

**HARRIS COUNTY EMERGENCY DEPARTMENT USE STUDY
2012-2013 ALL HOSPITALS REPORT**

Prepared By

The School of Public Health

University of Texas Health Science Center at Houston

Charles Begley, Jane Hamilton, Shin Jeong

November 6, 2015

HARRIS COUNTY EMERGENCY DEPARTMENT USE STUDY

2012-2013 ALL HOSPITALS REPORT

TABLE OF CONTENTS

I. Overview 1

II. Methods 2

III. Results 5

 Total ED Visits

 ED Visits Resulting in Hospital Admission

 Behavioral Health ED Visits for Harris County Residents

IV. Conclusion 15

V. Tables and Figures 20

HARRIS COUNTY EMERGENCY DEPARTMENT USE STUDY

2012-2013 ALL HOSPITALS REPORT

I. OVERVIEW

The Harris County Emergency Department (ED) Use Study is a collaborative effort of participating hospitals in the Houston area and The University of Texas School of Public Health (UTSPH). With initial support from Gateway to Care and the Memorial Hermann Healthcare System, UTSPH began working in 2002 with Memorial Hermann and Hospital Corporation of America hospitals to obtain and aggregate ED visit data of Harris County residents. Every year since 2002, a diverse group of 17-24 public and private hospitals in Harris County with EDs serving the general public (that accept walk-ins and 911 deliveries) have provided financial support for the Harris County ED Use Study and have provided ED visit data for aggregation and analysis. The ED visits provided by the participating hospitals account for more than half of all hospital-based ED visits in the county. After collaborating with hospitals to obtain and clean the ED visit data, the UTSPH analyzes the data and produces an annual report on ED visit patterns and patient characteristics for the community at large and for individual participating hospitals.

This report presents the aggregate analysis of ED visits for the 17 hospitals that provided complete data for the 2012-13 hospital ED study. Aggregate reports from previous years are available from the authors. The 2012-13 ED visit data allow estimation of the total amount, type, and population rate of hospital-based ED visits for Harris County residents and the demographic and coverage characteristics of patients who visited a hospital ED for medical care. Following the methods section, the report presents results on the number and type of total hospital-based ED visits for Harris County residents in 2012 and 2013 by age, gender, source of payment, time of day, residence, medical condition, primary care- and non-primary care- related, and level of

severity. Separate sections provide results from more detailed analyses of the types of ED visits that result in hospitalizations and patient and clinical characteristics associated with behavioral health-related ED visits.

II. METHODS

Data

The 17 hospitals that provided data for the 2012-13 hospital ED study include all nine hospitals of the Memorial Hermann Healthcare System (Hermann/Texas Medical Center, Southwest, Southeast, Northeast, Northwest, The Woodlands, Memorial City, Katy, and Sugar Land); three hospitals of the Hospital Corporation of America (Bayshore Medical Center, Clear Lake Regional Medical Center, and West Houston Medical Center); two Texas Children's Hospitals (Texas Medical Center and West Campus); and three hospitals of the Methodist Hospital System (Methodist Willowbrook, Methodist Sugar Land, and Methodist West Houston).

Each participating hospital supplied the following information for all of their ED visits during calendar years 2012 and 2013:

1. Date and time of admission to ED
2. Date and time of discharge from ED
3. Primary and secondary discharge diagnoses (ICD 9 diagnoses fields one through ten)
4. Payment source (insurance status)
5. Patient age
6. Patient gender
7. Patient race/ethnicity

8. Patient zip code
9. Employment status (Employed, Unemployed, Other, Unknown)
10. Where the patient was discharged (home, hospital, etc.)
11. Method of transport/mode of arrival (ambulance vs. self-transport)
12. Emergency Severity Index (ESI) rating
13. Source of referral

The UTSPH research team worked with participating hospitals to ensure data completeness and comparability, then created a pooled dataset that included all ED visit information from all participating hospitals for each year.

Analysis

In the aggregate analyses, the total number of ED visits at participating hospitals was compared to the total number of visits at all Harris County hospitals¹ to determine the percentage of total hospital-based ED visits in the county represented by the sample. This percentage was used to estimate the total number of ED visits of Harris County residents at all hospitals in the area, allowing us to derive population-based frequencies, percentages, and rates of visits by type and for different demographic and coverage groups.

The proportion of visits that were primary-care related (PCR) was also estimated using the New York University (NYU) ED Classification Algorithm². The NYU ED Algorithm assigns probabilities that a visit was one or more of the following types based on the primary diagnosis (ICD-9 code):

¹ As reported by the Texas Annual Hospital Survey: 2012, 2013 Cooperative DSHS/AHA/THA Annual Survey of Hospitals and Hospital Tracking Database.

² Billings J, Parikh N, Mijanovish T. Issue Brief. The Commonwealth Fund; Nov, 2000. Emergency department use in New York City: A substitute for primary care? pp. 1–5. PubMed.

Billings J, Parikh N, Mijanovish T. Emergency department use: New York City. The Commonwealth Fund; Oct, 2000.

1. Non-emergent: Immediate treatment was not required within 12 hours.
2. Emergent-Primary Care Treatable: Treatment was required within 12 hours, but could have been provided effectively and safely in a primary care setting. Continuous observation was not required, no procedures were performed or resources used that are not typically available in a primary care setting.
3. Emergent-ED Care Needed-Preventable/Avoidable: ED care was required within 12 hours, but the emergent nature of the condition was potentially preventable/avoidable if timely/continuous primary care had been received for the underlying illness.
4. Emergent-ED Care Needed-Not Preventable/Avoidable: ED care was required within 12 hours and primary care could not have prevented the condition.

The probabilities were used as weights when aggregating the data to derive an overall estimate of the number and percentage of total ED visits of each type.

The distribution of visits by severity was also estimated by aggregating the Emergency Severity Index (ESI) rating that was applied by ED staff to each visit for all visits and calculating frequencies and percentages.

Multivariate logistic regression analyses were conducted to examine predictors of hospitalization following an ED visit. In the analysis, potential predictors of hospitalization included patient age, gender, race/ethnicity, payer source (insurance status) and co-morbid diagnosis including any behavioral health condition; cardiovascular disease; hypertension; diabetes; and any other chronic condition.

A separate multivariate logistic regression analysis was also conducted to examine predictors of hospitalization among individuals diagnosed with a behavioral health condition. In

this analysis, potential predictors included primary and secondary behavioral health diagnoses (psychiatric and/or substance abuse), age, gender, race/ethnicity, and payer source.

III. Results

Total ED Visits

1. Total ED Visits, Hospitalization, and Population Visit Rates

The number of ED visits made to all 17 participating hospitals increased slightly from 892,611 in 2012 to 898,365 in 2013. Of the total ED visits, 82.0% were made by Harris County residents in 2012 and 82.1% in 2013. The overall hospitalization rate was 7.7% in each respective year. (Table 1, Figure 1a).

The ED visits of participating hospitals represented 54.4% of all ED visits at Harris County hospitals in 2012 (1,642,327) and 54.9% in 2013 (1,636,187). Applying the percentage of Harris County residents in participating hospitals to total ED visits at all hospitals,³ an estimated 1,346,708 ED visits were made by Harris County residents to county hospitals in 2012 declining to 1,343,310 in 2013. Comparing these numbers to the Harris County population in corresponding years, the ED visit rate of the population fell slightly from 31.8 per 100 residents in 2012 to 31.0 per 100 in 2013.⁴ (Figures 1b and 1c).

2. ED Visits by Month and Day of Week

The number of ED visits by Harris County residents fluctuated seasonally, with slightly more visits occurring in the fall and winter months and fewer in the summer. The weekly pattern of visits peaked on Mondays and was lowest on Thursdays. (Table 2, Figure 2) (Table 3, Figure 3).

³ Multiply .82 times all visits in 2012 and .821 times all visits in 2013.

⁴ Harris County Population 2012 – 4,239,023, 2013 – 4,336,853.

3. *Patient Characteristics*

Gender: Almost six in ten (56.7% in 2012 and 56.4% in 2013) ED visits were made by females and four of ten (43.3% in 2012 and 43.6% in 2013) by males. (Table 4, Figure 4).

Age: Children age 0-18 made up about one third (34.9% in 2012 and 33.8% in 2013) of all ED visits, adults age 19-64 a little over half (53.7% in 2012 and 54.3% IN 2013). Older adults age 65 and over accounted for 11.4% of total ED visits in 2012 and 11.9% in 2013. (Table 5, Figure 5).

Race Ethnicity: Almost 60% of ED visits were by persons who were Black or Hispanic (57.4% in 2012 and 57.0% in 2013), about one third of ED visits were by Whites (35.6% in 2012 and 35.0% in 2013), and the rest were Asian or another race/ethnicity. (Table 6, Figure 6).

Payment Source: Medicaid-covered and uninsured patients accounted for almost 60% of all ED visits in both 2012 and 2013. In both years, the largest number of patients who visited a participating ED had Medicaid coverage (30.3% in 2012 and 30.0% in 2013), followed by the uninsured, who accounted for over a quarter of ED visits (27.9% in 2012 and 27.3% in 2013). Commercially insured patients accounted for just under a quarter of ED visits (24.9% in 2012 and 25.1% in 2013) and Medicare and other covered patients made up the rest. (Table 7, Figure 7).

4. *ED Visits by Primary Diagnosis*

Nine out of 10 patients visited a participating ED for treatment of an acute condition (92.6% in 2012 and 92.4% in 2013).⁵ Primary chronic physical conditions were treated in 5.4%

⁵ Acute conditions – Includes all conditions that were not chronic physical or behavioral health conditions. Chronic conditions – Includes Hypertension, Cardiovascular Disease, Diabetes and other chronic conditions (Hyperlipidemia, Stroke or Transient Ischemic Attack, Arthritis, Asthma, Cancer, Chronic Kidney Disease, Chronic Obstructive pulmonary Disease, Alzheimer’s and Other Senile Dementias and Osteoporosis).

of visits in 2012 and 5.6% in 2013. Visits with behavioral health related primary diagnoses accounted for 2.0% of total visits in 2012 and 2013.⁶ More than two-thirds (72.4% in 2012 and 72.3% in 2013) of patients had an acute secondary diagnosis. The most frequent secondary chronic conditions were hypertension (15.1% in 2012 and 15.5% in 2013) and behavioral health (11.2% in 2012 and 10.8% in 2013). (Tables 8-1 and 8-2, Figure 8).

5. *ED Visits by Mode of Transport*

About 80% of all patients (78.9% in 2012, 80.2% in 2013) arrived at the ED on their own and 20% (19.2% in 2012, 19.3% in 2013) arrived at the ED by ambulance transport or another source. (Table 9, Figure 9)

6. *ED Visits by Type*

About four in ten ED visits (39.8% in 2012 and 40.0% in 2013) were classified primary care-related (PCR) according to the NYU Algorithm (Non-emergent + Emergent, Primary Care Treatable + Emergent, ED Care Needed, Preventable/Avoidable). Most PCR ED visits were either non-emergent or primary care treatable. Injury, mental health, alcohol, and drug-related visits were not classified by the algorithm nor were about 30% of total ED visits (26.9.0% in 2012 and 26.8% in 2013) with incomplete codes or codes that the NYU Algorithm did not classify. (Table 10, Figure 10).

