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Nonadherence to Any Prescribed Medication Due to Costs Among Adults with HIV Infection — United States, 2016–2017

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The United States spends more per capita on prescription drugs than do other high-income countries (*1*). In 2017, patients paid 14% of this cost out of pocket (*2*). Prescription drug cost-saving strategies, including nonadherence to medications due to cost concerns, have been documented among U.S. adults (*3*) and can negatively affect morbidity and, in the case of persons with human immunodeficiency virus (HIV) infection, can increase transmission risk (*4*,*5*). However, population-based data on prescription drug cost-saving strategies among U.S. persons with HIV are lacking. CDC's Medical Monitoring Project* analyzed cross-sectional, nationally representative, surveillance data on behaviors, medical care, and clinical outcomes among adults with HIV infection. During 2016–2017, 14% of persons with HIV infection used a prescription drug cost-saving strategy for any prescribed medication, and 7% had cost saving–related nonadherence. Nonadherence due to prescription drug costs was associated with reporting an unmet need for medications from the Ryan White AIDS Drug Assistance Program (ADAP), not having Medicaid coverage, and having private insurance. Persons who were nonadherent because of cost concerns were more likely to have visited an emergency department, have been hospitalized, and not be virally suppressed. Reducing barriers to ADAP and Medicaid coverage, in addition to reducing medication costs for persons with private insurance, might help to decrease nonadherence due to cost concerns and, thus contribute to improved viral suppression rates and other health outcomes among persons with HIV infection.

The Medical Monitoring Project uses a two-stage sample design: 1) states and territories and 2) persons with a diagnosis of HIV infection. Data were collected using face-to-face or telephone interviews and medical record abstraction during June 2016–May 2017. Data were weighted for unequal selection probabilities and nonresponse. Using data from 3,948 persons taking prescription drugs, the prevalence of prescription drug cost-saving strategies among U.S. adults with HIV with accompanying 95% confidence intervals (CIs) was estimated overall and by selected sociodemographic characteristics. Differences in clinical outcomes between those who did and did not have prescription drug cost saving–related nonadherence were also assessed. Prevalence ratios with predicted marginal means were used to evaluate significant ($p<0.05$) differences between groups. SAS software (version 9.4; SAS Institute) was used to conduct all analyses.

* https://www.cdc.gov/hiv/statistics/systems/mmp/index.html.

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Persons taking prescription drugs were asked about their use of six cost-saving strategies over the past 12 months: 1) asking a doctor for a lower-cost medication, 2) buying prescription drugs from another country, 3) using alternative therapies, 4) skipping doses, 5) taking less medicine, and 6) delaying filling a prescription because of cost. Interviewees were asked about all prescription drugs, not solely antiretroviral medications. Cost saving–related nonadherence was defined as using any of the latter three strategies (*3*). Persons who reported needing but not receiving medications from ADAP were categorized as having an unmet need for ADAP. All examined covariates were self-reported, except viral suppression and care engagement, which were based on medical record abstraction. All were measured over the previous 12 months except where otherwise noted.

Overall, approximately 14% (95% CI = 12–15) of U.S. adults with HIV used any medication cost-saving strategy, including 7% (95% CI = 6–8) who reported cost saving–related nonadherence; among this group, 4% (95% CI = 3–5) skipped doses, 4% (95% CI = 3–5) took less medicine, and 6% (95% CI = 5–7) delayed a prescription. In addition, 9% (95% CI = 7–10) asked a doctor for lower-cost medicine, 1% (95% CI = <1–1) bought drugs from another country, and 2% (95% CI = 2–3) used alternative medicine. Cost saving–related nonadherence was not associated with age, race/ethnicity, gender, homelessness, or time since HIV diagnosis (Table 1). Household income above the poverty level was associated with nonadherence due to prescription drug costs (8% versus 5%). Nonadherence due to prescription drug costs was higher among persons with a disability (9%) than among those with no disability (5%). Among those with health insurance, cost saving–related nonadherence was more likely among persons with private insurance (8%) than among those who did not have private insurance (6%) and was less likely among those with Medicaid (5%) than among those who did not have Medicaid (8%). Persons who had an unmet need for medications from ADAP were approximately five times as likely to be nonadherent because of cost (32%) than were those who received ADAP (7%, prevalence ratio = 5).

Persons with cost saving–related nonadherence were also less likely to be virally suppressed at their last viral load test (64%) and at all tests during the past year (55%) than were those without cost saving–related nonadherence (76% and 68%, respectively) (Table 2). Nonadherence due to prescription drug costs was also associated with lower likelihood of HIV care engagement and higher numbers of emergency department visits and hospitalizations.

Discussion

In this analysis, nonadherence to any prescribed medication due to costs was associated with lack of recent and sustained HIV viral suppression. Addressing financial barriers to antiretroviral therapy (ART) adherence might improve levels of viral suppression, which is central to ending the HIV epidemic in this country (*6*). Cost saving–related nonadherence was not associated with race but was associated with having a household income above the poverty level. Persons with incomes above the

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TABLE 1. Prevalence of nonadherence to any prescribed medication due to costs among persons with human immunodeficiency virus (HIV) infection who were taking prescription medications (N = 3,948), by sociodemographic characteristics — Medical Monitoring Project, 2016–2017

Characteristic*	Cost savings–related nonadherence		Prevalence ratio (95% CI)	P-value
	No.†	% (95% CI)§		
Total	**252**	**7.0 (5.8–8.3)**	—	—
Age group (yrs)				0.91
18–39	57	7.1 (4.9–9.3)	1.1 (0.7–1.7)	
40–49	60	7.6 (4.6–10.5)	1.1 (0.7–2.0)	
≥50	135	6.7 (4.5–8.9)	Reference	
Race/Ethnicity				0.05
White, non-Hispanic	97	8.7 (6.9–10.4)	1.5 (0.8–2.6)	
Black, non-Hispanic	97	6.2 (4.8–7.6)	1.0 (0.6–1.9)	
Hispanic or Latino	37	5.9 (2.6–9.3)	Reference	
Other/Multiracial¶	21	8.2 (4.9–11.6)	1.4 (0.8–2.6)	
Gender				0.44
Male	180	6.9 (5.4–8.4)	Reference	
Female	70	7.8 (5.8–9.7)	1.1 (0.8–1.5)	
Education				0.19
<High school	29	4.8 (2.7–6.8)	Reference	
High school diploma or equivalent	52	6.5 (3.9–9.2)	1.4 (0.8–2.4)	
>High school	171	7.9 (6.0–9.9)	1.7 (1.0–2.9)	
Poverty level**				<0.01
Above poverty level	155	8.3 (6.5–10.2)	1.6 (1.2–2.1)	
At or below poverty level	78	5.3 (4.0–6.7)	Reference	
Homeless				0.21
Yes	29	9.1 (5.9–12.2)	1.3 (0.9–2.0)	
No	223	6.9 (5.5–8.2)	Reference	
Years since HIV diagnosis				0.92
<5	36	6.7 (4.7–8.7)	Reference	
5–9	52	7.4 (4.9–9.8)	1.1 (0.7–1.7)	
≥10	164	7.1 (5.3–8.8)	1.1 (0.7–1.6)	
Any disability††				<0.01
Yes	156	9.3 (7.1–11.4)	1.8 (1.4–2.5)	
No	96	5.1 (3.8–6.3)	Reference	
HIV disease stage 3				0.63
Yes	154	6.8 (5.1–8.5)	Reference	
No	98	7.4 (5.5–9.3)	1.1 (0.8–1.5)	
Any private insurance among insured				0.01
Yes	109	8.3 (6.6–10.1)	1.5 (1.1–2.0)	
No	109	5.7 (4.1–7.2)	Reference	
Any Medicaid coverage among insured				<0.01
Yes	89	5.0 (4.0–5.9)	Reference	
No	131	8.4 (6.0–10.8)	1.7 (1.2–2.4)	
Any Medicare coverage among insured				0.22
Yes	82	7.8 (5.2–10.4)	Reference	
No	138	6.3 (5.1–7.5)	0.8 (0.6–1.1)	
Any Ryan White HIV/AIDS Program coverage				0.70
Yes	122	6.7 (5.3–8.0)	Reference	
No	121	7.0 (5.2–8.9)	1.1 (0.8–1.4)	
Use of AIDS Drug Assistance Program (ADAP)				<0.01
Received	123	6.7 (5.4–8.0)	Reference	
Needed but did not receive	29	31.5 (16.2–46.8)§§	4.7 (2.8–7.7)	
Did not need or receive	95	5.9 (4.3–7.5)	0.9 (0.7–1.2)	

Abbreviations: AIDS = acquired immunodeficiency syndrome; CI = confidence interval.
* All variables assessed during the 12 months before the survey; all data were self-reported.
† Numbers are unweighted.
§ Percentages and corresponding CIs are weighted percentages.
¶ Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, or multiple races.
** Poverty guidelines as defined by the U.S. Department of Health and Human Services.
†† Self-reported problems with hearing, vision, cognition, mobility, self-care, or independent living.
§§ CI ≥0.30 and should be interpreted with caution.

TABLE 2. Prevalence of clinical characteristics* by nonadherence to any prescribed medication due to costs among persons with human immunodeficiency virus (HIV) who were taking prescription medications (N = 3,948) — Medical Monitoring Project, United States, 2016–2017

Characteristic	No cost savings–related nonadherence		Cost savings–related nonadherence		Prevalence ratio (95% CI)	P-value
	No.†	% (95% CI)§	No.†	% (95% CI)§		
Viral suppression at last test¶,**						
Yes	2,929	75.6 (72.9–78.2)	180	64.3 (54.2–74.5)	0.9 (0.7–1.0)	0.02
No	767	24.4 (21.8–27.1)	72	35.7 (25.5–45.8)	1.5 (1.1–2.0)	0.02
Viral suppression at all tests in past 12 months¶,**						
Yes	2,634	68.2 (65.9–70.5)	152	55.3 (46.4–64.1)	0.8 (0.7–1.0)	<0.01
No	1,062	31.8 (29.5–34.1)	100	44.7 (35.9–53.6)	1.4 (1.1–1.7)	<0.01
HIV care engagement,††**						
Yes	3,155	83.1 (80.8–85.4)	198	68.6 (60.5–76.8)	0.8 (0.7–0.9)	<0.01
No	459	16.9 (14.6–19.2)	51	31.4 (23.2–39.5)	1.9 (1.4–2.5)	
Hospitalizations						
0	3,053	83.2 (81.4–85.1)	186	74.5 (64.0–85.0)	0.9 (0.8–1.0)	0.04
1	365	9.9 (8.7–11.2)	34	14.8 (6.5–23.1)	1.5 (0.9–2.6)	0.17
≥2	269	6.8 (5.7–8.0)	32	10.7 (6.3–15.1)	1.6 (1.1–2.2)	0.01
Emergency department visits						
0	2,327	63.2 (60.9–65.5)	127	50.3 (38.2–62.3)	0.8 (0.6–1.0)	0.03
1	644	17.4 (15.8–19.0)	49	17.4 (12.5–22.4)	1.0 (0.7–1.4)	0.98
≥2	716	19.4 (17.9–21.0)	75	32.3 (22.3–42.2)	1.7 (1.2–2.2)	<0.01

Abbreviation: CI = confidence interval.

