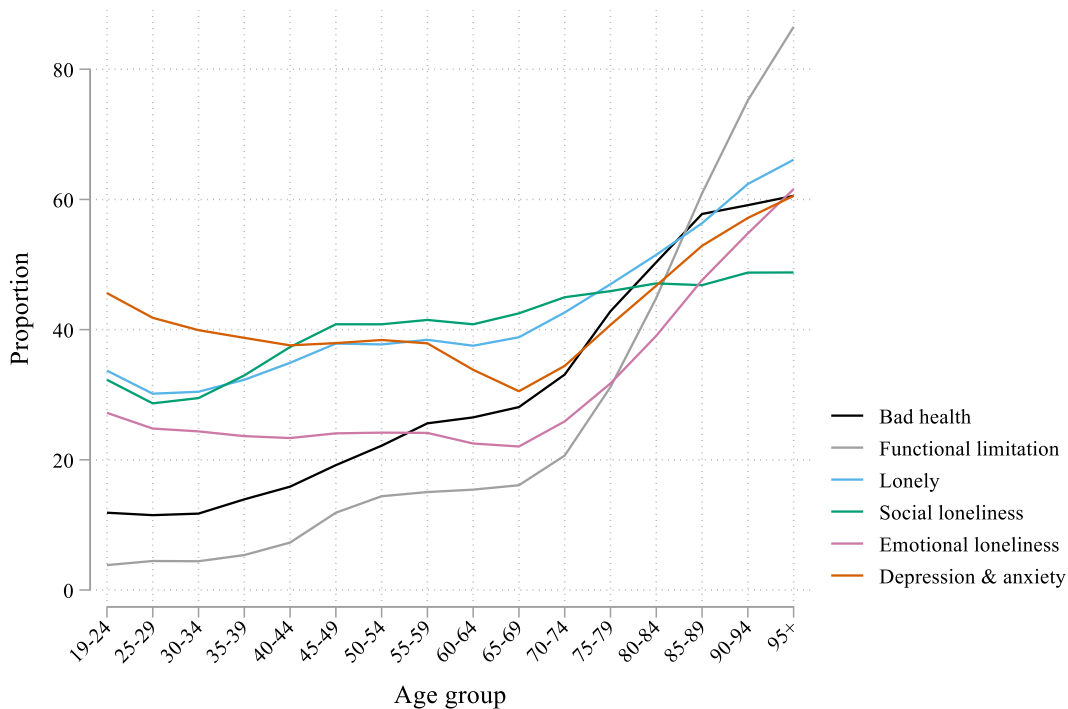
Table A2: Definition of well-being measures

Well-being measure	Definition
Loneliness	<p>Loneliness is assessed based on the 11 questions of the De Jong Gierveld scale (1999) which defines loneliness as the discrepancy between one's desired and achieved levels of social relations. A distinction is made between the following types of loneliness:</p> <ul style="list-style-type: none"> - Social loneliness: the absence of an acceptable social network, a wider circle of friends and acquaintances that can provide a sense of belonging, of companionship and of being a member of a community. - Emotional loneliness: the absence of an attachment figure in one's life and someone to turn to.
Risk of feeling depressed or anxious	<p>The scores range from:</p> <ul style="list-style-type: none"> - Loneliness: (0) no to (11) severe loneliness - Social loneliness: (0) no to (5) severe social loneliness - Emotional loneliness: (0) no to (6) severe emotional loneliness <p>Respondents were asked 10 questions related to feelings of depression and anxiety in the past 4 weeks, based on the Kessler Psychological Distress Scale (Kessler et al., 2002). Answers are transferred into a score between 10-50. A score of 10-15 represents no or a low risk; 16-29 moderate risk and 30-50 high risk of anxiety or depression. (RIVM, 2021a)</p>
Inadequate control over one's life	<p>Respondents were asked 7 questions related to control over one's life following the Pearlin & Schooler Mastery Scale (1978). Answers are transferred into a score between 7-35. For ease of interpretation the scores are reversed, meaning that now a high score indicates little control. A score of 7-22 represents average to much control; 23-35 indicates inadequate control (RIVM, 2021b)</p>

Appendix 3 – Well-being and physical health trends

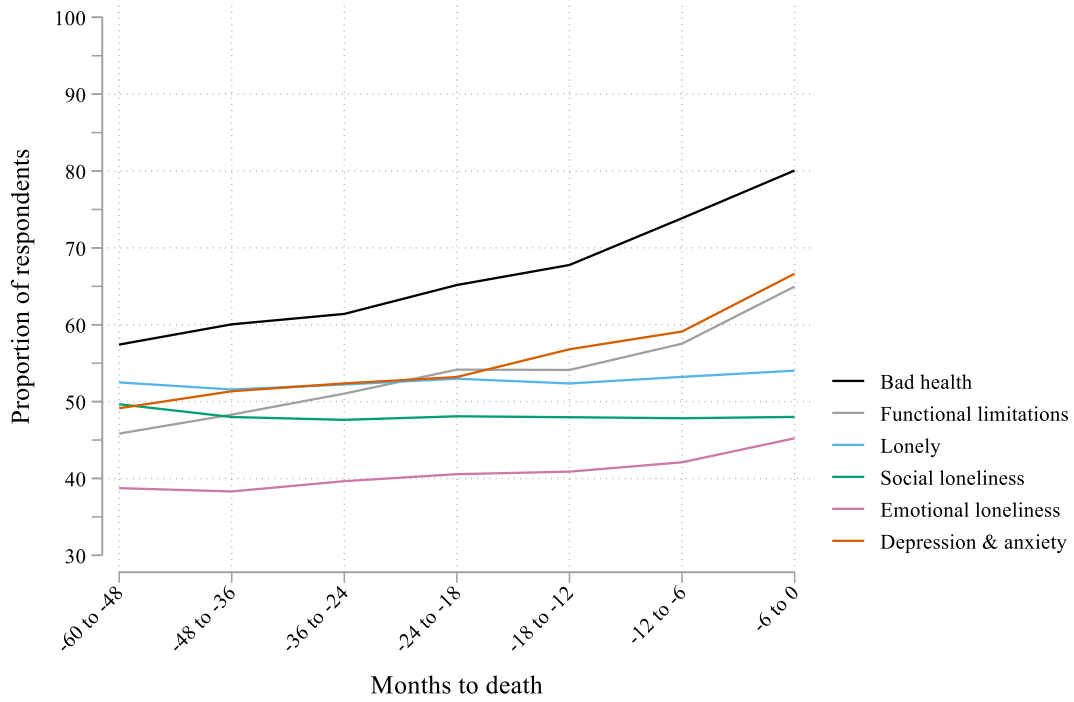
To gain insight into the health and well-being of the entire population, figure A3.1 plots scores of several measures by age group for all respondents of the Health Monitor. In line with what we would expect, they show that health and well-being deteriorate with age, in particular after the age of 75, which is the group that we mostly focus on. Especially the prevalence of functional limitations measured using the OECD-scale increases with age. Social loneliness has a rather flat curve, with only a slight increase with old age. Figure A3.2 shows the same health and well-being trends in terms of time away from death from five years before death until death. Again, as expected all indicators for having health problems and well-being issues increase with death approaching, except for social loneliness, which is stable at around 50% of respondents experiencing loneliness in the five years prior to death. These descriptive statistics suggest that these measures are good proxies of the dimensions of health and quality of life that matter for this age group.

