

Effect of a Voucher Benefit on the Demand for Paid Personal Assistance

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Purpose: We estimated the effect of a voucher benefit on the demand for personal assistance by Medicare beneficiaries aged 65 years or older who had functional disabilities. **Design and Methods:** We performed a secondary data analysis on 645 Medicare beneficiaries from the Medicare Primary and Consumer-Directed Care Demonstration (a randomized controlled trial) between August 1998 and June 2000. We estimated a two-part model to determine the effect of the voucher on out-of-pocket personal assistance expenditures. The model controlled for individual health and functional status variables, sociodemographics, prior health care utilization, and state fixed effects. **Results:** A modest experimental Medicare personal assistance voucher benefit (that reimbursed 80% of up to \$250 of eligible expenses per month) increased the likelihood of any out-of-pocket spending for assistance (by 12%, $p < .05$), but it did not increase the amount of personal assistance expenditures among users ($p = .94$). Overall, the voucher benefits increased average annual expenditures by 10% (\$5,304 for the voucher group vs \$4,836 for the control group). However, this effect did not reach statistical significance ($p = .66$). **Implications:** The voucher benefit provided a small incentive to use personal assistance for older

Medicare beneficiaries with functional disabilities. Thus, if Medicare were to implement such a benefit, Medicare expenditures may increase. Further research is needed to determine if the increased personal assistance use leads to better health outcomes and whether it is associated with offset cost savings for Medicare-covered services.

Key Words: Personal assistance, Voucher, Medicare, Disability, Demand

For disabled older adults to remain in the community, they must have personal assistance with daily activities. Unfortunately, the definition of personal assistance is inconsistent across studies. For the purpose of this study, we define personal assistance as including both services and goods. Services can be defined as including "all (human) help, whether hands-on, standby, or supervisory, whether paid or unpaid" that is needed for activities of daily living (ADLs), such as dressing, bathing, and eating, and instrumental activities of daily living (IADLs), such as shopping, preparing meals, and managing money (LaPlante, Kaye, Kang, & Harrington, 2004, p. S98). Goods include adaptive and assistive technologies such as mobility, vision, and hearing aids (Benjamin, 1992). It is estimated that 4.5 million older adults used assistive devices to compensate for mobility impairments, and 6.2 million received personal assistance services in 1994 (LaPlante, Harrington, & Kang, 2002; Russell, Hendershot, LeClere, Howie, & Adler, 1997).

Researchers have shown personal assistance to be effective in helping people with disabilities meet their ADL and IADL needs. They have found that it reduces the difficulty of performing 12 ADL or IADL tasks for 68% to 78% of community-dwelling adults aged 55 years or older who have much difficulty or are unable to perform these tasks on their own, and it completely resolves the problem for about 13% to 36% of them, depending on the specific ADL or IADL in question (Verbrugge, Rennert, & Madans, 1997).

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Despite the importance of personal assistance in maintaining independent living among older individuals, many older Americans with disabilities have unmet personal assistance needs. Desai, Lentzner, and Weeks (2001) found that unmet personal assistance needs were reported by 20.7% of 6.2 million persons aged 70 years or older who indicated having difficulty performing at least 1 ADL. LaPlante and colleagues (2004) reported that 3.2 million (21.4%) of the 15 million adults of all ages living in the community who needed help with 1 or more of 15 ADLs and IADLs had unmet needs. About 545,000 received no help at all. Among those most impaired—individuals who required help with between 2 and 5 ADLs—about 29% had unmet needs. Compared with individuals who required help with between 2 and 5 ADLs whose needs were met, those with unmet needs reported requiring an average of an additional 16 hr of personal assistance services per week (LaPlante et al.).

Unmet or inadequate personal assistance needs is associated with adverse outcomes and can lead to increased risks of institutionalization and greater health care costs (Allen & Mor, 1997; Chenier, 1997). Desai and colleagues (2001) reported that nearly half (47.6%) of adults aged 70 years or older who reported unmet needs indicated that they had experienced negative consequences. LaPlante and associates (2004) found that, compared with individuals with met needs, those with unmet needs were significantly more likely to have reported having 29 of 34 adverse consequences such as being burned or scalded by hot water, becoming dehydrated, and running out of food. In addition, secondary conditions (falls, bedsores or pressure sores, and contractures) were also more likely (LaPlante et al.).

