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Age and Gender Differences in Medicare Expenditures and Service Utilization at the End of Life for Lung Cancer Decedents

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Abstract

Study Purpose—Gender and age differences in medical care are well documented. We examined age and gender differences in Medicare expenditures for lung cancer decedents in the last year of life (LYOL) through a cross-sectional study of Medicare administrative and claims data.

Methods—Participants were aged Medicare beneficiaries (68+) with lung cancer, who were covered by Parts A and B for 36 months before death (1996−1999; N=13,120). Regression techniques were used to estimate age and gender differences in mean Medicare utilization and expenditures in the LYOL overall and by type of service, conditional on use: inpatient, outpatient, physician, skilled nursing facility (SNF), home health, and hospice, controlling for demographic, clinical, geographic, and supply characteristics.

Results—Women were more likely than men to use inpatient, SNF, home health, and hospice services. Women's average expenditures were approximately $1,900 greater than men's, with differences attributed to higher average expenditures for SNF, home health, and hospice. Older cohorts used less inpatient and outpatient services and used more SNF and hospice services in their LYOL. Average Medicare expenditures were significantly lower in older cohorts ($8,487 less for those age 85+ at death than for those 68 to 74). Adjusting for age explains most of the gender differences in average Medicare expenditures. Remaining gender differences vary across age cohorts, with larger gender differences in social-supportive service expenditures among those 68−74 and 75−84 and outpatient and physician services among those 75−84 and 85+.

Conclusions and Discussion—Our findings suggest that gender disparities in expenditures are generally small at the end of life for lung cancer decedents, particularly among the older cohorts. As expected, the bigger observed differences are by age although the direction of the association is not

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consistent across types of service. Higher expenditures for women on social-supportive services may reflect fewer informal supports for older women compared to men.

INTRODUCTION AND BACKGROUND

Gender differences in the elderly population's medical utilization and expenditures are well documented. For example, among both community dwellers and nursing home residents, older women are less likely than older men to be hospitalized, adjusting for disease type and severity (Barker et al., 1994; Dunlop, Manheim, Song, & Chang, 2002; Freiman & Murtaugh, 1993; Fried & Mor, 1997; Gordon, Kane, & Rothenberg, 1985; Kiel, Eichorn, Intrator, Silliman, & Mor, 1994). In terms of length of stay among those 65 and over, although earlier studies indicate that men received 5 percent more hospital care than women, more recent studies find that the gap has closed for short-stay hospitalizations (DeFrances & Hall, 2004; DeFrances, Hall, & Podgornik, 2005; DeFrances & Podgornik, 2006; Hall & DeFrances, 2003). However, women remain substantially more likely than men to use nursing home care, with women receiving two to six times more nursing home care than do men (Butler, 1996; Miles & Parker, 1997; Short, 1990). Gender differences in the quality and outcomes of care for the management of cardiovascular disease have also been well documented (Ayanian, Kohler, Abe, & Epstein, 1993; Rathore et al., 2000; Schulman et al., 1999; Schwartz et al., 1997; Vaccarino, Krumholz, Yarzebski, Gore, & Goldberg, 2001; Weitzman et al., 1997). Yet, relatively little is known about men's and women's patterns of utilization of medical care and related services in the last years of their lives. Do men and women typically use different services and for each type of service, do expenditures among service users differ by gender at the end of life? This gap in current research persists despite increasing attention to gender differences in health status and access to quality care among older adults. With the increasing size of the Medicare population and the growth in the average lifespan, gender may impact service demand and expenditures in the coming years.

In our previous work focusing on the general population, we found that age is much more important than gender in explaining variation in end of life care (Shugarman, Campbell, Bird, Gabel et al., 2004). The combination of being a Medicare beneficiary and being sick enough to die appears to attenuate gender differences in health care services utilization. Moreover, our previous work demonstrates that gender differences in total Medicare expenditures narrow over the last three years of life. Gender differences in expenditure patterns, however, do vary by age (Bird, Shugarman, & Lynn, 2002). Although expenditures are higher for women in younger cohorts across each of the three years before death, among decedents 90 years of age and older expenditures for men exceed those for women by 11 percent in the LYOL.

Much of the research prior to our work on end-of-life care relies on data that is over two decades old (Lubitz, Beebe, & Baker, 1995; Lubitz & Riley, 1993; Riley, Lubitz, Prihoda, & Rabey, 1987; Riley & Lubitz, 1989) or comes from a limited geographic population (Levinsky et al., 2001; Perls & Wood, 1996). Moreover, among those studies that examine gender differences in utilization and expenditures, few have examined differences with samples large enough to focus on a clinically meaningful subset of the population or to address the confounding of age and gender.

