Home vs. Nursing Care: Unpacking the Impact on Health and Well-Being

Abstract

In this paper, we present estimates of the effect of different care settings on health and well-being outcomes. We use data from the French CARE Survey, which interviews individuals aged 60 and above, to assess the differential effect of living at home or in a nursing home on mortality, morbidity and well-being indicators. In addition, we differentiate the effect between for-profit and non-profit nursing homes. To do so, we apply a propensity score matching approach that controls for selection on observables by matching people living at home with those living in nursing homes. Our results are threefold. First, we observe a positive effect of being in a nursing home on health outcomes but a negative effect on other well-being indicators such as happiness and nervousness. Second, the ownership status of the nursing home matters and the positive effect is stronger for non-profit and public nursing homes. Third, residents in for-profit nursing homes appear to to be worse off than those in nonprofit institutions. These findings raise important questions for the future organization and the funding of long-term care.

JEL Classification: C210, I100, J140.

Keywords: Health outcomes, nursing homes, private vs public, CARE, Propensity score matching.

1 Introduction

The challenges that come with population aging are at the core of Western society. From one side, individuals are living longer and will likely spend part of later life in situation of partial or full dependency, thus needing formal and informal care. One the other side, the provision of formal care is costly and weighs on the public spending. Therefore access to nursing home or long-term care facility is limited. However, understanding how formal care provision impacts individuals' health, and to a broader extent their well-being, is yet to be understood.

In this paper, we provide novel causal evidence on the effect of living in a nursing home on health and well-being outcomes. Our aim is to compare similar individuals living at home and in a nursing home and to estimate the differences in terms of mortality, health conditions, as well as a series of indicators of happiness and well-being. In addition we look at the ownership status of the nursing homes as well as if they are for-profit or not in order to identify possible difference of outcomes.

In the US and in Europe, recent public policies tend to support home and community-based care for the elderly as an alternative to institutional care. For instance, the European Care Strategy, introduced in 2022, emphasizes the need for accessible, high-quality, and affordable long-term care (LTC) with a significant focus on home care services. Similarly, in the U.S., there is a growing recognition of the need to expand home care to meet the needs of older adults (Che & Cheung 2024)[1]. Thus, recent policies increasingly favor home care for the elderly over institutional care. This shift is driven by a preference among older adults to remain in their homes, which is often more cost-effective and expected to be associated with improved quality of life (Wysocki et al. 2015). In France, the country on which this study is based, the *'virage domiciliaire'* ('homeshift') has become an important public policy question with more and more elderly choosing to stay at home. This phenomenon has been amplified by the COVID 19 crisis, as well as scandals surrounding the mistreatment of residents of private nursing homes.

In terms of public policy, the choice of residence is of great importance since it questions what is the best way to provide long-term care to elderly people and also what is the cost of supporting the care provided in each residential choice. Especially since informal care is expected to decrease with changes in women labor force participation and family arrangements (i.e. women, who used to be the main carers as wifes or children, are working more, people are getting more divorced, there are fewer children and they are moving away, etc.).

[1] See the recent Home and Community-Based Services Final Regulation of Medicaid for example.

In this paper, we use data from the French survey 'Capacités, Aides et REssources des seniors' (CARE)[2] to assess whether there are differences between people living in nursing homes and those receiving home care for a series of health and well-being outcomes. We are also interested in comparing outcomes for those who are in for-profit and non-profit nursing homes. The survey took place in 2015/2016 before the COVID 19 pandemic which allows us to look at the effect of nursing home in normal times. Since comparing individuals with different care arrangements is not trivial, we use propensity score matching methods in order to construct a sample in which treated (being in a nursing home) and untreated individuals (living at home) have similar characteristics in terms of age, gender, degree of dependency, state of health, availability of informal help (partner, children and relatives) and income. Doing so, we assume that after controlling for the determinants of entry into a nursing home, the difference in terms of outcomes between those two samples is to be attributed to the way the nursing homes are designed and organized, or alternatively to the quality of aid and services one finds staying home. This allows us to determine whether there is a causal link of being in a nursing home on our different measures of outcomes. In addition, we compare the type of nursing home (for-profit vs non-profit) and if they display different effects on our set of outcomes.

Although the question of the difference in effect between types of residence is important, little is known about the possible differential in terms of health and general well-being. While many studies have investigated the determinants of the choice of housing at old age, few studies have provided causal evidence on health, mortality or other individual outcomes (Flawinne et al. 2023). Moreover the ownership status and the type of nursing home may also affect the quality of nursing home care. Several studies have focused on the distinction between non-profit and for-profit institutions (see i.e. Comondore et al. 2009, Grabowski et al. 2013) or between private and public providers (Stolt et al. 2011) but the results are mixed as we exposed in the literature review below. Recently, Laferrère and Schoenmaeckers (2024) have also shown that the life satisfaction of people in nursing homes tends to be different than at home. It is especially important to consider both the health and well-being of people living in nursing homes because these institutions can have contrasting effects on the two. Although nursing homes often provide essential medical care, ensuring residents' physical health and safety, they can sometimes negatively impact happiness and emotional well-being. Limited social interaction or loss of independence may contribute to feelings of loneliness or dissatisfaction in life.

The paper contributes to a growing literature that estimate causal effect of the choice of residence at old age on the elderly situation. Thanks to a very rich data set, we first disentangle the various effects of living in a nursing home by looking at mortality, health outcomes and indicators of well-

[2]Which can be translated in english as "Ability, care and resources for the elderly".

being. The outcomes in our analysis are the probability to survive in the next few months, the number of hospital stays during last year, the number of falls, the self-assessed health level, as well as various individual well-being factors such as happiness, sadness or nervousness. Our analysis provides a big picture of the effect of nursing home care by considering different aspects of elderly well-being. Second, we adopt a causal analysis using the propensity score matching method as well as additional sensitivity analyses. This allows us to take into account the effect of individual characteristics and control for potential selection and endogeneity biases. Third, we differentiate the effects according to the type of the nursing home (for-profit or nonprofit) and its ownership status (private or public).

Our results are threefold. First, we show an overall positive impact of being in a nursing home on health outcomes such as mortality, self-assessed health level and the number of falls and hospital nights. However, results also show that being in a nursing home has detrimental effects on happiness, sadness and nervousness. We also investigate the effect of the violation of the conditional independence assumption by simulating the effect of relevant unobserved confounders affecting both the treatment and the outcomes of interest. It results that the existence of such confounders is unlikely to affect the results. Second, looking at heterogeneity, we observe that the size of these effects vary according to age, sex and the degree of loss of autonomy. Third, looking at the type of the nursing home as well as its ownership, findings show that nonprofit institutions have higher impact on health outcomes but there is no much difference on other well-being indicators. Finally the results also show that residents in non-profit nursing homes are significantly in better shape that those in for-profit institutions.

The paper is structured as follows. The next section presents a quick review of the existing literature on this topic. In Section 3, we present the propensity score matching method used to overcome selection bias along with sensitivity analysis performed to test the robustness of our results to the estimation assumptions. Section 4 presents the data and descriptive statistics and Section 5 presents the main results ad the sensitivity analysis. Section 6 is dedicated to a series of heterogeneity analysis. Finally, Section 7 concludes.

2 Related literature

Our paper is closely related to a literature that deals with long-term care issues and especially how this care is provided. When looking at cross-country comparison, one is surprised by how different is long-term provision between (and within) countries in terms of how it is organized, delivered, and financed. Informal care has been shown to be important (Klimaviciute et al. 2017)

and the substitution between formal and informal care has also been studied (Van Houtven & Norton 2004, Bolin et al. 2008, Bonsang 2009). But the place of residence is also likely to have an impact on the type of care that is received by the elderly and the question we are interested in is to identify the factors of different morbidity and well-being, if any, within the nursing homes.

There is relatively limited research on the specific issue of the role of the institutionalization on potential excess mortality and morbidity. Only few recent studies have tried to assess mortality differential for people in nursing homes versus at home. Giudici et al. (2019) investigate the role of family contact on mortality by looking at French individuals aged 55 and above, living at home or in institution. Their results suggest a higher mortality for those institutionalized, of about 10 years difference, due to lack of active relationships with family members. However, they do not consider endogeneity issues due to different types of people going into nursing home versus staying at home. Using Italian data, Braggion et al. (2020) find that mortality peaks during the first months after admission into nursing home, in particular for patients with a recent hospitalization. The deterioration of pre-existing chronic conditions appears to be the most common cause of death. Flawinne et al. (2023) confirm these results using data for a series of European countries. On the contrary, relying on Dutch administrative data, Bakx et al. (2020) show that individuals in nursing home have no difference in mortality compared to those at home. Similarly, Werner et al. (2019) show for the US that admission to nursing home lower hospital readmission and medical expenditures and has no impact on mortality. However, Kim & Lim (2015) find evidence of an increase in medical expenditures for highly disabled individuals entering nursing homes.