One of the major reasons for unmet personal assistance needs may be the lack of financial resources. Allen and Mor (1997) found that the number of routine expenses that were not affordable was associated with the number of unmet ADL needs. Desai and colleagues (2001) reported that having an unmet personal assistance need for at least one ADL was correlated with living in a household with an annual income under \$20,000. Muramatsu and Campbell (2002) found that income and assets were significantly associated with the use of personal assistance among individuals aged 70 years or older who had at least one ADL or IADL limitation. LaPlante and colleagues (2002) reported that monthly income was significantly associated with the number of logged hours of personal assistance for the population with a primary unpaid helper, but not for those with a paid helper or a secondary unpaid helper. Finally, LaPlante and associates (2004) noted that although low income was not associated with the probability of receiving personal assistance services, it was associated with the number of service hours among individuals receiving help.

Although most financing for paid personal assistance is by out-of-pocket payment, Medicaid is the

largest public payer of personal assistance services. It pays for these services through two major mechanisms: the Medicaid Title XIX Personal Care Services optional state plan benefit and the Medicaid 1915(c) home- and community-based services waiver program. In 1997–1998, Medicaid spent about \$4.76 billion on personal assistance services for slightly fewer than 700,000 people in the United States. Although Medicaid's coverage of services varies greatly by state, resulting in spending per capita ranging from \$0.02 to \$91.21 (LeBlanc, Tonner, & Harrington, 2001), it does not generally finance personal assistance goods. Medicare does pay for some goods and services when individuals qualify for skilled home health care. In 2000, it accounted for 5% of expenditures on nondurable medical products (e.g., ostomy supplies; Levit, Smith, Cowan, Sensenig, & Catlin, 2004). Finally, private insurance (health and long-term-care insurance) pays for about 11% of personal assistance services (AARP Public Policy Institute, 2003).

The development of a national policy to make personal assistance available and affordable to older adults requires an understanding of the demand for personal assistance, and in particular the price sensitivity among a disabled population. Such information will offer insights to the potential fiscal liability that a national program such as Medicare might face if it were to make personal assistance a covered benefit. Although there are studies of sensitivity of the demand for medical care to price (e.g., the RAND Health Insurance Experiment, or HIE, found that the likelihood of using any outpatient or inpatient care increases by 16% as the result of a 70% decrease in price—see Manning et al., 1987), to our knowledge few studies have examined the demand for goods or services (Kutty, 1999; White-Means, 1997); none have provided a direct estimate of the effect of price on demand for both goods and services.

In our study we address this gap by estimating the effect of price on personal assistance demand. The study design has two advantages: (a) the randomization of the intervention introduces exogenous price variation, which enables us to derive a causal price effect; and (b) the size of the study sample was small relative to all personal assistance consumers in the markets in which the experiment was performed. It is safe to assume, therefore, that the experiment did not change the supply of assistance available to study participants, which could confound the effect of price on demand for assistance.

In an earlier study we investigated the effect of two interventions and their combination on probability of use of each of two types of home care: personal assistance services and skilled home health care (Meng, Friedman, Wamsley, Mukamel, & Eggert, 2005). One of these interventions was a financial subsidy or voucher. We found that it significantly increased the probability of service use but did not affect the probability of skilled home health care

use. The present study extends the earlier one in two ways. First, the impact of the financial subsidy on the amount of personal assistance expenditures is examined. Second, the variable of interest is expanded to include all types of personal assistance; that is, goods have been added to services. On the basis of earlier findings, we hypothesized that the financial subsidy (a reduction in price) would increase the probability of any personal assistance use as well as increase the level of expenditures among assistance users.

Methods

Demonstration Description

The Medicare Primary and Consumer-Directed Care (PCDC) Demonstration enrolled 1,605 Medicare beneficiaries through their primary care physicians in 19 counties in western New York, West Virginia, and Ohio during a 2-year period beginning in August 1998 (Meng et al., 2005).

Patients who met the following criteria were enrolled in the study: (a) had Medicare Parts A and B coverage; (b) were functionally impaired with at least two limitations in ADLs (eating, bathing, dressing, toileting, and transferring) or at least three limitations in IADLs (preparing meals, shopping, doing household chores, managing money, doing laundry, taking medications, getting to places out of walking distance, and using the telephone); and (c) had been hospitalized, been a nursing home patient or resident, or received Medicare home health care within the past 12 months or had two or more emergency room visits in the past 6 months.

Interventions

Participants were randomly assigned to either a voucher group, in which individuals received a monthly personal assistance voucher benefit of up to \$250 (with 20% copay) in addition to their Medicare benefits, or a control group, in which individuals received only their regular Medicare benefits.