Figure A3.1 Health and well-being by age group (2012) (N=335.746)



Note: All well-being scales are transformed into binary variables where a 1 represents a worse health score. This refers to reporting medium, poor or very poor self-experienced health; being unable to perform one or more of the OECD problems; average to high general, emotional or social loneliness score; or having a medium to high risk of depression/anxiety.

Figure A3.2 Health and well-being five years before death (2012) (N=20,143)



Note: All well-being scales are transformed into binary variables where a 1 represents a worse health score. This refers to reporting medium, poor or very poor self-experienced health; being unable to perform one or more of the OECD problems; average to high general, emotional or social loneliness score; or having a medium to high risk of depression/anxiety.

Appendix 4 – Overview classification of groups of respondents

Table A4.1: Health monitor 2012

Group	Time since nursing home admission when completing survey	First day of 365+ days nursing home stay
1	-12 to -6 months (not yet admitted)	Between 01/03/2013 – 31/08/2013
2	-6 to 0 months (not yet admitted)	Between 01/09/2012 – 28/02/2013
3	0-6 months (admitted)	Between 01/03/2012 – 31/08/2012
4	6-12 months (admitted)	Between 01/09/2011 – 29/02/2012
5	12-18 months (admitted)	Between 01/03/2011 – 31/08/2011

Table A4.2: Health monitor 2016

Group	Time since nursing home admission when completing survey	First day of 365+ days nursing home stay
1	-12 to -6 months (not yet admitted)	Between 01/03/2017 – 31/08/2017
2	-6 to 0 months (not yet admitted)	Between 01/09/2016 – 28/02/2017
3	0-6 months (admitted)	Between 01/03/2016 – 31/08/2016
4	6-12 months (admitted)	Between 01/09/2015 – 29/02/2016
5	12-18 months (admitted)	Between 01/03/2015 – 31/08/2015

Appendix 5 – Overview of variables included in the propensity score model

Type	Included variables
Health status and care needs	<p>Type of nursing home care eligibility at T₋₃ but before nursing home admission</p> <p>Using any home care in T₋₄</p> <p>Hours of home care use in T₋₄</p> <p>An indicator of prescription medication use in the calendar year before T₋₃ correlated with a nursing home admission: A02, A06, A10, A12, B01, B03, C01, C03, D02, G04, H02, J01, L01, L02, M01, M04, N05, N06, R01, R03, Y (Bakx et al. 2020a; Tenand et al. 2020)</p> <p>Any hospital admission in T₋₄</p> <p>Total length of stay at the hospital in T₋₄</p> <p>Hospital admission by ISHTM category in T₋₃ and T₋₄</p> <p>Indicators for age (everyone above 95 is grouped into a 95+ category) Gender</p> <p>Indicator for short-term nursing home admission in T₋₄</p> <p>Length of stay of short-term nursing home admission in T₋₄</p> <p>Health insurance expenditure on hospital care in the calendar year before T₋₃</p> <p>GP expenditure in the calendar year before T₋₃</p> <p>Medication expenditure covered by the health insurance in the calendar year before T₋₃</p> <p>Total health insurance expenditure in the calendar year before T₋₃.</p>
Availability of nursing home care substitutes	<p>Living with a partner in T₋₄</p> <p>Becoming widowed in T₋₄</p>
Socioeconomic status	<p>Household income quartiles in calendar year before T₋₃</p> <p>Household wealth quartile in calendar year before T₋₃</p> <p>Migration background</p>

Appendix 6 – Propensity score models

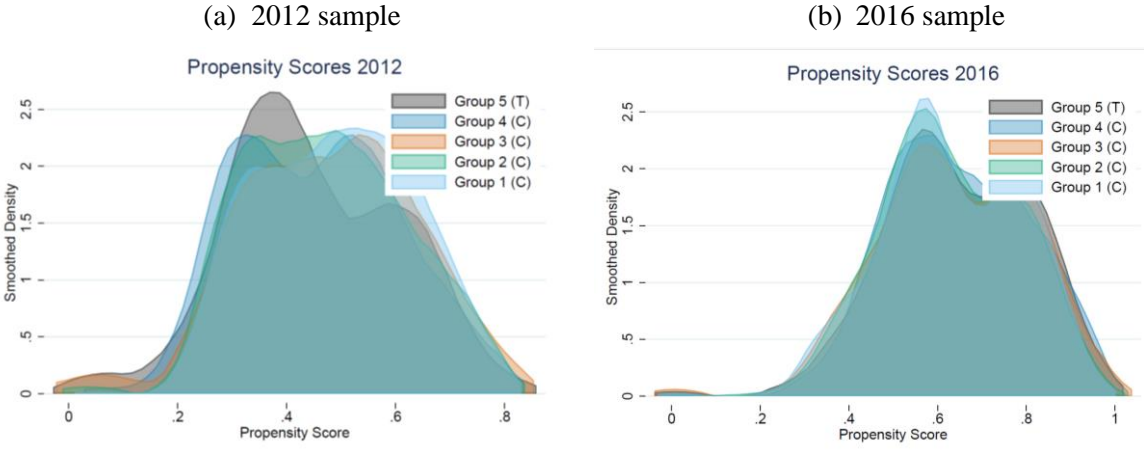
Table A6 Probability of a long-term nursing home admission at T_{-3}

