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Medical multimorbidity and drug use among adults in the United States

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ABSTRACT

Adults with medical multimorbidity (≥2 chronic conditions) present challenges for health care systems to provide coordinated care. Substance use can complicate the management of chronic medical conditions, but little research has focused on the intersection of medical multimorbidity and substance use. This study uses cross-sectional analysis of 115,335 adult respondents of the 2012–2014 administrations of the National Survey on Drug Use and Health to estimate the prevalence and correlates of past-year drug use among adults with multimorbidity. The prevalence of past-year drug use was compared between individuals reporting 0, 1, and ≥2 chronic medical conditions. We used multivariable logistic regression to determine correlates of past-year drug use among adults with ≥2 chronic medical conditions. 53.1% reported no chronic conditions, 29.5% reported one chronic condition, and 17.4% reported ≥2 chronic conditions. Past-year drug use was reported by 18.3% of those with no chronic conditions, 14.8% with 1 chronic condition, and 11.6% with ≥2 chronic conditions. Cannabis and opioid analgesics (nonmedical use) were the most common drugs used across all three groups. In the adjusted model, among adults with medical multimorbidity, adults with past-year drug use were more likely to be younger, male, have lower income, and report current tobacco use, alcohol dependence, past-year depression, and having received mental health treatment in the past year. In this national cohort, fewer adults with multimorbidity reported substance use compared to adults with no or one chronic condition, however, this population with high multimorbidity may be particularly vulnerable to the negative effects of drug use.

1. Introduction

Adults with medical multimorbidity, usually defined as ≥2 concurrent chronic conditions (Fortin et al., 2012; Wallace et al., 2015), have high rates of healthcare utilization and associated costs (Lehnert et al., 2011; Lochner and Cox, 2013). In addition to often receiving poorly coordinated care (Boyd and Fortin, 2010), people with medical multimorbidity experience the consequences associated with having multiple chronic conditions including adverse effects from treatments or interventions, disability, and death (American Geriatrics Society, 2012). In addition, living with medical multimorbidity often includes taking multiple prescribed medications and careful monitoring of individual diseases. Substance use can have profound negative effects on chronic diseases, therefore drug use and substance use disorder (SUD) must be considered when developing effective care for the increasing number of adults with medical multimorbidity (Paez et al., 2009).

Use of various psychoactive drugs is associated with a wide range of physiologic effects that can affect the cardiovascular, gastrointestinal, hematological, pulmonary, and neurological systems, and therefore influence existing chronic disease and complicate management (Center for Substance Abuse Treatment, 2006). SUDs themselves are considered chronic diseases with known physiological changes in the brain and need ongoing treatment and relapse prevention (Han and Moore, 2018). Therefore, the interaction of substance use with chronic medical disease can lead to poor treatment outcomes for both SUDs and chronic medical conditions.

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Many adults who are in treatment for SUD receive fragmented medical care for their other chronic conditions (Gourevitch et al., 2007), and unhealthy substance use often goes undiagnosed and unrecognized by primary care physicians (Saitz et al., 1997). The ability to manage chronic diseases depends on the awareness of substance use and its possible effects on chronic medical diseases. However, few studies have focused on the intersection of chronic medical disease and drug use, and there are no studies that estimate the prevalence of drug use among adults with multiple chronic conditions. Therefore, the objective for this study was to use cross-sectional data from a nationally representative sample of adults in the United States (US) to estimate the prevalence of drug use among adults with chronic medical diseases, and to determine demographic and behavioral correlates of drug use among adults with medical multimorbidity.

2. Methods

2.1. Data source and study sample

This study aggregated data from three cohorts (years 2012, 2013, and 2014) of the National Survey on Drug Use and Health (NSDUH), an annual cross-sectional survey of individuals in the US (Substance Abuse and Mental Health Services Administration [SAMHSA], 2018). A different cross-section of non-institutionalized respondents is sampled each year and therefore each cohort is independent of each other. NSDUH is a nationally representative sample of individuals living in the US (all fifty US states and the District of Columbia) and the sample was achieved by the following methods: census tracts were first chosen within each state, then sections in each tract were selected, then households, and then respondents were selected for the sample each year. Surveys were administered through computer-assisted interviewing—conducted by an interviewer and audio computer-assisted self-interviewing (ACASI). Sampling weights were provided by NSDUH to address individual and unit-level non-response. Weights were adjusted to ensure that approximations are consistent with estimates provided by the US Census Bureau. Detailed information regarding the NSDUH survey and its sampling methods can be found elsewhere (SAMHSA, 2018). The weighted interview response rates for NSDUH years 2012 through 2014 was 71.7–73.0%, and missing or incomplete data were revised by imputation.