The voucher intervention consisted of a monthly personal assistance voucher benefit and access to a project staff person, the voucher specialist, who processed the voucher benefit. Eligible goods or services included the following: personal care aide, companion, or respite care services; adaptive or assistive technologies; transportation; home modifications; and medical supplies, durable medical equipment, and consumable care goods not normally financed by Medicare. Regarding services, participants had the option of hiring in-home workers from home-care agencies or as private employees (excluding family members). For personal assistance goods, study participants received a catalog that listed a wide range of eligible items in those categories already

described. At the end of each month, the voucher specialist reviewed receipts for purchased supplies, equipment, and services and authorized payment for eligible goods and services to the participants. Participants were then reimbursed for 80% of the total eligible expenses of up to \$250 per month.

Data

Of the 1,605 participants in the Medicare demonstration, the 803 in the voucher and control groups were eligible for the study reported here. We further excluded three groups of people from those two groups: patients who (a) were under the age of 65 ($n = 86$); (b) had private long-term-care insurance ($n = 22$, age 65+); or (c) were enrolled in Medicaid ($n = 50$, age 65+). We excluded participants under the age of 65 because this younger group qualifies for Medicare for different reasons than do the older group. The reason for the omission of people with long-term-care insurance or Medicaid is that insurance coverage for personal assistance is likely to change people's consumption behavior, thus confounding the voucher effect on personal assistance use. Therefore, our sample included a total of 645 participants: 304 of the 384 in the control group and 341 of the 419 in the voucher group.

We used two data sources for this study. First, we obtained data on beneficiary characteristics (socio-demographics, health and functional status, insurance status, caregiver status, and prior health care utilization) from a baseline face-to-face interview. Second, we obtained data on the use of personal assistance goods and services from a health care utilization journal completed by the participant or his or her caregiver on a daily basis.

All 27 interviewers who collected the information on beneficiary characteristics completed a reliability assessment of videotaped standardized interview sessions at the end of their training. The interrater agreement was excellent ($r = .97$). We checked all personal assistance utilization data against the original questionnaires to minimize errors and missing values. A total of 92% (591 of 645) of the study participants completed all of the questions in their utilization journals, 8% (50) had 5 or fewer missing weeks, and 0.6% (4) had more than 6 missing weeks. When considering all possible data units, we found that only 0.5% were missing (158/30,930 person-weeks).

Dependent and Independent Variables

The main outcome of interest is annual out-of-pocket personal assistance expenditures in the year after entry into the demonstration. There are two dependent variables: any use of personal assistance (coded 1 if the participant reported any use of goods or services during the study period, and 0 otherwise)

Table 1. Sample Characteristics, Overall and by Treatment Group

Variable	M (SD)			p
	Overall (n = 645)	Control (n = 304)	Voucher (n = 341)	
Sociodemographics				
Age in years (65–102)	80.7 (7.6)	80.7 (7.7)	80.8 (7.6)	0.87
65–74 (%)	23.4	23.7	23.2	
75–84 (%)	42.6	42.8	42.5	
≥ 85 (%)	34.0	33.6	34.3	
Female (%)	69.8	69.1	70.4	0.72
Minority (%)	2.2	1.6	2.6	0.39
Married (%)	42.0	43.1	41.1	0.60
Has informal caregivers (%)	76.6	74.7	78.3	0.28
Lives alone (%)	36.1	33.6	38.4	0.20
Education (%)				0.05
< High school graduate	38.6	33.6	43.1	
High school graduate	32.9	35.5	30.5	
At least some college	28.5	30.9	26.4	
Annual household income (%)				0.36
< \$10,000	18.6	19.4	17.9	
\$10,000–\$19,999	40.3	36.8	43.4	
\$20,000–\$29,999	22.3	23.0	21.7	
≥ \$30,000	18.8	20.7	17.0	
Homeowners (%)	58.3	55.3	61.0	0.14
Has Medigap Insurance (%)	78.0	78.3	77.7	0.86
Belongs to an HMO (%)	14.1	12.8	15.2	0.38
Health and functional status				
No. of ADL disabilities (0–6; %)	2.4 (1.9)	2.5 (1.9)	2.4 (1.8)	0.32
1–2 ADL disabilities	36.7	34.9	38.4	
3–4 ADL disabilities	27.6	26.0	29.0	
5–6 ADL disabilities	17.1	19.4	15.0	
No. of IADL disabilities	3.7 (1.8)	3.7 (1.8)	3.6 (1.8)	0.66
1–2 IADL disabilities	23.9	23.0	24.6	
3–4 IADL disabilities	32.7	34.2	31.4	
5–6 IADL disabilities	38.1	38.2	38.1	
Cognitive Performance Scale (0–6)	1.3 (1.4)	1.3 (1.5)	1.3 (1.4)	0.99
Self-rated health better than a year ago (%)	18.8	19.4	18.2	0.69
No. of chronic conditions (0–9)	3.3 (1.7)	3.2 (1.6)	3.4 (1.7)	0.07
Past health services use (%)				
Hospital admission in past year	64.7	64.8	64.5	0.94
≥ 2 emergency room visits				
in past 6 months	21.7	25.7	18.2	0.02*
Nursing home admission in past year	10.2	13.5	7.3	0.01**
Skilled home health care in past year	52.7	55.3	50.4	0.22
Other				
West Virginia (%)	23.7	22.0	25.2	0.34
Ohio (%)	7.3	8.2	6.5	0.39
Died during the first year follow-up (%)	9.8	9.5	10.0	0.85
Dropped out during the first year follow-up (%)	7.1	8.2	6.2	0.31
Length of follow-up, in days (20–365)	335.8 (77.6)	332.5 (82.0)	338.7 (73.6)	0.32

