

more than 85 years have better functionality than those whose parents had lived only as long as 76 to 85 years.

- ❖ Females had significantly lower functionality than males, even in the presence of controls for age and health conditions.
- ❖ Other evidence in the literature, notably Mann, et al.(1999), shows that home modifications and assistive devices are effective in enhancing functionality for the frail elderly. The Mann, et al. (1999) study used a randomized experimental design.

POLICY RECOMMENDATIONS

In light of this evidence on the usefulness of home modifications in enhancing the functionality of older citizens, several policy recommendations seem appropriate. First, Medicare could expand its coverage to include specific home modifications under certain conditions. The benefits in terms of falls prevented, other health and safety advantages, and prevention or delay of expensive nursing home care are likely to outweigh the costs of such Medicare expansion. Under current rules, Medicare does not cover home modifications, although in some states, Medicaid covers certain home modifications. A benefit-cost analysis of expanding Medicare coverage to home modifications should include a sensitivity analysis of the conditions (degree of coverage, time-horizon) under which the net benefits from such an expansion are positive.

The finding that the demand for home modifications is quite income-inelastic implies that low-income households may be sacrificing other consumption, such as good nutritional intake, household utilities such as heating, and the maintenance of better family ties, in order to pay for the needed home modifications. Medicare coverage of home modifications for such households would be especially beneficial, as it would free up resources for other expenditures, thus enhancing elderly well-being.

Given the evidence in Kutty (2000) and Mann, et al. (1999) that home modifications and assistive devices in the home enhance elderly functionality, public policies aimed at enhancing elderly well-being should include the dissemination of information about home modifications and assistive devices, and the provision of technical assistance for their installation in the homes of seniors. The design and construction of adaptable housing would also help the elderly raise their level of functionality.

The salutary effects of moderate alcohol consumption on bathing functionality (as well as salutary effects on other health outcomes reported in the health literature) should be recognized by policy makers. Physicians, social workers, and other health care providers should incorporate this knowledge, albeit with care, in the health advice they offer to the elderly.

Based on the finding that poverty status reduces elderly functionality, the alleviation of elderly poverty should be an important goal of public policies aimed at enhancing elderly well-being. The alleviation of elderly poverty, through the resulting increased likelihood of secure nutritional intake, is expected to improve the functionality of the elderly. Means for alleviating elderly poverty include social security reform and the proliferation of reverse mortgages targeted at homeowners in poverty. (Kutty (1998) showed that reverse mortgages had the potential to reduce elderly poverty by 2.4.

In summary, the four policy recommendations are

- ❖ Expand coverage of Medicare to include home modifications.
- ❖ Provide information to seniors about the types of home modifications currently available, their cost, and how to obtain them. Provide technical assistance for the installation of modifications in the homes of seniors.
- ❖ Incorporate the knowledge of the salutary effects of moderate drinking in health advice to seniors.
- ❖ Alleviate elderly poverty through social security reform and reverse mortgages.

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Research Brief



THE DEMAND FOR HOME MODIFICATIONS AMONG SENIORS

Americans are living longer and, by most accounts, healthier lives. Yet, as people age, some decline in the ability to perform basic activities is not uncommon. According to the National Center for Health Statistics, the prevalence of such difficulties is greatest among seniors: 38 percent of the elderly (those aged 65 or more) who do not live in institutions have some limitation of activity caused by chronic conditions, while only 10 percent of the population between the ages of 15 and 44 experience any limitation of activity. The most common activity that the elderly have difficulty performing is walking; the second and third most common activities are bathing and getting outside.

Home modifications, such as ramps, shower seats, and so forth, offer one way for the elderly to cope better with age-related limitations of activity. This Brief presents the findings of two studies (Kutty 1999, 2000) on the use of home modifications among the elderly. Specifically, these studies address the following questions:

- (1) What determines the demand for home modifications among seniors?
- (2) How useful are home modifications in enhancing the functionality of seniors? It concludes with several policy recommendations.