One of the main issue with comparing individuals at home with those in institutions comes from self-selection. The individuals in nursing homes may often be in worse health condition than those at home which makes residential group comparison difficult. Some scholars have tried to overcome this issue by applying matching techniques on observable characteristics and estimate the impact of institutional care on healthcare use (Chappell et al. 2004, Kok et al. 2015, Blackburn et al. 2016, Wysocki et al. 2014). Their results are mixed and depends on the sample and the outcomes they consider.

Another question is also to identify if nursing homes can be a source of worry for individual well-being. If individuals in those facilities suffer from lower well-being compared to their life satisfaction at home, this prevents older people from aging well and might lead them to depression. Studies have investigated this issue, exploiting both cross-sectional and longitudinal data, and the results are also mixed. Böckerman et al. (2012) look at Finnish data and found that institutionalized individuals have a higher level of well-being compared to those at home. Bom et al. (2022) find similar results

using Dutch data and exploiting an event study method before and after nursing home admission. Similar evidence is also found by Kok et al. (2015), Bakx et al. (2020), Rapp et al. (2018). Laferrere and Schoenmaekers (2024) confirm these results by exploiting a panel of European countries of older people aged 65+. By using propensity score matching methods, they show that living in a nursing home is associated with lower well-being in Europe. However, when they make use of longitudinal data to further reduce the potential impact of non-observables, the conclusions are globally reversed: living in a nursing home is associated with higher well-being. This would be coherent with a model of optimal residential choices: living in a nursing home might not be desired, but proves to be the best choice for those who make it. However, Prieto-Flores et al. (2011) find a strong association between loneliness and institutionalization using Spanish data. Admission may also be perceived as a stressful event and a decrease in contact with friends and family members (Port et al. 2001). The importance of visits and family contacts is also highlighted by Verbeek et al. (2020).

Finally, Comondore et al. (2009) conducted a meta-analysis of studies that examined the quality of care in facilities and found that non-profit facilities provide the best care, in particular due to the quality of staff. The importance of staff was also found by Antwi & Bowblis (2018), who show how staff turnover can lower quality and increase mortality in the US setting; and by Lin (2014) who documented that increasing registered nurse staffing has a large significant impact on quality of care.

3 Empirical Strategy

We are interested in the effects of residency, either at home or in a nursing home (private or public, for-profit or non-profit) on a series of outcomes. To evaluate the impact, one would ideally compare the outcome for someone who lives, for example, in a nursing home with the outcome we could observe if she had stayed at home. Unfortunately, we only observe individual in either one of the two states. Thus we face two selection problems. First, health status and housing may be determined simultaneously. This is why, as it becomes clear below, we only consider individuals with the same degree of limitations. The second problem arises because the characteristics of people in nursing homes can differ significantly from those still at home. The same is true when we compare people in different types of nursing homes. Therefore, to control for the selection bias due to observables, we use a propensity score matching method. It allows us to condition on sufficient observable information to obtain a counterfactual against which we can measure the effect of being in a nursing home[3].

[3]See Imbens (2015) for a detailed presentation of the matching method.

3.1 Propensity score matching

Applying the model of Rubin (1974), on can write the outcome we observe $Y = T \cdot Y_1 + (1-T) \cdot Y_0$, where T indicates whether an individual is assigned to treatment (e.g. being in a nursing home) or control group (e.g. living at home). Y is the outcome that is indexed by 1 for the potential outcome in a nursing home and 0 otherwise. We want to estimate $E(Y_1 - Y_0|X, T = 1)$ where X is a vector of observable characteristics.

By matching similar individuals from the two groups (treated or not), the average treatment effect on the treated (ATT) can be identified if the conditional independence assumption holds and assignment to treatment is random conditional on controls X: $(Y_0, Y_1) \perp T|X$. That is the outcome of the individuals in the control group and in the treated group are independent of the residence status once we control for a set of observable characteristics. Given the high dimension of X, a more feasible option is to concentrate on a summary index, a balancing score (Rosenbaum & Rubin 1983, 1985). The most prominent balancing score is the conditional probability of selection into treatment $P(X)$, i.e. the propensity score of being into a nursing home. The conditional independence assumption then implies $(Y_0, Y_1) \perp T|P(X)$.

To obtain propensity scores, Probit regressions are estimated to determine the probability of living in a nursing home. In our case, explanatory variables are gender, age, partnership situation, the number of informal caregivers (children and relatives), individualized household income. We also control for health and include the number of chronic diseases and the level of the GIR score[4]. Finally we include nursing homes characteristics such as the number of years spent in the nursing home, the cost, the size, the number of floors but also if the individual has previously worked for additional comparative analyses by type of nursing home. These are strong predictors of entering a nursing home (Laferrère et al. 2013). Depending on the analysis, the estimations of propensity scores will be done for the total sample or for specific subsamples. All Propensity score estimation results are presented in Table A.1 in the Appendix.

In our main analysis, we use Kernell matching method with replacement to estimate the ATT. As usual with matching analysis, there is a clear trade-off between bias and efficiency when it comes to choosing a matching algorithm. This estimator has the advantage of reducing the variance that is achieved since more information is used compared to other matching methods. However, it possibly

[4]The GIR score (*Groupe Iso-Ressources*) is a widely used classification tool in France to assess the level of dependency of elderly individuals, especially when determining their eligibility for long-term care services or financial aid. It is based on the AGGIR grid (*Autonomie Gérontologique Groupes Iso-Ressources*), which evaluates a person's physical and mental autonomy across several categories like mobility, personal hygiene, meal preparation, and cognitive functions. The GIR score goes from 1 to 6 with 1 being the worse and 6 means a low level of dependency. A GIR index lower than 5 gives eligibility to long-term care benefits.

uses observations that are not very good matches, so in addition, as robustness checks, we also present in the appendix results when we use other matching algorithms to compare our results to different matching methods, such as nearest-neighbor and radius ones.

3.2 Sensitivity analysis

Our analysis is based on the conditional independence assumption, which assumes that there is no unobservable characteristic that explains both the decision of residence and the outcomes of interest. In order to assess whether our average treatment effects are robust to possible deviations from this assumption, we implement a simulated sensitivity analysis as proposed by Ichino et al. (2008). The idea is to assume that the conditional independence assumption is not satisfied given the considered observables but would be if one could observe an additional binary variable. This potential confounder can be simulated in the data and used as an additional covariate in combination with the matching estimator. By comparing the results obtained with and without matching on the simulated confounder, we can show to what extent our results are robust to specific sources of failure of the conditional independence assumption.

The assumption of the analysis is that the conditional independence assumption no longer holds given the set of covariates X but it holds given X and an unobserved binary variable U. This means that as long as U is not observed, the outcome of the control individuals cannot be used to estimate the counterfactual outcome of the treated individuals. We assume that U may impact both the treatment and the outcome and that the distribution U can be fully characterized by four probabilities p_{ij} given the treatment T and the outcome Y:

$$p_{ij} = P(U = 1|T = 1, Y = j)$$

with $i, j \in 0, 1$, which give the probability that $U = 1$ in each of the four groups defined by the treatment status and the outcome value. Given arbitrary values of the parameters p_{ij}, a value of U is attributed to each individual according to its belonging to one of the four groups defined by the treatment status and the outcome value. U can then be treated as any other observed covariate and is included in the set of variables used to estimate the propensity score and to compute the effect of the treatment. The difference $d = p_{01} - p_{00}$ can be interpreted as a measure of the effect of U on the untreated outcome, and the difference $s = p_1 - p_0$ as a measure of the effect of U on the selection into treatment. The expression p_1 and p_0 correspond to the probability of being treated given the value of U and controlling for the set of covariates X: $p_1 = P(T = 1|U = 1, X)$ and

$p_0 = P(T = 1|U = 0, X)$.