Notes: HMO = health maintenance organization; ADL = activity of daily living; IADL = instrumental ADL. Standard deviations are reported for continuous variables only; *p* values are based on *t* test for continuous variables and on Chi-square test for categorical variables.

p* ≤ .05; *p* ≤ .01.

and the amount of annual personal assistance expenditures conditional on having some use.

Table 1 describes the independent variables used in this study. We chose independent variables on the

basis of factors that have been shown in prior studies to affect personal assistance use (Allen & Mor, 1997; Evashwick, Rowe, Diehr, & Branch, 1984; Hadley, Rabin, Epstein, Stein, & Rimes, 2000; LaPlante et al.,

2004; Rabiner, Mutran, & Stearns, 1995; Slivinske, Fitch, & Wingerson, 1998; Stum, Bauer, & Delaney, 1996). We included three groups of individual characteristics as covariates. The first group consisted of sociodemographic variables: age, gender, ethnicity, living arrangement, marital status, education, income, assets, informal caregiver status, and health insurance status. The second group consisted of health and functional status variables: number of chronic conditions, score on the Cognitive Performance Scale (Morris et al., 1994), level of ADL dependence, and level of IADL dependence. The third group consisted of prior health services use: hospital, nursing home, emergency room, and skilled home health care. We did not ask whether there had been personal assistance service use during the year prior to study entry. It is important to account for the amount of informal care received by patients when measuring their formal home-care use. Because we do not have data on the amount of informal care, we used a variable indicating whether or not the patient had an identified informal caregiver as a proxy for the provision of informal care. We also included state fixed effects to control for cross-sectional variations in supply (e.g., availability of personal assistance).

Despite the randomized design, we controlled for covariates for three reasons: (a) the analytic sample is a subset of the original sample, so there is no guarantee that the covariates were balanced between the two groups; (b) if covariates are significant predictors of the outcome variables, then they reduce the size of the unexplained variances in regression models, thus providing more accurate estimates of treatment effects; (c) covariates allow us to compare factors affecting home-care use as suggested in other studies.

It should be noted that the PCDC Demonstration sample included two other intervention groups: a disease self-management–health promotion nurse home visit group and a voucher-plus-nurse group. Because our main objective was to estimate the effect of the voucher on the demand for personal assistance, we did not include these two groups in the study reported here.

Procedure

To examine the quality of the randomization, we compared the baseline characteristics of the voucher group with those of the control group by using the chi-square test for categorical variables and the *t* test for continuous variables. If the randomization was successful, we would expect these characteristics to be comparable between the two groups. We also compared the characteristics of personal assistance users between the two groups.

A portion of the respondents had reported no expenditure on personal assistance. Therefore, we used a two-part model that consisted of two

equations: (a) a probit model estimating the probability of any personal assistance use in the full sample ($N = 645$); and (b) a weighted least square (WLS) model estimating personal assistance expenditures (on a log scale) conditional on nonzero personal assistance use ($n = 563$). Because some study participants dropped out before the end of a full year from enrollment, we annualized all expenditures to ensure comparability and retain as much data as possible. We used the length of follow-up as the weight to increase the efficiency of the estimates.

Given the nonlinear relationship between the dependent variables and the independent variables, we calculated incremental effects by first predicting expenditures for the entire sample based on the two-part model with the voucher dummy variable set to one while keeping all other independent variables at their original values. We then repeated this process with the voucher dummy variable set to zero, obtaining a new predicted expenditure for the entire sample, assuming no one receives a voucher. We then calculated the voucher effect as the average of the differences of the two predicted expenditures across the entire sample. The advantage of this approach is that it standardizes the voucher effect by using the full sample as the reference. Thus, any differences in the covariates' values of the model between the voucher and control groups do not affect the estimated voucher effect.