7. *ED Visits by Patient Residence*

About 30% of ED visits (32.0% in 2012, 31.9% in 2013) were made by patients who lived in one of the top 20 Zip codes with the most visits. Eighteen out of the 20 top patient resident Zip codes in 2012 were also in the top 20 in 2013. In about one third of the PCR ED visits (32.9% in 2012, 34.6% in 2013) the patient lived in one of the top 20 Zip codes. Most of

⁶ Behavioral health conditions – Includes mental illness and substance use-related diagnoses.

the top 20 Zip code areas with the highest number of total ED visits also had the highest volume of PCR ED visits (17). (Tables 11 and 12).

8. *ED Visits by Emergency Severity Index (ESI)*⁷

Of all ED visits by Harris County residents reported by participating hospitals, almost half (47.8%) were assigned an ESI score in 2012 and almost 70% had one in 2013. Among those with an ESI score in 2012, 13.5% were high acuity (ESI 1-2) and 38.5% were low acuity (ESI 4-5). In 2013, 14.2% were high acuity (ESI 1-2) and 33.2% low acuity (ESI 4-5). The most frequent rating was ESI 3 (moderate acuity) which accounted for almost half of the rated visits in 2012 (48.0%) and a little more than half in 2013 (52.6%). (Table 13, Figure 13).

ED Visits Resulting in Hospital Admissions

While ED visit costs for the nation represent only about 2% of the nation's \$2.9 trillion annual healthcare bill, the ED serves as a gateway to greater costs associated with subsequent inpatient care.⁸ The ED has become the primary source of hospitalizations in the U.S., and admitting a patient to the hospital from the ED is one of the most expensive decisions made in healthcare.^{9,10} Recent studies have found that admission rates are highly variable across hospitals. Patients with chronic and behavioral health conditions are more likely to be

⁷ The ESI, is a score commonly assigned to each ED patient at the point of admission to the ER. The score, which ranges from 1 (most acute) to 5 (least acute) is used as an initial assessment of patient need and urgency of care.

⁸ Institute of Medicine (IOM). Hospital-based emergency care at the breaking point. IOM Web site. [http://www.iom.edu/~media/Files/Report% 20Files/2006/Hospital-Based-Emergency-Care-At-the-Breaking-Point/EmergencyCare.ashx](http://www.iom.edu/~media/Files/Report%20Files/2006/Hospital-Based-Emergency-Care-At-the-Breaking-Point/EmergencyCare.ashx). Published June 2006. Accessed December 8, 2014.

⁹ Cowan, R.M., Trzeciak S. Clinical review: Emergency department overcrowding and the potential impact on the critically ill. *Crit Care*. 2005; 9(3): 291–295.

¹⁰ Agency for Healthcare Research and Quality. Emergency Room Services-Mean and Median Expenses per Person with Expense and Distribution of Expenses by Source of Payment: United States, 2006. Medical Expenditure Panel Survey Household Component Data.

hospitalized following an ED visit, and 10% of total healthcare costs have been associated with the hospitalization of ED patients with primary or secondary chronic health conditions.

10

For Harris County residents in 2012, the overall rate of ED visits resulting in a hospital admission at the 17 participating hospitals was 7.7%. Controlling for age, gender, race/ethnicity, payer source (insurance status), and the presence of a chronic health condition (hypertension, cardiovascular disease, diabetes or other chronic condition), patients with a primary diagnosis of a behavioral health condition were 2.2 times more likely to be hospitalized compared to patients with another primary diagnosis (Odds Ratio [OR]: 2.193; 95% Confidence Interval [CI]: 2.089, 2.303). Patients with a primary diagnosis of cardiovascular disease were 1.9 times more likely to be hospitalized following an ED visit (OR: 1.914; 95% CI: 1.824, 2.008), patients with a primary diagnosis of diabetes were 2.4 times more likely to be hospitalized following an ED visit compared to patients with another primary diagnosis (OR: 2.428; 95% CI: 2.215, 2.661). Persons with a chronic illness other than a behavioral health condition, cardiovascular disease, diabetes or hypertension were 2.1 times more likely to be hospitalized following an ED visit (OR: 2.078; 95% CI: 1.999, 2.159). In contrast, a person with a diagnosis of hypertension was 46% less likely to be hospitalized following an ED visit compared to patients with another primary diagnosis (OR: .526; 95% CI: .481, .575). Additional significant factors associated with increased risk of hospitalization following an ED visit included increasing age (OR: 1.031; 95% CI: 1.031, 1.032) and male gender (OR: 1.152; 95% CI: 1.131, 1.173). Compared to non-Hispanic White patients, non-Hispanic Black patients (OR: .843; 95% CI: .824, .862) and Hispanic patients (OR: .688; 95% CI: .670, .705) were less likely to be hospitalized following an ED visit. In contrast, patients who were another race/ethnicity were more likely to be hospitalized following an ED visit compared to non-Hispanic Whites (OR: 1.290; 95% CI: 1.238, 1.343).

Compared to patients with commercial insurance, patients who were uninsured (OR: 1.137; 95% CI: 1.106, 1.170), had Medicare insurance (OR: 1.877; 95% CI: 1.821, 1.934), had Medicaid insurance (OR: 1.107; 95% CI: 1.072, 1.144) or had another payer source (OR: 1.115; 95% CI: 1.031, 1.206) were more likely to be hospitalized following an ED visit.

In 2013, the overall rate of ED visits resulting in a hospital admission for Harris County residents for the 17 Harris County EDs included in our study was 7.7%. Controlling for age, gender, race/ethnicity, payer source (insurance status), and the presence of a chronic health condition (hypertension, cardiovascular disease, diabetes or other chronic condition), patients with a primary diagnosis of a behavioral health condition were 2.1 times more likely to be hospitalized compared to patients with another primary diagnosis (OR: 2.098; 95% CI: 1.998, 2.203). Patients with a primary diagnosis of cardiovascular disease were 2 times more likely to be hospitalized following an ED visit (OR: 2.009; 95% CI: 1.917, 2.105), and patients with a primary diagnosis of diabetes were 2.4 times more likely to be hospitalized following an ED visit compared to patients with another primary diagnosis (OR: 2.310; 95% CI: 2.114, 2.523). Persons with a chronic illness other than a behavioral health condition, cardiovascular disease, diabetes or hypertension were 2.1 times more likely to be hospitalized following an ED visit while persons (OR: 2.067; 95% CI: 1.989, 2.147). In contrast, a person with a diagnosis of hypertension was only 51.4% as likely to be hospitalized following an ED visit compared to patients with another primary diagnosis (OR: .486; 95% CI: .445). Additional significant factors associated with increased risk of hospitalization following an ED visit included increasing age (OR: 1.030; 95% CI: 1.029, 1.030) and male gender (OR: 1.136; 95% CI: 1.115, 1.157). Compared to non-Hispanic White patients, non-Hispanic Black patients (OR: .853; 95% CI: .834, .872) and Hispanic patients (OR: .630; 95% CI: .614, .646) were less likely to be

hospitalized following an ED visit. In contrast, patients who were another race/ethnicity were more likely to be hospitalized following an ED visit compared to non-Hispanic whites (OR: 1.537; 95% CI: 1.484, 1.592).

Compared to patients with commercial insurance, patients who were uninsured (OR: 1.147; 95% CI: 1.115, 1.180), had Medicare insurance (OR: 1.865; 95% CI: 1.810, 1.922) or had Medicaid insurance (OR: 1.109; 95% CI: 1.074, 1.145) were more likely to be hospitalized following an ED visit.

Behavioral Health Visits for Harris County Residents

Persons with behavioral health (mental health and substance abuse) conditions who are unable to access community-based behavioral health services frequently seek treatment in EDs.⁸ Behavioral health-related ED visits are associated with overcrowding and a subsequent increase in preventable medical errors,¹¹ due in part to being admitted to the hospital but waiting for an inpatient bed (psychiatric ED boarding).¹² This is a concern both to providers and consumers because of the high costs as well as the decreased quality of care.

In 2012, there were 14,494 Harris County ED visits for patients with a primary behavioral health diagnosis⁶ at the 17 EDs included in our aggregated study, accounting for 2.0% of total ED visits (Table 8.1). Additionally, there were another 81,746 ED visits for patients with a secondary behavioral health diagnosis, accounting for another 11.2% of 2012 ED visits. The majority of patients who visited a Harris County ED in 2012 with a primary behavioral health diagnosis were female (52.2%) compared to males (47.8%). Additionally, more ED patients with a behavioral health diagnosis were non-Hispanic White (45.4%) compared to non-Hispanic

¹¹Epstein, S.K., Huckins, D.S., Liu, S.W. Emergency department crowding and risk of preventable medical errors. *Internal Emergency Medicine*. Pp. 173-180, 2012.

¹² Alakeson, V., Pande N., Ludwig, M. A Plan to Reduce Emergency Room 'Boarding' Of Psychiatric Patients. *Health Affairs*, 2010 29(9)(2010):1637-1642.

Black (23.1%), Hispanic (24.7%), Asian (1.7%) or other race/ethnicities (5.1 %) in 2012. (Figure 14).

The majority of patients who visited a Harris County ED in 2012 with a primary behavioral health diagnosis were uninsured (39.3%) while 24.3% of patients had commercial insurance, 17.3% had Medicare, 17.6% had Medicaid and 1.6% had another payer source (Figure 15). Uninsured individuals account for 20.6% of behavioral health-related ED visits nationally. This difference may reflect the higher rates of uninsured persons and the limited availability of behavioral health services in Harris County.

The majority of patients who visited the ED in 2012 and received a primary diagnosis of a behavioral health condition were treated for anxiety disorders (21.3%), while fewer patients were treated for schizophrenia/psychotic disorders (8.7%) or affective (mood) disorders, (8.1%). Among patients visiting the ED in 2012 for substance abuse problems, the majority were for alcohol-related disorders (15.1%) while drug-related visits were less common (9.6%). (Figure 16).