Using data from a large sample of Medicare decedents spanning 1993−1999, we present an analysis of age and gender differences in Medicare expenditures and service use for lung cancer decedents. We selected a cohort of Medicare beneficiaries with lung cancer for two reasons. In general, cancer is one of the most common causes of death among Medicare beneficiaries (Miniño, Arias, Kochanek, Murphy, & Smith, 2002). Moreover in both genders, lung cancer represents the second most common cancer diagnosis and the leading cause of cancer death: accounting for one in four cancer deaths for women and one in three for men (American Cancer

Society, 2005). The American Cancer Society estimated that in 2006 approximately 162,460 Americans would die from lung cancer (90,330 men and 72,130 women), constituting 29% of all cancer-related deaths in the year (American Cancer Society, 2006).

More specifically, we selected lung cancer to illuminate whether gender is associated with actual differences in cost and utilization of services. The presenting symptoms, detection, and standard-of-care practices for lung cancer generally do not vary by gender. While prior research provides evidence that women have improved survival relative to men due in part to histological variation between the genders (Batevik, Grong, Segadal, & Stangeland, 2005; Chen, Chang, Yu, Kuo, & Yang, 2005; Moore, Doherty, Chamberlain, & Khuri, 2004; Rivera & Stover, 2004; Visbal et al., 2004), disease recurrence patterns and treatment are similar across the genders (Keller et al., 2002; Visbal et al., 2004).

METHODS

Design

We utilized a retrospective cohort study of aged Medicare decedents with lung cancer. We estimated differences in the likelihood of service use using logistic regression and differences in expenditures using linear regression, conditional on service use in the LYOL. Data sources included Medicare's 5% sample denominator and claims files (1993−1999), the Area Resource File for supply variables, and the 1990 Census for area income linked to claims by zip code of beneficiary residence in their LYOL. The RAND Corporation's Institutional Review Board reviewed and approved this project. Patient consent was not required because administrative claims records were obtained for decedents only. Appropriate data safeguarding plans were established and put in place prior to the start of data analysis.

Setting and Participants

From the aged (65+) Medicare beneficiaries who died between 1996 and 1999 (N=265,170), we excluded those eligible for Medicare because of disability or end-stage renal disease and those in managed care (2.2%). We further excluded those not continuously enrolled in both Medicare Part A (Hospital Insurance) and Part B (Supplemental Medical Insurance) for 36 months prior to their death (5.5%). Because the ‘other’ race category comprised a small proportion of our sample (2.0%), we excluded them, retaining only white and black beneficiaries.

From the resulting sample (N=241,047), we identified Medicare decedents with lung cancer using the administrative data for the three years preceding death. Those who had a plurality of their expenditures for physician services where lung cancer was a diagnosis in the line item (ICD-9-CM code 162) were selected. A secondary method for identifying decedents included identifying individuals for whom lung cancer was the diagnosis on a plurality of all claims in the LYOL (Visbal et al., 2004). Our approach does exclude those who were diagnosed shortly before death and/or if they had other health conditions that dominated their care in the last year of life. This approach also excludes those who may have been diagnosed with lung cancer but died from some other cause prior to their treatments becoming the dominant treatment in the last year of life. Our resulting analytic sample included decedents age 68+ (N=13,120).

Outcome Measures

The principal outcome measures were service utilization and total annual Medicare expenditures for six services conditional on use: inpatient, outpatient, physician, skilled nursing facility (SNF), home health, and hospice. Dummy variables for utilization of each service type were created. Medicare expenditures were the inflation-adjusted (to 1999 dollars) Medicare expenditures for each service. We summed expenditures for each decedent to capture total

expenditures. Results presented on expenditures are conditional on use and thus reflect the average spending among those who used a particular service and not the average across all members of the sample. Deductibles, co-insurance, durable medical equipment, expenditures by other insurance, and out-of-pocket expenses were not included.

Covariate Measures

Patient attributes included age, gender, race, Medicaid enrollment, area income, comorbidities and an indicator for metastatic disease, duration of illness, and history of service utilization (prior to the LYOL). Area measures included rural/urban residence, physician supply, and SNF bed supply.

We derived age, gender, race, and Medicaid enrollment from the Medicare Denominator files. Age at death was collapsed into three cohorts: 68−74, 75−84, and 85+. We categorized race as white or black. Medicaid enrollment reflects any state buy-in to Medicare during the LYOL.

To capture socio-economic resources, we used zip code-level area income, reflecting differences across residential areas in income, assets, and likely richer community resources (Geronimus & Bound, 1998; Krieger, Williams, & Moss, 1997). We linked this data with zip code-level census data and obtained the median household income for the zip code of residence: < $20,000, $20,000 to $34,999, and ≥$35,000.