2.2. Definitions

The NSDUH survey asks respondents if they had ever been informed by a doctor or other medical professional that they have ever had the following 12 medical diseases: asthma, bronchitis, cirrhosis of the liver, diabetes, heart disease, hepatitis, hypertension (high blood pressure), lung cancer, HIV/AIDS, sleep apnea, stroke, and ulcers. These medical diseases are frequently considered chronic medical conditions, and are included in either the validated Katz chronic disease comorbidity questionnaire (Katz et al., 1996)[15] or the Hierarchical Condition Category system (Pope et al., 2004) and obstructive sleep apnea, which is recognized as one of the most prevalent chronic respiratory disorders (Lee and McNicholas, 2011) and therefore included in our analysis. Medical multimorbidity is defined in the literature as 2 or more chronic diseases (Fortin et al., 2012; Wallace et al., 2015). Using the above conditions to study medical multimorbidity ($\geq$2 chronic conditions) with the NSDUH has been performed in other studies (Stanton et al., 2016).

Drug use was assessed by NSDUH by self-report of cannabis (marijuana and hashish), cocaine (including crack), heroin, inhalants, hallucinogens, and nonmedical use of prescription medications (including opioids, tranquilizers, stimulants, and sedatives). Nonmedical use of prescription medications was defined as use of a drug that was not prescribed or used for the experience or feeling it caused. Nicotine dependence was defined based on dependence criteria of the Nicotine Dependence Syndrome Scale (NDSS) (Shiffman et al., 2004) and alcohol dependence was defined by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association, 1994). SUDs were determined by participant responses to a series of questions that determined if criteria would meet DSM-IV abuse or dependence (American Psychiatric Association, 1994) categories for each drug. While NSDUH is not a diagnostic interview, this method provided a proxy diagnosis.

2.3. Statistical analyses

Analyses include all respondents aged 18 and older. We aggregated data from the three separate cohort years into a single cross-section to be able to increase power for examining associations between variables with low prevalence (i.e., use of various drugs among those with multimorbidity). We first examined bivariable associations between demographic characteristics and number of self-reported conditions (i.e., 0, 1, $\geq$2). Demographic measures included age (i.e., 18–34, 35–49, 50–64, and $\geq$65), sex, race/ethnicity (i.e., non-Hispanic white, African American, Asian, Hispanic of any race, and other), education level (i.e., < high school, high school, some college, college or more), total family income (i.e., < $20,000, $20,000–$49,999, $50,000–$74,000, $\geq$$75,000), marital status (i.e., married, widowed, divorced or separated, never married). NSDUH only provides pre-coded categorical responses for the age and income variables, and therefore could not be analyzed as a continuous variable. Tobacco use (past month, year), nicotine dependence, alcohol use (past month, year), alcohol dependence, self-reported overall health (i.e., excellent, very good, good, fair), and self-reported mental health problems in the past-year (i.e., major depressive episode based on DSM IV criteria, self-reported anxiety, respondents who received mental health treatment) were also compared among adults reporting 0, 1, and $\geq$2 chronic conditions.

Bivariable analyses was also performed comparing past-year drug use and diagnosed substance use disorder for adults with 0, 1, and $\geq$2 chronic conditions. We evaluated correlates of past-year drug use among adults with medical multimorbidity using binary logistic regression. We first estimated odds of each covariate separately, generating unadjusted odds ratios (ORs). We then fit covariates simultaneously using multiple logistic regression. The adjusted ORs (AORs) represent the odds of each category with all else in the model being equal. All analyses were weighted as part of NSDUH to account for the complex survey design and to obtain accurate standard errors for estimates at the population level. More detailed information regarding the development of analysis weights are found elsewhere (Center for Behavioral Health Statistics and Quality, 2017). Since our analyses utilized data from 3 cohorts, we divided the weights by 3 to obtain nationally representative estimates. Stata SE 13 (Stata, 2013) was used for all analyses, and survey ("svy") commands were utilized to provide accurate standard errors using Taylor series estimation methods (Heeringa et al., 2010). Secondary analysis of this publically available data was exempt for review by the New York University Langone Medical Center Institutional Review Board.

