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Costs of Substance Use Disorders from Claims Data for Medicare Recipients from a Population-Based Sample

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Abstract

Medicare spending is projected to increase over the next decade, including for substance use disorders (SUD). Our objective was to determine whether SUDs are associated with higher six-year Medicare costs (1999–2004) among participants in the Baltimore Epidemiologic Catchment Area (ECA) Study. Medicare claims data for the years 1999–2004 from the Centers for Medicare and Medicaid Services were linked to four waves of data from the Baltimore ECA cohort collected between 1981–2005 (n=566). A generalized linear model with a log link and gamma distribution was used to examine direct Medicare costs associated with SUD status. Medicare recipients with no history of SUD had mean six-year costs of \$42,576. Those with a history of SUD based on both Baltimore ECA and Medicare data, or based on Medicare claims data alone, had significantly higher costs (\$98,754 and \$64,876, respectively). A history of SUD based solely on Baltimore ECA data alone had lower average costs (\$25,491). Findings indicate that Medicare costs differ by source of SUD diagnosis when comparing treatment versus survey data. This may have future implications for projecting Medicare costs among SUD individuals as healthcare coverage expands under the Affordable Care Act.

Keywords

alcohol; substance use disorder; Medicare; medical costs

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1. Introduction

Alcohol and other internationally regulated drugs (IRDs) account for nearly 5% of the global disease burden (Rehm, Taylor, & Room, 2006). A significant proportion of this burden is due to alcohol and/or IRD use disorders (herein referred to as *substance use disorders, SUD*), which affect as many as 15% of people who have ever used alcohol or other IRDs (Anthony, Warner, & Kessler, 1994). In the US alone, specialty care for alcohol use disorders represents the largest direct cost (\$10 billion) out of all health care costs attributed to alcohol (\$24 billion), and this figure does not account for the costs due to lost productivity (\$161 billion), and other indirect costs (e.g., criminal justice and motor vehicle crashes; \$37 billion) totaling \$223 billion (Bouchery, Harwood, Sacks, Simon, & Brewer, 2011). Costs related to IRD use disorders has been less studied, and are lower than for alcohol, but nonetheless reach into the billions (Mark, Woody, Juday, & Kleber, 2001; Rice, 1999). Pain and suffering due to alcohol and IRD use further add an immeasurable societal toll in terms of an otherwise preventable burden.

The novel contribution of this brief report is to examine the overall Medicare costs associated with the lifetime occurrence of SUD among prospectively followed Medicare-eligible recipients sampled from a large mid-Atlantic US city. Specifically, we focus on the issue of medical costs when older/disabled SUD individuals come to the attention of the healthcare system (e.g., as identified by Medicare claims data) versus SUD individuals identified from the community who may never seek treatment for SUD (i.e., identified by self-report). This research group has previously employed a similar approach with respect Medicare costs in relation to major depression (Alexandre, Hwang, Roth, Gallo, & Eaton, 2016). Costs related to SUD will be a pertinent issue for years to come as Medicare costs for SUD treatment are projected to double from \$1.2 to \$2.3 billion by 2020 (Substance Abuse and Mental Health Services Administration, 2014).

2. Materials and Methods

2.1. Sample and Measures

Data are from the Baltimore Epidemiologic Catchment Area (ECA) study, which sampled 3,481 household residents in Eastern Baltimore, MD in 1981–82. There have been three follow-up waves of the cohort with the most recent in 2004–05. We identified participants (n=1,920) interviewed in Wave 3 (1993–1996) just prior to the period of Medicare claims data availability (1999–2004). Many could not be included in analyses because they were not eligible for Medicare at the time (n=1,121; 58%), were missing for social security numbers used to match participants to Medicare claims data (n=218; 11%), or had received Medicare benefits, but lacked details of claims (n=15; 0.8%). Therefore, analyses were based on 566 (29.5%) Medicare eligible individuals (i.e., based on age, disability, end-stage renal disease, and/or amyotrophic lateral sclerosis) who could be linked to Centers for Medicare & Medicaid Services (CMS) claims data from 1999–2004 (claims data were not available prior to 1999). Further details of the Baltimore ECA study design and methods, along with procedures linking Medicare data have been described elsewhere (Alexandre et al., 2016; Regier et al., 1984). The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved the research.