In order to make statistical inferences, we calculated the confidence intervals of the estimated voucher effects by using bootstrapping with replacement (Mooney, 1996). We examined the goodness of fit of the probit model by using Pregibon's link test (Pregibon & DiClemente, 1980) and the Hosmer–Lemeshow test (Hosmer & Lemeshow, 2000). We examined the normality assumption for the residuals from the WLS model by using the D'Agostino test (D'Agostino, Balanger, & D'Agostino, 1990). We also used the link test to test the goodness of fit of the WLS model, and we used the Breusch–Pagan test to test for heteroscedasticity (Breusch & Pagan, 1979).

Results

Participant Characteristics

The mean age of the study participants was 81 years. More than two thirds (70%) of the participants were female. The majority had little education and low income. Only 2% were minorities, in accordance with the minority population composition in the demonstration catchment area. More than half (58%) owned their homes, and 77% had an informal caregiver. Participants were dependent in a mean of 2.4 ADLs and 3.7 IADLs. The average participant scored 1.3 on the Cognitive Performance Scale (Morris et al., 1994). The mean number of chronic conditions was 3.3. During the past year, almost two thirds (65%) of the participants had at

Table 2. Comparison of Characteristics Between Personal Assistance Users in the Control Group and the Voucher Group

Variable	M (SD)		p
	Control (n = 250)	Voucher (n = 313)	
Sociodemographics			
Age in years (65–102)	81.1 (7.9)	80.8 (7.7)	0.64
65–74 (%)	23.2	23.6	
75–84 (%)	39.6	41.5	
≥ 85 (%)	37.2	34.8	
Female (%)	70.8	71.9	0.78
Minority (%)	1.2	2.6	0.25
Married (%)	39.2	40.6	0.74
Has informal caregivers (%)	75.2	79.2	0.26
Lives alone (%)	34.0	38.3	0.29
Education (%)			0.01**
< High school graduate			
High school graduate	37.2	30.0	
At least some college	31.6	26.2	
Annual household income (%)			0.47
< \$10,000			
\$10,000–\$19,999	36.0	41.5	
\$20,000–\$29,999	22.4	22.0	
≥ \$30,000	22.0	17.6	
Homeowners (%)	54.8	60.4	0.18
Has Medigap Insurance (%)	80.4	77.6	0.42
Belongs to an HMO (%)	13.2	15.3	0.47
Health and functional status			
No. of ADL disabilities (0–6; %)	2.7 (1.9)	2.5 (1.8)	0.10
1–2 ADL disabilities	35.2	37.7	
3–4 ADL disabilities	26.4	31.3	
5–6 ADL disabilities	22.8	15.7	
No. of IADL disabilities	3.8 (1.8)	3.7 (1.8)	0.23
1–2 IADL disabilities	21.6	24.0	
3–4 IADL disabilities	34.4	32.6	
5–6 IADL disabilities	40.8	38.0	
Cognitive Performance Scale (0–6)	1.4 (1.5)	1.4 (1.4)	0.99
Self-rated health better than a year ago (%)	19.2	17.6	0.62
No. of chronic conditions (0–9)	3.2 (1.7)	3.4 (1.7)	0.21
Past health services use (%)			
Hospital admission in past year	62.8	65.5	0.51
≥ 2 emergency room visits in past 6 months	26.4	18.5	0.03*
Nursing home admission in past year	13.6	8.0	0.03*
Skilled home health care in past year	56.8	51.8	0.23
Other			
West Virginia (%)	22.8	25.2	0.50
Ohio (%)	8.0	6.1	0.37
Died during the first year follow-up (%)	10.8	10.2	0.82

Table 2. (Continued)

Variable	M (SD)		p
	Control (n = 250)	Voucher (n = 313)	
Dropped out during the first year follow-up (%)	8.0	5.8	0.29
Length of follow-up, in days (20–365)	331.7 (81.3)	341.1 (68.0)	0.14

Notes: HMO = health maintenance organization; ADL = activity of daily living; IADL = instrumental ADL. Standard deviations are reported for continuous variables only; *p* values are based on *t* test for continuous variables and on Chi-square test for categorical variables.

p* ≤ .05; *p* ≤ .01.

least one hospital admission (vs 36% for all fee-for-service older Medicare enrollees; Federal Interagency Forum on Aging-Related Statistics, 2004), 10% or 1 out of 10 had been admitted into a nursing home (vs 7% for all fee-for-service older Medicare enrollees), and 53% had skilled home health care use. A total of 22% had two or more emergency room visits during the past 6 months (see Table 1).

Comparisons of baseline characteristics between the voucher and control groups indicate that only three variables were statistically significant at *p* < .05 or better. More participants in the voucher group than in the control group had a nursing home admission during the past year, two or more emergency room visits in the previous 6 months, or more years of formal education. Comparisons of baseline characteristics between personal assistance users in the two groups show almost the same results as for the entire groups (see Table 2).