3. Results

The analytic sample included 115,335 respondents. Chronic medical conditions were common among respondents with weighted percentages of 29.5% of adults reporting 1 chronic condition and 17.4% reporting 2 or more conditions, and therefore 46.9% reported at least 1 chronic condition and 53.1% reported no chronic conditions (Table 1). Most adults with medical multimorbidity were middle-aged (50–64 years of age) and older adults ($\geq$65 years old), while younger adults (18–34 years of age) were more likely to report no chronic conditions ($p < 0.001$). Compared with adults reporting no chronic conditions, adults with medical multimorbidity were also more likely to be non-Hispanic white, less educated, married, have nicotine

Table 1
Sample characteristics by number of chronic conditions, % (n) – United States 2012–2014[a].

	Number of chronic conditions						
	0 chronic conditions		1 chronic condition		≥2 chronic conditions		*p*-Value
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	
Characteristic	72,341	53.1% (52.6, 53.7)	29,419	29.5% (29.0, 30.0)	13,575	17.4% (17.0, 17.8)	
Age group (years of age)							
18–34	49,318	41.3 (40.6, 42.0)	14,634	21.9 (21.3, 22.5)	4083	10.7 (10.2, 11.2)	< 0.001
35–49	15,365	28.9 (28.4, 29.5)	7051	23.6 (22.8, 24.4)	3406	18.3 (17.5, 19.1)	< 0.001
50–64	5435	20.6 (19.9, 21.4)	4450	29.8 (28.8, 30.9)	3215	35.1 (33.7, 36.4)	< 0.001
≥65	2223	9.1 (8.7, 9.6)	3284	24.7 (23.8, 25.6)	2871	36.0 (34.6, 37.3)	< 0.001
Sex							
Male	33,975	48.0 (47.4, 48.5)	13,470	48.6 (47.8, 49.4)	5899	47.0 (45.7, 48.4)	0.12
Female	38,366	52.0 (51.5, 52.6)	15,949	51.4 (50.6, 52.2)	7676	53.0 (51.6, 54.3)	0.12
Race/ethnicity							
Non-Hispanic White	43,301	62.5 (61.8, 63.2)	18,894	67.8 (66.6, 69.0)	9565	74.0 (72.7, 75.2)	< 0.001
Non-Hispanic African American	8468	10.5 (10.0, 11.0)	4236	13.8 (13.0, 14.6)	1624	11.6 (10.6, 12.6)	< 0.001
Hispanic	13,370	18.4 (17.9, 19.0)	3898	12.2 (11.5, 12.9)	1304	8.9 (8.2, 9.7)	< 0.001
Non-Hispanic Asian	3710	6.4 (6.0, 6.8)	879	3.7 (3.2, 4.3)	313	3.0 (2.4, 3.6)	< 0.001
Other	3492	2.2 (2.0, 2.3)	1512	2.6 (2.3, 2.8)	769	2.6 (2.3, 3.0)	< 0.001
Education							
< High school	10,602	13.4 (13.0, 13.9)	4251	14.0 (13.4, 14.7)	1920	13.2 (12.3, 14.0)	< 0.001
High school	22,370	27.8 (27.2, 28.3)	9418	31.1 (30.3, 32.0)	4359	31.0 (30.0, 32.1)	< 0.001
Some college	21,584	27.3 (26.7, 27.8)	8645	25.9 (25.1, 26.7)	3936	28.0 (26.9, 29.1)	< 0.001
College or more	17,785	31.6 (30.9, 32.3)	7105	28.9 (28.0, 29.9)	3360	27.8 (26.7, 28.9)	< 0.001
Total family income							
