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Dispelling An Urban Legend: Frequent Emergency Department Users Have Substantial Burden Of Disease

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Abstract

Urban legend has often characterized frequent emergency department (ED) patients as mentally ill substance users who are a costly drain on the health care system and who contribute to ED overcrowding because of unnecessary visits for conditions that could be treated more efficiently elsewhere. This study of Medicaid ED users in New York City shows that behavioral health conditions are responsible for a small share of ED visits by frequent users, and that ED use accounts for a small portion of these patients' total Medicaid costs. Frequent ED users have a substantial burden of disease, and they have high rates of primary and specialty care use. They also have linkages to outpatient care that are comparable to those of other ED patients. It is possible to use predictive modeling to identify who will become a repeat ED user and thus to help target interventions. However, policy makers should view reducing frequent ED use as only one element of more-comprehensive intervention strategies for frequent health system users.

In recent years an urban legend has emerged about emergency department (ED) “frequent fliers,” the small number of patients who each have multiple— even hundreds of—ED visits annually. The legend stems largely from media coverage of ED overcrowding and the saga of patients with extremely high costs. It characterizes these patients as mentally ill substance users¹ who are a costly drain on the health care system²⁻⁴ and who contribute to ED overcrowding^{5,6} because of their unnecessary visits for conditions that could be treated more efficiently elsewhere.⁷

A growing body of research has begun to disprove much of the legend, at least among readers of academic emergency medicine literature. There is no standard definition for *frequent ED use*,⁸⁻¹⁰ and it is not clear that having specific cutoffs (in terms of number of visits) is useful from a policy standpoint.¹¹ However, many studies have defined *frequent use* as three to five ED visits in a year.

Compared to occasional ED users, frequent users have been found to have high illness acuity levels (often with multiple chronic conditions), high rates of primary and specialty care use outside the ED, and frequent hospital admissions for serious conditions.^{8-10,12-14} Uninsured and Medicaid patients and those who are members of minority groups have relatively high

rates of frequent ED use. However, the majority of frequent users are white and have private or Medicare coverage.^{14,15}

Previous studies have sought to characterize the heterogeneous population of frequent ED users. Nonetheless, few studies have examined ED use and costs in the context of the use of other health services over multiple years or attempted to develop models to predict future frequent ED use to assist with targeting interventions for high-risk patients.

Importantly, although policy makers' focus on frequent ED use has concentrated on Medicaid programs, to date the body of literature on ED use—specifically, frequent use—within Medicaid is limited.¹⁶ Medicaid programs in many states have implemented some initiative to control or reduce ED use, and Medicaid managed care plans in forty-three states have programs to reduce ED use that is deemed inappropriate.¹⁷

In 2011 the Washington State Health Care Authority attempted to impose an annual three-visit limit on “nonemergency” ED visits, based on a list of discharge diagnoses for which an ED visit was deemed unnecessary.¹⁸ This proposed policy was ultimately suspended in favor of an alternative plan that did not involve refusing reimbursement.¹⁹ However, it highlights the current policy focus on strategies to reduce ED use. Such policies have provoked strong criticism from some observers,²⁰ who have suggested that improving access to primary care would be a more effective strategy to reduce ED use.

This study of ED use among Medicaid enrollees in New York City characterized factors associated with ED use—especially frequent use—both during a single year and over multiple years. We examined whether it is possible to predict who will become a frequent ED user with predictive modeling. We also compared ED expenditures to total Medicaid services expenditures. Each of these issues is of major importance given the Medicaid expansion that will occur in 2014 in many states, with the implementation of provisions of the Affordable Care Act that provide coverage to many patients currently not well connected to the primary care delivery system.

Recent work has shown that proposed state policies to limit or refuse payment based on nonemergency ED discharge diagnoses may not be possible.²¹ A better understanding of ED use by Medicaid beneficiaries could help inform the policy discussion based on empirical evidence about ED use (and potential suboptimal use). It could also guide Medicaid agencies and managed care plans in developing more-targeted interventions to meet the needs of frequent ED users.