In 2012, the overall rate of ED visits resulting in a hospital admission for Harris County residents with a behavioral health disorder was 15.3%. Using multivariate logistic regression, we examined which behavioral health conditions were associated with an increased risk of hospitalization following an ED visit while controlling for age, gender, race/ethnicity, payer source (insurance status), primary and secondary behavioral health diagnoses. In 2012, patients with a primary diagnosis of schizophrenia/psychotic disorder were 3.9 times more likely to be hospitalized compared to patients with another primary behavioral health diagnosis (OR: 3.922; 95% CI: 3.403, 4.521). Patients with a primary diagnosis of an affective disorder were 2.6 times

more likely to be hospitalized following an ED visit compared to patients with another behavioral health diagnosis (OR: 2.608; 95% CI: 2.249, 3.026). In contrast, patients with a primary diagnosis of anxiety were only 81% as likely to be hospitalized compared to patients with another behavioral health diagnosis (OR: .186; 95% CI: .148, .233). Patients presenting to the ED because of alcohol (OR: .526; 95% CI: .441, .627) or drug use (OR: .401; 95% CI: .319, .504) were also less likely to be hospitalized. In contrast, patients with a primary and secondary behavioral health diagnosis were 1.6 times more likely to be hospitalized compared to patients with only a primary behavioral health diagnosis (OR: 1.571; 95% CI: 1.415, 1.745).

In 2012, patients with a behavioral health diagnosis who were older were more likely to be hospitalized following an ED visit (OR: 1.014, 95% CI: 1.011, 1.017). In contrast, patients visiting the ED with a primary behavioral health diagnosis who were non-Hispanic Black (OR: .856, 95% CI: .753, .973) or Hispanic (OR: .666; 95% CI: .577, .769; $p < 0.001$) were less likely to be hospitalized than non-Hispanic Whites.

In contrast to our analysis of the predictors of all 2012 ED visits resulting in hospitalizations, our subgroup analysis of the predictors of behavioral health visits resulting in hospitalization found patients who were uninsured were not as likely to be hospitalized compared to patients with commercial insurance (OR: .704; 95% CI: .609, .814). However, similar to the overall analysis of hospitalizations following an ED visit, patients who had Medicare were more likely to be hospitalized compared to patients with commercial insurance (OR: 1.602; 95% CI: 1.357, 1.890).

In 2013, there were 15,018 Harris County ED visits for patients with a primary behavioral health diagnosis⁶ at the 17 EDs included in our study, accounting for 2.0% of total ED

visits (Table 8.2). Additionally, there were another 79,648 Harris County ED visits for patients with a secondary behavioral health diagnosis; accounting for another 10.8% of 2013 ED visits. The majority of the patients who visited a Harris County ED in 2013 with a primary behavioral health diagnosis were female (51.3%) compared to males (48.7%). Additionally, more ED patients with a behavioral health diagnosis were non-Hispanic white (45.3%) compared to non-Hispanic black (22.1%), Hispanic (25.1%), Asian (1.6%) or other race/ethnicities (5.9%) in 2013 (Figure 14).

The majority of patients who visited a Harris County ED in 2013 with a primary behavioral health diagnosis were uninsured (39.6%) while 23.5% of patients had commercial insurance, 17.5% had Medicare, 17.8% had Medicaid and 1.7% had another payer source (Figure 15). The majority of patients who visited the ED in 2013 and received a primary diagnosis of a mental health condition were treated for anxiety disorders (23.8%), while fewer patients were treated for schizophrenia/unspecified psychotic disorders (8.6%) or affective (mood) disorders, (7.9%). Among patients visiting the ED in 2013 for substance abuse problems, the majority were for alcohol related disorders (15.7%) while drug-related visits were less common (9.6%) (Figure 16).

In 2013, the overall rate of ED visits resulting in a hospital admission for Harris County residents with a behavioral health disorder included in our study was 14.4%. Controlling for age, gender, race/ethnicity, payer source (insurance status), primary and secondary behavioral health diagnoses, we examined which behavioral health conditions were associated with an increased risk of hospitalization following an ED visit. In 2013, patients with a primary diagnosis of schizophrenia/psychotic disorder condition were 3.5 times more likely to be hospitalized compared to patients with another primary behavioral health diagnosis (OR: 3.517; 95% CI:

3.051, 4.053). Patients with a primary diagnosis of an affective disorder were 2.9 times more likely to be hospitalized following an ED visit compared to patients with another behavioral health diagnosis (OR: 2.667; 95% CI: 2.299, 3.093). In contrast, patients with a primary diagnosis of anxiety were 79.3% less likely to be hospitalized compared to patients with another behavioral health diagnosis (OR: .207; 95% CI: .169).

Patients treated in the ED with an alcohol related diagnosis (OR: .521; 95% CI: .437, .620) or a drug related diagnosis (OR: .360; 95% CI: .285, .457) in 2013 were also less likely to be hospitalized. Patients with a primary and secondary behavioral health diagnosis were 1.6 times more likely to be hospitalized compared to patients with only a primary behavioral health diagnosis (OR: 1.518; 95% CI: 1.368, 1.685).

In 2013, patients with a behavioral health diagnosis who were older were more likely to be hospitalized following an ED visit (OR: 1.011, 95% CI: 1.007, 1.014). Patients visiting the ED with a primary behavioral health diagnosis who were Hispanic (OR: .651; 95% CI: .563, .752) were less likely to be hospitalized than non-Hispanic whites.

Consistent with our 2012 findings, patients with a behavioral health diagnosis who were uninsured were less likely to be hospitalized than patients with commercial insurance (OR: .576; 95% CI: .496, .669). In contrast, ED patients with a primary behavioral health diagnosis who had Medicare (OR: 1.623; 95% CI: 1.375, 1.917) or Medicaid (OR: 1.293; 95% CI: 1.108, 1.508) were more likely to be hospitalized compared to patients with commercial insurance.

IV. Conclusions

ED visits of Harris County residents in area hospitals increased slightly in total volume between 2012 and 2013 but the population rate of ED visits declined slightly. The highest volume and percentage of visits were by patients who were uninsured or who had Medicaid coverage. This finding is consistent with prior research indicating that issues of access to healthcare are key determinants of ED use. Because EDs are the only point of entry into the U.S. healthcare system where the low-income uninsured cannot be turned away, EDs have been shown to be disproportionately used by low-income Medicaid and uninsured patients.¹³

The study also found that the percentage of visits that were PCR fell slightly but continued to account for about 40% of all ED visits classified by the NYU Algorithm. One half to two thirds of ED visits and PCR ED visits came from the same 20 highest volume zip codes. This finding in particular may reflect barriers in access to primary healthcare services within these areas. Additionally, one out of three ED patient visits assessed for severity with ESI ratings were determined to have a low level of severity. This finding along with the NYU Algorithm findings suggests that many patients visiting the ED in Harris County could have been treated in primary care clinics. if timely access to primary care services was available.

About a third of total ED visits were by patients diagnosed with a chronic medical or behavioral health condition, and patients with chronic (including cardiovascular disease and diabetes) and behavioral conditions were more likely to be hospitalized following an ED visit. Additionally, uninsured patients, patients with Medicaid, and Medicare patients were more likely to be hospitalized following an ED visit as compared to patients who were commercially insured.

Taken together, these findings support the need to continue to find alternative sources of primary care for the Medicaid and uninsured. Multiple ED diversion strategies targeting high

¹³ Gonzalez Morganti, K., Bauhoff S., Blanchard J.C., Abir, M., Iyer, N., Smith, A., Vesely, J.V., Okeke E.N., Kellermann A.L., The Evolving Role of Emergency Departments in the United States. Santa Monica, CA: RAND Corporation, 2013.http://www.rand.org/pubs/research_reports/RR280.

risk population groups may be needed to reduce the high rates of non-urgent and PCR ED visits including: a) expanded outpatient primary and specialty care capacity, especially for adults and the elderly, b) patient education about appropriate ED use and navigation assistance in obtaining primary care, c) after-hours clinics for children and adults, d) more hospital staffing at peak hours of ED use, and e) efforts to link the population, particularly the uninsured, as well as Medicaid and CHIP enrollees to a medical home.

The findings regarding the predictors of hospitalization indicate a need for addressing the higher hospitalization rates of populations with chronic and behavioral health conditions. To reduce hospitalizations of patients with chronic and behavioral health conditions, providers and payers might consider encouraging high-risk patients with these conditions to participate in disease-management programs and/or provide wraparound services with a focus on wellness and prevention.

It is important to note that the finding that patients with Medicare or Medicaid or patients who were uninsured were more likely to be hospitalized following an ED visit compared to patients with commercial insurance is consistent with national ED research showing that inpatient admission rates vary by the patient's insurance status.¹⁴ While research has found that a majority of commercially insured patients are admitted to the hospital from their doctors' office or a clinic, 60 percent of all inpatient admissions of Medicare beneficiaries and nearly half (47 percent) of inpatient admissions of Medicaid beneficiaries have been found to be admitted to the hospital through the ED.¹⁴ Additionally, less than a quarter of uninsured patients have been shown to be admitted from a doctor's office, clinic or other sources with three out of every four uninsured patients (73 percent) admitted from an ED. Further, the finding that patients with Medicaid were more likely to be hospitalized following an ED visit is consistent with national

research findings in which patients with Medicaid were visiting the ED for more urgent or serious conditions¹⁴

Our study also found that compared to non-Hispanic White patients, non-Hispanic Black and Hispanic patients were significantly less likely to be hospitalized following an ED visit when controlling for other factors in the multivariate model. Accordingly, future studies are needed to examine the possibility of racial/ethnic disparities in ED treatment to determine if these differences were related to differences in medical conditions, patient severity, availability of family support or socio-demographic factors (age, gender, payer source) among patients visiting the ED.

The finding that patients with a behavioral health condition who were uninsured were significantly less likely to be hospitalized following an ED visit may be related to a higher demand for and a lower availability of indigent inpatient psychiatric beds in Harris County compared to psychiatric beds that require third party reimbursement. Prior research has shown that overcrowded U.S. EDs have become a place of last resort for vulnerable psychiatric patients. Psychiatric boarding, defined as psychiatric patients' waiting in hallways or other ED areas for inpatient beds, is a serious problem nationwide. Psychiatric ED boarding consumes scarce ED resources and prolongs the amount of time that all patients must spend waiting for services. This phenomenon has been previously associated with an inability for individuals with a behavioral health condition to gain timely access to community-based care.¹³ In our study, uninsured patients with behavioral health conditions may have visited the ED to obtain a respite from psychosocial stressors which may have been alleviated during the ED stays, resulting in the patient asking to be discharged back to community after a period of prolonged psychiatric ED

¹⁴ Sommers A.S., Boukus E.R., Carrier E. Dispelling myths about emergency department use: Majority of Medicaid visits are for more urgent or serious conditions. Center for Studying Health System Change: Research Brief 23; July 2012.

boarding. Research suggests that a reduction in psychiatric boarding is best achieved through a comprehensive approach to mental health services that create appropriate alternatives to EDs for mental health crises and routine care. Accordingly, continued monitoring of ED utilization trends for uninsured psychiatric patients is needed to assess the impact of recent expansion of community-based mental health services in Harris County through the Delivery System Reform Incentive Payment (1115 Medicaid Waiver) program that began in 2011.

