

Trends in Hospitalizations Related to Anxiety, Depression, and/or Substance Use Among Adult Inpatients from 2016-2020 in the United States

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Introduction

- In the United States (US), over 40 million adults experience anxiety annually and over 20 million adults experienced at least one episode of major depressive disorder in 2020¹⁻²
- One third of all hospitalizations were mental health or substance use related in 2016³
- Recent published data suggested that anxiety, depression and substance use diagnoses and associated hospitalizations may be increasing over time
 - Anxiety and depression emergency department visits increased by 55% from 2006-2013⁴
 - Substance use related emergency department visits increased by 37% from 2006-2013⁴
- Since most recent studies have focused on emergency department data, this research aims to assess the potential increase in trends from inpatient hospitalizations from 2016-2020

Objectives

- Anxiety, depression, and substance use (ADSU)-related inpatient hospitalizations were analyzed to assess potential increases in trends from 2016-2020

Methods

Study Methodology

- This study was a multi-year cross-sectional analysis using the Healthcare Cost and Utilization Project's (HCUP) National Inpatient Sample (NIS), a nationally representative sample of the US hospitalized population derived from hospital billing data
- Three cohorts were identified based on the position of the ADSU diagnosis code in the hospitalization claim record. An earlier positioning suggests the diagnosis code was a greater contributing reason for the hospitalization:
 - First 2:** contains an ADSU code in their first 2 diagnosis code positions
 - First 5:** contains an ADSU code in their first 5 diagnosis code positions
 - Any Position:** contains an ADSU code in any diagnosis code positions
- ADSU was originally only examined in the First 2 cohort, similar to previous analyses of emergency department trends; the First 5 and Any diagnosis position was also explored
- Annual counts, prevalence, and absolute and percentage changes in ADSU-related hospitalizations were calculated by year and for 2016-2020 and weighted to obtain national estimates

Study Population

- The cohorts were identified per inclusion criteria from the HCUP NIS 2016-2020 data (**Figure 1**)
- This study included 8,641,130 total ADSU hospitalizations in 2016 and 8,712,521 total ADSU hospitalizations in 2020