Study Data and Methods

Data

We analyzed Medicaid fee-for-service claims and managed care encounter records for Medicaid patients ages 18–62 who resided in New York City. Patients with Medicare were excluded because we did not have access to Medicare records for this study. We also limited the analysis to patients with at least ten months of Medicaid eligibility in the year prior to the first ED visit in the “index year.” This was to ensure that we had adequate data to

examine at least some prior ED and inpatient or outpatient use and to predict future use. A total of 212,259 patients were included in the main analysis.

Statistical Analysis

For each patient, we examined eligibility, use, spending, and diagnostic history for the three years before the patient's first ED visit in 2007 (the "index ED visit"). We also examined eligibility, use, spending, and diagnostic history for the twelve months following that visit (the "index year") and for the subsequent two years. We determined each patient's age and residency and whether or not the patient was eligible for Medicaid because of disability—all as of the date of the index ED visit. Use and spending were expressed as annualized rates based on the number of months that the patient was enrolled in Medicaid during the period.

Patients' prior diagnostic history was based on *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM), codes from all diagnosis fields (that is, both principal and secondary diagnoses) from all inpatient and outpatient records that included diagnostic information. The Charlson Comorbidity Index was calculated for each patient as one measure of the acuity of a condition or severity of a disease.²²

Classification of hospital admissions as ambulatory care-sensitive or not was based on the principal diagnosis only.²³ We also characterized ED use by patients whose visits were not due to injury or behavioral health issues, using the New York University ED profiling algorithm.²⁴ The algorithm first divides ED use into "emergent" and "nonemergent," with "nonemergent" being considered "primary care treatable." "Emergent" use is then divided into "ED care needed" and "primary care treatable." Finally, "ED care needed" is divided into "not preventable or avoidable" and "preventable or avoidable."²⁴

To assess the linkage of ED care to primary care, we examined patterns of primary care use in the two years before the index ED visit. Patients with three or more visits during that two-year period who saw a single provider for the majority of their visits were categorized as "loyal" patients. Patients with three or more visits and no predominant provider were termed "shoppers," patients with one or two visits were "occasional users," and patient with no visits were "nonusers."²⁵

We also examined "serial frequent ED users," a group of patients who were divided in four subgroups. Patients in one subgroup had three or more ED visits in the index year and also three or more visits in both the year before and the year after the index year. Patients in the second group had five or more ED visits in the index year and also five or more visits in both the year before and the year after. Patients in the third group had three or more visits in the index year and also three or more visits in the two years before and the two years after the index year. Patients in the fourth group had five or more visits in the index year and also in the two years before and two years after.

We limited the analysis of serial users to patients with at least ten months of Medicaid eligibility during these periods. That left 150,558 patients in the first and second groups, collectively, and 114,758 in the third and fourth groups, collectively.

Predictive modeling using standard logistic regression techniques was performed to predict which patients would become frequent ED users in the index year. As noted above, there is no consensus on what constitutes a *frequent ED user*,^{9,10} so we modeled predictions according to patients' having three or more ED visits (including the index visit), five or more, eight or more, and ten or more. We expect that this approach will facilitate the efforts by planners and researchers to design intervention models by making it unnecessary to choose a single cutoff point to define *frequent use*.¹¹

We assumed a sixty-day lag in the availability of claims and eligibility data. A total of 205,139 patients met the eligibility criteria described above for inclusion in the predictive modeling analysis. A split sample approach was used to test for over fitting, using a 50 percent sample to develop the model and applying the regression coefficients to the remaining 50 percent of the patients. For all models, only nominal differences between the two samples were observed in positive predictive values, sensitivity, and specificity.

The results reported here are for the application of the modeling to the full sample. Regression results and descriptive information are provided for various levels of ED use to give policy makers flexibility in targeting interventions. The variables included in the model and regression output are reported in the online Appendix.²⁶

Predictive modeling was also performed to identify patients at risk of becoming future serial users. These patients were predicted to have either three or more or five or more ED visits in the index year and in each of the following two years.

We report our findings in a relatively fine-grained manner, based on the number of ED visits in the index year. This approach reveals the way high ED use, costs, and number of prescriptions increase progressively with increasingly high ED use.

