Out-of-Pocket Health-Care Expenditures among Older Americans with Cancer

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ABSTRACT

Objective: There is currently limited information regarding the out-of-pocket expenditures (OOPE) for medical care made by elderly individuals with cancer. We sought to quantify OOPE for community-dwelling individuals age 70 or older with: 1) no cancer (No CA), 2) a history of cancer, not undergoing current treatment (CA/No Tx), and 3) a history of cancer, undergoing current treatment (CA/Tx).
Methods: We used data from the 1995 Asset and Health Dynamics Study, a nationally representative survey of community-dwelling elderly individuals. Respondents identified their cancer status and reported OOPE for the prior 2 years for: 1) hospital and nursing home stays, 2) outpatient services, 3) home care, and 4) prescription medications. Using a multivariable two-part regression model to control for differences in sociodemographics, living situation, functional limitations, comorbid chronic conditions, and insurance coverage, the additional cancer-related OOPE were estimated.

Results: Of the 6370 respondents, 5382 (84%) reported No CA, 812 (13%) reported CA/No Tx, and 176 (3%) reported CA/Tx. The adjusted mean annual OOPE for the No CA, CA/No Tx, and CA/Tx groups were $1210, $1450, and $1880, respectively ($P < .01$). Prescription medications ($1120 per year) and home care services ($250) accounted for most of the additional OOPE associated with cancer treatment. Low-income individuals undergoing cancer treatment spent about 27% of their yearly income on OOPE compared to only 5% of yearly income for high-income individuals with no cancer history ($P < .01$).
Conclusions: Cancer treatment in older individuals results in significant OOPE, mainly for prescription medications and home care services. Economic evaluations and public policies aimed at cancer prevention and treatment should take note of the significant OOPE made by older Americans with cancer.
Keywords: cancer, cost of illness, elderly, health-care expenditures, health economics.

Introduction

Although nearly all individuals age 65 or older in the United States are eligible for health insurance benefits from the federal Medicare program, coverage limitations may result in large additional out-of-pocket expenditures (OOPE) for deductibles, copayments, and uncovered services [1–3]. The increasing OOPE incurred by Medicare beneficiaries has spurred intense political debate regarding extending Medicare coverage to previously uncovered services such as prescription medications and long-term care [3–5]. Underlying this debate is the concern that large OOPE may result in decreased access to necessary health-care services [6] decreased use of effective medications [7–9] and, ultimately, decreased health status and quality of life for older Americans, especially those with low income [10].

The increasing number of elderly individuals with chronic health conditions [11,12] are at espe-

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cially high risk of having significant OOPE owing to their greater use of health-care services and medications [3]. Cancer is a common cause of morbidity and mortality among elderly individuals and therefore may lead to significant health-care utilization and OOPE. In fact, cancer is the most common cause of death in older women and is roughly equal to heart disease as the leading cause of death in men [13,14]. Total cancer-related costs in the United States may approach $100 billion per year [15].

A number of studies have examined the direct medical costs associated with cancer [16–26], but these studies did not identify the OOPE that patients and families incur. Although other studies have focused more closely on OOPE for cancer patients, few have examined expenditures for elderly cancer patients [17,27–34]. In addition, most prior studies have used patient data from small geographically restricted samples and focused on a single cancer type, raising concerns about the generalizability of findings.

Given the growing importance of cancer among elderly individuals and the potential for significant increases in the OOPE related to a cancer diagnosis, we undertook this study to provide valid and generalizable estimates of the OOPE associated with cancer in older Americans. Our aim was to identify the additional OOPE owing to cancer, as opposed to the expenditures for other comorbid conditions. In addition, we chose to examine four important cost categories separately so as to better identify the determinants of OOPE among older individuals, in general, and older individuals with cancer, in particular.

