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November 5, 2020

Hospital Bed Capacity and COVID-19

This ProPublica dataset comprises data for 306 areas in the United States, with 36 columns of data describing population, number of hospital beds, projected infected individuals, available beds, and more. The predictions for the amount of hospital beds needed are projected for 6, 12, and 18 months. Additionally, all of this data is presented if 20%, 40% and 60% of the population is infected with COVID-19. To begin looking at this data, I separated each of the 306 areas into 5 regions: Midwest, Northeast, Southeast, Southwest and West. I will be using this categorization throughout the data analysis to streamline the results.

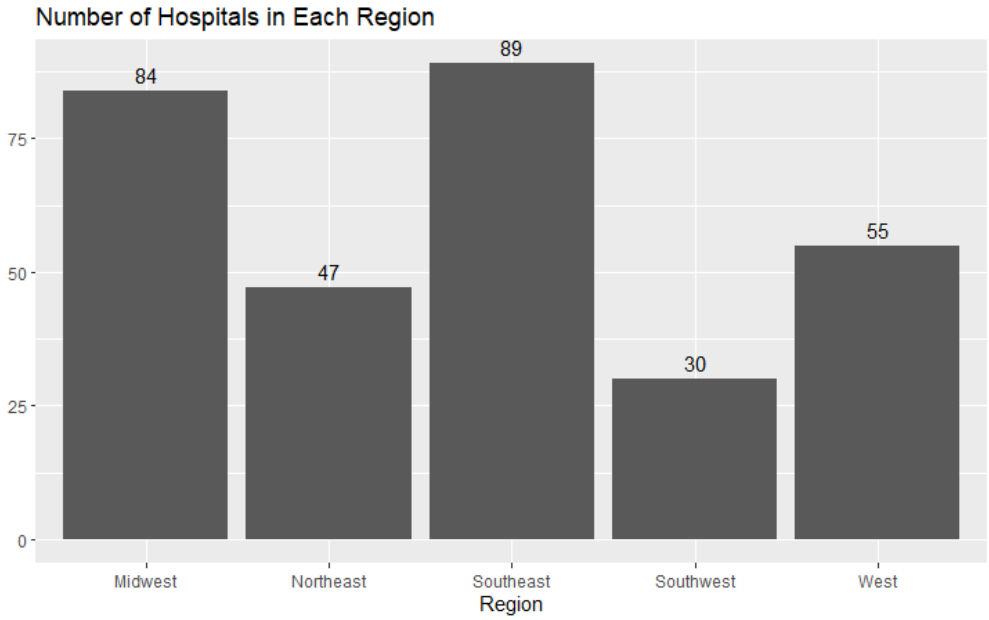

Figure 1: Number of hospitals in each of the five regions

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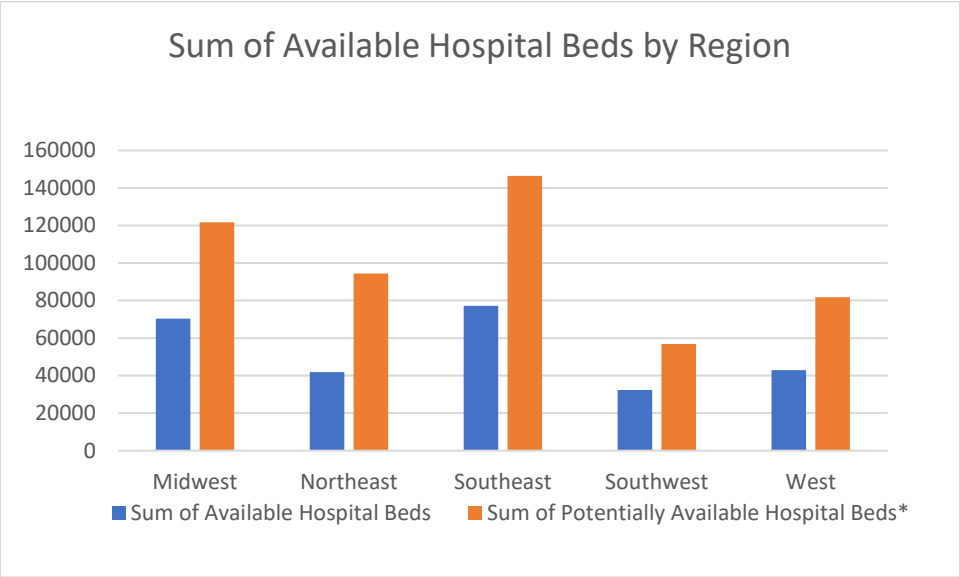

Figure 2: Available hospital beds in each region

Above, Figure 1 shows a summary of the number of hospitals in each region of the United States. The Midwest and Southeast regions have the greatest number of hospitals while the Southwest has the least. These values are important as they can have an impact on how many hospital beds are available. Figure 2 shows the number of available hospital beds in each region. The dataset contains a category in which the 50% of the current used beds are freed up. This is referred to as the potential bed capacity. This information is also shown in Figure 2 above. Figure 3 shows the population of those aged 65+ in each region. Because these individuals are at a higher risk of a more severe infection, this information can affect the number of hospital beds available. These values will be consistent regardless of how much of the population is infected.