Limitations

This study has some important limitations. First, we relied solely on claims and encounter records to identify frequent ED users and predict those with high risk of future ED use. Other studies examining high-cost patients and those at risk of future hospitalization have demonstrated that important factors not available in administrative data can be critical in designing interventions.

For example, patients at high risk of hospitalization have been shown to be socially isolated, have low levels of perceived support, and be precariously housed (either homeless, living in shelters, or living temporarily with family or friends).²⁷ These factors could be important contributors to frequent ED use and information about them is likely to be essential in planning intervention strategies.

We also did not include information on providers' performance. Although frequent ED users were shown to have substantial outpatient contact with providers, we could not characterize the effectiveness of these providers in managing chronic disease and coordinating care. We had no information on patients' satisfaction with the providers, including providers' level of courtesy and respect, delays in appointment scheduling, and clinic wait times. Some patients may be voting with their feet in their choice of the ED as their site of care.

Some measures of performance can be obtained from administrative data, such as hospitalization rates for ambulatory care-sensitive conditions for patients loyal to their providers.¹⁵ However, more definitive analysis will require further study. Other routinely collected data on outpatient providers' performance and quality are not collected uniformly and are not widely available from any public source.

Encounter data available to us did not include payment information, such as how much managed care plans paid for hospital admissions or ED visits. Therefore, we could not produce an accurate business model for an intervention, showing how much could be spent on a patient at various levels of predicted risk for future ED use, given assumptions about potential reductions in future ED use or hospital use.^{8,10,28}

Finally, because we analyzed only Medicaid data, the results may not be generalizable to patients who are not Medicaid beneficiaries.

Study Results

Characteristics of Frequent ED Users

Extremely frequent ED users (those with ten or more visits) represented only 1.7 percent of all ED users (Exhibit 1). However, 29.0 percent of all ED users made three or more visits. This same group of frequent ED users accounted for 60.4 percent of all visits.

There were no substantial differences among users by number of ED visits in terms of age or sex, except that ultra-high users—those with fifteen or more visits—were older and more likely to be male than other users (Exhibit 1). The percentage of ED users who were disabled increased progressively with ED utilization rates (18.6 percent for patients with a single ED visit, rising steadily to 53.4 percent for the ultra-high users). The percentage of patients enrolled in managed care was relatively stable, except that it began to decline with patients who had seven or more ED visits.

Levels of chronic illness were relatively high among ED users (50.4 percent overall), with rates increasing from 45.5 percent for patients with a single visit to 84.5 percent for the ultra-high users (Exhibit 1). Rates of substance use (23.0 percent) and mental illness (35.1 percent) were also high, and they, too, increased progressively with the number of ED visits. So did the percentage of patients with dual diagnoses of substance use and mental illness.

The overall burden of disease or condition acuity, as measured by the Charlson Comorbidity Index,²² also increased with ED use (Exhibit 1). The index rose from 1.15 for patients with a single ED visit to 3.20 for ultra-high users.

As the number of ED visits in the index year increased, annualized ED use rates in prior and future years also increased, although overall rates were substantially lower in years other than the index year (Exhibit 2). Frequent ED users also tended to visit multiple ED sites. On average, patients with 5–6 visits in the index year visited two EDs, and ultra-high users visited five.

Visits For Mental Illness and Substance Use

Principal diagnoses of substance use and mental illness accounted for a relatively small share of ED visits during the index year (3.8 percent for each), with rates increasing modestly with the number of ED visits in the index year (Exhibit 2). The single exception was a large increase in substance use cases among the two groups with the highest ED use.

Visit rates for substance use (5.2 percent) and mental illness (4.9 percent) remained relatively low even when both principal and secondary diagnostic fields were examined (Exhibit 2). Again, the groups with the two highest ED use had substantially higher rates than groups with fewer ED visits.

The percentage of ED visits that were nonemergent or emergent but primary care treatable²⁴ were fairly stable as ED use increased (Exhibit 2). However, rates dropped somewhat for the groups with the highest use, compared to groups with fewer ED visits. Rates of ED use for conditions that were emergent but preventable or avoidable with timely and effective care²⁴ increased gradually with the frequency of ED visits.