	2012		2016	
Eligible for care package 1-4 T_{-3}	2.825***	(0.0368)	5.317***	(0.0854)
Eligible for care package 5&7 T_{-3}	3.355***	(0.0545)	5.831***	(0.0972)
Eligible for care package 6&8 T_{-3}	3.573***	(0.0722)	5.978***	(0.0927)
Eligible for care package 9 T_{-3}	3.251***	(0.0476)	5.987***	(0.204)
Eligible for care package 10 T_{-3}	4.894***	(0.415)	5.776***	(0.454)
Eligibility information missing T_{-3}	0.546**	(0.248)	n.a.	
Eligibility based on psychogeriatric condition T_{-3}	0.461***	(0.0370)	0.275***	(0.0553)
Home care T_{-4}	0.0611*	(0.0325)	n.a.	
Hours home care T_{-4}	0.000360***	(0.000)	n.a.	
Expenditure home care in year before T_{-3}	n.a.		0.00285	(0.00203)
<i>Prescription medication (ATC3 code)</i>				
A02 at T_{-4}	-0.00668	-0.0286	0.0326	(0.0391)
A06 at T_{-4}	0.0826***	(0.0294)	-0.0285	(0.0400)
A10 at T_{-4}	-0.0236	(0.0318)	0.00880	(0.0441)
A12 at T_{-4}	-0.0140	(0.0333)	-0.0741*	(0.0403)
B01 at T_{-4}	0.0359	(0.0273)	-0.0745*	(0.0394)
B03 at T_{-4}	0.0140	(0.0355)	-0.0125	(0.0481)
C01 at T_{-4}	-0.0395	(0.0333)	-0.0641	(0.0488)
C03 at T_{-4}	-0.00791	(0.0263)	0.0570	(0.0369)
D02 at T_{-4}	0.0335	(0.0340)	-0.0483	(0.0444)
G04 at T_{-4}	0.00245	(0.0425)	0.0977*	(0.0567)
H02 at T_{-4}	0.0422	(0.0393)	-0.0567	(0.0542)
J01 at T_{-4}	-0.0328	(0.0270)	-0.00281	(0.0371)
L01 at T_{-4}	0.0353	(0.121)	0.311*	(0.161)
L02 at T_{-4}	0.228***	(0.0884)	0.0317	(0.117)
M01 at T_{-4}	0.0404	(0.0341)	-0.0118	(0.0515)
M04 at T_{-4}	0.0524	(0.0711)	0.155	(0.1000)
N05 at T_{-4}	0.128***	(0.0346)	0.0522	(0.0440)
N06 at T_{-4}	-0.104***	(0.0307)	-0.238***	(0.0392)
R01 at T_{-4}	-0.115**	(0.0573)	0.00777	(0.0821)
R03 at T_{-4}	-0.0595	(0.0364)	-0.0437	(0.0510)
Y at T_{-4}	0.131**	(0.0642)	-0.0306	(0.0665)
Hospitalisation at T_{-3}	0.0805	(0.137)	0.262	(0.295)
Hospitalisation at T_{-4}	0.650**	(0.264)	0.0663	(0.132)
Total LOS hospital at T_{-3}	0.0191***	(0.00197)	0.0150***	(0.00327)
Total LOS hospital at T_{-4}	0.00643***	(0.00202)	0.0368***	(0.00354)
Male	0.160***	(0.0314)	0.207***	(0.0429)
Age 80-85 at T_{-3}	0.0289	(0.0368)	0.0211	(0.0520)
Age 85-90 at T_{-3}	0.139***	(0.0373)	0.0253	(0.0524)
Age 90-95 at T_{-3}	0.189***	(0.0445)	0.0896	(0.0601)
Age 95+ at T_{-3}	0.411***	(0.0782)	0.348***	(0.0998)
Dutch	0.0230	(0.0427)	0.0607	(0.0540)
Alone living at T_{-4}	-0.444***	(0.0531)	0.228***	(0.0629)
Living with partner at T_{-4}	-0.607***	(0.0507)	0.141**	(0.0598)
Partner in T_{-4} , alone in at T_{-3}	0.500***	(0.0953)	0.489***	(0.142)
Q2 income in year before T_{-3}	-0.311***	(0.0365)	-0.378***	(0.0530)
Q3 income in year before T_{-3}	-0.274***	(0.0404)	-0.446***	(0.0562)
Q4 income in year before T_{-3}	-0.340***	(0.0436)	-0.453***	(0.0606)
Q5 income in year before T_{-3}	-0.450***	(0.0490)	-0.481***	(0.0668)
Q2 wealth in year before T_{-3}	0.0397	(0.0377)	0.0527	(0.0526)
Q3 wealth in year before T_{-3}	0.0948**	(0.0384)	0.0738	(0.0541)
Q4 wealth in year before T_{-3}	0.0117	(0.0415)	0.118**	(0.0573)
Q5 wealth in year before T_{-3}	-0.0161	(0.0454)	0.0896	(0.0611)
<i>Hospital admission diagnosis</i>				
Infection/parasites at T_{-3}	0.546**	(0.232)	-0.0471	(0.367)
Neoplasms at T_{-3}	0.181	(0.185)	0.215	(0.381)
Blood/bloodforming organs at T_{-3}	-0.197	(0.217)	0.243	(0.356)