Methods

Data
We used the 1995 Asset and Health Dynamics among the Oldest Old (AHEAD) cohort of the Health and Retirement Study (HRS) for this analysis. The HRS is a nationally representative biennial longitudinal survey conducted by the Institute for Social Research at the University of Michigan with funding from the National Institute on Aging. AHEAD respondents included 7443 men and women 70 years of age or older at the time of the baseline interview in 1993 (i.e., born in 1923 or before). Interviews were conducted in person or over the telephone in English or Spanish. Proxy respondents were interviewed in cases where the selected respondents were unable to answer the survey questions independently. A response rate of 80.4% was achieved [35].

The 1995 AHEAD survey included a sample of 6644 respondents aged 70 or older who were representative of the approximately 23 million elderly individuals in the United States in 1995. For this study, we excluded 264 respondents (4%) who were living in a nursing home at the time of the interview and 10 respondents (0.1%) who had missing data necessary for the analyses. The final study sample of community-dwelling individuals age 70 or older consisted of 6370 respondents.

Determining OOPE
In the AHEAD study, respondents were asked to report the extent of their insurance coverage and their OOPE for four categories of health-care services: 1) hospital and nursing home stays; 2) outpatient services, such as doctor visits, dental visits, and outpatient surgery; 3) home care or other community-based "special services"; and 4) prescription medications. For each of the first three categories, the survey question was phrased, "About how much did you pay out of pocket for [hospital/doctor visit/home care] bills in the last two years?" For prescription medications, the question was phrased, "On the average, about how much have you paid out of pocket per month for prescription medications in the last two years?" Responses were converted to average yearly expenditures for each of the categories, and total average yearly expenditures per individual were calculated by summing the expenditures for each of the four categories.

The AHEAD survey uses an innovative "bracketing" method to collect data that are usually subject to high rates of nonresponse, such as health-care expenditures [36]. When a respondent is unwilling to provide an exact amount in response to one of the expenditure questions, he/she is presented with response brackets such as, "Was it more than $200?"; "more than $500?"; "less than $1000?"; etc. The responses to these bracket questions are then used to impute an expenditure value for these questions that can then more easily be used in data analyses. Imputed responses for bracketed questions were derived for between 2% (home care expenditures) and 19% (doctor visits) of respondents for the individual expenditure categories. The full methodology for this imputation procedure is described elsewhere [37].

Defining Cancer and Cancer Treatment History
All AHEAD respondents were asked, "Has a doctor ever told you that you have cancer or a malignant tumor, excluding minor skin cancers?" All respondents who answered "yes" to this question, were

then asked, "Are you now receiving treatment for cancer?" Based on their responses to these two questions, respondents were sorted into three mutually exclusive categories: 1) no history of cancer (No CA); 2) history of cancer, but no current treatment (CA/No Tx); and 3) history of cancer, currently receiving treatment (CA/Tx).

Household Net Worth and Yearly Income

The AHEAD study collects detailed financial information regarding total household net worth and current yearly income. Both measures were examined in this analysis because yearly income may provide an inadequate measure of financial status for older individuals if they are retired from the labor force. Net worth was defined as total household assets, including housing equity, stocks, bonds, savings accounts, and other assets, minus current debts [35]. We defined net worth terciles (low, middle, high) to describe the level of wealth of an individual's household. Yearly household income was defined as the total of all sources of income over the prior year, including income from work, Social Security benefits, private pensions, and other investments [35]. Because the AHEAD study calculated yearly income on a household level and OOPE on an individual level, we divided household income by two for married couples to obtain an estimate of per capita yearly income. We constructed per capita yearly income quartiles when performing analyses of OOPE as a proportion of yearly income. As in prior studies of OOPE [2,10] for this analysis, OOPE were capped at 100% of yearly income to decrease the influence of outlier values for OOPE on the calculated ratios.