Other Visits and Total Medicaid Expenditures

Primary care and specialty care visit rates during the index year and the year prior to the index visit generally increased with the number of ED visits that the patient had in the index year (Exhibit 3). OB-GYN visits showed similar patterns, although the rates of such visits were somewhat lower among the highest ED users (groups that also had lower percentages of female patients).

Linkage to primary care was relatively stable across the ED visit groups, with somewhat lower rates of provider “loyalty” among the two groups of most frequent users (Exhibit 3). Nonetheless, the percentage of “shoppers” increased steadily with the frequency of ED use.

There were only minor differences in frequency of ambulatory care contact in the thirty days prior to, or on the day of, ED visits during the index year among the ED visit rate groups (Exhibit 3). Ambulatory care follow-up visits in the thirty days after ED visits in the index year were also comparable across groups, with patients who had multiple ED visits during the index year also having slightly higher follow-up visit rates than patients who had only a single visit.

Annualized total Medicaid expenditures were substantially higher for frequent ED users, increasing progressively with the number of ED visits in the index year (Exhibit 3). Somewhat attenuated but still higher rates were also observed in the two years before and after the index year (data not shown). Rates of nonobstetric admission to the hospital also increased steadily with ED use rates in the index year (Exhibit 3). However, the percentage of admissions attributable to ambulatory care-sensitive conditions remained relatively constant across the frequency of ED use categories.

Serial High Users

“Serial high users” represented a relatively small share of ED users overall. See the online Appendix²⁶ for detailed descriptions of serial users.

Patients with five or more visits in the index year, the year prior, and the year after represented 1.2 percent of ED visitors, and those with five or more visits in each of the two years prior and two years after represented 0.8 percent of ED patients. However, they accounted for a higher percentage of ED visits: 10.9 percent for the three-year period and 8.4 percent for the five-year period. Patients with three or more annual visits during these periods also represented a relatively small percentage of patients (3.5 percent for the three-year period and 1.7 percent for the five-year period), but accounted for a higher percent of visits (19.2 percent and 12.1 percent, respectively).

However, the “serial high users” had very high ED use rates in the index year, and a larger percentage of their visits involved substance use and mental illness, compared to all ED users. The mean annual ED user ate among three-year serial high users with five or more visits per year was 13.2 visits during the period; for five-year serial high users, the figure was 16.3 visits.

Visits related to substance use and mental illness accounted for 27.8 percent of visits for the three-year period and 27.5 percent for the five-year period. Comparable, although somewhat lower, rates were observed for serial high users with three or more visits per year.

Predictive Modeling

Identifying which patients to target for interventions to improve their health outcomes and reduce their frequent use of health services has proved challenging. Therefore, we conducted predictive modeling to determine whether patients at various levels of ED use in the index year could be identified.

The strongest results were obtained in predicting patients who would have three or more visits (including the index visit) during the index year, with a positive predictive value of 0.663, sensitivity of 0.229, and specificity of 0.952. Comparable results were obtained for predicting five or more, eight or more, and ten or more visits, although with lower sensitivity.

A list of the regression variables included and their regression coefficients are provided in the online Appendix.²⁶ Positive predictive values, sensitivity, and the number of patients identified are displayed in the Appendix²⁶ for various risk level cutoffs to demonstrate that sensitivity levels can be increased at lower cutoff levels with modest sacrifice in predictive accuracy.

Characteristics of patients with three, five, eight, and ten or more visits identified by the model at cutoff levels of 0.500 and 0.250 are also shown in the Appendix.²⁶ This information can provide guidance in the design of intervention strategies. For example, in predictive modeling to identify frequent users with three or more visits in the index year, patients identified by the model at the 0.500 cutoff level had high levels of chronic illness (77.9 percent). Half had multiple chronic conditions. The mean number of annualized ED visits in the index year was 5.73, with high rates (5.11 and 4.41) in the prior two years as well.

Behavioral health problems were also prevalent, with 58.8 percent of the patients having a history of substance use, 72.3 percent a history of mental illness, and 48.9 percent a history of both substance use and mental illness. ED use for substance use and mental illness was substantially higher among those identified by predictive modeling than for all ED patients. However, only 10.2 percent of ED visits during the index year had a principal diagnosis of substance use, and the figure for mental health diagnoses was 5.6 percent.

