

# ARIZONA INPATIENT UTILIZATION

## A Study of Demand Variation by Service Line, Age Group and Geography

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## EXECUTIVE SUMMARY

### Introduction

Planning for inpatient care requires a keen understanding of inpatient utilization by service line, age, and geographic location. Specifically, this study was undertaken to answer the following questions:

- What is the overall inpatient utilization rate for the state of Arizona?
- What are the utilization rates by service line and age group?
- How do differences in population age impact service line utilization rates?
- Are there significant differences in utilization rates among Pima County, Maricopa County, and the Rest of Arizona?
- What percent of inpatient discharges are admitted through the ED and how does this vary by service line?

The answers to these questions provide Arizona health care planners and administrators insight into the demand for care, how each specialty makes up that demand, demand variation by age and geography, and the varied importance of the ED to different service lines. For those outside Arizona, these data provide a baseline for comparison as well as a methodology that can be reproduced in other geographies.

This study presents an analysis of overall hospital inpatient (IP) utilization rates (bed days of care (BDOC) per thousand) in the state of Arizona using a three-year average from 2017-2019. Further geographic breakdowns are provided for Maricopa County, Pima County, and the Rest of Arizona with utilization rates stratified by age group and service line. Discharge rates, average length of stay (ALOS) and discharges via the Emergency Department (ED) are presented by service line. A demographic overview of each geographic study area is also provided.

### Methods

Utilization Rate Calculation

$$\frac{\text{Number of Bed Days of Care}}{\text{Population}} \times 1,000 = \text{Utilization Rate}$$

DRG-level BDOC, discharge and ED usage data were obtained from hospital discharge data from the Arizona Department of Health Services and mapped to the patient residence's specific geographic study area and The Innova Group's service and product lines. U.S. Census (Esri, 2020) and Arizona Office of Economic Opportunity (OEO) population and demographic data from those same specific geographic areas were used as the denominator for the creation of the patient utilization rates.

### Results

Arizona's overall IP utilization rate across all service lines is 467.0 bed days of care per thousand. This total utilization is made up of a Medicine bed days of care utilization rate at 190.9 (41% of total) followed by Surgery at 132.3 (28%), Mental Health and Substance Abuse at 76.5 (16%) and Maternal / Child Health at 67.2 (14%).

Overall utilization rates trend up with age but vary widely by service line: Medicine and Surgery utilization rates trend up with age, Mental Health & Substance Abuse peak in the 18-44 age group, and, not surprisingly, Maternal / Child Health peaks earlier, with Obstetrics reaching maximum utilization in the 18-44 age group.

Geographically, there is relatively little difference in utilization rates between Maricopa and Pima counties, both of which consist of large metropolitan areas with ample access to care. The Rest of Arizona has utilization rates 15% lower than Maricopa and Pima counties, likely due to lower proximity and more difficult access to care.

The overall Arizona state discharge rate is 88.3 (per 1,000) across all service lines with an average length of stay (ALOS) of 4.6 days. The ED plays a vital gatekeeper role for IP services, with 50.8% of all IP discharges initially admitted through the ED. However, the ED's contribution to IP discharges varies widely by service line, ranging from 7.1% for Maternal / Child Health to 84.7% for Medicine.

## METHODS

### Demographics

The population and race/ethnicity data for all areas studied in Arizona (Pima and Maricopa Counties, Rest of Arizona, and Arizona – see Figure 1 below) were obtained from the Arizona OEO (2020). The US Census Bureau's Race and ethnicity data were obtained from Esri Data and Maps (2019). Finally, the median age data for all areas were obtained from the Advisory Board (2020).

For demographic comparison, Arizona state was viewed as a whole and further divided into 3 regions: (1) Pima County, (2) Maricopa County, and (3) Rest of Arizona (all counties excluding Pima and Maricopa). Comparisons were also made to the overall US population. The two demographic data sets that were studied are (1) age and (2) race/ethnicity.

