



RESEARCH ARTICLE

Is frequent emergency department use a complement or substitute for other healthcare services? Evidence from South Carolina Medicaid enrollees

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Abstract

Objective: To compare healthcare services utilization across the healthcare system between frequent and non-frequent emergency department (ED) users among Medicaid enrollees in South Carolina.

Study Setting and Design: We conducted a retrospective, longitudinal study of individuals with at least one ED visit in 2017 in South Carolina and identified their healthcare services visits over 730 days (2 years) after their first ED visit. We classified individuals based on intensity of ED use: superfrequent (≥ 9 ED visits/year), frequent (4–8 ED visits/year), and non-frequent ED users (≤ 3 visits/year). We estimated differences between the three groups of ED users and non-ED hospital and office-based visits using multivariable two-part regression models.

Data Sources and Analytic Sample: We used statewide Medicaid claims from January 2017 to December 2019 for ED users aged 18–64 years with continuous Medicaid enrollment. We analyzed data on all frequent and superfrequent users and selected a 4:1 random sample among all non-frequent users (~half of all non-frequent users).

Principal Findings: The study included 52,845 ED users, of whom 42,764 were non-frequent, 7677 frequent, and 2404 superfrequent users. Within 2 years from the date of their first ED visit, superfrequent ED users averaged 38.3 ED visits, frequent ED users 10.9 ED visits, and non-frequent ED users 2.6 ED visits ($p < 0.001$). Compared with non-frequent users, frequent and superfrequent ED users had more comorbidities and chronic conditions on average (1.6 vs. 3.5 vs. 6.4, $p < 0.001$). Both frequent

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and superfrequent users had more hospital visits beyond the ED overall (marginal effects: 0.23, 95% CI 0.18–0.27; 0.40, 95% CI 0.29–0.50), and more outpatient office visits overall (marginal effects: 4.39, 95% CI 2.52–6.27; 9.23, 95% CI 5.66–12.81), including primary care and most specialists' visits, compared with non-frequent users.

Conclusions: Frequent ED users utilized non-ED hospital and outpatient office-based healthcare services significantly more than non-frequent ED users. These findings can guide tailored interventions using data across the healthcare system to efficiently coordinate care, contain costs, and improve health outcomes for these individuals.

KEYWORDS

complementary care, Emergency department, frequent use, healthcare services use

What is known on this topic

- It is commonly presumed that frequent ED users have limited access to outpatient services, using the ED as a substitute for care that could be provided in more cost-effective settings.
- Interventions targeting frequent ED users have focused on case management and care coordination, but most programs are hospital-based and have yielded mixed and inconclusive results.
- Some evidence indicates that frequent ED users utilize more non-ED services across the healthcare system than non-frequent ED users, but findings are based on county-specific data that are almost a decade old.

What this study adds

- Using statewide Medicaid claims data, we found that superfrequent and frequent ED users had significantly more hospital visits beyond the ED and outpatient office visits compared with non-frequent users.
- Our findings extend the literature using updated, cross-sector, statewide data and provide empirical evidence regarding the intensity of frequent ED users' cross sector healthcare services utilization beyond the ED.
- Using healthcare system-wide data is critical to guide tailored interventions to efficiently coordinate care, contain costs, and improve health outcomes among frequent ED users.

1 | INTRODUCTION

Every year, around 140 million emergency department (ED) visits occur in the United States and about 1 in 10 healthcare dollars spent on episodes of care originate in EDs.^{1,2} Yet, ED visits are not distributed equally; about 10% of all ED users account for up to 45% of all ED visits and a disproportionately large share of ED spending.^{3–5} These frequent ED users—commonly defined as patients with four or more ED visits per year, have long been identified as individuals who are more likely to have Medicaid coverage, multiple chronic conditions, mental health and substance use disorders, and health-related social needs, such as lack of housing and unemployment, which often predispose them to rely heavily on EDs for care.^{3–10}

Hospitals, insurers, and agencies, such as the Centers for Medicare and Medicaid Services (CMS), have made substantial investments in identifying frequent ED users and developing healthcare delivery models designed to contain their ED use, achieve cost-savings, and improve their health outcomes.^{11–17} It is commonly presumed that

many of these individuals have limited access to outpatient services and use the ED as a substitute for conditions that could be monitored, managed, and treated in more cost-effective settings.^{18–23} Although most of the interventions targeting frequent ED users have focused on case management, care coordination, and follow-up outpatient care appointments, these programs were hospital-based, and relied on siloed hospital-system medical records which often limit clinicians' ability to understand a person's total health and social history and comprehensively coordinate care.^{11,23} Hence, it is unsurprising that efforts to evaluate the effectiveness of various interventions targeting frequent ED users across distinct settings nationwide have yielded mixed and inconclusive results, with some even documenting increased ED use after an intervention.^{7,12,13,17,24–28}