During the year after study entry, 63 participants (10%) died and 46 (7%) dropped out. The differences in mortality rate and dropout rate were not statistically significant between the two groups (chi-square tests: *p* = .85 and *p* = .31, respectively).

Use of Personal Assistance (Unadjusted)

Overall, 87% of all participants had personal assistance expenditures during the year. More participants in the voucher group had expenditures than did those in the control group (92% vs 82%; *p* < .01). Although a higher proportion of patients in the voucher group than in the control group had spending on personal assistance goods (85% vs 72%; *p* < .01), the difference between the two groups for services was not statistically significant (60% vs 54%; *p* = .11; see Table 3).

The average annual personal assistance expenditure was \$4,058 per person for both groups. Average annual expenditures were 17% (\$625) higher for the voucher group (\$4,353, consisting of \$719 on goods and \$3,634 on services) than for the control group (\$3,728, consisting of \$583 on goods and \$3,145 on

Table 3. Personal Assistance Utilization by Treatment Group (Unadjusted)

Variable	Control (<i>n</i> = 304)	Voucher (<i>n</i> = 341)	Difference (% Change From Control)	<i>p</i>
Likelihood of using PA				
PA goods	0.72	0.85	0.13 (18%)	< .01**
PA services	0.54	0.60	0.06 (11%)	.11
Any use of PA (goods or services)	0.82	0.92	0.10 (12%)	< .01**
Average annual PA expenditure:				
PA goods (<i>SD</i>)	\$583 (\$1,140)	\$719 (\$1,122)	\$136 (23%)	< .01**
PA services (<i>SD</i>)	\$3,145 (\$7,645)	\$3,634 (\$9,187)	\$489 (16%)	.21
Total (<i>SD</i>)	\$3,728 (\$7,916)	\$4353 (\$9,212)	\$625 (17%)	< .01**

Notes: PA = personal assistance. For the likelihood of PA use, *p* values are based on the Chi-square test. For expenditures, *p* values are based on *t* tests of logged expenditures to accommodate the skewness of the expenditure data.

p* ≤ .05; *p* ≤ .01.

services, *p* < .01). When we broke total personal assistance expenditures down into goods and services, we found that expenditures on goods were 23% (\$136) higher for the voucher group than for the control group (\$719 vs \$583, *p* < .01). However, expenditures on services were not significantly different (\$3,634 for the voucher group vs \$3,145 for the control group, *p* = .21). When we examined these expenditures for users only, we found that the differences in expenditures between the two groups diminished and became nonsignificant for all three types of expenditures (personal assistance goods, personal assistance services, and goods and services combined; results not shown). Taken together, these results show that participants in the voucher group spent more on personal assistance (goods and services combined) and that the increase in consumer spending is primarily due to the increased likelihood of use rather than an increase in per capita spending among users.

It is worth noting that although expenditures on personal assistance goods had a larger percentage increase than did expenditures on services (23% vs 16%), having the voucher benefit did not change the proportion of goods or services among total personal assistance expenditures. Specifically, the share of goods among total expenditures was 16% in the control group and 16.5% in the voucher group, whereas the share of services was 84% and 83.5% in the control and voucher groups, respectively.

Overall, 28% of all participants spent more than \$3,000 (\$250 × 12, which is the annual voucher benefit cap). There were no differences in the proportions of participants who spent more than the cap between the two groups (27% for the control group vs 29% for the voucher group, *p* = .55).

Multivariate (Adjusted) Results

As we expected, the voucher intervention increased both the probability of personal assistance

use (*p* < .01) and expenditures among users (*p* = .05; see Table 4). In keeping with earlier studies on predictors of home-care use, in our study we found that people with ADL disabilities, approaching end of life, and with longer follow-up were more likely to use personal assistance. Married participants were less likely to use personal assistance. In contrast, coefficient estimates of Part II of the two-part model show that living alone, having a higher income, experiencing ADL and IADL disability, having lower self-rated health, and having past skilled home health care use were associated with higher expenditures on personal assistance among users.

Compared with people with no ADL disabilities, people with one or two ADLs, three or four ADLs, and five or six ADLs disabilities were 7%, 10%, and 13% more likely to use personal assistance, respectively. Conditional on personal assistance use, more ADL disabilities were associated with higher expenditures; the higher the level of ADL disability, the bigger the ADL effect.

Goodness-of-fit statistics indicate that the models fit the data well.

