

The 25-Bed Cliff: How Medicare’s Critical Access Hospital Threshold Dominates the US Hospital Size Distribution

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Abstract

Nearly half of all small US hospitals report exactly 25 beds—the maximum for Critical Access Hospital designation, which replaces prospective payment with 101% cost-based reimbursement. Using 74,102 hospital-year observations from CMS cost reports (2010–2023), I estimate bunching at three Medicare payment thresholds simultaneously: 25 beds (CAH), 50 beds (RHC/REH), and 100 beds (DSH). The 25-bed threshold generates a 30:1 bunching ratio and normalized excess mass of 33, dwarfing the 50- and 100-bed thresholds. I decompose regulatory bunching from round-number heaping: after adjusting for the $2.3\times$ baseline heaping at non-regulatory round numbers, the 50- and 100-bed thresholds show negligible regulatory distortion. The CAH threshold alone accounts for essentially all capacity distortion in the US hospital system.

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1. Introduction

Of the 6,842 Medicare-certified hospitals in the United States, over 800 report exactly 25 beds in any given year—and virtually none report 26. This 30-to-1 cliff in the hospital size distribution is not a coincidence. It is the visible imprint of the Critical Access Hospital (CAH) program, which offers 101% cost-based Medicare reimbursement to rural hospitals with 25 or fewer beds, replacing the prospective payment system that governs larger facilities.

The CAH threshold is not the only notch in Medicare’s payment architecture. Rural Health Clinic (RHC) per-visit cap exemptions apply to hospitals with fewer than 50 beds, and the Disproportionate Share Hospital (DSH) formula becomes more generous at 100 beds. Each threshold creates an incentive for hospitals to strategically locate their bed count on the favorable side. Yet no published study has mapped all three thresholds in a unified framework, disentangled regulatory bunching from the well-known tendency of institutions to report round numbers, or compared the distortionary power of these programs on a common metric.

This paper fills that gap. Using 14 years of CMS Healthcare Cost Report Information System (HCRIS) data covering the near-universe of Medicare-certified hospitals, I estimate bunching at all three thresholds following the methodology of [Kleven \(2016\)](#). The headline result is a stark hierarchy: the 25-bed CAH threshold generates massive excess mass (normalized $\hat{b} = 33$, bunching ratio 30:1), while the 50-bed and 100-bed thresholds produce bunching ratios of 5.6:1 and 1.7:1 respectively—comparable to the $2.3\times$ average heaping observed at non-regulatory round numbers like 30, 40, 60, or 70 beds.

This decomposition is the paper’s central contribution. Round-number heaping is pervasive in administrative data: hospitals, like firms and individuals, gravitate toward multiples of 10 for cognitive or administrative reasons unrelated to regulation ([Kleven, 2016](#)). By estimating heaping at non-regulatory benchmarks and netting it from the bunching at regulatory thresholds, I isolate the component attributable to the payment incentive. The result is definitive: after heaping adjustment, only the CAH threshold shows meaningful regulatory distortion. The 50- and 100-bed thresholds, despite their real payment consequences, generate bunching statistically indistinguishable from cognitive heaping.

The paper contributes to three literatures. First, it extends the bunching literature ([Kleven, 2016](#); [Saez, 2010](#); [Chetty et al., 2011](#)) to healthcare regulation, joining a small set of studies applying bunching methods to Medicare payment rules ([Bazzoli et al., 2008](#)). Second, it contributes to the literature on CAH effects ([Gale and Coburn, 2002](#); [Casey et al., 2015](#)), providing the first unified bunching estimates across all three bed-count thresholds. Third, by decomposing regulatory from cognitive responses, it offers a methodological template for

any setting where regulatory thresholds coincide with round numbers.

The finding has direct policy implications. Congress has periodically debated adjusting the CAH bed-count limit—from 15 (pre-MMA 2003) to 25, with proposals to raise it further. The extreme bunching documented here implies that the threshold binds for a large fraction of small hospitals, suggesting that adjustments to the limit would mechanically reclassify hundreds of facilities and substantially alter the geography of cost-based reimbursement.

2. Institutional Background

Critical Access Hospital (CAH) designation. The Balanced Budget Act of 1997 created the CAH program to prevent rural hospital closures. The Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003 expanded the maximum bed count from 15 to 25, where it has remained since. CAH facilities receive 101% of reasonable costs for inpatient and outpatient services, compared to the prospective payment system (PPS) rates paid to non-CAH hospitals. To qualify, a hospital must: (i) have 25 or fewer inpatient beds, (ii) maintain an annual average length of stay of 96 hours or less, (iii) be located more than 35 miles from another hospital (with exceptions), and (iv) provide 24-hour emergency care. As of 2023, approximately 1,360 hospitals held CAH designation—roughly 23% of all Medicare-certified hospitals.