With the advent of large secondary databases across the healthcare sector, there is growing evidence that frequent ED users are also heavy users of a wide range of services beyond the ED.^{18,22,23} Studies of Medicaid enrollees in San Francisco County, California and Hennepin County, Minnesota, have documented that frequent ED users

were disproportionately more likely to seek non-ED hospital and primary care medical services, outpatient mental health, substance use disorder, and social services than less frequent ED users.^{22,23} These populations had also almost four times higher total public spending compared with less-frequent ED users, owing to their increased social vulnerability and medical needs.^{22,23} These findings contrast with widely held beliefs that enhanced access to outpatient healthcare services would potentially reduce ED use.^{18,22,23} Hence, interventions targeting frequent ED users using hospital-specific, nonintegrated data only provide a partial view of patients' patterns of healthcare services use, and limit clinicians' ability to effectively coordinate care across disciplines and agencies, and address care that is often fragmented, duplicated, or interrupted.²³ Despite the important contributions of prior work, existing evidence on healthcare services use across the health system by frequent ED users is limited and based on county-specific data that are almost a decade old, highlighting the need for additional studies.

In this study, we aimed to explore frequent ED users' patterns of healthcare services use beyond the ED among non-elderly adult Medicaid enrollees in South Carolina from 2017 to 2019. Our objectives were (1) to describe and identify the differentiating characteristics between frequent and non-frequent ED users and (2) to compare non-ED healthcare services use across the healthcare system between frequent and non-frequent ED users, including various types of non-ED hospital and office-based visits. The findings from our study extend the current literature using updated, statewide healthcare system data and provide clinicians, case managers, hospital administrators, and policymakers with empirical evidence regarding the unique characteristics of frequent ED users and the intensity of their healthcare services use beyond the ED. Such information can guide the development of tailored interventions to contain costs, while addressing the needs and improving the care coordination and health outcomes of these individuals.

2 | METHODS

2.1 | Study design, data source, and frequent ED user definition

We conducted a retrospective, longitudinal study using data for Medicaid enrollees with at least one ED visit in 2017 in South Carolina. We used the statewide Uniform Billing hospital data, the overall Medicaid claims data, and the Medicaid enrollment data from the South Carolina Department of Revenue and Fiscal Affairs from January 2017 to December 2019 to conduct our study. The Uniform Billing data included all individual level hospital encounters in South Carolina, while the Medicaid data included all itemized claims for healthcare encounters across various facilities and clinicians in the state. We used all hospital (outpatient, imaging, inpatient, ED) data from the Uniform Billing file for Medicaid enrollees, and the primary claim from the Medicaid data for all outpatient office-based facilities (e.g., dental, vision, primary care, and specialty care) to capture healthcare services

use across the healthcare system by ED users. The data included sociodemographic, clinical, facility, and provider specific information at the individual and claim-levels.

We included Medicaid enrollees aged 18–64 years who were continuously enrolled in Medicaid during the whole study period starting January 2017, the first month-year of our data. This approach enabled us to accurately document healthcare utilization patterns of Medicaid enrollees across time, while avoiding potential ex post moral hazard and bias due to some individuals' enrollment in Medicaid during an ED visit which could affect their healthcare services use in the future.²⁹ We initially used the hospital data and identified the first ED visit for each individual in 2017. Next, we counted the number of ED visits by all individuals within 365 days after their first ED visit (the baseline year). We then identified all ED users with four or more ED visits within 365 days after their first ED visit and selected a random sample among individuals with less than four ED visits in the same baseline year ensuring a 4:1 ratio (approximately half of all ED users with less than four visits were randomly selected).^{3–5} We then identified the number of ED visits for each ED user over a two-year period, defined as 730 days after the first ED visit at any point in 2017. We included both outpatient (treat and release) and hospital admissions where the patient was admitted to the hospital through the ED in our counts of ED visits. ED users were then stratified based on the intensity of ED use across 730 days post-index. Superfrequent ED users were defined as patients who had nine or more ED visits in each year (every 365 days), which was the upper 5th percentile of the overall distribution of ED visits, considering previous studies, regression to the mean, and the absence of a uniform definition of high-frequency ED use.^{3–5,9,23,30,31} Frequent ED users were defined as patients who had four to eight ED visits in each year (every 365 days), while non-frequent ED users were defined as those who had up to three visits in each year (every 365 days) (individuals with no ED visit in the second year were included in this subgroup if they had less than four ED visits in the first year). We then explored their use of various types of non-ED services over a 730 day period by linking ED users' encrypted identification numbers across the databases. Individuals who died during the last month of the study period were excluded (<0.5%) to ensure a full two-year period for each individual included in the analytical sample. Individuals who died at any point prior to the last month were already excluded from our original data, because they did not have 2 years of continuous enrollment. Finally, ED users with an inconsistent number of visits and who would move between categories from Year 1 (Days 1–365) to Year 2 (Days 366–730) were also excluded, similar to previous work.²³