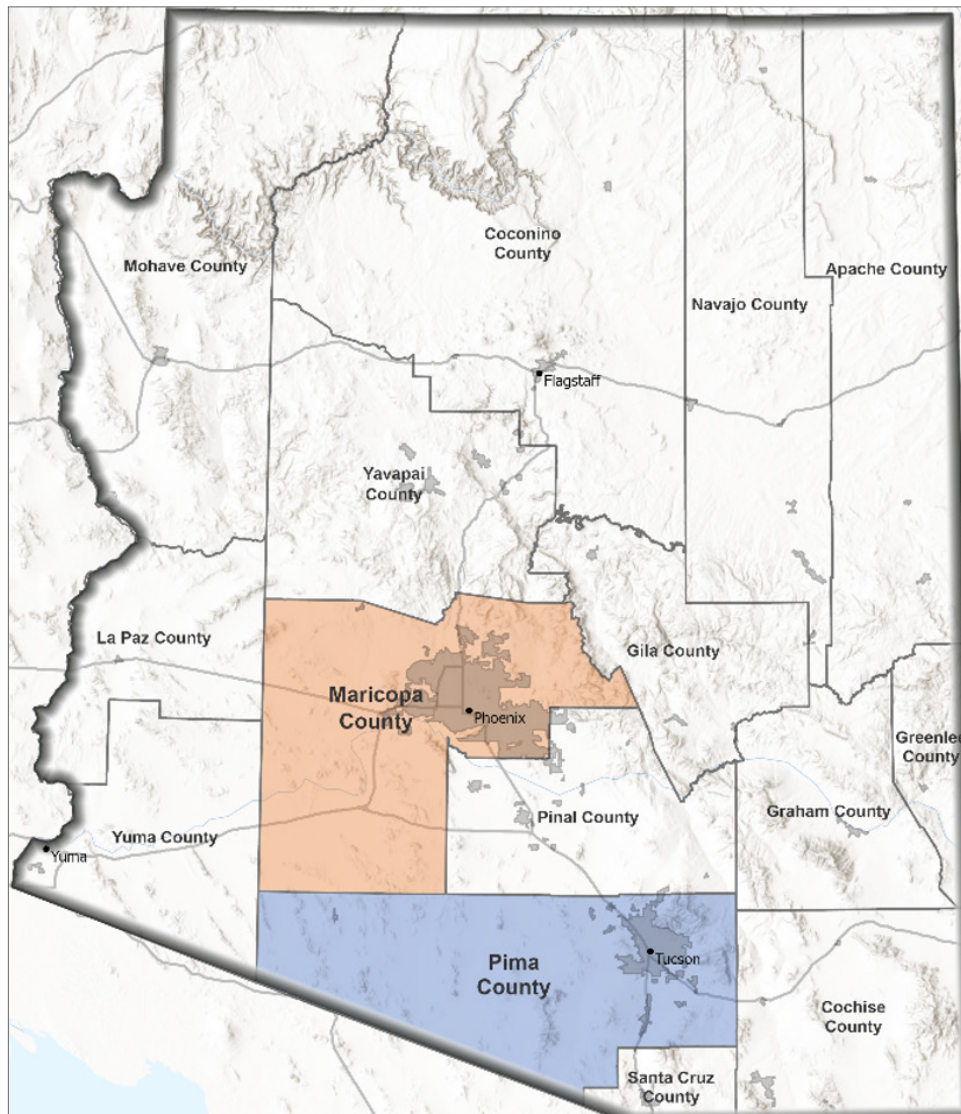


Figure 1: Map of Arizona Counties Highlighting Maricopa and Pima Counties

## Service and Product Lines

Initial inpatient service line and product line (sub-service line) definitions were obtained from the Advisory Board which uses 18 service line groupings and 83 product line groupings. DRG service and product line assignments were reviewed by a clinician and compared against commercial data sets for logic and consistency. Client feedback was also incorporated to ascertain the most relevant grouping methodology with the understanding that many clients use customized groupings.

Following this analysis, four meta-service lines were created:

1. Medicine
2. Surgery
3. Mental Health & Substance Abuse
4. Maternal / Child Health

New service lines were created for:

1. Mental Health & Substance Abuse, previously part of General Medicine
2. Oral & Maxillary Surgery, previously part of ENT
3. Burns

The previous service line for Rehabilitation, which has been rapidly declining in usage as a grouping, was rolled into Orthopedics. The Advisory Board's Other Trauma service line contained burns, head injuries, and body injuries. Burns became its own discrete service line, head injuries were moved to the trauma product line within Neurology, and body injuries were moved to the trauma product line within General Medicine.

Product lines were consolidated from 83 to 44 with most of the consolidation in Medicine and Surgery sub-specialties. The most significant product line additions centered around transplants with new product lines for cardiac, liver, kidney, pancreas, and bone marrow transplants.

Individual MS-DRGs and APR-DRGs were then mapped to the new product, service, and meta-service line groupings to arrive at our final listing. The Innova Group's service and product line groupings are shown in Table 1 below. A complete crosswalk of DRGs to product and service lines is available as an attachment.

The Innova Group Services and Product Lines		
Meta-Service Line	Service Lines	Product Lines
<b>Medicine</b>		
General Medicine	General Medicine	General Medicine
		Trauma (General Medicine)
		Cardiac Services
		Medical Cardiology
		Cardiac Cath
		Cardiac EP
		Neurology
		Neurology
		Trauma (Neurology)
Oncology/Hematology	Oncology/Hematology	Oncology/Hematology
		Radiation Oncology
		Burns
Burns	Burns	
<b>Surgery</b>		
General Surgery	General Surgery	General Surgery
		GI
		Bariatric/Obesity
		Liver Transplant
		Kidney Transplant
		Pancreas Transplant
		Bone Marrow Transplant
		Trauma (General Surgery)
		Cardiac Services
		Cardiac Surgery
		Cardiac Transplant
		Vascular Services
		Vascular Services
		Amputation
		Thoracic
		Lung Transplant
		Other Thoracic Surgery
		Neurosurgery
		Brain
		Peripheral & Cranial Diseases
		Trauma (Neurosurgery)
		Orthopedics
		Orthopedics
		Joint Replacement
		Sports Medicine
		Trauma (Orthopedics)
		Spine
		Fusion
		Medical Spine
		Other Surgical Spine
		Urology
		Urology
		Gynecology
Gynecology		
Ophthalmology		
Ophthalmology		
ENT		
ENT		
Oral & Maxillary Surgery		
Oral & Maxillary Surgery		
<b>Mental Health &amp; Substance Abuse</b>		
Mental Health & Substance Abuse	Mental Health & Substance Abuse	Psychiatry
		Substance Abuse
<b>Maternal/Child Health</b>		
Neonatology	Neonatology	Special Care Nursery / Nicu (L2/L3/L4)
		Well New Born Nursery (L1)