To control for case mix, we developed a count of comorbidities present in the claims for each beneficiary, adapting the method developed by Charlson and colleagues (Charlson, Pompei, Ales, & MacKenzie, 1987). We screened all claims for mention of 14 comorbid conditions: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic obstructive pulmonary disease, rheumatoid arthritis, peptic ulcers, chronic liver disease and cirrhosis, diabetes, hemiplegia, quadriplegia, renal failure, and AIDS. We included the number of comorbidities (0 to 14) as a control for burden of illness. We also included an indicator variable to identify those who had at least one mention of metastatic disease in their Medicare claims. Duration of illness was determined as the length of time between the first mention of lung cancer in the Medicare claims and the date of death. Due to our sampling methods, the measure of illness duration was censored at 36 months. Finally, we included an indicator to identify those who were diagnosed with lung cancer during their LYOL (incident cases).

We hypothesized that SNF or home health utilization prior to the LYOL was associated with an increased likelihood of using those services in the LYOL. We created a single dichotomous measure of prior SNF or home health service use in the two years prior to the LYOL. Prior utilization of inpatient, outpatient, or physician services were not assumed to be predictive of utilization due to the necessity of these services for diagnosis and treatment. Additionally, given that almost all hospice users use those services solely in the LYOL, we did not include a measure of prior hospice utilization. We assumed that the predisposition to use services would predict service use in the LYOL. However, we did not assume prior service utilization would influence expenditures. Therefore, we did not include these measures in our models estimating expenditures.

We included three area measures to control for effects of population density and health service supply from the Area Resource File linked to the Denominator file by state and county of residence at death (Gelfi & Parker, 1995). Population density was characterized as metropolitan, non-metropolitan urban, or rural using Urban Influence Codes. Number of total physicians and number of SNF beds were both expressed as the rate per 1000 people 65+. The physician rate was included in all logistic and linear models while the SNF bed rate was used only in logistic models to predict the likelihood of any use of a SNF in the LYOL.

Statistical Analysis

We analyzed data using SAS statistical software, version 8.0 (SAS Institute Inc, 1999). Using chi-square tests, we described age and gender differences in the proportion of Medicare decedents with any service use by type of service. We also employed analysis of variance to test for age and gender differences in and continuous descriptive characteristics.

Logistic regression models were estimated to examine the association between age and gender and the likelihood of using services in the LYOL, controlling for other characteristics. Models were fit for each service type with the exception of physician services. Nearly every lung cancer decedent had seen a physician in their LYOL, consequently, there was not enough variation in the outcome measure to warrant analysis. We estimated age and gender differences in mean Medicare program expenditures in the LYOL overall and for each service, conditional on use, using multivariable ordinary least squares regression equations, controlling for the same measures above (excepting prior service use). Finally, we stratified the linear models by age to examine the direct effect of gender on Medicare expenditures in each age cohort.

We examined the distribution of the expenditures for Medicare beneficiaries with lung cancer conditional on use to determine if we needed to transform the outcome measure for the linear regression models. We performed the analyses using the untransformed and transformed expenditure variables. We then used the Duan adjustment (i.e., smearing factor) to return the predicted values of the transformed variable back into dollar values and found that the results were very similar to those observed in the untransformed models (Duan, 1983). We report the regression results using the untransformed variables as they provide for easier interpretation of the linear regression results.

RESULTS

Of our 13,120 Medicare decedents with lung cancer, almost 90% were under 85 at death and 43% were female. About seven percent of the sample was black; race varied little by age and gender (Table 1). About one-quarter resided in areas with a median household income over $35,000; approximately 20% resided in areas with a median less than $20,000. About 13% used Medicaid, and women were significantly more likely to rely upon Medicaid than men in each age cohort. The majority of the sample (72%) resided in urban counties, and 15.8% resided in rural counties. Women comprised a larger proportion of the oldest cohort compared with younger cohorts. Mean illness duration did not differ significantly by gender within age group. However, the youngest cohort survived for about two months longer than the oldest cohort ($p<0.0001$).

Tables 2 through 5 examine service use and expenditures using bivariate and multivariate models. To avoid redundancy in the presentation of results, we have organized the presentation by type of service use, ending with analyses of total expenditures.

Inpatient Services

Approximately 85.4% of Medicare beneficiaries with lung cancer had at least one inpatient admission during their LYOL. In the bivariate comparisons, we found no difference in the proportion of lung cancer decedents who used any inpatient health care services in their LYOL by age at death or by gender (Table 2).

