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## Associations between Illness Burden and Care Experiences Among Medicare Beneficiaries Before or After a Cancer Diagnosis

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### Abstract

**INTRODUCTION:** To understand associations between a new measure of illness burden and care experiences in a large, national sample of Medicare beneficiaries surveyed before or after a cancer diagnosis.

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**Author contributions**

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**MATERIALS AND METHODS:** The SEER-CAHPS Illness Burden Index (SCIBI) was previously developed using Surveillance, Epidemiology, and End Results (SEER)–Consumer Assessment of Healthcare Providers and Systems (CAHPS) linked data. The SCIBI provides a standardized morbidity score based on self- and other-reported information from 8 domains and proxies relative risk of 12-month, all-cause mortality among people surveyed before or after a cancer diagnosis. We analyzed a population of Medicare beneficiaries ( $n = 116,735$ ; 49% fee-for-service and 51% Medicare Advantage [MA]; 73% post-cancer diagnosis) surveyed 2007 – 2013 to understand how their SCIBI scores were associated with 12 different care experience measures. Frequentist and Bayesian multivariable regression models adjusted for standard case-mix adjustors, enrollment type, timing of cancer diagnoses relative to survey, and survey year.

**RESULTS AND DISCUSSION:** SCIBI scores were associated ( $P < .001$ ) in frequentist models with better ratings of Health Plan (coefficient  $\pm$  standard error:  $0.33 \pm 0.08$ ) and better Getting Care Quickly scores ( $0.51 \pm 0.09$ ). In Bayesian models, individuals with higher illness burden had similar results on the same two measures and also reported reliably worse Overall Care experiences (coefficient  $\pm$  posterior SD:  $-0.17 \pm 0.06$ ). Illness burden may influence how people experience care or report those experiences. Individuals with greater illness burdens may need intensive care coordination and multilevel interventions before and after a cancer diagnosis.

### Keywords

comorbidity; care experiences; survey data; claims data; cancer

## INTRODUCTION

As people continue to live longer after a cancer diagnosis, the relative impact of other chronic health conditions on health outcomes continues to grow.<sup>1</sup> Older individuals who suffer from chronic conditions in addition to cancer experience poorer health status and quality of life,<sup>2</sup> higher mortality,<sup>3</sup> and shorter survival.<sup>4–6</sup> Many patients, particularly those with early stage cancer, are more likely to die from chronic conditions other than their primary cancer,<sup>7</sup> yet guidelines for treating patients with multiple chronic conditions are limited.<sup>8</sup>

Researchers have increasingly recognized important associations between health status, multiple chronic conditions, and patient experiences with care, particularly among individuals with cancer.<sup>9–11</sup> Care experiences among cancer patients are influenced by a range of factors, including demographic characteristics and health status.<sup>12</sup> National care experience measures, as publicly reported by the Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys, are thus adjusted for factors that have been shown to affect responses.<sup>13–16</sup>

Prior research has found that Medicare CAHPS respondents with cancer who rated their general or mental health status as excellent or very good were more likely than those with worse self-reported health to indicate excellent experiences.<sup>17,18</sup> Although the single-item health status measures used in those studies have been widely used,<sup>19–21</sup> a more comprehensive measure of morbidity may shed additional light on the association between illness burden and care experiences among people with cancer.

In a cross-agency collaboration, the Surveillance, Epidemiology, and End Results (SEER) cancer registry data from the National Cancer Institute have been linked with the Center for Medicare and Medicaid Services (CMS) data from Medicare CAHPS surveys, as well as Medicare claims and enrollment files. The data resource is known as SEER-CAHPS and was launched publicly in 2016.<sup>22</sup> Detailed descriptions of the SEER-CAHPS linkage have been previously reported.<sup>23</sup>

The linked data were previously used to develop and validate a machine learning-derived measure of comorbidity called the SEER-CAHPS Illness Burden Index, or SCIBI.<sup>24,25</sup> The SCIBI score is an omnibus measure that proxies the relative risk of all-cause mortality in the 12 months after CAHPS survey response.<sup>24,25</sup> The version we used for this analysis is the SCIBI-Concurrent Basic score, which incorporates factors including functional status, other conditions, and health services use that is associated with high medical need, serious illness, frailty, and the end of life. SCIBI-CB does not include standard case-mix adjustment variables, including age, education, and proxy response. The score is scaled such that higher values indicate higher relative risks of mortality within 12 months of survey response. SCIBI is based on a combination of self-reported (survey) measures, claims-based measures, administrative data, and cancer registry data from the SEER program.