2.2 | Outcomes

Our main outcomes of interest included the use and number of (1) overall hospital-based non-ED visits, including hospitalizations, outpatient, and imaging services, (2) hospital-based non-ED visits for elective services, (3) overall hospital-based non-ED and office-based mental health/substance use disorders-related visits, (4) overall office-

based visits, (5) primary care-related office-based visits, (6) specialty care-related office-based visits, (7) specific types of specialty care office-based visits, namely, oncological, physical therapy/chiropractic, dental, vision, and MH/SUD related. We used data indicators of the location where the service was provided (e.g., hospital inpatient, hospital outpatient, ED, office), the provider's specialty (e.g., dentistry, oncology, surgery, primary care—including family, general, internal and occupational medicine, geriatrics, osteopathy, general pediatrics, and nurse practitioners), and the ICD-10 code for the primary claim for each visit to classify non-ED visits into the categories above.

2.3 | Covariates

We also included patient-level sociodemographic, contextual, and clinical information at index from the ED data. Sociodemographic and contextual variables included age, sex, race, dual enrollment (i.e., Medicare and Medicaid) status, residence in a rural area (based on the revised primary Rural–Urban Commuting Area Codes; 1–3 = urban, 4–10=rural), and residence in a county within the lowest statewide income quartile based on counties' median 2017 income.^{32,33} Race was categorized as Black, White, and Other based on data availability. Clinical information included the Elixhauser comorbidity index using all available ICD-10 codes in the ED data (up to 15 codes), and the 10 most commonly documented comorbidities.³⁴

2.4 | Statistical analysis

We initially conducted a descriptive analysis of ED users stratified by their intensity of ED use and compared sociodemographic, contextual, and clinical information and non-ED services use between non-frequent, frequent, and superfrequent ED users using two-sample chi-squared and t-tests or Mann–Whitney U tests. We also conducted a multivariable logistic regression and used marginal effects to identify mean percentage point differences in the probability of being a superfrequent ED user versus a non-frequent ED user across baseline sociodemographic, contextual, and clinical characteristics.³⁵ We then used a two-part regression model to estimate the association between various types of healthcare system-wide services use and frequent and superfrequent ED users compared with non-frequent users. Because we expected that the number of all types of visits for various types of healthcare services would be right skewed and mass at zero, we chose the two-part model for mixed discrete-continuous outcomes over alternative specifications (e.g., log transformation, count models).^{36,37} The two-part model has been widely used to account for the heterogeneity between nonzero values and reduce estimation bias. The first part of the model was a probit regression estimating whether an individual had at least one visit, while the second part of the model was a generalized linear model with a log link and a Poisson distribution estimating the number of visits conditional on a having at least one visit from the first part of the model. We performed a

skewness and kurtosis test to identify the normality of the distribution of the outcome variables and then a Modified Park test to specify the appropriate distributional family and link of the model.³⁸ The tests supported the use of a generalized linear models with a Poisson distribution for our numeric outcomes and a log link. We then estimated the marginal effects of the combined probit and GLM versions of the two-part model to assess the predicted mean differences in non-ED healthcare services visits between non-frequent, frequent, and superfrequent ED users. We controlled for all covariates used in the descriptive analyses as well as the calendar month of the index visit to account for potential seasonality and unobserved heterogeneity. In all regressions, we clustered standard errors at the county of residence level. To evaluate the sensitivity of our findings to extreme outliers, we replicated the two-part regression models across all outcomes by excluding individuals with number visits beyond the 90th percentile of the distribution. Data were managed using SAS v9.0 (SAS Institute, NC) and statistical analyses were conducted using Stata v18.0 (StataCorp, TX). The study was approved by the institutional review board at the University of South Carolina as nonhuman subjects' research.

3 | RESULTS

3.1 | Descriptive characteristics by frequent ED use status

We identified 52,845 ED users in 2017, of whom 42,764 were non-frequent users, 7677 were frequent users, and 2404 were superfrequent users (Table 1). Within 730 days following the index ED visit, superfrequent ED users had a mean of 38.3 ED visits, frequent ED users had a mean of 10.9 ED visits, and non-frequent ED users had a mean of 2.6 ED visits ($p < 0.001$ for both). Both superfrequent and frequent ED users were significantly more likely to have at least one hospital admission through the ED relative to non-frequent users (60.0% vs. 34.4% vs. 14.7%, $p < 0.001$ for both). The number and share of ED visits related to mental health or substance use disorders were also higher among frequent and superfrequent ED users compared with non-frequent ED users. In contrast, a larger share of ED visits among non-frequent ED users was related to injuries compared with superfrequent and frequent ED users. Triage severity was similar across all three groups, with more than 92% of all ED visits triaged as emergent or urgent.

