

Occupancy Rates in Rural and Urban Hospitals: Value and Limitations in Use as a Measure of Surge Capacity

Introduction

The onset of the coronavirus and its disease, COVID-19, in the United States has caused concern among health care leaders and policy makers about the surge capacity of hospitals to accommodate a potential influx of patients. This is a particular concern in rural communities because 168 rural hospitals have closed since 2005.¹ The purpose of this brief is to provide health care leaders and policy makers with information about historic occupancy rates (the percent of available beds that are occupied) as an input for state and system-level planning to manage population health during a pandemic.

In this brief, we use data from the Centers of Medicare & Medicaid Services (CMS) Healthcare Cost Report Information System (HCRIS) to calculate state-level acute and intensive care unit occupancy rates for rural and urban hospitals.² Although these are probably the best data readily available, caution is warranted in any analysis of surge capacity because historical occupancy rates may not predict current and future use and availability of acute care and intensive care unit (ICU) beds, particularly during a nationwide crisis. A partial list of reasons that historical occupancy rates may not reflect care patterns in the short run include the following:

- In many rural communities, some local rural residents bypass their local hospital and travel to a more distant, larger hospital. Bypass behavior could change during a crisis, and a shift in either direction would affect use and availability of beds.
- Small rural hospitals historically transfer a significant proportion of higher acuity patients to larger hospitals. During a large increase in acute patients, those upstream hospitals will be much less likely to accommodate such transfers, meaning more patients will need to stay in the rural hospital.
- Hospital crisis preparation plans usually include postponement of elective care and other clinical strategies that would increase the availability of beds.
- Patients may be temporarily redirected to specific hospitals or other care locations during a crisis depending on their diagnosis and other clinical factors, which would affect local use and availability of beds.

KEY FINDINGS

As policymakers deal with the effects of the novel coronavirus pandemic on the hospital infrastructure, understanding the differences in occupancy rates between rural and urban hospitals may help state and local officials in their planning for dealing with surge demand. Historically rural hospitals have reported lower occupancy rates than urban hospitals and more licensed than staffed beds. This may represent surge capacity for state and local officials to consider in responding to this crisis. The purpose of this brief is to describe variations in hospital occupancy rates nationally and by state, provide additional data for state and local officials, and highlight challenges in identifying surge capacity. Key findings are:

- In almost every state, rural hospitals have lower acute care and intensive care unit (ICU) occupancy rates compared to their urban counterparts.
- However, historical average occupancy rates may not reflect care patterns in the short run and sites such as recently closed hospitals may be less feasible for rapid deployment of surge capacity.

Results

Acute Care Occupancy Rates

Appendix 1 shows the 2018 (or most recent) acute care weighted occupancy rates for rural and urban hospitals.² In 48 out of 50 states, rural hospitals have lower acute care occupancy rates than their urban counterparts. Across the U.S., the acute care occupancy rate was 25 percentage points lower in rural hospitals (37%) compared to urban hospitals (62%). Among states with at least three rural hospitals, Colorado (24%) and Louisiana (25%) had the lowest acute care occupancy rates for rural hospitals, while New Hampshire (65%) and Hawaii (63%) had the highest occupancy rates for rural hospitals. Figure 1 displays the variation in rural acute care occupancy rates.

Intensive Care Unit Occupancy Rates

Appendix 2 shows the 2018 (or most recent) ICU weighted occupancy rates for rural and urban hospitals. In 49 out of 50 states, rural hospitals have lower ICU occupancy rates than their urban counterparts. Across the U.S., the ICU occupancy rate was 20 percentage points lower in rural hospitals (45%) compared to urban hospitals (65%). Among states with at least three rural hospitals, Colorado (6%) and Nevada (23%) had the lowest ICU occupancy rates for rural hospitals, while Delaware (80%) and Hawaii (64%) had the highest occupancy rates for rural hospitals. Figure 2 displays the regional variation in rural ICU occupancy rates.

Figure 1: 2018 (or most recent) acute care weighted occupancy rates for rural hospitals