The high level of continued participation by Harris County hospitals has allowed monitoring community-wide trends in ED visits in Harris County hospitals. The analyses of 2012-2013 data indicate a slight trend in total visits, a high number and percentage of Medicaid and uninsured patients, high concentrations from certain parts of the county, substantial percentage of low severity and/or primary care related visits, high percentage with chronic conditions particularly behavioral health-related and disproportionate rates of hospitalization of patients with these chronic conditions. Starting in 2015, all hospitals in the state will be required to submit their ED visit data to the state health department. This will create the opportunity to continue monitoring ED visit trends in Harris County using a more comprehensive data set that will be maintained by the state. It also will allow comparisons of ED visit patterns in Harris County and the rest of the state. With the addition of more data items available for each visit, more in-depth analyses will be possible of the type of patients making visits, the type of visits being made, and the factors associated with hospitalizations.

V. TABLES AND FIGURES

Table 1. ED Visits at Participating Hospitals

Category \ Year	2012	Percent	2013	Percent
All Visits	892,611	100.0	898,365	100.0
Harris County Residents	732,151	82.0	737,809	82.1
Harris County Residents Hospitalized	56,430	7.7	56,460	7.7
Harris County Residents Not Hospitalized	675,721	92.3	681,349	92.3

Figure 1a. Admitted/Non-Admitted ED Visits of Harris County Residents at Participating Hospitals

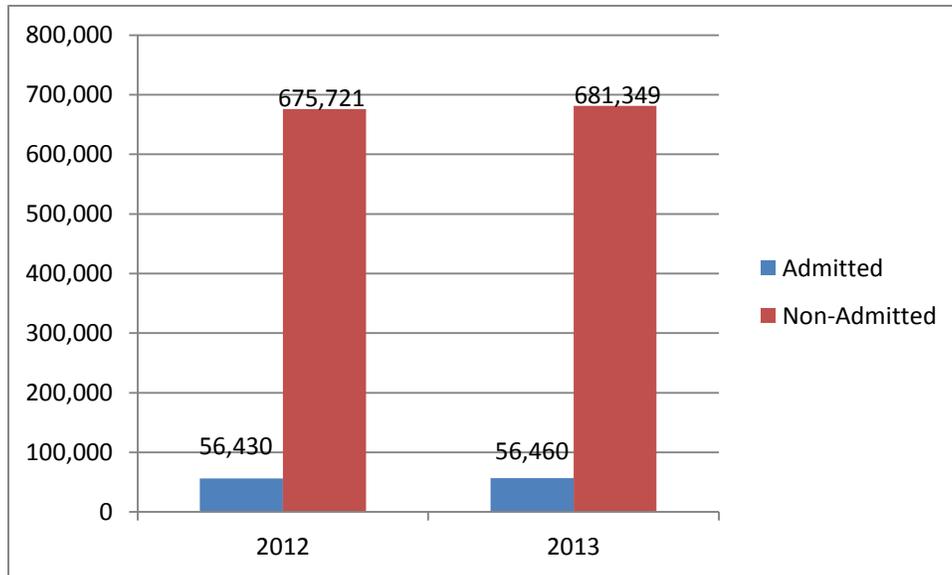


Figure 1b. ED Visits at Participating Hospitals and at All Harris County Hospitals

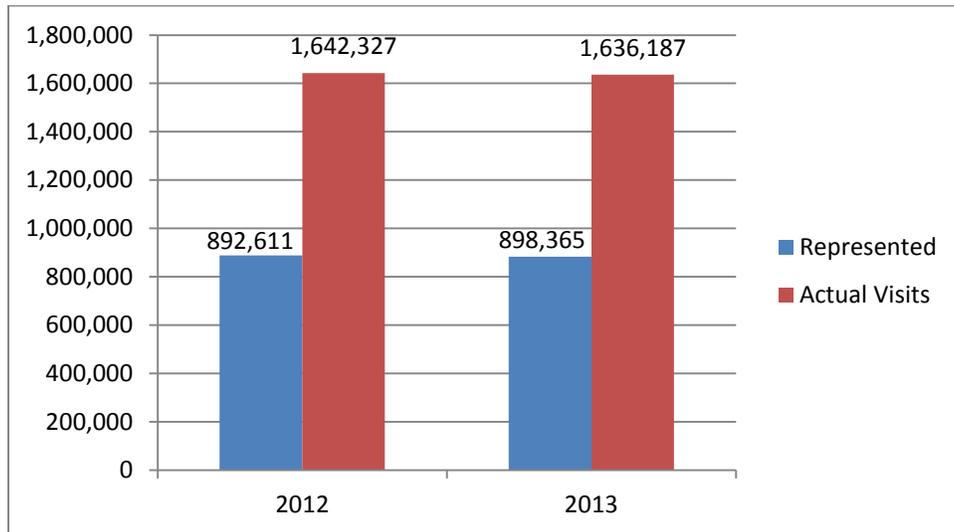


Figure 1c. ED Visits of Harris Residents and All Patients at All Hospitals

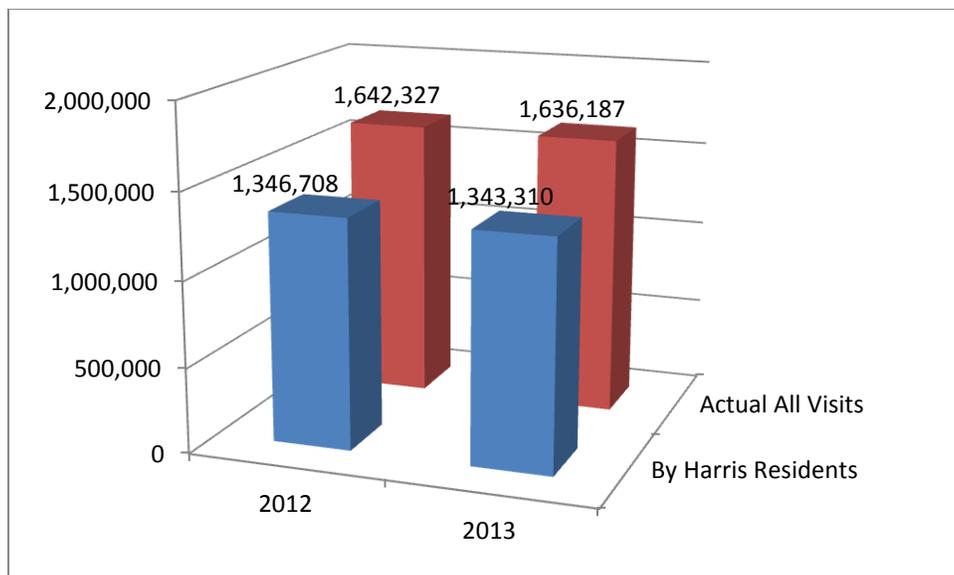


Table 2. ED visits by Month

Month	2012	Percent	2013	Percent
January	57,839	7.9	63,757	8.6
February	55,543	7.6	55,110	7.5
March	63,185	8.6	63,719	8.6
April	62,146	8.5	61,225	8.3
May	63,254	8.6	63,517	8.6
June	56,907	7.8	59,789	8.1
July	56,077	7.7	58,286	7.9
August	59,179	8.1	58,357	7.9
September	63,188	8.6	61,239	8.3
October	64,539	8.8	62,525	8.5
November	64,391	8.8	63,819	8.6
December	65,903	9.0	66,466	9.0
Total	732,151		737,809	

Figure 2. ED Visits by Month

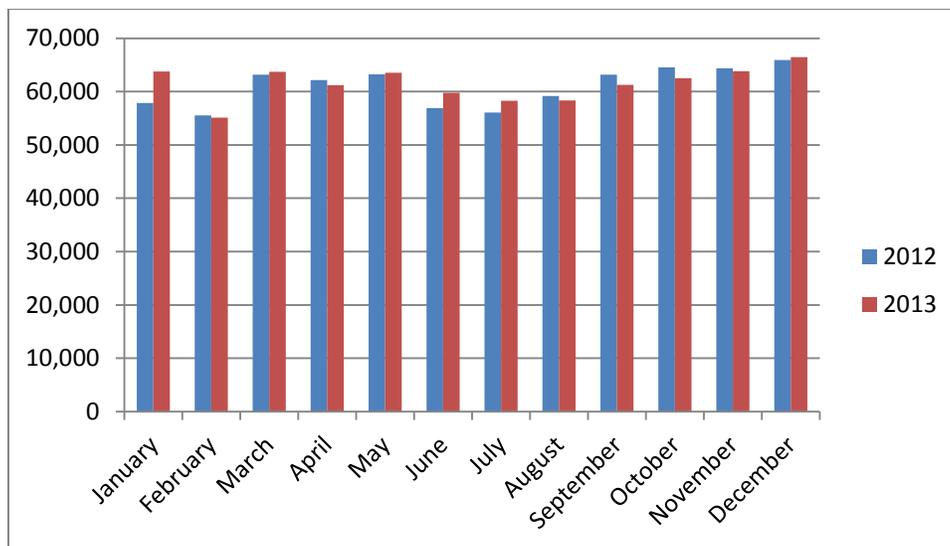


Table 3. ED Visits by Day of the Week

Week	2012	Percent	2013	Percent
Sunday	108,947	14.9	108,068	14.6
Monday	112,563	15.4	111,928	15.2
Tuesday	104,109	14.2	108,087	14.6
Wednesday	101,971	13.9	103,096	14.0
Thursday	100,464	13.7	100,498	13.6
Friday	100,722	13.8	101,601	13.8
Saturday	103,375	14.1	104,531	14.2
Total	732,151		737,809	

Figure 3. ED Visits by Day of the Week

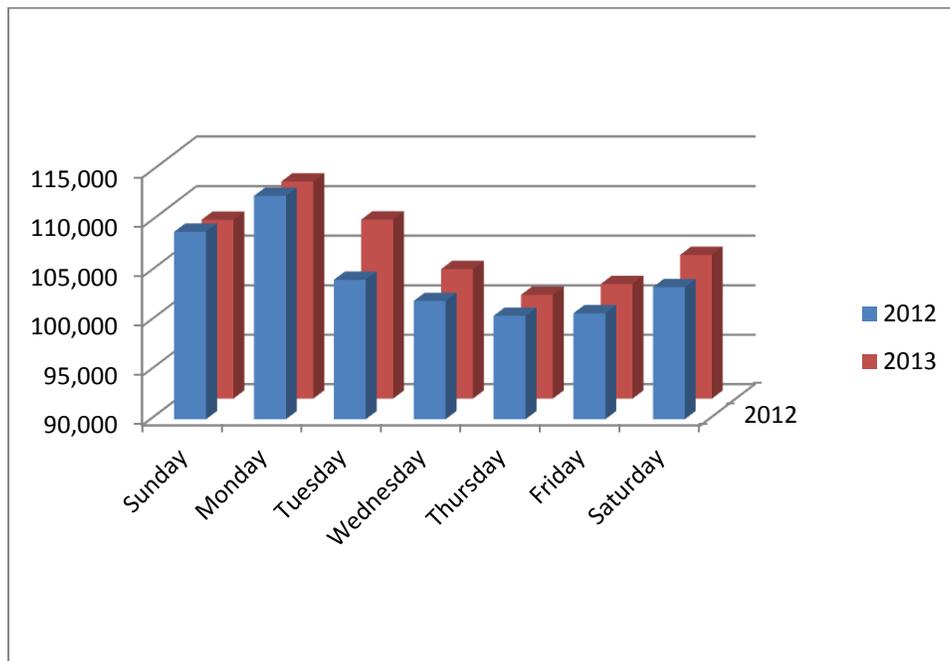
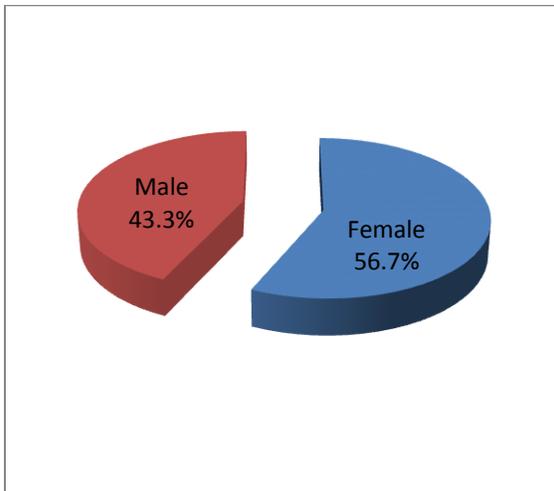