* All variables assessed during the 12 months before the survey; all data were self-reported, except where otherwise noted.

† Numbers are unweighted.

§ Percentages and corresponding CIs are weighted percentages.

¶ <200 copies of viral RNA/mL.

** Ascertained by medical record abstraction.

†† Receipt of at least two elements of outpatient HIV care (i.e., encounter with an HIV care provider [could also be self-reported], viral load test result, CD4 test result, HIV resistance test or tropism assay, antiretroviral therapy prescription, *Pneumocystis carinii* pneumonia prophylaxis, or *Mycobacterium avium* complex prophylaxis) at least 90 days apart.

poverty level might not be eligible for the Ryan White HIV/AIDS Program or other assistance programs that can reduce medication costs. Persons who were nonadherent due to prescription drug costs were more likely to seek care at emergency departments and be hospitalized, services that are more costly to the health care system than routine outpatient care. Further, persons who were nonadherent due to prescriptions drug costs were nearly twice as likely to not be engaged in HIV medical care, which might contribute to poorer health outcomes. Increasing the number of persons with HIV infection who are virally suppressed by reducing cost-related barriers to medication adherence might decrease morbidity, mortality, and risk for HIV transmission, as well as promote less costly health care utilization.

Many ART adherence interventions focus on changing patient behaviors, but reducing nonadherence due to costs might require increasing use of programs that provide affordable access to ART and reducing medication costs for the privately insured. Persons with private insurance, those without Medicaid, and those with an unmet need for ADAP were more likely to report nonadherence due to prescription drug costs. The U.S. Department of Health and Human Services has prioritized efforts to lower prescription drug prices and reduce out-of-pocket costs.† Medicaid expansion has reduced the number of persons with HIV infection who are uninsured and is associated with an increase in the number of persons who are taking ART and are virally suppressed (*7*). CDC has provided information for state and local HIV prevention and care programs regarding Medicaid coverage for persons with HIV infection to improve access to care and medications (*8*). Case managers can assist persons with HIV infection obtain needed financial assistance for prescription medications. Cost-sharing assistance programs and patient assistance programs can help lower or eliminate the cost of ART for persons with HIV infection who are privately insured or who are not eligible for Medicaid or ADAP (*9*). The U.S. Department of Health and Human Services, in collaboration with pharmaceutical companies, the National Alliance of State and Territorial AIDS Directors, and community partners, developed a common enrollment tool to facilitate patient applications for patient assistance programs (*10*).

The prevalence of prescription nonadherence due to prescription drug costs among U.S. adults with HIV infection (7%) was similar to that in the U.S. adult population overall in 2013 (8%) (*3*). Fewer persons with HIV infection asked their doctors for a lower cost medication (9%) or used alternative therapies (2%) than did all U.S. adults (15% and 4%, respectively), and the prevalence of buying prescription drugs from another country was similar among persons with HIV infection (1%)

† https://www.hhs.gov/sites/default/files/AmericanPatientsFirst.pdf.

Summary

What is already known about this topic?

U.S. patients pay 14% of prescription drug costs out of pocket. Limited information exists about whether out-of-pocket costs for human immunodeficiency virus (HIV) medication are associated with treatment adherence.

What is added by this report?

Analysis of Medical Monitoring Project data found that approximately 14% of persons with HIV infection used prescription drug cost-saving strategies; 7% had cost saving–related nonadherence, which was associated with unmet need for the Ryan White AIDS Drug Assistance Program (ADAP), not having Medicaid, having private insurance, lower HIV medical care engagement, and lower viral suppression.

What are the implications for public health practice?

Removing barriers to ADAP and Medicaid and reducing private insurance medication costs might decrease cost saving–related nonadherence among persons with HIV infection and improve their health.

and the population overall (2%). Nonadherence to prescribed medications can have negative consequences for all conditions. Because of the strong relationship between HIV infection and unsuppressed viral load, nonadherence among persons with HIV infection leads to increased morbidity, mortality, and risk for HIV transmission (*4*,*5*).

The findings in this report are subject to at least four limitations. First, self-reported information might be subject to biases that can result in measurement error. Recall and social desirability biases might underestimate adherence; therefore, these estimates of cost saving–related nonadherence should be viewed as minimum estimates. Second, the Medical Monitoring Project's person-level response rate was low; however, the data were adjusted for nonresponse, which should reduce bias. Third, unmet need for ADAP was self-reported, and eligibility for ADAP was not assessed. Finally, interviewees were asked about nonadherence to all prescription drugs, not solely antiretroviral medications. However, among all persons taking prescription drugs in this study, 97% were taking ART, thus, these results are likely reflective of cost savings–related ART nonadherence. Nevertheless, adherence to all prescribed medications is important for optimal patient health outcomes.

Adults with HIV in the United States used various strategies to reduce prescriptions drug costs. The prevalence of nonadherence due to prescription drug costs among persons with HIV infection was similar to that among the overall U.S. population and was associated with poorer clinical outcomes, including reduced viral suppression rates and suboptimal medical care utilization. Removing barriers to ADAP and Medicaid coverage, in addition to reducing medication costs for persons with private insurance, could help to decrease nonadherence related to cost concerns, which will contribute to improved health outcomes among persons with HIV infection and decrease HIV transmission.

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Hospitalizations for Inflammatory Bowel Disease Among Medicare Fee-for-Service Beneficiaries — United States, 1999–2017

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Crohn's disease and ulcerative colitis, collectively referred to as inflammatory bowel disease (IBD), are conditions characterized by chronic inflammation of the gastrointestinal tract. The incidence and prevalence of IBD is increasing globally, and although the disease has little impact on mortality, the number of older adults with IBD is expected to increase as the U.S. population ages (*1*). Older adults with IBD have worse hospitalization outcomes than do their younger counterparts (*2*). CDC analyzed Medicare Provider Analysis and Review (MedPAR) data to estimate IBD-related hospitalization rates and hospitalization outcomes in 2017 among Medicare fee-for-service beneficiaries aged ≥65 years, by selected demographics and trends in hospitalization rates and by race/ethnicity during 1999–2017. In 2017, the age-adjusted hospitalization rate for Crohn's disease was 15.5 per 100,000 Medicare enrollees, and the IBD-associated surgery rate was 17.4 per 100 hospital stays. The age-adjusted hospitalization rate for ulcerative colitis was 16.2 per 100,000 Medicare enrollees, and the surgery rate was 11.2 per 100 stays. During 1999–2017, the hospitalization rate for both Crohn's disease and ulcerative colitis decreased among non-Hispanic white (white) beneficiaries, but not among non-Hispanic black (black) beneficiaries. Health care utilization assessment is needed among black beneficiaries with IBD. Disease management for older adults with IBD could focus on increasing preventive care and preventing emergency surgeries that might result in further complications.

MedPAR data, obtained from the Centers for Medicare & Medicaid Services, contain information on 100% of Medicare beneficiaries who use hospital inpatient services and skilled nursing facilities, including information about admission, discharge, diagnosis, and procedure codes related to a hospital stay.* To estimate IBD-related hospitalization rates and hospitalization outcomes in 2017, IBD-related hospital admissions† based on *International Classification of Diseases, Tenth Edition, Clinical Modification* (ICD-10-CM) principal diagnosis codes (K50 for Crohn's disease and K51 for ulcerative colitis) were used to identify eligible beneficiaries from 50 states and the District of Columbia (DC) who were aged ≥65 years at the time of Medicare enrollment and hospital admission, were continuously enrolled in Medicare Part A, and were not enrolled in a Health Maintenance Organization in 2017. To analyze temporal trends in hospitalization rates by race/ethnicity, ICD-9-CM diagnosis codes (555 for Crohn's disease and 556 for ulcerative colitis) were used for hospitalizations before October 1, 2015, and ICD-10-CM codes for those on or after that date. The age-adjusted hospitalization rate (hereafter referred to as hospitalization rate) was estimated per 100,000 eligible Medicare enrollees§ for 50 states and DC and by selected demographic characteristics. The surgery rate was defined as the number of partial or total resections of the small or large intestine per 100 hospital stays.¶ The 30-day readmission rate was calculated as the number of all-cause readmissions to acute-care, nonfederal hospitals within 30 days of the discharge date associated with the index admission, per 100 hospital stays.** The 30-day mortality rate was defined as the number of all-cause deaths that occurred

* https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareFeeforSvcPartsAB/MEDPAR.

† Hospital admissions were limited to those at short-stay facilities. https://www.resdac.org/cms-data/variables/medpar-short-staylong-staysnf-indicator-code.

§ Direct age adjustment according to 2000 U.S. Standard Population based on two age groups (65–74 years and ≥75 years). https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

¶ Surgery was identified using *International Classification of Diseases, Tenth Edition, Procedure Coding System* involving small or large intestines. Partial resection: 0DB80ZZ, 0DB90ZZ, 0DBA0ZZ, 0DBB0ZZ, 0DBC0ZZ, 0DBE0ZZ, 0DBF0ZZ, 0DBG0ZZ, 0DBH0ZZ, 0DBK0ZZ, 0DBL0ZZ, 0DBM0ZZ, 0DBN0ZZ, 0DBP0ZZ, 0DB83ZZ, 0DB93ZZ, 0DBA3ZZ, 0DBB3ZZ, 0DBC3ZZ, 0DBE3ZZ, 0DBF3ZZ, 0DBG3ZZ, 0DBH3ZZ, 0DBK3ZZ, 0DBL3ZZ, 0DBM3ZZ, 0DBN3ZZ, 0DBP3ZZ, 0DB84ZZ, 0DB94ZZ, 0DBA4ZZ, 0DBB4ZZ, 0DBC4ZZ, 0DBE4ZZ, 0DBF4ZZ, 0DBG4ZZ, 0DBH4ZZ, 0DBK4ZZ, 0DBL4ZZ, 0DBM4ZZ, 0DBN4ZZ, 0DBP4ZZ, 0DB87ZZ, 0DB97ZZ, 0DBA7ZZ, 0DBB7ZZ, 0DBC7ZZ, 0DBE7ZZ, 0DBF7ZZ, 0DBG7ZZ, 0DBH7ZZ, 0DBK7ZZ, 0DBL7ZZ, 0DBM7ZZ, 0DBN7ZZ, 0DBP7ZZ, 0DB88ZZ, 0DB98ZZ, 0DBA8ZZ, 0DBB8ZZ, 0DBC8ZZ, 0DBE8ZZ, 0DBF8ZZ, 0DBG8ZZ, 0DBH8ZZ, 0DBK8ZZ, 0DBL8ZZ, 0DBM8ZZ, 0DBN8ZZ, 0DBP8ZZ; Total resection: 0DT80ZZ, 0DT90ZZ, 0DTA0ZZ, 0DTB0ZZ, 0DTC0ZZ, 0DTE0ZZ, 0DTF0ZZ, 0DTG0ZZ, 0DTH0ZZ, 0DTK0ZZ, 0DTL0ZZ, 0DTM0ZZ, 0DTN0ZZ, 0DTP0ZZ, 0DT84ZZ, 0DT94ZZ, 0DTA4ZZ, 0DTB4ZZ, 0DTC4ZZ, 0DTE4ZZ, 0DTF4ZZ, 0DTG4ZZ, 0DTH4ZZ, 0DTK4ZZ, 0DTL4ZZ, 0DTM4ZZ, 0DTN4ZZ, 0DTP4ZZ, 0DT87ZZ, 0DT97ZZ, 0DTA7ZZ, 0DTB7ZZ, 0DTC7ZZ, 0DTE7ZZ, 0DTF7ZZ, 0DTG7ZZ, 0DTH7ZZ, 0DTK7ZZ, 0DTL7ZZ, 0DTM7ZZ, 0DTN7ZZ, 0DTP7ZZ, 0DT88ZZ, 0DT98ZZ, 0DTA8ZZ, 0DTB8ZZ, 0DTC8ZZ, 0DTE8ZZ, 0DTF8ZZ, 0DTG8ZZ, 0DTH8ZZ, 0DTK8ZZ, 0DTL8ZZ, 0DTM8ZZ, 0DTN8ZZ, 0DTP8ZZ.