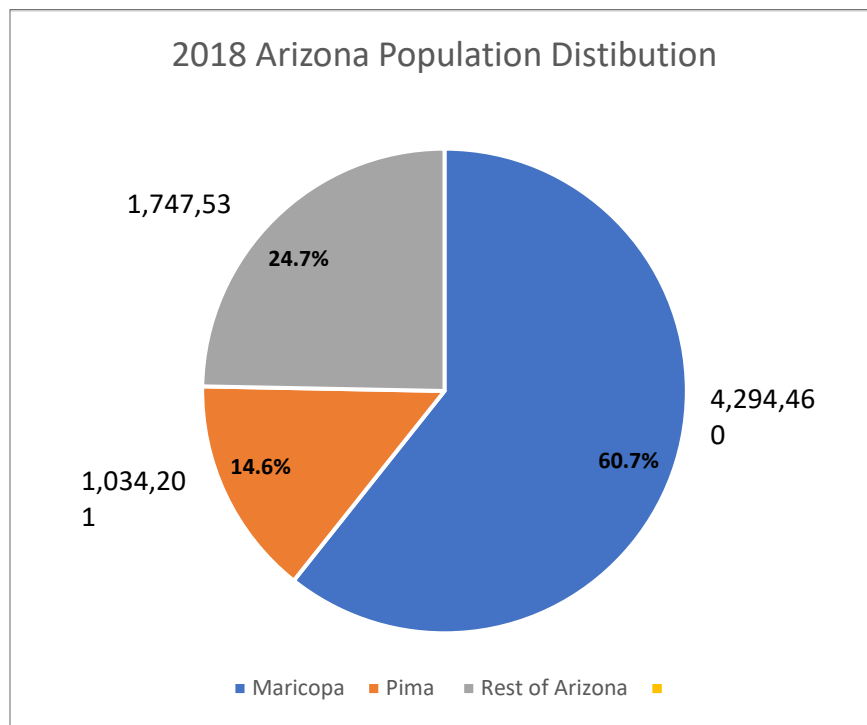
Table 1

## Inpatient Utilization

2017-2019 DRG-level bed days of care, discharge, and ED usage data were obtained from the Arizona Department of Health Services (AZDHS) Hospital Discharge Data source. This data was grouped to The Innova Group’s Service Line definitions by DRG and aggregated to the specific geographic study areas to determine inpatient service line volume by geography. The bed days of care per service line are divided by the population of each geography to determine utilization. The Arizona Hospital Discharge Data has some limits worth noting. Patients residing in Arizona but seeking care at a facility outside of Arizona are not included. Also, not all hospitals within Arizona are required to report to AZDHS. Data for Indian Health Service (IHS) hospitals, for example, are not available and therefore not included when calculating utilization.

## Demographics

The population of the state of Arizona in 2018 per the Arizona OEO was 7,076,199 (2019). Pima County comprises 14.6% of the state population, Maricopa County comprises 60.7% of the state population and the Rest of the Arizona counties comprise 24.7% of the population (see Figure 2).



Source: Arizona Office of Economic Opportunity

Figure 2

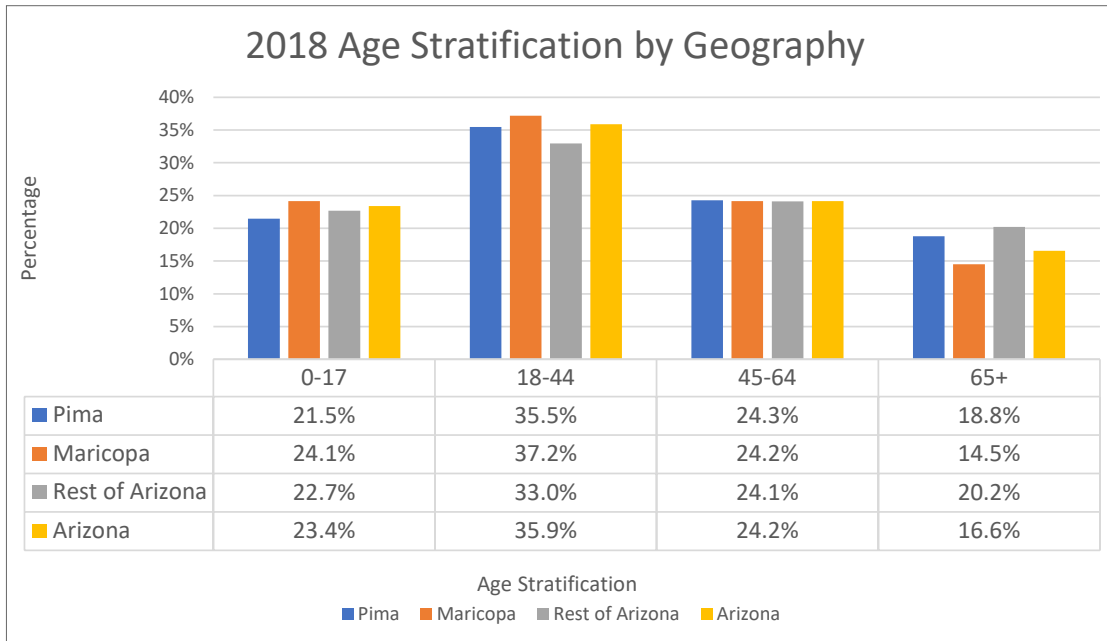
## Age

As shown in Table 2, the state of Arizona’s median age of 37.9 is the same as the U.S. median age. Within Arizona, the Rest of Arizona has the highest median age at 40.9, followed by Pima County at 39.0 and Maricopa County at 36.6.

AREA	2019 Median Age <sup>(1)</sup>
Pima	39.0
Maricopa	36.6
Rest of Arizona	40.9
Arizona	37.9
US	37.9

Table 2: Advisory Board’s Median Age (2020)

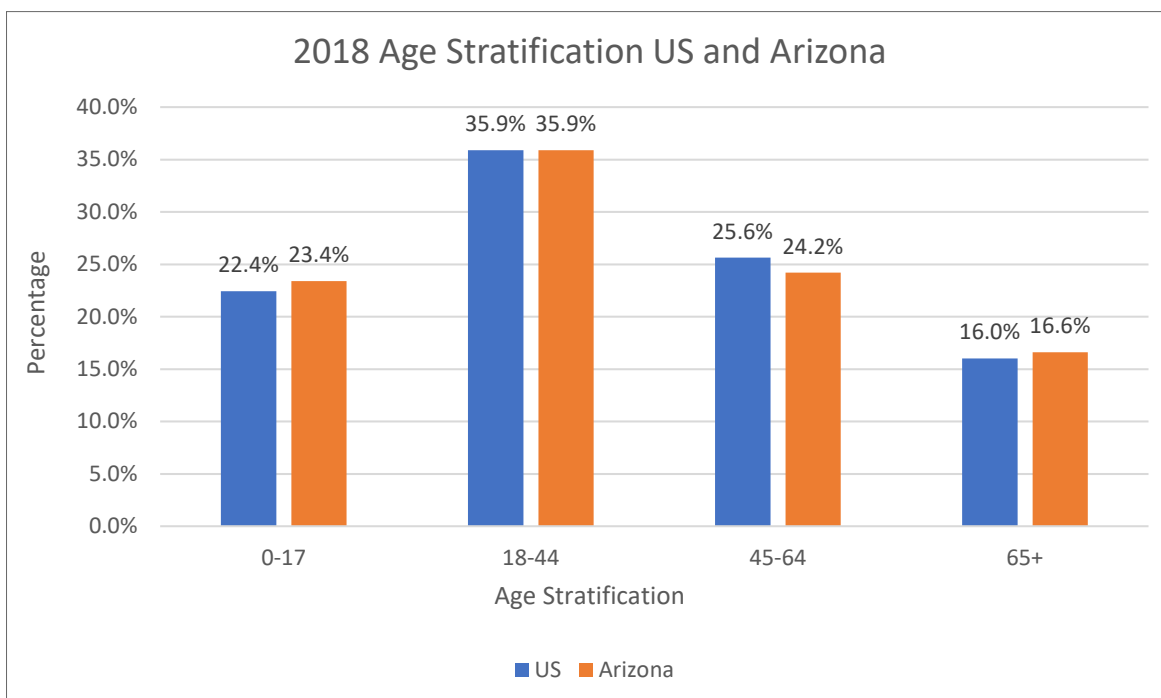
As shown in Figure 3 below, population was stratified by age into four groupings for this study: 0-17, 18-44, 45-64 and 65+. The largest geographic variation is in the 65+ age group. In Maricopa County, this accounts for only 14.5% of the population compared to 20.2% in the Rest of Arizona. Compared to other regions, Maricopa County also has the highest percentage in both the 0-17 and 18-44 age groups, resulting in a lower median age.