Health Insurance Coverage

In addition to coverage by the Medicare and/or Medicaid government health insurance programs, the AHEAD study identified whether individuals obtained supplemental health insurance coverage (e.g., "Medi-Gap" insurance) through a current or former employer, an organization, or the private insurance market. Enrollment in a Medicare HMO was also identified. Because supplemental health insurance plans, enrollment in a Medicare HMO, and coverage under Medicaid may have a significant impact on the level of OOPE for health-care services, we included these insurance variables in our regression analyses.

Potential Confounding Variables

Because the goal of the analysis was to quantify the additional OOPE attributable to a cancer diagnosis

and cancer treatment, we controlled for the presence of other factors that might independently affect the likelihood and/or level of OOPE. The variables controlled for in the analysis were self-reported chronic health conditions (heart disease, stroke, diabetes, hypertension, lung disease, psychiatric problem, and arthritis); the presence of cognitive impairment consistent with dementia as measured by a previously validated cognitive status instrument [38,39]; the number of reported limitations in activities of daily living (ADLs) (eating, transferring, toileting, dressing, bathing, walking across a room) and instrumental activities of daily living (IADLs) (preparing meals, grocery shopping, making phone calls, taking medications, managing money); sociodemographic characteristics (age, race, sex, net worth); and living situation (married, unmarried living alone, unmarried living with others). The presence of supplemental insurance coverage, enrollment in a Medicare HMO, and coverage by Medicaid were also included as independent variables in the regression analyses.

Data Analysis

Because a substantial proportion of respondents had no OOPE for some of the individual expenditure categories, for example, approximately 90% of respondents reported no OOPE for hospital or nursing home care, and because the distribution of expenditures was highly skewed, we used a two-part multivariable regression model [40]. For the first part, we used logistic regression to determine the relationship of cancer category (No CA, CA/No Tx, or CA/Tx) to the likelihood of reporting any OOPE, adjusting for the above potentially confounding factors. For the second part, we used ordinary least squares linear regression to examine the association between cancer category and the natural log of OOPE among those who reported any OOPE, again adjusting for the same potentially confounding factors. The results from the two parts of the model were then combined to obtain an estimate of the unconditional effect (i.e., not conditioned on having any OOPE) of cancer category on OOPE. For ease of reporting and interpretation, the results from the regression analyzes were retransformed to whole dollar yearly expenditures [41].

Analyses were weighted and adjusted for the complex sampling design of the AHEAD study. We tested for significant interaction effects among the independent variables and performed regression diagnostics to check for influential observations and heteroscedasticity in the residuals. All analyses were performed using STATA Statistical Software (release

7.0, 2001, Stata Corporation, College Station, TX). The HRS/AHEAD study was approved by an institutional review board at the University of Michigan. The data used for this analysis contained no unique identifiers so respondent anonymity was maintained.

Results

Characteristics of the Sample

Of the 6370 community-dwelling individuals age 70 or older in the 1995 AHEAD study, 5382 (84%) reported no history of cancer, 812 (13%) reported a history of cancer but no current treatment, and 176

(3%) reported a history of cancer and current treatment. The characteristics of these three groups are shown in Table 1. Those with a history of cancer were more likely to be white and male, but there was no significant difference between those with and without cancer in age, net worth, or living situation. Those undergoing cancer treatment were less likely to be in the bottom income quartile than either of the other two groups. Those with a history of cancer were more likely to report one or more ADL limitations. The presence of comorbid chronic conditions was relatively similar across all three categories with arthritis, hypertension, and heart dis-

Table 1 Characteristics of the study population, by cancer category ($N = 6370$)