Endocrine at T_{-3}	0.286	(0.200)	0.141	(0.350)
Mental disorders at T_{-3}	-0.0628	(0.172)	0.744**	(0.369)
Nervous system at T_{-3}	0.00253	(0.185)	0.272	(0.340)
Eyes/adnexa at T_{-3}	-0.406**	(0.168)	-0.263	(0.359)
Ears at T_{-3}	0.519	(0.578)	1.277	(1.389)
Circulatory at T_{-3}	0.319**	(0.144)	0.537*	(0.305)
Respiratory at T_{-3}	0.426**	(0.169)	0.418	(0.320)
Digestive at T_{-3}	-0.00221	(0.166)	0.201	(0.326)
Skin at T_{-3}	-0.182	(0.288)	0.592	(0.459)
Musculoskeletal at T_{-3}	-0.230	(0.163)	0.522	(0.332)
Genitourinary at T_{-3}	0.312*	(0.176)	0.532	(0.326)
Congenital malformations at T_{-3}	0.518	(1.136)	n.a.	
Other at T_{-3}	0.0865	(0.153)	0.204	(0.314)
Injury at T_{-3}	0.380***	(0.146)	0.783**	(0.304)
Factors influencing health services at T_{-3}	-0.0861	(0.168)	0.125	(0.371)
Infection/parasites at T_{-4}	-0.582	(0.354)	0.259	(0.267)
Neoplasms at T_{-4}	-0.890***	(0.296)	0.495*	(0.290)
Blood/bloodforming organs at T_{-4}	-0.789**	(0.332)	0.127	(0.253)
Endocrine at T_{-4}	-0.346	(0.315)	0.714**	(0.281)
Mental disorders at T_{-4}	-0.530*	(0.285)	0.268	(0.267)
Nervous system at T_{-4}	-0.820***	(0.304)	0.275	(0.218)
Eyes/adnexa at T_{-4}	-0.538*	(0.277)	0.292	(0.252)
Ears at T_{-4}	-0.556	(0.598)	-0.125	(0.693)
Circulatory at T_{-4}	-0.502*	(0.271)	0.629***	(0.155)
Respiratory at T_{-4}	-0.393	(0.290)	0.394**	(0.182)
Digestive at T_{-4}	-0.724**	(0.284)	-0.0890	(0.191)
Skin at T_{-4}	-0.488	(0.379)	-0.729*	(0.437)
Musculoskeletal at T_{-4}	-0.854***	(0.283)	0.0584	(0.209)
Genitourinary at T_{-4}	-0.588**	(0.297)	0.0946	(0.199)
Other at T_{-4}	-0.633**	(0.275)	0.503***	(0.177)
Injury at T_{-4}	-1.021***	(0.274)	0.700***	(0.156)
Factors influencing health services at T_{-4}	-0.823***	(0.279)	-0.0998	(0.240)
<i>Other health related variables</i>				
Short NH stay at T_{-4}	-0.248***	(0.0648)	-0.617***	(0.125)
LOS short NH stay at T_{-4}	0.0119***	(0.000860)	-0.00348*	(0.00191)
HI expenditure GP in year before T_{-3}	0.0573	(0.0648)	0.258***	(0.0855)
HI expenditure hospital in year before T_{-3}	-0.0205***	(0.00785)	-0.00644	(0.0111)
HI expenditure total in year before T_{-3}	0.0116*	(0.00702)	-0.000834	(0.0101)
HI expenditure drugs in year before T_{-3}	-0.0127	(0.0122)	-0.0327*	(0.0177)
Constant	-3.145***	(0.0783)	-5.807***	(0.122)
Observations	65,741		54,597	

Note: Calendar time T_{-4} refers to the six-month period before nursing home (NH) admission of group 5 (the first admitted group), and calendar time T_{-3} represents the six-month period of the first admitted group. We distinguish between six types of nursing home care eligibility grouping similar care packages. The definition of care packages can be found in Footnote 3. LOS stands for length of stay, and HI for health insurance. Q2 is short for second quintile and similarly for higher quintiles. Some information is not available (n.a.) for the 2016 cohort due to data recording changes for home care and care packages; or because no one was hospitalized with congenital malformations.

Figure A6.1 Propensity score distributions



Note: Smoothed densities of propensity scores by groups. Group 5 represents the treatment group (T) in our setting, and groups 1-4 the control group (C).

Appendix 7 – Comparability groups in health monitor sample

Table A7.1 presents the descriptive statistics for the survey population before and after weighting the data. The tables show that the survey respondents in the different groups are already before matching comparable to each other.

Table A7.1: Sample statistics of weighted and unweighted pooled health monitor sample

