

DESIGN TO SUPPORT ACCESSIBLE AND HIGH-QUALITY CARE IN RURAL COMMUNITIES

*A COLLABORATIVE EXPLORATION OF INNOVATIONS IN RURAL
HEALTHCARE ENVIRONMENTS*

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Agenda

1. **Background:** Rural Hospitals in the United States

2. **Research:** Post-Occupancy Evaluation of two CAHs

3. **Design:** Design ideas that address unique challenges of small rural hospitals

A rural landscape featuring three large, cylindrical hay bales in a field. The sky is dramatic, with a rainbow visible on the right side. The text is overlaid on the left side of the image.

BACKGROUND

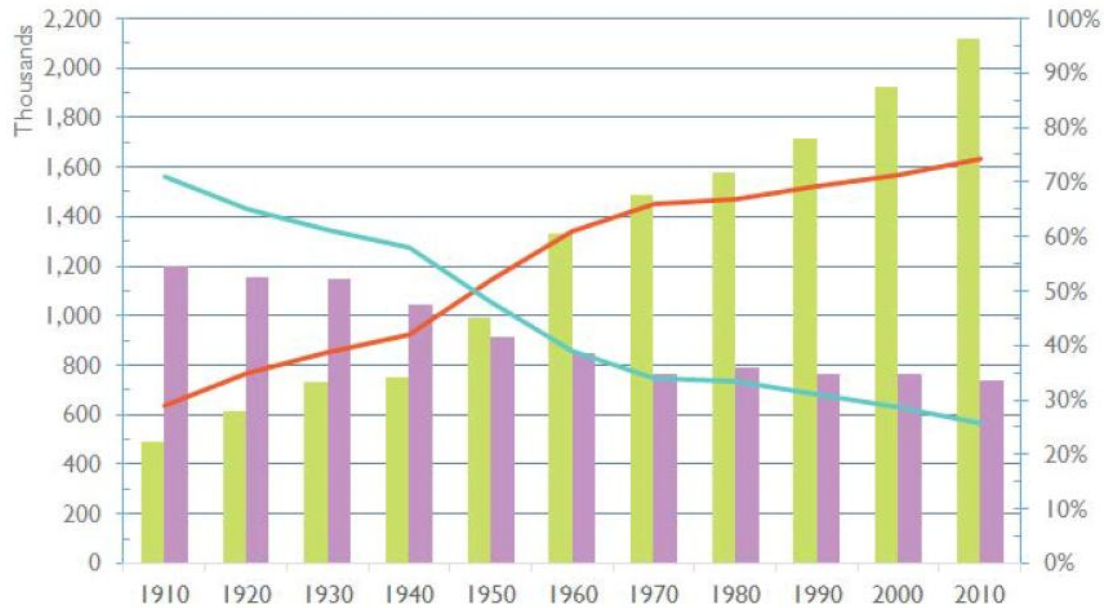
WHAT ARE THE UNIQUE CHARACTERISTICS OF RURAL HOSPITALS IN THE UNITED STATES?

CASE STUDY TOWNS

	BURNS	CORNING	CORYDON	ELECTRA	GANADO	HIAWASSE	JULESBURG	LUSK	MUNISING
	2806	1,635	3,122	2,769	1,227	880	1,227	1,568	2,355
	SALES AND OFFICE	SERVICES	PRODUCTION, TRANSPORTATION	SALES & OFFICE	SALES & OFFICE	SALES & OFFICE	SALES & OFFICE	SALES & OFFICE, SERVICE	SERVICE
	-5.46%	-0.25%	3.6%	-1.79%	0.9%	5.63%	0.9%	6.74%	-4.07%
	120 MILES	45 MILES	19 MILES	19 MILES	132 MILES	32 MILES	132 MILES	96 MILES	38 MILES
	98	65	66	58	38	65	38	62	48
	6.5 OUT OF 10	3 OUT OF 10	3 OUT OF 10	4.5 OUT OF 10	3 OUT OF 10	3 OUT OF 10	3 OUT OF 10	3.5 OUT OF 10	1 OUT OF 10
	884	918	2,125	1,704	1,770	1,643	1,232	2,897	946
	SERVICE, SALES & OFFICE	PROFESSIONAL OCCUPATIONS	SALES & OFFICE	SALES & OFFICE	PRODUCTION & TRANSPORTATION	PRODUCTION & TRANSPORTATION	SALES & OFFICE	SALES & OFFICE	SALES & OFFICE
	-0.9%	0%	-0.39%	0.77%	-3.0%	3.87%	-0.25%	-3.13%	-7.76%
	129 MILES	51 MILES	55 MILES	29 MILES	37 MILES	19 MILES	23 MILES	154 MILES	111 MILES
	65	34	91	48	65	35	35	69	58
	2 OUT OF 10	2 OUT OF 10	4.5 OUT OF 10	3 OUT OF 10	3 OUT OF 10	3 OUT OF 10	2 OUT OF 10	3 OUT OF 10	2 OUT OF 10

Data derived from the US Census (citydata.com and bestplaces.com)

Background: Rural-urban disparity

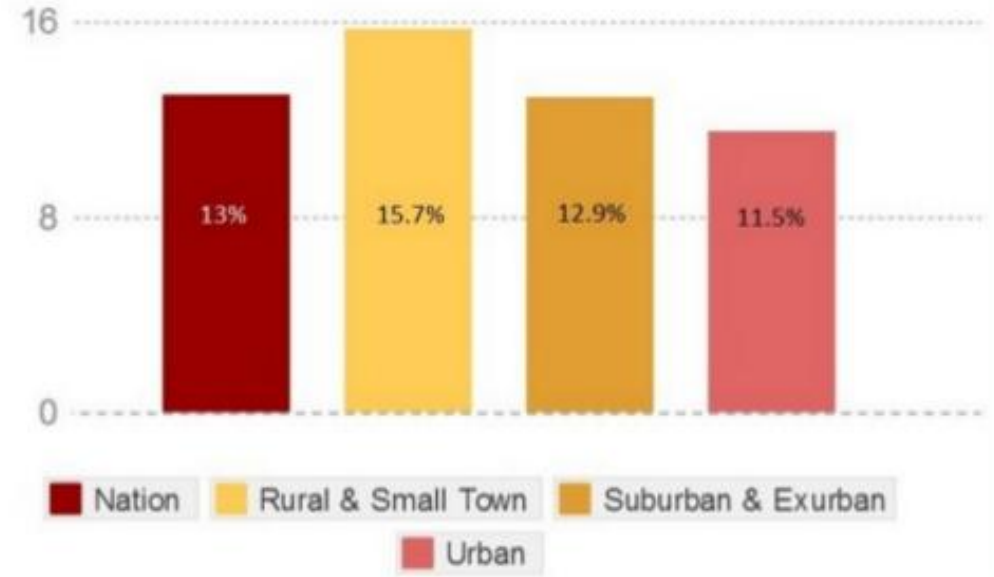


KANSAS URBANIZATION



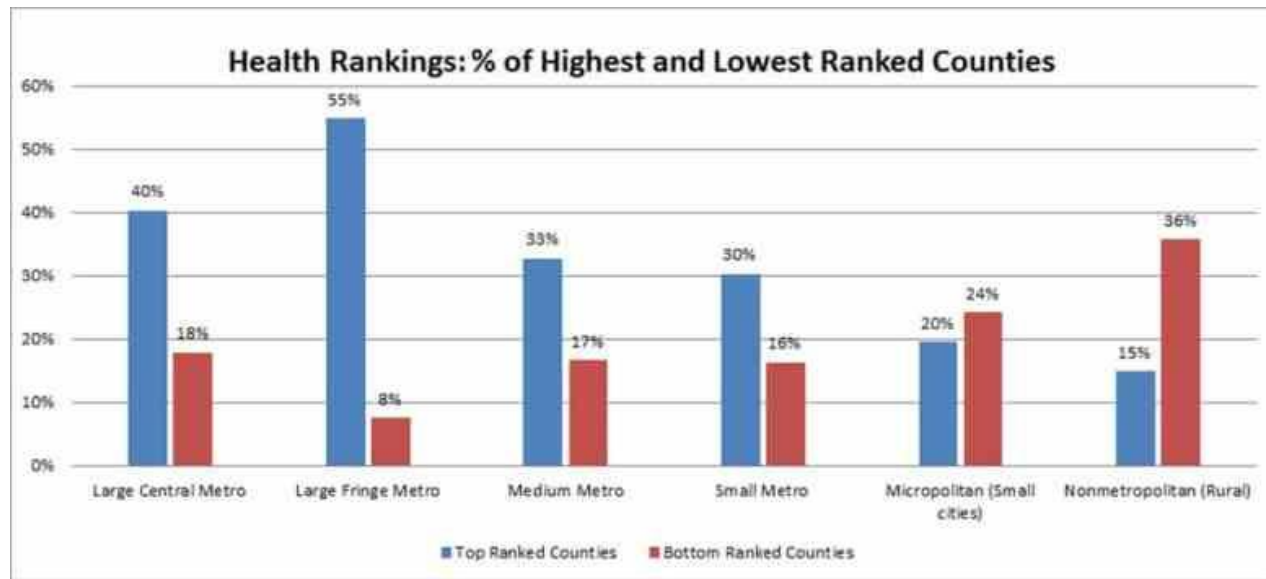
AGING RURAL POPULATION

(15.7% elderly population)