Table 4. ED Visits by Gender

Gender	2012	Percent	2013	Percent
Male	316,703	43.3	321,666	43.6
Female	415,426	56.7	416,120	56.4
Missing	22		23	
Total	732,151		737,809	

Figure 4. ED Visits by Gender

<2012>



<2013>

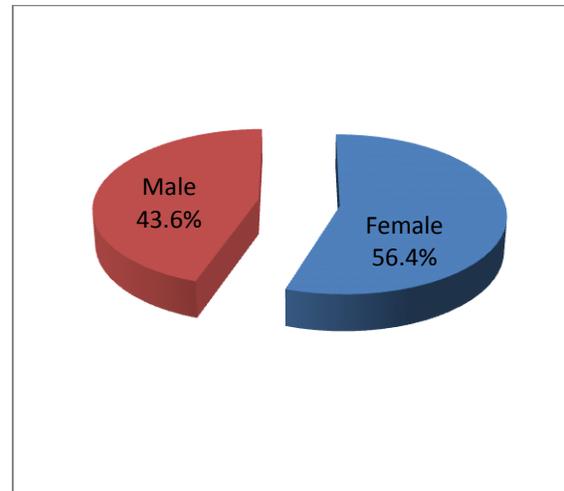


Table 5. ED Visits by Age Group

Age	2012	Percent	2013	Percent
Infant (0 – 2)	90,615	12.4	88,130	11.9
Youth (3 -18)	165,091	22.5	161,532	21.9
Adult (19-64)	393,223	53.7	400,352	54.3
Senior (65+)	83,217	11.4	87,780	11.9
Missing	5		15	
Total	732,151		737,809	

Figure 5. ED Visits by Age Group

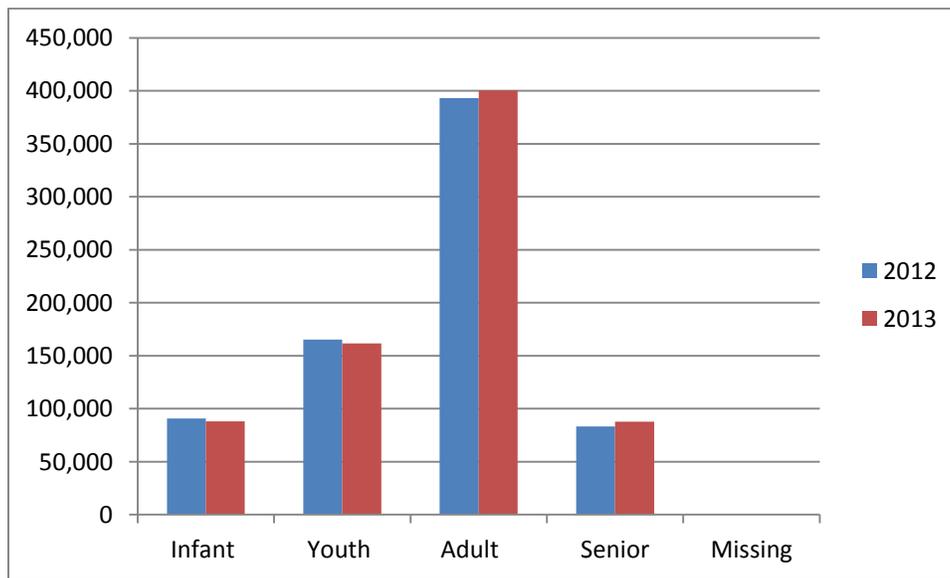


Table 6. ED Visits by Race-Ethnicity

Race Ethnicity	2012	Percent	2012	Percent
Hispanic	203,403	27.8	198,594	26.9
Non-Hispanic White	260,841	35.6	258,562	35.0
Non-Hispanic Black	216,652	29.6	221,753	30.1
Non-Hispanic Asian	16,143	2.2	15,511	2.1
Other	35,112	4.8	43,389	5.9
Total	732,151		737,809	

Figure 6. ED Visits by Race-Ethnicity

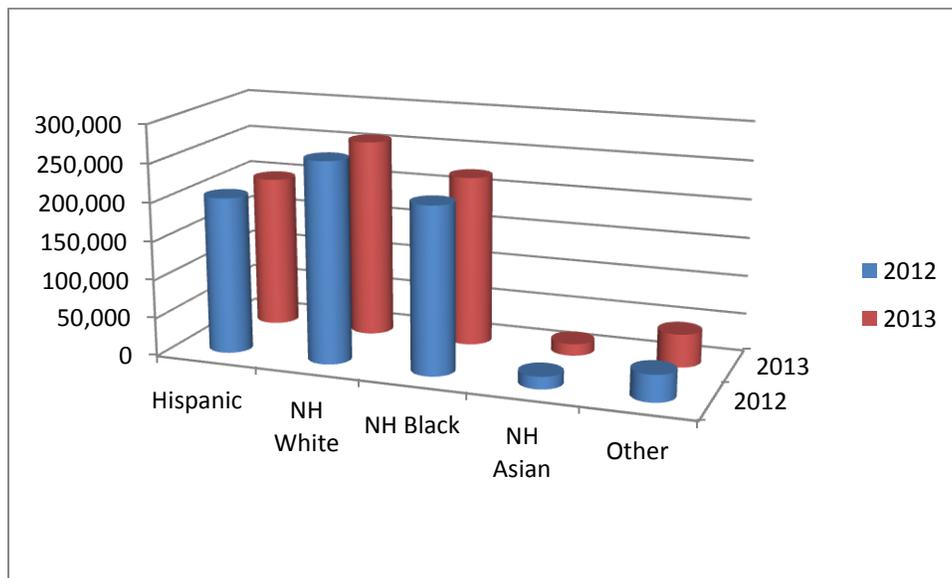


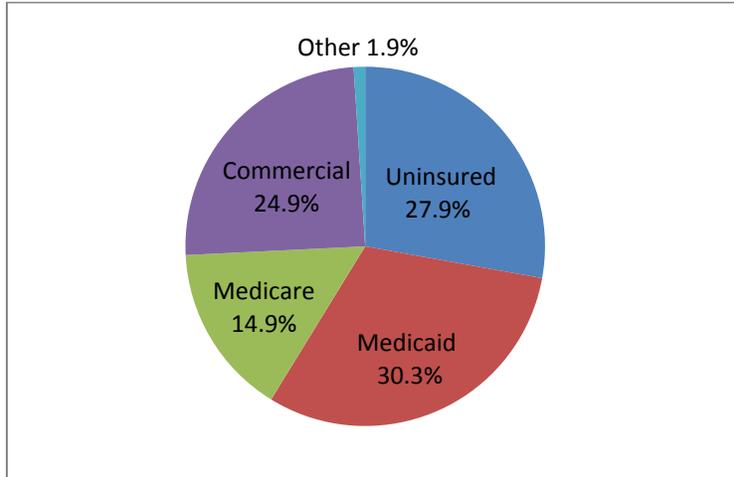
Table 7. ED Visits by Payment Source

Payment Source	2012	Percent	2013	Percent
Commercial	182,489	24.9	185,069	25.1
Medicaid	221,921	30.3	221,165	30.0
Medicare	109,350	14.9	117,022	15.9
Uninsured	204,347	27.9	201,106	27.3
Other*	14,044	1.9	13,447	1.8
Total	732,151		737,809	

*Other Payment Sources may include research/institutional programs, etc.

Figure 7. ED Visits by Payment Source

<2012>



<2013>

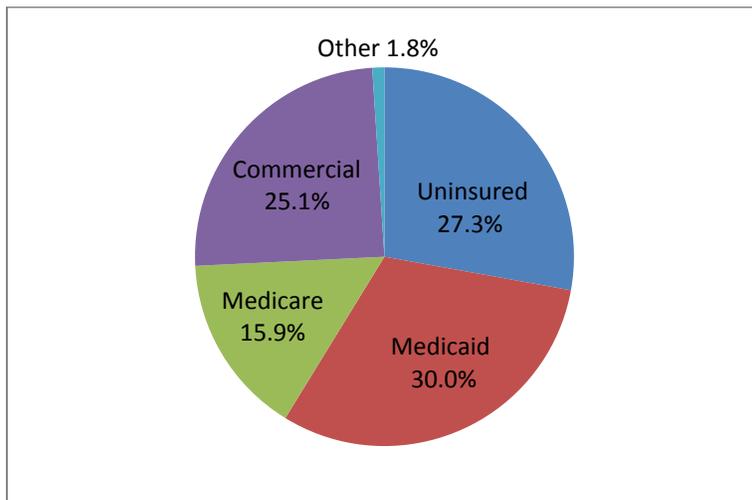


Table 8-1. ED Visits by Primary Diagnosis

Condition	2012	Percent	2013	Percent
Acute*	678,017	92.6	681,663	92.4
Chronic	39,640	5.4	41,128	5.6
Hypertension	6,019	0.8	6,592	0.9
Cardiovascular	9,370	1.3	10,084	1.4
Diabetes	3,141	0.4	3,553	0.5
Other Chronic**	22,639	3.1	22,662	3.1
Behavioral***	14,494	2.0	15,018	2.0
Total	732,151		737,809	

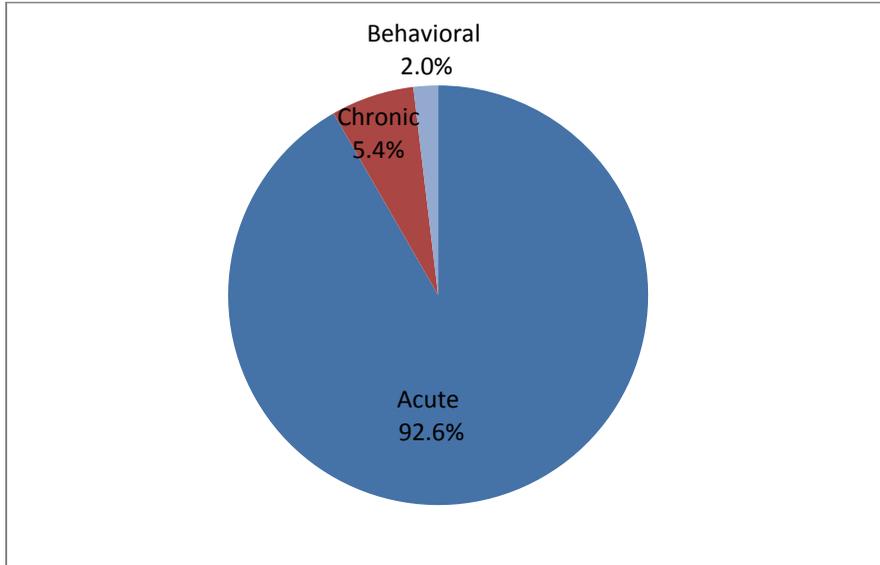
*Acute conditions are defined as all visits beside Chronic and Behavioral Conditions.