Variable	No cancer ($n = 5382$)	Cancer, no current treatment ($n = 812$)	Cancer, current treatment ($n = 176$)	P value
	Weighted percentage*			
Age, years (mean ±SD)	79.6 ± 0.1	79.9 ± 0.2	80.1 ± 0.5	
70–79	56	53	50	.1
80–89	38	41	43	
≥90	6	6	7	.3
Race				
White	90	94	94	
African-American	9	5	5	
Other	2	1	1	<.001
Sex				
Male	39	44	57	<.001
Female	61	56	43	
Net worth (US$)				
<38,000	45	41	37	
38,000–139,000	22	25	29	.2
>139,000	33	34	35	
Yearly income				
Bottom quartile	23	18	14	
Second quartile	25	24	24	<.001
Third quartile	25	28	29	
Top quartile	26	30	33	
Living situation				
Married	36	36	28	
Unmarried living w/others	13	13	10	.1
Unmarried living alone	51	51	62	
ADL limitations				
0	68	64	62	
1–3	25	28	33	.05
4–6	7	8	5	
IADL limitations				
0	77	77	73	
1–3	19	17	24	.09
4–5	5	6	3	
Chronic conditions				
Heart disease	34	37	38	.3
Stroke	11	12	12	.3
Diabetes	14	14	15	.9
Hypertension	52	50	48	.4
Dementia	9	7	8	.3
Lung disease	11	13	12	.09
Psychiatric problem	11	13	9	.2
Arthritis	54	55	53	.8
Insurance status				
Medicare	99	99	99	.9
Medicare HMO	13	14	13	.8
Supplemental insurance	67	71	69	.1
Medicaid	9	6	8	.04

*Weighted percentage derived using the AHEAD respondent population weights to adjust for the complex sampling design of the AHEAD survey.

ease most prevalent. There was a trend toward a higher probability of supplemental insurance coverage among those with cancer, whereas those with cancer not currently undergoing treatment had a slightly lower probability of Medicaid coverage than the other two groups.

Unadjusted OOPE

The great majority of individuals (86%) had some type of OOPE. The number and percentage of respondents reporting OOPE for each of the expenditure categories is shown in Table 2. The mean total OOPE ranged from $1370 for those in the No CA category to $2100 in the CA/Tx category ($P < .05$). The median total OOPE was less than the mean OOPE for each cancer category, suggesting that the distribution of total OOPE was skewed right-ward with relatively few respondents having very large OOPE.

Among the individual expenditure categories, respondents in the CA/Tx category were more likely those in the No CA category to have OOPE for hospital/nursing home services ($P < .01$) and for prescription medications ($P < .01$). Among those reporting any OOPE in each of the individual expenditure categories, the mean unadjusted OOPE for the CA/Tx group were generally higher for each expenditure category, except home care services. Although the difference in unadjusted mean OOPE

for total expenditures was significantly greater for those undergoing current cancer treatment ($P < .05$), the differences across cancer categories for the individual expenditure types were not statistically significant, likely owing to the much smaller sample sizes for the individual expenditure categories.

OOPE as a Percentage of Yearly Income

Total unadjusted OOPE as a percentage of yearly income, by cancer category, is shown in Figure 1. Within each cancer category, the percentage of yearly income that went to OOPE was inversely related to income ($P < .01$). For individuals with no history of cancer, OOPE as a percentage of yearly income ranged from 5% for those in the top income quartile to 17% for those in the bottom income quartile. When looking across the three cancer categories, there was a trend toward an increasing percentage of yearly income going toward OOPE based on cancer status, as the percentage increased from 17% among low-income individuals with no cancer history to 27% for those currently undergoing cancer treatment ($P < .07$).

Adjusted OOPE

After adjusting for all other control variables using the two-part regression model, the mean yearly total OOPE for the No CA category was $1210 per year (95% CI $1180–$1240) whereas for the CA/

Table 2 Unadjusted yearly OOPE among those reporting any expenditures, by expenditure type and cancer category ($N = 6370$)