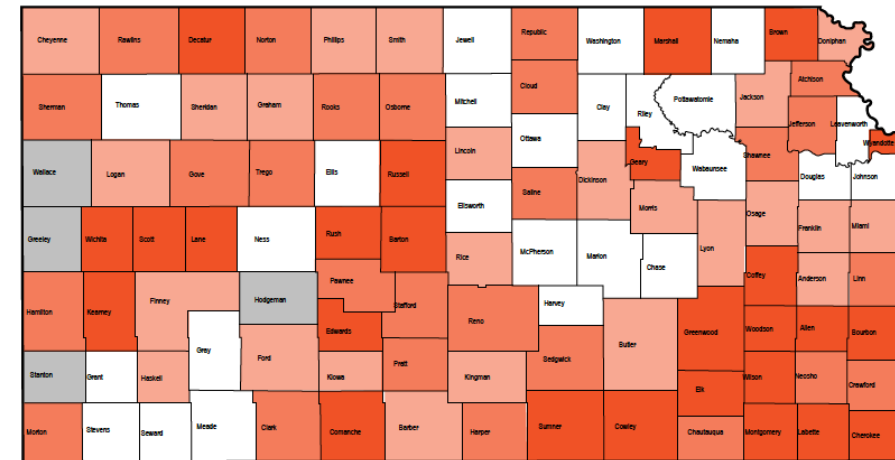


Seniors by Location, 2010

Background: Rural-urban disparity

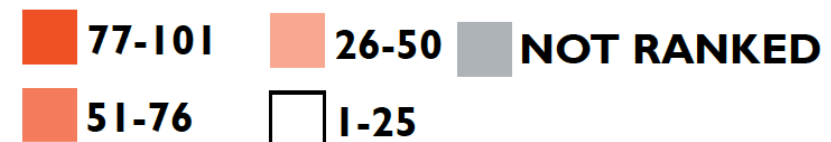


“In rural health, location matters”, North Carolina Health News, 2018, <https://www.northcarolinahealthnews.org/2018/06/11/in-rural-health-location-matters/>

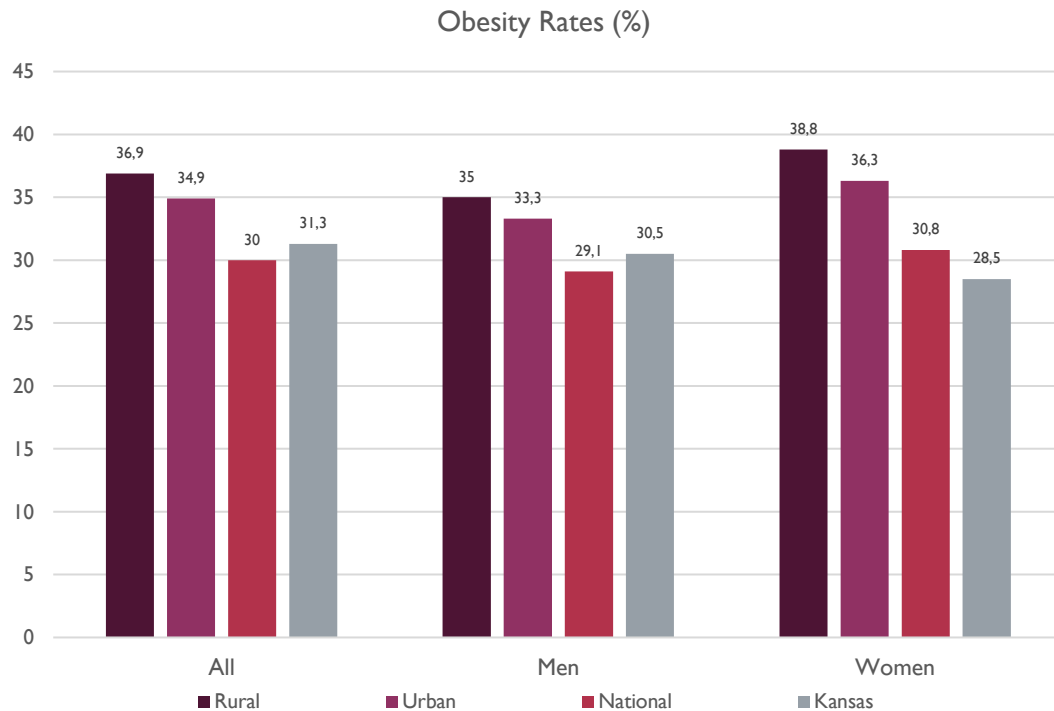


RANKINGS IN HEALTHCARE OUTCOMES

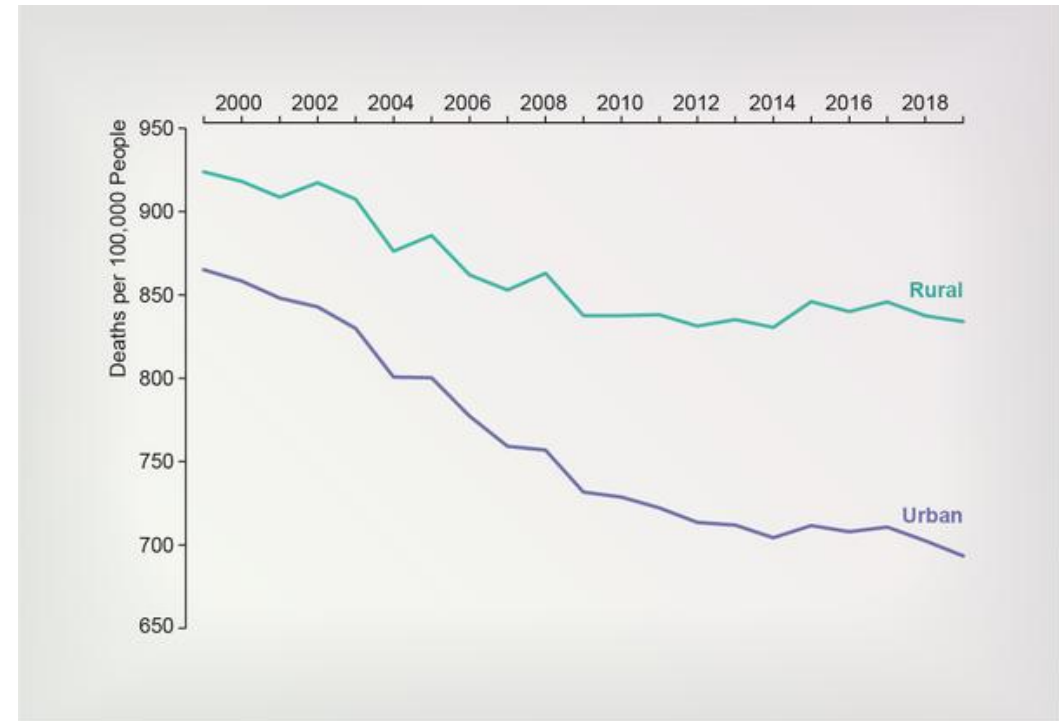
Ranking Factors: Length of Life, Quality of Life, Health Behaviors, Clinical Care, Social & Economic Factors, Physical Environment
<http://www.countyhealthrankings.org/app/kansas/2015/overview>



Background: Rural-urban disparity



Rural urban disparities of obesity prevalence among adults age 18 and above, 2010-2011, source: data based on the 2014 update of the rural-urban chartbook (Meit et al. 2014)



Amanda Montañez; Source: "Trends in Death Rates in Urban and Rural Areas: United States, 1999–2019," by Sally C. Curtin and Merianne Rose Spencer, in National Center for Health Statistics Data Brief, No. 417; September 2021

What is a Critical Access Hospital (CAH)?