In the current analysis, our goals were to examine differences in illness burden (SCIBI) scores in a large Medicare population with a documented incidence of cancer, surveyed either before or after their diagnosis, and analyze associations between illness burdens and care experiences, controlling for standard case-mix adjustors used in public reporting. The SCIBI was developed as a tool specifically for this data resource and to enable researchers to better control for illness burden. This study provides an application of the tool and baseline comparative information for a large sample, so that future researchers have a benchmark for their own analyses.

## METHODS

### Study Population

Our Institutional Review Board declared this research exempt [45CFR46.101(b)] from IRB review. For this analysis, we included individuals aged 18 or older who responded to a Medicare CAHPS survey between 2007 and 2013. SEER-CAHPS includes Medicare beneficiaries diagnosed with cancer (including benign tumors) while residing in a SEER region. We stratified by whether survey response was before or after a first cancer diagnosis and whether the beneficiary was enrolled in Medicare Advantage (MA) or fee-for-service (FFS). We excluded a few individuals missing their date of cancer diagnosis (either year or month) and a small number of individuals who had a death date before the survey response date or diagnosis date. The stage variable we used was the *summ2k1* variable, Summary Staging, which uses all the information available in the medical record. According to the SEER documentation, all cases are blank for a number of sites, including many of the head and neck cancers.<sup>26</sup> In addition, nearly 20% of the sample had benign tumors.

## Measures

CAHPS measures included 5 global ratings (Overall Care, Personal Doctor, Specialist, Health Plan/Medicare, Prescription Drug Plan) and 7 composite measures (Doctor Communication, Getting Needed Care, Getting Needed Prescription Drugs, Getting Care Quickly, Care Coordination, Health Plan Customer Service, and PDP Customer Service). All measures were available for all years of the study except for the Care Coordination measure, which was limited to surveys returned in 2012 or 2013. The number of survey respondents analyzed for each measure ranged from 22,282 to 103,286 (see Technical Appendix, Table A-1).

The global ratings are scored from 0 to 10, with 0 being the worst possible and 10 the best possible. Composite measure scores range from 0 to 100 and are calculated based on prior psychometric research that grouped different survey items into logical clusters representing single concepts. The customer service measures encompass getting needed information, being treated with courtesy and respect by customer service staff, and getting information about which services or medicines are covered and how much they cost. Further details about how each measure is defined are available online.<sup>22</sup> Following prior research, the 5 global ratings were linearly rescaled to a possible range of 0–100 for comparability and ease of interpretation.<sup>27</sup>

## Statistical Analysis

Our analysis included both frequentist and Bayesian estimations due to concerns about the applicability of OLS estimation to the data. The inclusion and agreement of both methods reinforces the robustness of the results.

We estimated frequentist ordinary least-squares (OLS) multivariable regression models for each outcome measure, with the exposure being SCIBI z-score (standardized to have an overall population mean of 0 and SD of 1) and controlling for sex, year, survey timing (before or after diagnosis), and Medicare enrollment (MA or FFS). We also adjusted for standard case-mix adjustment variables used in public reporting of MA and PDP CAHPS Survey results: age, education, general health status, mental health status, received help responding or proxy answered questions for respondent, dual (Medicare-Medicaid) enrollment or low-income subsidy, and survey language.

After exploring alternative specifications, we used survey-weighted ordinary least squares (OLS) models to identify significant associations between SCIBI scores and CAHPS measures. Bonferroni corrections were applied to adjust for multiple comparisons; the significance level was set at  $P < .004$ .