Source: Arizona Office of Economic Opportunity

Figure 3

As shown in Figure 4 below, the US population was stratified consistent with the four age groupings and base year used for the Arizona population stratification. The key comparison to note is that the US population follows the same age group distribution pattern as the Arizona population. Also note that the variance between all four age stratifications when comparing the US to Arizona is between -1.4% to +1.0%.



Source: US Census Bureau

Figure 4

## Race/Ethnicity

Race/Ethnicity was broken into six categories for this study: (1) Asian (2) Black (3) Hispanic, (4) Native American (5) Other and (6) White. The four areas and the US that were examined are consistent with the areas used in the Age analysis section. See Table 3 below for a comprehensive look across all areas and all race/ethnicity categories. Arizona has a considerably higher Hispanic population (32.3%) compared to the US population at 18.3%. The percentage of Black residents in Arizona is considerably lower than the US population. The Asian and White population in Arizona is slightly less than the US population, while the Native American population is higher in Arizona when compared to the US Native American population.

Notable highlights include the high rate of Native Americans (10.7%) in the Rest of Arizona as compared to 1.6% in Maricopa County and 2.5% in Pima County. The Rest of Arizona, while having the highest Native American population just mentioned, is lower than all the areas in Arizona and the US for the race/ethnicities of Asian, Black, and Other. The White population in the Rest of Arizona is equal to the state of Arizona at 54.4%, while all areas studied in Arizona are between 3.2% and 6.4% less than the US White population (58.2%).

2018 Percentage of Population <sup>(1)</sup> (US 2019 <sup>(2)</sup> )					
Race/Ethnicity	Pima	Maricopa	Rest of Arizona	Arizona	US
Asian	2.9%	4.3%	1.6%	3.4%	5.9%
Black	3.2%	4.8%	2.1%	3.9%	13.4%
Hispanic	37.5%	32.2%	29.4%	32.3%	18.3%
Native	2.5%	1.6%	10.7%	4.0%	1.3%
Other	2.0%	2.1%	1.8%	2.0%	2.9%
White	51.8%	55.0%	54.4%	54.4%	58.2%

(1) Arizona Office of Economic Opportunity

(2) US Census Bureau

Table 3



## Utilization by Service Line and Age Group

### Overall Utilization by Service Line

As shown in Table 4, the overall IP utilization rate (BDOC per 1,000 people) across all service lines for the State of Arizona is 467.0. Medicine accounts for 41% of total utilization, followed by Surgery at 28%, Mental Health and Substance Abuse at 16% and Maternal / Child Health at 14%.

Within Medicine, Cardiac Services – including medical cardiology, catheterizations, and EP – is among the largest service lines accounting for 7% of total IP utilization.

The two largest Surgery categories are General Surgery, accounting for 13% of total IP utilization, and Orthopedics, accounting for 6% of total IP utilization. No other surgical service makes up more than 2% of total IP utilization.

2017-2019 Average Patient Days by Service per 2018 Population by County (Utilization per 1,000)					
TIG Service Lines	All of Arizona				Total
	0-17	18-44	45-64	65+	
<b>Medicine</b>	<b>42.9</b>	<b>71.6</b>	<b>220.4</b>	<b>615.8</b>	<b>190.9</b>
Burns	0.5	0.7	1.1	1.0	0.8
Cardiac Services	1.6	5.4	33.3	124.3	31.0
General Medicine	31.1	53.2	150.4	386.9	126.8
Neurology	4.2	7.3	22.4	72.1	21.0
Oncology/Hematology	5.4	5.0	13.1	31.6	11.5
<b>Surgery</b>	<b>29.3</b>	<b>56.1</b>	<b>178.9</b>	<b>375.0</b>	<b>132.3</b>
Cardiac Services	2.1	1.2	10.6	28.6	8.2
ENT	1.4	1.3	2.4	4.2	2.1
General Surgery	15.7	32.6	88.7	136.6	59.4
Gynecology	0.2	1.7	2.7	2.5	1.7
Neurosurgery	2.6	2.7	7.6	14.9	5.9
Ophthalmology	0.2	0.3	0.4	0.8	0.4
Oral & Maxillary Surgery	0.2	0.3	0.4	0.6	0.3
Orthopedics	2.2	7.3	29.2	99.7	26.7
Spine	1.3	2.4	10.5	23.3	7.6
Thoracic Surgery	1.0	1.8	6.8	18.0	5.5
Urology	1.5	2.6	8.2	16.2	5.9
Vascular Services	1.0	1.9	11.4	29.7	8.6
<b>Mental Health &amp; Substance Abuse</b>	<b>66.1</b>	<b>94.9</b>	<b>81.3</b>	<b>44.3</b>	<b>76.5</b>
Mental Health & Substance Abuse	66.1	94.9	81.3	44.3	76.5
<b>Maternal/Child Health</b>	<b>166.0</b>	<b>78.8</b>	<b>0.4</b>	<b>0.0</b>	<b>67.2</b>
Neonatology	164.0	0.0	0.0	0.0	38.4
Obstetrics	2.0	78.8	0.4	0.0	28.9
<b>Total</b>	<b>304.4</b>	<b>301.4</b>	<b>481.0</b>	<b>1035.1</b>	<b>467.0</b>

Table 4

### Overall Utilization by Age Group

Overall utilization rates vary widely and increase with age as would be expected. The utilization rate is lowest in the 18-44 age group at 301.4 followed by 304.4 for 0-17, 481.0 for 45-64, and 1,035.1 for 65+. Put another way, there is more than 1 bed day of care per year for every person in the 65+ age group.