Critical Access Hospital (CAH), was created by the Centers for Medicare and Medicaid Services (CMS) in 1997



having no more than
25 inpatient beds



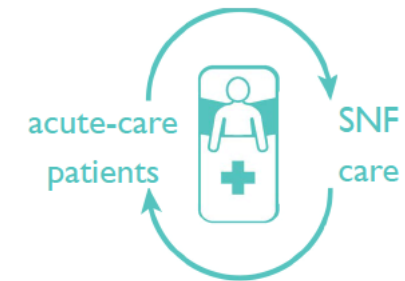
maintaining an annual
average length of stay of no
more than
96 hours
for acute inpatient care



offering 24-hour, 7-day-a-
week
emergency care



being located in a rural area,
at least **35 miles drive**
away from any other
hospital or CAH (fewer
in some circumstances)

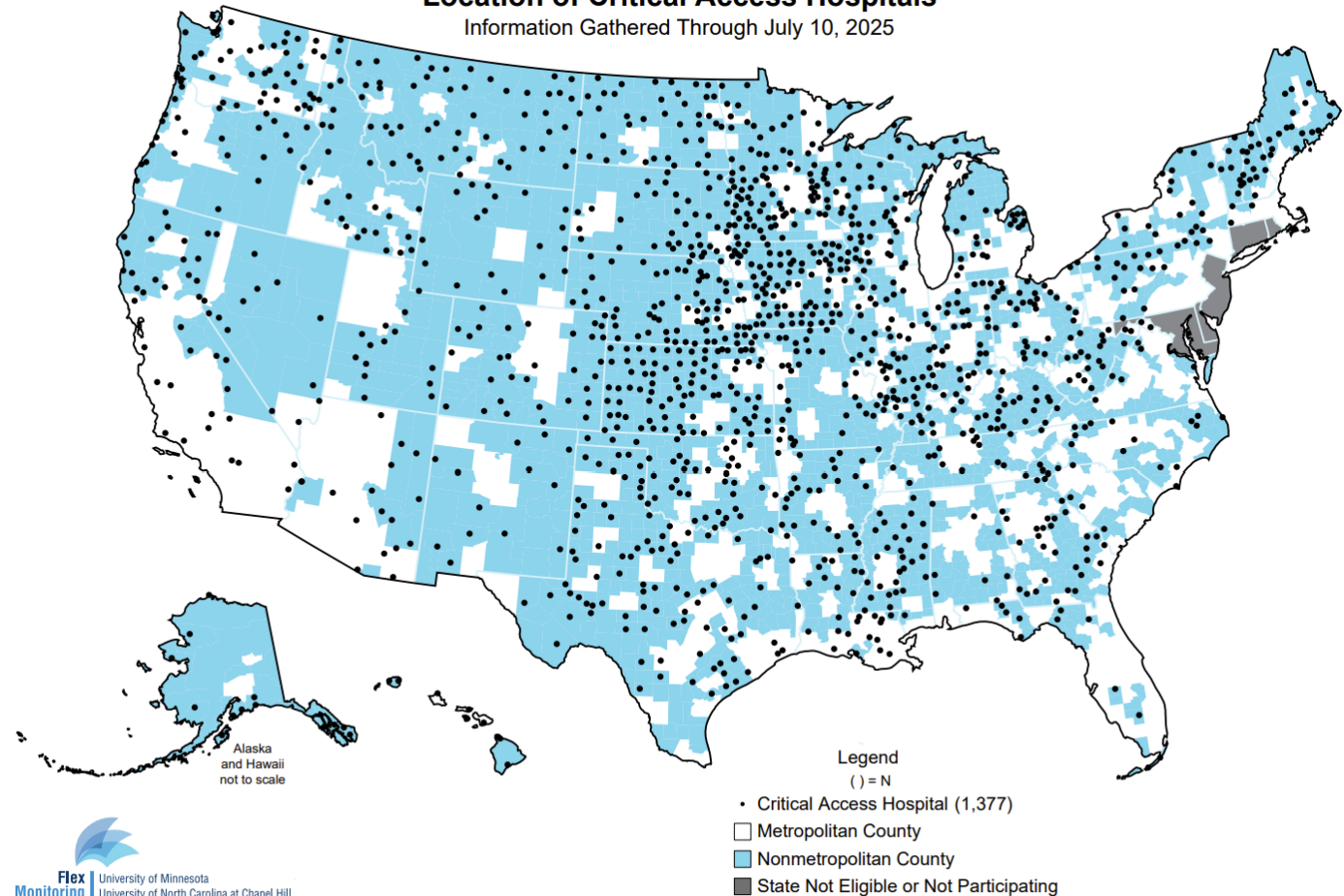


swing bed
agreement: a hospital
can use its beds, as needed,
to provide either acute
or Skilled Nursing Facility
(SNF) care

- Of the nearly 5,100 community hospitals in the United States, 1,377 (27 percent) are certified CAHs (Flex Monitoring Team, 2025).

Location of Critical Access Hospitals

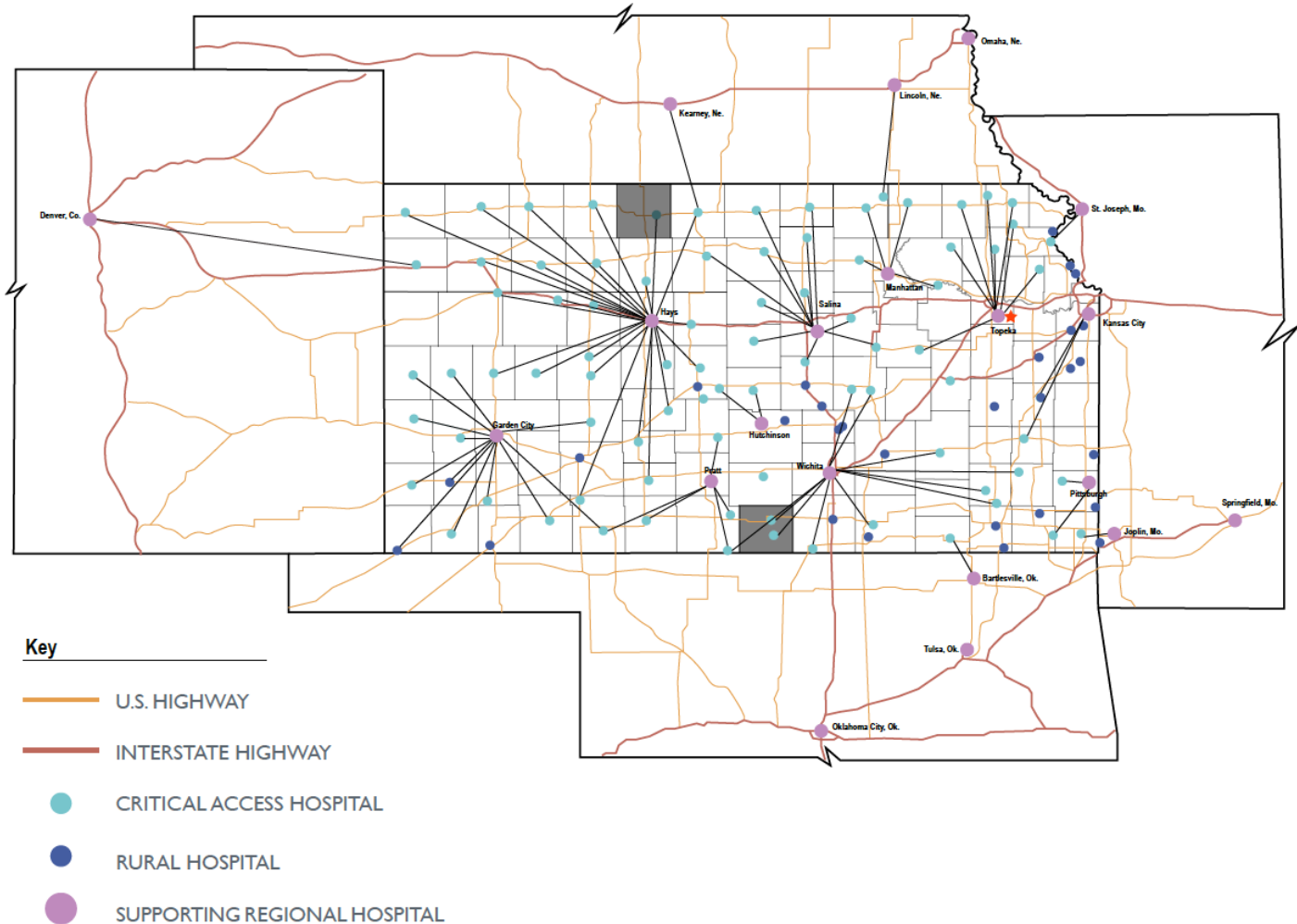
Information Gathered Through July 10, 2025



Flex Monitoring Team
University of Minnesota
University of North Carolina at Chapel Hill
University of Southern Maine

Sources: US Census Bureau, 2018; CMS Regional Office, ORHP, and State Offices Coordinating with MRHFP, 2018.
Note: Core Based Statistical Areas are current as of the April 2018 update. Nonmetropolitan counties include micropolitan and counties outside of CBSAs.
Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

Hospital Transfer and Referral Network



CAH provides the frontline access to residents in remote rural areas and provide the connection to larger rural hospitals and regional medical centers.