Ichino et al. (2008) define the selection effect Λ as the effect of U on the relative probability to be assigned to the treatment and the outcome effect Γ as the effect of U on the relative probability to have a positive outcome in the absence of treatment.

$$\Lambda = \frac{\frac{P(T=1|U=1,X)}{P(T=0|U=1,X)}}{\frac{P(T=1|U=0,X)}{P(T=0|U=0,X)}}$$

and

$$\Gamma = \frac{\frac{P(Y=1|T=0,U=1,X)}{P(Y=0|T=0,U=1,X)}}{\frac{P(Y=1|T=0,U=0,X)}{P(Y=0|T=0,U=0,X)}}$$

By measuring the two effects Γ and Λ, one can characterize the simulated confounder U An outcome effect of $\Gamma > 1 (< 1)$ means that the unobserved U positively (negatively) affect the outcome. Similarly if the selection effect $\Lambda > 1 (< 1)$, it means that the unobserved U increases (decreases) the probability to be treated.

In order to pick the parameters p_{ij}, we follow Ichino et al. (2008) and assume that the distribution of the unobserved variable U is similar to the empirical distribution of important binary covariates, we can fix p_{ij} according to their values for a set of covariates used in the propensity score model. If this does not confound our results and the ATTs are very close to the ones presented without this "unobserved and hypothetical" binary variable U, then the exercise supports the robustness of the estimates derived under the conditional independence assumption.

3.3 Falsification exercise

In addition to our sensitivity analysis, we perform a falsification population test. We take the sample of people living at home and we randomly split the sample in one control and one fakely treated, respecting the proportions of treated and controls in the main analysis. We repeat it 100 times, and we run our estimation model. Then we can see the size of the effect and in how many cases we find statistically significant differences. We should not find any differences in the outcomes of the two samples in this falsification population exercise if the only reason for the differences is the residential status.

4 Data and descriptive statistics

We use the French CARE Survey (*Capacités, Aides et REssources des Seniors*), which is a general population survey of French individuals aged 60 and above. The survey targeted living con-

ditions of individuals living at home and in communities (residential facilities) and was conducted in 2015-2016. The survey aimed at understanding individuals' relationship with their relatives, limitations of daily activities and any type of support received. It is composed on two parts: one is devoted to individuals living at home (*CARE-Menages*) and the other to individuals in institutions (*CARE-Institutions*). The survey is representative of the older population in France aged 60 or more and about 10,628 individuals living at home and 3,262 nursing home residents have been interviewed. It provides exhaustive information on socioeconomic characteristics, health status, limitations, and assistance received. It also asks questions about the general well-being of the respondent.

Our study population covers every individual interviewed in one of the two parts of the survey for whom we have all information we need to match pairs of elderly. Indeed, to obtain propensity scores, we use Probit regressions where the dependent variable is being in a nursing home and explaining variables are those presented in the previous section. Table 1 summarizes the information on the demographic and household variables according to the type of residence. On average, people in nursing homes are older, have more limitations, are more female and single and have lower income than those living at home. They have also less chronic diseases and more helpers. These descriptive statistics show important differences on average between the two group which motivates the use of propensity score matching method to control for the differences between the two groups elderly and determine a potential impact of nursing homes on the outcomes.

We consider eight outcomes related to health status and individual well-being. First, we consider mortality. The CARE survey of 2015-2016 have been matched with an additional information from the census of 2021. This allows us to identify for each respondent if she was still alive or not and in case of death, the date of passing. On this basis, we construct a variable giving the number of months not in life between the initial date of the survey and the census which is an indicator of mortality. We also consider two other objective health outcomes which are the number of nights spent in hospital and if the person has fallen during the last 12 months. In the survey, respondents are asked to rate their health on a scale from 1 meaning very good to 5 meaning very bad[5]. We create a dummy variable for being in poor health when the answer to this question is poor or very poor. In Table 1, we see the summary statistics for these four health outcomes. Nursing homes residents have higher mortality and worse health status which is expected given their higher age. Table 2 also presents detailed statistics for our outcomes of interest.

In addition to these health outcomes, we consider four well-being indicators. Respondents have been asked if during the four weeks before the survey they have felt 1) happy, 2) sad and down,

[5]The question is "How is your general state of health? 1 = Very good, 2 = Good, 3 = Quite good, 4 = Poor and 5 =Very poor".

Table 1: Summary statistics of CARE data

	At home	Nursing Home	Both	(Observations)
Age	75.6	86.4	78.7	(7729; 3135; 10864)
GIR score	5.1	2.8	4.4	(7729; 3105; 10834)
% of female	61.5	74.7	65.3	(7729; 3135; 10864)
Disposable Income (€)	27179.5	18917.9	24793.7	(7721; 3135; 10856)
% in couple	48.4	12.5	38.1	(7729; 3129; 10858)
# of helpers	0.672	0.940	0.749	(7729; 3135; 10864)
# of chronic diseases	0.773	0.695	0.750	(7729; 3099; 10828)
Outcomes				
# months not in life	9.091	20.443	12.217	(7729; 2938; 10667)
# of hospital nights	0.269	0.302	0.278	(7722; 3088; 10810)
% Fell	32.4	43.6	35.6	(7719; 3095; 10814)
% in poor health	30.8	36.5	32.4	(7729; 3135; 10864)
% Unhappy	52.0	62.1	55.1	(7102; 3135; 10237)
% Sad	40.5	54.3	43.3	(7209; 1818; 9027)
% Not relaxed	47.6	71.6	54.9	(7191; 3135; 10326)
% Nervous	17.6	53.0	28.3	(7218; 3135; 10353)

3) calm and relaxed or 4) very nervous. For each of these they have to answer on a scale from 1 meaning never to 5 meaning all the time[6]. We transform the information into dummy variables which indicates if the individual feels Unhappy, Sad, Not relaxed and Nervous. This gives us four well-being indicators that are also displayed in Table 1 and 2.

[6]The possible answer are 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often. and 5 = All the time.

Table 2: Summary statistics of the outcomes of interest

Main covariates		Months not in life	Hospital nights (%)	Fell (%)	Poor Health (%)	Unhappy (%)	Sad (%)	Not relaxed (%)	Nervous (%)
		Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)
All	AH	9.1 (17.7)	26.9 (44.3)	32.4 (46.8)	30.8 (46.2)	52.0 (50.0)	40.5 (49.1)	47.6 (49.9)	17.6 (38.0)
	NH	20.4 (18.3)	30.2 (45.9)	43.6 (49/6)	36.5 (48.2)	62.1 (48.5)	54.3 (49.8)	71.6 (45.0)	53.0 (50.0)
	Both	12.2 (18.6)	27.8 (44.8)	35.6 (47.9)	32.4 (46.8)	55.1 (49.7)	43.3 (49.5)	54.9 (49.8)	28.3 (45.0)
Women	AH	8.3 (16.9)	26.5 (44.1)	35.9 (48.0)	31.4 (46.4)	48.2 (50.0)	46.7 (49.9)	42.9 (49.5)	20.0 (40.0)
	NH	19.9 (18.3)	28.8 (45.2)	44.2 (49.7)	37.1 (48.3)	62.4 (48.4)	55.0 (49.8)	70.8 (45.5)	54.2 (49.8)
	Both	12.0 (18.2)	27.2 (44.5)	38.6 (48.7)	33.3 (47.1)	53.2 (49.9)	48.6 (50.0)	52.6 (49.9)	31.9 (46.6)
Men	AH	10.4 (18.9)	27.5 (44.7)	26.8 (44.3)	29.8 (45.7)	57.9 (49.4)	30.6 (46.1)	55.0 (49.8)	13.6 (34.2)
	NH	21.9 (18.3)	34.7 (47.6)	41.8 (49.4)	34.7 (47.6)	61.0 (48.8)	52.6 (50.0)	74.2 (43.8)	49.1 (50.0)
	Both	12.7 (19.3)	29.0 (45.4)	29.9 (45.8)	30.8 (46.2)	58.6 (49.3)	33.8 (47.3)	59.2 (49.1)	21.4 (41.1)
Single	AH	11.0 (18.8)	30.1 (45.9)	38.0 (48.5)	33.3 (47.1)	42.6 (49.5)	47.4 (49.9)	46.4 (49.9)	17.6 (38.1)
	NH	20.0 (18.3)	29.5 (45.6)	43.1 (49.5)	35.3 (47.8)	60.9 (48.8)	53.5 (49.9)	70.5 (45.6)	51.9 (50.0)
	Both	14.5 (19.1)	29.9 (45.8)	40.1 (49.0)	34.1 (47.4)	50.4 (50.0)	49.2 (50.0)	56.6 (49.6)	32.1 (46.7)
In couple	AH	7.0 (16.2)	23.4 (42.3)	26.4 (44.1)	28.1 (45.0)	61.9 (48.6)	33.2 (47.0)	48.8 (50.0)	17.5 (38.0)
	NH	22.9 (18.2)	35.4 (47.9)	46.9 (50.0)	44.6 (49.8)	70.4 (45.7)	60.8 (48.9)	79.8 (40.1)	59.9 (49.0)
	Both	8.5 (17.0)	24.5 (43.0)	28.3 (45.1)	29.7 (45.7)	62.8 (48.3)	34.6 (47.6)	52.0 (50.0)	21.8 (41.3)
Less than 80	AH	4.9 (13.7)	24.7 (43.1)	26.4 (44.1)	27.9 (44.9)	55.9 (49.7)	37.2 (48.3)	48.3 (50.0)	17.9 (38.3)
	NH	14.2 (17.6)	30.4 (46.0)	38.7 (48.7)	37.3 (48.4)	62.2 (48.5)	57.7 (49.5)	71.0 (45.4)	53.7 (49.9)
	Both	5.9 (14.4)	25.3 (43.4)	27.7 (44.8)	28.9 (45.3)	56.6 (49.6)	38.6 (48.7)	50.8 (50.0)	21.9 (41.3)
More than 80	AH	17.1 (21.5)	31.1 (46.3)	43.8 (49.6)	36.4 (48.1)	43.6 (49.6)	47.5 (50.0)	46.0 (49.9)	16.8 (37.4)
	NH	21.9 (18.1)	30.2 (45.9)	44.8 (49.7)	36.3 (48.1)	62.0 (48.5)	53.5 (49.9)	71.8 (45.0)	52.8 (49.9)
	Both	19.4 (20.1)	30.7 (46.1)	44.3 (49.7)	36.3 (48.1)	53.4 (49.9)	49.9 (50.0)	59.5 (49.1)	35.6 (47.9)