We had concerns about whether the data met the usual assumptions of the frequentist OLS models for the outcome measures, which are ordinal (as is common in survey data) and asymmetrically distributed, rather than normally distributed. While the large sample size of the data alleviated those concerns to some degree, we followed up the OLS analysis with a Bayesian analysis that relaxed the distributional assumptions of the frequentist model. Our Bayesian models were implemented using the BAS package for R.<sup>28</sup> The Bayesian models used uniform, noninformative priors for each variable. We used the survey weights from

the frequentist analyses as probability weights for the response covariates in the Bayesian models. Analyses were conducted in R version 3.6.0, SAS v. 9.4 (SAS Institute, Cary, NC) and Stata/MP v. 15.1 (StataCorp LLC, College Station, TX).

## RESULTS

### Descriptive Results

The analytic sample included 116,735 survey respondents with cancer information in our data. About half (49%) were enrolled in FFS at the time of their survey, and 73% were surveyed after diagnosis. Among people surveyed before diagnosis, 6% died within 12 months of their survey response; among those surveyed after diagnosis, 7% died within 12 months. Among people with SCIBI scores in the top percentile (>99<sup>th</sup> percentile) of the distribution, 59% died; in the bottom quartile (<26<sup>th</sup> percentile), about 1% died.

Sociodemographic (Table 1) and clinical (Table 2) characteristics show that the four tabulation groups were dissimilar, with different distributions on most of the characteristics examined. Comparing the tabulation groups on clinical characteristics (Table 2) reveals that the group reporting the highest prevalence of having multiple chronic conditions was FFS enrollees with cancer surveyed pre-diagnosis (nearly 19%). FFS enrollees were more likely than MA enrollees to report poor/fair health (vs. good/very good/excellent), depression, pain that interferes with activities, a physical condition that interferes with independence, and needing help with routine tasks.

### Multivariable Regression Results

In frequentist linear regressions, SCIBI scores were significantly associated with better ratings of Health Plan (coefficient  $\pm$  standard error:  $0.33 \pm 0.08$ ) and better Getting Care Quickly scores ( $0.51 \pm 0.09$ ; Figure 1). Figure 2 provides the point estimates and 95% credible intervals for the Bayesian associations between each measure and *z*-normalized SCIBI score, which strongly supported the conclusions of the frequentist models. In Bayesian models, individuals with higher illness burden had similar results on the same two measures and also reported reliably worse Overall Care experiences (coefficient  $\pm$  posterior SD:  $-0.17 \pm 0.06$ ). The coefficients that were significant in the frequentist analysis had the same sign and a posterior probability of greater than 99% of being non-zero in the Bayesian analysis. The 95% credible intervals around those coefficients were uniformly more compact than the frequentist 95% confidence intervals. As indicated, the Bayesian analyses supports the same conclusions as the frequentist analyses with stronger evidence in the form of more precise interval estimates and without the assumptions of frequentist linear regression.

## DISCUSSION

### Summary of Main Findings

Our omnibus measure of illness burden, the SCIBI score, was associated with 3 out of 12 care experience measures (Health Plan, Getting Care Quickly, and Overall Care). Individuals who had greater morbidity per their SCIBI score—whether before or after a cancer diagnosis—reported better care experiences on Health Plan and Getting Care Quickly measures than

healthier individuals. This was confirmed by both frequentist and Bayesian analyses. The Bayesian model averaging approach also identified a reliable association between greater morbidity and worse Overall Care ratings that was not significant in the frequentist model.

### Comparisons with Prior Studies

This study is novel in its examination of associations between illness burden and outcomes among people with cancer using a comprehensive measure of illness burden that incorporates self-report and medical claims data. It is also consistent with prior studies showing that outcome measures are affected by illness burden. Several prior studies using SEER-CAHPS have found that patients with better general or mental health status were significantly more likely to indicate excellent experience with nearly all measures examined.<sup>10,17,29</sup>

As in the current study, a prior SEER-CAHPS study of dual (Medicare/Medicaid) enrollees found that they gave higher ratings of their Health Plan than non-duals, but lower ratings on Overall Care.<sup>28</sup> Lower cost-sharing responsibilities for duals could be one explanation for that finding. Similarly, it is possible that sicker individuals rate their health plans higher than healthier individuals because they appreciate the benefits they receive once their deductibles are met. Supporting this hypothesis, among those with higher health plan ratings in this study, DME, inpatient care, and SNF utilization rates were higher, and a greater proportion were dual enrollees. Future research is needed to understand how total and out-of-pocket expenditures affect care experiences.