**Other chronic conditions are defined as Hyperlipidemia, Stroke or Transient Ischemic Attack, Arthritis, Asthma, Cancer, Chronic Kidney Disease, Chronic Obstructive Pulmonary Disease, Alzheimer's and other senile Dementias and Osteoporosis

*** Behavioral conditions include both mental health and substance use conditions.⁶

Figure 8. ED Visits by Primary Diagnosis

<2012>



<2013>

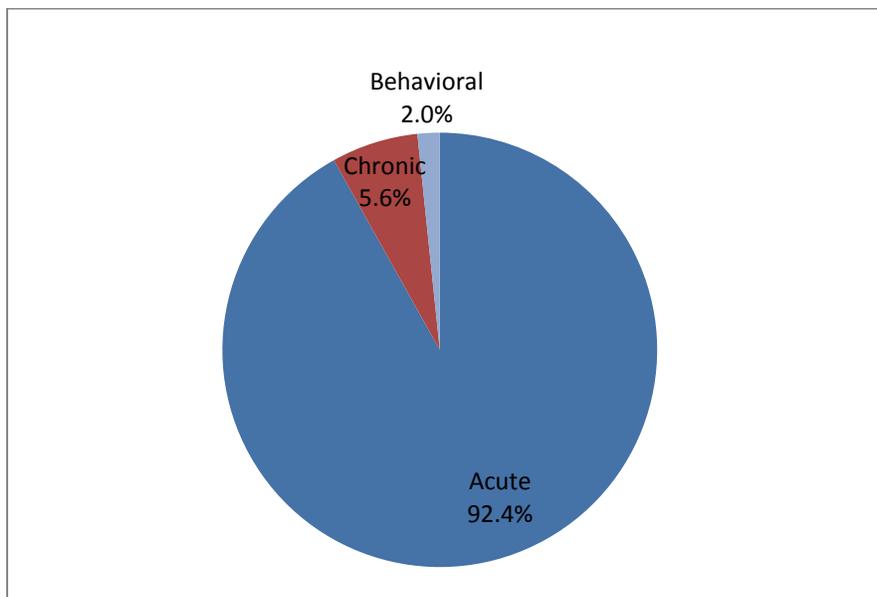


Table 8-2. ED Visits by Secondary Diagnosis

Secondary Condition	2012	Percent	2013	Percent
Acute*	530,356	72.4	533,125	72.3
Chronic	153,901	21.0	159,248	21.6
Hypertension	110,664	15.1	114,145	15.5
Cardiovascular	34,712	4.7	36,239	4.9
Diabetes	19,724	2.7	18,987	2.6
Other Chronic**	69,217	9.5	73,068	9.9
Behavioral***	81,746	11.2	79,648	10.8
Total	766,003	104.6****	772,021	104.1****

*Acute conditions are defined as all visits beside Chronic and Behavioral Conditions.

**Other chronic conditions are defined as Hyperlipidemia, Stroke or Transient Ischemic Attack, Arthritis, Asthma, Cancer, Chronic Kidney Disease, Chronic Obstructive Pulmonary Disease, Alzheimer's and other senile Dementias and Osteoporosis

*** Behavioral conditions include both mental health and substance use conditions.

**** Doesn't sum to 100% ED visit may contain a secondary diagnosis of more than one type.

Table 9. ED Visits by Transport

ED Visits by Transport	2012	Percent	2013	Percent
Walk-In by own means	577,329	78.9	591,429	80.2
Non Walk- In	140,654	19.2	142,343	19.3
Unknown	14,168	1.9	4,037	0.5
Total	732,151		737,809	

Figure 9. ED Visits by Transport

< 2012 >

< 2013 >

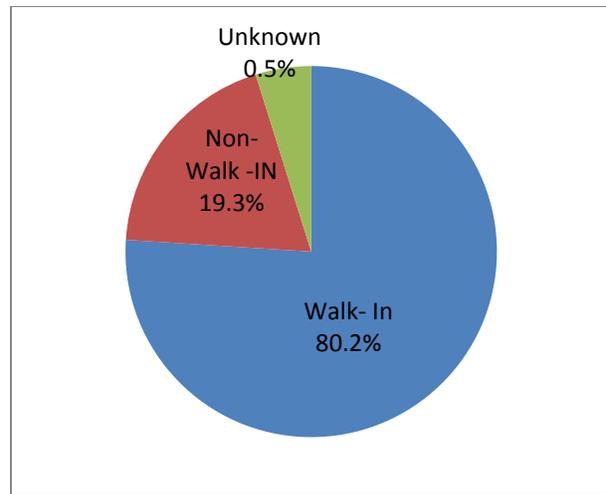
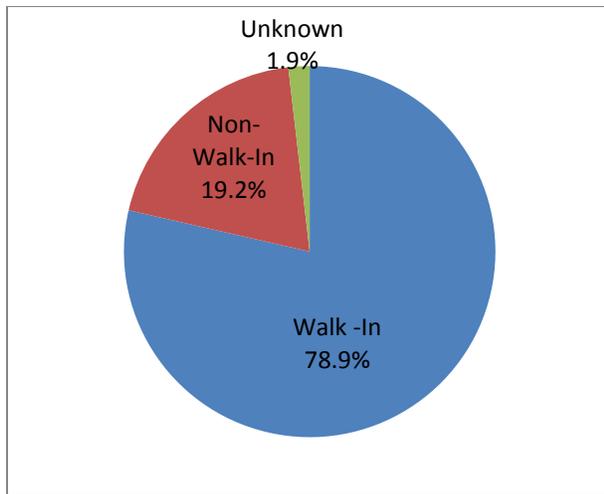
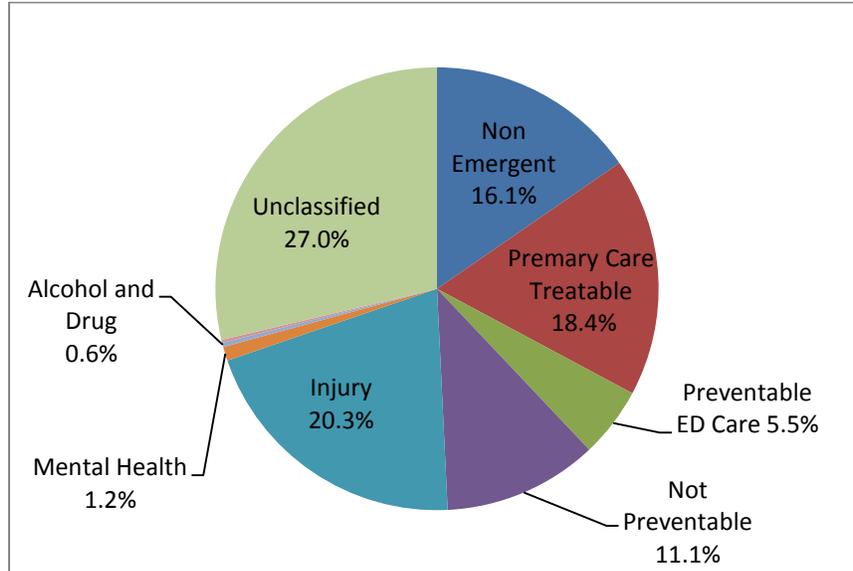


Table 10. ED Visits by Type

ED Visits by Type	2012	Percent	2013	Percent
Non-Emergent	117,529	16.0	119,541	16.3
Emergent, Primary Care Treatable	134,808	18.4	136,120	18.4
Emergent, ED Care Needed, Preventable	40,120	5.5	40,024	5.5
Sub Total	292,457	39.9	295,685	40.2
Emergent, ED Care Needed, Not Preventable	80,935	11.0	81,829	11.2
Sub Total of Classified	373,392	50.9	377,514	51.4
Injury	148,714	20.3	149,233	20.4
Mental Health Related	8,868	1.2	9,240	1.3
Alcohol Related	2,187	0.3	2,398	0.3
Drug Related (excluding alcohol)	1,392	0.3	1,439	0.2
Not in a Special Category, and Not Classified	197,598	27.0	197,985	27.0
Sub Total of Unclassified	358,759	49.1	360,295	49.2
Total	732,151		737,809	