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DATA AND PREVALENCE ESTIMATES

The Survey of Asset and Health Dynamics among the Oldest Old (AHEAD) is a nationally representative data set of individuals in the United States who are aged 70 or older (the older elderly). The collection of this data set was sponsored by the National Institute on Aging and was implemented by the Institute for Social Research at the University of Michigan. Wave 1 of the data was acquired in 1993-94; it surveyed 7,500 people who were aged 70 or older and were living in the community—that is, in non-institutional settings; of this group, 2,500 were aged 80 or older.

National estimates were obtained by weighing the AHEAD data with appropriate population weights. These estimates suggest that 40 percent of Americans aged 70 or older had modified their homes by installing such items as grab bars and shower seats in the bathrooms, railings, ramps, modifications for wheelchair access, and call devices. More than 6.4 million homes in which older Americans live had at least one of these modifications.

A look at the older segments of the senior population indicates that they use home modifications even more. The proportion of households with some home modification was 34 percent among householders aged 70 to 79, 47 percent among householders between the ages of 80 and 89, and as high as 60 percent among householders aged 90 or older.

The most common types of home modifications tend to be related to bathing, for example, grab bars and seats in the tub or shower area; such bathroom modifications have been installed in 27 percent of the residences of senior Americans aged 70 or older. About 12 percent of the seniors have homes modified for indoor wheelchair use, the second most common modification. Call buttons to summon help are installed in 10 percent of the homes, the same percentage that have railings. Ramps are found in 8 percent of the homes.

SOME CHARACTERISTICS OF SENIORS WITH MODIFIED HOMES

The survey data and the estimation results provide a profile of seniors who live in modified homes. Figure 1 presents a breakdown of the types of residences the seniors live in. In addition, the following characteristics about this population emerge from the data:

- ❖ Median annual income is \$15,000.
- ❖ 60 percent of modified homes were owner-occupied.
- ❖ Median home value of owner-occupied modified homes was \$70,000.

WHAT DETERMINES THE DEMAND FOR HOME MODIFICATIONS?

The following results on the demand for home modifications are based on the analysis in Kutty (1999), in which a logit demand model was estimated for the AHEAD data.

- ❖ The use of other assistive devices, such as wheelchairs and walkers, is a very strong predictor of the presence of modifications in the home.
- ❖ The demand for home modifications is income-inelastic. In other words, when a senior householder needs a modification to the home in order to cope with some age-related disability, she will obtain the modification regardless of her income. For example, a senior who needs a wider door for wheelchair access is likely to incur the cost of the modification regardless of whether her income is high or low. In some states, Medicaid covers the costs of such modifications, making it possible for very low-income households to obtain them when needed.
- ❖ The demand for home modifications depends strongly on health conditions, such as stroke and heart disease. Seniors who have suffered severe health problems are more likely to have home modifications than those whose health problems are moderate.
- ❖ A fall in the past year with no serious injury increases the probability of having home modifications. A fall resulting in a severe injury further increases the probability of home modifications.
- ❖ People living alone are more likely to demand home modifications.
- ❖ Householders who use formal personal care in the home are more likely to live in modified homes.
- ❖ The likelihood of modifications increases with the age of the oldest member. Households in which the oldest member is in HER 80s are more likely to have modifications than those in which the oldest member is in HER 70s. (Results for households in which the oldest member is in HER 90s were not statistically significant).
- ❖ The likelihood of having home modifications increases with the years of schooling of members of the household.
- ❖ Seniors who are currently engaged in any employment are less likely to have home modifications.
- ❖ Seniors living in apartments are more likely to have home modifications than those living in single-family detached homes. This is a finding from the analytical model, although, as mentioned earlier, a majority of modified homes are single-family detached units.

- ❖ Seniors living in rental units are more likely to have home modifications than those who own their home. This is a finding from the analytical model, although, as mentioned earlier, a majority of modified homes are owner-occupied.

