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ORIGINAL REPORT

Cancer-Specific Outcomes Among Young Adults Without Health Insurance

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ABSTRACT

Purpose
The Patient Protection and Affordable Care Act (ACA) will likely improve insurance coverage for most young adults, but subsets of young adults in the United States will face significant premium increases in the individual market. We examined the association between insurance status and cancer-specific outcomes among young adults.

Methods
We used the SEER program to identify 39,447 patients age 20 to 40 years diagnosed with a malignant neoplasm between 2007 and 2009. The association between insurance status and stage at presentation, employment of definitive therapy, and all-cause mortality was assessed using multivariable logistic or Cox regression, as appropriate.

Results
Patients who were uninsured were more likely to be younger, male, nonwhite, and unmarried than patients who were insured and were also more likely to be from regions of lower income, education, and population density ($P < .001$ in all cases). After adjustment for pertinent confounding variables, an association between insurance coverage and decreased likelihood of presentation with metastatic disease (odds ratio [OR], 0.84; 95% CI, 0.75 to 0.94; $P = .003$), increased receipt of definitive treatment (OR, 1.95; 95% CI, 1.52 to 2.50; $P < .001$), and decreased death resulting from any cause (hazard ratio, 0.77; 95% CI, 0.65 to 0.91; $P = .002$) was noted.

Conclusion
The improved coverage fostered by the ACA may translate into better outcomes among most young adults with cancer. Extra consideration will need to be given to ensure that patients who will face premium increases in the individual market can obtain insurance coverage under the ACA.

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INTRODUCTION

The Patient Protection and Affordable Care Act (ACA) expands insurance coverage to many previously uninsured patients.[1] If rates of insurance coverage among young adults in the United States follow the pattern seen in Massachusetts before and after implementation of near-universal coverage in 2006, coverage for young adults would be expected to rise overall.[2] However, unhealthy older patients will be able to join the risk pool, given community rating and guaranteed issue, thereby increasing premiums for young healthy patients, particularly those in the individual market. It has been projected that by 2014, the ACA will result in health insurance premium increases for patients age < 40 years, particularly young men, for whom premiums are estimated to rise by 18% to 97%.[3-5] Consequently, select healthy young adults in the individual market may forego buying health care coverage at a higher cost, particularly in regions where premiums are expected to increase significantly,[5] and instead pay the penalty associated with the individual mandate.[6,7] Because the ACA is likely to significantly affect rates of uninsurance among young adults, we sought to study the effect of insurance status on cancer-specific outcomes in adults age 20 to 40 years.

METHODS

Patient Population and Study Design

We used the SEER program[8] to identify 56,583 patients age 20 to 40 years with no preceding malignancies who were diagnosed with a malignant neoplasm between 2007 and 2009. Sponsored by the National Cancer Institute, the SEER program collects and publishes cancer incidence, treatment, and survival data from population-based cancer registries; the program captures approximately 97% of incident cancers, and the tumor registries cover approximately 26% to 28% of the US population.[8] Patients who had a primary malignancy that was either leukemia or a malignancy originating in the brain, eye, spinal cord, or neuroendocrine system (n = 5,606), and patients whose demographic or insurance-related information was not available (n = 11,530) were excluded, leaving 39,447 patients in the cohort.

Statistical Analysis

The predictor of interest for this study was insurance status. Insurance status was treated as binary based on the presence or absence of insurance coverage. The insured classification included "any Medicaid," "insured," and "insured/no specifics." We felt that a dichotomous representation was the most optimal way to characterize the insurance covariate, because we suspected that the differences in outcome between patients who had insurance versus not were greater than the variation in outcome by specific insurance policies. In addition, SEER does not provide details regarding the specific type of insurance that patients possess. Baseline patient characteristics of those who had insurance coverage versus not were compared with the *t* test, Wilcoxon rank sum test, or χ^2 test, as appropriate. Univariable and multivariable logistic regression models were used to determine the unadjusted and adjusted associations between insurance status on presentation with metastatic versus localized disease. The multivariable model for this end point included the demographics of age, sex, race, residence type (urban *v* rural), education, and median household income, as well as the primary malignancy. Race was classified as white, African American, Hispanic American, Asian American, or other, as determined by SEER.[8] Residence type, education level (ie, percentage of adults age ≥ 25 years with high school education), and median household income were determined at the county level by linkage to the 2003 US Department of Agriculture rural-urban continuum codes,[9] 2000 US Census,[10] and 2004 small-area income and poverty estimates from the US Census, respectively.[11] After restricting the cohort to patients without distant metastases, univariable and multivariable logistic regression models were performed to assess the association between insurance status on receipt of definitive therapy (surgery and/or radiation therapy). Patients with lymphoma were excluded from this analysis, given the primary role of chemotherapy in the management of many lymphomas. The multivariable model included primary malignancy and the same demographic variables as described above, as well as stage at presentation, as assessed using the American Joint Committee on Cancer staging system (sixth edition).[12] Cox proportional hazards multivariable regression was employed to characterize the association between insurance status and all-cause mortality, after adjusting for demographic factors, primary malignancy, stage at presentation, and receipt of definitive therapy versus not. Patients with lymphoma were again excluded from this analysis. Regression models employed in this study included covariates that were either confounders or those that prior literature had established to be predictors of the outcome of interest (details provided in Appendix, online only).