5 Main results

5.1 The effect of being in a nursing home

We begin with our main result on the impact of being in a nursing home compared to living at home. We consider the eight outcomes presented above and Table 3 displays the estimated average treatment effects as well as the number of observations used for the treated and the control groups. We estimate four different matching models for each outcome by successively introducing exact matching on sex, level of dependency measured by the GIR score, and age. This allows us to see if matching exactly on some important variables affects our results. We present the results according to the Kernell matching method but the results obtained with other matching methods are presented in Table A.2 in the Appendix. They are qualitatively similar. In the Appendix, Table A.3 shows additional results from an OLS regression instead of a propensity score matching estimation.

The ATTs are similar whatever the model which tends to show that exact matching does not provide much more precision to our estimations. Therefore, in the following analysis, we will present estimations without exact matches for the sake of calculation. The number of individuals used to match varies for each estimation. It depends on both the outcome considered and the matching procedure. The effect of being in a nursing home is significant at 1% level for every outcomes except for being *Sad*.

Being in a nursing home has a negative and significant effect on mortality. We find that elderly in a nursing home have almost 5 to 6 more months to live than those staying at home. They are also about 7 to 9 percentage points less likely to have hospital stay, 11 percentage points less to fall. Looking at subjective health measure, people in nursing home have a lower probability of being in poor health by almost 16 percentage points.

However these results in favor of nursing homes are tempered by the effects we observe for outcomes related to life satisfaction, stress and nervousness. Indeed, being in a nursing home means that the residents experience much often lack of happiness feeling. They are also more likely to experience a lack of calm and nervousness. These results are very interesting because they show that while living in a nursing home is beneficial for health, the same cannot be said for general well-being and, in particular, feelings of happiness.

Table 3: Average Treatment of the Treated (ATT)

Dep. Variable	No exact match (1)	Exact match on sex (2)	Exact match on sex & GIR (3)	Exact match on sex, GIR & age (4)
Time not in life months				
ATT	-5.994***	-6.190***	-6.014***	-4.887***
	(1.025)	(1.004)	(0.987)	(0.951)
Treated	2757	2743	2689	2509
Control	6955	7078	7264	4995
Obs	9712	9821	9953	7504
Hospital Nights				
ATT	-0.092***	-0.077***	-0.070***	-0.080***
	(0.020)	(0.021)	(0.021)	(0.020)
Treated	2899	2889	2858	2637
Control	6742	6995	7219	5022
Obs	9641	9884	10077	7659
Fell				
ATT	-0.116***	-0.109***	-0.119***	-0.104***
	(0.021)	(0.021)	(0.021)	(0.020)
Treated	2917	2892	2848	2617
Control	6884	7079	7208	5043
Obs	9801	9971	10056	7660
Poor health				
ATT	-0.152***	-0.153***	-0.163***	-0.188***
	(0.021)	(0.021)	(0.022)	(0.020)
Treated	2934	2924	2880	2667
Control	6843	7032	7199	5046
Obs	9777	9956	10079	7713
Unhappy				
ATT	0.309***	0.315***	0.317***	0.261***
	(0.026)	(0.025)	(0.027)	(0.023)
Treated	2931	2876	2879	2280
Control	6841	7006	6802	4485
Obs	9772	9882	9681	6765
Sad				
ATT	0.010	-0.005	-0.010	-0.024
	(0.024)	(0.024)	(0.026)	(0.022)
Treated	1672	1663	1670	1516
Control	6972	7116	6846	4497
Obs	8644	8779	8516	6013
Not relaxed				
ATT	0.310***	0.323***	0.314***	0.291***
	(0.030)	(0.030)	(0.033)	(0.024)
Treated	2921	2895	2879	2290
Control	6976	7095	6892	4565
Obs	9897	9990	9771	6855
Nervous				
ATT	0.308***	0.291***	0.258***	0.263***
	(0.026)	(0.034)	(0.045)	(0.023)
Treated	2942	2889	2880	2293
Control	702	7131	6927	4581
Obs	3644	10020	9807	6874

Notes: All estimation with the Propensity-Score Kernel Matching method. Standard errors are reported in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

We also look at the effect of our various covariates on the ATTs. Table A.4 in the Appendix shows how much each of the existing observables impacts the treatment effect. Although the ATT is rather stable for some outcomes, we see that it is important to control for the level of dependency for others. In particular, the estimated treatment effects for health-related outcomes change signs

once we control for the GIR score and remain stable afterward. This comforts us in the necessity to take into account several important explicative variables.

These first results appeal some comments based on additional (not reported here). First, we have decided to use the GIR score as an indicator of the need for long-term care because it is the one that is mainly used in France. However, the survey includes also a very detailed record of daily limitations (up to 23). In our propensity score matching estimations, if we replace the GIR score by the sum of the daily limitations, the estimated coefficients and their significance are almost identical. GIR scores and limitations are indeed highly correlated. Second, we consider mortality by using the census of 2021 which could have been affected by the COVID-19 crisis. If instead, we stop counting the number of months alive at a date just before the start of the pandemia, i.e. we look at whether people have died by 28 February 2020, the estimated ATTs are a little bigger (-6.433 instead of -5.994 without exact matching or -5.602 instead of -4.887 with exact matching), as the contagion and its effects have been significant in nursing homes in terms of deaths, illustrating the consistency of the results.

In order to confirm our main results, we conduct two additional analysis as presented in Section 3. First we conduct the sensitivity analysis suggested by Ichino et al. (2008) to test whether our results are robust to the violation of the conditional independence assumption. Second, we perform a falsification population exercise.

5.2 Sensitivity analysis

In order to further test whether the results obtained with the propensity score matching are robust to the violation of the conditional independence assumption, we conduct the sensitivity analysis suggested by Ichino et al. (2008). It is possible that one unobserved variable simultaneously influences the decision to go into a nursing home (selection effect, Λ) and the probability to die (outcome effect, Γ). For example, actual informal care may influence simultaneously the decision to enter a nursing home and the health of the elderly. The former would be related to a selection effect and the later would have an outcome effect.

To investigate how sensitive our estimates are with respect to the possible existence of this unobservable variable, we perform one simulation exercise. We simulate an unobserved variable which would have a distribution similar to the empirical distribution of important binary covariates. Covariates with the greatest selection and outcome effects are reported in Table 4 for three different dependent variables [7]: Being a female, being in couple and be aged 80 or more. We see that any

[7] Results for all outcomes are available upon request.