In Kansas, the 95 small rural hospitals represent 75% of the 127 community hospitals in the state (Flex Monitoring Team 2017).

RURAL HOSPITAL CLOSURES

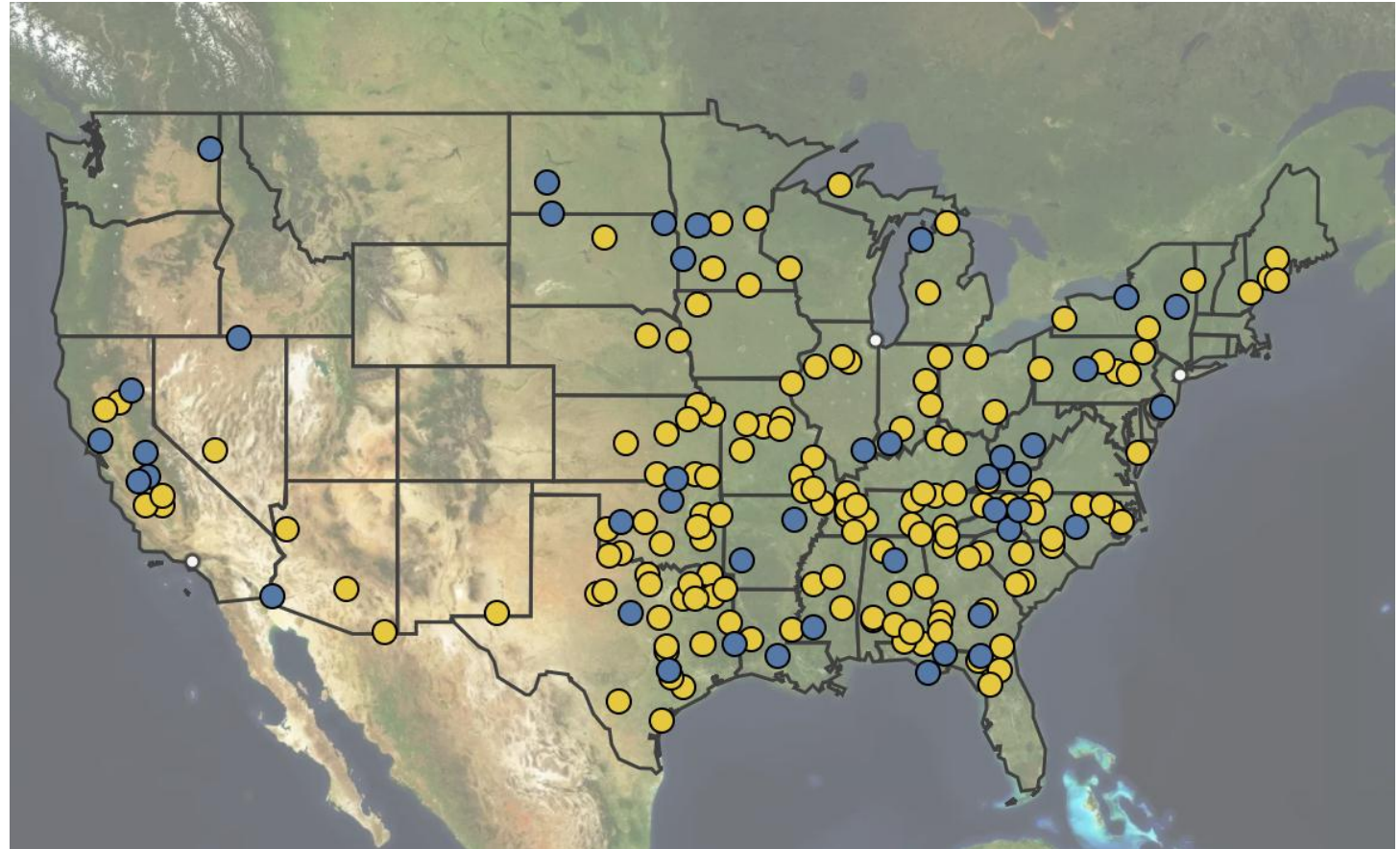
They share similar challenges:

- Geographic isolation
- Income level disparities and inability to afford care
- A small labor pool affecting recruitment efforts

■ **195 Rural Hospital Closures and Conversions since January 2005**

110 complete closures* +
85 converted closures**

(Sheps Center, 2025)

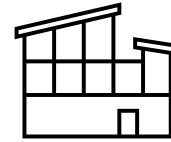


<https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>

CHALLENGES OF CAH DESIGN



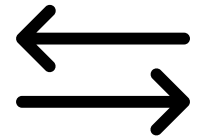
Poor visual appeal, spatial constraints, and building system constraints presented challenges for the **recruitment of clinicians and specialists**



The **spatial constraints** include lack of privacy and infection risk with shared patient bathrooms, centralized nurse stations affecting access to patients and communication, smaller operating rooms, and improper adjacencies.



Lack of proper care configuration to support optimal patient experience and accommodate **new outpatient and preventive care-based models.**



The **lack of flexibility and resilience** made them vulnerable to responding to the pandemics, as experienced in the recent COVID-19 pandemic.

(Pati et al., 2023)



POST-OCCUPANCY EVALUATION OF CAHS

HOW DOES THE BUILT ENVIRONMENT OF CAHS AFFECT PATIENT, STAFF AND ORGANIZATIONAL PERFORMANCE?

RESEARCH SETTINGS

Cross-sectional Comparative Study

CAH A

- County Population: 4,733
- Number of Beds: 25
- Building history: originally built in 1953, partial renovation and addition in 1983
- Building area: 27,393 square feet
- Total Discharges: 213
- Total Patient Days: 2,426

CAH B: Scott County Hospital

- County Population: 4,914
- Number of Beds: 25
- Building history: originally built in 1953, new building in 2012, with clinic addition in 2019
- Building area: 68,000 square feet
- Total Discharges: 397
- Total Patient Days: 3,025



CAH B: SCOTT COUNTY HOSPITAL

DESIGNED BY HFG



- ▶ EMERGENCY DEPARTMENT
- ▶ MEDICAL CLINICS
- ▶ OUTPATIENT SERVICES
- ▶ PATIENT ROOMS
- ▶ CAFETERIA
- ▶ MEETING ROOMS
- ▶ ADMINISTRATION
- ▶ HUMAN RESOURCES

HOSPITAL ADMISSIONS

Scott County Hospital Lobby (Image credit: HFG)

