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Costs of substance use disorders from claims data for Medicare recipients from a population-based sample

Brian J. Fairman^{a,*}, Seungyoung Hwang^b, Pierre K. Alexandre^c, Joseph J. Gallo^b, William W. Eaton^b

^a Health Behavior Branch, Division of Intramural Population Health, Eunice Kennedy Shriver National Institute of Child Health and Human Development, USA

^b Department of Mental Health, Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD, USA

^c Department of Management, Florida Atlantic University College of Business, Boca Raton, FL, USA

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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 and 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.

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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 3481 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 ($n = 1920$) 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 ($n = 1121$; 58%), were missing for social security numbers used

* Corresponding author at: Division of Intramural Population Health Research, Eunice Kennedy Shriver National Institute of Child Health & Human Development, 6710B Rockledge Dr., Bethesda, MD 20817, USA.

E-mail address: brian.fairman@nih.gov (B.J. Fairman).

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 to 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 to 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 1 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

Table 1
Demographic and clinical characteristics of Baltimore Epidemiologic Catchment Area (ECA) Medicare recipients identified from CMS Medicare claims data 1999–2004.

Characteristic, n (%)	Total n = 566	No SUD n = 401	Substance use disorder (SUD) by source identified (Medicare claims and/or Baltimore ECA)			
			Medicare-only n = 47	ECA-only n = 90	Either n = 165	Both n = 28
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)***	63.2 (10.3)***
Female (vs. male)	380 (67.1)	302 (75.3)	35 (74.5)	31 (34.4)***	78 (47.3)***	12 (42.9)***
White (vs. non-White)	398 (70.3)	300 (74.8)	37 (78.7)	45 (50.0)***	98 (59.4)***	16 (57.1)*
Education @ Wave 4						
Less than high school	308 (54.4)	222 (55.4)	23 (48.9)	50 (55.6)	86 (52.1)	13 (46.4)
High school	156 (27.6)	109 (27.2)	16 (34.0)	24 (26.7)	47 (28.5)	7 (25.0)
At least some college	102 (18.0)	70 (17.5)	8 (17.0)	16 (17.8)	32 (19.4)	8 (28.6)
Married (vs. non-Married) @ Wave 4	237 (41.9)	166 (41.4)	20 (42.6)	43 (47.8)	71 (43.0)	8 (28.6)
Household income @ Wave 4						
Low (<\$25,000)	402 (71.0)	292 (72.8)	31 (66.0)	58 (64.4)	110 (66.7)	21 (75.0)
Medium (\$25,000 to \$49,999)	104 (18.4)	67 (16.7)	11 (23.4)	21 (23.3)	37 (22.4)	5 (17.9)
High (≥\$50,000)	46 (8.1)	30 (7.5)	3 (6.4)	11 (12.2)	16 (9.7)	2 (7.1)
Medical conditions (Medicare claims)						
Cardiovascular disease	458 (80.9)	336 (83.8)	43 (91.5)	56 (62.2)***	122 (73.9)**	23 (82.1)
Diabetes	207 (36.6)	143 (35.7)	17 (36.2)	33 (36.7)	64 (38.8)	14 (50.0)
Cancer	77 (13.6)	53 (13.2)	12 (25.5)*	8 (8.9)	24 (14.5)	4 (14.3)
Chronic pulmonary disease	186 (32.9)	118 (29.4)	29 (61.7)***	26 (28.9)	68 (41.2)**	13 (46.4)
Depression	117 (20.7)	81 (20.2)	13 (27.7)	11 (12.2)	36 (21.8)	12 (42.9)**
Lifetime cigarette smoker	267 (47.2)	150 (37.4)	38 (80.9)***	56 (62.2)***	117 (70.9)***	23 (82.1)***
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)*	54.9 (20.6)

SD = Standard deviation.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ 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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