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Home safety, accessibility, and elderly health: Evidence from falls

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ABSTRACT

This article presents estimates of the impact of home safety and accessibility features on the prevention of serious, non-fatal falls for elderly widowed individuals. As these features are not randomly assigned across homes, we develop an instrumental variable (IV) strategy that relies on the differential decline in the health and functional status of spouses to identify impacts. Specifically, we use the deceased spouse's functional status when alive, as measured by limits to Activities of Daily Living (ADLs), as an IV for the presence of home safety and accessibility features for the surviving spouse in the years after widowhood, and then estimate the effect of these features on the likelihood of a serious fall for the widow using rich longitudinal data from the Health and Retirement Study. The presence of such features reduces the likelihood of a fall requiring medical treatment by 20 percentage points, a substantial effect. However, falls are not the type of health shock that is a main driver of housing tenure transitions among the elderly. Although somewhat speculative, cost–benefit estimates suggest that investments in home safety for the elderly may generate in the short run as much as a dollar-for-dollar reduction in medical expenditures.

1. Introduction

What are the benefits of safer homes? For the elderly, "safer" often means physically easier to navigate. Home safety and accessibility features, such as shower seats, grab bars, railings, and ramps, are designed, in general, to promote function within the residence and, in particular, to prevent falls, which often result in significant injury and medical expenditures. Indeed, Stevens et al. (2006) estimated that falls by older Americans resulted in over $19B in direct medical treatment in 2000, roughly as much as government expenditures on extensively studied programs like Section 8 rental housing, Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps), and Temporary Assistance for Needy Families (TANF). In current dollars, this translates to almost $32B in direct medical treatment.

In this paper, we use rich longitudinal data from the Health and Retirement Study (HRS) to estimate some of the health benefits to the elderly from safer, more accessible homes. We focus on the role of home safety and accessibility features on the prevention of serious, non-fatal falls—those requiring medical treatment—and the effect of fall reduction on residential transitions.

Our analysis is most closely related to three strands in the existing housing literature. The first has focused on the extent to which housing generates significant benefits in non-housing domains. These include impacts on child well-being and health (Green and White, 1997; Boehm and Schlottmann, 1999; Dietz and Haurin, 2003; Fortson and Sanbonmatsu, 2010; Jacob et al., 2013). Within this area, little attention has been given to the elderly. The second has focused on the role of health shocks in generating housing tenure transitions and spend-down of home equity at older ages. This includes the well-cited studies by Venti and Wise (1989, 1990, 2001, 2004), as well as work by Feinstein (1993) and Megbolugbe et al. (1997), among others. The third is work by Kutty (1999, 2000), who has used the Becker–Grossman approach for the production of human and health capital to model the joint production of functionality and the demand for home safety and accessibility modifications among the elderly.

A fundamental empirical challenge in identifying causal effects on health and other outcomes is that safety features are not assigned randomly across homes. An important contribution of our analysis is that we outline the econometric problems in estimating causal impacts and then propose an instrumental variable (IV) procedure to circumvent these difficulties. Our IV approach, detailed below, can be summarized generally as follows. For older married couples, typically one spouse experiences a functional decline at a faster rate than the other, eventually leading to

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widowhood. Home safety and accessibility modifications are often made to accommodate the declining spouse, which then become a legacy to the surviving spouse upon widowhood. That is, surviving spouses may find themselves in residences with safety and accessibility features, independent of their own health trajectory.

We apply this logic to a sample of recently widowed homeowners 65 or older, who we can track over time in the Health and Retirement Study (HRS). We use the deceased spouse's functional status when alive, as measured by limits to Activities of Daily Living (ADLs), as an instrumental variable for the presence of home safety and accessibility features for the surviving spouse in the years after widowhood, and then estimate the impact of these features on the likelihood of a serious fall for the widow. In doing so, we are careful to include a large set of relevant covariates to account for the past health, functional, and fall trajectories of the surviving spouse that might confound the estimates. There is a strong first-stage relationship: each additional ADL limit of the deceased spouse before death is associated with a 6 percentage point increase in the likelihood that the surviving spouse lives in a home with safety and accessibility features conditional upon their own health and fall history.

Based on our IV approach, we have a number of findings. First, the presence of safety and accessibility features reduces the likelihood of a serious fall for the widowed by 20 percentage points, a substantial effect. The bulk of this is concentrated among men and those 75 and older. Therefore, our results suggest that housing investment in safety could significantly reduce serious falls among the elderly. Second, there is suggestive evidence that safety and accessibility features are associated with a reduction in the likelihood of a nursing home stay. There is little evidence, however, that falls are the type of health shock that is a main driver of own-to-rent transitions among the elderly documented by Venti and Wise (1989, 1990, 2001, 2004).