Table 4: Sensitivity analysis with confounder-like

Dep. variable		Outcome Effect Γ	Selection Effect Λ	ATT
Months not in life	PSM (Kernell)	1	1	-5.994***
	Confounder-like			
	Being a female	0.790	1.972	-5.055***
	Being in couple	0.526	0.178	-6.789***
	Be aged 80 and over	5.069	5.187	-9.192***
Poor health	PSM (Kernell)	1	1	-0.152***
	Confounder-like			
	Being a female	1.094	1.861	-0.144***
	Being in couple	0.784	0.156	-0.158***
	Be aged 80 and over	1.491	7.660	-0.172***
Unhappy	PSM (Kernell)	1	1	0.309***
	Confounder-like			
	Being a female	0.670	1.792	0.311***
	Being in couple	2.188	0.168	0.350***
	Be aged 80 and over	0.603	8.103	0.347***

Notes: All estimation with the Propensity-Score Kernel Matching method. Bootstrapped standard errors are reported in parentheses. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

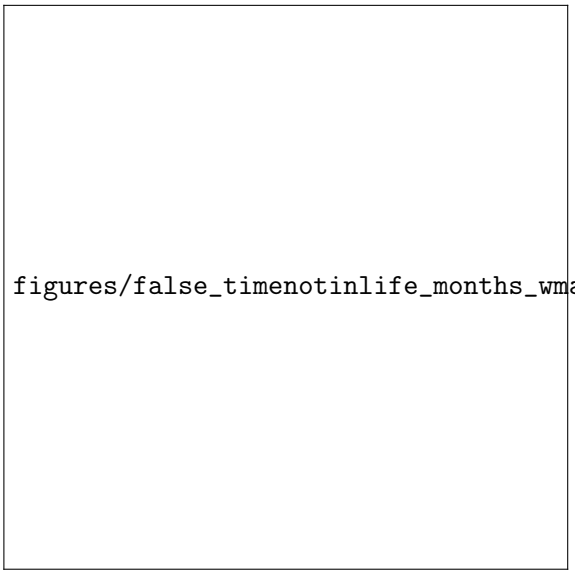
unobserved variable with similar treatment and selection effects as the covariates already introduced in the propensity score matching will not confound our results. The estimate for the ATTs are very close to the ones presented in Table 3.

5.3 Falsification exercise

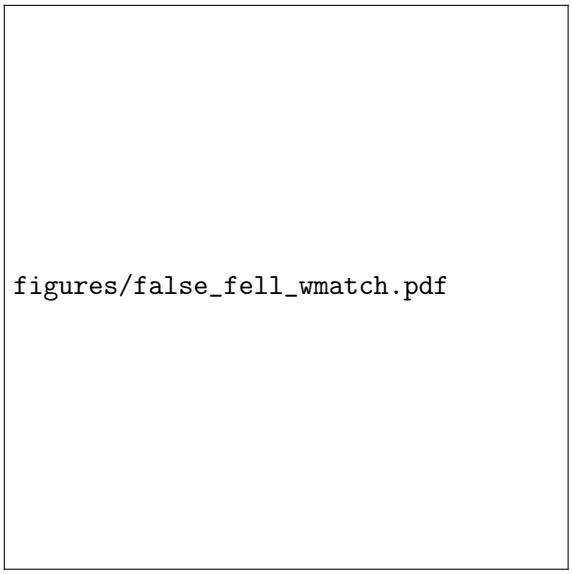
Figures 1 displays the results of a falsification population exercise based on 100 simulations of random assignment of fake residency in a nursing home to control groups as presented in Section 5.1. For each of the eight outcomes we consider here, we see that our main estimations presented in Table 3 differ significantly from the simulated results. These findings support also that there is no confounding factors that affect our estimates.

Figure 1: Falsification population exercise

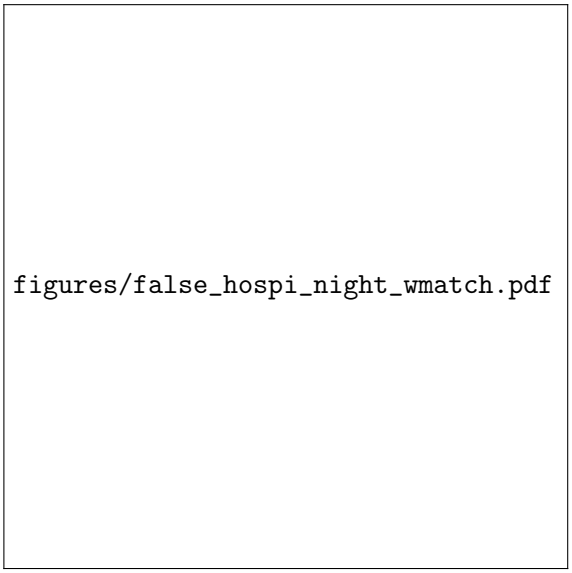
Time not in life (months)



Fell

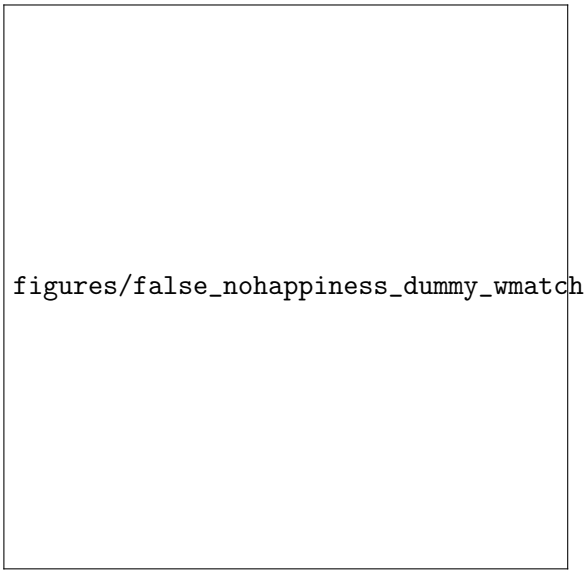


Night in the hospital

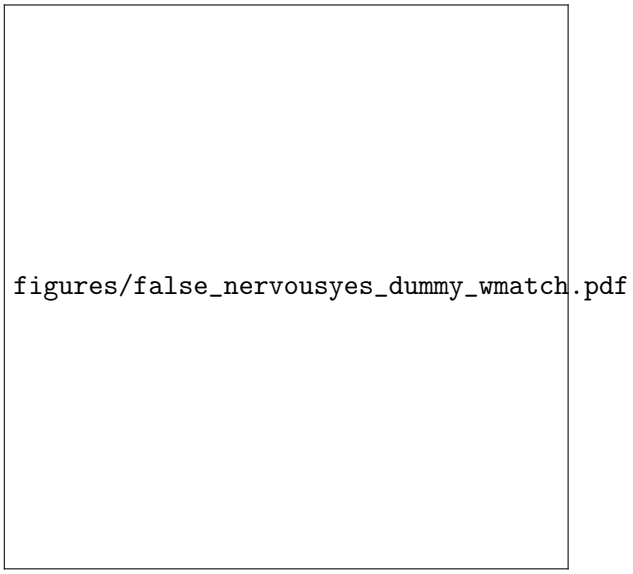


Poor health status

Unhappy



Nervous



Not relaxed

Sad

6 Heterogeneity analyses

We perform a series of additional estimations to explore the heterogeneity of effects. In the following all results are obtained with the Kernell method without exact matching for the sake of calculation. We look at the effects for some subsamples obtained according to age, sex, level of need for long-term care and type and ownership status of nursing homes.

6.1 By sex, age and level of dependency

We first look at variations according to age by estimating the ATT for the subgroups of people aged less and more than 80. Remember that our sample is made of people aged 60 or more. The first two columns of results of Table 5 show the two estimations. For all outcomes except mortality and sadness, the ATTs are significantly different than zero and of the same signs at those presented in Table 3. This means that being in nursing homes do affect both age groups in the same way. However, the size of the effect may be different for some groups. The negative effect of being in a nursing home appears to be stronger for the young group (less than 80) for what concerns the number of hospital nights and the probability of being in poor health. This is probably an age effect since older people are more likely to experience bad health issues. Interestingly we observe no effect on mortality for those aged less than 80 years old. Which is expected since it is below the average life expectancy that was in 2018 in France 85.3 for women and 79.4 years for men. Looking at the well-being measure, we do not observe big differences in the probability of Unhappy and Nervous but younger individuals appear to be much more impacted in terms of absence of calm.