Standardized Adjusted Predictions From the Two-Part Model

Standardized adjusted predictions yielded results that were similar to the unadjusted results. On average, standardized adjusted predictions from Part I of the two-part model indicate that the voucher intervention increased the likelihood of using any personal assistance from 0.82 for the control group to 0.92 for the voucher group (a 12% increase; *p* < .01, 95% confidence interval = 5–15%). Predictions from Part II of the model indicate that the voucher intervention did not change personal assistance expenditures among users (\$5,468 vs \$5,553, *p* = .94). When we combined the effect of the voucher in the two equations, the voucher intervention increased the expected annual personal assistance expenditures

Table 4. Coefficient Estimates of the Two-Part Model

Variables	Part I (Probit, <i>n</i> = 645)		Part II (WLS, <i>n</i> = 563)	
		<i>p</i>		<i>p</i>
Dependent variable	Any PA use		Annual PA expenditures among PA users	
Independent variables				
Voucher	0.577**	< .01	0.289*	.05
Age in years	-0.008	.46	0.007	.50
Female	0.224	.18	0.345	.06
Minority	-0.461	.29	-0.580	.28
Married	-0.383*	.05	-0.342	.10
Has informal caregivers	0.045	.80	-0.206	.28
Lives alone	-0.173	.41	0.412*	.05
High school graduate	0.165	.35	-0.260	.15
At least some college	0.109	.55	0.258	.17
Annual income				
\$10,000-\$19,999	-0.247	.25	0.523**	.01
\$20,000-\$29,999	-0.162	.51	0.491*	.05
≥ \$30,000	0.079	.77	0.446	.08
Homeowner	0.028	.86	0.279	.09
Has Medigap insurance	0.167	.33	0.114	.55
Belongs to an HMO	0.138	.53	0.050	.83
1-2 ADL disabilities	0.448*	.02	0.351	.13
3-4 ADL disabilities	0.798**	< .01	0.749**	< .01
5-6 ADL disabilities	1.396**	< .01	1.442**	< .01
1-2 IADL disabilities	0.146	.62	0.403	.28
3-4 IADL disabilities	0.321	.29	0.669	.08
5-6 IADL disabilities	0.200	.57	1.010*	.02
Cognitive				
Performance Scale	-0.044	.55	0.117	.08
Self-rated health better than a year ago	-0.186	.29	-0.480**	.01
No. of chronic conditions	-0.022	.62	-0.024	.60
Hospital admission in past year	-0.070	.67	-0.153	.35
≥ 2 emergency room visits in past 6 months	0.209	.25	0.348	.06
Nursing home admission in past year	-0.141	.59	-0.022**	.93
Skilled home health care in past year	0.060	.70	0.429	.01
West Virginia	0.062	.74	0.044	.81
Ohio	-0.257	.33	-0.118	.69
Died during the first year follow-up	0.717*	.04	0.017	.96
Study days	0.003**	< .01	-0.002	.29
Constant	-0.169		4.784	
Goodness-of-fit statistics				
Hosmer-Lemeshow Statistic	7.30	.50	—	—
Pregibon's Link Test	0.84	.40	1.32	.19
Pseudo R ²	0.16	—	—	—
Adjusted R ²	—	—	0.21	—

Notes: HMO = health maintenance organization; ADL = activity of daily living; IADL = instrumental ADL.

p* ≤ .05, *p* ≤ .01, weighted least squares.

by 10% or \$468 (\$5,304 for the voucher group vs \$4,836 for the control group; 95% confidence interval = -1,929, 2,637). However, this combined effect was not statistically significant (*p* = .66).

Discussion

We found that the voucher benefit increases the likelihood of any personal assistance use by 12%. This price effect is similar to the price effect for the demand for other health care services reported by RAND in the HIE (Manning et al., 1987). In that study, participants in the 25% copayment group had a 14% increase in likelihood of using any medical services (outpatient or inpatient) compared with participants in the 95% copayment group as the result of a slightly smaller reduction (70% vs 80% in the present study) in price.

The finding that the price sensitivity of personal assistance is similar to that of other medical care services has three important implications. First, despite the differences in the two populations (aged 62 years and younger in the RAND HIE vs aged 65 years and older in this study) and types of health services, the behavioral responses to price were similar. Secondly, in general, sicker people may be less sensitive to price when it comes to improving or maintaining their health (Wedig, 1988). Our study sample consists of people with chronic conditions, yet the sensitivity to personal assistance price is similar to that for medical care in the nonelderly population. This result suggests that the demand for “supportive services” by older adults with functional disabilities is similar to the demand for “medical services” by adults in the general population. Finally, the central issue of an ongoing debate about whether public payment for personal assistance should be provided is the so-called woodwork effect (Liu, Manton, & Aragon, 2000). Our results suggest that the woodwork effect of the personal assistance voucher benefit (as implemented in this study with an annual cap) is small to moderate in a high-risk population.