Patients identified by the model were also at higher risk of becoming serial users, with three or more or five or more visits in the index year and each of the following two years. This phenomenon was even more pronounced in the predictive modeling used to identify patients at risk of higher numbers of ED visits in the index year.

Ambulatory care visits were also high in the index year (6.70 primary care visits, 2.15 specialty care visits, and 0.83 OB-GYN visits) for patients identified by the predictive modeling, with comparable high rates in the prior two years. Linkage to primary care for patients identified by the model—50.6 percent were “loyal”—was comparable to the rates for all ED patients (50.2 percent; Exhibit 3). However, a larger number of patients identified by the model were “shoppers” (25.6 percent versus 15.4 percent).

Annualized Medicaid expenditures for patients identified by predictive modeling were high: \$38,420 in the index year, \$34,667 in the prior year, and \$31,586 in the year two years prior. These expenditures were more than double the expenditures for all patients (Exhibit 3). The expenditures were driven largely by hospitalizations: The patients identified by the model had a rate of admission that was more than three times higher than the rate for patients overall.

Discussion

Repeat ED users accounted for a relatively large share of Medicaid ED visits. For example, patients with ten or more visits per year accounted for 12.3 percent of all ED visits; those with five or more visits, 34.2 percent; and those with three or more visits, 60.4 percent (Exhibit 1). But much of the urban legend that has grown up around frequent ED users appears to be largely unfounded.

Repeat ED users did have high underlying rates of substance use and mental illness, and these conditions undoubtedly affected their health status and contributed to their ED use. Nonetheless, ED visits for these conditions represented a relatively small share of these patients' ED visits overall. The exception was ultrahigh users (those with fifteen or more ED visits in the index year), for whom 20.0 percent of ED visits had a principal diagnosis of substance use and 5.9 percent had a principal diagnosis of mental illness. For other repeat ED users, substance use visits accounted for only 1.7–7.6 percent of ED visits, and mental illness for just 3.0–6.2 percent. Even when all diagnostic fields for the ED visits were considered, these numbers remained modest.

The higher rates of substance use and mental illness ED visits observed among repeat ED users who appeared in the ED year after year (serial high users) might explain how the urban legend evolved. Media coverage is generally based on interviews with ED clinicians, and

these few repeat customers whom ED personnel came to know by name likely became the face of the “frequent fliers.” In contrast, the majority of high users were out of sight and out of mind.

It is difficult to assess the appropriateness or necessity of ED visits from administrative data alone. However, rates of ED use for nonemergent and emergent but primary care treatable visits²⁴ were comparable among all levels of ED frequency. Again, contrary to the urban legend, most repeat ED users in this study did appear to have relatively strong linkage to ambulatory care, at least as evidenced by their high rates of primary and specialty care visits. Except for ED users with ten or more visits in the index year, ambulatory care visit rates actually exceeded ED visit rates.

Moreover, a lower percentage of repeat users had no primary care visits or “occasional use” (one or two visits) in the two years prior to the index visit, compared to patients with a single ED visit in the index year. Repeat ED users also had higher ambulatory care visit rates in the thirty days prior to and thirty days following an ED visit, compared to patients with only a single ED visit.

It is clear from this study that frequent ED users are generally quite sick. Their levels of chronic disease are high, and these levels increased along with the Charlson Comorbidity Index among patients with higher ED use rates. Frequent ED users also had very high rates of nonobstetric hospital admissions, again increasing with the frequency of ED use.

However, the percentage of hospitalizations that were potentially preventable or avoidable—those resulting from ambulatory care-sensitive conditions—were comparable across frequency levels. This suggests that underlying rates of illness and disease are more likely to be driving high rates of ED use than are barriers to receiving timely and effective ambulatory care, including lack of access. These results are consistent with a recent analysis of ED use in the Veterans Affairs system that found that frequent ED use occurs even in a coordinated system of care where patients have ready access to outpatient services.⁸

Frequent ED users are indeed costly patients, with annualized Medicaid expenditures in the index year rising from \$11,193 for patients with a single ED visit to \$73,599 for patients with fifteen or more visits, the ultra-high users. However, it is important to note that these costs are largely driven by inpatient, not ED, use.