	Weighted sample					Unweighted sample				
	Mean group 1	Mean group 2	Mean group 3	Mean group 4	Mean group 5	Mean group 1	Mean group 2	Mean group 3	Mean group 4	Mean group 5
Eligible for care packages 1-4 at s_0	0.33	0.35	0.32	0.32	0.35	0.42	0.43	0.41	0.42	0.44
Eligible for care packages 5&7 at s_0	0.39	0.39	0.29	0.35	0.29	0.34	0.34	0.24	0.29	0.23
Eligible for care packages 6&8 at s_0	0.24	0.17	0.21	0.14	0.20	0.21	0.14	0.16	0.10	0.15
Eligible for care package 9 at s_0	0.04*	0.09	0.18	0.20	0.16	0.03*	0.08	0.17	0.19	0.15
Eligibility based on psychogeriatric condition at s_0	0.51	0.54*	0.41	0.47	0.36	0.47*	0.49*	0.36	0.39	0.30
Age at s_0	85.9	85.6	85.6	85.2	84.9	85.9	85.6	85.6	85.0	84.6
Male	0.33	0.32	0.30	0.27	0.33	0.31	0.30	0.29	0.27	0.32
Living with partner at s_{-1}	0.32	0.35	0.38	0.34	0.29	0.31	0.33	0.37	0.35	0.26
A02 at s_{-1}	0.52	0.51	0.56	0.52	0.57	0.50	0.51	0.57	0.51	0.57
A06 at s_{-1}	0.28	0.27	0.36	0.35	0.35	0.28	0.27	0.36	0.33	0.36
A10 at s_{-1}	0.20	0.19	0.25	0.26	0.26	0.19	0.18	0.22	0.25	0.25
A12 at s_{-1}	0.20	0.22	0.19	0.20	0.20	0.20	0.23	0.21	0.19	0.22
B01 at s_{-1}	0.58	0.57	0.54	0.58	0.58	0.58	0.56	0.55	0.57	0.55
B03 at s_{-1}	0.16	0.15	0.16	0.14	0.14	0.16	0.14	0.14	0.16	0.14
C01 at s_{-1}	0.18	0.18	0.21	0.17	0.19	0.19	0.19	0.21	0.17	0.18
C03 at s_{-1}	0.40	0.39	0.42	0.44	0.41	0.40	0.39	0.41	0.44	0.42
D02 at s_{-1}	0.19	0.18	0.24	0.18	0.19	0.19	0.19	0.25	0.17	0.19
G04 at s_{-1}	0.15	0.13	0.17	0.15	0.11	0.15	0.12	0.17	0.14	0.10
H02 at s_{-1}	0.16	0.13	0.18	0.13	0.13	0.15	0.13	0.19	0.11	0.13
J01 at s_{-1}	0.46	0.38	0.42	0.45	0.33	0.45	0.38	0.41	0.44	0.34
M01/M04 at s_{-1}	0.20	0.19	0.22	0.18	0.23	0.20	0.19	0.21	0.19	0.23
R03 at s_{-1}	0.18	0.15	0.18	0.19	0.11	0.18	0.16	0.19	0.18	0.12
Other drugs at s_{-1}	0.73	0.62	0.88*	0.82	0.56	0.73	0.63	0.85	0.80	0.59
Hospitalisation	0.39	0.43	0.51	0.38	0.34	0.34	0.37	0.43	0.33	0.28
Hospitalisation at s_{-1}	0.33	0.27	0.24	0.29	0.29	0.30	0.24	0.19	0.24	0.23
Total LOS hospital	5.32	6.52	8.50	6.40	4.95	4.36	5.04	6.72	4.91	3.83
Total LOS hospital at s_{-1}	4.01	2.88	4.17	5.13	3.29	3.42	2.35	3.07	3.70	2.33
Dutch	0.89	0.90	0.90	0.88	0.89	0.89	0.90	0.90	0.88	0.89
Alone living at s_{-1}	0.62	0.57	0.50	0.58	0.67	0.63	0.58	0.53	0.58	0.69
Living with partner at s_{-1}	0.32	0.35	0.38	0.34	0.29	0.31	0.33	0.37	0.35	0.26
Q1 income in year before s_0	0.24	0.19*	0.28	0.21*	0.39	0.23	0.19*	0.273	0.19*	0.37
Q2 income in year before s_0	0.20	0.19	0.18	0.20	0.15	0.21	0.20	0.18	0.20	0.16
Q3 income in year before s_0	0.19	0.18	0.18	0.19	0.14	0.19	0.19	0.18	0.19	0.14
Q4 income in year before s_0	0.18	0.20	0.20	0.19	0.14	0.18	0.20	0.20	0.20	0.14
Q5 income in year before s_0	0.20	0.23	0.16	0.22	0.18	0.20	0.23	0.16	0.22	0.20
Q1 wealth in year before s_0	0.18	0.17	0.13	0.18	0.18	0.18	0.17	0.13	0.19	0.19
Q2 wealth in year before s_0	0.22	0.19	0.23	0.22	0.24	0.23	0.19	0.23	0.20	0.22
Q3 wealth in year before s_0	0.21	0.19	0.26	0.23	0.21	0.21	0.18	0.27	0.23	0.22
Q4 wealth in year before s_0	0.18	0.23	0.17	0.17	0.19	0.18	0.23	0.18	0.18	0.20
Q5 wealth in year before s_0	0.20	0.23	0.21	0.20	0.18	0.20	0.23	0.19	0.21	0.18
Short NH stay at s_{-1}	0.04	0.06	0.10	0.12	*1	0.04	0.06	0.10	0.10	0.08
LOS short NH stay at s_{-1}	1.65	4	4.51	10	3.60	1.52	3.31	3.83	7.93	5.11
HI expenditure GP in year before s_0	0.36	0.34	0.43	0.32	0.33	0.36	0.33	0.40	0.30	0.33
HI expenditure hospital in year before s_0	3482	3072	5067	3316	3564	3367	3123	4671	3135	3542
HI expenditure total in year before s_0	6632	5985	8758	6408	6821	6451	6002	8261	6078	6854

HI expenditure drugs in year before

s_0	1087	1016	1328	1139	1081	1081	1022	1336	1098	1131
N	1,048	729	187	168	123	1,048	729	187	168	123

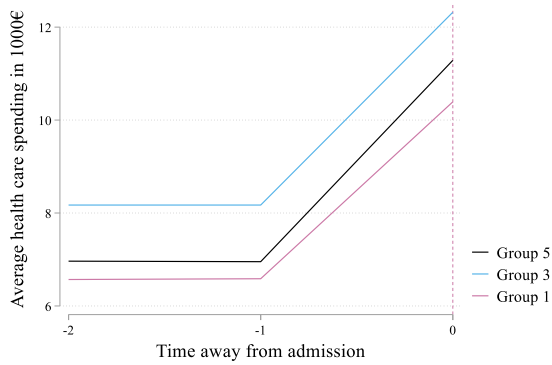
Note: Differences between groups are calculated using standardized differences between group 5 and one of the other groups, * standardized difference > 0.25 following the threshold of Stuart et al (2013). Event time s_0 refers to the period of the nursing home (NH) admission, and s_{-1} to the six-month period before nursing home admission. We distinguish between four types of nursing home care eligibility grouping similar care packages. The definition of care packages can be found in Footnote 3. LOS stands for length of stay, and HI for health insurance. Q1 is short for first quintile and similarly for higher quintiles.

1. Result not reported for confidentiality reasons.

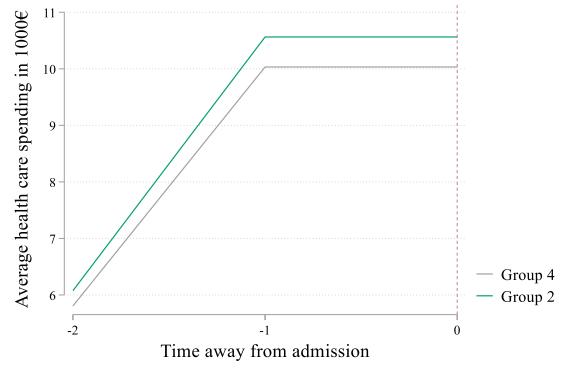
Appendix 8 – Comparability in pre-admission trends across groups

Health Care spending in basic insurance package

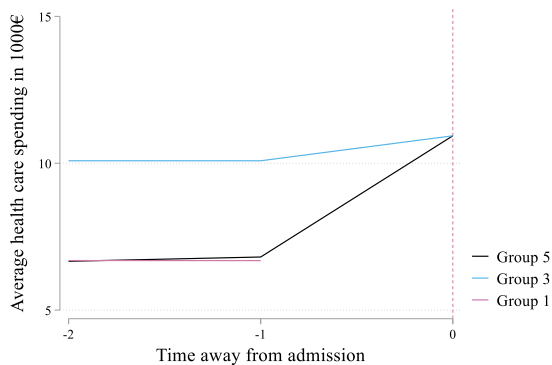
Mean annual health care spending of individuals within 6 months intervals before nursing home admission (2012). Group 1, 3 and 5