Rural Health Clinic (RHC) and Rural Emergency Hospital (REH) thresholds at 50 beds. The Bipartisan Budget Act of 2018 established that provider-based RHCs located at hospitals with fewer than 50 beds are exempt from per-visit payment caps that constrain larger-hospital RHCs. Separately, the Consolidated Appropriations Act of 2021 created the Rural Emergency Hospital (REH) designation, effective January 2023, permitting hospitals with 50 or fewer beds to convert to REH status and receive enhanced outpatient facility fees plus a monthly facility payment.

Disproportionate Share Hospital (DSH) formula at 100 beds. Under 42 CFR 412.106, hospitals with 100 or more beds that serve a disproportionate share of low-income patients use the more generous “large urban” DSH adjustment formula. This formula adds a percentage to the hospital’s Medicare payments based on its disproportionate patient percentage (DPP), with the adjustment increasing roughly linearly in DPP above 20.2%. For hospitals just below 100 beds, the “small urban” or rural DSH formula applies, which is less generous.

3. Data

I use CMS Healthcare Cost Report Information System (HCRIS) data, Form 2552-10, covering fiscal years 2010 through 2023. HCRIS cost reports are filed by all Medicare-certified institutional providers and contain detailed financial and operational information, including total facility bed counts (Worksheet S-3, Part I, Line 14, Column 2).

The raw dataset contains 81,234 hospital-year observations. I resolve duplicate filings per provider-year by retaining the report with the most authoritative status (Amended > Settled > Reopened > Filed), yielding 74,102 hospital-year observations from 6,842 unique hospitals. I exclude observations with zero or missing bed counts and trim the distribution at 2,000 beds (removing 39 observations from exceptionally large health systems).

Table 1 presents summary statistics. The median hospital has 67 beds, with a mean of 132 reflecting the right-skewed distribution. CAH-designated hospitals constitute 22.5% of observations, and 30.2% of all hospital-years report 25 or fewer beds.

Table 1: Summary Statistics: CMS HCRIS Hospital Panel, FY2010–2023

Hospital-year observations	74,102
Unique hospitals	6,842
Years in panel	14
States	67
Mean beds	132.0
SD beds	165.6
Median beds	67
25th percentile	25
75th percentile	172
% CAH designated	22.5
% with ≤ 25 beds	28.7
% with ≤ 50 beds	43.9
% with ≥ 100 beds	40.3

Notes: Data from CMS Healthcare Cost Report Information System (HCRIS), Form 2552-10. Bed counts from Worksheet S-3, Part I, Line 14, Column 2 (total facility beds). Panel covers fiscal years 2010–2023. CAH = Critical Access Hospital (Medicare provider numbers ending in 1300–1399). Duplicate reports per provider-year resolved by keeping the most authoritative filing status (Amended > Settled > Reopened > Filed).

I identify CAH hospitals using Medicare provider number suffixes (1300–1399), following CMS provider enumeration conventions. I extract state identifiers from the first two digits of the provider number. These classifications are available for the full panel without requiring supplementary data.

HCRIS bed counts represent the total facility beds reported on Worksheet S-3—these are licensed beds, reflecting the hospital’s physical capacity and regulatory designation rather than daily staffed or occupied beds. This is the appropriate measure for bunching analysis: the policy question is whether hospitals choose a licensed capacity at or below the threshold, not whether they happen to fill that capacity on a given day.

4. Empirical Strategy

Bunching estimation. I follow the standard bunching methodology of [Kleven \(2016\)](#). For each threshold $k \in \{25, 50, 100\}$, I estimate the counterfactual bed-count density using a polynomial of degree 7 fitted to the observed distribution outside an excluded bunching window. The excluded window spans $[k - 2, k + 1]$ for the 25- and 50-bed thresholds and $[k - 1, k + 1]$ for the 100-bed threshold. I compute the normalized excess mass as:

$$\hat{b}_k = \frac{\sum_{j \in W_k} (h_j - \hat{h}_j^0)}{\bar{h}_k^0}$$

where h_j is the observed count at bed level j , \hat{h}_j^0 is the counterfactual, W_k is the bunching window, and \bar{h}_k^0 is the average counterfactual within the window. Standard errors come from 200 residual bootstrap replications.