Total direct medical costs were calculated by adding all payments made by beneficiaries (deductibles, coinsurance), Medicare, and health care providers. Costs were adjusted to 2004 dollars using the Consumer Price Index (as recommended by Weinstein, Siegel, Gold, Kamlet, & Russell, 1996).

In the Baltimore ECA, trained non-clinicians administered the Diagnostic Interview Schedule (DIS), a fully structured diagnostic interview used to assess SUD based on clinical features in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (Robins, 1981). All four waves of Baltimore ECA data were used to identify lifetime SUD. From 1999–2004 Medicare claims data, research identifiable files (RIF) distinguished SUD individuals based on the International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) codes that listed abuse and/or dependence on alcohol, cannabis, cocaine, opioids, amphetamines, hallucinogens, antidepressants, or other unspecified drug (see online Appendix for details). Based upon the above information, we categorized participants into the following groups: 1) No SUD based on either Medicare claims or ECA; 2) SUD based on Medicare data alone; 3) SUD based on ECA data alone; 4) SUD based on both.

Responses to the final wave of the Baltimore ECA provided background and socioeconomic characteristics of the sample. These included age, sex, race/ethnicity, educational attainment, marital status, household income, and lifetime cigarette smoking status. Data from prior waves were used only if missing in wave 4. Using Medicare data, we also examined months of Medicare eligibility and presence of other medical conditions: cardiovascular disease, diabetes, cancer, chronic pulmonary disease (COPD), and depression.

2.2. Statistical Analysis

First, we compared differences in personal characteristics by SUD status. Fisher's exact tests were used for significance testing of differences for categorical variables while t-tests were used for continuous variables (e.g., age). A generalized linear model (GLM) with a log link and gamma distribution to account for skewness of medical costs measures in the upper tail of the distribution compared Medicare costs in each SUD group defined by source of ascertainment to the reference group with no SUD history. We reported mean, standard deviation (SD), median, and 25th and 75th quantiles of unadjusted Medicare costs, for ease of interpretation, as well as exponentiated unadjusted and adjusted model coefficients and their 95% confidence intervals. Adjusted models controlled for background and other measured covariates. Differential treatment and survival according to the SUD status were not controlled for in these models; rather, our approach mirrors that of cost-effectiveness analysis in which costs are estimated in parallel with effects of treatment and survival but not adjusted for them (Gold, Siegel, Russel, & Weinstein, 1996). Statistical analyses were conducted using SAS version 9.4 (SAS Institute Inc., Cary, NC) with alpha set at 0.05.

3. Results

Twenty-nine percent of Medicare-eligible individuals in the Baltimore ECA were identified as having an SUD based upon self-report in the ECA or Medicare claims data (i.e., 165/566; see Table 1). Twice as many people with lifetime SUD were identified based on ECA self-

report alone (n=90; 16%) compared to those identified solely from Medicare claims (n=47; 8%); fewer were identified in both sources (n=28; 5%). Lifetime SUD status did not statistically differentiate individuals by education, marital status, or household income. However, those with a lifetime SUD tended to be younger, male, non-White, smoke cigarettes, have fewer months of Medicare eligibility, and were more likely to have COPD, cancer, and depression as compared to those without SUD.

The average Medicare costs for a subject in the Baltimore ECA cohort who had no self-reported lifetime SUD and had not made any Medicare claims related to an SUD was \$42,576 (Table 2). Recipients who had a lifetime SUD based only on ECA self-report (i.e., they made no Medicare claim for an SUD) had lower Medicare costs (\$25,491; relative ratio, RR=0.6). Those who had made a Medicare claim for SUD, but did not report SUD during any of the ECA follow-up waves had higher Medicare costs (\$64,876; RR=1.5). Those having a lifetime SUD based on the Baltimore ECA assessment and who also made an SUD Medicare claim had the highest costs (\$98,754; RR=2.3). Unadjusted and adjusted GLM estimates were similar with exception of the Medicare claims only group, which became statistically significant in the adjusted model (adjusted RR=1.72, 95% CI [1.08, 2.75]).