Encounter data for managed care patients do not include payment information. But if the mean fee-for-service reimbursement rate is applied to all patients, ED costs represent 2.1 percent (\$324) of total expenditures for all patients who used the ED in the index year and 4.6 percent (\$3,371) for the ultra-high users. This finding is consistent with other estimates of the cost of ED use relative to overall health care expenditures.^{29,30}

There is a substantial opportunity to improve care and health outcomes for these very needy patients. The levels for nonemergent and emergent but primary care treatable conditions²⁴ for all ED patients are high. In addition, there is clearly potential to treat large numbers of these patients—both occasional and frequent ED users—in an ambulatory care setting.

The fact that frequent ED users also have high hospitalization rates suggests an opportunity to improve outcomes and reduce costs with more-effective care management and coordination, using the ED as a possible point of intervention. This study confirms what previous analyses⁸ have found: Frequent ED users are also frequent users of other services, including ambulatory care. In many instances, the ED may be the right site of care, and interventions would do well to focus on reducing ED use together with addressing other unmet needs of this population.

Our analysis indicates that predictive modeling can identify patients who will become frequent users in the coming year at the time of their initial ED visit. This finding suggests an opportunity to effectively target interventions for these future high users by identifying the right people for interventions.

However, the challenges involved should not be underestimated, given patients' characteristics. Patients at risk of three or more visits in the index year had high levels of chronic disease, and more than half had multiple chronic conditions. Behavioral health issues also were common, with 82.2 percent having a history of substance use or mental illness and 48.9 percent a history of both. Intervention strategies will undoubtedly require a multidisciplinary approach to cope with the broad range of health needs of these patients.

The frequent ED users identified by the model generally had high rates of primary and specialty care use, and 50.2 percent of them were loyal to a single primary care provider. It is important to learn more about how effective the ambulatory care delivery system is in meeting these patients' complex needs. For the subset without stable outpatient contact, intervention strategies should include efforts to ensure effective linkages to a primary care home.

Conclusion

It will be challenging to meet the significant needs of this patient population and provide the cross-system coordination required to improve care and reduce health care expenditures for them. The predictive modeling approach demonstrated here could be applied in real time, identifying a sample of patients at high risk of future ED use. These patients could be interviewed and assessed while still in the ED, so providers and policy makers could learn more about what led to the ED visit, the patient's satisfaction with his or her current ambulatory care providers, and the presence or absence of the social factors described above that can inhibit effective care delivery.

Where possible, the patient's family and care providers could also be interviewed for additional perspectives. This information, combined with what can be learned from administrative data, could help inform the design of intervention strategies that are effective and sustainable.

It is also important to note that only a small number of “frequent fliers” are ultra-high ED users or serial high ED users, with frequent ED use year after year. To date, most thinking by providers and policy makers about the problem of frequent ED users has focused on these serial users, but the overwhelming majority of frequent users have only episodic periods of

high ED use, instead of consistent use over multiple years. More needs to be learned about these patients as well (they, too, could be interviewed in the ED), and predictive modeling and quick intervention will probably be critical since their repeat ED use is unlikely to continue over time.

Finally, the findings of this study should serve as a cautionary tale for Medicaid programs and managed care plans that attempt to reduce spending by imposing annual limits on ED visits or denying payment for ED visits deemed to be nonemergent. ED use is not a major Medicaid cost driver, and frequent ED users often suffer from a substantial burden of illness that can require emergency care. The primary care delivery system must find ways to be more responsive to these patients, and the narrow focus on ED use seems misguided.