Compared with non-frequent ED users, frequent ED users were disproportionately female, were Black, and had a mean of 2 more comorbidities (3.5 vs. 1.6, $p < 0.001$). Superfrequent ED users were more likely to be 34–54 years of age, dual enrollees, and had about five more comorbidities (6.4 vs. 1.6, $p < 0.001$) compared with non-frequent ED users. Almost all chronic conditions documented were several times higher across both the frequent and superfrequent cohorts compared with non-frequent ED users, but the prevalence of these conditions was substantially higher among superfrequent users overall. For example, alcohol or substance use disorders, and

TABLE 1 Descriptive characteristics, ED use, and non-ED healthcare services use among non-frequent, frequent, and superfrequent ED users in South Carolina from 2017 to 2019.

	Type of ED users		
	Non-frequent	Frequent	Superfrequent
N	42,764	7677	2404
Individual characteristics			
Female (%)	72.4	81.2	72.1
Age—mean (SD)	37.7 (13.3)	37.1 (13.0)	39.2 (12.4)
Age groups (%)			
18–24	17.9	19.2	13.0
25–34	30.9	30.7	27.5
34–54	35.0	35.9	44.8
55–64	16.2	14.2	14.7
Race groups (%)			
White	41.9	38.0	40.9
Black	54.6	60.4	57.5
Other	3.5	1.6	1.6
Dual enrollees (%)	26.0	27.7	35.8
Rural residence (%)	23.2	23.2 [‡]	19.6
Residence in lowest income quartile counties (%)	16.6	16.5 [‡]	16.2 [‡]
Elixhauser comorbidities			
Mean (SD)	1.6 (2.0)	3.5 (3.0)	6.4 (3.7)
Most common (%)			
Hypertension	33.3	52.4	71.6
COPD	16.6	38.2	57.3
Diabetes	14.3	24.8	39.6
Obesity	12.3	26.3	37.9
Depression	11.1	27.9	52.9
Alcohol/Substance use disorders	7.8	19.0	42.3
Other neurological conditions	6.2	13.9	26.8
CHF	3.7	9.6	19.0
Psychoses	3.0	6.3	16.6
Liver disease	2.4	5.9	13.9
Cancer/Lymphoma	1.4	2.0	3.3
AIDS/HIV	0.5	1.5	2.0
Healthcare services use			
ED visits			
Total—mean (SD)	2.62 (1.36)	10.91 (1.98)	38.33 (34.94)
Outpatient—mean (SD)	2.44 (1.36)	10.15 (2.33)	35.12 (34.25)
Inpatient (admission via the ED)—mean (SD)	0.18 (0.50)	0.75 (1.48)	3.21 (5.38)
At least one inpatient (%)	14.7	34.4	60.0
Injury-related—mean (SD)	0.44 (0.70)	1.35 (1.42)	3.37 (6.37)
% of all ED visits for injuries	17.9	12.5	9.6
MH/SUD – mean (SD)	0.09 (0.37)	0.44 (1.24)	2.71 (7.47)
% of all ED visits for MH/SUD	3.5	3.9	6.6
% of ED visits triaged as emergent/urgent	92.2	93.4	94.1
Hospital visits (non-ED)			
Total—mean (SD)	0.81 (1.63)	1.42 (2.08)	2.21 (3.83)

(Continues)

TABLE 1 (Continued)

	Type of ED users		
	Non-frequent	Frequent	Superfrequent
Inpatient only—mean (SD)	0.19 (0.46)	0.36 (0.72)	0.58 (1.12)
Outpatient/Imaging only—mean (SD)	0.63 (1.53)	1.07 (1.89)	1.64 (3.56)
Elective—mean (SD)	0.55 (1.39)	0.96 (1.73)	1.45 (3.31)
% of elective hospital visits among hospital users	65.0	65.6 [‡]	61.8
Any MH/SUD—mean (SD)	0.01 (0.11)	0.04 (0.34)	0.15 (0.89)
Office-based visits			
Total—mean (SD)	32.31 (86.36)	45.09 (98.40)	68.49 (122.43)
Primary care/family medicine	4.95 (7.00)	6.75 (8.18)	9.32 (11.37)
Specialty	27.06 (85.22)	37.95 (96.81)	58.75 (120.24)
Dental	0.01 (0.11)	0.02 (0.15)	0.02 (0.16)
Vision	0.30 (1.07)	0.38 (1.25)	0.41 (1.24)
Physical therapy/Chiropractic	0.45 (2.77)	0.54 (2.71)	0.64 (3.67)
Oncology	0.10 (1.59)	0.16 (1.75)	0.25 (2.99)
MH/SUD	5.47 (25.72)	5.34 (24.15) [‡]	7.54 (20.87)
Total MH/SUD (hospital and office)—mean (SD)	5.48 (25.73)	5.38 (24.18) [‡]	7.69 (21.05)

Note: All comparisons indicate two-sample comparisons across variables between non-frequent versus frequent ED users and non-frequent versus superfrequent ED users and were statistically significant at the 0.05 level, except for those with the symbol [‡].