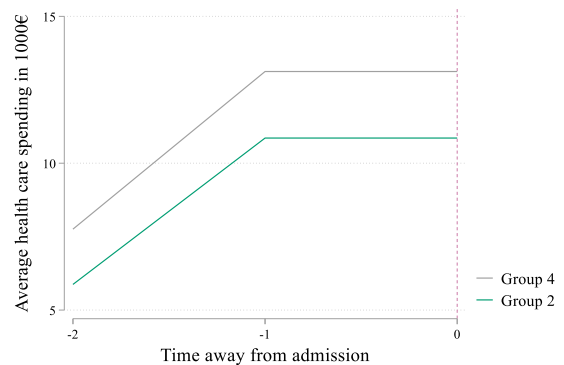
Mean annual health care spending of individuals within 6 months intervals before nursing home admission (2012). Group 2 and 4



Mean annual health care spending of individuals within 6 months intervals before nursing home admission (2016). Group 1, 3 and 5



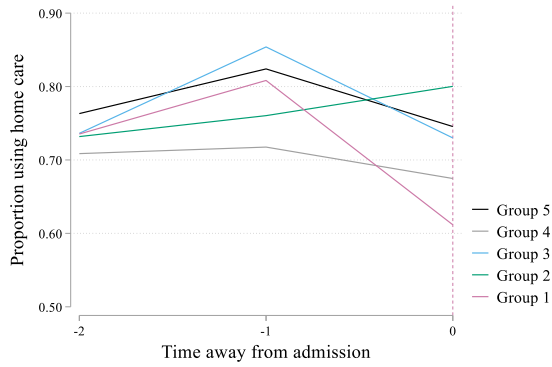
Mean annual health care spending of individuals within 6 months intervals before nursing home admission (2016). Group 2 and 4



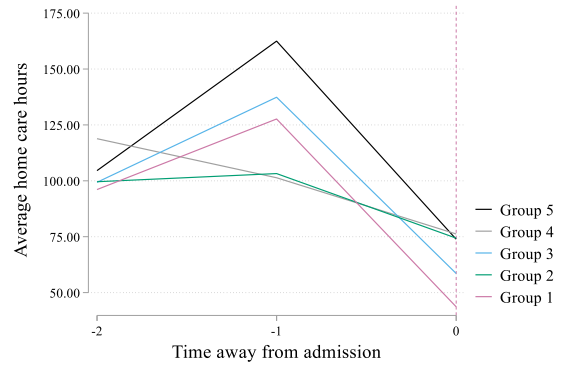
Note: As we are using annual data trends are not similar for all groups. Time 0 represents the average health care spending in the year of admission, for example for group 1 who is admitted between March and September 2013, the 2013 expenditures. At time -1 we for this group use September 2012-March 2013 as reference and use the 2012 data, same goes for time -2 were we use the March 2012-September 2012 data. For group 2 (admitted between September 2012-March 2013) we use the 2012 data for both Time 0 and Time -1. Hence, we can only compare trends between group 1,3 and 5 and group 2 and 4.

Home care

Proportion of individuals within cohort are making use of home care within 6 months intervals before nursing home admission (2012)



Average hours of home care per cohort in 6 months intervals before nursing home admission (2012)



Appendix 9 – Well-being and physical health scores by group

Table A9.1: Well-being and physical health scores by group for the pooled sample (weighted)

Health Monitor 2012+2016, weighted	Group 1	Group 2	Group 3	Group 4	Group 5
	Mean	Mean	Mean	Mean	Mean
Loneliness	5.19	5.30	6.33	5.51	5.61
Social loneliness	2.26	2.30	2.65	2.22	2.38
Emotional loneliness	2.96	3.04	3.69	3.37	3.28
Depression & anxiety	22.66	25.01	26.39	25.56	24.97
Inadequate control over life ¹	22.27	24.96	27.33	26.36	26.73
Functional limitations	2.58	3.10	3.55	3.28	3.88
General health	3.07	3.25	3.32	3.21	3.28
<i>Observations</i>	997	685	163	148	106

Note: Observations differ by outcome as sample is not restricted to availability of all outcomes.

1. For inadequate control over life only information is available in the 2016 sample.

Appendix 10 – Regression results

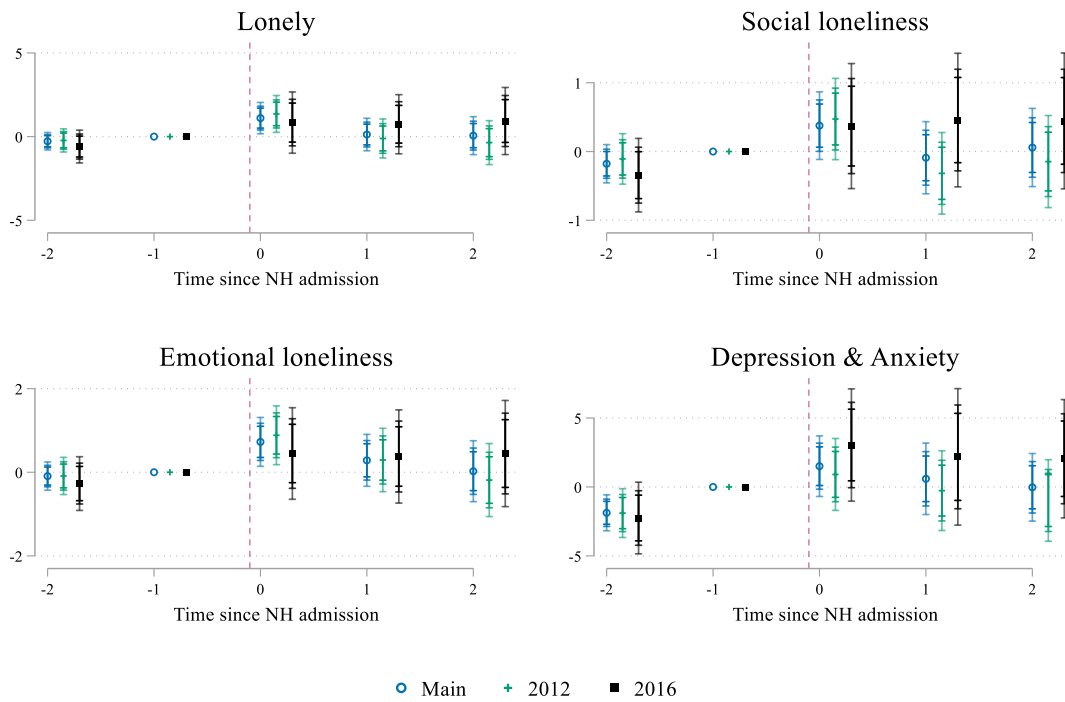
Table 10.1: Regression results pooled sample