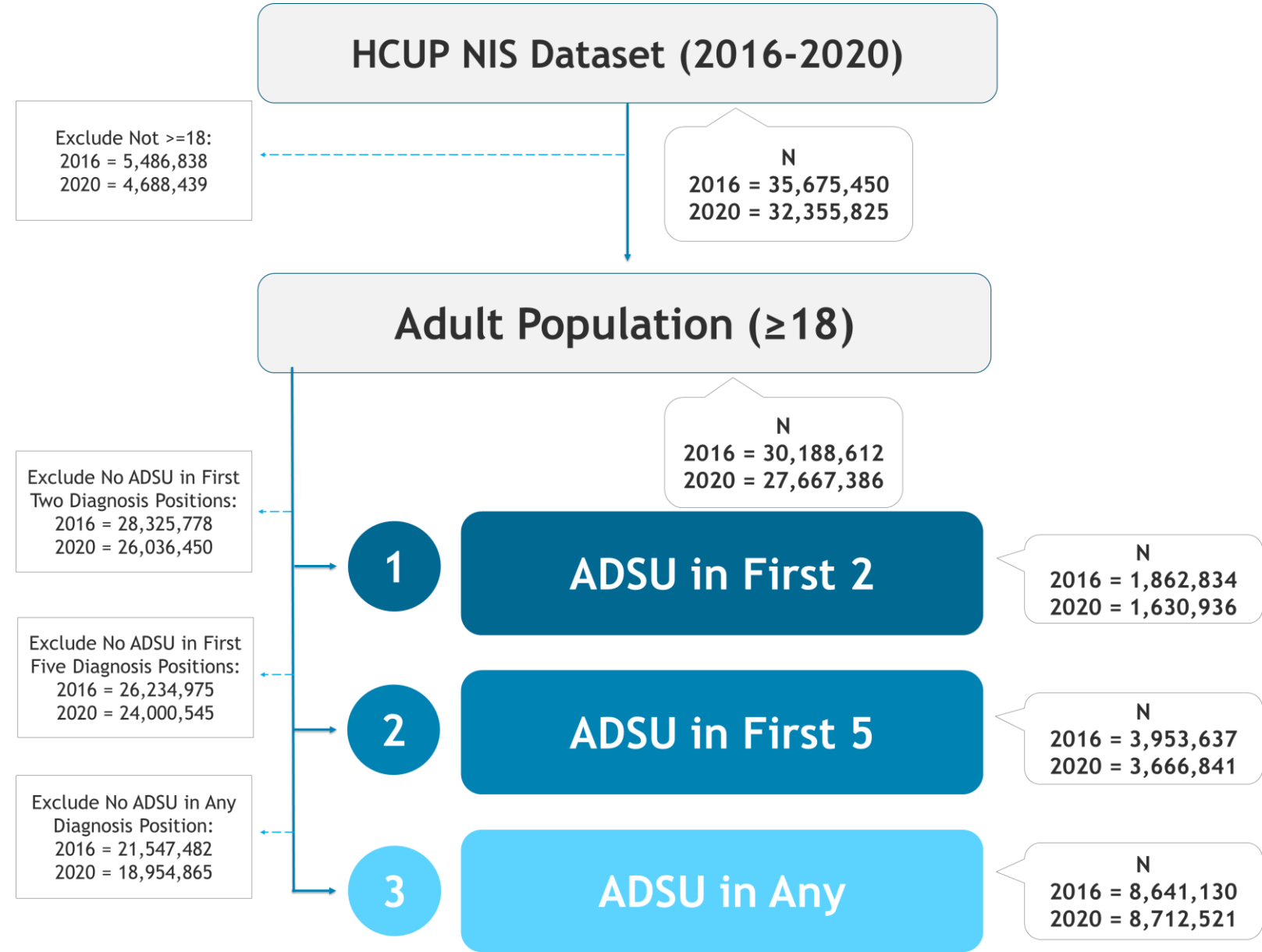
Inclusion Criteria

- Hospitalizations were included if they met the following criteria:
 - Patient age was ≥18 years
 - Recorded in the HCUP NIS data 2016-2020
 - ADSU International Hospitalized in the US from Classification of Diseases 10th version-clinical modification (ICD-10-CM) diagnosis code in medical record

Exclusion Criteria

- Hospitalizations were excluded if:
 - Patient age was <18 years
 - Medical record did not have an ADSU ICD-10-CM diagnosis

Figure 1. Attrition Flow Diagram



Statistical Analysis

- Descriptive statistical analyses were performed using SAS version 9.2 on each of the three cohorts for each year from 2016-2020 for the following:
 - Patient demographics (age, gender, and race) and hospitalization characteristics (length of stay [LOS] and hospital division)
 - Annual count and prevalence of inpatient hospitalizations associated with ADSU
 - Absolute and percentage change in inpatient hospitalization associated with ADSU diagnoses from 2016 to 2020

Results

Table 1. Patient Demographics and Hospitalization Characteristics for ADSU Related Hospitalizations, 2016-2020