Abbreviations: CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; MH/SUD, mental health/substance use disorders, Diabetes and hypertension included disease specific codes with and without complications; SD, standard deviation.

depression were four to six times higher among superfrequent ED users compared with non-frequent users.

The characteristics and factors most strongly associated with an increased probability of being superfrequent ED users compared with non-frequent users were being under 55 years of age, particularly 18–34 versus 55 to 64 (0.051; 95% CI 0.046–0.056), Black compared with White (0.013, 95% CI 0.009–0.017), and having several chronic conditions, mainly substance use disorders (0.049, 95% CI 0.045–0.053), chronic obstructive pulmonary disease (0.040, 95% CI 0.037–0.044), and depression (0.041, 95% CI 0.037–0.045) (Table 2). Residents of rural areas and those who resided in areas within the lowest statewide income quartile had lower probabilities of being superfrequent users.

4 | USE OF NON-ED HEALTHCARE SERVICES BY FREQUENT ED USE STATUS

4.1 | Hospital visits

Compared with non-frequent users, both frequent and superfrequent ED users sought significantly more hospital services overall (Figure 1, Table 1). Overall, superfrequent ED had 2.2, frequent ED users had 1.4, and non-frequent ED users had 0.8 hospital visits on average within 730 days after the index ED visit ($p < 0.001$ for both). Both non-ED inpatient and outpatient or imaging hospital encounters followed the same pattern. Similarly, both superfrequent and frequent ED users had more hospital visits for care classified as elective

compared with non-frequent users (1.5 vs. 1.0 vs. 0.6, $p < 0.001$ for both), although the share of hospital visits for elective services was similar across groups.

4.2 | Office visits

In total, superfrequent ED users had on average about 36 more office visits (68.5 vs. 32.3, $p < 0.001$) and frequent ED users averaged about 13 more office visits (45.1 vs. 32.3, $p < 0.001$) compared with non-frequent ED users within 730 days post-index. Specialist visits accounted for most of these visits (58.8 vs. 38.0 vs. 27.1, $p < 0.001$ for both). Differences among specific types of specialty care were also observed, particularly between superfrequent and non-frequent ED users, with the former having more dental, oncology, and vision related visits. Office-based primary care use followed a similar pattern (superfrequent ED users: 9.3 visits; frequent ED users: 6.8 visits; non-frequent ED users: 5.0 visits, $p < 0.001$ for both).

4.3 | Mental health or substance use disorders visits

Hospital visits for mental health or substance use disorders were about 15 and 4 times higher among superfrequent and frequent ED users compared with non-frequent users, respectively ($p < 0.001$ for both). Superfrequent ED users averaged also about 2.0 more office visits for mental health or substance use disorders compared with

TABLE 2 Multivariable regression estimates of the association between sociodemographic, contextual, and clinical characteristics and being a superfrequent ED user.

	Marginal effects (95% CI)
Sex (Ref = Male)	
Female	0.001 (−0.004 to 0.005)
Age groups (Ref = 55–64)	
18–34	0.051 (0.046–0.056)
35–54	0.019 (0.016–0.022)
Race groups (Ref = White)	
Black	0.013 (0.009–0.017)
Other	−0.007 (−0.019 to 0.005)
Dual enrollment (Ref = No)	
Yes	−0.002 (−0.005 to 0.002)
Rural residence (Ref = No)	
Yes	−0.021 (−0.023 to −0.020)
Residence in lowest income quartile counties (Ref = No)	
Yes	−0.024 (−0.025 to −0.023)
Elixhauser comorbidities	
Substance use disorders	0.049 (0.045–0.053)
COPD	0.040 (0.037–0.044)
Depression	0.041 (0.037–0.045)
Other neurological conditions	0.032 (0.028–0.037)
Hypertension	0.032 (0.026–0.038)
Psychoses	0.029 (0.024–0.035)
Liver disease	0.028 (0.000–0.026)
Obesity	0.021 (0.016–0.026)
Diabetes	0.017 (0.013–0.021)
CHF	0.016 (0.010–0.021)
AIDS/HIV	0.013 (0.000–0.026)
Cancer/lymphoma	0.006 (−0.005 to 0.017)

Note: The model compares the mean percentage point differences across variables in the predicted and adjusted probability of being a superfrequent versus a non-frequent ED user based on the definitions in the methods. The model includes index ED visit-month and county fixed effects. Standard errors are clustered at the county of residence level. Abbreviation: CI, confidence intervals.

non-frequent users (7.5 vs. 5.5, $p < 0.05$), but no difference was observed between frequent and non-frequent ED users. Total visits (both hospital and office-based) for these disorders followed a similar pattern, with no difference between non-frequent and frequent ED users, but more visits among superfrequent ED users compared with non-frequent users (7.7 vs. 5.5, $p < 0.001$).