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression	Inadequate control over life ¹	Functional limitations	Bad health
<i>Time since nursing home admission</i>							
-12 to -6 months (not yet admitted)	-0.0965** (0.0438)	-0.361*** (0.105)	-0.276 (0.203)	-0.178* (0.108)	-0.0916 (0.131)	-1.874*** (0.505)	-2.202*** (0.666)
0-6 months (admitted)	0.0832 (0.0751)	0.461*** (0.154)	1.107*** (0.362)	0.377** (0.191)	0.726*** (0.227)	1.507* (0.852)	2.274*** (0.871)
6-12 months (admitted)	-0.0278 (0.0849)	0.179 (0.190)	0.125 (0.377)	-0.0904 (0.204)	0.285 (0.241)	0.590 (1.005)	1.150 (1.282)
12-18 months (admitted)	0.0382 (0.0802)	0.728*** (0.181)	0.0586 (0.440)	0.0586 (0.221)	0.0247 (0.283)	-0.0255 (0.951)	1.648 (1.177)
Married at T ₀	0.0492 (0.0412)	-0.0485 (0.100)	-1.558*** (0.201)	-0.406*** (0.107)	-1.167*** (0.130)	0.450 (0.489)	0.243 (0.473)
Antithrombotics at s ₋₁	0.0182 (0.0437)	0.0108 (0.101)	-0.512** (0.205)	-0.270** (0.111)	-0.232* (0.132)	-0.170 (0.512)	-0.695 (0.676)
Drug for acid-related disorders at s ₋₁	0.230*** (0.0441)	0.369*** (0.102)	0.294 (0.209)	-0.0272 (0.111)	0.357*** (0.135)	1.923*** (0.526)	1.819*** (0.672)
Drugs for diabetes at s ₋₁	0.0919* (0.0494)	0.176 (0.114)	-0.0228 (0.254)	-0.0952 (0.131)	0.0195 (0.160)	-0.111 (0.610)	-0.400 (0.767)
Drugs for obstructive airway diseases at s ₋₁	0.158*** (0.0535)	0.168 (0.127)	-0.0553 (0.282)	0.0248 (0.146)	-0.0905 (0.181)	0.000291 (0.643)	-0.416 (0.974)
Eligible for care package 1-4 at s ₀	0.294 (0.214)	-0.786 (0.544)	1.093 (1.477)	0.0408 (0.650)	1.124 (0.934)	-0.742 (4.233)	-5.029*** (0.661)
Eligible for care package 5&7 at s ₀	0.434** (0.216)	-0.155 (0.547)	1.423 (1.479)	0.188 (0.652)	1.319 (0.936)	1.898 (4.242)	-3.380*** (0.685)
Eligible for care package 6&8 at s ₀	0.465** (0.217)	-0.251 (0.547)	1.248 (1.486)	0.133 (0.657)	1.138 (0.939)	0.902 (4.254)	-4.518*** (0.716)
Eligible for rehabilitative care at s ₀	0.305 (0.223)	-0.431 (0.562)	0.963 (1.503)	-0.0144 (0.670)	1.050 (0.953)	0.834 (4.315)	-5.216*** (1.577)
Hospitalization at s ₀	-0.00886 (0.0375)	-0.111 (0.0911)	-0.315* (0.182)	-0.0594 (0.0989)	-0.326*** (0.118)	-0.705 (0.446)	-0.967** (0.457)
Male	0.0531 (0.0407)	-0.250** (0.100)	0.137 (0.194)	0.183* (0.105)	-0.0462 (0.127)	-1.743*** (0.470)	-0.434 (0.465)
Aged 80-85 at s ₀	-0.165*** (0.0569)	-0.0142 (0.140)	0.415 (0.279)	0.185 (0.151)	0.227 (0.181)	-0.836 (0.703)	-0.405 (0.711)
Aged 85-90 at s ₀	-0.189*** (0.0552)	0.204 (0.137)	-0.0295 (0.269)	0.0226 (0.146)	-0.0911 (0.173)	-1.335* (0.685)	0.146 (0.650)
Aged 90-95 at s ₀	-0.292*** (0.0596)	0.447*** (0.149)	0.0482 (0.291)	-0.137 (0.156)	0.174 (0.187)	-1.518** (0.749)	0.621 (0.701)
Aged 95+ at s ₀	-0.340*** (0.109)	1.493*** (0.249)	-0.230 (0.519)	-0.156 (0.263)	-0.0231 (0.354)	-1.405 (1.203)	0.662 (1.242)
Constant	2.850*** (0.222)	3.171*** (0.561)	4.794*** (1.503)	2.482*** (0.667)	2.304** (0.952)	25.19*** (4.296)	29.01*** (1.090)
Observations	1,736	1,721	1,647	1,895	768	2,063	2,037

* p < 0.10, ** p < 0.05, *** p < 0.01; Results are weighted. We distinguish between four types of nursing home care eligibility grouping similar care packages. The definition of care packages can be found in Footnote 3. ¹ For inadequate control over life only information is available in the 2016 sample.

Appendix 11

Figure 11.1: Robustness checks – Results per survey



Note: Estimates of $\widehat{\delta}_q$ and their 90, 95, and 99 confidence intervals. The following results are presented: “2012” main results for the 2012 sample, “2016” main results for the 2016 sample.