SALUTOGENIC AND BIOPHILIC DESIGN

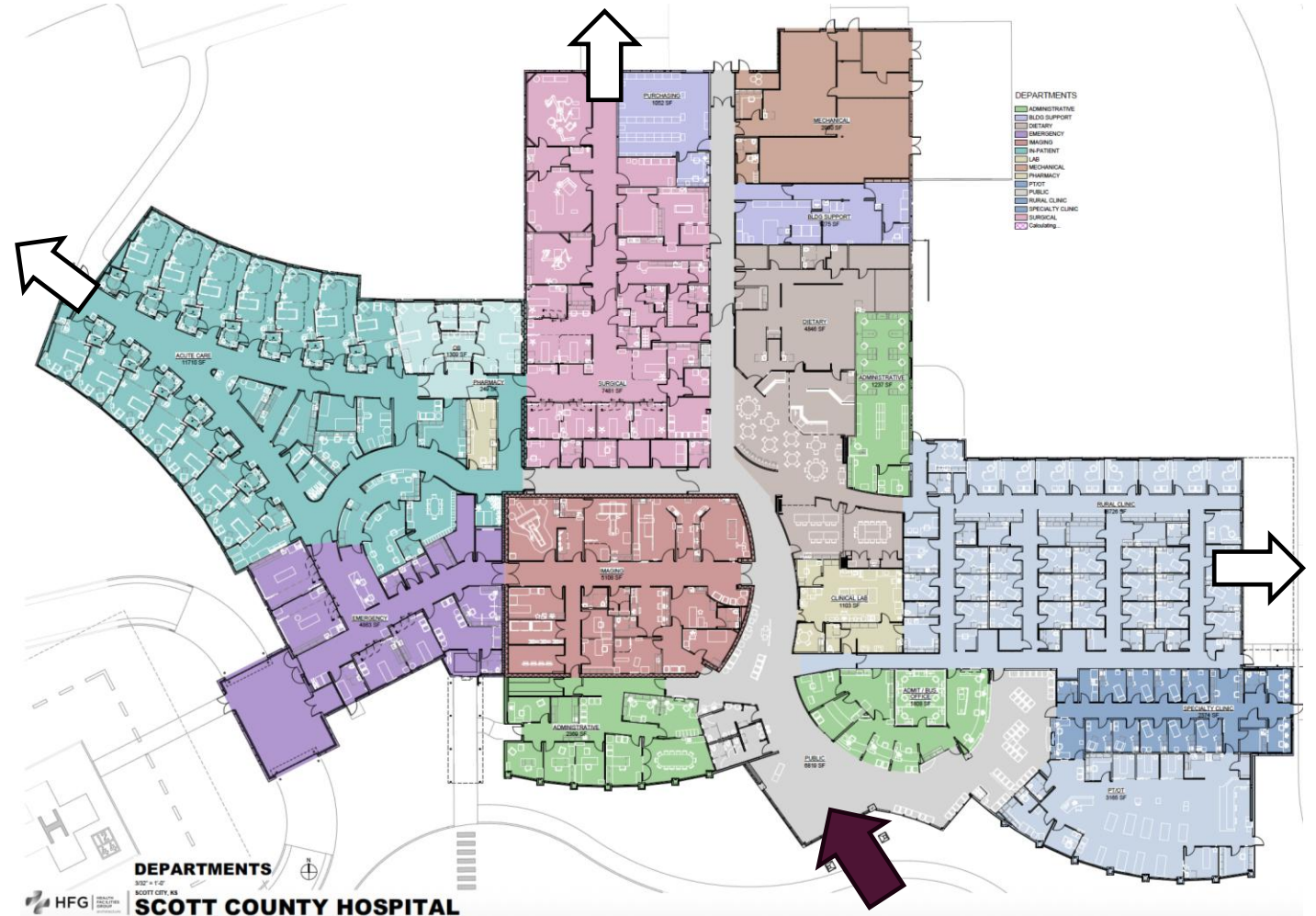


CAH B

- Hospital as a social hub
- Café for healthy eating
- Natural materials: wood, stone, local context, and daylight throughout the building

CAH B: OVERALL LAYOUT

- **Clear circulation street /“canyon”**
- **Clear main entrance**
- **Consolidated check-in area**
- **Critical adjacencies for better staff efficiency**
- **Separation of outpatient and inpatient areas**



CAH B: INPATIENT UNIT DESIGN

- **Racetrack layout in a triangular shaped floorplate**
- **One main nurse station and one satellite nurse station at the tip of the support core**
- **8 single-patient rooms and 6 larger single-patient rooms with capacity to expand to double patient rooms**



LDRP ROOM



Image credit: HFG

DESIGN FEATURES



Satellite nurse station



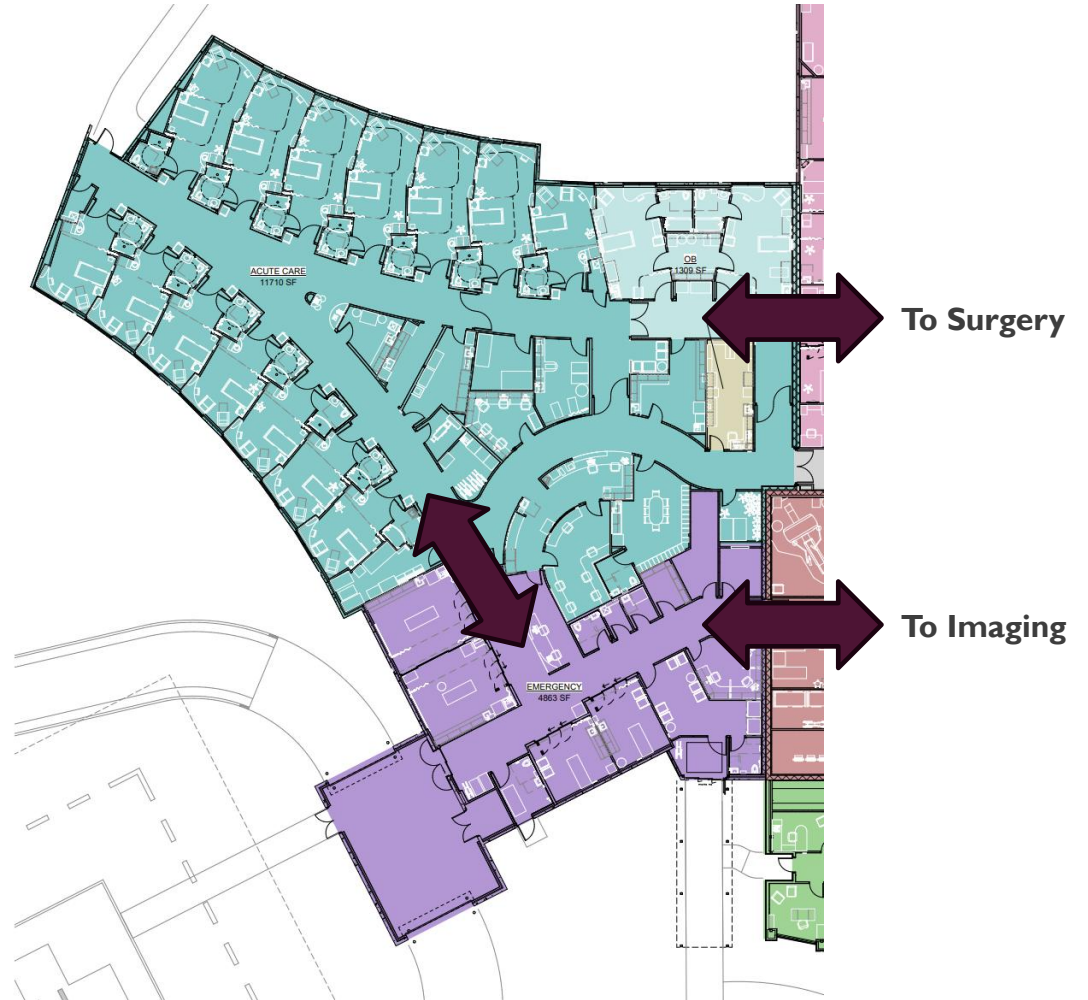
Nurse server



Medical gas outlets hide behind the art panel

CAH B: INPATIENT UNIT AND ED FLEXIBLE USE

- **Connected nursing center through internal hallway**
- **Multi-use of patient care areas (patient rooms can be used as ED exam/treatment rooms and observation beds, and pre- and post-procedure rooms, and skilled nursing beds)**



POE RESEARCH METHODS

Standardized Patient Room POE

Focused Group Interviews

Medical Flow and Departmental
Adjacencies

Behavioral Shadowing

Retrospective Performance Evaluation

POST-OCCUPANCY EVALUATION OF CAH CHD POE CHECKLIST

Center for Health Design (CHD) POE CHECKLIST

- A standardized set of EBD checklists and POE tool for three types of patient rooms: adult medical-surgical, adult intensive care, and maternity care
- Organized around 23 EBD Goals, in 4 overarching categories: **Patient safety, worker safety and effectiveness, quality of care and patient experience, and organizational performance**
- Customization based on importance of EBD Goals
- Easy to use for designers, healthcare staff, and researchers (1 hr)
- Support interdisciplinary and participatory approach

HOME page

The tool is organized by 23 evidence-based design (EBD) goals in 4 overarching categories. At a particular building project, some EBD goals are relatively more important. In the table below, the relative importance of design goals for a typical medical-surgical inpatient room has been identified by assigning a priority rating (1-3, 1 as least important, and 3 as most important) for each EBD goal (in column C). However, due to project-specific conditions, priority ratings applicable to your particular project might be different from the default ratings. Please confirm or change priority ratings applicable to your particular project after consulting with the facility owner. Please limit highest priority (rating 3) to seven EBD goals. If the priority levels were rated during design process using the design checklist, please copy the priority levels to this table.