In terms of actual bed days (not utilization rate), the 65+ group accounts of 36.7% of total BDOC compared to 24.9% for 45-64, 23.2% for 18-44, and 15.3% for 0-17 (see Figure 5 below).

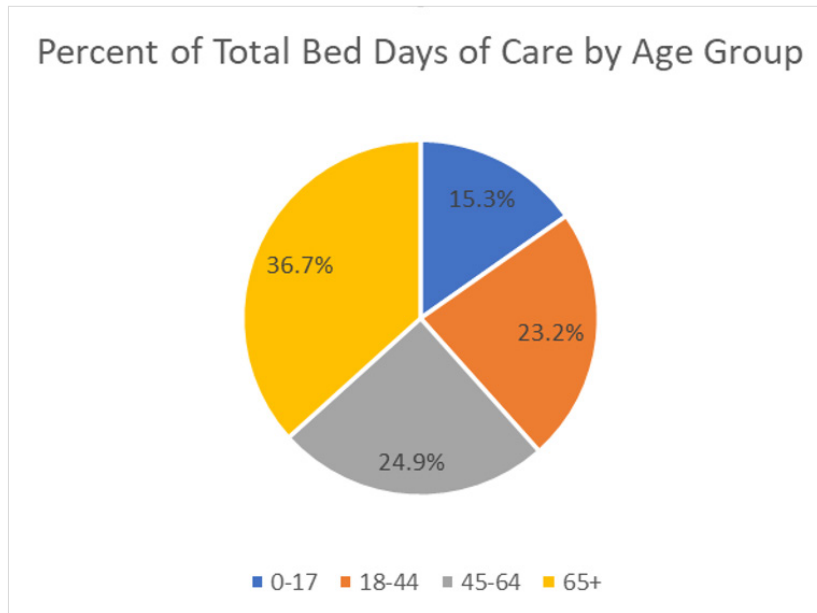


Figure 5

### Service Line Variations by Age Group

Medicine utilization rates trend up with age from a low of 42.9 for 0-17 to a high of 615.8 for 65+. The only exception is Burns which shows less variation and peaks in the 45-64 age group. Cardiac Services notably grows 511% from the 18-44 age group to the 45-64 age group (see Figure 6 below).

Surgery utilization rates trend up in a similar fashion to Medicine from a low of 29.3 for 0-17 to a high of 132.3 for 65+. Like Medicine, Cardiac utilization increases sharply from the 18-44 age group to the 45-64 age group, increasing 796%. Orthopedics utilization in the 65+ age group is 99.7, accounting for 27% of Surgery utilization and 10% of total utilization in that age group.

Mental Health and Substance Abuse utilization has a different growth pattern than Medicine and Surgery, peaking in the 18-44 age group at 94.9, decreasing 14% in the 45-64 group and then decreasing sharply (46%) in the 65+ age group. Mental Health and Substance Abuse comprises 31% of total utilization within the 18-44 group, falling to 4% in the 65+ group. To put this in perspective, nearly half (46%) of all Mental Health BDOC across all age groups occurs in the 18-44 age group.

Maternal / Child Health comprises both Neonatology and Obstetrics. Unsurprisingly, Obstetrics peaks in the 18-44 age group. Neonatology accounts for 54% of total IP utilization across all service lines for the 0-17 age group. Excluding Neonatology, total utilization for the 0-17 age group is 140.4, less than half the utilization rate of the 18-44 group.