An analysis of Medicare CAHPS responses among people with end-stage renal disease (ESRD) found that those with ESRD reported better experiences than those without on 7 out of 10 measures. Recent research found that Medicare Current Beneficiary Survey respondents with more ADL limitations reported lower ratings of care, although the relationship was not linear.<sup>29</sup> Another study found that measures of care quality (effective acute and chronic treatment) were often worse among cancer survivors with comorbid conditions when compared to noncancer controls with the same conditions, although results varied among types of cancer.<sup>30</sup> Prior research using Home Health CAHPS data also supports the idea that there may be a need to adjust for morbidity when examining patient experiences of care.<sup>31</sup> The current publicly reported Medicare CAHPS measures are adjusted for both GHS and MHS.

We did not examine the associations between strictly claims-based comorbidity indices and care experience measures in this paper, since about half of our sample was enrolled in MA and thus had no claims data. However, previous analyses using a FFS subgroup of older Medicare beneficiaries ( $n = 9,305$ ) surveyed up to 5 years after a cancer diagnosis found associations between care experiences and the NCI Combined Index, comorbidity count, and a study-specific measure of burden.<sup>32</sup> Specifically, the Kent et al. analysis reported that individuals with higher morbidity burden rated their Personal Doctor, Specialist Physician, and Doctor's Communication higher, while rating Getting Care Quickly lower; however, results varied depending on how morbidity was defined.

## Caveats and Limitations

Limitations of this analysis are important to take into consideration when interpreting our findings. Our sample included FFS and MA Medicare beneficiaries of all ages, but only in areas covered by the SEER cancer registry program (which includes roughly 30% of the US population). Of note, between 42–61% of the sample (depending on the survey year and Medicare program enrollment) resided in the West Census region. In addition, the Medicare CAHPS surveys have relatively low (and declining) response rates.<sup>33</sup> Nonetheless, response rates are a poor proxy for nonresponse bias.<sup>34,35</sup> As a further protection against nonresponse bias, all analyses used person-level poststratification weights that account for sample design and nonresponse.

While much prior research supports the validity of CAHPS items, the Medicare CAHPS survey is a general population survey that asks patients to think about their most frequently seen physicians. Results using SEER data linked with CAHPS data targeted at the population examined here, such as the CAHPS Cancer Care Survey, might find different results. Finally, while the SCIBI incorporates information on multiple measures of health (including mental health), many unmeasured factors may also influence care experiences, such as a particular patient's expectations around care quality.<sup>28</sup>

## Implications for Policy and Practice

The results of our study point to the need to improve care experiences overall, particularly for cancer survivors with compromised health status. Patients with worse health status and other chronic conditions may not only suffer from their diseases but may also experience the burden of having to manage treatment and follow-up related care in concert with managing their health conditions. It is encouraging that patients report better scores on Getting Care Quickly when they have higher illness burdens. Many patients see several medical specialists and often must coordinate their own care, which may consist of multiple treatment regimens. Cancer patients with poorer health status also may have higher utilization rates than those without other chronic conditions.<sup>36</sup> Given the complexity of cancer care, it is critical to understand and address an individual's total illness burden and its effect on care.

Over the past decade, many new health policies have been enacted in the US, such as Medicaid expansion and the many other provisions of the Affordable Care Act. In addition, the Oncology Care Model (OCM), launched in 2016, has aimed to reform oncology care by bundling reimbursement based on chemotherapy episodes. Our study sample extends through 2013; however, we have no reason to believe that the study's findings would be any different if we used more contemporary data. Most of the policy changes affect those who were previously uninsured, as opposed to those covered by Medicare. The OCM only directly affects those Medicare beneficiaries diagnosed with cancers who are treated with chemotherapy at a participating practice (as of July 2021, there were 126 participating practices),<sup>30</sup> although it is possible that there have been (or will be) spill-over effects in the larger cancer population. Future research is needed to understand how the OCM may influence care experiences in future, especially around care coordination and access to care.