< $20,000	42,615	44.5 (43.8, 45.2)	15,851	41.6 (40.7, 42.6)	6854	42.3 (41.2, 43.5)	< 0.001
$20–$49,999	19,439	31.8 (31.2, 32.4)	8535	34.0 (33.0, 35.0)	4263	34.7 (33.5, 36.0)	< 0.001
$50,000–$74,999	5345	11.5 (11.1, 12.0)	2596	11.4 (10.8, 12.1)	1260	11.1 (10.4, 11.9)	< 0.001
≥$75,000	4942	12.2 (11.6, 12.8)	2437	13.0 (12.3, 13.7)	1198	11.8 (11.0, 12.7)	< 0.001
Marital status							
Married	25,045	49.8 (49.1, 50.4)	11,871	54.5 (53.6, 55.5)	6363	56.2 (54.8, 57.6)	< 0.001
Widowed	1007	3.4 (3.1, 3.6)	1218	8.0 (7.5, 8.6)	952	10.5 (9.7, 11.4)	< 0.001
Divorced or separated	6019	12.5 (12.1, 12.9)	3447	15.1 (14.5, 15.8)	2294	18.4 (17.6, 19.4)	< 0.001
Never married	40,270	34.4 (33.8, 35.0)	12,883	22.3 (21.7, 23.0)	3966	14.8 (14.0, 15.7)	< 0.001
Tobacco use							
Past month use	24,715	29.4 (28.8, 30.1)	9667	26.5 (25.8, 27.3)	4175	24.4 (23.4, 25.4)	< 0.001
Past year use	30,524	35.5 (34.9, 36.1)	11,663	31.2 (30.4, 32.1)	4887	27.9 (26.8, 29.0)	< 0.001
Past year nicotine dependence[b]	6997	8.6 (8.3, 9.0)	3125	8.6 (8.2, 9.1)	1760	10.2 (9.6, 10.9)	< 0.001
Alcohol use							
Past month use	43,742	60.0 (59.3, 60.7)	17,180	55.3 (54.4, 56.3)	7026	48.4 (47.1, 49.6)	< 0.001
Past year use	55,110	74.1 (73.5, 74.8)	21,806	69.6 (68.6, 70.5)	9327	63.6 (62.2, 65.0)	< 0.001
Past year alcohol Use, but not dependence	51,826	70.7 (70.1, 71.4)	20,483	66.2 (65.2, 67.1)	8741	60.7 (59.3, 62.1)	< 0.001
Past year alcohol dependence[c]	3284	3.4 (3.2, 3.6)	1323	3.4 (3.1, 3.7)	566	2.9 (2.6, 3.3)	< 0.001
Overall Health							
Excellent	21,590	30.1 (29.5, 30.7)	5141	15.6 (14.9, 16.3)	1102	7.0 (6.4, 7.6)	< 0.001
Very good	29,479	39.2 (38.7, 39.7)	11,395	37.0 (36.1, 37.8)	3772	26.2 (25.0, 27.4)	< 0.001
Good	16,793	23.3 (22.8, 23.9)	9055	32.1 (31.3, 33.0)	4875	36.8 (35.6, 38.0)	< 0.001
Fair/poor	4467	7.3 (7.0, 7.6)	3820	15.3 (14.6, 16.1)	3821	30.0 (28.9, 31.2)	< 0.001
Mental health							
Past year major depressive episode[c]	4894	5.7 (5.5, 6.0)	2530	6.5 (6.1, 7.0)	1878	10.9 (10.2, 11.6)	< 0.001
Past year anxiety	4511	5.7 (5.4, 5.9)	2272	6.0 (5.6, 6.4)	1807	10.4 (9.7, 11.1)	< 0.001
Received mental health treatment in past year	8672	12.0 (11.6, 12.4)	4811	15.3 (14.7, 15.9)	3521	23.1 (22.0, 24.2)	< 0.001

[a] All percentages are weighted.
[b] Based on the Nicotine Dependence Syndrome Scale (NDSS).
[c] Based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

dependence, drink alcohol less frequently, report having worse health status, and more likely to have depression, anxiety, and need mental health treatment in the past year ($p < 0.001$ for all comparisons).