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Demographic Characteristics And Diagnostic History Of Emergency Department (ED) Users In New York City, 2007 (Index Year)

Exhibit 1

	Number of ED visits							All
	1	2	3-4	5-6	7-9	10-14	15+	
Number of patients	100,556	50,144	39,652	12,529	5,653	2,438	1,287	212,259
Percent of patients	47.4	23.6	18.7	5.9	2.7	1.1	0.6	100.0
Percent of ED visits	19.9	19.8	26.2	13.3	8.6	5.5	6.8	0.0
Demographic Characteristics								
Mean age (years)	36.5	36.4	36.1	36.1	36.5	37.7	41.3	36.4
Percent female	65.8	69.1	71.6	70.7	68.2	60.8	41.3	67.8
Race or ethnicity (%)								
Black	33.9	38.1	41.1	43.8	44.6	46.0	45.0	37.3
Hispanic	17.3	19.5	21.1	20.6	19.4	17.7	13.6	18.8
White	26.7	23.6	21.4	20.7	20.7	21.5	24.1	24.4
Other or unknown	22.1	18.8	16.4	15.0	15.4	14.8	17.3	19.6
Insurance Coverage (%)								
Disabled eligibility ^a	18.6	23.3	27.4	32.8	37.1	42.1	53.4	23.2
In managed care	56.3	55.9	55.1	52.5	48.2	41.7	28.5	55.2
History of Chronic Conditions								
Any chronic condition	45.5%	50.2%	55.1%	61.2%	66.9%	73.0%	84.5%	50.4%
Number of chronic conditions	0.82	0.95	1.09	1.26	1.46	1.71	2.37	0.96
Multiple chronic conditions	21.2%	24.7%	28.2%	33.3%	38.8%	46.1%	63.0%	25.1%
Substance use	17.4	22.3	27.7	35.0	43.8	55.5	73.3	23.0
Mental illness	28.4	34.9	41.3	49.2	57.6	65.3	78.9	35.1
Schizophrenia	5.0	6.8	9.0	12.6	16.1	23.1	33.6	7.3
Bipolar disorder	4.4	6.5	9.0	12.8	17.4	23.5	31.6	7.0
Depressive psychosis	8.8	11.6	14.7	18.0	21.6	25.8	34.6	11.8
Substance use or mental illness	36.0	43.6	50.8%	58.8	67.8	77.4	90.2	43.6

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	Number of ED visits							
	1	2	3-4	5-6	7-9	10-14	15+	All
Substance use and mental illness	9.7	13.6	18.2	25.4	33.6	43.3	62.0	14.5
Charlson index ^b	1.15	1.39	1.60	1.89	2.19	2.43	3.20	1.39

Source Authors' analysis of New York City Medicaid claims and encounter data. **Note** Percentages may not sum to 100 because of rounding, in both exhibit and text.

^aEligible for Medicaid because of disability.

^bCharlson Comorbidity Index (see Note 22 in text).

**Exhibit 2
Annualized Emergency Department (ED) Visits In Prior, Index, And Subsequent Years**

Number of ED visits in index year (2007)							
	1	2	3-4	5-6	7-9	10-14	15+ All
Number of annualized ED visits							
2 years prior	0.59	0.90	1.34	1.98	2.74	4.33	11.84 1.06
1 year prior	0.39	0.63	1.03	1.68	2.58	4.49	13.78 0.83
Index year	1.15	2.16	3.52	5.55	7.90	11.69	27.30 2.62
1 year after	0.65	1.04	1.65	2.63	3.99	6.47	18.47 1.36
2 years after	0.71	1.07	1.64	2.46	3.58	5.57	15.98 1.34
Number of EDs visited, index year							
1.00	1.38	1.74	2.14	2.57	3.15	5.00	1.39
Primary diagnosis, visits in index year							
Injury	18.0%	14.8%	12.2%	10.0%	8.6%	8.1%	5.9% 12.6%
Chronic condition	5.0	5.7	6.7	7.6	8.9	10.3	12.4 7.0
Substance use	1.6	1.7	2.2	3.2	4.6	7.6	20.0 3.8
Mental illness	2.7	3.0	3.4	4.2	5.1	6.2	5.9 3.8
Nonemergent ^a	27.3	27.9	28.1	27.7	26.5	24.4	19.4 26.9
Emergent, primary care treatable ^a	22.6	22.9	22.9	21.9	20.9	19.5	17.0 21.9
Emergent, preventable or avoidable ^a	5.8	6.7	7.8	8.6	9.7	11.0	11.2 7.9
Diagnoses 1-3, visits in index year ^b							
Substance use	2.3%	2.6%	3.3%	4.6%	6.3%	10.0%	24.1% 5.2%
Mental illness	3.4	3.9	4.5	5.6	6.7	8.2	8.1 4.9
Frequent users, index year and 2 years after							
3+ visits each year	0.0%	0.0%	7.0%	16.0%	27.0%	42.0%	63.0% 4.0%
5+ visits each year	0.0	0.0	0.0	5.0	12.0	25.0	51.0 1.0

Source Authors' analysis of New York City Medicaid claims and encounter data. **Note** Visit rates are annualized based on the number of months a patient was eligible for Medicaid in a given year.