Existing measures of morbidity adjustment are inadequate or unavailable for over half the SEER-CAHPS population. Single-item measures of health status are separately accounted for in case-mix analysis, but may not fully capture an individual's illness burden. Data on self-reported comorbidities and physical function are complex and cumbersome to include in multivariable modeling, especially because they are often colinear. This paper demonstrates the utility of the SCIBI scores as a method for controlling for illness burden and provides benchmark data on their associations with care experiences in a large sample.

## Conclusions

In conclusion, our findings suggest associations between illness burden and a few care experience measures. Our findings highlight the need for additional investigation, since cancer patients with greater morbidity often need more tailored and coordinated care. Future research should examine the use of the SCIBI in longitudinal and interventional studies to support symptom management and improved care quality for cancer patients.

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## TECHNICAL APPENDIX

**Table A-1.**

Availability of outcome measures by year and tabulation group and number of beneficiaries included in each regression model

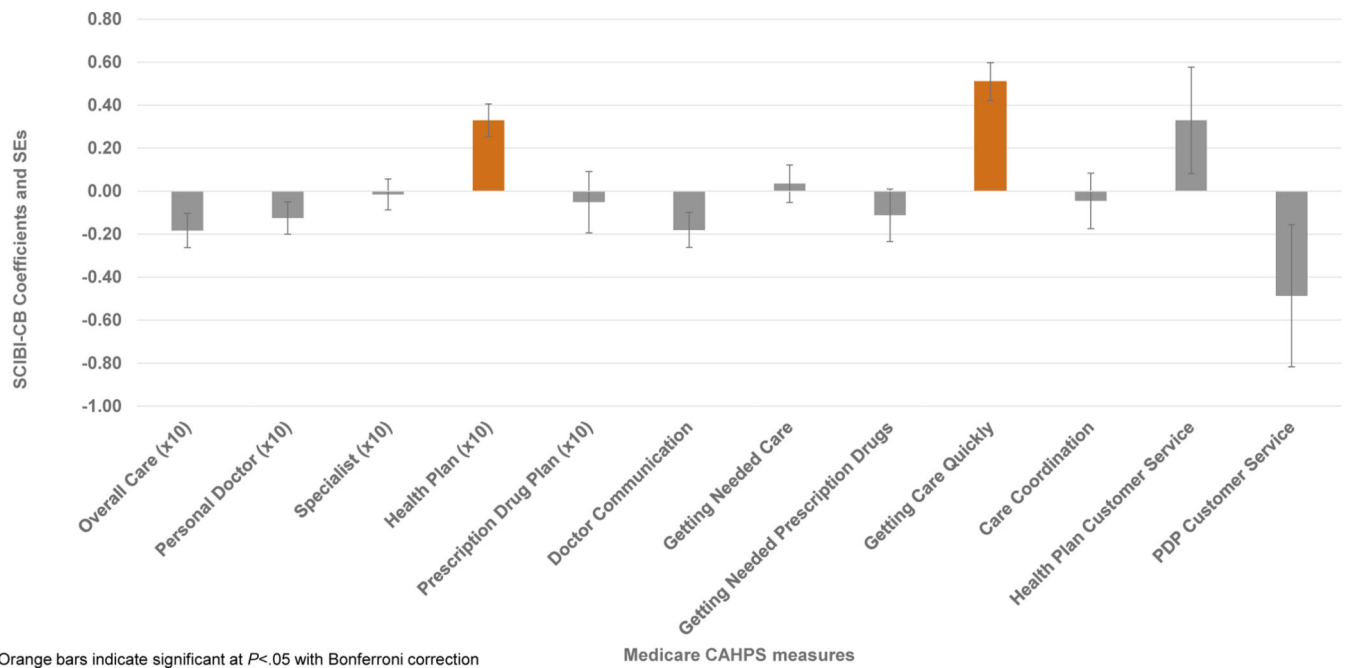
Measure	Model N	Years available
<b>Global ratings</b>		
Overall Rating of Care	95,470	All
Personal Doctor	86,765	All
Specialist	65,584	All
Health Plan	103,286	All
Prescription Drug Plan	74,846	All
<b>Composite scores</b>		
Getting Needed Care	83,339	All
Getting Care Quickly	98,281	All
Getting Needed Prescription Drug	73,229	All
Care Coordination	22,282	2012–2013
Doctor Communication	87,474	All
Health Plan Customer Service	29,920	All
PDP Customer Service	22,425	All