An interaction model was performed to determine if the association between insurance status and each outcome measure evaluated in this study differed between men and women. The interaction between sex and insurance was prespecified, given that young men may be more affected by increases in insurance premiums under the ACA than young women.[4] Other interactions were not pursued. To ensure the robustness of the multivariable models presented in this study, propensity scores for the presence of insurance coverage versus not were derived from logistic regression models incorporating each of the same covariates adjusted for in the multivariable models. Propensity scores were then used as continuous covariates in the logistic or Cox proportional hazards model (along with any residual confounders, defined as covariates that changed odds ratio [OR] or hazard ratio [HR] of insurance covariate by ≥ 10%) to assess the association between insurance status and the end points of presentation with metastatic versus localized disease, receipt of definitive treatment versus not, and all-cause mortality.

We performed sensitivity analyses to examine the impact of missing data on our results. The median follow-up in surviving patients was 2.3 years. All *P* values are two sided. The Bonferroni correction was used to account for multiple testing (n = 3). The threshold of .0167 was therefore used to determine significance. Automated selection was not employed during model building. Statistical analyses were performed using SAS software (version 9.3; SAS Institute, Cary, NC) by authors M.-H.C. and A.A.A. This study was approved by the institutional review board at our institution; a waiver for informed consent was obtained.

RESULTS

Patient Characteristics

Among the entire cohort, 36,869 (93%) of 39,447 patients were insured, and 2,578 (7%) of 39,447 were not. Patient characteristics are listed in Table 1. Patients who were uninsured were more likely to be younger, male, nonwhite, and unmarried than patients who were insured and were also more likely to be from regions where the median household income, education level, and population density were lower ($P < .001$ in all cases).

Table 1. Baseline Demographic Characteristics of Patients With and Without Insurance

	Uninsured (n = 2,578)*		Insured (n = 36,869)*		
Variable	No.	%	No.	%	*P*
Age, years					< .001
Median	33		35		
IQR	27-37		29-38		
High school education, %†					< .001
Median	79		82		
IQR	70-84		74-85		
Annual household income, US$†					< .001
Mean	46,000		49,000		
SD	10,000		11,000		
Sex					< .001
Male	1,286	50	12,164	33	
Female	1,292	50	24,705	67	
Race					< .001
White	1,153	45	22,864	62	
African American	364	14	3,575	10	
Hispanic American	929	36	6,825	19	
Asian American	115	4	3,284	9	
Other	17	1	321	1	
Marital status					< .001
Unmarried	1,734	67	15,996	43	
Married	844	33	20,873	57	
Residence†					< .001
Rural	349	14	3,208	9	
Urban	2,229	86	33,661	91	
Disease site					< .001
Breast	252	10	7,677	21	
Connective tissue	59	2	810	2	
Female genital	393	15	4,103	11	
GI	327	13	3,240	9	
Head and neck	99	4	1,050	3	
Lymphoma	450	17	4,525	12	
Male genital	438	17	3,352	9	
Skin	151	6	3,180	9	
Thoracic	68	3	630	2	
Thyroid	256	10	6,897	19	
Urinary	85	3	1,405	4	

Abbreviations: IQR, interquartile range; SD, standard deviation.
*Percentages may not sum to 100 because of rounding.
†County-level estimates.