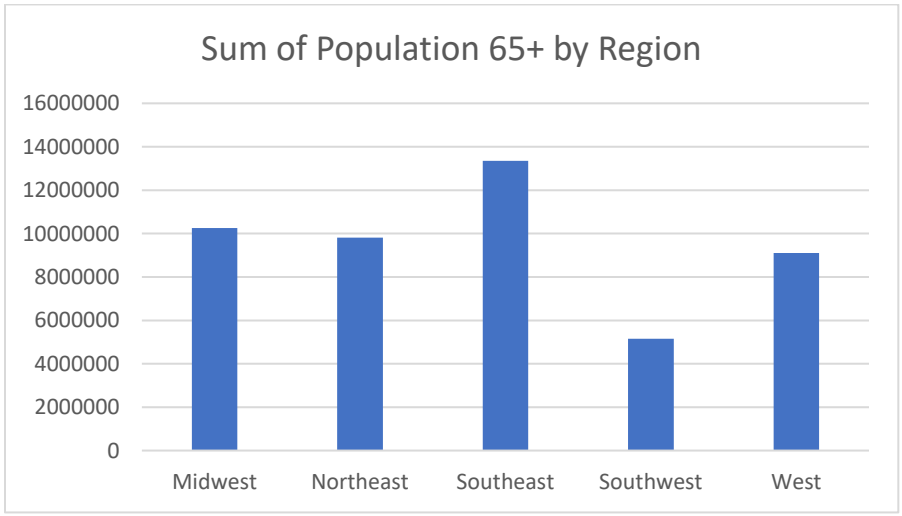

Figure 3: Population aged 65+ for each of the five regions

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Hospitals were determined to have enough bed capacity based on whether the percentage data of available hospital beds needed was less than 100%. Each hospital was categorized as having enough bed capacity (0) or not enough bed capacity (1). The first data that I took a more in-depth look at was that of which 20% of the population was infected with COVID-19. The tables below on the left show the number of hospitals with and without bed capacity in 6, 12 and 18 months if 20% of the population is infected. The tables on the right show the same information for potential bed capacity. As expected, there are more hospitals with potentially available beds than with available beds. The number of hospitals with enough capacity increases as time goes on. Figure 5 shows the number of individuals over the age of 18 projected to be hospitalized if 20% of the population is infected. This data is for the entire course of the pandemic.

Hospitals with bed capacity in 6 months

Region	0	1
Midwest	2	82
Northeast	0	47
Southeast	2	87
Southwest	1	29
West	1	54

Hospitals with potential bed capacity in 6 months

Region	0	1
Midwest	26	58
Northeast	1	46
Southeast	31	58
Southwest	8	22
West	4	51

Hospitals with bed capacity in 12 months

Region	0	1
Midwest	39	45
Northeast	3	44
Southeast	41	48
Southwest	12	18
West	6	49

Hospitals with potential bed capacity in 12 months

Region	0	1
Midwest	82	2
Northeast	44	3
Southeast	87	2
Southwest	27	3
West	38	17

Hospitals with bed capacity in 18 months

Region	0	1
Midwest	77	7
Northeast	24	23
Southeast	77	12
Southwest	24	6
West	25	30