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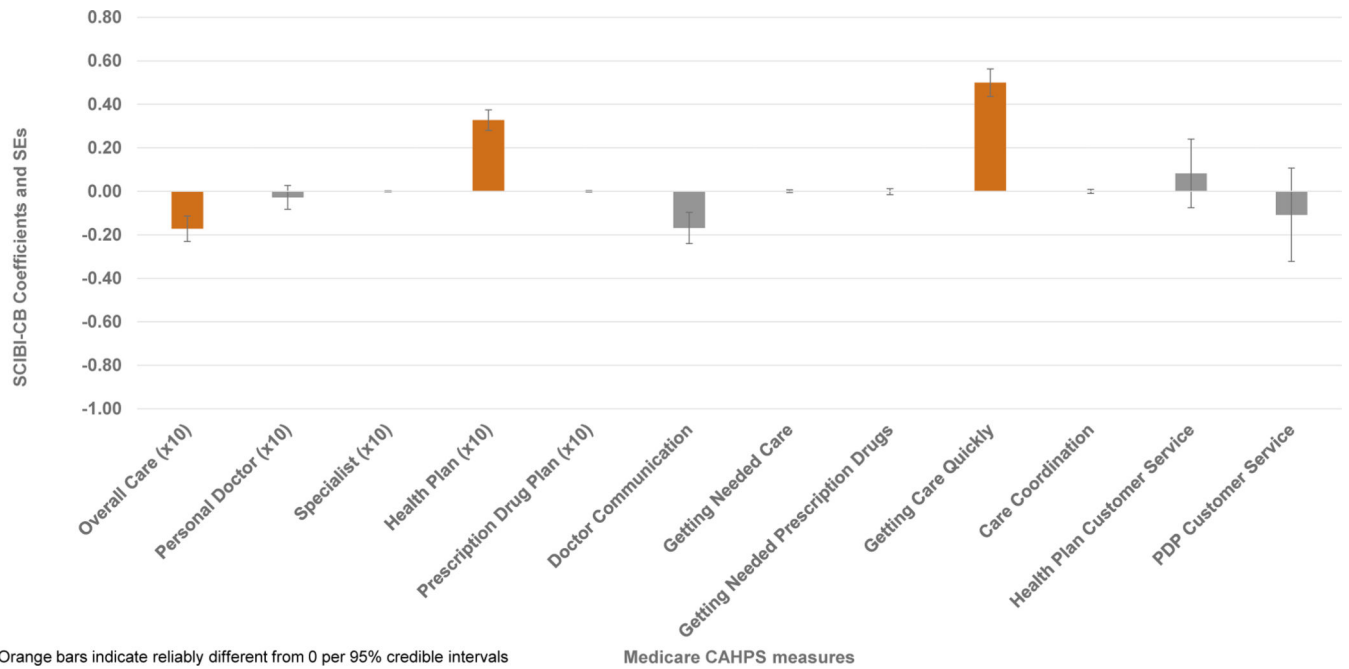
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**Figure 1. Coefficients and standard errors from frequentist linear regressions estimating associations between SCIBI z-scores and care experience measures**

Source: Authors’ analysis of SEER-CAHPS, 2007–2013. Orange bars represent significant associations at  $P < .004$ . Regressions adjusted for sex, year, survey timing (before or after diagnosis), Medicare enrollment (MA or FFS), age, education, general health status, mental health status, received help responding or proxy answered questions for respondent, dual (Medicare-Medicaid) enrollment or low-income subsidy, and survey language.