** Index admissions were nonfederal, acute-care hospital admissions with Crohn's disease or ulcerative colitis as the principal diagnosis, had a live discharge, and had a routine discharge to home or skilled nursing facility. To ensure the calculation of the complete 30-day readmission, index admissions with discharge date in December 2017 were excluded. Readmissions were defined as all-cause acute admissions in which discharge destinations for the index admission were not against medical advice or expired. Multiple readmissions within the 30-day time frame from one index admission were counted as one readmission. A readmission from a previous index admission could be also be counted as a new index admission if it met the selection criteria for an index admission. https://www.medicare.gov/hospitalcompare/data/30-day-measures.html.

within 30 days of the index admission per 100 hospital stays.[††] All hospitalization outcome rates were calculated with 95% confidence intervals by demographic variables including age group (65–74 and ≥75 years), sex, race/ethnicity (white, black, other [Hispanic, Asian/Pacific Islander, American Indian/Alaska Native, and other], or unknown)[§§] and urban or rural residence of beneficiary.[¶¶] Group differences were determined by Z-test with the significance level set at alpha = 0.05. Trends in hospitalization rates were assessed using a linear regression. All analyses were performed separately for Crohn's disease and ulcerative colitis using SAS Enterprise Guide (version 7.1; SAS Institute).

In 2017, among approximately 30,658,000 eligible Medicare enrollees aged ≥65 years, 4,782 hospital admissions were attributable to Crohn's disease (15.5 per 100,000 Medicare population), and 4,932 were attributable to ulcerative colitis (16.2 per 100,000 Medicare population) (Table). For both diseases, the hospitalization rate was higher among women, whites, and urban residents than among men, blacks, and rural residents. Compared with older beneficiaries (those aged ≥75 years), younger beneficiaries (those aged 65–74 years) had a higher rate of hospitalization for Crohn's disease but a lower rate for ulcerative colitis. Overall, the surgery rate was 17.4 per 100 hospital stays for Crohn's disease and 11.2 per 100 stays for ulcerative colitis. For both diseases, the surgery rate was lower among older beneficiaries, women, and blacks than among their counterparts. The 30-day readmission rate for ulcerative colitis was higher among older beneficiaries, and for Crohn's disease was higher among men than women. The 30-day mortality rates for Crohn's disease and ulcerative colitis were 2.7 and 3.8 per 100 stays, respectively. For both diseases, the 30-day mortality rate was higher among older beneficiaries. The hospitalization rate was generally higher in the Midwest for Crohn's disease and in the Northeast for ulcerative colitis (Figure 1). In each year during 1999–2017 a modest decrease occurred in the hospitalization rate for Crohn's disease overall (0.08 per 100,000 eligible Medicare enrollees, $p = 0.002$) and among whites (0.07, $p = 0.01$), but no significant change among blacks occurred ($p = 0.11$) (Figure 2). In each year during 1999–2017, the hospitalization rate for ulcerative colitis decreased overall (0.31, $p<0.001$) and among whites (0.32, $p<0.001$), with no significant change among blacks ($p = 0.06$).

[††] Hospital admissions were excluded if patients were discharged against medical advice. https://www.medicare.gov/hospitalcompare/data/30-day-measures.html.

[§§] https://www.resdac.org/cms-data/variables/research-triangle-institute-rti-race-code.

[¶¶] Based on 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties. Urban counties include large metro, large fringe metro, medium metro, or small metro. Rural counties include micropolitan and noncore. https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf.

Discussion

During 1999–2017, the overall hospitalization rate for both Crohn's disease and ulcerative colitis decreased among older adults, with a sharper decline in the hospitalization rate for ulcerative colitis. A previous study also reported that the 2013 hospitalization rate for Crohn's disease decreased compared with that in 2003 among adults aged 65–84 and ≥85 years (*3*). The overall decline in hospitalization rates during the current study period was accompanied by the evolution of biologic therapies to treat IBD. A unique geographic pattern of hospitalization rates at the state level was observed for each disease. The geographic variation was similar to that in the previous study, which used the Nationwide Inpatient Sample of adults aged ≥18 years with hospitalizations for any listed diagnosis of Crohn's disease (*3*). In addition, the IBD-related hospitalization rate was higher among beneficiaries who were urban residents than among those who were rural residents. An urban living environment was previously found to be associated with a higher risk of developing IBD, although rural residents might also have limited health care access to receive IBD-related care or diagnosis (*4*).

The current study indicated that hospitalization rates were higher among older Medicare beneficiaries with ulcerative colitis and among younger beneficiaries with Crohn's disease; however, the rate of IBD-associated surgery was lower among older beneficiaries for both conditions. Surgery is indicated in severe cases or for patients who fail to respond to medication. Although the overall IBD-associated surgical rates have declined in recent decades, possibly because of new medication treatment (*5*), in the current analysis, approximately 10% of hospitalizations for ulcerative colitis and nearly 20% of hospitalizations for Crohn's disease still required surgery. The lower surgery rates among older beneficiaries might reflect an increased concern for postoperative complications, mortality, prolonged hospital stay, and hospital-acquired infections among older patients (*2*).

This is the first study to document the temporal trends in IBD-associated hospitalization during the past 2 decades among older adults in United States by race/ethnicity. In contrast to the decreased hospitalization rates for both diseases observed among whites, no significant temporal changes in hospitalization rates among blacks were observed. In addition, in 2017, blacks experienced lower hospitalization rates for both Crohn's disease and ulcerative colitis than did whites. These findings are consistent with those in a previous study in which reported rates of IBD incidence, prevalence, and hospitalization in blacks and Hispanics were lower than were those reported for whites (*6*). However, this previous study also found that the ratio of IBD-associated hospitalizations and mortality to IBD

TABLE. Hospitalizations for inflammatory bowel disease (IBD)* as the principal diagnosis among Medicare fee-for-service beneficiaries,† by age, sex, race/ethnicity, and urban-rural status of residence — United States, 2017

Characteristic	No. of hospitalizations	Hospitalization rate,§ (95% CI)	Surgery rate, ¶,**,†† (95% CI)	30-Day readmission rate,¶,§§ (95% CI)	30-Day mortality rate,¶,¶¶ (95% CI)	Length of stay (days)** geometric mean,*** (95% CI)
Crohn's disease†††						
Total	**4,782**	**15.5 (15.0–15.9)**	**17.4 (16.3–18.4)**	**15.8 (14.5–17.1)**	**2.7 (2.2–3.1)**	**3.9 (3.8–4.0)**
Age group (yrs)						
65–74	2,912	17.1 (16.5–17.7)	19.3 (17.8–20.7)	15.4 (13.7–17.0)	1.7 (1.2–2.1)	3.8 (3.7–3.9)
≥75	1,870	13.7 (13.1–14.4)	14.4 (12.8–16.0)	16.5 (14.3–18.7)	4.2 (3.3–5.1)	4.1 (3.9–4.2)
Sex						
Men	2,001	14.1 (13.5–14.8)	19.0 (17.3–20.8)	17.6 (15.5–19.7)	3.0 (2.3–3.8)	3.8 (3.6–3.9)
Women	2,781	16.7 (16.1–17.3)	16.1 (14.8–17.5)	14.5 (12.7–16.1)	2.4 (1.8–3.0)	4.0 (3.9–4.1)
Race/Ethnicity						
White, non-Hispanic	4,227	16.9 (16.4–17.5)	17.5 (16.4–18.7)	16.1 (14.6–17.5)	2.6 (2.1–3.0)	4.0 (3.9–4.0)
Black, non-Hispanic	250	10.3 (9.0–11.5)	10.8 (7.0–14.6)	14.7 (9.1–20.2)	—§§§	4.2 (4.0–4.5)
Other or unknown¶¶¶	305	8.8 (7.8–9.8)	20.3 (15.8–24.8)	13.1 (8.3–17.7)	—§§§	4.1 (3.8–4.3)
Beneficiary residence****						
Urban	3,938	16.0 (15.5–16.5)	17.0 (15.8–18.2)	16.1 (14.6–17.5)	2.6 (2.1–3.1)	3.9 (3.8–4.0)
Rural	844	13.4 (12.5–14.3)	19.0 (16.3–21.6)	14.5 (11.3–17.7)	3.1 (1.9–4.3)	3.8 (3.7–4.0)
Ulcerative colitis†††						
Total	**4,932**	**16.2 (15.8–16.7)**	**11.2 (10.3–12.1)**	**16.0 (14.6–17.3)**	**3.8 (3.3–4.4)**	**4.1 (4.0–4.2)**
Age group (yrs)						
65–74	2,395	14.1 (13.5–14.6)	15.6 (14.1–17.0)	14.5 (12.7–16.3)	2.1 (1.5–2.7)	4.1 (4.0–4.3)
≥75	2,537	18.6 (17.9–19.4)	7.0 (6.0–8.0)	17.4 (15.5–19.3)	5.5 (4.6–6.4)	4.0 (3.9–4.2)
Sex						
Men	1,872	13.5 (12.9–14.2)	16.9 (15.2–18.6)	17.6 (15.3–19.8)	4.0 (3.1–4.9)	4.2 (4.1–4.4)
Women	3,060	18.4 (17.7–19.0)	7.6 (6.7–8.6)	15.0 (13.4–16.6)	3.7 (3.1–4.4)	4.0 (3.9–4.1)
Race/Ethnicity						
White, non-Hispanic	4,205	17.0 (16.5–17.5)	11.5 (10.6–12.5)	16.0 (14.6–17.4)	4.0 (3.4–4.6)	4.0 (3.9–4.0)
Black, non-Hispanic	325	14.0 (12.4–15.5)	7.1 (4.3–9.9)	18.9 (13.5–24.1)	—§§§	4.2 (4.0–4.5)
Other or unknown¶¶¶	402	12.0 (10.8–13.3)	10.7 (7.7–13.7)	13.2 (8.9–17.4)	—§§§	4.1 (3.8–4.3)
Beneficiary residence****						
Urban	4,110	17.0 (16.5–17.6)	10.8 (9.9–11.8)	16.2 (14.7–17.6)	3.9 (3.3–4.5)	4.1 (4.0–4.2)
Rural	819	13.2 (12.2–14.1)	12.9 (10.6–15.2)	14.9 (11.5–18.1)	3.4 (2.2–4.7)	4.0 (3.8–4.2)

Abbreviation: CI = confidence interval.