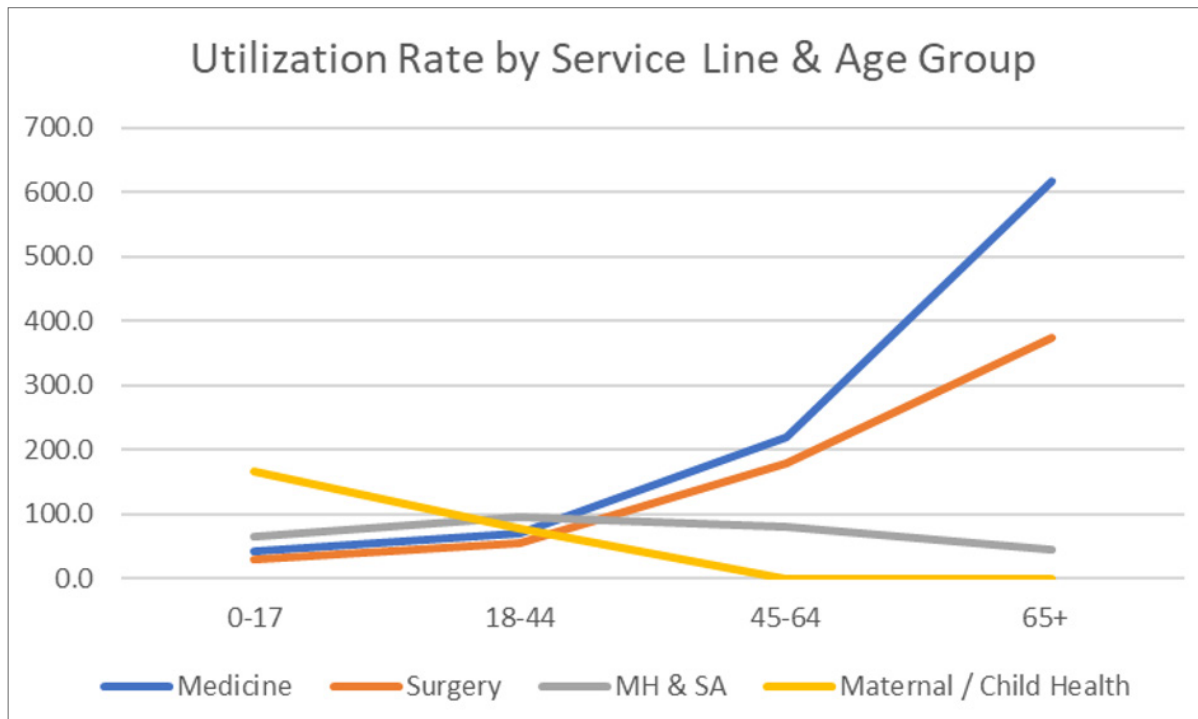


Figure 6

### Service Line BDOC by Payor Type

Across all service lines, Medicare is the single largest payor, accounting for 42.2% of total BDOC (Table 5). This is slightly higher than total percent of BDOC from the 65+ age group (36.7%). One potential explanation is that Medicare is can also be the payor for younger age groups with disabilities as well as patients with End Stage Renal Disease (ESRD). Medicaid is the second largest payor at 31.4% of BDOC, followed by Commercial insurance at 23.6%, and Self/No Pay at 2.8%.

There are large variations in payer mix by service line, perhaps reflecting the relative age-group utilization of service lines. Medicare is the largest payer for Medicine (59.0%) and Surgery (51.7%) service lines, in line with the large increases in utilization rates in those service lines in the 65+ age group. More specifically, the two service lines with the highest percent of payments from Medicare are Cardiac Services (69.8%) and Vascular Services (63.6%). The Mental Health & Substance Abuse service line follows a different pattern with Medicaid as the leading payer (49.1%). This may reflect the higher utilization in younger age groups as previously noted as well as high utilization rates of these services among the socioeconomically disadvantaged. Medicaid is also the leading payor for Maternal / Child Health (54.7%) including both Neonatology (58.1%) and Obstetrics (50.2%), indicating the importance of this coverage to Medicaid recipients.

AZ Service Line Percent of BDOC by Payor Type				
TIG Service Lines	Commercial	Medicaid	Medicare	Self/No Pay
<b>Medicine</b>	<b>17.8%</b>	<b>21.7%</b>	<b>59.0%</b>	<b>1.5%</b>
Burns	24.1%	45.9%	27.3%	2.6%
Cardiac Services	14.7%	14.1%	69.8%	1.3%
General Medicine	17.5%	23.8%	57.1%	1.5%
Neurology	19.5%	18.2%	60.8%	1.5%
Oncology/Hematology	26.6%	23.8%	48.2%	1.4%
<b>Surgery</b>	<b>24.0%</b>	<b>22.8%</b>	<b>51.7%</b>	<b>1.5%</b>
Cardiac Services	27.4%	15.7%	55.7%	1.1%
ENT	27.8%	33.0%	36.9%	2.3%
General Surgery	25.4%	27.8%	45.1%	1.8%
Gynecology	40.0%	30.9%	25.1%	4.1%
Neurosurgery	28.1%	26.8%	43.4%	1.7%
Ophthalmology	21.7%	37.4%	37.7%	3.2%
Oral & Maxillary Surgery	23.5%	37.3%	34.3%	4.9%
Orthopedics	20.2%	14.2%	64.5%	1.2%
Spine	28.9%	16.3%	54.0%	0.9%
Thoracic Surgery	22.5%	15.8%	60.7%	1.0%
Urology	20.6%	30.2%	47.5%	1.7%
Vascular Services	16.1%	19.3%	63.6%	1.0%
<b>Mental Health &amp; Substance Abuse</b>	<b>20.3%</b>	<b>49.1%</b>	<b>22.2%</b>	<b>8.3%</b>
Mental Health & Substance Abuse	20.3%	49.1%	22.2%	8.3%
<b>Maternal/Child Health</b>	<b>42.6%</b>	<b>54.7%</b>	<b>0.3%</b>	<b>2.4%</b>
Neonatology	39.4%	58.1%	0.1%	2.3%
Obstetrics	46.6%	50.2%	0.6%	2.6%
<b>Total (All Service Lines)</b>	<b>23.6%</b>	<b>31.4%</b>	<b>42.2%</b>	<b>2.8%</b>

Table 5

### Utilization by Geography

Geographically, there is relatively little difference in utilization between Maricopa County and Pima County, with overall utilization rates of 483.9 (see Table 6 for details) and 489.5 (see Table 7 for details), respectively, and minimal differences in age group utilization. This is not surprising as both counties are centered around larger metropolitan areas with ample access to care. Given its higher rurality, the Rest of Arizona has a lower overall utilization rate of 412.0 (see table 8 for details) and utilization rates which are lower across all age groups. Figure 7 below shows that utilization rates across the geographies studies are very consistent for the services lines studied.