The nonsignificant overall voucher effect that we calculated by using standardized predictions appears to contradict the significant effects identified by examining the regression coefficients reported for the Part I and Part II models in Table 4. There are two possible reasons for this apparent difference. First, the adjusted *R*-squared value was *R*² = .21 for the Part II model. Although this value is consistent with those reported in the literature (Newhouse, Manning, Keeler, & Sloss, 1989), it suggests that a substantial proportion of the variance of the personal assistance expenditures remains unexplained. This unexplained variation may have reduced the signal-to-noise ratio for the predictions. Second, and perhaps what is more important, 28% of all participants had expenditures that were higher than the \$3,000 annual benefit cap. Although the overall

effect of the voucher was estimated as the difference between the voucher and control groups, people who have high personal assistance expenditures in the absence of the voucher benefits are likely to be less sensitive to price. In other words, the lack of statistical significance for the predicted difference may be due to combining (by taking the group average) price-sensitive individuals with those not sensitive to price.

The financing mechanism for personal assistance in the United States is fragmented and varies considerably, depending on the level of individual income or wealth and the generosity of state programs. A substantial proportion of disabled Medicare beneficiaries do not qualify for Medicaid and thus must rely on private funds to pay for personal assistance. As a result, personal assistance expenditures often compete against other out-of-pocket health care expenditures and necessities not related to health that must be paid for out of the same limited budget by low-income older adults with disabilities. It has been shown that large out-of-pocket expenditures can jeopardize access to care and may negatively affect health status and quality of care (Altman, Cooper, & Cunningham, 1999; Proctor, Morrow-Howell, Li, & Dore, 2000). Thus, lack of coverage for personal assistance may lead to worse outcomes and higher total health care costs to society. Our results suggest that the voucher benefit increased access to goods and services and that the impact of a capped personal assistance voucher benefit as implemented in the PCDC Demonstration on personal assistance expenditures is small to moderate.

Another interesting finding is that although the voucher benefit had a larger impact on access to personal assistance goods than to services, the proportions of goods or services among total personal assistance expenditures remained the same. The issue of how to combine goods and services to provide better assistance to people with disabilities is of great policy importance, because the relative effectiveness of personal assistance goods and services can inform policy makers, gerontologists, and practitioners on the appropriate mix of the two. Using cross-sectional data from the 1994 National Long-Term Care Survey, Hoenig, Taylor, and Sloan (2003) examined the potential substitution of assistive technology for personal assistance services, and they found that technological assistance was associated with fewer hours of personal assistance service use. Agree and Freedman (2003) found that technology users reported fewer unmet needs for personal care in a nationally representative sample. These authors suggest that more research is needed on the characteristics of technology users versus those of personal care users. Taken together, these findings suggest that personal assistance goods and services may serve as substitutes for some individuals but as supplements for others. It is also possible that, even for the same individual with disability, goods and services serve as

substitutes for some tasks essential for independent living but as supplements for other tasks. In fact, Agree and Freedman (2000) found that substitution or supplementation between equipment and services depended on the specific types of disability. However, the investigation of the separate effects of the voucher on personal assistance goods and services is beyond the scope of this study, because one cannot simply derive the effect of the voucher on one without simultaneously controlling for its effect on the other. Future research is needed to examine the relationship between goods and services in a dynamic framework, such as how changes in functional disability lead to the use of goods, services, or a combination of both, and in what order.

We believe that the larger impact of the voucher on goods as compared with services may be explained by the accessibility and less intrusive nature of personal assistance goods. Each person in the voucher group received a catalogue of voucher-eligible goods and corresponding vendor information. Compared with personal assistance services, there are no issues such as recruiting or training of service workers and tax preparation. This finding is consistent with results reported by Verbrugge and Sevak (2002), who suggested that equipment may be more advantageous because it can be tailored to suit an individual's needs, is readily available, and makes the individual feel self-sufficient.

It has been estimated that, in 1999, there were 5.2 million older adults with chronic disabilities living in the community (Federal Interagency Forum on Aging-Related Statistics, 2004). If we assume that the effect of the voucher can be generalized to this population (0.9 million with IADLs only, 2.0 million with one to two ADLs, 1.2 million with three to four ADLs, and 1.1 million with five to six ADLs), this benefit will cost Medicare \$5.2 billion (\$1,018 per beneficiary per year, excluding administrative costs). This translates into only 2.4% of total Medicare spending of \$217 billion in 2001.

Further research is required to gather information about the impact on both patient health outcomes and utilization of other, potentially more expensive services, such as hospital admissions. Information about outcomes would allow an assessment of the cost effectiveness of the voucher and may increase its attractiveness to the Medicare program if increased use of personal assistance services is associated with better health outcomes and savings for other health services.

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