4.4 | Multivariable regression estimates on non-ED healthcare utilization

Estimates from the two-part regression models of the association between frequent and superfrequent ED use and non-ED healthcare

services use adjusting for sociodemographic, contextual, and clinical covariates are presented in Table 3. The estimates were generally consistent with the bivariate, unadjusted findings and suggested that superfrequent ED users in particular exhibited significantly higher non-ED healthcare services use across most types of care. Superfrequent ED users had significantly more visits to hospitals outside the ED (0.40, 95% CI 0.29–0.50), more hospital-based non-ED elective care visits (0.20, 95% CI 0.12–0.29), more office visits overall (9.23, 95% CI 5.66–12.81), more visits to dental clinicians, and more hospital and/or office-based visits for mental health or substance use disorders, after adjusting for covariates. Primary care office-based visits were also higher among both frequent and superfrequent ED users compared with non-frequent users. Office-based visits for physical therapy, vision, and oncology services were also higher among superfrequent ED users as well, but not statistically significant. The results of the sensitivity analyses excluding individuals whose number of visits exceeded the 90th percentile of the distribution were in-line with the main analyses, suggesting robust findings.

5 | DISCUSSION

Our study is one of the first analyses of healthcare services use across a state's healthcare system by frequent ED users enrolled in Medicaid. Using Medicaid claims data from 2017 to 2019 in South Carolina, we found that frequent ED users, in particular superfrequent users with nine or more ED visits in each year, had disproportionately higher chronic disease burden, and particularly higher rates of mental health and substance use disorders. We also presented empirical evidence that frequent ED users also used non-ED hospital and office-based services heavily, particularly for primary, specialty, and mental health and substance use services, even after adjusting for sociodemographic and clinical differences between frequent and non-frequent users.

Our findings align with previous studies in California and Minnesota, which found that frequent ED users used multiple avenues of medical care beyond the ED and had severe and complex physical and behavioral health needs.^{22,23} Similar findings have also been documented in Sweden and Ireland, two countries with different healthcare systems than the United States.^{18,39} Combined, these studies, including our own, suggest that frequent ED users are high-risk and high-cost populations who also frequently use a wide range of other healthcare and social services. Relying exclusively on hospital-based electronic health record data provides only partial insight into these individuals' care seeking behaviors. Additionally, since most frequent ED users visit multiple hospitals annually, site-specific data are even more limited in their ability to enable the accurate identification of frequent users notwithstanding cross-health sector care seeking.⁴⁰ These findings highlight the importance of timely access to healthcare system-wide shared information among clinicians to better understand frequent ED users' care patterns and guide evidence-based initiatives targeting these individuals.²³

While frequent ED use, particularly among individuals with mental health and substance use disorders, has been linked to limited