Table 2 presents frequencies and weighted percentages of specific drugs used by 0, 1 or ≥2 chronic conditions. Overall, 16.1% of the full study sample reported past-year use of an illegal drug or cannabis and 2.6% reported meeting criteria for a SUD. The most common drug used in the past-year was cannabis, and cannabis use disorder was the most common SUD. Nonmedical use of opioid analgesics was the next-most common and opioid-related SUD was the second most common SUD. Among all adults with chronic conditions, past-year drug use was reported by 14.8% with 1 chronic condition and 11.6% with ≥2 conditions, and drug use was considerably higher among adults with no chronic conditions (18.3%) ($p < 0.001$ for all comparisons). Among adults reporting no chronic conditions, 5.5% used ≥2 drugs, while 4.3% of adults with 1 chronic disease and 3.2% of adults with ≥2 chronic diseases reported use of > 1 drug in the past year ($p < 0.001$). Criteria for past-year SUD was met by 2.4% with 1 chronic condition and 2.1% with ≥2 conditions, and 2.9% of adults with no chronic conditions ($p < 0.001$).

Table 3 presents results from the multivariable logistic regression model with past-year drug use as the outcome variable for adults with medical multimorbidity (n = 13,575). Results from the adjusted model suggest that among adults with multimorbidity, odds of past-year drug use decreased with increasing age (AOR 0.17 for adults ≥65, AOR 0.46 for adults 50–64, and AOR 0.57 for adults 35–49, all $p < 0.001$ with adults 18–34 as the comparison) and for females (AOR 0.52, $p < 0.001$). For race/ethnicity, compared to whites non-Hispanic

Table 2
Past-year drug use by number of chronic conditions, % (n) – United States 2012–2014[a].

	Number of chronic conditions						
	0 chronic conditions (n = 72,341)		1 chronic condition (n = 29,419)		≥2 chronic conditions (n = 13,575)		*p*-Value
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	
Drug use category (past-year use)							
Any drug	18,419	18.3 (17.9, 18.8)	6663	14.8 (14.2, 15.4)	2448	11.6 (10.8, 12.4)	< 0.001
Any drug, excluding cannabis	8360	8.5 (8.2, 8.9)	3216	7.3 (6.9, 7.7)	1240	5.8 (5.3, 6.4)	< 0.001
Cannabis	15,722	14.9 (14.5, 15.2)	5446	11.2 (10.7, 11.8)	1909	8.4 (7.8, 9.0)	< 0.001
Cocaine	2101	2.1 (2.0, 2.3)	758	1.7 (1.5, 1.9)	266	1.2 (1.0, 1.4)	< 0.001
Heroin	371	0.3 (0.3, 0.4)	145	0.3 (0.2, 0.3)	76	0.3 (0.2, 0.4)	< 0.001
Opioid analgesics	4359	4.6 (4.4, 4.8)	1758	4.1 (3.8, 4.4)	764	3.4 (3.1, 3.8)	< 0.001
Hallucinogens	2607	2.1 (2.0, 2.3)	788	1.3 (1.1, 1.5)	263	0.7 (0.6, 0.9)	< 0.001
Tranquilizers/sedatives	2243	2.3 (2.2, 2.5)	976	2.3 (2.1, 2.6)	467	2.1 (1.8, 2.4)	0.36
Stimulants	1587	1.5 (1.3, 1.6)	558	1.0 (0.9, 1.1)	214	0.8 (0.7, 1.1)	< 0.001
≥2 illegal drug use	6006	5.5 (5.3, 5.8)	2196	4.3 (4.1, 4.6)	804	3.2 (2.8, 3.6)	< 0.001
Substance use disorder (past-year)							
Any drug	3208	2.9 (2.7, 3.1)	1279	2.4 (2.2, 2.7)	509	2.1 (1.8, 2.4)	< 0.001
Any drug, excluding cannabis	1399	1.4 (1.3, 1.6)	612	1.4 (1.2, 1.6)	292	1.3 (1.1, 1.5)	0.58
Cannabis	2124	1.7 (1.6, 1.8)	823	1.3 (1.1, 1.4)	266	1.0 (0.8, 1.2)	< 0.001
Cocaine	328	0.4 (0.3, 0.5)	138	0.4 (0.3, 0.5)	81	0.4 (0.3, 0.6)	0.94
Heroin	255	0.2 (0.2, 0.3)	107	0.2 (0.1, 0.2)	59	0.2 (0.2, 0.3)	0.58
Opioid analgesics	762	0.8 (0.7, 0.9)	311	0.7 (0.6, 0.9)	175	0.8 (0.6, 1.0)	0.76
Hallucinogens	145	0.1 (0.1, 0.1)	53	0.1 (0.1, 0.1)	19	0.0 (0.0, 0.1)	0.07
Tranquilizers/sedatives	183	0.2 (0.1, 0.2)	110	0.2 (0.2, 0.3)	62	0.2 (0.2, 0.4)	0.25
Stimulants	187	0.2 (0.1, 0.3)	96	0.2 (0.1, 0.2)	43	0.2 (0.1, 0.3)	0.84