* IBD encompasses Crohn's disease and ulcerative colitis.

† The number of eligible Medicare beneficiaries aged ≥65 years in 2017 in the United States was approximately 30,658,000.

§ Hospitalizations per 100,000 Medicare enrollees, age-adjusted to the 2000 U.S. Standard Population aged ≥65 years based on two age groups (65–74 years and ≥75 years), except for age-specific analysis. https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

¶ Per 100 hospital stays.

** The denominator is number of hospital admissions. To calculate surgery rate and geometric mean of length of stay, n = 4,782 for Crohn's disease and n = 4,932 for ulcerative colitis.

†† International Classification of Diseases, Tenth Edition, Procedure Coding System procedure codes involving small and large intestine include partial resection (0DB80ZZ, 0DB90ZZ, 0DBA0ZZ, 0DBB0ZZ, 0DBC0ZZ, 0DBE0ZZ, 0DBF0ZZ, 0DBG0ZZ, 0DBH0ZZ, 0DBK0ZZ, 0DBL0ZZ, 0DBM0ZZ, 0DBN0ZZ, 0DBP0ZZ, 0DB83ZZ, 0DB93ZZ, 0DBA3ZZ, 0DBB3ZZ, 0DBC3ZZ, 0DBE3ZZ, 0DBF3ZZ, 0DBG3ZZ, 0DBH3ZZ, 0DBK3ZZ, 0DBL3ZZ, 0DBM3ZZ, 0DBN3ZZ, 0DBP3ZZ, 0DB84ZZ, 0DB94ZZ, 0DBA4ZZ, 0DBB4ZZ, 0DBC4ZZ, 0DBE4ZZ, 0DBF4ZZ, 0DBG4ZZ, 0DBH4ZZ, 0DBK4ZZ, 0DBL4ZZ, 0DBM4ZZ, 0DBN4ZZ, 0DBP4ZZ, 0DB87ZZ, 0DB97ZZ, 0DBA7ZZ, 0DBB7ZZ, 0DBC7ZZ, 0DBE7ZZ, 0DBF7ZZ, 0DBG7ZZ, 0DBH7ZZ, 0DBK7ZZ, 0DBL7ZZ, 0DBM7ZZ, 0DBN7ZZ, 0DBP7ZZ, 0DB88ZZ, 0DB98ZZ, 0DBA8ZZ, 0DBB8ZZ, 0DBC8ZZ, 0DBE8ZZ, 0DBF8ZZ, 0DBG8ZZ, 0DBH8ZZ, 0DBK8ZZ, 0DBL8ZZ, 0DBM8ZZ, 0DBN8ZZ, 0DBP8ZZ) and total resection (0DT80ZZ, 0DT90ZZ, 0DTA0ZZ, 0DTB0ZZ, 0DTC0ZZ, 0DTE0ZZ, 0DTF0ZZ, 0DTG0ZZ, 0DTH0ZZ, 0DTK0ZZ, 0DTL0ZZ, 0DTM0ZZ, 0DTN0ZZ, 0DTP0ZZ, 0DT84ZZ, 0DT94ZZ, 0DTA4ZZ, 0DTB4ZZ, 0DTC4ZZ, 0DTE4ZZ, 0DTF4ZZ, 0DTG4ZZ, 0DTH4ZZ, 0DTK4ZZ, 0DTL4ZZ, 0DTM4ZZ, 0DTN4ZZ, 0DTP4ZZ, 0DT87ZZ, 0DT97ZZ, 0DTA7ZZ, 0DTB7ZZ, 0DTC7ZZ, 0DTE7ZZ, 0DTF7ZZ, 0DTG7ZZ, 0DTH7ZZ, 0DTK7ZZ, 0DTL7ZZ, 0DTM7ZZ, 0DTN7ZZ, 0DTP7ZZ, 0DT88ZZ, 0DT98ZZ, 0DTA8ZZ, 0DTB8ZZ, 0DTC8ZZ, 0DTE8ZZ, 0DTF8ZZ, 0DTG8ZZ, 0DTH8ZZ, 0DTK8ZZ, 0DTL8ZZ, 0DTM8ZZ, 0DTN8ZZ, 0DTP8ZZ).

§§ 30-day readmission rate was calculated as the number of all-cause readmissions to acute care, nonfederal hospitals within 30 days from the discharge date associated with an index admission per 100 stays. Index admissions were nonfederal acute-care hospital admissions with Crohn's disease or ulcerative colitis as the principal diagnosis, had a live discharge, and had a routine discharge to home or skilled nursing facility. To ensure the calculation of the complete 30-day readmission, index admissions with discharge date in December 2017 were excluded. Readmissions were defined as all-cause acute admissions whose discharge destinations were not against medical advice or expired. Multiple readmissions within the 30-day time frame from one index admission were counted as one readmission. A readmission from a previous index admission could be also counted as a new index admission if it met the selection criteria for an index admission (https://www.medicare.gov/hospitalcompare/data/30-day-measures.html). To calculate 30-day all-cause readmission rate, n = 3,022 for Crohn's disease; n = 3,060 for ulcerative colitis.

¶¶ 30-day mortality rate was defined as number of all-cause deaths occurred within 30 days from IBD-related admissions per 100 hospital stays. Hospitalizations were excluded if patients were discharged against medical advice. More information is available at https://www.medicare.gov/hospitalcompare/data/30-day-measures.html. To calculate 30-day all-cause readmission rate, n = 4,781 for Crohn's disease; n = 4,932 for ulcerative colitis.

*** Geometric mean is the xth root of the product of the length of stay (days) from x patients (x indicates the number of patients), which, because it is not influenced by outliers, is used here rather than arithmetic mean.

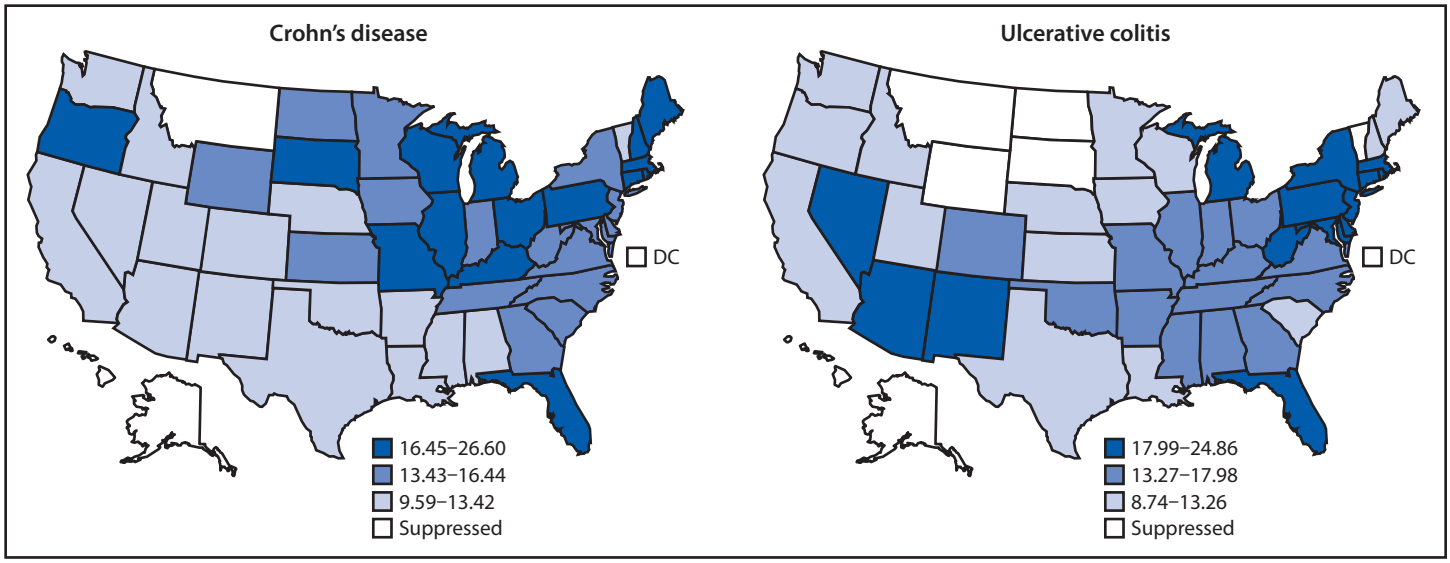
††† *International Classification of Diseases, Tenth Edition, Clinical Modification* diagnosis codes K50 (Crohn's disease) and K51 (ulcerative colitis).

§§§ Data were suppressed according to the cell size suppression (https://www.resdac.org/articles/cms-cell-size-suppression-policy) or if the relative standard error was >0.3.

¶¶¶ Other includes Hispanic, Asian, Native American, and all others.

**** Urban areas include large metro, large fringe metro, medium metro, or small metro. Rural areas include micropolitan and noncore. The definition is based on 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties (https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf).