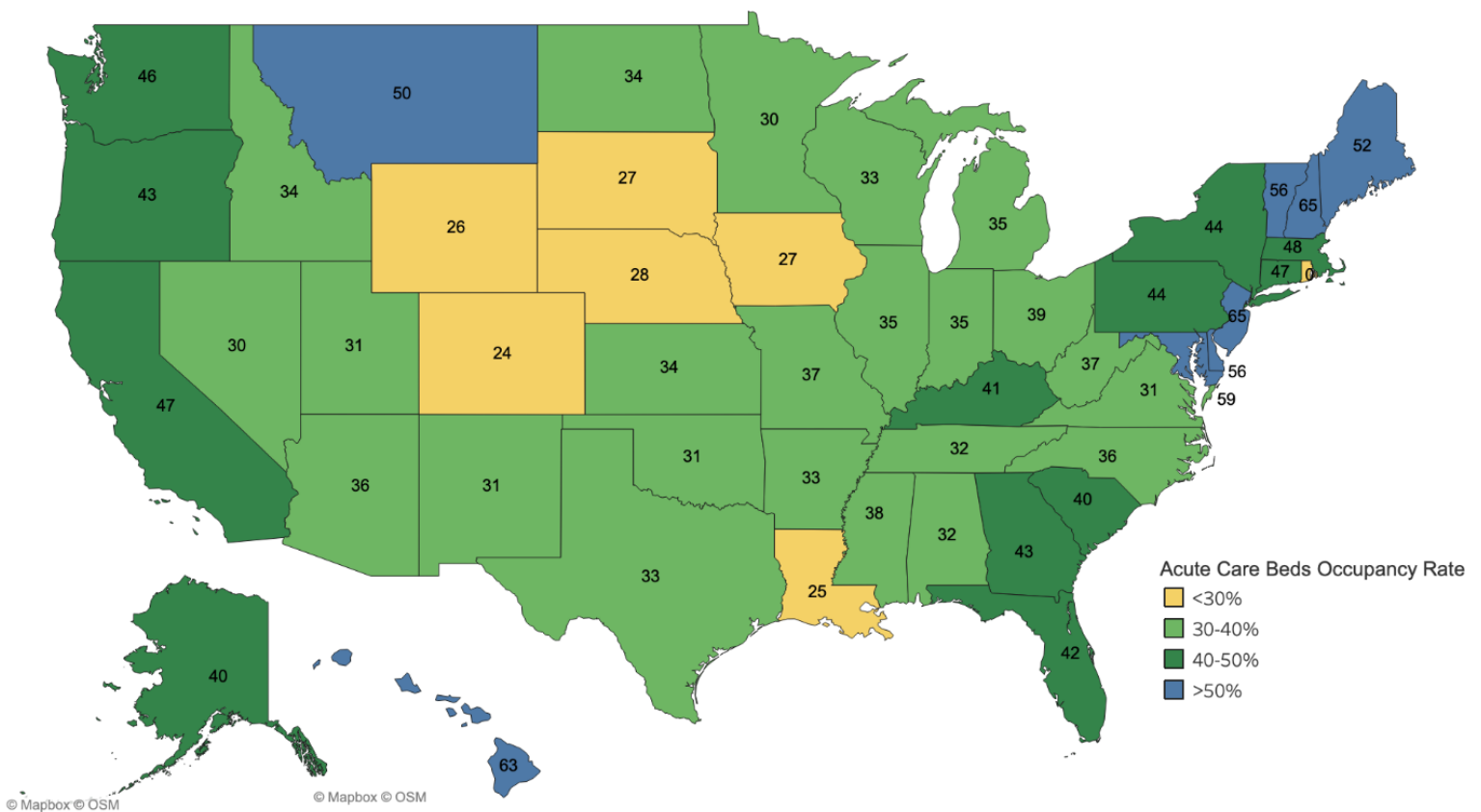
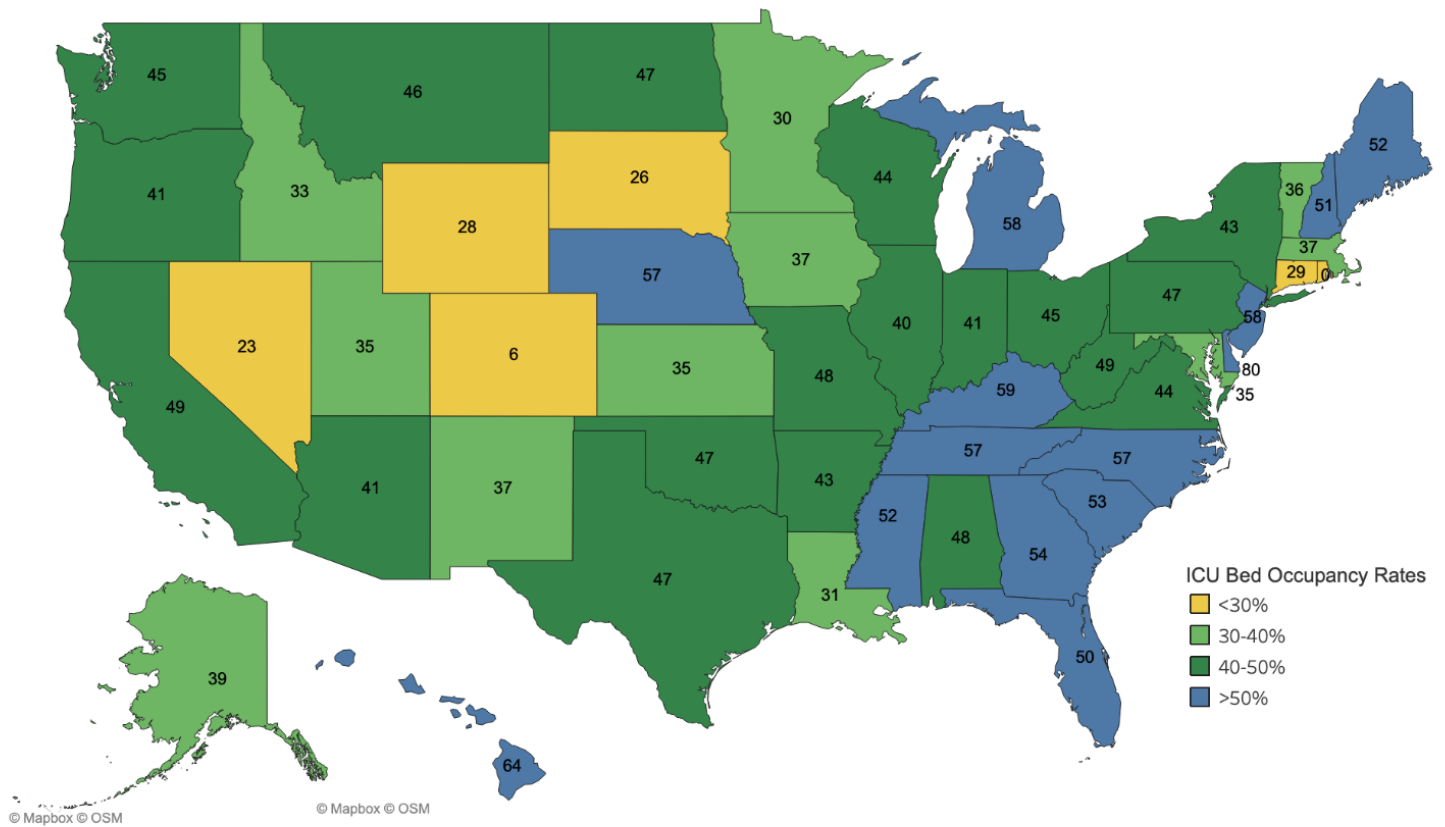