Multivariate logistic regression analysis of inpatient service use indicates that women were more likely to use inpatient services than men in the LYOL even after controlling for age, race, Medicaid enrollment, area income, rural/urban setting, co-morbidities and other clinical measures, duration of illness, history of service utilization (prior to the LYOL), physician supply, and SNF bed supply. Although not significant in the bivariate case, women's adjusted

odds of using inpatient care were 1.2 times that of men (95% CI: 1.07, 1.33). Both those age 75−84 and those 85+ were significantly less likely to use inpatient services relative to the youngest cohort in the LYOL.

Although women were more likely to use inpatient services, multivariate linear regression analyses indicate that conditional on use, inpatient service expenditures did not differ by gender (Table 4). However they did differ by age, with significantly fewer dollars spent on inpatient services for the two older cohorts as compared to the youngest cohort controlling for race, co-morbidities, illness duration, prior service use, region of residence, area income, and supply factors.

The results presented above examined the association of age and gender separately on Medicare expenditures overall and by type of service. We also examined the association between gender and expenditures stratified by age as summarized in Table 5. Only the gender coefficients are shown. We controlled for the same set of covariates as in the previously described multivariate models. In the age-stratified analyses, we found that no significant gender differences in spending between men and women across all three age cohorts.

Outpatient Services

Gender was not associated with use of outpatient services in the LYOL. Older cohorts were less likely to have used outpatient services. Descriptive and multivariate analyses provided similar results.

Among those who used outpatient services, expenditures for women were statistically lower than for men, although the difference was only $216. Expenditures by age were statistically significant only for the oldest cohort compared to the youngest: approximately $1,427 less for those age 85+ than for those age 68−74 at death. Age stratified analyses indicate that while expenditures on outpatient services were lower for women in the LYOL, the differences were only significant in the older two cohorts.

Physician Services

Not surprisingly, nearly all lung cancer decedents saw a physician in the LYOL. Use of physician services did not differ by age or gender. However, expenditures on physician services, conditional on use, for women were almost $500 less than for men after controlling for other characteristics. Expenditures were also significantly lower for older decedents than younger decedents, being about $1,286 lower for those age 75−84 and $3,222 for those 85+, as compared to those 68−74 at death. As with outpatient services, stratified analyses indicated that the gender differences were only significant in the older two cohorts.

SNF Services

Bivariate and multivariate descriptive analyses demonstrated that women were more likely than men to have used a SNF. Multivariate analyses also indicated that older cohorts were significantly more likely than the youngest cohort to have used SNF. Among those who used SNF, women's adjusted expenditures were approximately $722 higher than those for men. Controlling for other factors, SNF expenditures did not differ by age among those who used the services. After stratifying by age, we found gender differences in SNF expenditures in the two younger decedent cohorts. SNF spending was $849 and $661 higher for women 68−74 and 75−84, respectively, relative to similar-aged men.

Home Health Services

Women were more likely than men to use home health services as observed in descriptive and multivariate models, although only the former showed small differences across age cohorts

(with no age trend). Medicare home health expenditures were higher for women than for men by almost $900, conditional on use and controlling for other factors. Older cohorts' home health expenditures were also higher than the youngest cohort ($525 more for 75−84 year olds; $812 more for 85+). Age stratified analyses indicated that gender differences were significant in the younger two cohorts, with Medicare home health services expenditures $794 higher for women 68−74 and $1102 higher for women age 75−84, compared to similar-aged men.

Hospice Services

Women and older cohorts were more likely to use hospice services. Controlling for other factors, women were 14% more likely than men to have used hospice services. Older cohorts were also significantly more likely than the youngest to have used hospice services. Controlling for other factors, hospice expenditures were approximately $830 higher for female vs. male utilizers. Multivariate analyses also indicated that expenditures were $765 higher for those age 75−84 and $1,826 higher for those age 85+, as compared to those age 68−74 at death. Age-stratified multivariate analyses indicate that hospice expenditures in the LYOL were just over $800 higher for women age 68−74 and 75−84 than for men in the same age cohorts at death; but there were no significant differences in spending by gender for the oldest cohort.

Total Expenditures

Overall Medicare expenditures during the LYOL were lower for older decedents. Average expenditures for beneficiaries age 68−74 at death were 39% higher than expenditures for those age 85+ at death. The gender differences in unadjusted LYOL expenditures were also lower in older cohorts, dropping from about $2200 higher for women in the youngest age cohort ($34,133 for women vs. $31,928 for men), to about $1100 in the middle cohort (75−84 years; $p<0.05$), to no gender differences in the oldest cohort (data not shown).