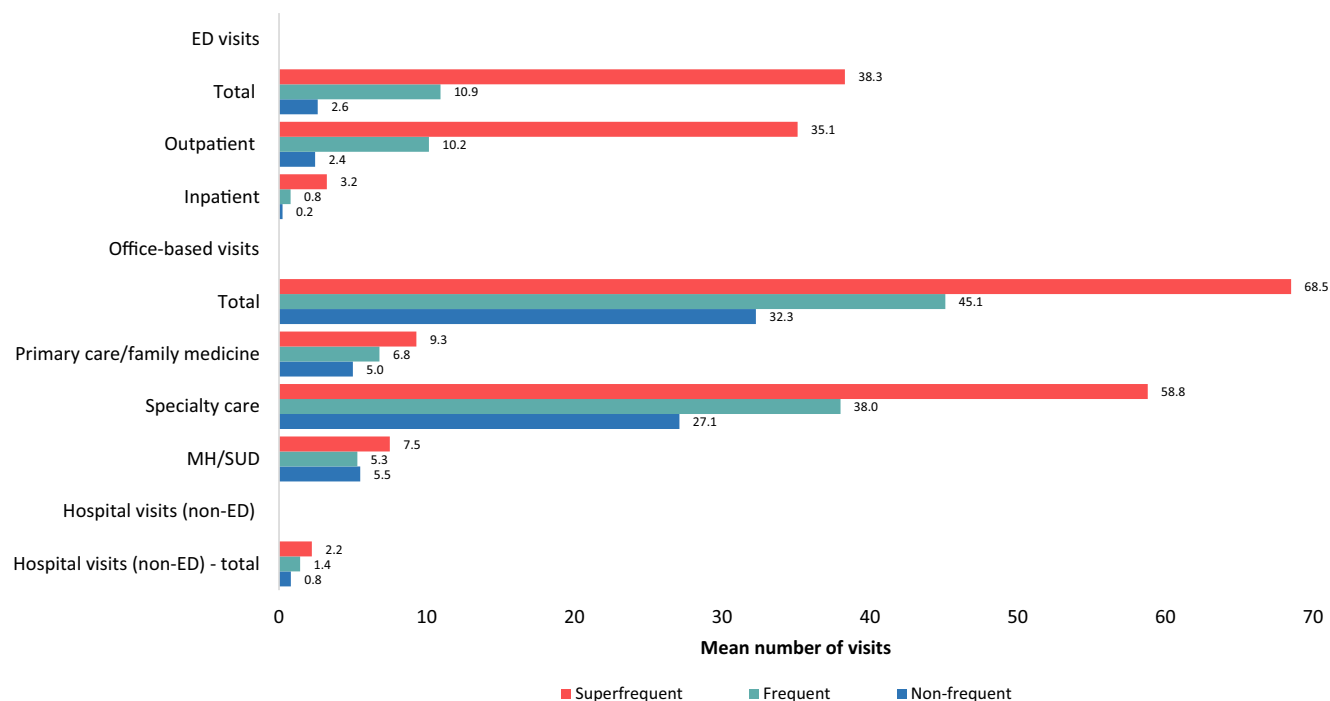


FIGURE 1 Superfrequent, frequent, and non-frequent ED users' healthcare services use beyond the ED across 2 years following the index ED visit.

access to clinicians specializing in these areas, our findings indicate that frequent users use such services—particularly outpatient office-based specialty services—very often. Interestingly, we did not find large differences between the triage severity of ED visits across superfrequent, frequent, and non-frequent ED users, with more than 92% of all ED visits triaged as emergent or urgent across all three groups. There is some evidence indicating that low acuity and less emergent ED visits can be substituted with outpatient primary care or care delivered in urgent care centers.^{20,21} However, given that nearly all ED visits by frequent users were triaged as emergent or urgent, our findings defy common assumptions that many visits by frequent users are inappropriate and could be substituted with outpatient or urgent care at the time of ED presentation.^{20,40–42} This finding aligns with recent work that documented high uncertainty in attempting to prospectively classify ED visits as less acute or non-emergent given the limited information available upon patient arrival at the ED.^{41,42}

The disproportionately high burden of chronic conditions among frequent ED users documented in this and prior studies, particularly among superfrequent users who averaged almost seven comorbidities, is likely related to the high intensity and multitude of clinicians and services that these individuals must use to manage their conditions.^{3,22,23} Although most of the services used by these individuals could be attributed to their disease burden, and potentially indicative of non-ED follow-up care triggered by the ED visit, it is possible that some of their use could be curtailed if services rendered were less fragmented, duplicated, or interrupted.^{23,43,44} Yet, increased referrals to the ED by outpatient clinicians, particularly after hours and in provider constrained settings, have recently been documented in New York.²¹ Considering the medical complexity of frequent ED users,

some ED visits might be a complement for outpatient services, particularly when they are unsatisfied, confused, or cannot access nonhospital-based clinicians at times of need, which could have been prevented.²¹

Care management and ongoing coordination, coupled with health coaching and behavioral health care in real time, has been highlighted as one of the few effective interventions that reduced ED visits among frequent users and increased their subsequent use of primary care.^{11–17,24–27} This bundle of services further highlights the importance of screening such patients for mental health and substance use disorders and incorporating care transitions and services as needed.¹² Simultaneously, such initiatives can increase the use of primary care clinicians, which was lower than that of specialists in both our and others' previous work, who might be able to holistically assess, coordinate, and monitor the services required to meet frequent users' needs.²³ Interestingly, a recent study among primary care practices in Virginia found that patients with multiple physical and mental health conditions were less likely to receive screening for unhealthy alcohol use than those with no multiple chronic conditions, despite having higher unhealthy alcohol use, highlighting the need to incentivize and streamline efforts for high-quality substance use-related preventive service delivery in primary care settings for high-need individuals.⁴⁵

However, under a fee-for-service system without financial incentives, primary care clinicians are often limited in their ability to help such complex individuals navigate the healthcare system.⁴⁶ Given shared savings incentives, accountable care organizations (ACOs) and fully integrated systems might be well positioned to eliminate duplication of services and improve health outcomes through tailored high-quality care and more efficient coordination and in turn reduce the

TABLE 3 Multivariable regression estimates of the association between non-ED healthcare services use and frequent ED use status.