We also look at gender difference in Table 5. For all outcomes, except Sad, and for each sex, the ATTs are significantly different than zero and of the same signs at those presented in Table 3. This means that being in nursing homes do affect both sex in the same way but the size of the effect is different for some outcomes. In particular, male health outcomes, such as mortality, hospital nights and the probability of poor health, are much more affected than female ones. However, there is no much difference of effect for the other outcomes and we do not observe big difference between the two groups.

Finally we estimate the ATT of being in a nursing home for each of the outcome for those who have a GIR score lower than 5 or greater or equal to 5. That is we make the difference between those who are according to French legislation eligible for long-term care benefits and the others. This is to differentiate the estimation according the level of dependency. In Table 5, we see that the overall difference in terms of health conditions between being in a nursing home and living at home

Table 5: ATT by Age, Female and GIR

Dep. Variable	Age		Gender		Gir	
	≤80	>80	Male	Female	<5	≥5
Time not in life months						
ATT	-0.151	-7.352***	-7.235***	-5.395***	-6.274***	-2.401*
	(2.116)	(1.155)	(1.648)	(1.240)	(1.054)	(1.236)
Hospital night						
ATT	-0.144***	-0.0684***	-0.136***	-0.0823***	-0.108***	0.0246
	(0.044)	(0.024)	(0.037)	(0.026)	(0.023)	(0.030)
Fell						
ATT	-0.095**	-0.112***	-0.123***	-0.114***	-0.120***	0.005
	(0.045)	(0.025)	(0.036)	(0.027)	(0.023)	(0.034)
Poor health						
ATT	-0.288***	-0.115***	-0.203***	-0.121***	-0.172***	0.0123
	(0.042)	(0.025)	(0.037)	(0.027)	(0.023)	(0.026)
Unhappy						
ATT	0.268***	0.299***	0.245***	0.321***	0.343***	-0.050
	(0.063)	(0.032)	(0.047)	(0.030)	(0.032)	(0.036)
Sad						
ATT	-0.001	0.008	0.044	-0.015	-0.008	0.061
	(0.052)	(0.028)	(0.041)	(0.031)	(0.030)	(0.038)
Not relaxed						
ATT	0.439***	0.286***	0.229***	0.341***	0.352***	0.038
	(0.042)	(0.033)	(0.043)	(0.035)	(0.033)	(0.035)
Nervous						
ATT	0.275***	0.294***	0.342***	0.287***	0.308***	0.107***
	(0.056)	(0.034)	(0.031)	(0.038)	(0.033)	(0.027)

Notes: All estimations are obtained with the Propensity-Score Kernel Matching method. Standard errors are reported in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

is actually driven by those with a GIR score less than 5. This means that those with important needs for long-term care can benefit from being in a nursing home. However, we also see that the effect on well-being is significant for these individuals and positively affect the probability of being unhappy or nervous.

6.2 By type of nursing home

In France, nursing homes can be categorized into different types based on their funding and ownership structures. Public nursing homes are typically managed by local authorities or public health institutions. Among these, some are affiliated with hospitals and are integrated into the healthcare system, providing a higher level of medical supervision and care. Other public nursing homes operate independently, often run by municipalities or regional authorities. Private nursing homes, on the other hand, are divided into two subcategories: non-profit and for-profit. Non-profit nursing homes are often run by charitable organizations and prioritize affordability, while for-profit facilities are managed by private companies.

Table 6 displays descriptive statistics for each type of nursing homes. In our data, we can identify privately owned nursing homes, either for-profit or non-profit as well as publicly owned affiliated with hospital or not. There is not much difference in the characteristics of the residents of these nursing

homes, apart from income. Residents of private nursing homes are richer than others. They also stay for shorter periods on average. For the rest, apart from the fees, there are no notable differences between the institutions either.

Table 6: Descriptive statistics by type of Nursing Home

	Private		Public	
	For-profit	Non-profit	Hospital	Non-hospital
Women (%)	76.8	78.7	70.3	73.1
Couple (%)	13.8	10.1	13.5	13.4
More than 80 (%)	85.7	82.9	74.1	80.3
GIR 1 or 2 (%)	54.4	45.4	59.2	45.9
GIR 3 or 4 (%)	38.2	41.3	32.6	42.7
GIR 5 or 6 (%)	7.4	13.3	8.2	11.4
Individualized income (€, mean)	24883	18779	16743	16932
Years in nursing home (mean)	2.7	3.6	3.6	4.1
# Dwellings before (mean)	3.3	3.5	4.8	3.6
# Floors in nursing home (mean)	2.3	2.1	2.1	2.0
# Beds in nursing home (mean)	81.1	80.1	129.3	94.0
Nursing home fees (€, mean)	2532	1779	1651	1578

In Table 7, we present the effect of being in a nursing home when we differentiate by types. For each outcome, we estimate the ATT of being in a certain type of nursing home vs living at home. The first columns of results show the effect for private for-profit and non-profit institutions as well as public hospital related or not. The last two columns present estimations once we gather all private nursing homes together (for-profit and non-profit) and when we gather all non-profit institutions (private non-profit and public).

At first sight, we do not observe much difference between the types of nursing home. The ATTs are all significant (except for Sad) and of the same sign as in our main estimates. Whatever type of nursing home, it reduces mortality, the number of hospital nights, the probability of falling, and the likelihood of poor health, this compared to living at home. However, the size of the effect varies. In particular, it seems that non-profit institutions (private or public) have a bigger impact than for-profit ones. This is shown in the last column, which displays bigger effects for non-profit nursing homes (except for mortality where the coefficients are similar). The reduction in health outcomes is greater when in a non-profit nursing home.

Table 7: ATT by type of nursing home

Dep. Variable	Private		Public		Private	Non-profit
	For-profit	Non-profit	Hospital	Non-hospital		
Time not in life months						
ATT	-6.838***	-5.869***	-5.341***	-5.763***	-6.880***	-6.179***
	(1.402)	(1.156)	(1.221)	(1.217)	(1.126)	(0.981)
Hospital Nights						
ATT	-0.015	-0.076***	-0.143***	-0.054**	-0.054**	-0.101***
	(0.030)	(0.023)	(0.026)	(0.026)	(0.022)	(0.021)
Fell						
ATT	-0.010	-0.103***	-0.157***	-0.117***	-0.071***	-0.138***
	(0.031)	(0.025)	(0.027)	(0.026)	(0.024)	(0.021)
Poor Health						
ATT	-0.132***	-0.165***	-0.174***	-0.132***	-0.150***	-0.169***
	(0.031)	(0.024)	(0.027)	(0.026)	(0.024)	(0.021)
Unhappy						
ATT	0.302***	0.280***	0.280***	0.341***	0.270***	0.305***
	(0.033)	(0.029)	(0.037)	(0.030)	(0.030)	(0.026)
Sad						
ATT	0.017	0.034	0.016	-0.0035	0.014	0.009
	(0.039)	(0.030)	(0.034)	(0.033)	(0.027)	(0.024)
Not relaxed						
ATT	0.282***	0.286***	0.302***	0.296***	0.258***	0.298***
	(0.036)	(0.030)	(0.037)	(0.031)	(0.030)	(0.029)
Nervous						
ATT	0.329***	0.263***	0.305***	0.316***	0.287***	0.282***
	(0.033)	(0.026)	(0.035)	(0.028)	(0.027)	(0.028)

Notes: Each ATT is estimated by taking the given type of nursing home as a treatment group and the control group is composed of people living at home. All estimations are obtained with the Propensity-Score Kernel Matching method. Standard errors are reported in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

6.3 For-profit versus non-profit nursing homes

Observing that non-profit nursing homes have a greater impact than for-profit ones is important because it highlights the prioritization of resident well-being over financial gain. Previous studies have shown that nursing homes owned by for-profit companies tend to have a lower quality than homes with public and non-profit owners (**?**Comondore et al. 2009, Winblad et al. 2017, Hjelmar et al. 2018). Non-profit nursing homes often reinvest resources into improving care quality, staffing, and facilities, which directly benefits residents. They tend to focus on accessibility and equitable service, ensuring that even those with limited financial means receive adequate care. This contrasts with for-profit nursing homes, where profit motives can sometimes result in cost-cutting measures that may compromise the quality of care.