Hospitals with potential bed capacity in 18 months

Region	0
Midwest	84
Northeast	47
Southeast	89
Southwest	30
West	55

Figure 4: Bed capacity if 20% of population is infected

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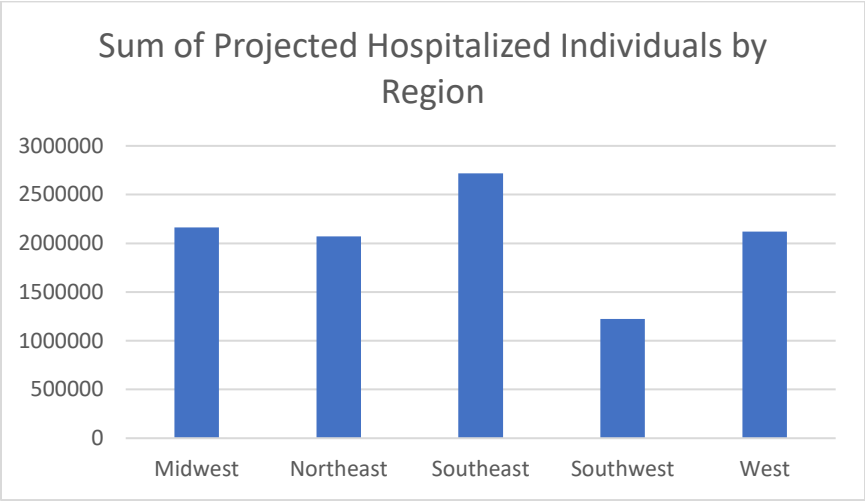

Figure 5: Individuals requiring hospitalization with 20% infected

The same information was gathered for the data with 40% of the population infected. The tables in Figure 6 below show that there would be no hospitals with available beds in 6 months, but this number improves as time goes on. Again, there are more hospitals with potentially available beds.

Hospitals with bed capacity in 6 months

Region	1
Midwest	84
Northeast	47
Southeast	89
Southwest	30
West	55

Hospitals with potential bed capacity in 6 months

Region	0	1
Midwest	1	83
Northeast	0	47
Southeast	0	89
Southwest	0	30
West	1	54

Hospitals with bed capacity in 12 months

Region	0	1
Midwest	2	82
Northeast	0	47
Southeast	2	87
Southwest	1	29
West	1	54

Hospitals with potential bed capacity in 12 months

Region	0	1
Midwest	26	58
Northeast	1	46
Southeast	31	58
Southwest	8	22
West	4	51

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Hospitals with bed capacity in 18 months

Region	0	1
Midwest	20	64
Northeast	1	46
Southeast	16	73
Southwest	7	23
West	3	52

Hospitals with potential bed capacity in 18 months

Region	0	1
Midwest	69	15
Northeast	29	18
Southeast	76	13
Southwest	21	9
West	19	36

Figure 6: Bed capacity if 40% of population is infected

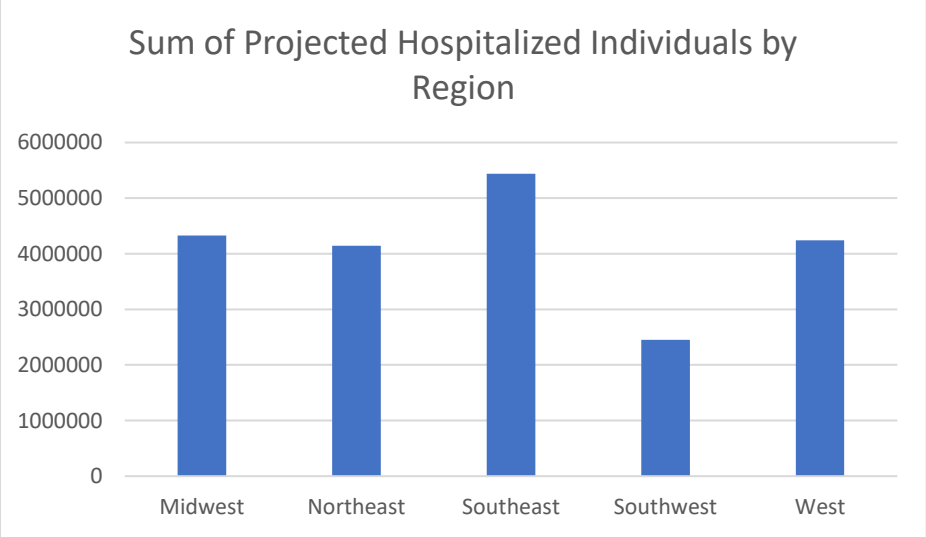

Figure 7: Individuals requiring hospitalization with 40% infected

If 60% of the population were infected, there would be no hospitals with available beds for 6 or 12 months. At 18 months, there are only a few hospitals with available beds, and none in the Northeast. The number of hospitals with potentially available beds increases with time, but again, there are not potentially available beds at 6 months. Figure 9 shows the individuals require hospitalization with 60% of the population infected. Of course, this directly relates to the number of beds that will be needed.