[a] All percentages are weighted.

African Americans (AOR 0.71, $p < 0.05$) and Asians (AOR 0.48, $p < 0.05$) also had lower odds for past-year drug use. For family income, compared to incomes < $20,000, higher incomes (AOR 0.53 for incomes ≥$75,000/year, $p < 0.001$; AOR 0.64 for incomes $50,000–$74,999, $p < 0.01$; AOR 0.62 for incomes $20,000–$49,999, $p < 0.001$) were associated with lower odds for past-year drug use. In contrast, respondents reporting past-month use of tobacco (AOR 2.45, $p < 0.001$), alcohol use (not meeting criteria for dependence) (AOR 3.33, $p < 0.001$), alcohol dependence (AOR 10.19, $p < 0.001$), past-year major depressive episode (AOR 1.28, $p < 0.05$), and received mental health treatment in the past year (AOR 1.79, $p < 0.001$) all had higher odds of reporting past-year drug use.

4. Discussion

In this large, nationally representative survey, we estimated the prevalence of past-year drug use among adults without chronic medical conditions and among those with one and two or more chronic medical conditions (i.e., medical multimorbidity). While the prevalence of past-year drug use was lower among adults with medical multimorbidity, compared to adults with no chronic conditions, nearly 12% of adults with multimorbidity reported engaging in past-year drug use. The lower prevalence of drug use among adults with multimorbidity may be due to both the fact that younger adults were more likely to engage in drug use and less likely to have chronic medical conditions, and some of those with multimorbidity may have stopped using drugs because of their morbidities (Naimi et al., 2016). In alcohol studies for example, the "sick quitter" hypothesis proposes that adults may stop drinking due to medical illness, hospitalizations, or declining health, and therefore this group is not included as individuals with alcohol-related problems even though alcohol may have contributed to their illnesses (Shaper et al., 1988). A similar phenomenon is likely occurring in observational studies with drug use including our study. However, we did find in multivariable models that among adults with medical multimorbidity, adults with alcohol dependence, current tobacco use, and adults with mental health problems were more likely to have engaged in past year drug use, and therefore be at particularly high risk for adverse effects of drug use. This emphasizes the importance of including SUDs and polysubstance use disorders to the multimorbidity framework as a distinct clinical profile that necessitates further research to better care for patients with complex multimorbid disease (Bhalla et al., 2017; North et al., 2016).

The intersection of substance use and medical multimorbidity is complex. Drug use has a wide array of physiologic effects on the body, that may negatively impact existing chronic medical disease and complicate its management. For example, cocaine use can impact both the cardiovascular and cerebrovascular systems that can lead to stroke, disability or sudden death, particularly among adults with pre-existing disease (Center for Substance Abuse Treatment, 2006). Second, substance use can also complicate the clinical management of existing chronic diseases. Studies have shown decreased adherence to antiretroviral therapy among adults with HIV who engage in active substance use (Pozner et al., 2005), and poor medication adherence for adults with psychosis who used cannabis (Nijhawan et al., 2008). This is particularly relevant for adults with medical multimorbidity, who often have complex medication schedules that demand careful monitoring and daily management. In addition, the complicated medical care that adults with medical multimorbidity face places them at risk for medication management mistakes as well as adverse drug effects and interactions (Schoeler et al., 2017). This emphasizes the importance of substance use screening for adults with chronic conditions. In addition, since many adults in SUD treatment often have fragmented primary care (Gourevitch et al., 2007), it is also important for SUD treatment providers to screen and ensure medical comorbidities are being managed.