Figure 2: 2018 (or most recent) intensive care unit weighted occupancy rates for rural hospitals



Conclusion

COVID-19 has hospitals bracing for a surge in the volume of patients. In almost every state, rural hospitals have lower acute care and ICU occupancy rates compared to their urban counterparts. Considered in isolation, lower occupancy rates appear to be an opportunity for surge capacity. However, there may be other more feasible alternatives because:

- Surge capacity depends on many factors. In addition to a state/federal license and a building, a hospital must have usable space, qualified staff, equipment, and supplies necessary for patient care. Many rural hospitals have fewer beds than when they opened and may have subsequently changed their physical layout.
- Supply and demand must both be considered. On a per-person basis, urban areas have more acute and ICU beds than rural areas.³ Depending on care patterns, a sudden increase in patients in rural areas may outstrip local short-run surge capacity faster than in urban areas.
- Other sites of care may be more feasible. In the short run, empty hospital beds may be the best surge strategy; however, alternatives such as hotel rooms, university dorms, and military bases may be easier and faster to bring into operation as sites of care as additional staff and supplies become available.
- Focusing care may be more efficient and effective. If some facilities focus on care for clinical conditions other than COVID-19 (e.g., maternal health, trauma, stroke), then other facilities could focus on COVID-19. For example, a repurposed college residence hall may be a better fit for less risky acute conditions, which would allow COVID-19 patients to be managed in a hospital.

Data Source and Limitations

Data source:

Medicare Cost Report Worksheet S-3, Part I		
Component	Number of beds	Patient days
Total adult and pediatric	Line 7, column 2	Line 7, column 8
Intensive care unit	Line 8, column 2	Line 8, column 8
Coronary care unit	Line 9, column 2	Line 9, column 8
Surgical ICU	Line 11, column 2	Line 11, column 8
Days in reporting period	Included in hospital identifier information	

Columns in tables:

Total hospitals is the total number of acute care, non-federal hospitals in the state.