Expenditure type	No cancer (n = 5382)	Cancer, no current treatment (n = 812)	Cancer, current treatment (n = 176)
Total expenditures			
Number	4593	743	156
%[†]	86	92	89
Mean ±SD*	$1370 ± $3440	$1560 ± $3700	$2100 ± $4770
Median	$570	$640	$920
Hospital/nursing home			
Number	511	104	29
%[†]	10	14	16
Mean ±SD	$1090 ± $2580	$860 ± $1340	$1680 ± $3910
Median	$370	$370	$370
Prescription medications			
Number	3456	578	128
%[†]	66	72	74
Mean ±SD	$1200 ± $3200	$1410 ± $3960	$1390 ± $4010
Median	$470	$480	$490
Outpatient services			
Number	3699	598	117
%[†]	70	75	67
Mean ±SD	$360 ± $670	$380 ± $550	$670 ± $1420
Median	$160	$180	$270
Home care services			
Number	232	36	19
%	5	5	11
Mean ±SD	$1310 ± $5500	$800 ± $1940	$1170 ± $2380
Median	$100	$280	$100

*$P < .05$ for difference across cancer categories in mean total expenditures. Differences across cancer categories in means for individual expenditure types were not statistically significant.
[†]$P < .05$ for difference across cancer categories in proportion of respondents having any OOPE.
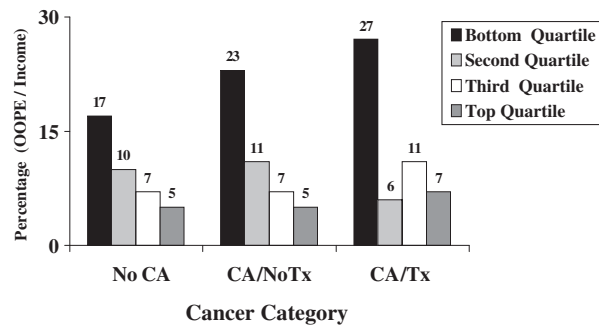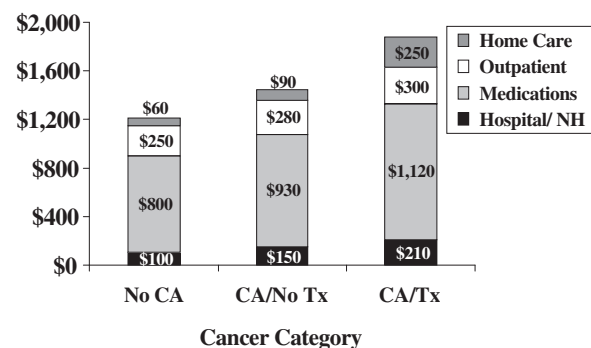
Figure 1 Total out-of-pocket expenditures as a percentage of yearly income, by income quartile and cancer category. OOPE, out-of-pocket expenditures; No CA, no cancer; CA/No Tx, cancer, not undergoing current treatment; and CA/Tx, cancer, undergoing current treatment. $P < .01$ for difference in OOPE as a percentage of yearly income across income quartiles within each cancer category.

No Tx category it was $1450 per year (95% CI $1420–$1480), and for the CA/Tx category it was $1880 per year (95% CI $1840–$1920) ($P < .01$) (Fig. 2). So the OOPE of those with a prior cancer diagnosis were 20% greater ($240 per year) than those with no cancer history, and 55% greater ($670 per year) among those undergoing current treatment for cancer.

When separating the total expenditures by individual expenditure type, we found that prescription medications were the main source of increased OOPE among those undergoing cancer treatment. Of the $670 additional total OOPE among those in the CA/Tx group, $320 (48%) was attributable to greater prescription medication expenditures. Those in the No CA group averaged $800 per year in OOPE for prescription medications, which accounted for 66% of their total OOPE. Those in

Figure 2 Adjusted yearly out-of-pocket expenditures, by expenditure type and cancer category. No CA, no cancer; CA/No Tx, cancer, not undergoing current treatment; and CA/Tx, cancer, undergoing current treatment. "Outpatient" includes doctor visits, dental visits, and outpatient surgery. NH, nursing home. $P < .01$ for difference in adjusted yearly total OOPE across cancer categories.

the CA/No Tx group had $930 in OOPE for medications (64% of total), whereas those in the CA/Tx group had $1120 in OOPE for medications (60% of total) ($P < .05$).