FIGURE 1. Age-adjusted hospitalization rates*,† for Crohn's disease or ulcerative colitis§ as the principal diagnosis among Medicare fee-for-service beneficiaries, by state — United States, 2017



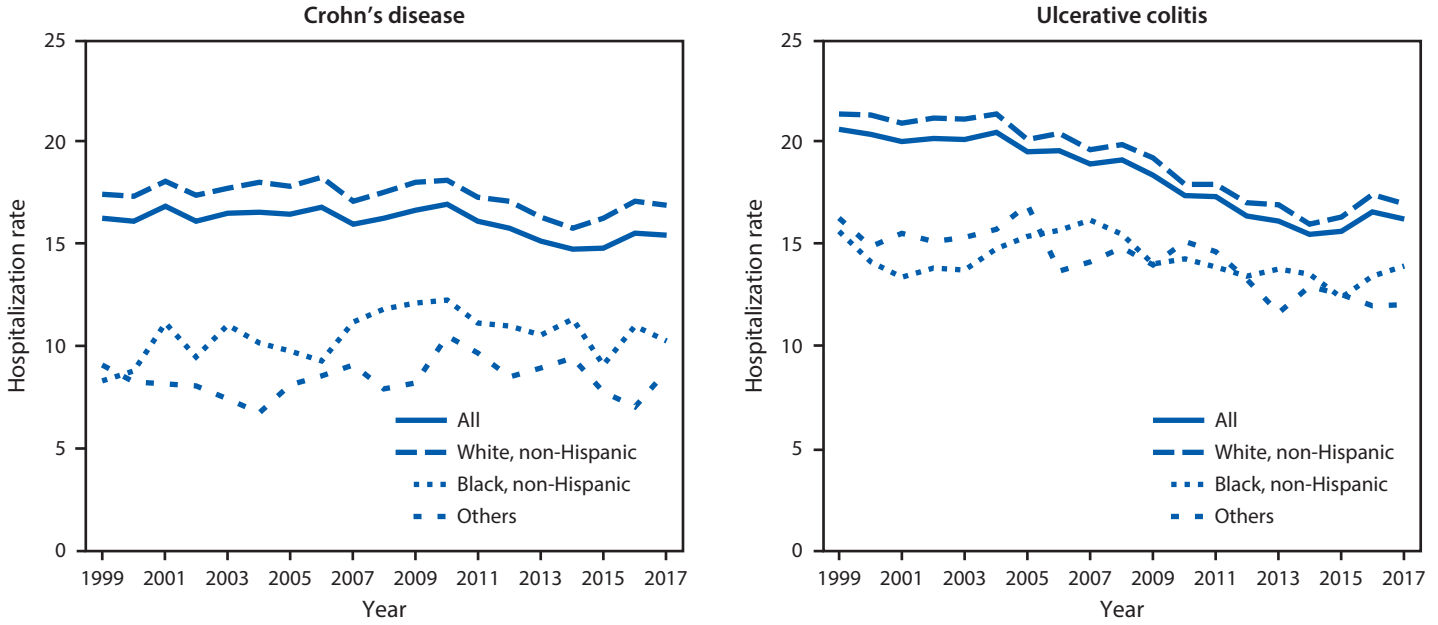
Abbreviation: DC = District of Columbia

* Hospitalizations per 100,000 eligible Medicare enrollees, age-adjusted to the 2000 U.S. standard population aged ≥65 years (https://www.cdc.gov/nchs/data/statnt/statnt20.pdf) based on two age groups (65–74 years and ≥75 years).

† State-level age-adjusted hospitalization rates were categorized into tertiles. Data were suppressed if relative standard errors were >0.3.

§ Crohn's disease and ulcerative colitis, collectively referred to as inflammatory bowel disease, are conditions characterized by chronic inflammation of the gastrointestinal tract.

FIGURE 2. Age-adjusted hospitalization rates*,† for inflammatory bowel disease§ as the principal diagnosis among Medicare fee-for-service beneficiaries, by race/ethnicity — United States, 1999–2017¶



* Hospitalizations per 100,000 eligible Medicare enrollees, age adjusted to the 2000 U.S. standard population aged ≥65 years (https://www.cdc.gov/nchs/data/statnt/statnt20.pdf) based on two age groups (65–74 years and ≥75 years).

† Linear trend p-values were assessed from a linear regression.

§ Inflammatory bowel disease is a term for two conditions (Crohn's disease and ulcerative colitis) that are characterized by chronic inflammation of the gastrointestinal tract.

¶ The conversion from *International Classification of Diseases, Ninth Edition* diagnosis codes to the *International Classification of Diseases, Tenth Edition, Clinical Modification* diagnosis codes occurred on October 1, 2015.

Summary

What is already known about this topic?

The number of older adults with Crohn's disease or ulcerative colitis, collectively referred to as inflammatory bowel disease (IBD), is expected to increase as the U.S. population ages.

What is added by this report?

In 2017, the hospitalization rates for Crohn's disease and ulcerative colitis (approximately 16 hospitalizations per 100,000 Medicare beneficiaries) were higher among urban than rural beneficiaries. Surgery rates for Crohn's disease and ulcerative colitis were 17 and 11 per 100 stays, respectively. During 1999–2017, hospitalization rates for IBD decreased among whites but not among blacks.

What are the implications for public health practice?

Disease management among older adults with IBD could focus on achieving and maintaining remission and preventing IBD-related emergency surgery.

prevalence was higher among blacks than that among whites and Hispanics (*6*). Another study found lower use of biologics or lower adherence to medications among blacks (*7*), which could contribute to the higher ratio of IBD hospitalization to IBD prevalence among this group.

The findings in the report are subject to at least three limitations. First, Medicare data are collected for insurance reimbursement purposes and are not designed for research. The collected data do not include information about health-risk behaviors and additional demographic variables, which limited the ability to study these measures. Second, diagnoses or procedures might be subject to coding errors. Finally, the study population is limited to Medicare fee-for-service beneficiaries. Therefore, the findings might not be generalizable to all U.S. adults aged ≥65 years.

IBD management is challenging because comorbidities and polypharmacy are common among older adults. For older adults, the necessity of surgery should be carefully evaluated based on an individual patient's disease severity and comorbid mental and physical conditions (*8*). If surgery is indicated and performed, early intervention, together with pain control and a proper discharge plan might prevent poor hospitalization outcomes, such as readmissions, and might ultimately reduce health care costs (*9*). In addition, further assessment of health care utilization among blacks with IBD is needed. Optimal multidisciplinary disease management, including outpatient follow-up visits and receiving recommended preventive care such as vaccinations and cancer screening (*10*), is important to maintain remission, improve quality of life, and prevent surgery and hospitalization among the growing population of older adults with IBD.

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Patient Characteristics and Product Use Behaviors Among Persons with E-cigarette, or Vaping, Product Use–Associated Lung Injury — Indiana, June–October 2019

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As of December 4, 2019, a total of 2,291 cases of hospitalized e-cigarette, or vaping, product use–associated lung injury (EVALI) have been reported from 50 states, the District of Columbia, and two U.S. territories (Puerto Rico and the U.S. Virgin Islands) (*1*). State health departments, including the Indiana State Department of Health (ISDH), are working with their local health departments and with CDC, the Food and Drug Administration, and other clinical and public health partners in investigating this outbreak of EVALI. On August 7, 2019, ISDH issued an advisory regarding patients hospitalized in Wisconsin with severe acute lung injury who reported the use of e-cigarette, or vaping, products (*2*); health care providers were requested to notify ISDH of similar cases. On August 8, 2019, ISDH received reports of five similar cases among Indiana residents. Suspected cases EVALI reported to ISDH were investigated further only among patients who required hospitalization. Established case definitions were used to classify cases.* Medical record abstractions and patient interviews were completed using nationally standardized forms to ascertain patient characteristics, medical care received, and product-use behaviors.

A total of 127 suspected EVALI cases were reported to ISDH during August 8–October 28, 2019; among these, 97 (76%) patients met the confirmed (41; 42%) or probable (56; 58%) case definitions and were hospitalized, including three (3%) who died. Because of staffing constraints, medical record abstractions could only be completed for 54 (56%) patients; among these, the median age was 26 years (range = 16–68 years), and 38 (70%) were male (Table 1). Among the patients for whom information on medical care was available, 13 of 51 (25%) were admitted to an intensive care unit, 34 of 52 (65%) were treated with steroids, and seven of 50 (14%) required intubation and mechanical ventilation. Among the 54 patients with available information documenting preexisting conditions, nine (14%) had asthma, 12 (22%) had depression, and 14 (26%) had anxiety.

Interviews were successfully completed for 29 (30%) of 97 patients (Table 2); 33 (34%) patients were lost to follow-up or refused to be interviewed. Among the 29 patients interviewed, seven (24%) reported using only tetrahydrocannabinol (THC)-containing products, seven (24%) reported using only nicotine-containing products, 13 (45%) reported using both, and two (7%) reported using flavored products containing neither THC nor nicotine. A total of 20 (69%) reported using any THC-containing product; among those with available information on product use, eight of 15 (53%) reported using the product daily, 14 of 19 (74%) reported using products labeled "Dank Vapes," and 10 of 20 (50%) obtained the products from a friend or other acquaintance.

TABLE 1. Characteristics of patients hospitalized with e-cigarette, or vaping, product use–associated lung injury ascertained from medical record abstraction (N = 54) — Indiana, June–October 2019

Patient characteristic (no. with available information)	No. (%*)
Sex (54)	
Male	38 (70)
Female	16 (30)
Age group (yrs) (54)	
13–17	7 (13)
18–29	27 (50)
30–39	12 (22)
40–49	3 (6)
50–59	3 (6)
≥60	2 (4)
Symptoms on admission (54)	
Shortness of breath	48 (89)
Cough	44 (81)
Chest pain	17 (31)
Nausea	27 (50)
Vomiting	27 (50)
Diarrhea	15 (28)
Abdominal pain	12 (22)
Weight loss	8 (15)
Sweating	11 (20)
Preexisting conditions (54)	
Asthma	9 (17)
COPD	2 (4)
Depression	12 (22)
Anxiety	14 (26)
Medical care received	
Antibiotics (51)	44 (86)
Steroids (52)	34 (65)
Bronchoscopy (44)	13 (30)
Lung biopsy (45)	7 (16)
ICU admission (51)	13 (25)
Intubation and mechanical ventilation (50)	7 (14)

Abbreviations: COPD = chronic obstructive pulmonary disease; ICU = intensive care unit.
* Percentages rounded and therefore might not sum to 100% in each category.

* https://www.cdc.gov/tobacco/basic_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf.

TABLE 2. Product use preferences and behaviors of patients hospitalized with e-cigarette, or vaping product use–associated lung injury identified through patient interview (N = 29) — Indiana, June–October 2019

Product preference/behavior (no. with available information	No. (%*)
Type of product (29)	
THC-containing only	7 (24)
Nicotine-containing only	7 (24)
Both THC- and nicotine-containing	13 (45)
Neither THC- nor nicotine-containing	2 (7)
Nicotine-containing brands used (19)	
Juul	8 (42)
Njoy	2 (11)
Nicotine-containing product use frequency (19)	
Daily	16 (84)
2–3 times per week	2 (11)
Monthly or less	1 (5)
THC-containing brands used (19)	
Dank Vapes	14 (74)
Chronic Carts	2 (11)
Exotic Carts	2 (11)
THC-containing product use frequency (15)	
Daily	8 (53)
2–3 times per week	3 (20)
Monthly or less	4 (27)
Source of THC-containing products (20)	
Friend or acquaintance	10 (50)
Online	1 (5)

Abbreviation: THC = tetrahydrocannabinol.
* Percentages rounded and therefore might not sum to 100% in each category.