DO HOME MODIFICATIONS ENHANCE FUNCTIONALITY?

In Kutty (2000), home modifications are viewed as an input in producing functionality. Just as land, labor, and capital equipment are combined to produce buildings, a senior household combines nutrition, medicines, lifestyle habits, such as exercise, home modifications, and personal assistance to produce or enhance functionality. This model is called the household production function model of elderly functionality. Household production function models have been used in both the human capital and health economics literatures. In the human capital literature, households are seen as combining schooling, parents' time, and other inputs to produce human capital in their children. In the health economics literature, household production function models have been commonly applied to the production of birth-weight through combining pre-natal care, personal habits (such as, smoking), and other inputs. Kutty's research provides the first theoretical and empirical economic analyses of a household production function model of elderly functionality.

The analysis uses a two-stage estimation technique that takes into account unobserved heterogeneity. In the first stage, demand functions for the endogenous inputs were estimated; then these predicted values were used as inputs in the second-stage estimation of the production of elderly functionality. The two-stage estimation was performed on AHEAD data.

For three reasons, the analysis focused on home modifications that enhanced bathing functionality. First, there are data limitations: Although the AHEAD data set has information on the presence of several types of home modifications, its information on use is available only for bathroom modifications. Second, as indicated above, bathroom modifications are the most common home modifications among the elderly. Third, bathing is second only to walking as the most common difficulty seniors face.

The results indicate that home modifications, such as grab bars and shower seats, are, in fact, very important inputs in the production of functionality for senior households. Other factors, such as "secure nutritional intake" (the availability of food on a regular basis), and moderate alcohol consumption also help compensate for reverses in bathing functionality caused by age and health conditions. However, non-inputs, such as chronic health conditions, age, sex, and genetic endowment exert a strong influence on the level of functionality. These and other results are discussed more fully in the following itemization of key findings from the study.

- ❖ The use of home modifications in bathing, such as grab bars and shower seats, significantly increases bathing functionality. The size of this coefficient is relatively large. As a point of comparison, the coefficient is almost as large as the absolute value of the negative coefficient for the 90s or older age category. An interpretation of this result is that a person can gain almost as much functionality by using such assistive devices as the functionality that is lost when people in their 80s age into their 90s.
- ❖ Assistive devices are even more effective in the case of the elderly aged 80 or older. After separately estimating the household production function model for seniors in this category, it was found that persons in their 80s gain more than twice as much bathing functionality through assistive devices as they would lose when they age into their 90s.
- ❖ People in their 80s gain more bathing functionality through assistive devices than is lost through severe stroke.
- ❖ Moderate alcohol consumption has a strong positive influence on bathing functionality. This conforms to the evidence in the literature on the beneficial impacts of moderate alcohol consumption on cardiovascular function.
- ❖ Lower nutritional intake, proxied by poverty status, has a very significant negative influence on bathing functionality.
- ❖ Not surprisingly, age plays a very significant role in determining the level of bathing functionality. The very oldest among the elderly, that is, those in their 90s or older, have significantly worse bathing function than those in their 80s. Similarly, those in their 70s (the youngest elderly category) have significantly better bathing function than those in their 80s. The magnitude of the impairment of functionality in the 90s or older category is quite high and, as mentioned earlier, is comparable to the improvement in functionality through the use of home modifications.
- ❖ The chronic health conditions of stroke, arthritis, diabetes, cancer, and lung disease all reduce bathing functionality very significantly, with severe stroke having the strongest impact.
- ❖ Educational attainment of the household members enhances the efficiency of the production function.
- ❖ Parental longevity, which was used as a proxy for higher genetic endowment, has a positive influence on functionality among seniors. Seniors whose parents had lived as long as 76 to 85 years have better functionality than those whose parents had lived only as long as 66 to 75 years. Seniors whose parents had lived for