Those undergoing cancer treatment also had significantly higher hospital/nursing home expenditures than those in the other two groups ($210 per year vs. $100 and $150 per year, respectively, $P < .05$), although the absolute difference in OOPE across groups for this expenditure category was not as great as for prescription medications. OOPE for outpatient services were relatively similar across the three categories, whereas OOPE for home care or "special services" were more than three times greater among those undergoing cancer treatment compared to the other two groups ($P < .05$).

Discussion

In this nationally representative sample of older Americans, we found that a prior history of cancer was associated with an additional $240 per year in OOPE, whereas current cancer treatment was associated with an additional $670 per year in OOPE, even after controlling for differences across these groups in sociodemographics, living situation, functional limitations, comorbid chronic conditions, and insurance coverage. When translating these findings to a national level using prevalence estimates from the AHEAD study, individuals age 70 or older with a history of cancer made $700 million ($240/person × 2.9 million people) in additional yearly OOPE in 1995 compared to those with no history of cancer, whereas those undergoing cancer treatment made an additional $400 million ($670/person × 600,000 people) in OOPE.

Older individuals undergoing cancer treatment had significantly greater prescription medication expenditures than those without a cancer history. We hypothesize that prescription medications to address common symptoms and side effects of cancer and its treatment (e.g., nausea, pain, and infections) and oral hormonal agents were the main cause for increased OOPE for medications among those undergoing cancer treatment. The AHEAD study did not collect information on the specific medications that individuals used, so we were unable to determine the number and type of medications that resulted in increased OOPE for those undergoing cancer treatment. The increased OOPE for home care services were likely the result of both increased utilization of postacute home care services after hospitalizations for cancer treatment or complications, as well as long-term home care services

to address the greater level of ADL and IADL limitations that were present among older individuals undergoing cancer treatment.

Payments for hospital and/or nursing home care were also greater among those undergoing cancer treatment. Although the AHEAD data do not allow expenditures for these two types of services to be separated, we performed a secondary analysis that showed that individuals undergoing cancer treatment were more likely to be hospitalized at least once in the prior 2 years (56% vs. 31% for those with no cancer history, $P < .01$) and, among those hospitalized the mean number of days in the hospital, was significantly greater (15 days vs. 10 days, $P < .01$). Conversely, the likelihood of short- or long-term nursing home stays was similar for those in both the No CA and the CA/Tx groups. This suggests that payments for acute care hospital services, not short- or long-term nursing home stays, accounted for the significantly greater OOPE for those undergoing cancer treatment.

We expect that the greater utilization of hospital services, and the greater associated OOPE for these services, among those undergoing cancer treatment was likely due to a number of factors including: 1) acute complications related to cancer and subsequent inpatient evaluation and treatment for these complications; 2) cancer treatments provided in the inpatient setting (e.g., surgery); and 3) hospitalizations for complications related to cancer treatment. The higher risk for multiple hospital stays related to cancer treatment and its complications may be an important contributor to the greater OOPE that we found for older individuals undergoing treatment. Currently, individuals covered by Medicare hospital insurance (Part A) pay a deductible of $876 for each hospital stay of 1 to 60 days during a benefit period. There is an additional copayment of $219 per day for hospital days 61 through 90 [42]. So multiple hospital stays for cancer treatment or complications might quickly lead to significant OOPE for older cancer patients.