The percentage of Indiana EVALI patients who reported using THC-containing products (69%) was lower than that reported by patients in Utah (92%), Illinois and Wisconsin (80%), and nationally (80%) (*1*–*3*). Reported concurrent use of THC-containing and nicotine-containing products in Indiana (45%) was also slightly lower than that reported nationally (52%) (*1*). Further, nearly one third (31%) of Indiana patients reported using products that did not contain THC. These findings need to be investigated to determine whether Indiana patients might have underreported THC use or whether use of multiple product types might cause EVALI. Results of this investigation of Indiana EVALI patients were consistent with findings from Illinois that frequently using THC-containing products and obtaining these products through personal contacts has been associated with EVALI (*4*). In addition, the high proportion of reported use of Dank Vape products might be important, because these products are largely counterfeit (*4*).

The findings in this report are subject to at least four limitations. First, medical record abstractions were completed for one half of EVALI patients in Indiana, and only one third were interviewed, which might result in selection bias and inaccurate estimates of patient characteristics and product use patterns. Second, preexisting conditions and details of medical care were not consistently documented in medical records. Therefore, percentages reported here could be underestimates. Third, because THC-containing products are illegal in Indiana, use of these products might be underreported for fear of legal repercussions or perceived stigma. Finally, only hospitalized cases in Indiana were investigated, potentially leading to bias related to the severity of cases.

The specific cause, or causes, of EVALI has not yet been determined. Vitamin E acetate, frequently used as a thickening agent in THC-containing products, has been detected in bronchoalveolar lavage samples from 29 EVALI patients in 10 states and five EVALI patients in Minnesota (*5*,*6*). However, it is possible that more than one compound or ingredient could be the cause, and evidence is not yet sufficient to rule out contributions of other toxicants to EVALI. CDC recommends not using e-cigarette, or vaping, products containing THC, especially those obtained from informal sources such as friends, family, or in-person or online dealers (*1*). Because the specific cause or causes of lung injury are not yet known, persons should consider refraining from use of all e-cigarette, or vaping, products (*1*). Youths, young adults, or women who are pregnant should never use e-cigarette, or vaping, products (*1*).

Summary

What is already known about this topic?

As of December 4, 2019, 2,291 U.S. persons have been hospitalized with cases of e-cigarette, or vaping, product use–associated lung injury (EVALI). Among those with available data, 80% reported using products containing tetrahydrocannabinol (THC).

What is added by this report?

During August 8–October 28, 2019, 97 patients in Indiana were hospitalized with confirmed or probable cases of EVALI. Interviews were completed for 29 patients; among these, 69% reported using THC-containing products.

What are the implications for public health practice?

The percentage of Indiana EVALI patients reporting THC use was low compared with that reported for all U.S. EVALI patients. This might be due to underreporting of THC use but could also suggest that EVALI is not exclusively associated with THC use.

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Morbidity and Mortality Weekly Report

Update: Demographic, Product, and Substance-Use Characteristics of Hospitalized Patients in a Nationwide Outbreak of E-cigarette, or Vaping, Product Use–Associated Lung Injuries — United States, December 2019

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On December 6, 2019, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

CDC, the Food and Drug Administration (FDA), state and local health departments, and public health and clinical stakeholders continue to investigate a nationwide outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI) (*1*). This report updates demographic and self-reported product-use and substance-use characteristics of hospitalized EVALI patients reported to CDC from available interview or medical record abstraction data. As of December 3, 2019, all 50 states, the District of Columbia (DC), and two U.S. territories (Puerto Rico and U.S. Virgin Islands) reported 2,291 patients hospitalized with EVALI. A total of 48 (2% of total reported cases) deaths occurred in 25 states and DC. Median patient age was 24 years, 67% were male, and the largest number of weekly hospitalized cases occurred during the week of September 15, 2019; weekly hospitalized cases since then have steadily declined. Among all hospitalized EVALI patients reported to CDC weekly, the percentage of recent cases (patients hospitalized within the preceding 3 weeks) declined from 58% reported November 12 to 30% reported December 3. Overall, 80% of hospitalized EVALI patients reported using tetrahydrocannabinol (THC)-containing e-cigarette, or vaping, products. "Dank Vapes," a class of largely counterfeit THC-containing products of unknown origin, were the most commonly reported THC-containing branded products nationwide and among all major U.S. Census regions. However, regional differences in THC-containing product use were noted; TKO and Smart Cart brands were more commonly reported by patients in the West region compared with other regions. Because most patients reported using THC-containing products before symptom onset, CDC recommends that persons should not use e-cigarette, or vaping, products that contain THC. The nationwide diversity of THC-containing products reported by patients suggests it is unlikely a single brand is responsible for the EVALI outbreak, and regional differences in THC-containing products might be related to product sources. Although it appears that vitamin E acetate is associated with EVALI, many substances and product sources are being investigated, and there might be more than one cause. Therefore, while the investigation continues, persons should consider refraining from the use of all e-cigarette, or vaping, products.

CDC has worked with state health departments and a task force formed by the Council of State and Territorial Epidemiologists to develop and disseminate surveillance case definitions* and data collection tools† to monitor and track cases beginning in August 2019. States and jurisdictions voluntarily report the number of confirmed and probable hospitalized EVALI cases and all EVALI-associated deaths to CDC on a weekly basis. This report is limited to data on hospitalized EVALI patients and all EVALI-associated deaths reported to CDC as of December 3, 2019 (*2*), and updates patient demographic characteristics, the number and diversity of self-reported substances, and brands used in e-cigarette, or vaping, products. Distribution of THC-containing brands is reported nationally and by U.S. Census region.§ 2018 U.S. Census population estimates were used to calculate rates (hospitalized EVALI cases per 1 million population) by state.¶ Because of the time required to investigate cases, weekly reports to CDC include recent EVALI cases (patients hospitalized within the preceding 3 weeks) and past EVALI cases (those hospitalized earlier). To assess the recent trajectory of the EVALI outbreak, this report examined the percentage of all hospitalized EVALI patients reported weekly who had been hospitalized within the preceding 3 weeks.

As of December 3, 2019, all 50 states, DC, Puerto Rico, and the U.S. Virgin Islands reported 2,291 hospitalized EVALI

* https://www.cdc.gov/tobacco/basic_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf.

† https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/pdfs/National-Case-Report-Form-v01.pdf.

§ *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South:* Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Puerto Rico and U.S. Virgin Islands were included in the South region.

¶ https://www.census.gov/.

cases to CDC (Table). Overall, a total of 48 (2% of total reported cases) EVALI-associated deaths occurred in 25 states and DC, which include one nonhospitalized case and two cases with unknown hospitalization status. Among hospitalized EVALI patients for whom data were available, 67% were male, and the median age was 24 years (range = 13–77 years); 78% of patients were aged <35 years and 16% were <18 years. Most EVALI patients were non-Hispanic white (75%), and 16% were Hispanic. Among the 48 deaths, 54% of patients were male, and the median age was 52 years (range = 17–75 years).

Since February 2019, the largest number of hospitalized EVALI patients (217) was reported during the week of September 15, 2019 (Figure 1). Since September 15, there has been a steady decline in hospitalized EVALI patients reported weekly to CDC. Among all hospitalized EVALI patients reported weekly to CDC by states since November 5, 2019, the percentage of recent EVALI cases declined from 58% reported November 12 to 30% reported December 3. Although EVALI cases have been reported in all states, DC, and two US territories, population-based prevalence rates varied widely across states (Figure 2).

As of December 3, among 1,782 hospitalized EVALI patients with information on substances used in e-cigarette, or vaping, products in the 3 months preceding symptom onset, 80% and 35% reported any and exclusive use, respectively, of THC-containing products (Table). This compared with 54% and 13% of hospitalized EVALI patients who reported any and exclusive use, respectively, of nicotine-containing products and 12% and 1% who reported any and exclusive use, respectively, of cannabidiol (CBD)-containing products. Among 214 hospitalized patients who reported using CBD-containing products, 80% also reported using THC-containing products. Among 770 hospitalized patients who reported using THC-containing products and had frequency reported, 75% reported using THC-containing products daily.

Among hospitalized EVALI patients who reported using THC-containing e-cigarette, or vaping, products and had complete data on product use, 482 reported using 152 different products (861 observations; median = 2; range = 1–25). Dank Vapes, the most frequently reported product brand, was used by 56% of hospitalized EVALI patients nationwide (Figure 3). TKO (15%), Smart Cart (13%), and Rove (12%) were the next most commonly reported product brands. When stratified by U.S. Census regions, Dank Vapes remained the most commonly reported THC-containing product in all regions and was reported by >60% of hospitalized EVALI patients in the Northeast and South regions. Regional differences were seen in reported use of many products, including Smart Cart, which was reportedly used by a higher proportion of hospitalized EVALI patients in the West (24%) compared with those in the South (14%), Midwest (14%) and Northeast (6%). TKO was reported by more than twice as many hospitalized EVALI patients in the West (29%) as in the Northeast (14%), Midwest (12%), and South (2%) regions.

Discussion

This report updates the characteristics of hospitalized EVALI patients, as well as those who died, and provides the first national data on the number and diversity of THC-containing products used. Among hospitalized EVALI patients as of December 3, 2019, the age, sex, and race distributions were similar to those reported previously (*1*–*3*), with a predominance of patients being young adults, male, and white. The persistent decline in number of cases reported each week since mid-September, coupled with the declining percentage of recent cases reported weekly, suggest that the outbreak may have peaked around September 15. However, states continue to report new cases, including deaths, to CDC on a weekly basis. Therefore, this investigation remains ongoing, and it is important for states to remain vigilant with EVALI case finding and reporting.

THC-containing products continue to be the most commonly reported e-cigarette, or vaping, products used by hospitalized EVALI patients; 80% reported any use of these products in the 3 months preceding symptom onset. Dank Vapes were the most commonly reported THC-containing branded product reported nationally, as well as by U.S. Census region, which is consistent with data reported in October from Illinois and Wisconsin (*4*). Dank Vapes are a class of largely counterfeit THC-containing products and have been associated with EVALI (*4*,*5*). However, regional differences in THC-containing product use were identified. The nationwide diversity of THC-containing products reported by EVALI patients highlights that it is not likely a single brand that is responsible for the EVALI outbreak, and that regional differences in THC-containing products might be related to product sources.