Hospitals with bed capacity in 6 months

Region	1
Midwest	84
Northeast	47
Southeast	89
Southwest	30
West	55

Hospitals with potential bed capacity in 6 months

Region	1
Midwest	84
Northeast	47
Southeast	89
Southwest	30
West	55

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Hospitals with bed capacity in 12 months

Region	1
Midwest	84
Northeast	47
Southeast	89
Southwest	30
West	55

Hospitals with potential bed capacity in 12 months

Region	0	1
Midwest	4	80
Northeast	0	47
Southeast	3	86
Southwest	0	30
West	1	54

Hospitals with bed capacity in 18 months

Region	0	1
Midwest	3	81
Northeast	0	47
Southeast	3	86
Southwest	1	29
West	1	54

Hospitals with potential bed capacity in 18 months

Region	0	1
Midwest	28	56
Northeast	2	45
Southeast	33	56
Southwest	8	22
West	4	51

Figure 8: Bed capacity if 60% of population is infected

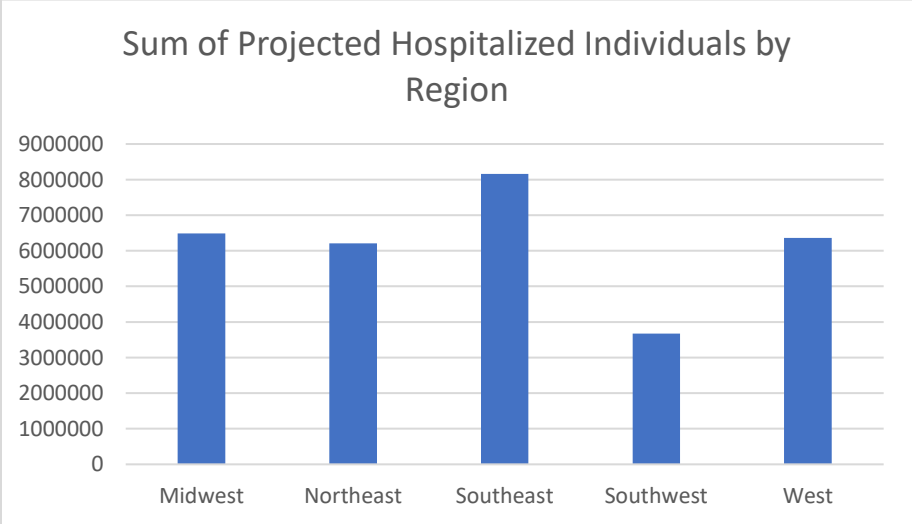

Figure 9: Individuals requiring hospitalization with 60% infected

The age of the population can contribute to the required number of hospitalizations and therefore affect if a hospital has enough bed capacity. Figures 10, 11 and 12 below show this comparison for 6, 12 and 18 months, respectively.

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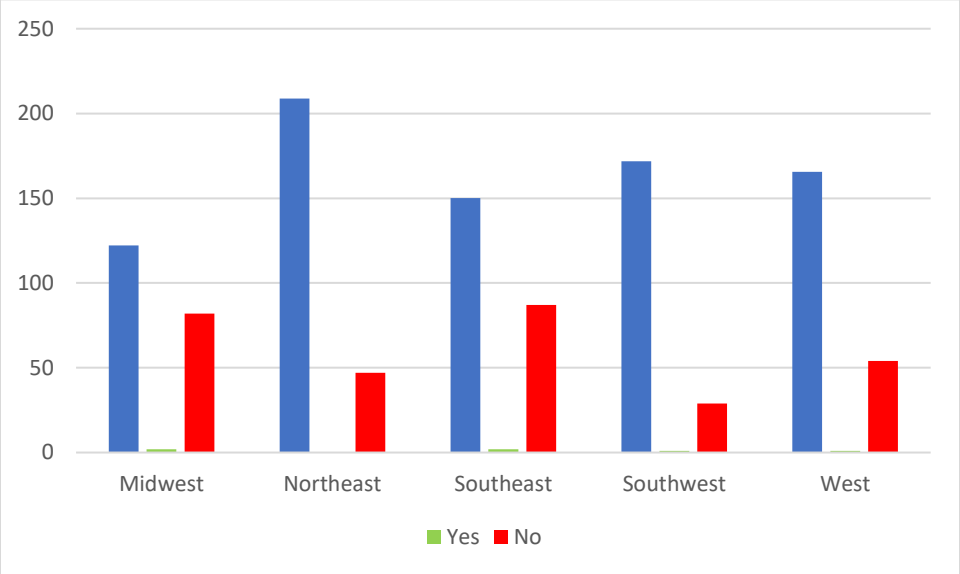