Prior studies have shown that older individuals with high OOPE may restrict their use of effective prescription medications [7,8]. Our findings raise a related question as to whether older cancer patients, especially those with low income, might forgo potentially beneficial treatments owing to concerns over the high OOPE that may be associated with them. We found a positive association between higher levels of income and current cancer treatment in the AHEAD cohort, and we also found that low-income individuals undergoing cancer treatment spent more than one-fourth of their yearly

income on their medical care compared to only 7% for those in the upper quartile of income. Future research should examine the extent to which the financial burden associated with cancer treatment affects the decisions of both older patients and their physicians when considering cancer therapy.

The major strength of the AHEAD study is its large nationally representative sample of older Americans that allows results to be generalized with greater confidence. Nevertheless, our findings should be interpreted with a number of potential limitations of these data in mind. First, because AHEAD is a population-based cohort rather than a treatment-based cohort, the number of individuals who reported cancer treatment is relatively small. In addition, data on the primary site of the cancer, as well as treatment type, were not available, so we were unable to identify expenditure differences related to type of cancer or mode of treatment. Furthermore, we did not have clinical information such as cancer stage, whether the cancer was a new diagnosis or a recurrent diagnosis, and whether treatment was intended to be curative or palliative. Although this clinical information was not available, the self-reported prevalence of cancer in this AHEAD sample (15,600 cases per 100,000 individuals) is nearly equivalent to the national prevalence of cancer predicted by Surveillance, Epidemiology, and End Results (SEER) data for individuals age 70 or older (15,800 cases per 100,000 individuals) [43], suggesting that AHEAD does provide an accurate assessment of cancer history in this age cohort.

A second limitation of our study is the lack of medical claims data to verify the self-reported OOPE in AHEAD. Ideally, expenditures reported by individuals would be matched and cross-checked with medical claims information to minimize both under- and overreporting of medical utilization and OOPE [44]; in the absence of such verification, it is difficult to determine both the magnitude and the direction of potential reporting inaccuracies for OOPE within our sample. Nevertheless, comparisons of the AHEAD OOPE data to that reported in prior studies that relied on both self-report and claims data show comparable results. For instance, the Medicare Current Beneficiary Survey (MCBS), a survey that cross-checks self-reported OOPE with Medicare claims [2], found that the mean 1995 total OOPE for individuals age 65 or older ranged from approximately $1400 for those with no chronic conditions to $2100 for those with three to five chronic conditions, similar to our findings using AHEAD data, although direct comparison to the MCBS is difficult owing to differences in the cate-

gories of services and payments that are included in the OOPE totals [2,10]. The 1995 MCBS data also confirm our findings of increased OOPE among older individuals with a history of cancer, as those reporting a cancer history not necessarily with current treatment in the MCBS had OOPE of about $300 per year more than those without a cancer history (personal communication with K. Hutchins, Research Data Assistance Center, Centers for Medicare and Medicaid Services, 2001, unpublished).

Finally, the expenditure data used for this study were from 1995, and therefore provide information on OOPE for a time period before the recent large increase in OOPE for prescription drugs among older Medicare beneficiaries [45]. Further research using more recent OOPE data is necessary to determine how recent trends in OOPE, in general, and among older patients receiving cancer treatment, in particular, have affected the quantity and distribution of OOPE for medical care among older Americans. Our study provides representative baseline information to which future studies of OOPE can be compared.

This study of a nationally representative sample of older Americans suggests that undergoing treatment for cancer may result in significant OOPE for medical care presumably related both to the treatment itself and to complications from the underlying cancer and its treatment. Although a new benefit within the Medicare program to cover prescription medications would relieve a significant burden of OOPE for older Americans, those undergoing cancer treatment may still face significant out-of-pocket costs related to both acute care and community-based long-term care services. Low-income older Americans may face an especially daunting financial burden if cancer treatment is required, because a significant portion of their yearly income may be necessary to pay for treatment-related medical costs. Future research should examine how recent increases in prescription medication use and costs among elderly individuals has affected the level of their out-of-pocket spending and the possibility that significant OOPE related to cancer treatment may lead older individuals to forgo cancer therapies that might provide significant benefit.

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