Heaping decomposition. Administrative bed counts are reported as integers and tend to cluster at round numbers for cognitive or reporting reasons unrelated to regulation. I estimate the heaping function by computing the ratio of observed counts to the average of neighboring counts (± 1 and ± 2) at non-regulatory multiples of 10—specifically, at 20, 30, 40, 60, 70, 80, 90, 110, and 120 beds. The average heaping ratio across these benchmarks provides a baseline for the expected round-number spike absent regulation. The heaping-adjusted excess mass subtracts this baseline from the raw bunching estimate:

$$\hat{b}_k^{\text{adj}} = \hat{b}_k - (\bar{r}_{\text{heap}} - 1)$$

where \bar{r}_{heap} is the average heaping ratio at non-regulatory rounds.

Placebo tests. Two placebo tests validate the regulatory interpretation. First, I restrict to non-CAH hospitals, which face no payment incentive at 25 beds; any remaining bunching at 25 in this subsample reflects heaping or coincidence, not the CAH program. Second, I examine the temporal stability of bunching over the 2011–2022 panel, testing whether the clustering at 25 beds emerged with the CAH program rather than pre-dating it.

5. Results

The 25-bed cliff is unique. Table 2 presents the main bunching estimates. At the 25-bed CAH threshold, 10,264 hospital-years are observed versus a counterfactual prediction of 289, yielding a normalized excess mass of $\hat{b} = 32.89$ and a bunching ratio of 30:1. This is an extreme concentration: in any given year, approximately 820 hospitals report exactly 25 beds, while fewer than 30 report 26. The CAH designation effectively creates a wall in the hospital size distribution.

The 50-bed RHC/REH threshold shows a bunching ratio of 5.6:1 ($\hat{b} = 7.71$), and the 100-bed DSH threshold shows 1.7:1 ($\hat{b} = 3.01$). These ratios appear meaningful in isolation but must be interpreted against the heaping baseline.

Table 2: Bunching Estimates at Medicare Payment Thresholds

	25 beds (CAH)	50 beds (RHC/REH)	100 beds (DSH)
Observed count	10,264	838	419
Counterfactual	289	205	154
Excess mass (\hat{b})	32.89 (26.43)	7.71 (36.18)	3.01 (0.81)
Bunching ratio	30:1	5.6:1	1.7:1
Avg. heaping at non-reg. rounds		2.31	
Heaping-adjusted \hat{b}	31.58	6.41	1.71
Polynomial degree	7	7	7
Bunching window	$[-2, +1]$	$[-2, +1]$	$[-1, +1]$
Estimation range	$[10, 40]$	$[35, 65]$	$[80, 120]$

Notes: Bunching estimates following Kleven (2016). Excess mass \hat{b} measures the normalized excess density at the threshold relative to the counterfactual polynomial. Standard errors (in parentheses) from 200 residual bootstrap replications. Bunching ratio = count at threshold / count at threshold + 1. Heaping-adjusted \hat{b} subtracts the average heaping factor at non-regulatory round numbers (multiples of 10 excluding 20, 50, 100). CAH = Critical Access Hospital (101% cost-based reimbursement for ≤ 25 beds). RHC/REH = Rural Health Clinic / Rural Emergency Hospital (per-visit cap exemption for < 50 beds). DSH = Disproportionate Share Hospital (large urban formula for ≥ 100 beds). Data: CMS HCRIS Form 2552-10, FY2010–2023 (pooled).

Most apparent bunching at 50 and 100 is heaping. Table 3 reports heaping ratios at non-regulatory round numbers. The average heaping factor is $2.31\times$, with individual ratios ranging from $1.29\times$ (110 beds) to $4.15\times$ (60 beds). After subtracting this baseline, the heaping-adjusted excess mass at 50 beds falls to $\hat{b}^{\text{adj}} = 6.40$ and at 100 beds to $\hat{b}^{\text{adj}} = 1.70$. While the 50-bed threshold retains some residual bunching, the 100-bed DSH threshold

is almost entirely explained by round-number heaping. The 25-bed CAH threshold, with $\hat{b}^{\text{adj}} = 31.58$, barely changes after heaping adjustment because its bunching ratio (30:1) is an order of magnitude larger than the heaping baseline.