This home page serves as a central hub to access to evaluation tabs. Each of the listed EBD goal on this page is hyperlinked to a corresponding tab which includes the assessment items for the particular EBD goal. You have the flexibility to evaluate only a subset of EBD goals, for example only those which are highly important.

After the completion of each tab, a single achievement score for the particular EBD goal will appear in column D in the table below. This score is calculated as the average of all assessment items for one EBD goal.

Categories	EBD Goals	Priority Level	Score
PATIENT SAFETY	01. IMPROVE MOBILITY AND REDUCE FALLS	High	
PATIENT SAFETY	02. REDUCE RISK OF INJURY	High	
PATIENT SAFETY	03. REDUCE RISK OF CONTAMINATION	High	
PATIENT SAFETY	04. IMPROVE HAND SANITIZATION	Medium	
PATIENT SAFETY	05. PROVIDE SAFE DELIVERY OF CARE	Medium	
WORKER SAFETY & EFFECTIVENESS	06. PROVIDE EFFICIENT DELIVERY OF CARE	High	
WORKER SAFETY & EFFECTIVENESS	07. IMPROVE COMMUNICATION	Medium	
WORKER SAFETY & EFFECTIVENESS	08. IMPROVE STAFF HEALTH	Medium	
WORKER SAFETY & EFFECTIVENESS	09. IMPROVE JOB SATISFACTION	Medium	
QUALITY OF CARE & PATIENT EXPERIENCE	10. REDUCE PATIENT STRESS AND ANXIETY	High	
QUALITY OF CARE & PATIENT EXPERIENCE	11. ENABLE & ENHANCE PATIENT SENSE OF CONTROL	Medium	
QUALITY OF CARE & PATIENT EXPERIENCE	12. IMPROVE PATIENT ENGAGEMENT	Medium	
QUALITY OF CARE & PATIENT EXPERIENCE	13. IMPROVE PATIENT SATISFACTION	High	
QUALITY OF CARE & PATIENT EXPERIENCE	14. IMPROVE FAMILY PRESENCE AND ENGAGEMENT IN PATIENT CARE	High	
QUALITY OF CARE & PATIENT EXPERIENCE	15. IMPROVE COMFORT	Medium	
QUALITY OF CARE & PATIENT EXPERIENCE	16. REDUCE NOISE	Medium	
QUALITY OF CARE & PATIENT EXPERIENCE	17. RESPECT PRIVACY	Medium	
ORGANIZATIONAL PERFORMANCE	18. ENSURE DURABILITY	Low	
ORGANIZATIONAL PERFORMANCE	19. IMPROVE AIR QUALITY	Medium	
ORGANIZATIONAL PERFORMANCE	20. PROVIDE A SECURE ENVIRONMENT	Medium	
ORGANIZATIONAL PERFORMANCE	21. ENABLE CHANGE READINESS/ FUTURE-PROOFING	Medium	
ORGANIZATIONAL PERFORMANCE	22. ENHANCE SUSTAINABILITY	Low	
ORGANIZATIONAL PERFORMANCE	23. PROVIDE RETURN ON INVESTMENT (ROI)	Low	

Note: The rating of several assessment items needs more technical knowledge and better suited for individuals in your organization knowledgeable about the selection of fixture, equipment and finish materials for the patient rooms, for example building engineers and facility managers. The items are identified by a blue color (including 3-4, 3-5, 16-1, 18-1/2/3, 19-1/2/3, 22-1/2/3, and 23-1). Please ignore these items if they do not seem appropriate for your expertise.

EBD PATIENT ROOM CHECKLIST

The single-patient room design in Hospital B is outperformed Hospital A in **Patient safety, worker safety and effectiveness, quality of care and patient experience, and organizational performance.**

New design supports all aspects of **organizational performance: ensuring durability, improving air quality, providing a secure environment, enabling change readiness, enhancing sustainability, and return on investment.**

The patient room design also excels in several aspects of **patient safety**, including **reducing the risk of injury, reducing contamination, and providing safe delivery of care.**

			Hospital A		Hospital B	
			Hospital A Single Room	Hospital A Double Room	Hospital B Single Room	Hospital B Double Room
EBD Goals						
1	PATIENT SAFETY	Improve Mobility, Reduce Falls	2.70	2.50	4.00	3.80
2	PATIENT SAFETY	Reduce Risk of Injury	1.47	1.23	5.00	5.00
3	PATIENT SAFETY	Reduce Contamination	2.71	2.05	4.56	4.33
4	PATIENT SAFETY	Improve Hand Sanitation	1.88	1.88	4.00	4.00
5	PATIENT SAFETY	Provide Safe Delivery of Care	1.50	1.50	4.50	4.50
6	WORKER SAFETY & EFFECTIVENESS	Provide Efficient Delivery of Care	0.86	0.86	4.55	4.45
7	WORKER SAFETY & EFFECTIVENESS	Improve Communication	3.17	2.20	4.00	3.00
8	WORKER SAFETY & EFFECTIVENESS	Improve Staff Health	2.20	2.20	5.00	5.00
9	WORKER SAFETY & EFFECTIVENESS	Improve Job Satisfaction	2.50	2.20	5.00	4.67
10	QUALITY OF CARE & PATIENT EXPERIENCE	Reduce Patient Stress and Anxiety	1.50	1.20	4.25	4.00
11	QUALITY OF CARE & PATIENT EXPERIENCE	Enable Patient Sense of Control	1.84	1.20	2.50	2.50
12	QUALITY OF CARE & PATIENT EXPERIENCE	Improve Patient Engagement	2.25	1.80	4.00	4.00
13	QUALITY OF CARE & PATIENT EXPERIENCE	Improve Patient Satisfaction	2.50	2.00	4.33	4.00
14	QUALITY OF CARE & PATIENT EXPERIENCE	Improve Family Engagement in Care	1.83	1.42	4.33	4.00
15	QUALITY OF CARE & PATIENT EXPERIENCE	Improve Comfort	2.17	1.80	4.67	4.67
16	QUALITY OF CARE & PATIENT EXPERIENCE	Reduce Noise	1.50	1.30	5.00	4.50
17	QUALITY OF CARE & PATIENT EXPERIENCE	Respect Privacy	2.00	1.50	4.00	3.50
18	ORGANIZATIONAL PERFORMANCE	Ensure Durability	2.42	2.42	5.00	5.00
19	ORGANIZATIONAL PERFORMANCE	Improve Air Quality	1.58	1.58	4.50	4.50
20	ORGANIZATIONAL PERFORMANCE	Provide Secure Environment	1.82	1.50	4.67	4.67
21	ORGANIZATIONAL PERFORMANCE	Enable Change Readiness	1.34	1.34	4.50	4.50
22	ORGANIZATIONAL PERFORMANCE	Enhance Sustainability	1.67	1.67	4.50	4.50
23	ORGANIZATIONAL PERFORMANCE	ROI	0.67	0.67	5.00	5.00

Overall Ratings

1.92 1.65 4.43 4.26



POST-OCCUPANCY EVALUATION OF CAH

FOCUS GROUP INTERVIEW

CAH A

- The workflow and departmental adjacencies
 - multiple entrances,
 - unclear wayfinding system, non-ideal adjacencies of functions within the hospitals, large distance between clinics and hospital,
 - challenges in compliant with handicap accessibility and HIPPA.
- Need more programs to maintain the hospital's relationship with the local community

CAH B: Scott County Hospital

- The workflow and departmental adjacencies
 - single entrance,
 - clear wayfinding system, adjacencies between various departments are efficient.
 - Accessible pathway
- Welcoming public spaces invite community into the hospital