^aAccording to the New York University ED profiling algorithm (see Note 24 in text).

^bIncludes principal diagnosis and two secondary diagnosis fields.

**Exhibit 3
Annualized Outpatient And Inpatient Use Of The Emergency Department (ED), Index And Prior Years**

		Number of ED visits in index year (2007)							All
		1	2	3-4	5-6	7-9	10-14	15+	All
Primary Care Visits									
1 year prior		3.80	4.29	4.80	5.36	5.90	6.31	6.72	4.30
Index year		3.89	4.53	5.25	6.12	6.80	7.16	7.45	4.59
Specialty Care Visits									
1 year prior		1.32	1.45	1.59	1.77	1.75	2.00	1.84	1.45
Index year		1.62	1.88	2.10	2.34	2.37	2.52	2.03	1.85
OB-GYN Visits									
1 year prior		0.80	0.84	0.85	0.86	0.84	0.71	0.41	0.82
Index year		0.78	0.99	1.21	1.41	1.48	1.30	0.66	0.98
Primary Care Loyalty Status^a									
Loyal		49.3%	50.9%	51.4%	51.8%	51.8%	49.6%	44.7%	50.2%
Shopper		13.5	15.5	17.6	19.3	21.5	22.0	23.1	15.4
Occasional user		20.0	18.6	17.5	16.6	14.8	15.8	15.9	18.8
Nonuser		17.3	15.0	13.5	12.4	11.9	12.6	16.4	15.5
Visit 1-30 Days Prior to ED Visit^b									
Primary care		22.7%	24.6%	25.3%	27.2%	29.9%	29.0%	30.2%	24.2%
Specialty care		8.3	8.7	9.1	9.7	10.7	9.7	8.1	8.7
OB-GYN care		6.0	6.5	6.7	6.9	6.2	5.2	1.8	6.3
Same-Day Visit^b									
Primary care		4.0	3.5	3.2	2.9	3.3	3.1	2.8	3.6
Specialty care		1.2	1.2	1.1	1.3	1.0	1.1	0.7	1.2

Number of ED visits in index year (2007)

	1	2	3-4	5-6	7-9	10-14	15+	All
OB-GYN care	0.9	1.1	1.0	1.1	0.9	0.7	0.2	1.0
Visit 1–30 Days After ED Visit^b								
Primary care	30.2	32.3	33.6	35.2	35.4	36.3	33.8	31.9
Specialty care	13.2	13.9	14.1	13.6	14.1	13.2	12.4	13.6
OB-GYN care	6.8	8.1	8.9	9.0	8.5	7.2	2.7	7.6
Nonobstetric Admission								
1 year prior	0.24	0.36	0.54	0.87	1.36	2.28	5.39	0.45
Index year	0.24	0.40	0.63	1.07	1.79	3.09	7.34	0.53
Ambulatory Care–Sensitive Admission								
1 year prior	17.2%	19.2%	18.9%	18.8%	18.8%	17.4%	15.2%	18.1%
Index year	18.5	18.8	19.3	18.1	19.2	16.3	16.4	18.4
Total Medicaid Expenditures								
1 year prior	\$9,886	\$12,258	\$15,045	\$19,204	\$25,227	\$30,861	\$55,215	\$12,885
Index year	11,193	14,698	18,311	24,371	32,674	41,172	73,599	15,642

Source Authors' analysis of New York City Medicaid claims and encounter data. **Note** Visit rates are annualized based on the number of months a patient was eligible for Medicaid in a given year.

^aBased on the number of primary care visits in two years prior to index ED visit, as explained in text.

^bIn index year.