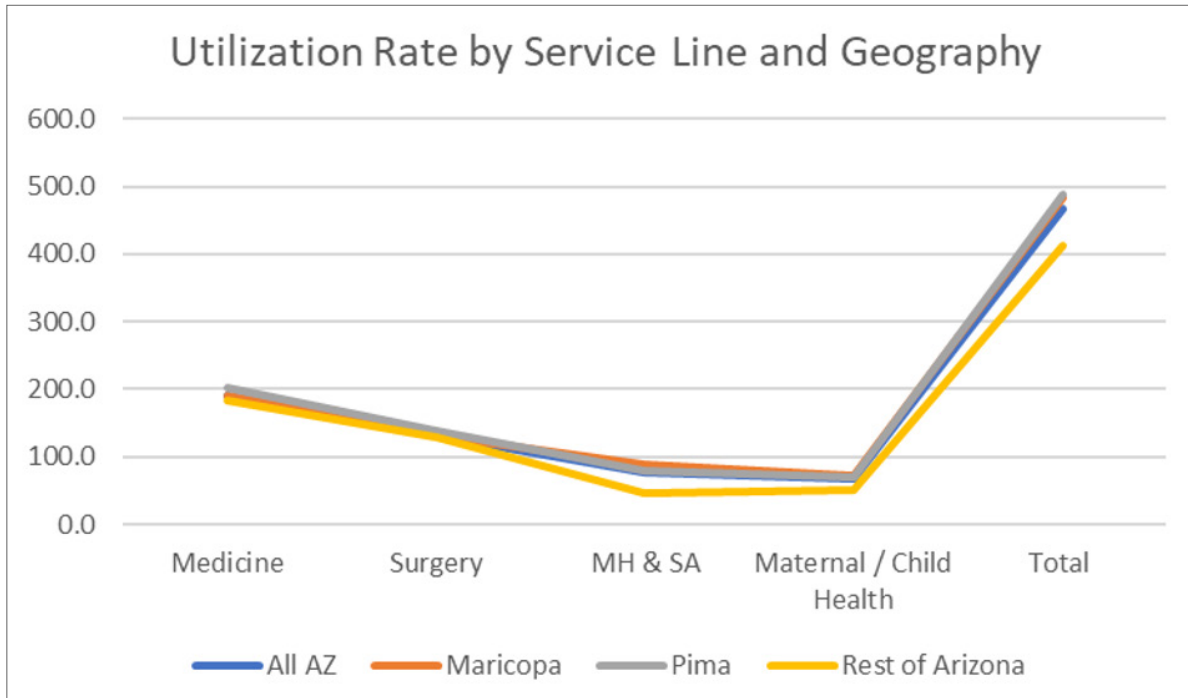


Figure 7

2017-2019 Average Patient Days by Service per 2018 Population by County (Utilization per 1,000)					
	Maricopa County				
TIG Service Lines	0-17	18-44	45-64	65+	Total
<b>Medicine</b>	<b>43.5</b>	<b>73.4</b>	<b>223.5</b>	<b>684.2</b>	<b>191.1</b>
Burns	0.5	0.8	1.2	1.1	0.9
Cardiac Services	1.6	5.6	33.1	136.3	30.3
General Medicine	31.7	53.6	151.7	427.9	126.4
Neurology	4.3	7.6	23.5	82.5	21.5
Oncology/Hematology	5.4	5.9	14.0	36.4	12.2
<b>Surgery</b>	<b>30.5</b>	<b>57.3</b>	<b>182.1</b>	<b>408.3</b>	<b>132.0</b>
Cardiac Services	1.9	1.2	10.7	28.1	7.6
ENT	1.5	1.3	2.2	4.2	2.0
General Surgery	16.2	33.3	91.4	153.8	60.7
Gynecology	0.1	1.8	2.8	2.5	1.7
Neurosurgery	2.9	3.0	8.1	17.4	6.3
Ophthalmology	0.2	0.3	0.3	0.7	0.3
Oral & Maxillary Surgery	0.2	0.3	0.4	0.6	0.3
Orthopedics	2.3	7.4	28.3	104.6	25.4
Spine	1.3	2.5	10.8	25.7	7.6
Thoracic Surgery	1.1	1.8	7.3	21.0	5.8
Urology	1.4	2.6	8.4	17.8	5.9
Vascular Services	1.3	2.0	11.2	31.8	8.4
<b>Mental Health &amp; Substance Abuse</b>	<b>68.7</b>	<b>110.4</b>	<b>93.2</b>	<b>52.7</b>	<b>87.8</b>
Mental Health & Substance Abuse	68.7	110.4	93.2	52.7	87.8
<b>Maternal/Child Health</b>	<b>173.3</b>	<b>83.6</b>	<b>0.4</b>	<b>0.0</b>	<b>73.0</b>
Neonatology	171.3	0.0	0.0	0.0	41.4
Obstetrics	2.0	83.6	0.4	0.0	31.7
<b>Total</b>	<b>315.9</b>	<b>324.7</b>	<b>499.2</b>	<b>1145.2</b>	<b>483.9</b>

Table 6

2017-2019 Average Patient Days by Service per 2018 Population by County (Utilization per 1,000)					
	Pima County				
TIG Service Lines	0-17	18-44	45-64	65+	Total
<b>Medicine</b>	<b>45.1</b>	<b>76.1</b>	<b>233.4</b>	<b>576.1</b>	<b>201.6</b>
Burns	0.4	0.4	0.6	0.6	0.5
Cardiac Services	1.7	5.6	35.2	110.3	31.6
General Medicine	32.5	59.0	161.1	363.9	135.4
Neurology	4.8	7.2	23.6	75.2	23.4
Oncology/Hematology	5.6	3.9	12.9	26.1	10.6
<b>Surgery</b>	<b>29.6</b>	<b>59.0</b>	<b>187.3</b>	<b>350.8</b>	<b>138.7</b>
Cardiac Services	2.2	1.2	9.7	27.9	8.5
ENT	1.4	1.4	3.1	5.2	2.5
General Surgery	16.4	35.8	95.4	119.5	61.8
Gynecology	0.2	1.6	2.6	2.7	1.7
Neurosurgery	1.9	2.6	6.9	12.2	5.3
Ophthalmology	0.3	0.5	0.8	1.5	0.7
Oral & Maxillary Surgery	0.2	0.4	0.5	0.5	0.4
Orthopedics	2.2	7.2	32.0	102.8	30.1
Spine	1.2	2.0	11.1	25.0	8.3
Thoracic Surgery	1.0	1.8	6.5	13.2	4.9
Urology	2.0	2.7	7.3	12.8	5.5
Vascular Services	0.8	1.8	11.5	27.6	8.8
<b>Mental Health &amp; Substance Abuse</b>	<b>73.0</b>	<b>86.9</b>	<b>90.8</b>	<b>53.9</b>	<b>78.7</b>
Mental Health & Substance Abuse	73.0	86.9	90.8	53.9	78.7
<b>Maternal/Child Health</b>	<b>194.9</b>	<b>80.8</b>	<b>0.3</b>	<b>0.0</b>	<b>70.6</b>
Neonatology	192.4	0.0	0.0	0.0	41.3
Obstetrics	2.5	80.8	0.3	0.0	29.3
<b>Total</b>	<b>302.8</b>	<b>342.7</b>	<b>511.8</b>	<b>980.8</b>	<b>489.5</b>