Table 2. Univariable and Multivariable Logistic Regression Models for Presentation With Metastatic Disease

Variable	Univariable			Multivariable*		
	OR	95% CI	*P*	OR	95% CI	*P*
Age at diagnosis (per year increase)	0.99	0.98 to 0.99	< .001	1.00	0.99 to 1.00	.27
Median household income (per US$10,000 annual increase)	0.93	0.91 to 0.96	< .001	0.99	0.94 to 1.03	.51
High school education (per 10% increase)	0.88	0.85 to 0.92	< .001	0.92	0.87 to 0.98	.009
Sex						
Male	Ref		—	Ref		—
Female	0.42	0.40 to 0.45	< .001	0.79	0.72 to 0.86	< .001
Race						
White	Ref		—	Ref		—
African American	1.91	1.74 to 2.10	< .001	1.41	1.27 to 1.56	< .001
Hispanic American	1.47	1.37 to 1.59	< .001	1.30	1.19 to 1.42	< .001
Asian American	1.30	1.17 to 1.45	< .001	1.19	1.05 to 1.34	.007
Other	1.01	0.71 to 1.45	.95	1.10	0.75 to 1.61	.64
Marital status						
Unmarried	Ref		—	Ref		—
Married	0.66	0.62 to 0.70	< .001	0.80	0.75 to 0.86	< .001
Population density						
Rural	Ref		—	Ref		—
Metropolitan	1.07	0.96 to 1.19	.22	1.10	0.97 to 1.26	.15
Insurance status						
Uninsured	Ref		—	Ref		—
Insured	0.56	0.50 to 0.62	< .001	0.84	0.75 to 0.94	.003

Abbreviation: OR, odds ratio; Ref, referent.
*Adjusted for primary site as well.

Association Between Insurance Status and Cancer-Specific Outcomes

Among the insured and uninsured populations, 11.3% and 18.5% of patients presented with metastatic disease, respectively. On univariable logistic regression, the presence of insurance was associated with decreased likelihood of metastatic disease at initial presentation (OR, 0.56; 95% CI, 0.50 to 0.62; $P < .001$; Table 2). After adjustment for age, median household income, education status, race, marital status, population density, and site of primary malignancy, the association between insured status and presentation with nonmetastatic disease remained significant (OR, 0.84; 95% CI, 0.75 to 0.94; $P =$ .003). The propensity score approach yielded a similar adjusted association (OR, 0.84; 95% CI, 0.75 to 0.93; $P = .001$) An interaction model revealed no significant difference with regard to the association of insurance status and stage at presentation among men versus women (interaction $P = .32$).

The presence of insurance was associated with an increased likelihood of receipt of definitive therapy on univariable logistic regression (OR, 2.68; 95% CI, 2.13 to 3.39; $P < .001$; Table 3). This association remained significant after adjustment for demographic factors, primary malignancy, and cancer stage (OR, 1.95; 95% CI, 1.52 to 2.50; $P < .001$); a similar estimate was obtained using the propensity score approach (OR, 1.96; 95% CI, 1.53 to 2.50; $P < .001$). On univariable Cox regression, the presence of insurance was associated with decreased all-cause mortality (HR, 0.43; 95% CI, 0.37 to 0.51; $P <$ .001; Table 4). After adjustment for demographic factors, cancer stage, and receipt of definitive treatment versus not, the presence of insurance was associated with lower estimates of all-cause mortality (HR, 0.77; 95% CI, 0.65 to 0.91; $P = .002$). The adjusted propensity score model yielded a similar estimate (HR, 0.70; 95% CI, 0.60 to 0.83; $P <$ .001). No significant differences were noted when the effect of insurance status on men versus women was analyzed for the outcome of all-cause mortality (interaction $P = .91$), although the association between insurance status and definitive treatment was significantly stronger in women than men (interaction $P = .02$). As a sensitivity analysis, we retained patients with missing data and found that the univariable and multivariable ORs and HRs for the insurance covariate remained largely unchanged. Among all three outcome measures, no multivariable OR or HR changed by more than 5% after patients with missing data for other covariates were retained.