4. Discussion

The unique feature of this paper was its focus upon estimating Medicare costs associated with an SUD diagnosis based upon case ascertainment from Medicare claims data and upon self-reported diagnostic interview among a population-based cohort. We find that Medicare-eligible individuals with an SUD history identified from Medicare claims alone or in addition to self-report interview had higher Medicare costs than individuals with no SUD history. This may be unsurprising considering that substance use is associated with poorer physical health and co-morbidity with other psychiatric disorders, which could increase short- and long-term medical costs (Jones et al., 2004; Kessler, Chiu, Demler, & Walters, 2005). However, one interesting finding is that individuals with an SUD diagnosis based upon Medicare claims *and* self-report interview had higher Medicare costs than those identified from Medicare claims alone. Individuals with persistent or more severe SUD problems might explain both higher Medicare costs and case identification from both sources. Nevertheless, this finding suggests that reliance upon Medicare claims data alone may underestimate the true medical costs related to this important condition.

We also found that Medicare recipients with a history of SUD based on self-report interview, but not identified based on Medicare claims had *lower* medical costs than individuals with no SUD history. There are several plausible explanations for this unanticipated finding. SUDs often go untreated (Mojtabai, Olfson, & Mechanic, 2002), and individuals with a history of SUD but not in treatment may have less severe or less persistent SUD. It is also possible that individuals with an SUD history who do not appear in the Medicare claims are less likely to seek medical treatment in general, further reducing their costs. Another explanation for these results may be that the category of SUD is broad, including both abuse and dependence. Since marijuana use was illegal, even a single episode of use would satisfy the criteria for diagnosis of substance abuse, but it seems unlikely this behavior would lead to a Medicare claim. Among those with an SUD based on the ECA interview alone, the

predominant disorder was alcohol abuse, for which the diagnostic criteria can be satisfied with behaviors that might not lead to a treatment episode.

This study is not without important limitations. First, many of the Baltimore ECA participants were too young to qualify for Medicare. Low rates of lifetime SUDs in this older, Medicare-eligible cohort may underestimate future long-term costs of SUDs from more recent birth cohorts with higher rates of substance use. Second, since SUDs are associated with an earlier mortality, they may be under-represented in epidemiologic studies, and their likely Medicare costs would be underestimated to the degree they are less likely to survive to the age of Medicare eligibility (Neumark, Van Etten, & Anthony, 2000a, 2000b). Conversely, individuals with a history of SUD and who do survive to the age of Medicare eligibility may be more likely to have genetic, behavioral, and environmental influences that are protective of health.

Notwithstanding these limitations, these findings may have important implications for further Medicare cost estimation associated with SUD. It is unclear how these costs will be affected by the Affordable Care Act (ACA) passed in 2010, which greatly expanded the number of people covered by health insurance. According to a recent governmental report, the ACA, especially the Medicaid expansion, is expected to increase overall healthcare spending with mental health (MH) and SUD-specific spending projected to increase by 7.3%, or \$7.3 billion by 2020 (Substance Abuse and Mental Health Services Administration, 2014). It is anticipated this will slow the increasing rate of Medicare costs, including for MH and SUDs, but it remains to be seen whether this trend similarly affects older Americans with and without SUDs. However, future work in this area could be hindered by recent changes by the CMS, which after 2006 has begun to suppress some substance use disorder-related claims from the Medicare and Medicaid Research Identifiable Files (Rough et al., 2016). This could make it difficult to conduct future work on health care utilization and comparing pre- and post-ACA Medicare costs associated with SUDs.

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Highlights

- Medicare costs differed by substance use disorder (SUD) in population-based sample.
- SUD status based on Medicare claim and survey self-report associated with 2x costs.
- SUD status based on Medicare claim alone associated with 70% increased costs

Demographic and clinical characteristics of Baltimore Epidemiological Catchment Area (ECA) Medicare recipients identified from CMS Medicare claims data 1999–2004.