Table 7

2017-2019 Average Patient Days by Service per 2018 Population by County (Utilization per 1,000)					
	Rest of Arizona				
TIG Service Lines	0-17	18-44	45-64	65+	Total
<b>Medicine</b>	<b>40.1</b>	<b>63.7</b>	<b>205.1</b>	<b>517.0</b>	<b>184.1</b>
Burns	0.5	0.7	1.3	1.0	0.9
Cardiac Services	1.5	5.0	32.6	110.9	32.3
General Medicine	28.9	48.4	140.7	327.1	122.6
Neurology	3.9	6.3	19.2	52.0	18.1
Oncology/Hematology	5.4	3.2	11.3	26.0	10.3
<b>Surgery</b>	<b>26.2</b>	<b>50.7</b>	<b>166.2</b>	<b>329.6</b>	<b>129.4</b>
Cardiac Services	2.3	1.2	10.9	29.9	9.6
ENT	1.2	1.3	2.4	3.5	2.0
General Surgery	13.8	28.7	78.0	115.6	54.8
Gynecology	0.2	1.5	2.5	2.2	1.6
Neurosurgery	2.4	2.3	6.7	12.1	5.4
Ophthalmology	0.2	0.3	0.4	0.5	0.3
Oral & Maxillary Surgery	0.2	0.2	0.3	0.5	0.3
Orthopedics	2.2	7.0	29.4	89.3	28.0
Spine	1.1	2.4	9.7	18.1	7.0
Thoracic Surgery	0.8	1.5	5.9	15.5	5.2
Urology	1.3	2.6	8.0	15.2	6.1
Vascular Services	0.5	1.9	12.0	27.1	9.1
<b>Mental Health &amp; Substance Abuse</b>	<b>55.6</b>	<b>57.1</b>	<b>46.5</b>	<b>24.1</b>	<b>47.5</b>
Mental Health & Substance Abuse	55.6	57.1	46.5	24.1	47.5
<b>Maternal/Child Health</b>	<b>130.9</b>	<b>64.4</b>	<b>0.3</b>	<b>0.0</b>	<b>51.0</b>
Neonatology	129.0	0.0	0.0	0.0	29.3
Obstetrics	1.9	64.4	0.3	0.0	21.7
<b>Total</b>	<b>252.8</b>	<b>235.8</b>	<b>418.0</b>	<b>870.7</b>	<b>412.0</b>

Table 8



## Discharge Rates, Average Length of Stay & ED Utilization

The overall Arizona state discharge rate is 88.3 (per 1,000) across all service lines with an average length of stay (ALOS) of 4.6 days (see Table 9 below). Discharge rates are highest in Medicine at 38.6, followed by Maternal / Child Health at 21.1, Surgery at 21.0, and Mental Health & Substance Abuse at 7.5. Specific service lines with the highest discharge rates include Obstetrics (10.8), Neonatology (10.3), Mental Health & Substance Abuse (7.5), medical Cardiac Services (7.2), and Orthopedics (6.5) (see Table 8 below).

ALOS is highest in Mental Health & Substance Abuse (8.7) followed by Surgery (5.2), Medicine (4.3), and Maternal / Child Health (2.9). Within Surgery, the Cardiac Services and Thoracic service lines have notably longer ALOS than average, both at 8.5.

The ED plays a vital gatekeeper role for IP services, accounting for 50.8% of all IP discharges. However, the ED's relative importance varies widely by services line accounting for 84.7% of all Medicine discharges, 45.7% of Surgery discharges, 14.4% of Mental Health & Substance Abuse discharges, and 7.1% of Maternal / Child Health discharges.

2017-2019 Average Discharges by Service per 2018 Population by County (Utilization per 1,000)			
Tig Service Lines	All of Arizona		
	Discharge Rate	ALOS	Percentage of All IP Discharges via ED
<b>Medicine</b>	<b>38.6</b>	<b>4.3</b>	<b>84.7%</b>
Burns	0.1	9.1	58.2%
Cardiac Services	7.2	3.8	81.6%
General Medicine	25.7	4.3	88.6%
Neurology	3.8	4.7	71.9%
Oncology/Hematology	1.9	5.1	69.4%
<b>Surgery</b>	<b>21.0</b>	<b>5.2</b>	<b>45.7%</b>
Cardiac Services	0.8	8.5	29.1%
ENT	0.6	3.0	54.6%
General Surgery	7.0	7.1	60.8%
Gynecology	0.5	2.8	26.9%
Neurosurgery	0.7	6.5	38.4%
Ophthalmology	0.1	3.1	73.5%
Oral & Maxillary Surgery	0.1	3.0	70.3%
Orthopedics	6.5	3.5	33.0%
Spine	1.6	3.8	23.5%
Thoracic Surgery	0.5	8.5	56.4%
Urology	1.2	4.1	56.5%
Vascular Services	1.4	5.0	53.1%
<b>Mental Health &amp; Substance Abuse</b>	<b>7.5</b>	<b>8.7</b>	<b>14.4%</b>
Mental Health & Substance Abuse	7.5	8.7	14.4%
<b>Maternal/Child Health</b>	<b>21.1</b>	<b>2.9</b>	<b>7.1%</b>
Neonatology	10.3	3.3	1.0%
Obstetrics	10.8	2.4	12.9%
<b>Total</b>	<b>88.3</b>	<b>4.6</b>	<b>50.8%</b>

Table 9

## Planning Implications for Bed Requirements

Overall Arizona utilization rates were used to determine the number of beds needed per 1,000 population at various occupancy rates as shown in 10 below. These range from 1.51 beds per 1,000 population at 85% occupancy to 1.97 at 65% occupancy. With a total 2018 state population of 7,076,188, Arizona needed between 10,651 beds (85% occupancy) and 13,928 beds (65% occupancy). The appropriate distribution of these beds across the state is a subject for further study.

Total AZ Beds Needed per 1,000 Population by Occupancy Rate	
Occupancy Rate	Beds per 1,000 Population
65%	1.97
75%	1.71
85%	1.51

Table 10

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