Table A11.1: Logit models using binarized outcomes (weighted), margins

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression	Control over life ¹
	Margins	Margins	Margins	Margins	Margins
<i>Time since nursing home admission</i>					
-12 to -6 months (not yet admitted)	-0.0348	-0.0617**	-0.0227	-0.0992***	-0.153**
-6 to 0 months (not yet admitted)	Ref.	Ref.	Ref.	Ref.	Ref.
0-6 months (admitted)	0.0530	0.112**	0.146***	0.0754	0.125
6-12 months (admitted)	0.0103	-0.0810	0.0359	0.0247	0.0686
12-18 months (admitted)	-0.00608	0.00878	0.0206	0.0260	0.137
N	1,736	1,721	1,647	1,895	768

Note: All well-being scales are transformed into binary variables where a 1 represents a worse health score. This refers to reporting medium, poor or very poor self-experienced health; being unable to perform one or more of the OECD problems; average to high general, emotional or social loneliness score; or having a medium to high risk of depression/anxiety. Including controls: male, age, married, atc B01; atc R03; atc A02, atc_A10, ZZP-score and hospitalization. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Results are weighted.

1. For inadequate control over life only information is available in the 2016 sample.

Table A11.2: Regression results 2012 sample

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression
<i>Time since nursing home admission</i>				
-12 to -6 months (not yet admitted)	-0.229 (0.268)	-0.108 (0.142)	-0.0887 (0.172)	-1.895*** (0.685)
-6 to 0 months (not yet admitted)	Ref.	Ref.	Ref.	Ref.
0-6 months (admitted)	1.355*** (0.427)	0.473** (0.229)	0.884*** (0.273)	0.909 (1.010)
6-12 months (admitted)	-0.110 (0.451)	-0.317 (0.230)	0.293 (0.293)	-0.267 (1.121)
12-18 months (admitted)	-0.360 (0.509)	-0.146 (0.259)	-0.187 (0.338)	-0.983 (1.146)
Observations	979	969	931	1,058

Note: Including controls: male, age, married, atc B01; atc R03; atc A02, atc_A10, care package scores and hospitalization. * p < 0.10, ** p < 0.05, *** p<0.01. Results are weighted.

Table A11.3: Regression results 2016 sample

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression	Inadequate control over life
<i>Time since nursing home admission</i>					
-12 to -6 months (not yet admitted)	-0.595 (0.380)	-0.344* (0.207)	-0.271 (0.249)	-2.252** (1.007)	-2.202*** (0.666)
-6 to 0 months (not yet admitted)	Ref.	Ref.	Ref.	Ref.	Ref.
0-6 months (admitted)	0.839 (0.709)	0.370 (0.352)	0.448 (0.424)	3.042* (1.577)	2.274*** (0.871)
6-12 months (admitted)	0.740 (0.685)	0.458 (0.376)	0.376 (0.431)	2.183 (1.918)	1.150 (1.282)
12-18 months (admitted)	0.932 (0.777)	0.445 (0.383)	0.447 (0.492)	2.046 (1.662)	1.648 (1.177)
Observations	757	752	716	837	768

Note: Including controls: male, age, married, atc B01; atc R03; atc A02, atc_A10, care package score and hospitalization. * p < 0.10, ** p < 0.05, *** p<0.01. Results are weighted.

Table A11.4: Regression results November sample

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression	Inadequate control over life ¹
<i>Time since nursing home admission</i>					
-12 to -6 months (not yet admitted)	-0.285 (0.186)	-0.0923 (0.0999)	-0.197 (0.121)	-1.541*** (0.455)	-1.579*** (0.571)
-6 to 0 months (not yet admitted)	Ref.	Ref.	Ref.	Ref.	Ref.
0-6 months (admitted)	0.710** (0.295)	0.279* (0.152)	0.387** (0.187)	0.952 (0.721)	2.327*** (0.657)
6-12 months (admitted)	0.492 (0.376)	0.0245 (0.205)	0.581** (0.228)	0.920 (0.901)	1.046 (1.103)
12-18 months (admitted)	-0.0668 (0.387)	-0.0453 (0.197)	-0.0203 (0.250)	0.734 (0.953)	2.433** (1.075)
Observations	1,977	1,962	1,869	2,150	894

Note: Including controls: male, age, married, atc B01; atc R03; atc A02, atc_A10, care package score and hospitalization. * p < 0.10, ** p < 0.05, *** p < 0.01. Results are weighted.

1. For inadequate control over life only information is available in the 2016 sample.

Table A11.5: Regression results excluding individuals who enter for rehabilitative care (zzp9)

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression	Inadequate control over life ¹
<i>Time since nursing home admission</i>					
-12 to -6 months (not yet admitted)	-0.365* (0.209)	-0.202* (0.111)	-0.149 (0.135)	-1.783*** (0.511)	-2.163*** (0.690)
-6 to 0 months (not yet admitted)	Ref.	Ref.	Ref.	Ref.	Ref.
0-6 months (admitted)	0.561 (0.424)	0.206 (0.213)	0.360 (0.258)	1.651* (0.935)	2.312** (0.900)
6-12 months (admitted)	0.191 (0.438)	-0.0640 (0.228)	0.300 (0.272)	1.406 (1.096)	1.318 (1.265)
12-18 months (admitted)	-0.0537 (0.490)	0.0379 (0.240)	-0.0368 (0.308)	0.144 (1.025)	1.840 (1.192)
Observations	1,600	1,588	1,520	1,754	750

Note: Including controls: male, age, married, atc B01; atc R03; atc A02, atc_A10, care package score and hospitalization. * p < 0.10, ** p < 0.05, *** p < 0.01. Results are weighted.

1. For inadequate control over life only information is available in the 2016 sample.

Table A11.6: Regression results excluding individuals who stay for at least 180 days

	Lonely	Social Loneliness	Emotional loneliness	Anxiety and depression	Inadequate control over life ¹
<i>Time since nursing home admission</i>					
-12 to -6 months (not yet admitted)	-0.252 (0.205)	-0.160 (0.108)	-0.0865 (0.132)	-1.874*** (0.509)	-2.036*** (0.679)
-6 to 0 months (not yet admitted)	Ref.	Ref.	Ref.	Ref.	Ref.
0-6 months (admitted)	1.139*** (0.362)	0.389** (0.190)	0.736*** (0.227)	1.458* (0.838)	2.281** (0.897)
6-12 months (admitted)	0.0651 (0.385)	-0.127 (0.205)	0.246 (0.248)	0.854 (1.002)	1.072 (1.269)
Observations	1,662	1,648	1,576	1,818	751

Note: Including controls: male, age, married, atc B01; atc R03; atc A02, atc_A10, care package score and hospitalization. * p < 0.10, ** p < 0.05, *** p < 0.01. Results are weighted.

1. For inadequate control over life only information is available in the 2016 sample.

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