Figure 10. ED Visits by Type

< 2012 >



< 2013 >

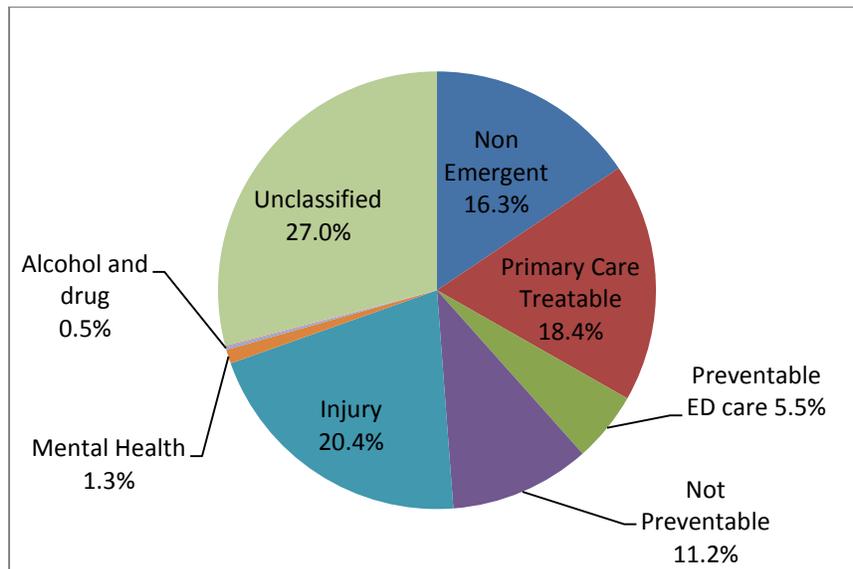


Table 11. ED Visits by Patient Residence

Rank	Zip Code	2012	Percent	Zip Code	2013	Percent
1	77449	18,633	2.5	77449	18,579	2.5
2	77084	15,279	2.1	77015	16,176	2.2
3	77015	14,890	2.0	77084	15,077	2.0
4	77036	14,405	2.0	77036	14,703	2.0
5	77082	13,918	1.9	77082	13,423	1.8
6	77072	12,902	1.8	77083	12,933	1.8
7	77083	12,517	1.7	77072	12,890	1.7
8	77506	12,102	1.7	77506	12,120	1.6
9	77089	11,426	1.6	77089	11,582	1.6
10	77494	11,062	1.5	77088	11,431	1.5
11	77099	10,896	1.5	77099	11,191	1.5
12	77502	10,783	1.5	77502	10,813	1.5
13	77088	10,642	1.5	77494	10,791	1.5
14	77077	10,266	1.4	77077	10,419	1.4
15	77080	9,458	1.3	77080	10,131	1.4
16	77573	8,976	1.2	77034	9,009	1.2
17	77584	8,965	1.2	77055	8,759	1.2
18	77034	8,856	1.2	77338	8,663	1.2
19	77450	8,594	1.2	77450	8,508	1.2
20	77338	8,505	1.2	77396	8,443	1.1
Total		233,075	32.0	235,641		31.9

Table 12. PCR (Primary Care Treatable) ED Visits by Top 20 Zip Code Areas

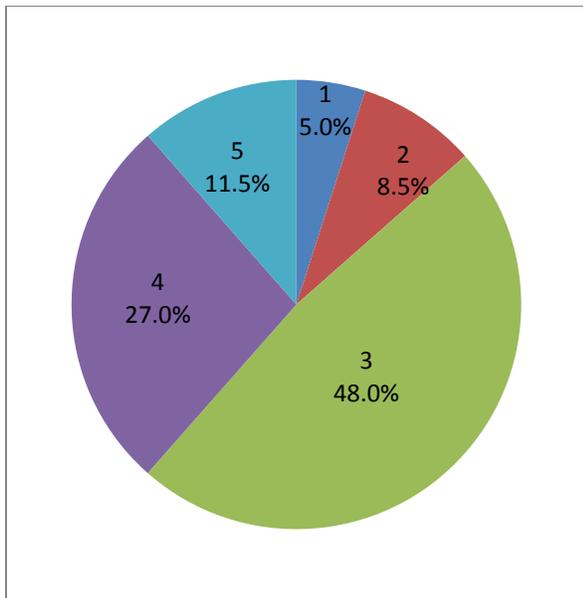
Rank	Zip Code	2012	Percent	Zip Code	2013	Percent
1	77449	8,911	2.5	77015	9,493	2.7
2	77015	8,483	2.4	77449	9,010	2.5
3	77082	7,573	2.2	77082	7,477	2.1
4	77084	7,232	2.1	77084	7,176	2.0
5	77506	7,052	2.0	77506	7,089	2.0
6	77072	6,596	1.9	77036	6,934	2.0
7	77036	6,582	1.9	77072	6,762	1.9
8	77083	6,279	1.8	77083	6,607	1.9
9	77502	5,985	1.7	77502	6,052	1.7
10	77099	5,297	1.5	77099	5,645	1.6
11	77077	5,125	1.5	77077	5,267	1.5
12	77089	5,076	1.4	77088	5,116	1.4
13	77088	4,965	1.4	77089	5,058	1.4
14	77494	4,872	1.4	77494	4,690	1.3
15	77530	4,726	1.3	77530	4,677	1.3
16	77034	4,536	1.3	77034	4,666	1.3
17	77573	4,330	1.2	77080	4,412	1.2
18	77584	4,220	1.2	77044	4,394	1.2
19	77504	4,197	1.2	77042	4,317	1.2
20	77080	4,152	1.2	77504	4,266	1.2
Total		116,189	33.1	119,108		33.4

Table 13. ED Visits by ESI Level

ESI	2012	Percent	2013	Percent
1	17,391	2.4	10,514	1.4
2	29,915	4.1	63,642	8.6
3	168,118	23.0	275,713	37.4
4	94,720	12.9	149,279	20.2
5	40,185	5.5	24,580	3.3
Unclassified	381,822	52.2	214,081	29.0
Total	732,151		737,809	

Figure 13. ED Visits by ESI Level

< 2012 >



< 2013 >

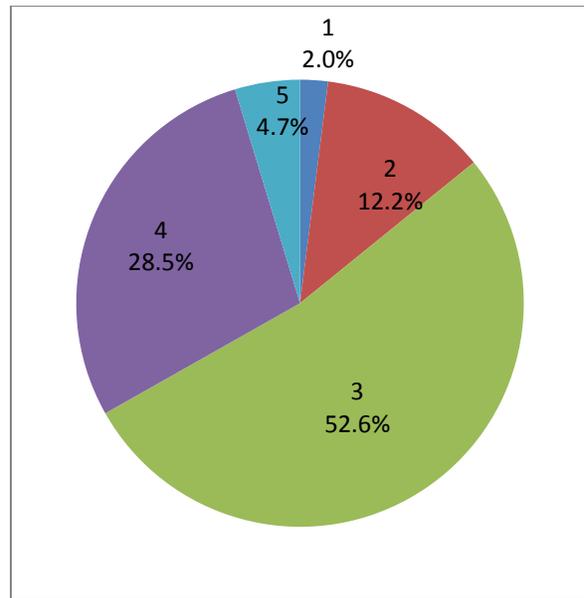


Table 14. Significant Predictors of 2012 ED Visits Resulting in a Hospital Admission

Predictors	Odds Ratio	95% CI
Age	1.031**	1.030 - 1.032
Male Gender	1.152**	1.131 - 1.173
Non-Hispanic Black (Non-Hispanic White Reference)	.843**	.824 - .862
Hispanic (Non-Hispanic White Reference)	.688**	.670 -.705
Asian (Non-Hispanic White Reference)	1.159**	1.097 - 1.223
Other Race/Ethnicity (Non-Hispanic White Reference)	1.290**	1.238 - 1.343
Uninsured (Commercial Insurance Reference)	1.137**	1.106 - 1.170
Medicare (Commercial Insurance Reference)	1.877**	1.821 - 1.934
Medicaid (Commercial Insurance Reference)	1.107**	1.072 - 1.144
Other Payment Source (Commercial Insurance Reference)	1.115**	1.031 - 1.206
Behavioral Health Condition	2.193**	2.089 - 2.303
Hypertension	.526**	.481 - .575
Cardiovascular Disease	1.914**	1.824 - 2.008
Diabetes	2.428**	2.215 - 2.661
Other Chronic Condition	2.078**	1.999 - 2.159

*p< .05; **p< .01

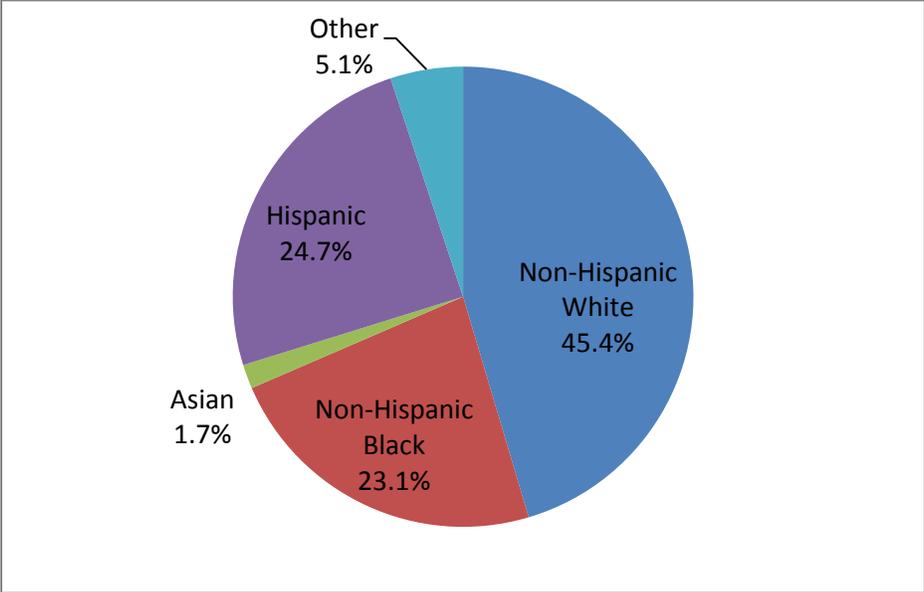
Table 15. Significant Predictors of 2013 ED Visits Resulting in a Hospital Admission

Predictors	Odds Ratio	95% CI
Age	1.030**	1.029 - 1.030
Male Gender	1.136**	1.115 - 1.157
Non-Hispanic Black (Non-Hispanic White Reference)	.853**	.834 - .872
Hispanic (Non-Hispanic White Reference)	.630**	.614 - .646
Asian (Non-Hispanic White Reference)	1.248**	1.182 - 1.318
Other Race/Ethnicity (Non-Hispanic White Reference)	1.537**	1.484 - 1.592
Uninsured (Commercial Insurance Reference)	1.147**	1.115 - 1.180
Medicare (Commercial Insurance Reference)	1.865**	1.810 - 1.922
Medicaid (Commercial Insurance Reference)	1.109**	1.074 - 1.145
Other Payment Source (Commercial Insurance Reference)	1.023**	.943 - 1.109
Behavioral Health Condition	2.098**	1.998 - 2.203
Hypertension	.486**	.445 - .531
Cardiovascular Disease	2.009**	1.917 - 2.105
Diabetes	2.310**	2.114 - 2.523
Other Chronic Condition	2.067**	1.989 - 2.147