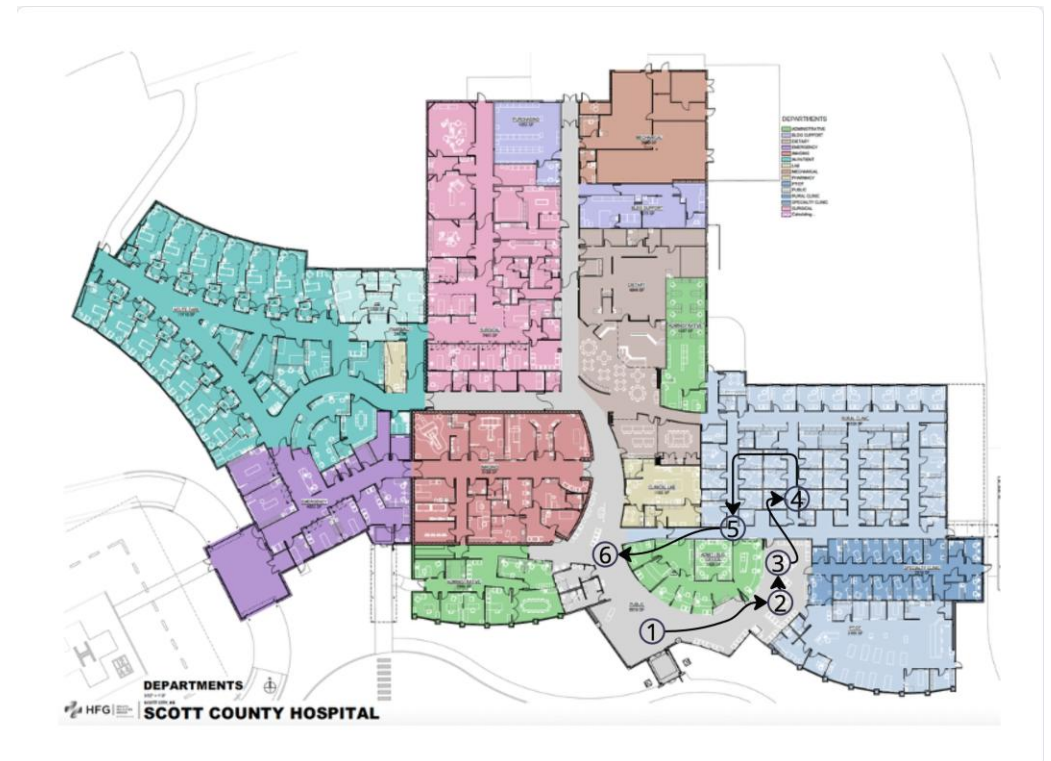
POST-OCCUPANCY EVALUATION OF CAH

Patient flow mapping (using specialty clinic visit as an example)

CAH A: 7 steps, 2 floors, >900 feet



CAH B: 6 steps, one floor, <450 ft



NURSE TIME AND MOTION STUDY

3 days, 4 nurses (1 hour each session)



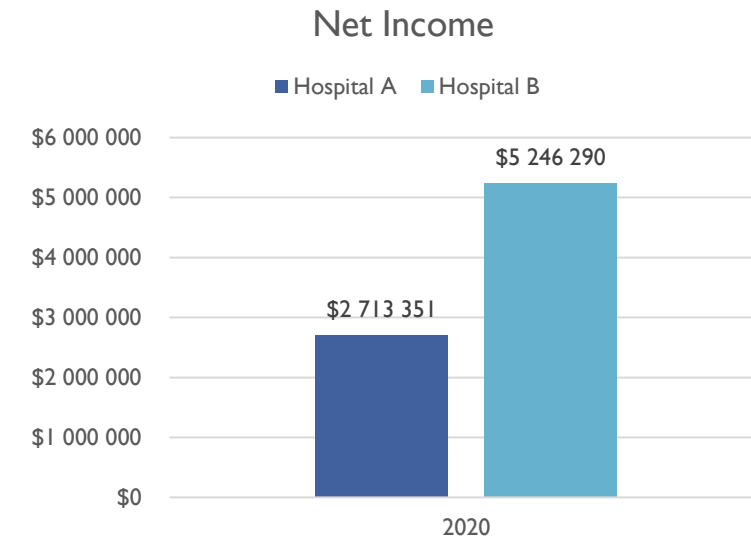
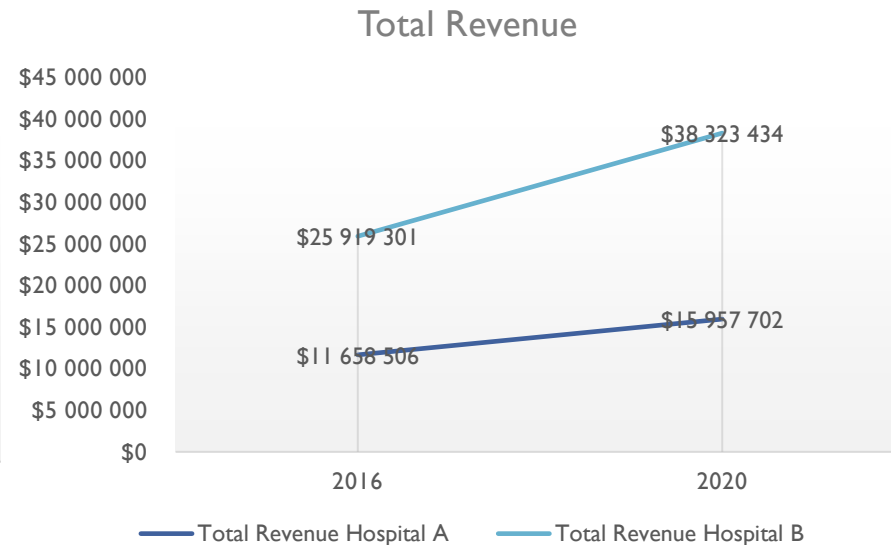
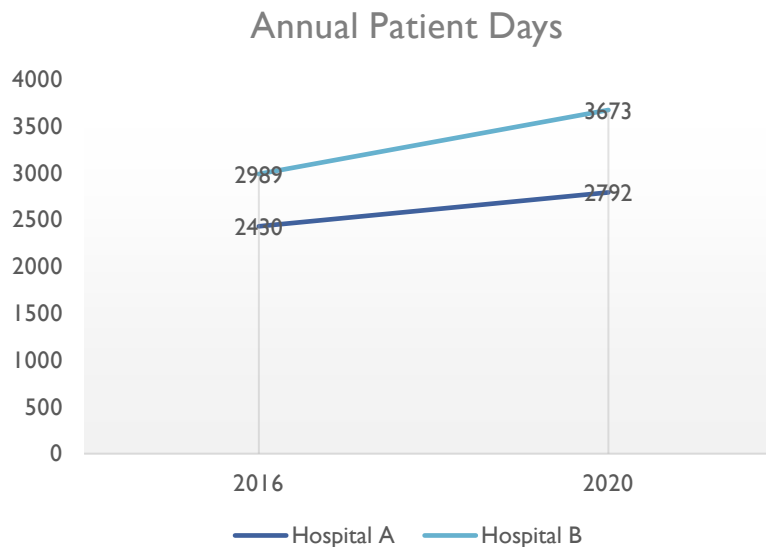
Nursing Activity Category	Percentage	Nurses Time and Motion Study based on 36-Hospitals data (Hendrich, et al., 2008)
Nursing Practice	81.9%	77.7%
Non-Clinical	7.7%	12.6%
Unit-related Function	1.3%	2.8%
Non-Value Added	4.6%	6.6%