DISCUSSION

In this study, we found that young adults who are uninsured may be more likely to present with metastatic disease, be undertreated, and die after a diagnosis of cancer relative to those who are insured. These associations remained significant on both univariable and multivariable analyses, for all outcome measures evaluated, suggesting that insurance status may be an independent predictor of outcome among patients with cancer. Although the ACA will likely expand insurance coverage among young adults in the United States,[2] select younger individuals in the individual market may face prohibitively high premium increases. Premiums for young men age 21 to 29 and 30 to 39 years, for example, are expected to increase by 56% and 49%, respectively,[4] increasing the likelihood that such patients will opt out of insurance coverage and experience a poor outcome after a cancer diagnosis.

The effect of insurance status on health care outcomes has been examined in a multitude of health conditions. In liver transplant recipients, lack of insurance has been associated with higher estimates of all-cause mortality.[13] Similarly, uninsured patients with chronic

Table 3. Univariable and Multivariable Logistic Regression Models for Receipt of Definitive Treatment

Variable	Univariable			Multivariable*		
	OR	95% CI	P	OR	95% CI	P
Age at diagnosis (per year increase)	0.99	0.97 to 1.00	.06	1.01	1.00 to 1.03	.17
Median household income (per US$10,000 annual increase)	1.18	1.09 to 1.27	< .001	1.06	0.94 to 1.19	.35
High school education (per 10% increase)	1.27	1.15 to 1.40	< .001	1.12	0.97 to 1.30	.12
Sex						
Male	Ref		—	Ref		—
Female	1.14	0.96 to 1.35	.13	1.24	0.98 to 1.57	.07
Race						
White	Ref		—	Ref		—
African American	0.28	0.22 to 0.34	< .001	0.40	0.32 to 0.51	< .001
Hispanic American	0.55	0.45 to 0.67	< .001	0.68	0.55 to 0.85	< .001
Asian American	0.48	0.37 to 0.62	< .001	0.58	0.45 to 0.76	< .001
Other	2.03	0.50 to 8.20	.32	2.07	0.51 to 8.40	.31
Marital status						
Unmarried	Ref		—	Ref		—
Married	1.39	1.19 to 1.62	< .001	1.11	0.94 to 1.32	.21
Population density						
Rural	Ref		—	Ref		—
Metropolitan	0.97	0.74 to 1.27	.82	0.84	0.61 to 1.15	.27
Cancer stage						
I	Ref		—	Ref		—
II	0.52	0.43 to 0.63	< .001	0.85	0.68 to 1.06	.14
III	0.32	0.27 to 0.39	< .001	0.78	0.63 to 0.97	.02
Insurance status						
Uninsured	Ref		—	Ref		—
Insured	2.68	2.13 to 3.39	< .001	1.95	1.52 to 2.50	< .001

Abbreviation: OR, odds ratio; Ref, referent.
*Adjusted for primary site as well.

kidney disease may have a significantly increased risk of death and progression to end-stage renal disease relative to insured patients.[14] With respect to cancer-related care, it has been shown that the uninsured have significantly lower rates of cervical, breast, and colorectal cancer screening.[15] Ayanian et al[16] examined the effect of insurance status on outcomes in patients with breast cancer and found that the adjusted risk of death was 49% higher in uninsured patients than privately insured patients. Wu et al[17] examined population-based state cancer registries containing patients with locoregional breast cancer and found that lack of insurance was a predictor of use of nonguideline regimens among chemotherapy recipients. Other investigators have linked uninsured status with poor outcomes among a number of cancer-related conditions, such as invasive cervical cancer[18] and spinal metastases.[19]

Little has been published with respect to cancer-related outcomes in young adults. Kirchhoff et al[20] examined health care outcomes in patients who were diagnosed with cancer between the ages of 15 and 34 years. The authors found that relative to healthy controls, survivors of cancer were more likely to forgo health care. A total of 22% of cancer survivors did not have a medical provider, and 40% reported no routine medical visits within the prior year. On the basis of these findings, the authors concluded that the ACA would benefit this subset of patients, given that the law enables young adults to remain on their parents' health plan until age 26 years and provides insurance plans for those with pre-existing conditions.[20]