	First 2 ADSU Related Hospitalizations ¹		First 5 ADSU Related Hospitalizations ²		Any ADSU Related Hospitalizations ³	
	2016	2020	2016	2020	2016	2020
N	1,862,834	1,630,936	3,953,637	3,666,841	8,641,130	8,712,521
Patient Demographics						
Age, years (%)						
18-29	21.4%	20.3%	17.3%	17.6%	10.4%	10.7%
30-49	38.4%	39.0%	33.9%	34.7%	24.5%	25.1%
50-64	28.9%	27.6%	30.3%	27.8%	30.9%	28.8%
65+	11.3%	13.1%	18.5%	20.0%	34.2%	35.4%
Mean (SD)	44.7 (16.0)	45.2 (16.3)	48.4 (17.3)	48.3 (17.7)	55.9 (18.5)	55.8 (18.6)
Median (Range)	44.1 (18 - 90)	43.6 (18 - 90)	48.3 (18 - 90)	47.6 (18 - 90)	56.4 (18 - 90)	57.0 (18 - 90)
Female Gender (%)	47.4%	44.9%	52.4%	51.4%	55.8%	54.8%
Race (%)						
White	71.1%	69.1%	71.6%	70.0%	73.7%	71.8%
Black	14.3%	14.9%	14.4%	14.9%	13.7%	14.2%
Hispanic	9.9%	10.6%	9.6%	10.0%	8.4%	9.2%
Asian or Pacific Islander	1.0%	1.1%	1.0%	1.2%	1.1%	1.3%
Native American	1.0%	1.2%	1.1%	0.9%	0.8%	0.9%
Other	2.7%	3.0%	2.5%	2.8%	2.3%	2.5%
Hospitalization Characteristics						
Length of Stay (days)						
Mean (SD)	4.7 (6.0)	4.9 (6.4)	4.5 (5.8)	4.6 (6.3)	5.4 (7.0)	5.6 (7.5)
Median (Range)	2.8 (0 - 360)	2.9 (0 - 353)	2.6 (0 - 363)	2.6 (0 - 353)	3.0 (0 - 363)	3.1 (0 - 365)
Hospital Division						
Northeast ⁴	23.1%	21.6%	20.8%	19.9%	19.4%	18.7%
Midwest ⁵	25.2%	26.0%	24.3%	24.7%	24.4%	24.3%
South ⁶	34.5%	34.6%	36.3%	36.7%	37.4%	38.3%
West ⁷	17.2%	17.8%	18.6%	18.7%	18.7%	18.7%

¹ Subjects must have an anxiety, depression, or substance use diagnosis code in the first 2 positions (diag1-dia2)

² Subjects must have an anxiety, depression, or substance use diagnosis code in the first 5 diagnosis code positions (diag1-dia5)

³ Subjects must have either an anxiety, depression, or substance use diagnosis code in any diagnosis code position (diag1-dia30)

⁴ Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey

⁵ Midwest: Wisconsin, Michigan, Illinois, Indiana, Ohio, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa

⁶ South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Mississippi, Alabama, Oklahoma, Texas, Arkansas, Louisiana

⁷ West: Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico, Alaska, Washington, Oregon, California, Hawaii