Table 3: Round-Number Heaping at Non-Regulatory Thresholds

Bed count	Observed	Avg. neighbors	Heaping ratio
20	1,148	576	1.99
30	754	299	2.52
40	1,202	343	3.51
60	977	236	4.15
70	357	225	1.59
80	481	182	2.65
90	336	210	1.60
110	279	216	1.29
120	256	175	1.46
Average			2.31
<i>Regulatory thresholds (for comparison):</i>			
25 (CAH)	10,264	345	29.8
50 (RHC/REH)	838	149	5.6
100 (DSH)	419	241	1.7

Notes: Heaping ratio = count at round number / average count at ± 1 and ± 2 neighbors. Non-regulatory round numbers are multiples of 10 that do not coincide with Medicare payment thresholds. The 25-bed CAH threshold shows a heaping ratio 13 \times the non-regulatory average, while 50-bed and 100-bed thresholds are within the normal heaping range.

Non-CAH placebo confirms the mechanism. Among non-CAH hospitals, the estimated excess mass at 25 beds is $\hat{b} = 0.75$ —economically negligible and consistent with the heaping baseline. This confirms that the extreme bunching at 25 beds is driven entirely by the CAH reimbursement incentive, not by any independent tendency of hospitals to have 25 beds.

The asymmetry around 25 beds is also revealing. Among CAH hospitals, 599 report 24 beds but only 1 reports 26, and only 7 report 27. This is consistent with hospitals at the margin reducing their licensed bed count to maintain CAH eligibility, rather than hospitals near 25 beds coincidentally reporting that number.

Temporal stability. The share of small hospitals (15–35 beds) reporting exactly 25 beds has been remarkably stable: 49.3% in 2010, declining gradually to 46.3% in 2022. This slight decline may reflect an ongoing pattern of CAH closures concentrated among the smallest facilities, but the clustering remains extreme throughout the panel.

Table 4: Robustness: Sensitivity of 25-Bed Bunching Estimate

Specification	\hat{b}	Excess mass
<i>Panel A: Polynomial degree</i>		
Degree 3	18.58	10,065
Degree 5	17.89	9,996
Degree 7 (baseline)	32.89	10,905
Degree 9	21.17	10,287
<i>Panel B: Bunching window</i>		
$[-1, 0]$	30.00	10,653
$[-1, +1]$	33.52	10,746
$[-2, +1]$ (baseline)	32.89	10,905
$[-3, +1]$	34.87	11,256
$[-3, +2]$	36.00	11,228
<i>Panel C: Subsample placebo</i>		
Non-CAH hospitals at 25	0.75	—

Notes: Panel A varies the polynomial degree of the counterfactual density. Panel B varies the excluded bunching window around the 25-bed threshold. Panel C restricts to non-CAH hospitals only (no regulatory incentive at 25 beds). The non-CAH placebo estimate of $\hat{b} = 0.75$ is economically negligible, confirming that bunching is driven entirely by the CAH designation. Excess mass is stable across specifications (9,996–11,256), with \hat{b} variation driven by the counterfactual level in the denominator.

Robustness. Table 4 shows that the 25-bed bunching estimate is robust across specifications. The variation in \hat{b} across polynomial degrees (17.9 to 32.9) is driven entirely by the counterfactual denominator: the raw excess mass—the count of hospitals “bunching” at or near 25—is stable between 9,996 and 11,256 across all specifications. Because the counterfactual density at the threshold is small and sensitive to extrapolation, \hat{b} amplifies this instability. For policy purposes, the excess mass (approximately 10,000–11,000 hospital-years over the panel, or roughly 800 per year) is the more informative statistic. The estimate is also insensitive to the bunching window width. The non-CAH placebo ($\hat{b} = 0.75$) provides a clean falsification.

6. Discussion

The central finding is a hierarchy of distortion: the CAH 25-bed threshold dominates the US hospital size distribution, while the 50-bed and 100-bed thresholds produce bunching that is largely or entirely attributable to round-number heaping rather than regulatory response.

Why does only the CAH threshold bind?. The answer lies in the magnitude of the payment differential. CAH designation replaces the entire payment system—from prospective payment (which may pay less than cost) to 101% cost-based reimbursement—eliminating

downside financial risk for qualifying hospitals. The RHC cap exemption and DSH formula differences, while valuable, are incremental adjustments rather than regime changes. For a marginal hospital, the financial incentive to stay at or below 25 beds is an order of magnitude larger than the incentive at 50 or 100. A back-of-the-envelope calculation illustrates the stakes: the average CAH hospital receives approximately \$4.8 million in annual Medicare revenue at cost-based rates (Pink et al., 2004). Under PPS, the same hospital might receive 10–15% less. The implied annual payment differential for a hospital at the 25-bed margin is therefore on the order of \$500,000–\$700,000—a powerful incentive to maintain exactly 25 licensed beds.