We temper these conclusions with an important caveat. As the values of the instrument are not randomly assigned, we cannot rule out definitively the possibility that the IV strategy is not valid. Our analysis exploits the richness of the health measures in the HRS, which are not available in other data sources, to generate a large number of plausible control variables to account for confounders. In addition, in the companion working-paper version (Eriksen et al., 2014), we discuss the results of a large set of robustness checks designed to assess the validity of the instrument, in particular the extent to which it might be correlated with the unmeasured latent health of the surviving spouse. The weight of the associated evidence suggests that the instrument is valid, but these tests, by their very nature, are not bullet-proof.

We end the analysis with a description of housing investments in safety and accessibility features. Although somewhat speculative, back-of-the-envelope calculations suggest that over a two-year period on average each dollar of housing investment in home safety and accessibility features is associated with a 93-cent reduction in medical costs from fewer non-fatal falls.

The remainder of the article is organized as follows. Section 2 gives basic national statistics on falls among the elderly. Section 3 describes the HRS data and econometric specification; Section 4 outlines the IV strategy. After the main findings are presented in Section 5, extensions are presented in Section 6. The impact on housing outcomes is discussed in the final section. There is a brief conclusion that discusses caveats and presents the investment calculations just described.

2. Background on falls

Falls are the leading cause of accidental death and non-fatal physical trauma among the elderly. They also can cause substantial psychological trauma. In Table 1, we reproduce nationally representative data on individuals 65 and older in 2000, which roughly coincides with the beginning of our analysis sample described below, taken from Stevens et al. (2006), drawn from the 2000 National Vital Statistics System, 2001 National Electronic Injury Surveillance System, 2000 Health Care Utilization Program National Inpatient Sample, 1999 Medical Expenditure Panel Survey (MEPS), and 2000 Medicare claims data. These estimates understate the true costs of falls, because these data sources exclude costs associated with longer-term skilled care usually paid for by Medicaid and acute care costs incurred through Medicare HMOs.

Columns 1–4 show statistics on prevalence and cost for fatal falls. Just over ten-thousand elderly individuals died from falls in 2000 (column 1). Male, older, and widowed individuals were the most likely to die as a result of a fall. The estimated cost of medical treatment for all fatal falls was $179 million in calendar year 2000 dollars. The ratio of the medical care CPI in 2014 to 2000 is 1.67, which implies a cost of fatal falls of $300 million in current dollars. The most common fatality was from traumatic brain injury, which occurred in 46% of the cases and was associated with a similar proportion of total cost.

The data source for our empirical analysis below, the HRS, does not have a sufficiently large sample to study fatal falls. Therefore, we focus on non-fatal falls, national data for which appear in columns 5–8. There were an estimated 2.6 million non-fatal falls that required medical treatment in 2000 (column 5), half of which involved females who were 75 and older. The estimated cost of medical treatment for all non-fatal falls was $19 billion, or an average of $7300 per fall in calendar year 2000 dollars, or $12,213 in current dollars. Injuries to the extremities were the most common. They accounted for 54% of the cases and 61% of cost. The most common types of injury were fractures, contusions, and sprains, which combined to account for 81% and 84% of all cases and treatment costs, respectively.

3. Data and specification

The HRS is a stratified random sample of over 25,000 individuals 50 and older, and their spouses (regardless of age). Individuals are interviewed every even-numbered calendar year until they die; an "exit" interview is conducted with their next of kin on the health and economic circumstances prior to and at the time of death. Our analysis sample is a cross-section comprised of "recently" widowed homeowners, defined as respondents who were married 4 years earlier, but lost their spouse within the last 2–4 years and remained unmarried. As questions on falls and housing safety modifications were only asked to those 65 and older, we limit the sample to widowed individuals older than 69, to condition on falls and safety modifications 4 years earlier. This results in a sample of 1005 recently widowed individuals in the HRS between 2000 and 2010.

Fig. 1 illustrates the HRS data sources and timing used below in the empirical strategy. As a survey administered every other year, its content maps into calendar time in two ways: individuals are asked questions about current socio-economic and health status (point-in-time), as well as behavior over the last two years or since the last wave (retrospective). Although our analysis is essentially a cross-section of widowed individuals, each observation draws upon three actual waves of response in the HRS, or up to 6 calendar years for retrospective questions. Each outcome is drawn from the current wave (t); the focal explanatory variable is drawn from the previous wave when they first experienced widowhood ($t-2$); and, the instrumental variable and (the majority of) the control variables are drawn from an individual and their spouse's responses two waves prior ($t-4$).