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The effect of living alone on the costs and benefits of surgery amongst older people

Alex J. Turner [a, *], Silviya Nikolova [b], Matt Sutton [a]

[a] Manchester Centre for Health Economics, The University of Manchester, Jean McFarlane Building, Oxford Road, Manchester, M13 9PL, UK
[b] Academic Unit of Health Economics, Leeds Institute of Health Sciences, Charles Thackrah Building, 101 Clarendon Road, Leeds, LS2 9LJ, UK

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ABSTRACT

Older people who live alone are a growing, high-cost group for health and social services. The literature on how living alone affects health and the costs and benefits of healthcare has focused on crude measures of health and utilisation and gives little consideration to other cost determinants and aspects of patient experience. We study the effect of living alone at each stage along an entire treatment pathway using a large dataset which provides information on pre-treatment experience, treatment benefits and costs of surgery for 105,843 patients receiving elective hip and knee replacements in England in 2009 and 2010. We find that patients who live alone are healthier prior to treatment and experience the same gains from treatment. However, living alone is associated with a 9.2% longer length of in-hospital stay and increased probabilities of readmission and discharge to expensive destinations. These increase the costs per patient by £179.88 (3.12%) and amount to an additional £4.9 million per annum. A lack of post-discharge support for those living alone is likely to be a key driver of these additional costs.

1. Introduction

Since 1950, the number and proportion of the elderly population that are living alone has increased considerably (Bureau of the Census, 1989; Grundy, 2000; United Nations, 2005) and the living arrangements of older people have been recognised as a pressing concern (United Nations, 2005). Recent work by Laporte et al. (2008) suggests that any potential problems associated with living alone are likely to be exacerbated in future cohorts of older people as individual social capital continues to erode for each succeeding age group down to early adulthood.

Much of the literature on living alone has focused on its effects on health. However, evidence regarding these health effects is mixed. Several studies have found that older adults who live alone are more likely to experience poor physical and emotional health (Kharicha et al., 2007), cognitive decline (Van Gelder et al., 2006), death (Lund et al., 2002), multiple falls and several chronic conditions (Kharicha et al., 2007), and are less likely to improve in Activities of Daily Living (ADL) following discharge (Mahoney et al., 2000). Men living alone are also less likely to survive following a myocardial infarction (Kilpi et al., 2015). Other studies suggest that living alone at older ages is associated with lower mortality risk (Davis and Moritz, 1997; Li et al., 2009; Walter-Ginzburg et al., 2002), lower risk of declines in mental health (Michael et al., 2001), fewer functional disabilities and higher cognitive competence (Lawton et al., 1984), and better quality of life (Cantor and Little, 1985). Further studies have found no association between living alone and changes in self-rated health (Hughes and Waite, 2002), and the number of major physical diagnosis (Iliffe et al., 1992).

Unmeasured heterogeneity may partially account for the discrepancies in results. Associations between living arrangements and health may be the result of unobserved characteristics that are related to both an individual's health and to the individual's choice to live alone (Lawton et al., 1984). Thus, longitudinal studies that control for baseline health characteristics, have more power than cross-sectional studies to identify the causal relationship. In addition, findings regarding the impact of living arrangements on health could be subject to reverse causality, since health might affect an individual's decision to live alone (Steinbach, 1992; Wolinsky et al., 1993).

The evidence of the effect of living alone on healthcare utilisation is much clearer. Living alone has been found to be associated with significantly higher physician visits amongst older adults (Cafferata, 1987; Guzman et al., 2004). Both longitudinal studies

* Corresponding author.
E-mail addresses: alexander.turner@manchester.ac.uk (A.J. Turner), S.K.Nikolova@leeds.ac.uk (S. Nikolova), matt.sutton@manchester.ac.uk (M. Sutton).

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(Hastings and George, 2008) and cross-sectional studies (Wakabayashi et al., 2011) have found that the elderly living alone visit emergency departments more frequently. Older people living alone have also been found to be at an increased risk of admission to a nursing home following hospitalisation (Mahoney et al., 2000). The limited number of studies examining the effect of living alone on other determinants of healthcare costs have found it to be associated with extended length of stay (Lim et al., 2006; Schwanhaeuser et al., 2002), and more frequent readmissions (Murphy et al., 2008).

Previous studies have focused primarily on measures of utilisation to study the effects of living alone on healthcare costs. However, healthcare costs are not only determined by the frequency of contact with health services, but also the cost of a treatment episode which depends on a variety of cost-drivers. In addition, previous studies have focused on a single indicator of health as the measure of patient benefit. Although health is arguably the most important outcome of treatment, other factors such as time spent waiting for treatment and/or in sub-optimal health, patient experience and patient satisfaction are also important outcomes for patients (Darzi, 2008). Furthermore, no previous study has evaluated the effects of living alone on costs and benefits in the same group of patients. This study extends the literature on living alone amongst older people by following the same group of patients along an entire treatment pathway and assessing the effect of living alone on a wide set of costs and benefits.