	Frequent versus non-frequent users Marginal effects (95% CI)	Superfrequent versus non-frequent users Marginal effects (95% CI)
Hospital visits (non-ED)		
Total	0.23 (0.18–0.27)	0.40 (0.29–0.50)
Elective	0.15 (0.11–0.19)	0.20 (0.12–0.29)
MH/SUD	0.01 (0.01–0.02)	0.02 (0.01–0.03)
Office-based visits		
Total	4.39 (2.52–6.27)	9.23 (5.66–12.81)
Primary care/ family medicine	0.86 (0.62–1.10)	1.32 (0.85–1.78)
Specialty	3.65 (1.81–5.49)	8.36 (4.99–11.72)
Dental	0.01 (0.00–0.01)	0.01 (0.00–0.01)
Vision	0.01 (0.02–0.06)	0.01 (–0.01 to 0.04)
Physical therapy/ chiropractic	0.01 (–0.06 to 0.08)	0.04 (–0.09 to 0.17)
Oncology	0.02 (–0.01 to 0.05)	0.06 (–0.03 to 0.14)
MH/SUD	0.20 (0.05–0.34)	0.26 (0.05–0.48)
Total MH/SUD (hospital and office)	0.04 (–0.27 to 0.34)	0.67 (0.10–1.23)

Note: Estimates are based on two-part regression models controlling for sociodemographic, contextual, and clinical covariates. The models include index ED visit-month and county fixed effects. Standard errors are clustered at the county of residence level. Marginal effects indicated the predicted difference in the average number of visits.

Abbreviations: CI, confidence intervals; MH/SUD, mental health/substance use disorder.

volume of ED visits among frequent users.^{11,46–48} The majority of ACOs have multiple initiatives in place to improve care for high-cost and high-need individuals, such as frequent ED users, although access to timely, and actionable information to identify and manage these individuals remains one of the major concerns and challenges to fully implement and evaluate programs' effectiveness.^{11,47,49} Nevertheless, despite the early stages of ACOs' initiatives targeting frequent ED users, most organizations are reluctant to scale back their interventions and programs, acknowledging the need to manage such individuals and also generate and disseminate evidence on best practices, which to-date are less established.¹¹ Integrated medical, mental health and substance use disorder, and social services data across the continuum can enhance clinicians' ability to understand and identify frequent users' needs and improve coordination and care-managed based initiatives through shared information.^{11–17,22–27,47}

5.1 | Limitations

Our study is not without limitations. First, we used data for only one state, South Carolina, potentially limiting the generalizability of our findings. However, this also conveyed the distinct advantage of a

state integrated data system needed to conduct the study and our findings are consistent with prior work. Similarly, our study focused only on non-elderly adult Medicaid enrollees in South Carolina. We note that nonhospital claims and healthcare services use data were only available for this population at the time of the study. However, Medicaid coverage is significantly associated with frequent ED use, Medicaid enrollees comprise up to half of all frequent ED users, and Medicaid programs have long experimented with care transition models for this population. We also note that we were unable to incorporate additional characteristics (e.g., homelessness) and other social determinants of health that could be disproportionately higher among the two frequent ED users' subgroups.^{8,23} We also excluded individuals with ED visit patterns that were distinct from the three-group categorization used in this study (e.g., those with <4 visits in year one and >9 visits in Year 2), similar to previous work.²³ We opted to do this because accounting for all possible combinations of ED use would result in three to six additional small groups with heterogeneous and unclear ED use patterns that would be difficult to interpret from a policy standpoint, while also considering regression to the mean. We further note that we were not able to discern the number and type of visits that were scheduled for post-ED follow-up care and could thus be justified. Given the nature and availability of information in our claims data, this highlights the need for further inquiry. Finally, we were unable to stratify superfrequent ED users into specific clusters with potentially distinct characteristics and heterogeneous use of healthcare services due to sample constraints which warrants future study.⁵⁰

6 | CONCLUSION

In this study among non-elderly adult Medicaid enrollees in South Carolina, we found that frequent ED users had increased chronic physical and behavioral needs and exhibited substantial non-ED hospital and office-based services use, particularly for outpatient specialty and mental health and substance use disorder services, within 730 days after their index ED visit in 2017. These findings can be used by policymakers, hospital administrators, and clinicians to inform and guide tailored interventions using data across the healthcare sector to efficiently coordinate care, contain costs, and improve health outcomes for these individuals.

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DATA AVAILABILITY STATEMENT

The data used in this study were approved by the South Carolina Data Oversight Council and are available upon request to the South Carolina Revenue and Fiscal Affairs Office.

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