*p< .05; **p< .01

Figure 14. Behavioral Health Visits by Racial/Ethnic Groups

<2012>



<2013>

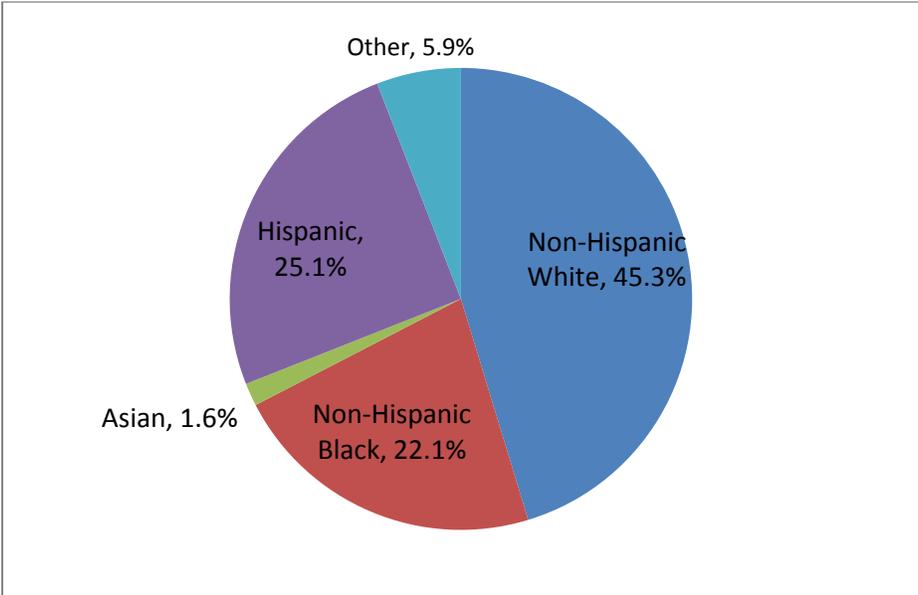
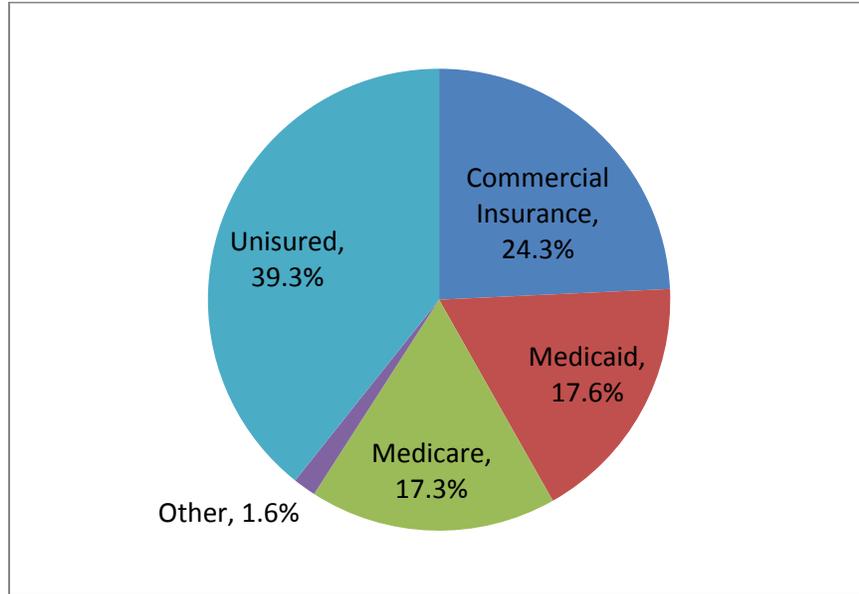


Figure 15. Behavioral Health Visits by Source of Payment

<2012>



<2013>

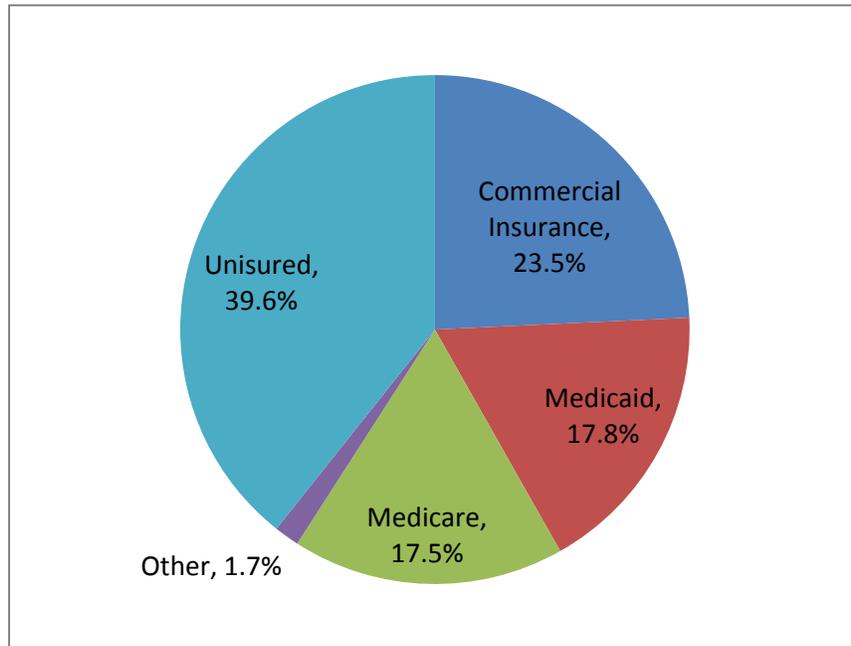
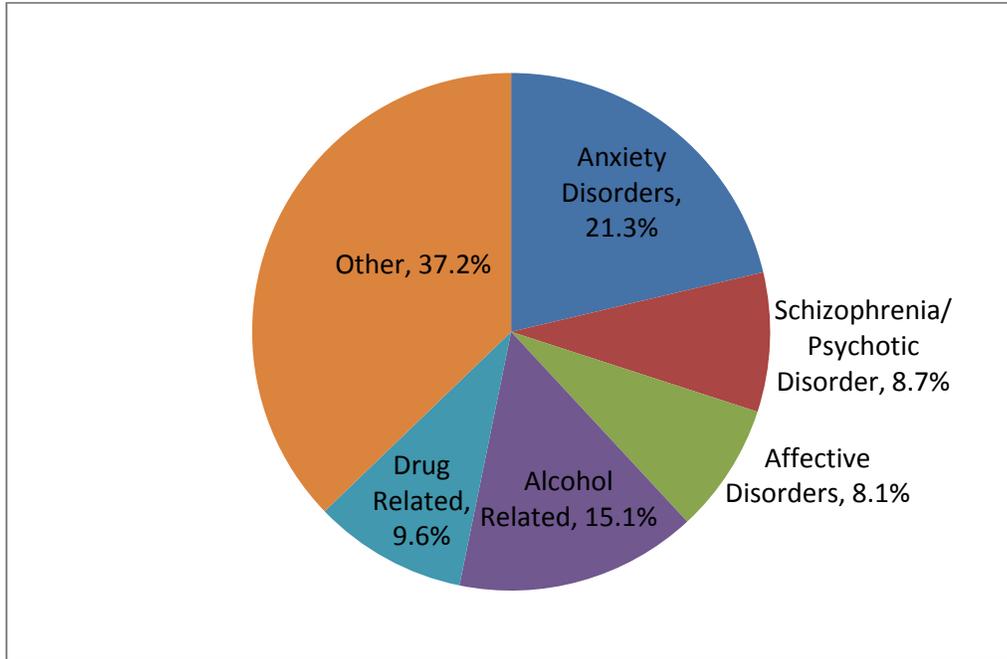


Figure 16. Behavioral Health ED Visits by Diagnosis

<2012>



<2013>

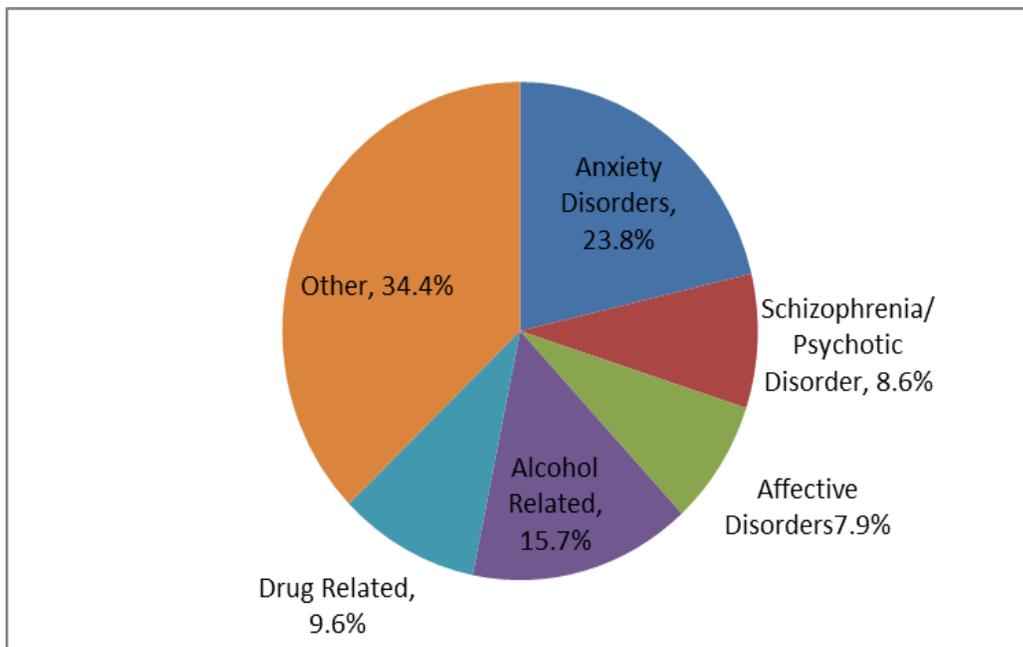


Table 16. 2012 Significant Predictors of Hospitalization following an ED Visit for Patients with Behavioral Health Diagnoses

Predictor	Odds Ratio	95% CI
Age	1.014**	1.011-1.017
Non-Hispanic Black (Non-Hispanic White Reference)	.856*	.753 - .973
Hispanic (Non-Hispanic White Reference)	.666**	.577 - .769
Uninsured (Commercial Insurance Reference)	.704**	.609 - .814
Medicare (Commercial Insurance Reference)	1.602**	1.357 - 1.890
Anxiety Disorders	.186**	.148 - .233
Schizophrenia/Psychotic Disorder	3.922**	3.403 -4.521
Affective (Mood) Disorders	2.608**	2.249 -3.026
Alcohol Use	.526**	.441 - .627
Drug Use	.401**	.319 - .504
Secondary Behavioral Health Diagnosis	1.571**	1.415 - 1.745

*p< .05; **p< .01

Table 17. 2013 Significant Predictors of Hospitalization following an ED Visit for Patients with Behavioral Health Diagnoses.

Predictor	Odds Ratio	95% CI
Age	1.011**	1.007 - 1.014
Hispanic (Non-Hispanic White Reference)	.651**	.563 - .752
Uninsured (Commercial Insurance Reference)	.576**	.496 - .669
Medicare (Commercial Insurance Reference)	1.623**	1.375 - 1.917
Medicaid (Commercial Insurance Reference)	1.293**	1.108 - 1.508
Anxiety Disorders	.182**	.169 -.255
Schizophrenia/Psychotic Disorder	3.517**	3.051 - 4.053
Affective (Mood) Disorders	2.667**	2.299 - 3.093
Alcohol Use	.521**	.437 - .620
Drug Use	.360**	.285 - .457
Secondary Behavioral Health Diagnosis	1.518**	1.368 - 1.685

*p< .05; **p< .01