The finding that most EVALI patients reported use of THC-containing products, in particular use of counterfeit branded products such as Dank Vapes, is important given recent findings from Minnesota that showed THC-containing products obtained from EVALI patients and counterfeit products seized in the state contained vitamin E acetate (*6*). Prior testing of bronchoalveolar lavage fluid samples implicated Vitamin E acetate as a chemical of concern in the outbreak after it was found in all assessed specimens from 29 EVALI patients (*7*). Additionally, FDA product testing identified vitamin E acetate in THC-containing products obtained from EVALI patients; among 545 THC-containing products collected from 70 EVALI patients, 79% of the 70 EVALI patients provided at

TABLE. Demographic and e-cigarette, or vaping, product use characteristics among patients with hospitalized* cases of e-cigarette, or vaping, product use–associated lung injury (EVALI) reported to CDC — United States, August–December 2019†

Characteristic	All EVALI patients, No./Total no. (%)§ (N = 2,291)	Any THC-containing product use (n = 1,421)	Any nicotine-containing product use (n = 956)	Any CBD-containing product use (n = 214)
Sex				
Male	1,449/2,155 (67)	987/1,414 (70)	645/952 (68)	135/213 (63)
Female	706/2,155 (33)	427/1,414 (30)	307/952 (32)	78/213 (37)
Median age, yrs (range)	24 (13–77)	23 (13–77)	22 (13–75)	27 (14–70)
Age group (yrs)				
13–17	341/2,159 (16)	237/1,417 (17)	177/953 (19)	16/213 (8)
18–24	817/2,159 (38)	567/1,417 (40)	424/953 (45)	72/213 (34)
25–34	524/2,159 (24)	341/1,417 (24)	199/953 (21)	64/213 (30)
35–44	278/2,159 (13)	171/1,417 (12)	95/953 (10)	36/213 (17)
45–64	165/2,159 (8)	88/1,417 (6)	46/953 (5)	24/213 (11)
≥65	34/2,159 (2)	13/1,417 (1)	12/953 (1)	1/213 (0)
Race/Ethnicity¶				
White	1,135/1,521 (75)	854/1,139 (75)	630/806 (78)	108/176 (61)
Black or African American	56/1,521 (4)	36/1,139 (3)	30/806 (4)	8/176 (5)
American Indian or Alaska Native	9/1,521 (1)	7/1,139 (1)	8/806(1)	4/176 (2)
Asian, Native Hawaiian, or other Pacific Islander	34/1,521 (2)	18/1,139 (2)	18/806 (2)	5/176 (3)
Other	39/1,521 (3)	32/1,139 (3)	24/806 (3)	6/176 (3)
Hispanic	248/1,521 (16)	192/1,139 (17)	96/806 (12)	45/176 (26)
Case status				
Confirmed	1,221/2,288 (53)	802/1,419 (57)	505/956 (53)	125/213 (59)
Probable	1,067/2,288 (47)	617/1,419 (43)	451/956 (47)	88/213 (41)
Substances used in e-cigarette or vaping products,††				
Any THC-containing product use	1,421/1,782 (80)	1,421/1,421 (100)	713/956 (75)	172/214 (80)
Daily THC-containing product use	581/770 (75)	581/770 (75)	297/415 (72)	102/130 (78)
Any nicotine-containing product use	956/1,782 (54)	713/1,421 (50)	956/956 (100)	97/214 (45)
Daily nicotine-containing product use	482/568 (85)	351/416 (84)	482/568 (85)	68/79 (86)
Any CBD-containing product use	214/1,782 (12)	172/1,421 (12)	97/956 (10)	214/214 (100)
Combination of substance use				
Both THC- and nicotine-containing product use	713/1,782 (40)	713/1,421 (50)	713/956 (74)	81/214 (3)
Both THC- and CBD-containing product use	172/1,782 (10)	172/1,421 (12)	81/956 (8)	172/214 (80)
Both nicotine- and CBD-containing product use	97/1,782 (5)	81/1,421 (6)	97/956 (10)	97/214 (45)
All three (CBD, nicotine, and THC)	81/1,782 (5)	81/1,421 (6)	81/956 (8)	81/214 (38)
Exclusive substance use				
THC-containing product use only	617/1,782 (35)	617/1,421 (43)	—	—
Nicotine-containing product use only	227/1,782 (13)	—	227/956 (24)	—
CBD-containing product use only	26/1,782 (1)	—	—	26/214 (12)
No THC- or Nicotine- or CBD-containing product use	92/1,782 (5)	—	—	—

Abbreviations: CBD = cannabidiol; THC = tetrahydrocannabinol.

* Includes all hospitalized EVALI patients and EVALI-associated deaths regardless of hospitalization status.

† For cases reported as of December 3, 2019.

§ Percentages might not sum to 100% because of rounding.

¶ Whites, blacks or African Americans, American Indians or Alaska Natives, Asians, Native Hawaiians or other Pacific Islanders, and Others were all non-Hispanic. Hispanic persons could be of any race.

** Data on both THC-containing and nicotine-containing product use required to be included (n = 1,782).

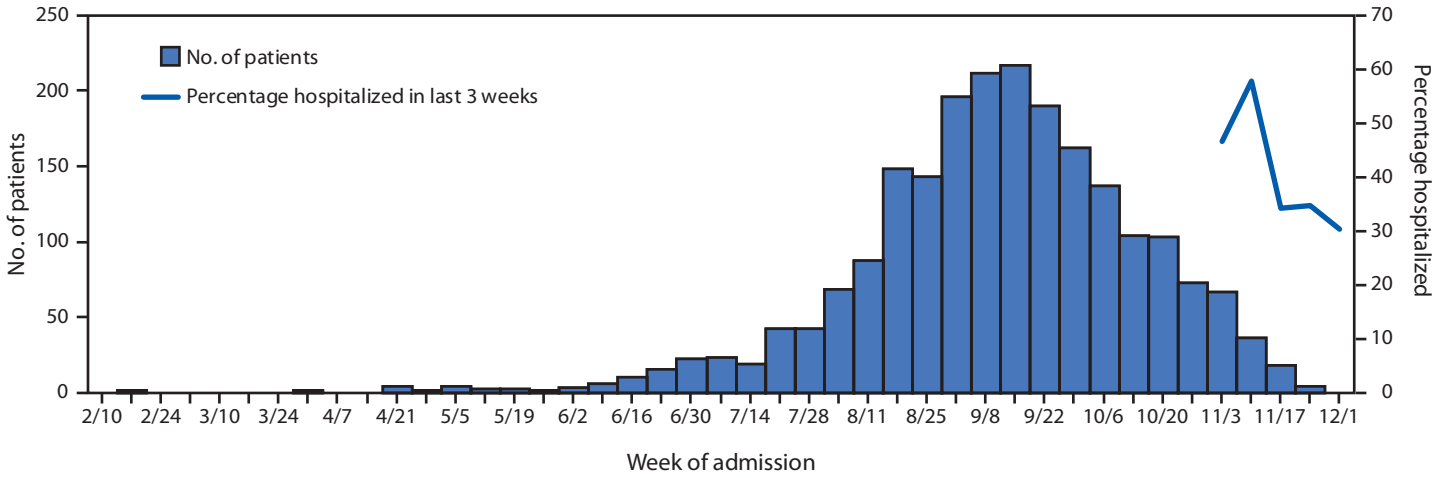
†† In the 3 months preceding symptom onset.

least one THC-containing product, and among those, 76% provided at least one product containing vitamin E acetate.** However, given that a small but consistent number of EVALI patients report exclusive use of nicotine-containing (13%) or CBD-containing (1%) products (*1*,*2*), additional product and biologic testing from EVALI patients with these use patterns is warranted. Further research is being conducted by CDC and others to compare biologic specimens from EVALI patients with those from nonpatients who use e-cigarette, or vaping, products and to explore possible pathophysiologic mechanisms through which vitamin E acetate might cause lung injury.

The findings in this report are subject to at least five limitations. First, data on substances used in e-cigarette, or vaping, products were self-reported or reported by proxies (e.g., family members) and might be subject to recall or social desirability bias. Second, data related to product use were missing for many patients, and conclusions derived from these data might

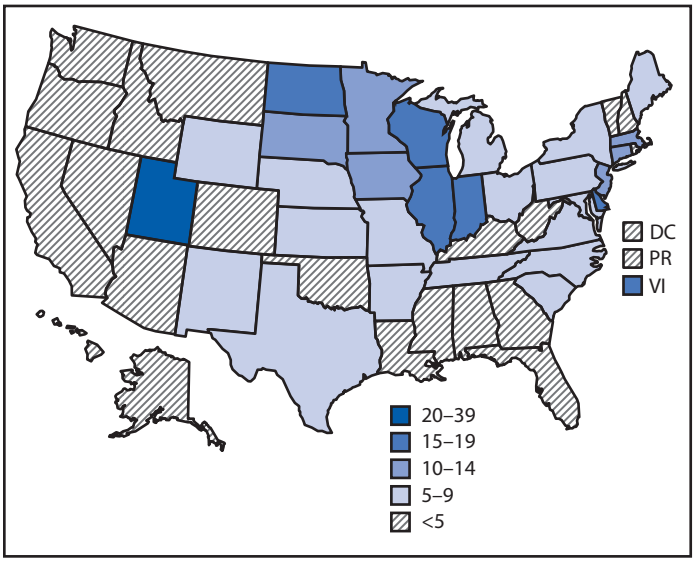
** https://www.fda.gov/news-events/public-health-focus/lung-illnesses-associated-use-vaping-products.

FIGURE 1. Number of patients (N = 2,163) with lung injury associated with e-cigarette, or vaping, product use, by week of hospital admission and percentage of patients hospitalized in last 3 weeks* — United States, February 10–December 3, 2019



* Percentage hospitalized within 3 weeks preceding the date reported to CDC.