**Figure 2. Associations between SCIBI z-scores and care experience measures from survey-weighted Bayesian Model Averaging**

Source: Authors’ analysis of SEER-CAHPS, 2007–2013. Orange bars represent estimates that were reliably different from 0 according to Bayesian Model Averaging-based regressions adjusted for sex, year, survey timing (before or after diagnosis), Medicare enrollment (MA or FFS), age, education, general health status, mental health status, received help responding or proxy answered questions for respondent, dual (Medicare-Medicaid) enrollment or low-income subsidy, and survey language.

**Table 1.**

Sociodemographic characteristics of individuals with cancer in the SEER-CAHPS Illness Burden Index sample

	Group 1		Group 2		Group 3		Group 4	
	Surveyed pre-diagnosis				Surveyed post-diagnosis			
	MA, %* (Unweighted n=16,222)	FFS, %* (Unweighted n=15,647)	MA, %* (Unweighted n=42,834)	FFS, %* (Unweighted n=42,032)	MA, %* (Unweighted n=42,834)	FFS, %* (Unweighted n=42,032)	MA, %* (Unweighted n=42,834)	FFS, %* (Unweighted n=42,032)
Age in yrs on survey date								
18–64	6.1	8.8	5.8	6.6				
65–69	22.4	23.8	18.8	19.7				
70–74	24.8	22.7	22.5	22.1				
75–79	21.4	19.5	21.1	20.1				
80–84	15.2	15.0	17.3	17.1				
85 or older	10.1	10.2	14.4	14.4				
Female	50.8	51.5	51.0	51.1				
Race/ethnicity								
White, non-Hispanic	79.0	84.3	78.8	86.2				
Black, non-Hispanic	11.5	8.9	10.2	6.7				
Hispanic, any race	2.3	1.8	2.2	1.3				
Asian, non-Hispanic	3.8	2.5	4.5	2.5				
Other/unknown	3.4	2.5	4.4	3.2				
Married	52.5	52.3	66.9	69.1				
Lives alone	31.1	30.8	30.3	29.3				
Continuously enrolled	98.7	93.1	98.9	93.6				
Dual (Medicare + Medicaid)	15.9	14.8	12.7	10.0				
Neighborhood poverty level								
<5%	19.4	20.9	23.6	27.0				
5 to <10%	27.1	25.8	24.7	24.4				
10 to <20%	30.4	29.6	22.9	22.1				
20%+	22.0	21.7	14.0	12.6				
Missing	1.1	2.0	14.8	13.8				
Educational attainment								
Less than 12 years	21.1	20.3	17.6	14.4				
12 to 15 years	51.9	50.9	52.4	51.5				
16 or more years	17.3	21.0	21.8	27.1				
Missing	9.6	7.8	8.1	7.0				
Urban/rural residence								
Metropolitan	95.6	86.7	95.9	88.9				
Non-metropolitan, non-rural	3.5	10.6	3.2	8.8				
Rural	0.7	2.6	0.7	2.1				
Census region								
Northeast	12.8	18.6	11.9	18.1				

	Group 1		Group 2		Group 3		Group 4	
	Surveyed pre-diagnosis		Surveyed post-diagnosis		Surveyed pre-diagnosis		Surveyed post-diagnosis	
	MA, %* (Unweighted n=16,222)	FFS, %* (Unweighted n=15,647)	MA, %* (Unweighted n=15,647)	FFS, %* (Unweighted n=15,647)	MA, %* (Unweighted n=42,834)	FFS, %* (Unweighted n=42,834)	MA, %* (Unweighted n=42,032)	FFS, %* (Unweighted n=42,032)
Midwest	7.0	11.6	10.4	14.8				
South	21.1	27.9	16.5	19.1				
West	59.0	41.9	61.2	47.9				

Source: Authors' analysis of SEER-CAHPS, 2007–2013. FFS: fee-for-service; MA: Medicare Advantage.