Average daily census (ADC) is the average number of patients receiving acute care (or ICU) per day during a reporting period. Acute care ADC includes ICU and swing but excludes newborn, psychiatric, hospice, and rehabilitation patient days.⁴ ICU ADC includes intensive care unit, coronary care unit, and surgical ICU patient days. ADC is calculated as patient days / days in reporting period.

Total acute care (or ICU) beds is the number of beds available for use by patients at the end of the cost reporting period. Acute care beds include ICU and swing but excludes newborn, psychiatric, hospice, and rehabilitation beds. ICU beds includes intensive care unit, coronary care unit, and surgical ICU beds.

Occupancy rate is the ratio of the reported use to the maximum use of inpatient beds. It is calculated as acute care (or ICU) ADC / acute care (or ICU) beds. For example, if a hospital had 100 acute care beds and an ADC of 60 patients, then on an average day the hospital was $(60/100 =)$ 60 percent full.

Data Limitations:

This brief is an *estimate* of occupancy rates because:

- The data are from the December 2019 files of the CMS Healthcare Cost Report Information System (HCRIS). Typically, HCRIS data are 12 to 18 months old on the file issue date. Therefore, the December 2019 files include data accurate as of 2017-2018.
- Some hospitals do not accept Medicare patients and thus do not report data to CMS.
- Since 2018, some hospitals have opened or closed, and some open hospitals have increased or reduced their numbers of acute care beds.
- Some hospitals may incorrectly report the number of licensed or certified beds instead of the number of beds available for use as stated in the instructions for Worksheet S-3, Part I.⁵
- Some hospitals may report neonatal beds as ICU beds. Neonatal beds are not suitable for pediatric or adult patients.

Appendix 1: 2018 (or most recent) acute care weighted occupancy rates for rural and urban hospitals

State	Rural Hospitals				Urban Hospitals			
	Total Hospitals	Average Daily Census	Total Acute Care Beds	Occupancy Rate (%)	Total Hospitals	Average Daily Census	Total Acute Care Beds	Occupancy Rate (%)
AK	17	167	420	40	4	535	851	63
AL	47	879	2,714	32	39	6,341	10,078	63
AR	48	798	2,443	33	25	2,918	5,088	57
AZ	27	430	1,196	36	47	6,467	11,193	58
CA	54	1,018	2,185	47	271	36,093	62,992	57
CO	41	364	1,542	24	39	4,379	7,273	60
CT	3	95	201	47	26	4,077	6,279	65
DC				0	7	1,549	2,121	73
DE	2	173	309	56	4	1,055	1,652	64
FL	23	432	1,031	42	156	30,208	49,338	61
GA	63	1,570	3,627	43	67	10,569	15,406	69
HI	12	270	432	63	9	1,182	1,823	65
IA	91	750	2,780	27	25	2,656	4,573	58
ID	28	255	745	34	13	1,103	2,052	54
IL	73	1,048	3,019	35	103	13,685	24,018	57
IN	51	713	2,045	35	66	7,322	12,923	57
KS	109	1,061	3,103	34	25	2,666	4,532	59
KY	70	2,064	4,981	41	20	4,643	7,356	63
LA	48	562	2,255	25	62	5,471	10,150	54
MA	5	87	182	48	54	8,872	13,203	67
MD	5	154	261	59	41	7,085	10,027	71
ME	24	517	990	52	8	1,022	1,657	62
MI	63	1,150	3,290	35	67	11,172	17,748	63
MN	92	745	2,496	30	34	5,181	7,772	67
MO	59	981	2,633	37	45	7,863	13,078	60
MS	68	1,826	4,850	38	24	2,453	4,331	57
MT	55	773	1,539	50	6	624	1,168	53
NC	55	1,972	5,455	36	49	10,530	15,302	69
ND	39	330	960	34	5	788	1,260	63
NE	72	586	2,105	28	15	1,678	2,695	62
NH	17	706	1,094	65	9	783	1,244	63
NJ	1	56	86	65	63	11,072	17,459	63
NM	30	367	1,198	31	12	1,622	2,517	64
NV	13	78	258	30	22	3,753	5,269	71
NY	51	1,509	3,469	44	113	27,900	38,386	73
OH	71	1,775	4,577	39	87	12,889	20,989	61
OK	76	1,102	3,609	31	39	4,062	6,257	65
OR	32	479	1,104	43	27	3,321	5,156	64
PA	44	1,371	3,130	44	114	16,061	26,250	61
RI				0	10	1,310	2,129	62
SC	25	942	2,352	40	32	5,204	8,018	65
SD	47	315	1,168	27	9	876	1,448	61
TN	49	959	3,007	32	48	8,906	13,252	67
TX	144	2,003	6,150	33	230	28,215	47,163	60
UT	21	160	517	31	23	1,894	3,831	49
VA	28	613	1,966	31	52	8,216	12,653	65
VT	13	320	576	56	1	303	415	73
WA	40	501	1,093	46	49	6,395	9,506	67
WI	72	852	2,545	33	49	4,921	8,403	59
WV	28	532	1,456	37	20	2,377	3,826	62
WY	23	204	798	26	2	185	382	48
US	2,169	36,615	99,942	37	2,367	350,452	56,2492	62