The passage and imminent implementation of the ACA is particularly relevant to the findings highlighted in our study. In 2006, Massachusetts enacted a health care reform bill that provided nearly universal access to its residents via expanded coverage through Medicaid and exchanges with community rating, guaranteed issue, and an individual mandate. Among patients age 19 to 26 and 27 to 33 years, uninsurance rates decreased by absolute percentages of 12.9% and 6.7%, respectively; unfortunately, a stratified analysis by sex was not available.[2] It is difficult to decipher the percentage of the currently uninsured population of Massachusetts that was previously insured in the individual market before reform, although there is evidence that young men were more likely to remain uninsured after reform.[21] In addition, data from 2011 to 2012 indicate that 57% of the uninsured population in Massachusetts are male, representing the fifth highest percentage in the United States.[22] However, the extent to which the uninsurance rates after the ACA will mirror uninsurance rates after reform in Massachusetts remains somewhat unclear. Of note, some reports suggest that premiums in the individual market are higher in Massachusetts than any other state, although how much of this was caused by recent health care reform efforts is debatable.[23] Moreover, the penalty for uninsurance was significantly higher during year 1 of reform in Massachusetts than it will be under the ACA. It is also possible that absolute uninsurance rates among young adults nationally will be affected even more profoundly after full implementation of the ACA, given greater baseline rates of uninsurance nationally than in Massachusetts before reform.[2,24]

There are many plausible explanations for why the ACA may result in increased coverage for young adults, including Medicaid

Table 4. Univariable and Multivariable Cox Regression Models for All-Cause Mortality

Variable	Univariable			Multivariable*		
	HR	95% CI	P	HR	95% CI	P
Age at diagnosis (per year increase)	1.03	1.02 to 1.04	< .001	1.01	1.00 to 1.02	.06
Median household income (per US$10,000 annual increase)	0.83	0.79 to 0.87	< .001	0.95	0.88 to 1.02	.12
High school education (per 10% increase)	0.82	0.77 to 0.88	< .001	0.96	0.87 to 1.05	.33
Sex						
Male	Ref		—	Ref		—
Female	0.70	0.63 to 0.78	< .001	0.72	0.63 to 0.83	< .001
Race						
White	Ref		—	Ref		—
African American	3.05	2.68 to 3.48	< .001	1.72	1.50 to 1.98	< .001
Hispanic American	1.35	1.18 to 1.54	< .001	1.08	0.94 to 1.25	.30
Asian American	1.31	1.09 to 1.57	.005	1.00	0.82 to 1.20	.96
Other	1.67	1.05 to 2.66	.03	1.84	1.15 to 2.94	.01
Marital status						
Unmarried	Ref		—	Ref		—
Married	0.64	0.58 to 0.70	< .001	0.76	0.68 to 0.84	< .001
Population density						
Rural	Ref		—	Ref		—
Metropolitan	0.79	0.67 to 0.92	.003	0.95	0.79 to 1.14	.57
Cancer stage						
I	Ref		—	Ref		—
II	4.49	3.84 to 5.25	< .001	3.37	2.85 to 3.99	< .001
III	15.57	13.59 to 17.84	< .001	7.97	6.87 to 9.24	< .001
Treatment received						
No	Ref		—	Ref		—
Yes	0.11	0.09 to 0.13	< .001	0.21	0.18 to 0.25	< .001
Insurance status						
Uninsured	Ref		—	Ref		—
Insured	0.43	0.37 to 0.51	< .001	0.77	0.65 to 0.91	.002

Abbreviation: HR, hazard ratio; Ref, referent.
*Adjusted for primary site as well.

expansion, subsidies for patients earning < 400% of the federal poverty level, community rating, guaranteed issue, an individual mandate, and the stipulation that young adults can remain on their parents' policies until age 26 years.[4,6,25] In addition, the premium increases for young and healthy patients may be limited to the individual market, which covers a relatively small percentage of the population between ages 19 and 29 years.[26] Ultimately, it is likely that coverage for young adults will improve under the ACA.[2] However, subsets of young patients will likely be disproportionally disadvantaged financially by the ACA, and increased premiums may cause subsets of patients, particularly young healthy men earning between 250% and 500% of the federal poverty limit, where subsidies do not cover the full premium but the consumer has limited financial resources, to forego insurance coverage.[6]

The US Department of Health and Human Services recently released information relating to the post-ACA cost of premiums in the 36 states in which the department will support or fully run the health insurance marketplace in 2014.[27] One analysis of these data revealed that unsubsidized premiums for the cheapest plan available to a man 27 years of age will be, on average, 97% more expensive than the cost of a pre-ACA plan. In other words, the average 27-year-old man would see his yearly premium increase from $1,723 to $3,394.[28] In addition, this difference in pre- versus post-ACA premium cost is expected to vary widely by state, with premiums in some states increasing by as much as 279%.[5] This suggests that extra consideration will need to be given to ensure that at-risk patients can obtain insurance coverage under the ACA.