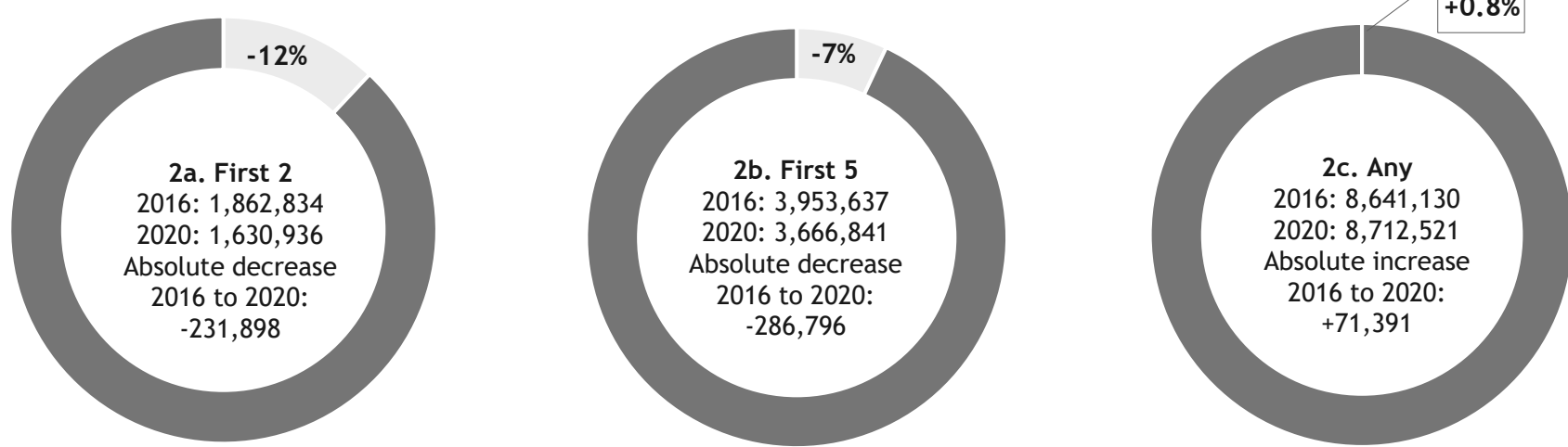
Prevalence

- There were over 30 million inpatient hospitalizations each year in the US from 2016-2019 and over 27 million inpatient hospitalizations in 2020
- Although the number of hospitalizations overall decreased in 2020, the number of ADSU-related hospitalizations increased
- The prevalence of any ADSU diagnoses increased slightly from 28,624 to 28,860 per 100,000 from 2016-2020
 - First 2 prevalence decreased from 6,171 to 5,402 per 100,000
 - First 5 prevalence decreased from 13,096 to 12,146 per 100,000

Absolute Change in Hospitalizations

- Hospitalizations with ADSU diagnosis codes in the First 2 and First 5 positions decreased 12% (-231,898) and 7% (-286,796) from 2016-2020 (**Figure 2**)
- Hospitalizations with ADSU diagnosis codes in Any position increased by 0.8% (+ 71,391) from 2016-2020

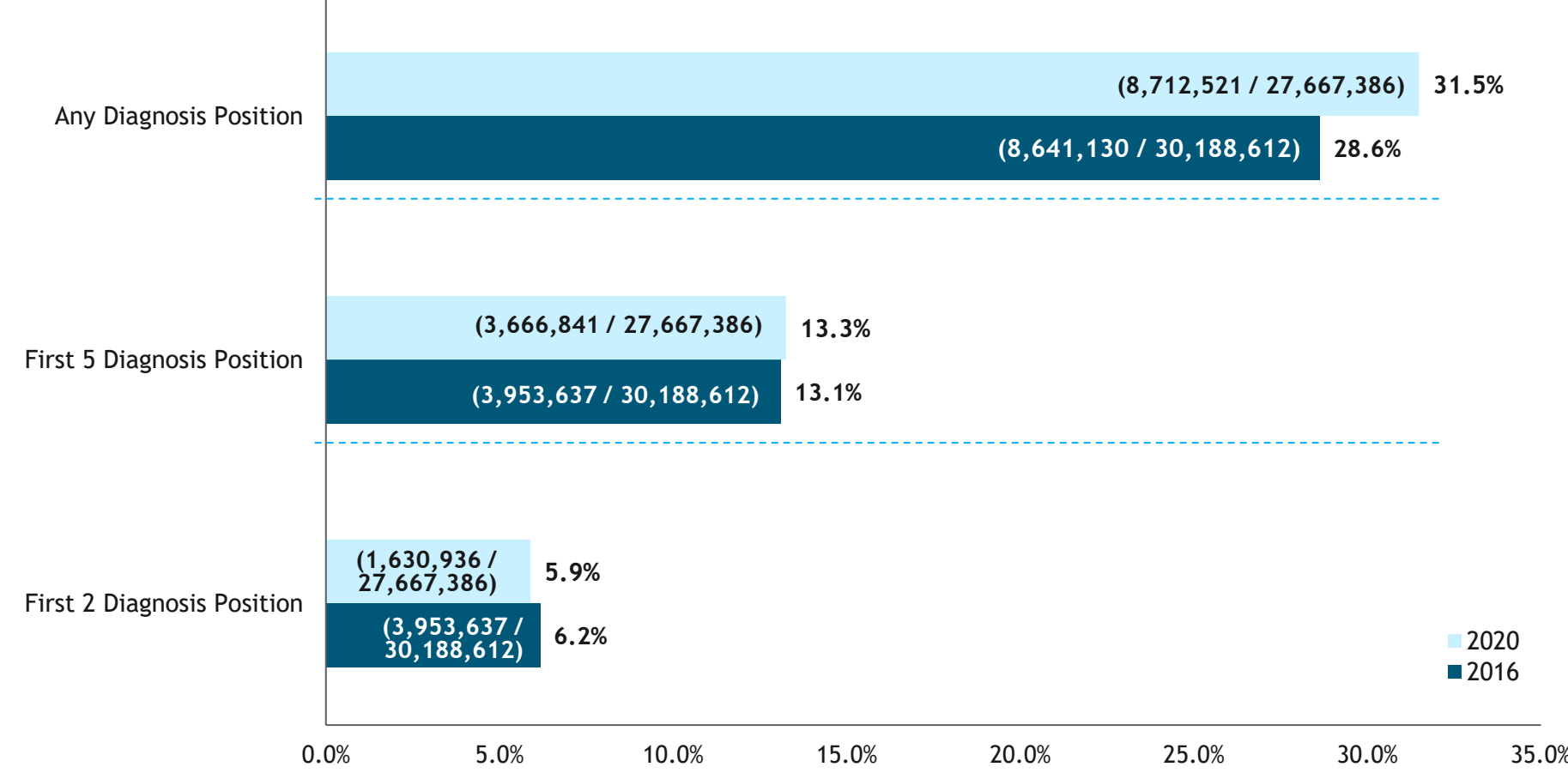
Figure 2. Absolute Change in ADSU-Related Hospitalizations from 2016-2020