Table 1

Characteristic, n (%)	Substance Use Disorder (SUD) by source identified (Medicare claims and/or Baltimore ECA)				
	Total	No SUD	Medicare-only	ECA-only	Either
	n = 566	n = 401	n = 47	n = 90	n = 165
Age @ Wave 4, mean (SD)	76.5 (12.2)	79.6 (10.9)	72.9 (11.2)***	68.8 (11.8)***	69.0 (11.8)***
Female (vs. Male)	380 (67.1)	302 (75.3)	35 (74.5)	31 (34.4)***	78 (47.3)***
White (vs. non-White)	398 (70.3)	300 (74.8)	37 (78.7)	45 (50.0)***	98 (59.4)***
Education @ Wave 4					
Less than high school	308 (54.4)	222 (55.4)	23 (48.9)	50 (55.6)	86 (52.1)
High school	156 (27.6)	109 (27.2)	16 (34.0)	24 (26.7)	47 (28.5)
At least some college	102 (18.0)	70 (17.5)	8 (17.0)	16 (17.8)	32 (19.4)
Married (vs. non-Married) @ Wave 4	237 (41.9)	166 (41.4)	20 (42.6)	43 (47.8)	71 (43.0)
Household income @ Wave 4					
Low (<\$25,000)	402 (71.0)	292 (72.8)	31 (66.0)	58 (64.4)	110 (66.7)
Medium (\$25,000 to \$49,999)	104 (18.4)	67 (16.7)	11 (23.4)	21 (23.3)	37 (22.4)
High (≥ \$50,000)	46 (8.1)	30 (7.5)	3 (6.4)	11 (12.2)	16 (9.7)
Medical conditions (Medicare claims)					
Cardiovascular disease	458 (80.9)	336 (83.8)	43 (91.5)	56 (62.2)***	122 (73.9)**
Diabetes	207 (36.6)	143 (35.7)	17 (36.2)	33 (36.7)	64 (38.8)
Cancer	77 (13.6)	53 (13.2)	12 (25.5)*	8 (8.9)	24 (14.5)
Chronic pulmonary disease	186 (32.9)	118 (29.4)	29 (61.7)***	26 (28.9)	68 (41.2)**
Depression	117 (20.7)	81 (20.2)	13 (27.7)	11 (12.2)	36 (21.8)
Lifetime cigarette smoker	267 (47.2)	150 (37.4)	38 (80.9)***	56 (62.2)***	117 (70.9)***
Months of Medicare eligibility, mean (SD)	54.2 (23.6)	55.5 (23.0)	56.1 (21.7)	47.1 (27.0)**	51.0 (24.8)*

SD = Standard Deviation.

*
p < 0.05,

**
p < 0.01, and

p < 0.001 for either t-test (continuous age) or Fisher's exact test (categorical variables) comparing SUD by source identified to the reference of Medicare recipients with no SUD.

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Table 2

Medicare costs (1999–2005) by substance use disorder (SUD) history and source of SUD identification among eligible Medicare recipients in the Baltimore Epidemiologic Catchment Area (ECA) study.

	n	Mean	SD	Median	Q25th	Q75th	Relative Ratio (95% CI)	
							Unadjusted	Adjusted ^a
Total	566	\$44,490	\$64,836	\$20,855	\$5,293	\$54,064		
No SUD (reference)	401	\$42,576	\$57,438	\$21,801	\$5,544	\$55,112	1.0	1.0
SUD History Ascertainment								
Medicare claims only	47	\$64,876	\$79,509	\$38,313	\$10,494	\$100,050	1.52 (0.98, 2.36)	1.72 (1.08, 2.75)
Baltimore ECA only	90	\$25,491	\$45,096	\$10,861	\$832	\$26,895	0.60 (0.43, 0.83)	0.60 (0.42, 0.86)
Both	28	\$98,754	\$128,771	\$55,886	\$11,002	\$140,397	2.32 (1.33, 4.04)	2.16 (1.18, 3.97)

^aModel was adjusted for age, sex, race/ethnicity, education, marital status, household income, chronic medical conditions, cigarette smoking, and months of Medicare eligibility.