Controlling for other variables, total expenditures for women were on average $1,882 higher than for men. Fewer Medicare dollars were spent on services for the older age cohorts in their LYOL. Medicare expenditures for those 75−84 at death were $3,424 less and for those 85+ were almost $8,500 less than for those age 68−74 at death. The age-stratified analyses suggest that the difference in expenditures by gender exists only among the younger cohorts (68−74 and 75−84).

CONCLUSIONS AND DISCUSSION

To our knowledge, our work is the first to focus on age and gender differences in end-of-life Medicare service utilization and expenditures by type of service for a lung cancer population. Although gender differences favoring men have been shown on numerous dimensions of health care at other points of the life course and for other diseases (Ayanian, Weissman, Chasan-Taber, & Epstein, 1999; Dunlop, Manheim, Song, & Chang, 2002; Fried & Mor, 1997; Schulman et al., 1999; Schwartz et al., 1997), this study finds that women are sometimes higher utilizers of services. Female decedents were more likely to use any inpatient care (the major driver of end-of-life expenditures) than males, although overall inpatient expenditures among those who used any are no difference between the two.

Our findings suggest that disparities in expenditures on the basis of gender are generally small at the end of life for lung cancer decedents, particularly among the older cohorts. As expected, the bigger observed differences are by age although the direction of the association is not consistent across types of service. Acute service (inpatient, outpatient, and physician) expenditures are significantly smaller for older cohorts, conditional on use. While expenditures for "social-supportive" services (home health and hospice) are generally higher for older cohorts, the total difference is much smaller as compared to acute services. Thus, fewer

inpatient stays among older cohorts are driving the difference in expenditures by age. This pattern confirms earlier research (Bird, Shugarman, & Lynn, 2002; Levinsky et al., 2001; Shugarman, Campbell, Bird, Gabel, Louis et al., 2004).

Gender differences in end-of-life care may arise from at least three independent sources: 1) age at death and the acute and chronic conditions patients experience at that age; 2) true differences in men's and women's health care needs; and 3) differential treatment. We assess the first two sources by examining a clinically meaningful cohort and by controlling for age and chronic conditions. Although we are unable to assess need for supportive services, the remaining gender differences we found may reflect at least in part the traditional gender differences in the availability of informal caregivers at the end of life. Due to gender differences in mortality and age differences between spouses, women are more likely to face the ends of their lives in widowhood than men (Lugaila, 1997). These differences may contribute to higher utilization and expenditures on social supportive services (e.g., SNF, home health, and hospice). Thus, the gender differences we observe at the end of life may be appropriate and necessary given differences in life situations. However, it is unclear at this time if providers or the Medicare program are well-positioned to address the social support needs of beneficiaries in a way that could reduce the disparities in expenditures at the end of life.

Several possibilities might explain the absence of substantial gender differences in the LYOL. Perhaps, as noted in our previous research (Bird, Shugarman, & Lynn, 2002; Shugarman, Campbell, Bird, Gabel, Louis et al., 2004), the combination of nearly universal Medicare coverage for the elderly and having serious illnesses in the LYOL overcomes some of the usual barriers to care (Crawley et al., 2000; LaForce & Wussow, 2001). Differences in aggregate expenditures might also narrow if services are mostly supportive and they are approaching a maximum likely utilization. Perhaps very sick people can receive only so much care in a year, thus reaching a “saturation point.” Or perhaps the usual patient finally becomes sick enough to make high-cost treatments inappropriate, and the use of those treatments may ordinarily evidence more disparities (Hamel et al., 1999). Discerning the origins of these findings should improve the understanding of disparities generally, as well as the understanding of expenditures and organization of care for those approaching the end of life.

Our analyses have several limitations. This study focuses on a sample of aged lung cancer decedents who are eligible for fee-for-service Medicare; thus, the findings cannot be generalized to other populations (e.g., younger decedents, decedents in managed care, and non-Medicare populations). Additionally, we used administrative claims to identify the lung cancer decedent population. As such, we are only able to include those who sought out care from a Medicare provider in their LYOL. We are unable to confirm that lung cancer was the actual cause of death and using the plurality of expenditures and claims approach we used to identify the lung cancer cohort may miss those who were diagnosed very shortly before their death or who may have been diagnosed with lung cancer and died from other causes, thus receiving little treatment for the cancer. Still, the plurality of expenditures and claims approach we used to identify the lung cancer cohort suggests that the population was receiving active treatment for the condition during their last years of life. While from a policy perspective, we are concerned about disparities that may exist in the timing of diagnosis; this paper cannot address those differences. Still, our approach to identifying our cohort is appropriate for evaluating the care of those receiving active treatment for lung cancer at the end of life.