We further investigate this difference by directly comparing the outcomes of for-profit and non-profit nursing homes. To do so, we apply the same propensity score matching method, but we match residents from a given type of nursing home to other types to see if we observe a significant difference. Table 8 presents several estimations. In the first column, we look at the difference between private for-profit nursing homes and other institutions. In the second column, we compare private non-profit nursing homes and others. In the third and fourth columns, we look at the effect of public institutions, and in the last two columns, we compare private and public nursing homes as well as for-profit and non-profit ones.

In Table 8, we observe a series of interesting results. First, there is no difference between the different nursing homes in terms of mortality. In the first set of results of Table 8, there is no significant ATT regardless of the groups we compare. However, private nursing homes, in particular for-profit ones, display a higher risk of hospital nights and falls as well as lower level of subjective health than other institutions. When we compare for-profit retirement homes with other types of institution, we observe a positive and highly significant effect on the probability of falling and on the number of nights spent in the hospital. The probability of being in poor health is also higher. This is not true if you only compare private non-profit nursing homes with the others. On the contrary, they even have a positive effect on health. This difference between private for-profit and non-profit institutions is confirmed by the results presented in the last two columns. Finally, there is no main difference in indicators of well-being such as Sad. Respondents in private for-profit nursing homes show more nervousness, while the coefficient is reduced for those in non-profit facilities.

Observing that for-profit nursing homes compared to nonprofit ones appear to have a detrimental impact on health conditions but not on other well-being indicators offers a nuanced perspective. The

Table 8: ATT between types of nursing home

Dep. Variable	Private		Public		Private	Non-profit
	For-profit	Non-profit	Hospital	Non-hospital		
Time not in life (months)						
ATT	0.918	-0.968	-0.181	-0.161	0.634	0.219
	(0.981)	(0.862)	(0.890)	(0.927)	(0.763)	(1.068)
Hospital night						
ATT	0.070***	-0.012	-0.064***	0.024	0.033*	-0.089***
	(0.025)	(0.020)	(0.021)	(0.022)	(0.019)	(0.027)
Fell						
ATT	0.090***	0.010	-0.063***	0.001	0.050**	-0.092***
	(0.025)	(0.022)	(0.023)	(0.024)	(0.021)	(0.028)
Poor health						
ATT	0.051**	-0.048**	0.008	0.020	-0.010	-0.012
	(0.024)	(0.021)	(0.023)	(0.023)	(0.019)	(0.027)
Unhappy						
ATT	0.009	0.027	-0.029	0.061***	0.000	0.035
	(0.025)	(0.022)	(0.023)	(0.023)	(0.020)	(0.028)
Sad						
ATT	0.054	0.014	-0.011	-0.047	0.015	-0.030
	(0.035)	(0.029)	(0.032)	(0.032)	(0.027)	(0.039)
Not relaxed						
ATT	0.007	0.014	0.012	-0.006	0.003	0.047*
	(0.023)	(0.020)	(0.021)	(0.022)	(0.019)	(0.027)
Nervous						
ATT	0.049*	-0.020	-0.007	0.015	-0.006	-0.050*
	(0.025)	(0.022)	(0.023)	(0.024)	(0.020)	(0.028)

Notes: Each ATT is estimated by taking the given type of nursing home as a treatment group and the other types of nursing homes as a control group. All estimations are obtained with the Propensity-Score Kernel Matching method. Standard errors are reported in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

first set of main results tend to show that being in a nursing home is better in terms of health than living at home, but this positive finding is actually driven by non-profit nursing homes. All else equal, when comparing nursing homes, it is better to choose a non-profit or a publicly owned one.

7 Conclusion

This paper investigates the impact of living in a nursing home compared to staying at home on a series of health and well-being outcomes for the elderly. Using propensity score matching techniques, we estimate the Average Treatment Effects on the Treated (ATT) across these outcomes. Our results reveal a trade-off between physical health and subjective well-being. While residing in a nursing home significantly reduces mortality, the likelihood of hospital stays, and the probability of falling or reporting poor health, it comes at the cost of a reduced emotional well-being, including a higher likelihood of experiencing sadness, nervousness, and lack of calm. To ensure the robustness of our results, we performed sensitivity analyses to test the conditional independence assumption and a falsification exercise to rule out confounding factors. Both approaches confirmed the validity of our findings.

These findings highlight the dual nature of nursing home care, which offers tangible health benefits but may not fully address the emotional and social needs of its residents. Importantly, we observe substantial heterogeneity in outcomes depending on the ownership type of the nursing home. Non-profit nursing homes are associated with better health outcomes, including lower risks of hospital nights, falls, and poor health, compared to for-profit institutions. Interestingly, our analysis does not find significant differences in subjective well-being indicators, such as sadness and happiness, across different types of ownership.

Our results raise several questions for future research. First, understanding the mechanisms behind the well-being effect of nursing home care is crucial. Future work could explore interventions aimed at improving the social and emotional environment in nursing homes, such as enhancing social interactions, providing psychological support, or creating more personalized care plans. Second, our study draws a picture at a given moment in time. Longitudinal studies examining the long-term trajectories of health and well-being for nursing home residents would provide a more comprehensive picture. It would be very interesting to see how and why our measures of outcomes change through time. Finally, further investigation is needed to identify the mechanisms through which non-profit nursing homes achieve superior health outcomes. This could involve studying staffing models, resource allocation and care practices that differentiate non-profit from for-profit institutions.

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A Appendix

Table A.1: Propensity score estimation

	Nursing home	Private profit NH	Private not profit NH	Public hospital NH	Public no hospital NH	Private NH NH	Public NH	Not profit NH
Covariates								
Health characteristics								
GIR >= 5	-0.315***	-0.101***	-0.106***	-0.129***	-0.089***	-0.187***	-0.198***	-0.266***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
Chronic disease	-0.109***	-0.022***	-0.040***	-0.017***	-0.020***	-0.063***	-0.037***	-0.081***
	(0.008)	(0.005)	(0.006)	(0.006)	(0.005)	(0.007)	(0.007)	(0.007)
Socio-economic characteristics								
Age	0.009***	0.003***	0.004***	0.002***	0.003***	0.006***	0.005***	0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Woman	-0.026***	0.005	0.005	-0.024***	-0.019***	0.010	-0.040***	-0.032***
	(0.007)	(0.005)	(0.006)	(0.006)	(0.005)	(0.007)	(0.007)	(0.000)
Percentiles of income	-0.001***	0.001***	-0.000	-0.001***	-0.001***	0.001***	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Family characteristics								
In couple	-0.121***	-0.049***	-0.057***	-0.029***	-0.018**	-0.102***	-0.042***	-0.083***
	(0.009)	(0.006)	(0.008)	(0.007)	(0.007)	(0.009)	(0.009)	(0.010)
# caregivers	-0.024***	-0.005**	-0.011***	-0.006***	-0.002	-0.016***	-0.008**	-0.019***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Pseudo-R^2	0.39	0.22	0.18	0.18	0.17	0.25	0.24	0.32
Obs	10784	10784	10784	10784	10784	10784	10784	10784

Table A.2: ATT with other matching algorithms

		Algorithm Alternatives		Ichino et al. (2006)			
Outcomes		Nearest Neighbour (3)	Nearest Neighbour (1)		Outcome Effect Γ	Selection Effect Λ	ATT (S.E.)
Months not in life		ATT (S.E.)	ATT (S.E.)	PSM (Nearest)	1	1	-6.993*** (1.233)
	(1)	-6.987*** (1.044)	-6.993*** (1.233)	Confounder-like			
	(2)	-6.519*** (1.028)	-6.929*** (1.172)	Female	0.765	2.014	-6.538*** (1.257)
	(3)	-6.174*** (1.004)	-7.359*** (1.168)	In couple	0.540	0.170	-8.155*** (1.423)
	(4)	-5.109*** (1.008)	-5.272*** (1.237)	age80+	5.044	5.172	-10.443*** (1.481)
Poor health		ATT (S.E.)	ATT (S.E.)	PSM (Nearest)	1	1	-0.142*** (0.025)
	(1)	-0.144*** (0.022)	-0.142*** (0.025)	Confounder-like			
	(2)	-0.152*** (0.022)	-0.147*** (0.025)	Female	1.099	1.865	0.141*** (0.031)
	(3)	-0.133*** (0.022)	-0.157*** (0.026)	In couple	0.763	0.152	-0.164*** (0.034)
	(4)	-0.194*** (0.021)	-0.171*** (0.025)	age80+	1.486	7.755	-0.179*** (0.037)
Unhappy		ATT (S.E.)	ATT (S.E.)	PSM (Nearest)	1	1	0.307*** (0.033)
	(1)	0.298*** (0.033)	0.307*** (0.033)	Confounder-like			
	(2)	0.329*** (0.029)	0.326*** (0.034)	Female	0.679	1.748	0.323*** (0.049)
	(3)	0.329*** (0.029)	0.337*** (0.035)	In couple	2.211	0.172	0.367*** (0.050)
	(4)	0.224*** (0.024)	0.269*** (0.028)	age80+	0.611	8.322	0.374*** (0.061)

NOTE: (1) without exact matching; (2) exact matching sex; (3) exact matching sex and GIR; (4) exact matching sex, GIR and age.