Figure 10: Average population aged 65+(x1000) and available beds, 6 months

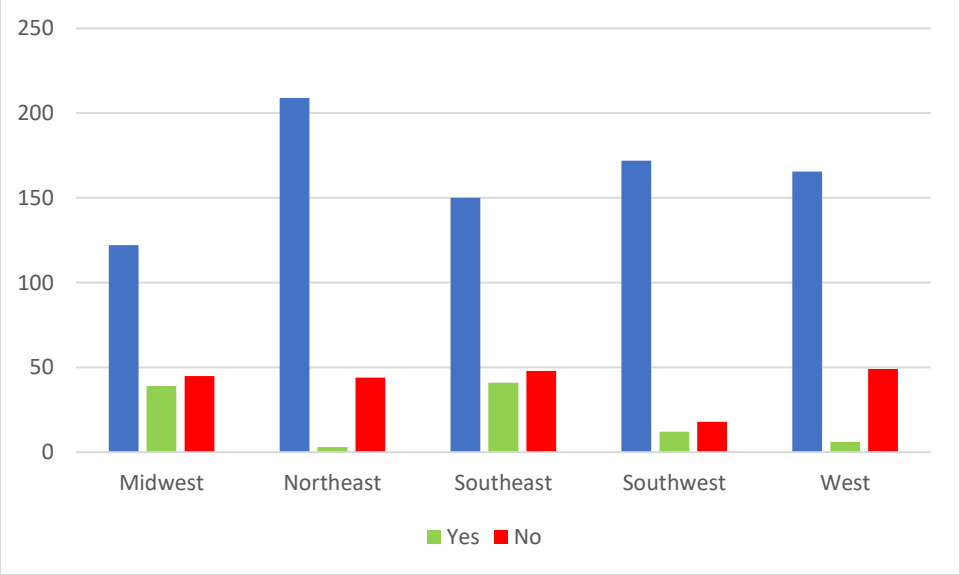

Figure 11: Average population aged 65+(x1000) and available beds, 12 months

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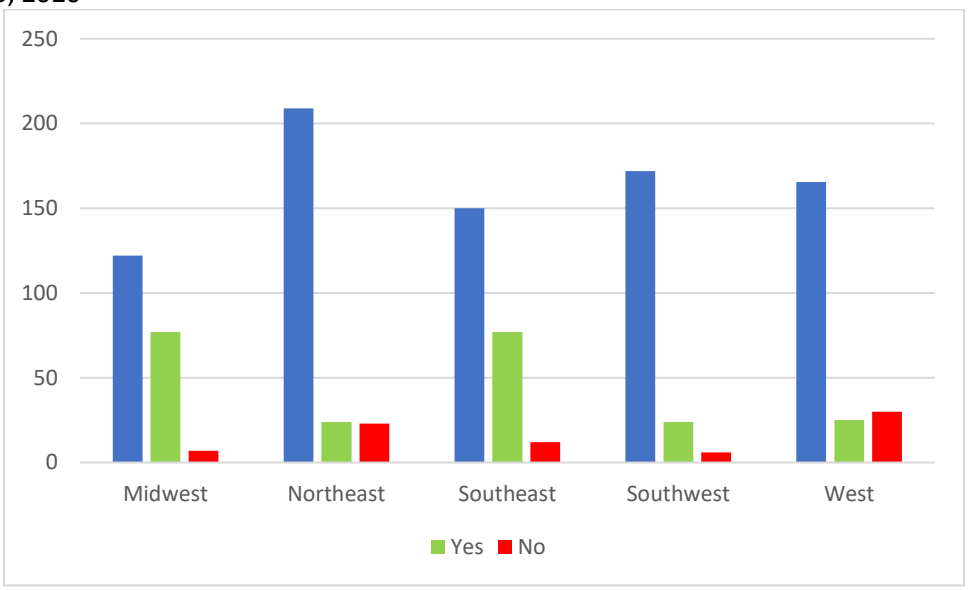

Figure 12: Average population aged 65+(x1000) and available beds, 18 months

This data can be furthered used to determine if hospitals will have enough beds to accommodate the individuals needing hospitalizations. The important factors will be the number of hospital beds in each region, the number of available hospital beds and individuals requiring hospitalization.

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References

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[2] Parul Pandey. 2019. A Comprehensive Guide to Data Visualisation in R for Beginners: An overview of the R visualisation capabilities. (February 2019). Retrieved from https://towardsdatascience.com/a-guide-to-data-visualisation-in-r-for-beginners-ef6d41a34174.

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[4] Fiona Robinson. 2016. Plotting with ggplot: adding titles and axis names. (May 2016). Retrieved from http://environmentalcomputing.net/plotting-with-ggplot-adding-titles-and-axis-names/.