Although the literature indicates that women have improved survival with certain tumor histologies (Batevik, Grong, Segadal, & Stangeland, 2005; Chen, Chang, Yu, Kuo, & Yang, 2005; Keller et al., 2002; Moore, Doherty, Chamberlain, & Khuri, 2004; Visbal et al., 2004), our focus on the LYOL minimizes this impact on utilization and expenditure, effectively truncating the effect that differential survival might have on our analyses. However, the impact

of better survival among women with lung cancer may be that they can better plan their care or may have higher expectations of survival. Both may impact the types and duration of services used, thus affecting costs. Further research on social-supportive services specifically may explore whether women's lengths of stays are longer than men's for these services.

In addition, further analyses could illuminate the composition of lung cancer services by gender. For example, are there age or gender differences in use of chemotherapy or other treatments? Furthermore, our data do not reflect all health care expenditures. Differences in expenditures may be quite different if the data included costs paid out-of-pocket, by private insurance, or Medicaid (Scitovsky, 1988). Our findings also do not address quality of care at the end of life. While several studies have identified poor quality care near death (Bernabei et al., 1998; Hogan, Lunney, Gabel, & Lynn, 2001; Lynn & Goldstein, 2003), few have examined the relationship of quality to patient characteristics.

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Table 1

Descriptive Characteristics of Sample Population*

Variable	All Ages (%) (n=6,657)	Age at Death (%)			p-value	Gender (%)		p-value
		68−74 (n=5,431)	75−84 (n=6,211)	85+ (1,478)		Women (n=5,594)	Men (n=7,526)	
% Female	42.6	41.5	42.7	46.9	0.001	—	—	—
% Black	7.3	7.7	7.0	7.2	0.344	6.7	7.7	0.024
Area Income (%)					<.001			<.001
<$20,000	19.9	20.8	19.1	20.6		17.4	21.7	
$20,000-$35,000	55.4	56.3	55.7	51.1		55.5	55.4	
>$35,000	24.7	23.1	25.2	28.3		27.2	22.8	
% Medicaid	13.2	13.9	12.8	12.8	0.209	17.4	10.1	<.001
Region (%)					<.001			<.001
Urban	72.1	70.7	72.6	75.6		75.3	69.8	
Non-Urban Metropolitan	12.1	12.0	12.5	11.0		11.6	12.6	
Rural	15.8	17.3	15.0	13.3		13.2	17.7	
Mean Illness Duration†	10.1	10.6	10.1	8.6	<.001	10.3	10.0	0.069
(+/− SD)	*(10.1)*	*(10.1)*	*(10.2)*	*(9.6)*		*(10.2)*	*(10.1)*	
Mean Comorbidities‡	2.3	2.2	2.4	2.3	<.001	2.2	2.4	<.001
(+/− SD)	*(1.5)*	*(1.5)*	*(2.4)*	*(1.5)*		*(1.5)*	*(1.5)*	

Source: 5% sample, Medicare Denominator Files, 1996−1999; 1990 Census; 1999 Area Resource File.

*All characteristics reflect population in last year of life.

†Duration measured in months.

‡Range: 0−14.

Table 2

Proportion of Decedents with Any Service Use, by Type of Service, Age at Death, and Gender

Service Type	All Ages (%) (n=6,657)	Age at Death			p-value	Gender		p-value
		68−74 (%) (n=5,431)	75−84 (%) (n=6,211)	85+ (%) (n=1,478)		Women (%) (n=5,594)	Men (%) (n=7,526)	
Inpatient	85.4	86.7	85.2	81.7	<.001	85.8	85.1	0.275
Outpatient	92.8	94.2	92.8	87.8	<.001	92.6	93.0	0.382
Physician	99.3	99.5	99.2	99.1	0.148	99.5	99.1	0.005
SNF	25.2	21.2	27.2	31.8	<.001	28.2	23.1	<.001
Home Health	45.0	43.9	46.1	44.5	0.043	49.8	41.5	<.001
Hospice	50.5	48.8	51.2	53.6	0.001	53.0	48.6	<.001

Table 3

Likelihood of Any Use of Medicare Services in Last Year of Life, by Type of Service[*,†]