ADSU-Related Hospitalization Rates

- Hospitalizations with an ADSU diagnosis code in the First 2 and First 5 positions consistently made up about 6% and 13% of all hospitalizations from 2016-2020 (**Figure 3**)
- Hospitalizations with an ADSU diagnosis code in Any position increased by 3% (29% to 32%) from 2016-2020
- Hospitalization rates in 2019 align with trends seen from 2016-2020; However, absolute number of hospitalizations in 2019 was higher than in 2020 potentially due to decreased healthcare resource use during the COVID-19 pandemic

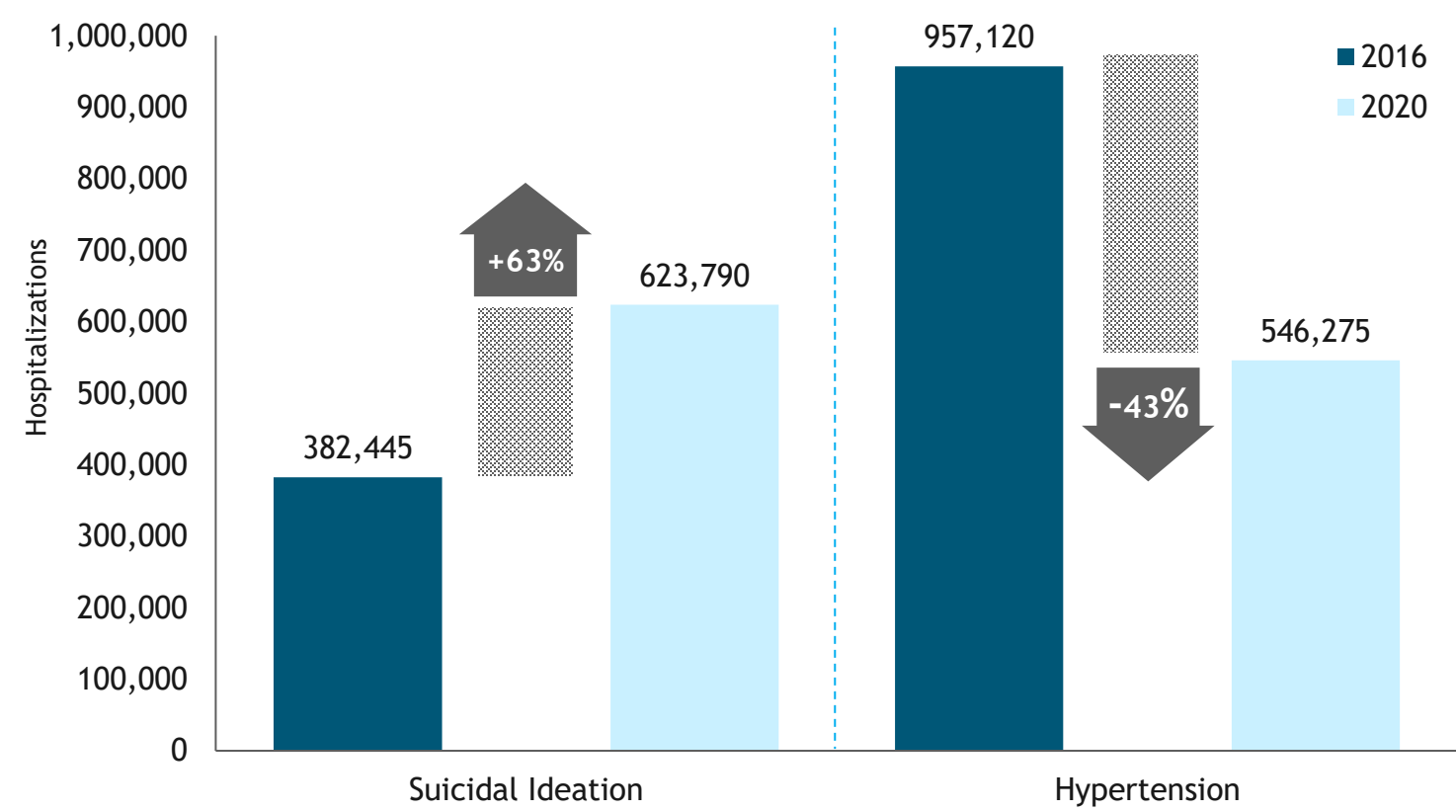
Figure 3. ADSU-Related Hospitalization Rate from 2016-2020