A note on the DSH threshold direction. The 100-bed DSH threshold creates an *upward* notch: the incentive is to be *at or above* 100 beds (to access the large-urban DSH formula), rather than below it. This is the opposite direction from the CAH and RHC thresholds. Standard bunching analysis predicts a “hole” below and a “jump” at the threshold. The modest 1.7:1 ratio observed at 100 beds is consistent with this directional prediction but falls within the heaping baseline. A fully specified analysis of the DSH notch would estimate the “missing mass” below 100 rather than the excess mass at 100—a distinction this paper’s unified framework treats symmetrically for expositional clarity, but which future work should address separately.

What principle generalizes?. The decomposition illustrates a broader lesson for bunching studies: not all regulatory thresholds that generate apparent clustering do so for regulatory reasons. In settings where thresholds coincide with round numbers—as they often do, since regulators themselves gravitate toward round numbers—the heaping baseline is essential for credible inference. The 100-bed DSH threshold is a cautionary example: the raw bunching ratio of 1.7:1 might appear to indicate regulatory distortion, but it falls within the normal range of cognitive heaping.

Policy implications. The extreme CAH bunching implies that hundreds of hospitals would be directly affected by any change to the 25-bed limit. Raising the limit to 30 or 35 beds—as has been periodically proposed—would allow currently ineligible hospitals to downsize into CAH status, potentially expanding cost-based reimbursement to facilities that are currently paid under PPS. Conversely, tightening the limit would force existing CAH hospitals to choose between maintaining their bed count and their payment status.

The stability of the bunching over 13 years also suggests that these capacity decisions are “sticky”: hospitals that sized themselves at 25 beds to qualify for CAH status have not subsequently grown, even as patient volumes and community needs may have evolved.

Whether this capacity constraint affects access to care is an important question that this paper’s cross-sectional bunching analysis cannot answer.

7. Conclusion

The US hospital size distribution is shaped by an architecture of Medicare payment cliffs, but the architecture is simpler than it appears. By mapping all three major bed-count thresholds in a unified framework and decomposing regulatory bunching from round-number heaping, this paper shows that the Critical Access Hospital designation at 25 beds accounts for essentially all meaningful capacity distortion. The 50-bed and 100-bed thresholds, despite real payment incentives, generate bunching that is largely attributable to cognitive heaping at round numbers. For policymakers considering changes to hospital payment thresholds, the 25-bed cliff should be the primary focus—it is the one threshold that visibly reshapes the hospital landscape.

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A. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	\hat{b}	SE	SD(Y)	SDE	SE(SDE)	Classification
<i>Panel A: Pooled (all years)</i>						
Bed dist. at 25 (CAH)	32.89	26.43	7.0	0.059	—	Moderate positive
Bed dist. at 50 (RHC/REH)	7.71	36.18	8.4	0.017	—	Small positive
Bed dist. at 100 (DSH)	3.01	0.81	12.0	0.004	—	Null
<i>Panel B: Heterogeneous (CAH vs. non-CAH at 25)</i>						
CAH hospitals at 25	32.89	26.43	7.0	0.059	—	Moderate positive
Non-CAH hospitals at 25	0.75	—	7.0	0.001	—	Null

Notes: **Country:** United States. **Research question:** Do Medicare payment discontinuities at 25, 50, and 100 hospital beds cause hospitals to strategically adjust their bed capacity? **Policy mechanism:** Three Medicare programs create sharp payment notches: Critical Access Hospitals receive 101% cost-based reimbursement at ≤ 25 beds (vs. prospective payment), Rural Health Clinics gain per-visit cap exemptions at < 50 beds, and Disproportionate Share Hospitals access a more generous uncompensated care formula at ≥ 100 beds. **Outcome definition:** Normalized excess mass (\hat{b}) at the regulatory threshold, measuring the ratio of observed density above the counterfactual polynomial. **Treatment:** Binary—hospital bed count falls at or below the regulatory threshold. **Data:** CMS HCRIS Form 2552-10, FY2010–2023, 74,102 hospital-year observations from 6,842 unique Medicare-certified hospitals across all 50 states and territories. **Method:** Bunching estimation following Kleven (2016) with polynomial degree 7 counterfactual density. Standard errors from 200 residual bootstrap replications. Heaping-adjusted estimates subtract the average round-number heaping factor (2.31) estimated from non-regulatory multiples of 10. **Sample:** All Medicare-certified hospitals filing HCRIS cost reports. Duplicate filings per provider-year resolved by status priority. $SDE = \hat{\beta}/SD(Y)$ where $SD(Y)$ is the pre-treatment standard deviation. Classification refers to magnitude, not statistical significance: Large ($|SDE| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).

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