\* Unweighted percentages shown.

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**Table 2.**

Clinical characteristics of individuals with cancer in the SEER-CAHPS Illness Burden Index sample

	Group 1	Group 2	Group 3	Group 4
	Surveyed pre-diagnosis		Surveyed post-diagnosis	
	MA (Unweighted n=16,222)	FFS (Unweighted n=15,647)	MA (Unweighted n=42,834)	FFS (Unweighted n=42,032)
<b>Point estimates</b>				
SCIBI z-score - mean	-0.19	-0.23	0.07	0.13
Median	-0.28	-0.47	-0.13	-0.42
Range	-0.50 to 4.00	-0.50 to 6.00	-0.50 to 8.12	-0.50 to 13.32
SF-12 Physical Component (v12) - mean	41.3	38.3	39.2	37.1
SF-12 Mental Component (v12) - mean	54.4	52.5	53.5	52.6
Comorbidity count - mean	0.85	0.89	1.4	1.5
<b>Percentages</b>				
Poor/fair general health status	25.7	31.7	29.9	33.7
Poor/fair mental health status	9.3	11.9	11.1	11.4
Depression (PHQ-2 ≥ 3)	29.7	36.1	32.7	37.7
Proxy respondent or assistance	12.0	13.6	13.3	13.5
Has had a condition/problem lasting 3+ months	91.3	92.8	92.0	93.7
Current smoker	14.8	15.5	8.6	8.6
Physical condition interferes with independence	18.8	23.8	22.5	27.1
Need help with personal care	6.8	9.2	9.5	11.3
Need assistance with routine tasks	16.9	22.1	20.9	25.7
<b>Activity limitations</b>				
Bathing	11.5	14.2	13.4	14.9
Dressing	8.9	11.4	11.0	12.0
Eating	4.8	5.4	5.9	6.2
Getting in/out of chairs	18.0	21.0	19.0	21.4
Walking	27.8	32.6	29.5	31.7
Using the toilet	7.0	8.2	8.4	9.0
Climbing stairs	52.3	62.8	56.8	65.6
Moderate activities	47.8	59.1	52.6	61.8
Social activities	7.2	11.2	9.3	11.5
Pain interferes	18.2	25.2	19.2	25.8
Has a lot of energy a little/none of the time	18.8	25.4	24.5	29.0
<b>Specific conditions reported</b>				
Heart attack or angina	23.9	28.0	25.0	27.7
Stroke	9.6	9.6	10.6	10.3
COPD	20.0	21.3	19.6	20.0
Diabetes	32.4	31.4	34.0	30.4

	Group 1	Group 2	Group 3	Group 4
	Surveyed pre-diagnosis		Surveyed post-diagnosis	
	MA (Unweighted n=16,222)	FFS (Unweighted n=15,647)	MA (Unweighted n=42,834)	FFS (Unweighted n=42,032)
Cancer	7.8	9.6	70.9	73.9
2+ self-reported chronic conditions	17.6	18.9	15.7	15.5
<b>Cancer-specific clinical characteristics</b>	<b>Not used</b>			
Stage at diagnosis				
In situ			8.9	9.8
Local			44.0	43.9
Regional			12.8	12.6
Distant			4.4	4.8
N/A, unknown, or unstaged			1.7	2.0
Missing			28.3	27.0
Cancer site				
Bladder			4.6	5.0
Breast			23.0	22.4
Colorectal			4.5	4.5
Lung			3.9	4.2
Prostate			24.5	23.4
Renal			2.3	2.4
Skin (melanoma)			6.9	7.8
Other			30.2	30.4
Primary/first cancer is malignant *			83.5	82.4

Source: Authors' analysis of SEER-CAHPS, 2007–2013. Unweighted percentages of non-missing responses shown. FFS: fee-for-service; MA: Medicare Advantage; N/A: not applicable; PHQ-2: Patient Health Questionnaire-2 question version; SF-12: the Medical Outcomes Study Short Form - 12 question version.

\* People with benign tumors were included in sample.