Demographic and Hospitalization Characteristic Trends

- Age increased as the the number of diagnosis code positions were expanded (**Table 1**)
 - For example, 2020 First 2 mean age: 45.2 vs 2020 Any mean age: 55.8
 - The age distribution of ADSU-related hospitalizations stayed relatively constant from 2016-2020 when looking at individual cohorts
- The number of females with an ADSU-related hospitalization increased when the number of diagnosis code positions were expanded (e.g., First 2: 47%, Any: 55%)
- The LOS increased slightly as the number of diagnosis code positions were expanded
 - For example, 2020 First 2 mean LOS: 4.9 days vs 2020 Any mean LOS: 5.6 days
 - The LOS distribution of ADSU-related hospitalizations stayed relatively constant from 2016-2020 when looking at individual cohorts
- Hospitals in the Southern US had the highest rates of ADSU-related hospitalizations for all three cohorts ranging from 34.5%-38.3%

Figure 4. First 5 Cohort: Most Common Comorbidity from 2016-2020



- The most common ADSU comorbidities were explored for the First 5 cohort from 2016-2020 (**Figure 4**)
- Comorbidities were non-ADSU diagnoses that occurred concurrently
- Suicidal ideation surpassed essential (primary) hypertension as the most common ADSU comorbidity from 2016-2020
 - Suicidal ideation comorbidity increased 63% (+241,000) from 2016-2020
 - Essential (primary) hypertension decreased by 43% (-410,845) from 2016-2020
- The increase in suicidal ideation is consistent with the trend in emergency department suicidal ideation admissions from 2006-2018⁵

Conclusions

- While the literature suggests there is an increase in Emergency Department related mental health and substance use disorders, the same trend is not observed for inpatient hospitalizations
 - First 2 and First 5 cohorts hospitalizations decreased
 - Any position cohort hospitalizations increased slightly
- ADSU are not key drivers of US hospitalization rate changes
 - First 2 and First 5 cohorts had consistent hospitalization rates from 2016-2020
 - Hospitalizations with ADSU listed in a more primary position are likely to only capture the most severe ADSU related cases
 - Any position cohort had a 3% increase in hospitalization rate from 2016 to 2020
 - Slight increase suggests that less severe ADSU may be on the rise
 - LOS was slightly longer for the Any position cohort; further exploration into if less severe ADSU, regardless of being a primary reason listed for the hospitalization, may drive greater resource utilization, including LOS may be warranted
- The rise in Any ADSU hospitalization rates and suicidal ideation comorbidities suggest that appropriate ADSU management may be needed to avoid future increased healthcare resource burden

References

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- Substance Abuse and Mental Health Services Administration. Results from the 2020 National Survey on Drug Use and Health(NSDUH).
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