Variable	Type of Service									
	Impatient		Outpatient		Skilled Nursing Facility		Home Health		Hospice	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Gender										
Male	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
Female	**1.20**	**(1.07, 1.33)**	1.00	(0.87, 1.15)	**1.34**	**(1.23, 1.46)**	**1.42**	**(1.32, 1.53)**	**1.14**	**(1.06, 1.23)**
Age Group										
68−74	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
75−84	**0.87**	**(0.78, 0.98)**	**0.83**	**(0.71, 0.97)**	**1.39**	**(1.28, 1.52)**	1.08	(1.00, 1.16)	**1.15**	**(1.07, 1.24)**
85+	**0.76**	**(0.64, 0.90)**	**0.55**	**(0.45, 0.67)**	**1.86**	**(1.63, 2.12)**	1.07	(0.95, 1.21)	**1.26**	**(1.12, 1.42)**
Race										
White	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
African-American	**1.57**	**(1.23, 2.01)**	**0.77**	**(0.60, 0.98)**	0.92	(0.78, 1.09)	1.11	(0.96, 1.29)	**0.84**	**(0.73, 0.97)**
Comorbidity Count[‡]	**2.11**	**(2.01, 2.22)**	**1.32**	**(1.25, 1.39)**	**1.33**	**(1.29, 1.37)**	**1.30**	**(1.27, 1.34)**	**0.80**	**(0.78, 0.82)**
Metastases										
No	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
Yes	**3.16**	**(2.82, 3.53)**	**2.12**	**(1.84, 2.44)**	**2.43**	**(1.94, 3.04)**	**2.83**	**(2.47, 3.25)**	1.06	(0.98, 1.13)
Enrolled in Medicaid										
No	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
Yes	1.03	(0.87, 1.22)	0.95	(0.77, 1.17)	**1.39**	**(1.23, 1.56)**	0.96	(0.86, 1.07)	0.94	(0.84, 1.05)
Geographic Region										
Cosmopolitan	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
Urban	1.13	(0.95, 1.34)	**1.54**	**(1.20, 1.96)**	1.09	(0.95, 1.24)	1.12	(0.99, 1.25)	**0.76**	**(0.68, 0.85)**
Rural	**1.22**	**(1.03, 1.44)**	**1.76**	**(1.38, 2.24)**	1.12	(0.99, 1.27)	1.15	(1.03, 1.29)	**0.66**	**(0.59, 0.73)**
Area Income										
<$20,000	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
$20−35,000	0.92	(0.80, 1.07)	1.13	(0.94, 1.36)	1.00	(0.90, 1.11)	0.99	(0.90, 1.10)	1.06	(0.96, 1.17)
>$35,000	**0.82**	**(0.68, 0.98)**	1.04	(0.83, 1.29)	0.93	(0.81, 1.07)	**1.19**	**(1.06, 1.34)**	1.07	(0.96, 1.21)
Duration of Illness[§]	0.99	(0.98, 1.00)	1.05	(1.04, 1.07)	1.01	(1.00, 1.01)	**1.02**	**(1.01, 1.02)**	1.01	(1.00, 1.02)
Incident Cancer										
No	1.00	--	1.00	--	1.00	--	1.00	--	1.00	--
Yes	**1.54**	**(1.25, 1.89)**	**1.64**	**(1.22, 2.21)**	**1.37**	**(1.15, 1.64)**	**1.43**	**(1.22, 1.67)**	1.03	(0.89, 1.19)
Physician Supply[‖]	**1.06**	**(1.03, 1.09)**	**0.96**	**(0.94, 0.99)**	0.98	(0.96, 1.00)	**1.03**	**(1.01, 1.05)**	**0.95**	**(0.93, 0.97)**
SNF Bed Supply[¶]	--	--	--	--	**1.01**	**(1.01, 1.01)**	--	--	--	--
Used Prior Years										
No	--	--	--	--	1.00	--	1.00	--	--	--
Yes	--	--	--	--	**1.47**	**(1.35, 1.60)**	**1.58**	**(1.47, 1.70)**	--	--

[*] Odds ratio presented along with 95% Confidence Intervals (CI).

[†] Most decedents used physician services and therefore no analyses could be conducted reliably for this service outcome.

[‡] Range: 0−13.

[§] Duration measured in months.

[‖] Physicians per 1000 population 65+.

¶SNF beds per 1000 population 65+.

Table 4

Linear Regression of Mean Medicare Expenditures Overall and by Type of Service[*,†]