Table A.3: OLS Analysis for several outcomes

	(1)	(2)	(3)	(4)
Dep. variable	baseline	including gir(1/6)	including gir(0/1)	including categorical gir
Time not in life months				
NH	4.941***	-1.926***	-1.575***	-1.268***
	(0.416)	(0.478)	(0.459)	(0.479)
Observations	10,631	10,609	10,602	10,602
Hospital nights				
NH	0.003	-0.062***	-0.049***	-0.053***
	(0.010)	(0.012)	(0.012)	(0.012)
Observations	10,779	10,757	10,750	10,750
Fell	0.025**	-0.074***	-0.071***	-0.068***
NH	(0.011)	(0.013)	(0.012)	(0.013)
Observations	10,782	10,759	10,752	10,752
Poor health	0.040***	-0.174***	-0.108***	-0.149***
NH	(0.010)	(0.012)	(0.011)	(0.012)
Observations	10,823	10,800	10,793	10,793
Unhappy				
NH	0.202***	0.228***	0.284***	0.192***
	(0.012)	(0.015)	(0.013)	(0.015)
Observations	10,208	10,185	10,178	10,178
Sad	0.101***	-0.001	0.0144	0.016
NH	(0.014)	(0.016)	(0.015)	(0.016)
Observations	9,012	8,994	8,989	8,989
Not relaxed	0.259***	0.264***	0.322***	0.245***
NH	(0.012)	(0.015)	(0.013)	(0.014)
Observations	10,299	10,276	10,269	10,269
Nervous	0.376***	0.210***	0.307***	0.211***
NH	(0.010)	(0.012)	(0.011)	(0.012)
Observations	10,331	10,308	10,301	10,301

Table A.4: Main results with covariates added sequentially

Addition of covariates	Sex	+ Couple	+ Age	+ Income	+ GIR	+ Chronic disease	+ # of helpers
ATT Months not in life	11.640***	10.010***	2.949***	2.800***	-5.711***	-5.871***	-5.994***
	(0.394)	(0.427)	(0.563)	(0.628)	(0.923)	(0.964)	(1.025)
# Treated	2938	2933	2932	2768	2790	2760	2757
# Control	7736	7736	7736	6072	6217	6771	6955
Observations	10,674	10,669	10,669	10,663	10,641	10,609	10,609
ATT Hospital Nights	0.035***	0.011	-0.0073	-0.021	-0.100***	-0.102***	-0.092***
	(0.009)	(0.010)	(0.012)	(0.014)	(0.019)	(0.020)	(0.020)
# Treated	3088	3084	3084	2911	2930	2888	2899
# Control	7729	7729	7729	5941	6208	6728	6742
Observations	10,817	10,813	10,813	10,807	10,785	10,757	10,757
ATT Fell	0.098***	0.072***	0.003	0.003	-0.126***	-0.120***	-0.116***
	(0.010)	(0.011)	(0.013)	(0.014)	(0.019)	(0.020)	(0.021)
# Treated	3095	3090	3090	2915	2920	2902	2917
# Control	7728	7728	7728	6023	6254	6908	6884
Observations	10,823	10,818	10,818	10,812	10,789	10,759	10,759
ATT Poor health	0.054***	0.036***	0.028**	0.009	-0.212***	-0.162***	-0.152***
	(0.010)	(0.010)	(0.012)	(0.014)	(0.019)	(0.020)	(0.021)
# Treated	3135	3129	3129	2948	2951	2930	2934
# Control	7736	7736	7736	6076	6089	6713	6843
Observations	10,871	10,865	10,865	10,859	10,836	10,800	10,800
ATT Unhappy	0.117***	0.175***	0.194***	0.205***	0.316***	0.302***	0.309***
	(0.010)	(0.011)	(0.013)	(0.015)	(0.023)	(0.026)	(0.026)
# Treated	3135	3129	3127	2939	2930	2922	2931
# Control	7121	7121	7121	5686	6923	7044	6841
Observations	10,256	10,250	10,250	10,244	10,221	10,185	10,185
ATT Sad	0.118***	0.079***	0.062***	0.061***	-0.011	0.002	0.010
	(0.013)	(0.013)	(0.015)	(0.017)	(0.021)	(0.024)	(0.024)
# Treated	1818	1814	1813	1706	1694	1655	1672
# Control	7227	7227	7227	5379	6303	7092	6972
Observations	9,045	9,041	9,041	9,035	9,017	8,994	8,994
ATT Not relaxed	0.258***	0.252***	0.233***	0.253***	0.295***	0.276***	0.310***
	(0.010)	(0.010)	(0.013)	(0.015)	(0.027)	(0.030)	(0.030)
# Treated	3135	3129	3126	3126	2959	2955	2920
# Control	7212	7212	7212	7212	5707	6972	7080
Observations	10,347	10,341	10,341	10,335	10,312	10,276	10,276
ATT Nervous	0.345***	0.351***	0.371***	0.348***	0.296***	0.278***	0.308***
	(0.010)	(0.010)	(0.011)	(0.013)	(0.024)	(0.032)	(0.026)
# Treated	3135	3129	3126	2945	2953	2916	2942
# Control	7243	7243	7243	5759	6993	7138	7020
Observations	10,378	10,372	10,372	10,367	10,344	10,308	10,308

Notes: All estimation with the Propensity-Score Kernel Matching method. Standard errors are reported in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Online Appendix

Table A.5: Probit conditional on being in a nursing home

	Private profit NH	Private not profit NH	Public hospital NH	Public no hospital NH	Private NH
Covariates					
Health characteristics					
GIR >= 5	-0.082***	0.078***	-0.017	0.007	0.009
	(0.026)	(0.030)	(0.026)	(0.029)	(0.031)
Chronic disease	0.020	-0.035	-0.006	0.016	-0.013
	(0.017)	(0.021)	(0.018)	(0.020)	(0.021)
Socio-economic characteristics					
Age	-0.001	-0.001	-0.001	0.002*	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Woman	0.024	0.062**	-0.044**	-0.042*	0.084***
	(0.019)	(0.024)	(0.019)	(0.023)	(0.024)
Percentiles of income	0.002***	-0.000	-0.001***	-0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Worked previously	-0.013	0.001	0.038	-0.020	-0.015
	(0.024)	(0.030)	(0.025)	(0.027)	(0.030)
Family characteristics					
In couple	-0.070***	-0.010	0.025	0.079**	-0.093***
	(0.026)	(0.035)	(0.028)	(0.031)	(0.033)
# informal caregivers	-0.005	-0.022**	0.016**	0.016*	-0.029***
	(0.008)	(0.010)	(0.008)	(0.009)	(0.010)
NH characteristics					
Years in NH	-0.017	0.011	-0.020	0.025	-0.005
	(0.016)	(0.021)	(0.017)	(0.019)	(0.020)
# dwellings before	-0.012	-0.042**	0.063***	-0.006	-0.056***
	(0.016)	(0.020)	(0.016)	(0.019)	(0.020)
Floors in NH	-0.006	0.028	0.040**	-0.057***	0.020
	(0.016)	(0.021)	(0.018)	(0.019)	(0.021)
Size of NH	-0.027**	-0.124***	0.158***	-0.035***	-0.141***
	(0.012)	(0.015)	(0.010)	(0.013)	(0.014)
NH fees	0.307***	0.017	-0.066***	-0.184***	0.253***
	(0.021)	(0.022)	(0.017)	(0.018)	(0.018)
Pseudo-R^2	0.206	0.037	0.131	0.064	0.123
Observations	2143	2143	2143	2143	2143