In our study sample, cannabis was the most commonly used drug among adults with chronic disease. This is not surprising since cannabis is the most common drug used in the NSDUH study sample and given more positive attitudes and policies related to cannabis use (Flaherty et al., 2000; Gallup, 2018). Cannabis has been used and studied for medical treatment of chronic diseases including HIV, multiple sclerosis, chronic pain, seizure disorder, and other mental health disorders (National Institute on Drug Abuse [NIDA], 2018). Although this study cannot distinguish between medical use versus recreational use of cannabis, using cannabis for these types of conditions may partially explain its high prevalence use among adults with chronic disease (both

Table 3
Correlates of past-year substance use among adults with medical multimorbidity[a] – United States 2012–2014.

Characteristic	OR	(95% CI)	AOR	(95% CI)
Age group				
18–34	1.00		1.00	
35–49	0.39‖	(0.34, 0.44)	0.57‖	(0.48, 0.69)
50–64	0.25‖	(0.21, 0.29)	0.46‖	(0.37, 0.57)
≥65	0.06‖	(0.04, 0.08)	0.17‖	(0.11, 0.25)
Sex				
Male	1.00		1.00	
Female	0.68‖	(0.60, 0.77)	0.52‖	(0.45, 0.61)
Race/ethnicity				
Non-Hispanic White	1.00		1.00	
Non-Hispanic African American	0.85	(0.69, 1.06)	0.71‡	(0.55, 0.92)
Hispanic	1.21	(0.94, 1.55)	0.94	(0.70, 1.26)
Non-Hispanic Asian	0.38§	(0.22, 0.66)	0.48‡	(0.26, 0.88)
Other	1.54‡	(1.08, 2.18)	1.12	(0.70, 1.81)
Education				
< High school	1.00		1.00	
High school	0.86	(0.68, 1.09)	0.81	(0.61, 1.09)
Some college	1.13	(0.93, 1.38)	1.08	(0.83, 1.41)
College or more	0.81	(0.65, 1.01)	1.08	(0.81, 1.44)
Total family income				
< $20,000	1.00		1.00	
$20,000–$49,999	0.57‖	(0.48, 0.67)	0.62‖	(0.50, 0.76)
$50,000–$74,999	0.60§	(0.45, 0.80)	0.64§	(0.47, 0.88)
≥$75,000	0.47‖	(0.36, 0.61)	0.45‖	(0.32, 0.63)
Marital status				
Never married	1.00		1.00	
Widowed	0.13‖	(0.09, 0.19)	0.57‡	(0.33, 0.98)
Divorced or separated	0.50‖	(0.41, 0.60)	0.80	(0.62, 1.04)
Married	0.23‖	(0.20, 0.27)	0.49‖	(0.39, 0.62)
Tobacco use				
Past month use	4.57‖	(3.95, 5.29)	2.45‖	(2.05, 2.92)
Alcohol use				
Past year alcohol use, but not dependence	3.96‖	(3.21, 4.90)	3.33‖	(2.62, 4.23)
Past year dependence	22.98‖	(17.26, 30.59)	10.19‖	(6.96, 14.94)
Overall health				
Fair/poor	1.00		1.00	
Good	0.86	(0.71, 1.04)	0.97	(0.65, 1.46)
Very good	0.85	(0.71, 1.03)	0.97	(0.76, 1.23)
Excellent	0.89	(0.65, 1.21)	0.97	(0.77, 1.22)
Mental health				
Past year major depressive episode[b]	2.94‖	(2.49, 3.47)	1.28‡	(1.02, 1.61)
Past year anxiety	2.78‖	(2.39, 3.24)	1.22	(0.95, 1.58)
Received mental health treatment in past year	2.48‖	(2.13, 2.90)	1.79‖	(1.40, 2.30)

[a] Multimorbidity defined as 2 or more of the following: asthma, bronchitis, cirrhosis of the liver, diabetes, heart disease, hepatitis, hypertension (high blood pressure), lung cancer, HIV/AIDS, sleep apnea, stroke, and ulcers.
[b] Based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.
‡ $p < 0.05$.
§ $p < 0.01$.
‖ $p < 0.001$.

self-medicated or prescribed in states where it is legal) (NIDA, 2018). The risks of cannabis have not been well-documented, particularly among older adults with medical multimorbidity who may be at higher risk for negative cardiovascular, pulmonary, and cognitive effects of cannabis use (Han and Moore, 2018). Further study is needed to better assess the benefits and risks of cannabis use for specific chronic diseases and overall use by adults with medical multimorbidity.