	Type of Expenditure													
	Total Expenditures		Inpatient		Outpatient		Physician		Skilled Nursing Facility		Home Health		Hospice	
Variable	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value	Coeff	p-value
Intercept	7149	<.001	4796	<.001	1011	<.001	3102	<.001	3632	<.001	1187	0.002	4895	<.001
	(1129)		*(1035)*		*(182)*		*(316)*		*(690)*		*(377)*		*(487)*	
Female	1882	<.001	556	0.104	−216	0.001	−496	<.001	722	0.001	898	<.001	831	<.001
	(384)		*(343)*		*(62)*		*(107)*		*(220)*		*(126)*		*(167)*	
Black	3624	<.001	3912	<.001	−103	0.409	−655	0.002	−302	0.487	838	0.001	376	0.291
	(764)		(668)		(125)		(214)		(433)		(247)		(356)	
Age 75–84[‡]	−3424	<.001	−2834	<.001	−645	<.001	−1286	<.001	−48	0.840	525	<.001	766	<.001
	(401)		(357)		(64)		(112)		(240)		(133)		(178)	
Age 85+[‡]	−8487	<.001	−7073	<.001	−1427	<.001	−3222	<.001	552	0.112	812	<.001	1826	<.001
	(638)		(578)		(105)		(179)		(347)		(213)		(277)	
Comorbidity Count[§]	4974	<.001	3249	<.001	6	0.759	635	<.001	559	<.001	461	<.001	−456	<.001
	(126)		*(114)*		*(20)*		*(35)*		*(71)*		*(41)*		*(58)*	
Metastases Present	6318	<.001	1559	<.001	923	<.001	2474	<.001	66	0.770	−178	0.166	−1843	<.001
	(382)		*(344)*		*(62)*		*(107)*		*(226)*		*(128)*		*(169)*	
Medicaid	540	0.353	289	0.574	−325	0.001	−1299	<.001	1153	<.001	813	<.001	1622	<.001
	(581)		*(514)*		*(94)*		*(162)*		*(300)*		*(189)*		*(264)*	
Urban[‖]	−2162	<.001	−1066	0.052	180	0.066	−874	<.001	−930	0.008	33	0.873	−504	0.065
	(614)		*(548)*		*(98)*		*(172)*		*(350)*		*(205)*		*(273)*	
Rural[‖]	−2631	<.001	−689	0.168	234	0.012	−1492	<.001	−2103	<.001	−13	0.946	−390	0.143
	(587)		*(523)*		*(94)*		*(164)*		*(332)*		*(195)*		*(267)*	
Income $20 −35,000[¶]	−1097	0.031	−598	0.185	235	0.004	−289	0.042	−205	0.474	−662	<.001	−211	0.352
	(508)		*(451)*		*(82)*		*(142)*		*(286)*		*(170)*		*(227)*	
Income >$35,000[¶]	1023	0.103	777	0.166	521	<.001	485	0.006	−96	0.790	−762	<.001	1	0.997
	(627)		*(561)*		*(101)*		*(176)*		*(359)*		*(207)*		*(275)*	
Illness Duration[**]	398	<.001	149	<.001	49	<.001	112	<.001	77	<.001	47	<.001	153	<.001
	(36)		*(33)*		*(6)*		*(10)*		*(21)*		*(12)*		*(16)*	
Incident Cancer	6747	<.001	4120	<.001	686	<.001	1686	<.001	843	0.075	151	0.543	31	0.926
	(788)		*(722)*		*(125)*		*(220)*		*(472)*		*(247)*		*(333)*	
Physician Supply[††]	815	<.001	803	<.001	94	<.001	29	0.266	75	0.164	13	0.655	−37	0.371
	(93)		*(82)*		*(15)*		*(26)*		*(54)*		*(29)*		*(42)*	

[*] The relationship between the variables of interest and expenditures are estimated using least squares regression; coefficients, standard errors (in italics) and p-values are presented.

[†] Models of expenditures conditional on use of service.

[‡] Reference: Age 65 to 74

[§] Range: 0–14

[‖] Reference: Cosmopolitan

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¶ Reference: Income <$20,000

** Duration measured in months

†† Physicians per 1000 population 65+

Table 5

Relationship Between Gender and Mean Medicare Expenditures, by Type of Service, Stratified by Age at Death[*,†]

Age at Death	Total Expenditures		Inpatient		Outpatient		Type of Expenditure Physician		Skilled Nursing Facility		Home Health		Hospice	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
68−74	2314.14	<.001	775.32	0.178	−127.45	0.249	−270.04	0.154	848.84	0.025	793.77	<.001	832.75	<.001
	(641)		*(576)*		*(111)*		*(189)*		*(377)*		*(179)*		*(240)*	
75−84	1632.86	0.003	251.40	0.605	−267.50	0.001	−611.41	<.001	660.93	0.033	1101.66	<.001	802.64	0.001
	(549)		*(486)*		*(83)*		*(147)*		*(310)*		*(191)*		*(247)*	
85+	1402.60	0.109	1086.10	0.136	−317.41	0.002	−789.29	<.001	550.79	0.334	379.06	0.357	692.29	0.225
	(876)		*(729)*		*(103)*		*(208)*		*(570)*		*(411)*		*(570)*	

[*] Coefficients represent differences in costs for women as compared to men, stratified by age.

[†] The relationship between gender and mean expenditures is presented controlling for socio-demographic and clinical characteristics, region of residence, and supply variables stratified by age at death; coefficients, standard errors (in parentheses), and p-values.