Appendix 2: 2018 (or most recent) ICU weighted occupancy rates for rural and urban hospitals

STATE	RURAL HOSPITALS				URBAN			
	Total Hospitals	Average Daily Census	Total ICU Beds	Occupancy Rate (%)	Total Hospitals	Average Daily Census	Total ICU Beds	Occupancy Rate (%)
AK	4	13	33	39	3	65	96	68
AL	33	132	275	48	35	1,292	1,681	77
AR	20	76	179	43	19	489	756	65
AZ	8	41	100	41	40	1,104	1,949	57
CA	33	101	206	49	259	5,030	8,601	58
CO	15	38	595	6	32	822	1,630	50
CT	2	6	21	29	22	425	693	61
DC				0	7	263	417	63
DE	2	23	29	80	4	211	304	70
FL	12	44	89	50	151	4,764	6,979	68
GA	34	194	363	54	54	1,807	2,430	74
HI	5	21	33	64	8	119	183	65
IA	21	47	127	37	20	384	604	64
ID	6	22	66	33	9	178	307	58
IL	30	82	208	40	96	2,052	3,430	60
IN	31	105	259	41	53	1,459	2,312	63
KS	25	73	208	35	17	477	741	64
KY	46	302	509	59	19	661	946	70
LA	25	59	189	31	39	846	1,337	63
MA	2	4	10	37	51	1,048	1,561	67
MD	4	11	30	35	39	879	1,292	68
ME	10	36	70	52	8	169	245	69
MI	35	190	327	58	57	1,644	2,453	67
MN	23	40	132	30	26	870	1,245	70
MO	23	100	209	48	42	1,341	2,225	60
MS	25	190	367	52	17	344	595	58
MT	11	38	83	46	5	109	189	58
NC	40	315	555	57	45	1,996	2,629	76
ND	3	21	45	47	5	170	249	68
NE	9	74	129	57	9	288	441	65
NH	8	66	130	51	9	77	122	63
NJ	1	14	24	58	63	1,203	2,042	59
NM	16	44	119	37	11	301	434	69
NV	3	3	14	23	19	856	1,078	79
NY	30	125	288	43	103	2,660	4,074	65
OH	51	229	509	45	74	2,166	3,173	68
OK	24	116	246	47	20	685	960	71
OR	14	45	110	41	25	533	825	65
PA	30	142	303	47	99	2,296	3,542	65
RI				0	9	209	295	71
SC	22	135	253	53	30	836	1,152	73
SD	10	15	56	26	3	111	192	58
TN	31	182	317	57	40	1,673	2,218	75
TX	50	277	594	47	160	4,696	7,259	65
UT	7	10	29	35	19	298	526	57
VA	21	89	202	44	50	1,263	1,837	69
VT	6	17	48	36	1	31	46	68
WA	12	42	95	45	38	876	1,372	64
WI	29	99	227	44	41	773	1,320	59
WV	15	65	132	49	16	476	609	78
WY	9	21	73	28	2	16	29	55
US	926	4,135	9,215	45	2,023	53,345	81,625	65

Notes and References

1. 168 Rural Hospital Closures: January 2005- Present, NC Rural Health Research Program. Retrieved from <https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>
2. State-level is a weighted occupancy rate - the sum of the acute care (ICU) ADCs of all hospitals in a state divided by the sum of all acute care (ICU) beds in a state.
3. Schulte F, Lucas E, Rau J, Szabo L, Hancock J. Millions Of Older Americans Live in Counties with No ICU Beds as Pandemic Intensifies, Kaiser Health News, March 20, 2020. Available at: <https://khn.org/news/as-coronavirus-spreads-widely-millions-of-older-americans-live-in-counties-with-no-icu-beds/>.
4. Under a swing bed agreement, a hospital can use its beds, as needed, to provide either acute or SNF care.
5. Licensed/certified beds may represent available but unused and unstaffed capacity, but they may also be unavailable in practice. Many rural hospitals have fewer beds than when they opened and may have changed their physical layout as a consequence. State and local officials would need to validate on a hospital-by-hospital basis.

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