The limitations in the previous literature may be due to a lack of information at an individual level in administrative datasets. Since 1 April 2009, all providers of publicly-funded inpatient care in England have been required to collect data on a range of patient-reported outcome measures (PROMs) for all patients undergoing four elective interventions: unilateral hip replacements; unilateral knee replacements; varicose vein surgery; and groin hernia repairs. Data are collected via two paper-based questionnaires, one completed prior to surgery and the other approximately six months after surgery (Appleby and Devlin, 2004). The inclusion of a question on living arrangements presents a unique opportunity to follow patients along the entire treatment pathway, and study the effects of living alone on a wide range of indicators of costs and benefits in the same patient population.

We focus on patients undergoing a hip or knee replacement and identify whether older patients who live alone have different levels of health prior to treatment, experience different levels of treatment benefit, and generate greater costs to the health service compared to those who live with others. The availability of a wide range of baseline health measures collected in the pre-operative questionnaire means that estimates of the effects of living alone on many outcomes are plausibly causal.

2. Data

Patient-level PROMs data were obtained from the NHS Health and Social Care Information Centre (HSCIC) (HSCIC, 2013c) for all patients in England undergoing hip or knee replacement paid for by the NHS in the financial years 2009/10 and 2010/11. These data were linked at patient level to administrative data in Hospital Episode Statistics (HES) (HSCIC, 2013a). The PROMs programme requires all providers of publicly-funded inpatient care to offer a pre-operative survey to all patients deemed fit for surgery. This occurs either on the day of admission or at any time in the interval between a patient being considered fit for surgery and the intervention taking place (Department of Health, 2008). Post-treatment data for hip and knee replacement patients are collected by the HSCIC via a postal survey approximately six months after surgery. The pre-operative questionnaire includes several health measures, including disability, symptom severity, general health, health-related quality of life, and co-morbid conditions. It also records responses to a range of non-health-related questions such as whether they have been assisted in completing the questionnaire. The post-operative questionnaire records responses for the same set of questions as the pre-operative questionnaire, and a range of questions assessing both the success of treatment and the patient's overall experience with the services they received. Patients also record their current living arrangements in both the pre-operative and post-operative questionnaires. A full list of variables included in both questionnaires is available online (HSCIC, 2010).

The main variable of interest, living alone, was taken from a question asking patients to report their living arrangements from a list of four options: living alone; living with a partner/spouse/family/friend; living in a nursing home, hospital or other long-term care home; or, “other” living arrangement. Those with living arrangements other than “living alone” (LA) are banded into one broad category, “not living alone” (NLA). To mitigate concerns over possible reverse causality, the living alone indicator was defined on pre-operative living arrangements. Conditioning on pre-treatment living arrangements creates “temporal separation of living arrangements from the assessment of health” (Hughes and Waite, 2002, p.6), which is a necessary, but not sufficient, condition for exogeneity in the presence of reverse causality (Antonakis et al., 2010).

Pre-operative health was measured using the Oxford Hip Score (OHS) and Oxford Knee Score (OKS). These measure symptom severity for hip and knee problems through a series of 12 questions (Dawson et al., 1996; Dawson et al., 1998). Responses to these questions are scored from 0 (most severe symptoms) to 4 (no symptoms) and were summed to create an overall score ranging from 0 (worst health state) to 48 (best health state).

Pre-treatment benefits were measured using the duration over which patients experience symptoms prior to treatment and the waiting time for treatment. Patients reported the duration of their symptoms in the pre-operative questionnaire in one of four categories: less than 1 year; 1–5 years; 5–10 years; or more than 10 years. The waiting time between the date on which the specialist decided to admit the patient and the admission date was obtained from HES. Lower values of these measures were assumed to be beneficial to patients.

Costs were measured using patients' lengths of in-hospital stay (LOS) and the probabilities of discharge to an expensive location, readmission, repeat surgery, and treatment-related complications. Information on readmissions and further surgeries were taken from the post-operative PROMs questionnaire, which asks patients whether they have been readmitted to hospital and whether they have required surgery on their hip or knee following discharge. HES records information on both the destination from which patients are admitted and the destination of discharge. A discharge was deemed expensive if the latter places greater costs on the State than the former. We defined this as being admitted either from home or from a temporary place of residence and discharged to an NHS, local authority, or non-NHS nursing home. Complications are self-reported in the post-operative PROMs questionnaire under four categories: allergic reaction to drugs; bleeding after surgery; urinary problems; and wound problems.

Finally, we examined whether older patients who live alone receive different levels of benefit from treatment, measured by health improvement, patient satisfaction, and their perception of treatment success in the post-operative PROMs questionnaire. Health improvement was measured using post-operative OHS or OKS after conditioning on their pre-operative values. Satisfaction with treatment was recorded on a scale of “excellent”, “very good”, “good”, “fair”, or “poor”. Perceptions of treatment success were