Our study should be considered in the context of its potential limitations. First, the specific insurance plans obtained by patients and details relating to coverage provided are not available in SEER. Second, follow-up for our study was relatively short. Insurance status is not available in SEER for patients diagnosed with cancer before 2007, and follow-up information is not available beyond 2010. However, despite the short follow-up, two of our outcome measures were not dependent on follow-up period, and the outcome of all-cause mortality achieved significance despite the short follow-up. Third, we treated the insurance covariate as binary. Insurance policies vary with regard to coverage, coinsurance, and copayment, and therefore, treating the insurance variable as binary might oversimplify the relationship between insurance status and the outcomes evaluated in this study. Fourth, the covariates of income and educational status were at the county, not the individual, level. Fifth, we used a complete case analysis to account for missing data. Such an approach may have affected the power and generalizability of our study and may also have introduced bias. However, given our large sample size, the loss of power was not of significant concern. In addition, a sensitivity analysis revealed that the impact of missing data was likely minimal. Sixth, although we are able to conclude that there was an association between insurance status and receipt of definitive treatment, there may be certain cancers where this relationship is not present. Lastly, it is possible that a confounding variable, and not insurance status, was responsible for the associations identified in this study. We tried to account for this possibility via a comprehensive multivariable analysis for each end point, including demographic factors, stage at diagnosis, and receipt of definitive therapy, as appropriate. However, our analysis does not prove causation; rather, it describes an association.

In conclusion, the findings of our study highlight the potential beneficial effect of insurance status on stage at presentation, receipt of definitive treatment, and survival among young patients with cancer. The ACA is likely to increase coverage among most young adults in the United States, although young healthy men who earn modest salaries and who purchase insurance on the individual market may face disproportionately high increases in premiums and therefore could choose to opt out of coverage. Additional means for such young adults to obtain insurance may be warranted.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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Appendix

Description of Model Building Process

Metastatic versus localized disease at presentation. There is a relative paucity of literature examining predictive factors for presentation of metastatic versus localized disease. Therefore, covariates were largely included in the model for presentation with metastatic versus localized disease if they were confounders of the association between insurance status and this end point. When age, sex, race, marital status, and site of disease were added to the model containing only insurance status, the effect of each covariate was to shift the association between the insurance covariate and the outcome of presentation with metastatic disease toward the null. Therefore, to make the odds ratio for the insurance covariate as accurate as possible, these covariates were included in the final model. The covariates of income, education, and urban versus rural status did not significantly alter the odds ratio for the insurance covariate when they were included in the model, but they were retained so that readers would know that these factors were accounted for in the analysis.

Receipt of definitive treatment. The covariates included in the model for the end point of receipt of definitive treatment were largely included based on a study that found that age, sex, race, marital status, stage, and site of disease were significant predictors of refusal of radiation therapy (Hamidi M et al: Am J Clin Oncol 33:629-632, 2010). The authors did not include income-, education-, or population density–based covariates. Given the concern that these were confounding variables of this analysis, income, education, and urban versus rural status were added to the model.

All-cause mortality. Lastly, covariates included in the model for cancer-specific mortality were largely guided by prior literature. Prior investigations have indicated that age (van de Water W et al: JAMA 307:590-597, 2012), sex (Cook MB et al: Cancer Epidemiol Biomarkers Prev 20:1629-1637, 2011), race (Simpson DR et al: J Natl Cancer Inst 105:1814-1820, 2013), marital status (Aizer AA et al: J Clin Oncol 31:3869-3876, 2013), income (Boyd C et al: J Clin Oncol 17:2244-2255, 1999), and educational level (Albano JD et al: J Natl Cancer Inst 99:1384-1394, 2007) are associated with cancer-specific mortality. In addition, urban versus rural status was included because it was included in the models for metastatic disease and receipt of definitive treatment. Finally, we felt that it was important to control for the site of the primary malignancy, given a potential imbalance in cancers between patients who were insured versus not. We also felt that it was important to control for stage of presentation and receipt of treatment versus not, to exclude these covariates as possible mediators of the relationship between insurance status and all-cause mortality.