The statistically significant correlates of past-year drug use among adults with medical multimorbidity identified in this study include younger age, male sex, low family income (< $20,000), current tobacco use, alcohol use and alcohol dependence, having had a major depressive episode, and having received mental health treatment. The demographic findings are similar to the overall results of NSDUH among the general adult population for illegal drug use including cannabis, such as adults with younger age and male sex having higher rates of use (SAMHSA, 2018). However, our results are novel in that they identify a potentially very high-risk population of adults with the combination of medical multimorbidity with polysubstance use (drug, alcohol, and/or tobacco use) and/or mental health disorders. The strong association we found with alcohol dependence with concurrent drug use among adults with medical multimorbidity is alarming. Unhealthy alcohol use itself can cause, exacerbate, and complicate the management of several chronic medical diseases (Park and Wu, 2017), and therefore the combination of illegal drug use with alcohol use, especially if used concurrently, can be particularly dangerous for adults with existing chronic medical conditions. Further, the co-occurrence of substance use and SUD with mental health illnesses are well documented (National Institute of Alcohol Abuse and Alcoholism, 2000), and interventions for addressing patients with co-occurring conditions have been developed and studied (Chapman et al., 2005). The added mental health comorbidity is particularly important as one recent study of 843,584 veterans in the VA system who had at least three visits to a mental health clinic found 30.6% had co-occurring psychiatric and SUDs (Bhalla et al., 2017). The added burden of polysubstance use along with mental health problems highlights the need for a syndemic framework for caring for patients with compound multimorbidity, where the focus is how multiple health conditions are adversely affected by behavioral, psychiatric, biological, and social conditions

(Bhugra and Ventriglio, 2017; Perry et al., 2015). The use of the syndemic framework can help identify intervention strategies to reduce harms and improve the management of chronic disease for adults with medical multimorbidity, polysubstance use, and mental health disorders. In practice, one approach using this framework could include the integration of primary care and chronic disease management into SUD and mental health treatment settings and vice-versa.

There are important limitations to this study. First, the NSDUH responses are based on self-report and thus are subject to both recall and social-desirability bias; although the survey attempts to limit the latter via ACASI (SAMHSA, 2018). Second, the NSDUH does not assess when a respondent first experienced or was diagnosed with a chronic medical disease, but asks only for lifetime prevalence. Therefore, participants may have had a chronic medical condition years before being surveyed and that condition may have been resolved and not overlap with past-year drug use. However, most of the conditions queried (i.e., hypertension, sleep apnea, heart disease, cirrhosis, stroke) tend to be lifelong. In addition, while the specific chronic diseases chosen in the NSDUH study design were based on expert opinion of medical diseases that are often related to substance use (SAMHSA, 2018), it does not include many chronic medical diseases that are often asked in clinical research and epidemiological studies to understand the burden of chronic disease in specific populations. It also does not specify "heart disease" further, thus this could include a wide range of cardiac diseases. Therefore, the generalizability of this study is limited to the specific chronic diseases asked of this study sample and how it was asked. Also, assessing DSM SUD criteria via surveys can also be limited as these are not full diagnostic interviews. Finally, our study classifies users of drugs if the individual used in the past-year and therefore does not distinguish between one-time use versus more frequent use, which may potentially have different risks and consequences. To help address this we did include substance use disorder in estimating substance use among adults with chronic diseases.

5. Conclusions

This study estimates the use of drugs by adults with medical multimorbidity and highlights areas that need to be better explored. Adults with multimorbidity should be screened for substance use to identify and treat unhealthy use, which can impact chronic disease. Further study is needed to better delineate the risks and harms of specific drug use not only on individual chronic diseases, but on individuals who live with and manage multiple chronic conditions.

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Conflict of interest

The authors declare no conflict of interest.

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