FIGURE 2. Prevalence* of hospitalized cases of e-cigarette, or vaping, product use–associated lung injury (N = 2,291) — United States, August–December 2019



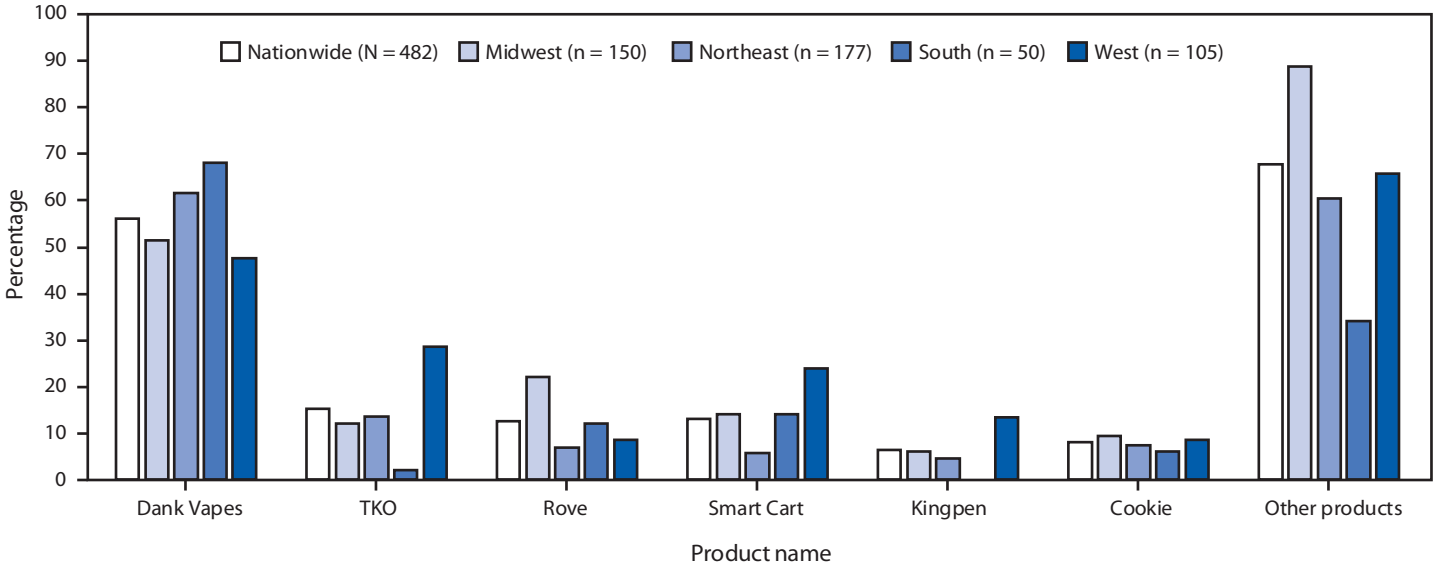
Abbreviations: DC = District of Columbia; PR = Puerto Rico; VI = U.S. Virgin Islands.
* Number of cases per 1 million population rounded to the nearest hundredth. The U.S. Census population from 2010 was used to calculate prevalence for U.S. Virgin Islands, and U.S. Census population estimates from 2018 were used to calculate prevalence for all other states, the District of Columbia, and territories.

not be generalizable to the entire affected population. Third, many EVALI patients were not interviewed because of loss to follow-up, refusal to be interviewed, or lack of resources to conduct interviews, which might limit the generalizability of these findings to other EVALI patients. Fourth, reporting lags make it difficult to evaluate the trajectory of the outbreak during recent weeks. Finally, these data might be subject to misclassification of substance use for multiple reasons. Patients might not know the content of the e-cigarette, or vaping, products they used, and methods used to collect data regarding substance use varied across jurisdictions. CDC is working with state and federal partners (e.g., FDA) to link epidemiologic, product, and biologic samples to further explore the complexities of the EVALI outbreak.

Based on findings to date, CDC recommends that persons not use e-cigarette, or vaping, products that contain THC, especially those acquired from informal sources like friends, family members, or in-person or online dealers. In addition, persons should not add any other substances to products not intended by the manufacturer, including products purchased through retail establishments. Vitamin E acetate should not be added to e-cigarette, or vaping, products. However, although it appears that vitamin E acetate is associated with EVALI, many substances and product sources are being investigated, and there might be more than one cause. Therefore, while the investigation continues, persons should consider refraining from the use of all e-cigarette, or vaping, products. Adults using e-cigarette, or vaping, products to quit smoking should not return to smoking cigarettes; they should weigh all risks and benefits and consider using FDA-approved cessation medications.†† Adults who continue to use e-cigarette, or vaping, products should carefully monitor themselves for symptoms and see a health care provider immediately if they develop symptoms similar to those reported in this outbreak (*8*). Irrespective of the ongoing investigation, e-cigarette, or vaping, products should never be used by youths, young adults, or pregnant women.

†† https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html?s_cid.

FIGURE 3. Percentage of hospitalized EVALI patients (N = 482) who reported brand names of THC-containing e-cigarettes, or vaping, products,* by U.S. Census region† — United States, August–December 2019



Abbreviations: EVALI = e-cigarette, or vaping, product use–associated lung injury; THC = tetrahydrocannabinol.

* "Other products" included 146 unique products. Dabwood and Brass Knuckles were reported by 10% of patients in the Northeast and West regions. Off White, Moon Rocks, Chronic Carts, Mario Carts, Cereal Carts, Runtz, Dr. Zodiac, Eureka, Supreme G, and CaliPlug were reported by 1%–5% of patients nationwide. Use of 134 other products were reported by <1% of hospitalized patients.

† *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South:* Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Puerto Rico and U.S. Virgin Islands were included in the South region.

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Summary

What is already known about this topic?

Patients with e-cigarette, or vaping, product use–associated lung injury (EVALI) in Illinois and Wisconsin reported using a variety of tetrahydrocannabinol (THC)-containing products in the 3 months preceding illness; a product labeled "Dank Vapes" was most commonly reported.

What is added by this report?

Nationally, Dank Vapes were the most commonly reported THC-containing product by hospitalized EVALI patients, but a wide variety of products were reported, with regional differences. Data suggest the outbreak might have peaked in mid-September.

What are the implications for public health practice?

These data further support the association of EVALI with THC-containing products; it is unlikely that one brand is responsible for the outbreak. CDC recommends that persons not use e-cigarette, or vaping, products that contain THC.

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Notes from the Field

Hospital Water Contamination Associated with a Pseudo-Outbreak of *Mycobacterium porcinum* — Wisconsin, 2016–2018

Heather Kloth[1]; Lina I. Elbadawi, MD[1,2]; Allen Bateman, PhD[3]; Laura Louison, MLS[3]; Nijika Shrivastwa, PhD[1]

During January–December 2017, a hospital laboratory in Wisconsin identified a cluster of seven isolates that tested positive for a rapidly growing nontuberculous mycobacterium, *Mycobacterium porcinum*, which is associated with infections of the respiratory tract, bloodstream (caused by pathogen-contaminated intravenous catheters and equipment), surgical sites, and soft tissue (*1*–*3*). All clinical isolates were obtained from respiratory cultures (sputum, bronchoalveolar lavages, or bronchial aspirates) from patients in the hospital's intensive care units. No associated clinical infections were reported. Because *M. porcinum* is rarely encountered, a concern that these isolates represented laboratory contamination was raised, and the hospital infection prevention team began an internal investigation. During this time, the hospital's infection prevention team and the Wisconsin State Laboratory of Hygiene (WSLH) investigated possible infection control breaches and laboratory workflow processes. Following the identification of four additional isolates in January 2018, all patient specimens submitted for acid-fast bacteria culture were routed directly to WSLH for testing beginning February 12. WSLH identified three additional positive *M. porcinum* isolates from patients, suggesting that the organism was not a hospital laboratory contaminant. On March 16, the hospital notified the Wisconsin Division of Public Health of the cluster of *M. porcinum*–positive respiratory isolates. By April 12, a total of 20 isolates had been obtained from 16 patients. A retrospective chart review demonstrated that none of the isolates were associated with a clinical infection; other infections accounted for all patients' illnesses.

Because nontuberculous mycobacteria are found in water, and *M. porcinum* in particular has been recovered from tap water (*1*), the investigation included testing water samples from the ice machines, water dispensers, and handwashing sinks in the intensive care units collected during the week of April 23. *M. porcinum* was subsequently identified during April 30–May 3 in samples obtained from two ice machines and one water dispenser. Inspection of these machines demonstrated visible debris on internal machine parts and dispenser spouts. Since the installation of new machines and parts in June 2018 and revision of the hospital's cleaning protocols, no further *M. porcinum* patient isolates have been identified. In accordance with a recommendation from the Wisconsin Division of Public Health, staff members at this hospital no longer use tap water when collecting respiratory cultures.

M. porcinum is a rapidly growing nontuberculous mycobacterium within the *Mycobacterium fortuitum* complex. Nontuberculous mycobacteria naturally occur in the environment and can be found in soil and water, including potable water systems that supply many U.S. health care facilities (*4*). Nontuberculous mycobacteria have also been associated with outbreaks in health care settings (*1*–*4*). Tap water was used during respiratory specimen collection at the Wisconsin facility and might have contaminated patient specimens. Tap water is not sterile, can lead to false-positive culture results (*4*), and should be avoided when collecting biologic specimens intended for culture. Hospital water management programs should engage clinical partners to ensure safe water use as part of patient care and address maintenance of ice machines and water dispensers within their facilities.

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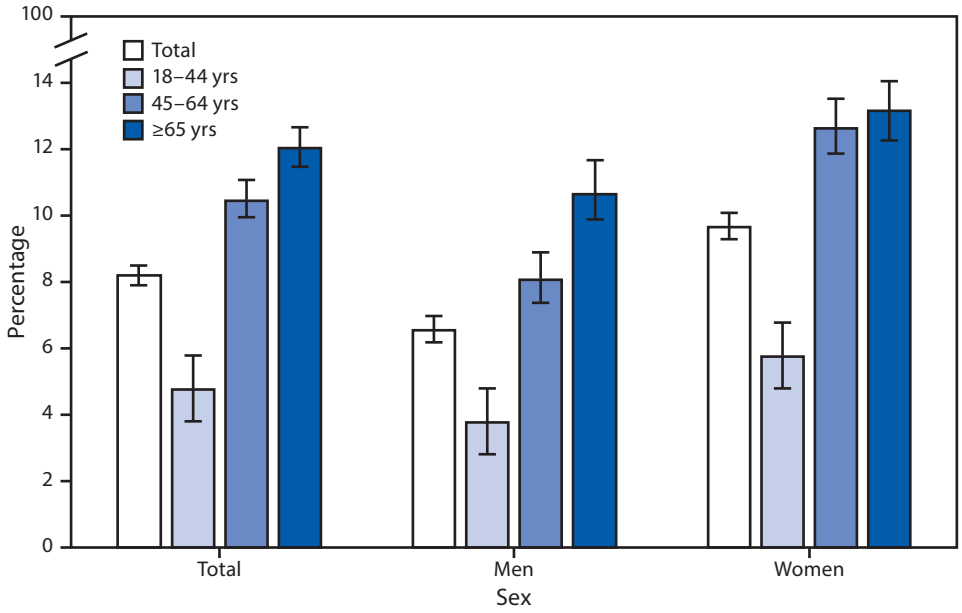
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Took Medication To Help Fall or Stay Asleep Four or More Times in the Past Week,† by Sex and Age Group — National Health Interview Survey, United States, 2017–2018§



* With 95% confidence intervals indicated by error bars.
† Based on a response of four or more to the survey question "In the past week, how many times did you take medication to help you fall asleep or stay asleep?"
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey, Sample Adult component.

During 2017–2018, 8.2% of adults aged ≥18 years took medication to help fall or stay asleep four or more times in the past week (6.6% for men and 9.7% for women). Among men, the percentage who took medication for sleep four or more times in the past week increased with age from 3.8% among those aged 18–44 years to 10.7% among those aged ≥65 years. Among women, the percentage increased from 5.8% for those aged 18–44 years to 12.7% among those aged 45–64 years and 13.2% among those aged ≥65 years. Across all age groups, the percentage was higher among women than men.

Source: National Center for Health Statistics, National Health Interview Survey, 2017 and 2018. https://www.cdc.gov/nchs/nhis.htm.

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