Sample behavioral tracking/shadowing spaghetti diagram

Categories were based on Hendrich et al., 2008

FINANCIAL OUTCOMES

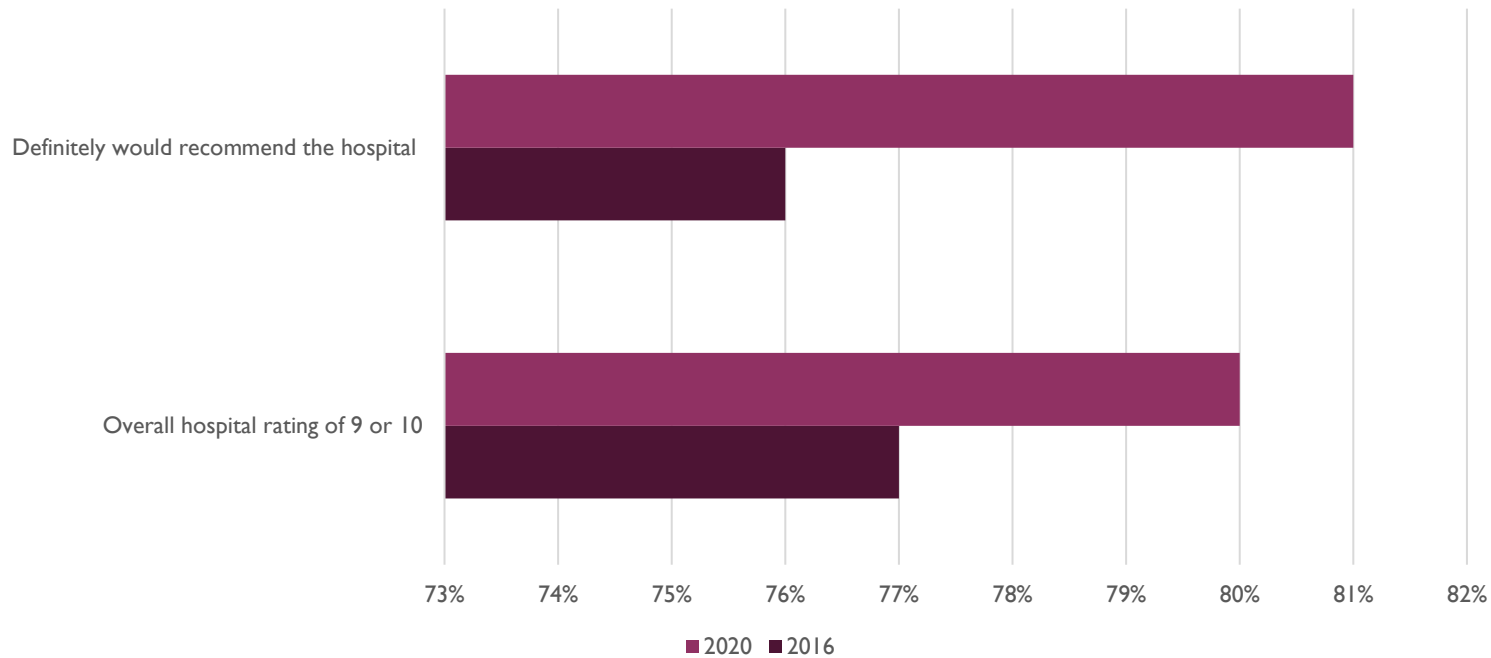
- The financial and operational data were obtained from the Hospital Provider Cost Report for 2016 and 2021 from the Centers for Medicare and Medicaid Services (CMS) databases.



- Annual Patient Days:** Larger increase for Hospital B than Hospital A (23% versus 15%)
- Gross Revenue (Middle Panel):** Hospital B's revenue trend is significantly higher than Hospital A's (48% versus 37%).
- Net Income (Bottom Panel):** 2020 comparison highlights Hospital B's stronger profitability.

PATIENT SATISFACTION

Patient Satisfaction for Hospital B



Patient satisfaction data from the HCAHPS Scores for Hospital B (2016-2020)

A well-designed built environment can support better patient care and experience, which can lead to a continuous improvement in patient satisfaction.



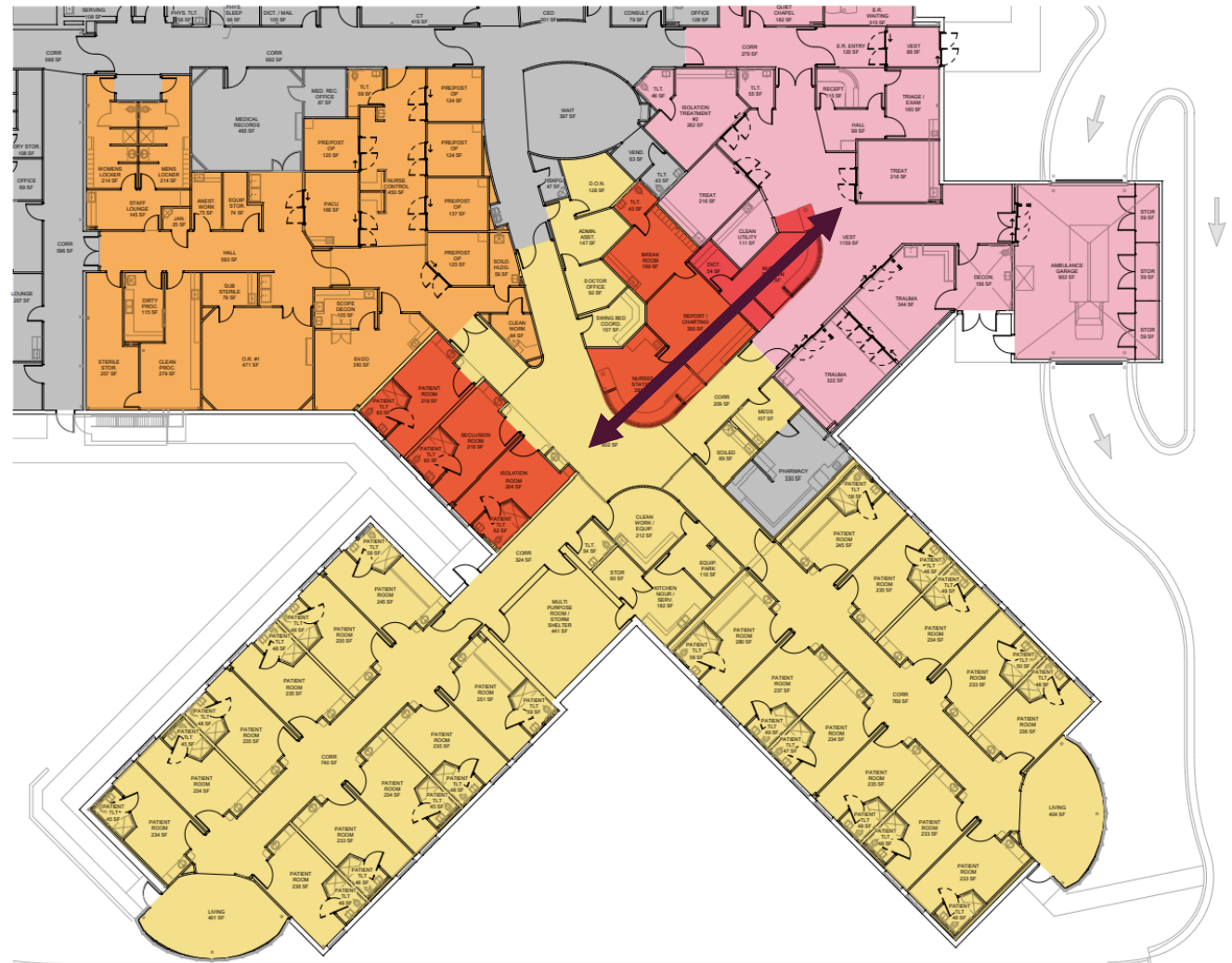
FROM RESEARCH TO INNOVATIVE DESIGN

WHAT DO WE LEARN FROM POE?

Image credit: HFG

ARBUCKLE MEMORIAL HOSPITAL

- Connected nursing center through shared charting and teamwork area
- Consolidated Staff Support Areas as backstage space (e.g., Teamwork area, Staff break room and toilets)
- Multi-use of patient care areas (Patient rooms can be used as ED exam/treatment rooms, observation beds, and pre- and post-procedure rooms)
- Allow three highly used multi-use beds to be separate from the skilled nursing beds in two wings



CAH DESIGN RECOMMENDATIONS

TO SUPPORT EFFICIENT USE OF SPACES, STAFF, AND OPTIMAL FINANCIAL OUTCOMES

Staff Efficiency	Shared spaces and departmental adjacencies can improve workflow and reduce staffing demands—for example, combining nurse stations for ED and inpatient units
Space Economy	Share staff support areas with other departments
Flexible use of Space	Design spaces (e.g., ED treatment rooms and inpatient rooms) to be used for different purposes, and allow expandability to enhances utilization and resilience.
Local cultural integration	Incorporating local culture into hospital design reinforces community identity.
Salutogenic design	Promote overall wellness and position rural hospitals as central health hubs.

Conclusions and Future Work



Good design DOES make a difference: patient experience, staff retention, and organizational performance.



Creative and intentional design solutions can help support staff work and address staff shortage in rural areas.



POE is a valuable tool for continuous quality improvement



More research that involves pre- and post- intervention and longitudinal study is warranted to further explore the impact of design on healthcare facilities' operational outcomes and patient outcomes.



The elimination of health disparities among rural populations will require a population approach that is sensitive to local variations in physical and cultural realities.

CONTACT INFORMATION

Questions?



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