

INTRODUCTION

- For the pediatric population, regional anesthesia has demonstrated efficacy for peri-operative analgesia and reduced opioid exposure.
- However, access to regional anesthesia care is unequally distributed with documented disparities among children in racial and ethnic minority groups.
- Children in racial and ethnic minority groups face several barriers to access:
 - Decrease in overall pain treatment by providers
 - Decrease in non-opioid pain treatment by providers
 - Decreased access to hospitals with specialized peri-operative and surgical services
- Medical centers and fellowship programs with these specialized pediatric regional anesthetic services varies across states and geographic regions.
- However, the relationship between these disparities and the distribution of pediatric regional anesthesia expertise remains incompletely characterized.

PURPOSE

- Characterize the relationship between racial and ethnic disparities in pediatric regional anesthetic care over different geographic regions given available pain management fellowship training in the area.

MATERIALS & METHODS

- Narrative review
- Cross-sectional, state-level, secondary data synthesis (2015–2025) using:
 - PubMed
 - ASRA Fellowship Directory
 - Publicly available ACGME pediatric anesthesiology fellowship listings
 - Association of Pain Program Directors (APPD) Pain Medicine Program Directory
- Studies were included if pediatric pain management or anesthetic modality use was stratified by:
 - race/ethnicity
 - geographic location
- Pediatric regional anesthesia training infrastructure was estimated using a composite weighted framework incorporating:
 - ACGME-accredited pediatric anesthesiology fellowships (weight = 1.0)
 - Pain medicine fellowship programs with documented pediatric clinical exposure (weight = 0.5)
 - RA/APM fellowship programs listed in the ASRA directory (weight = 0.25)

RESULTS:

- Published literature demonstrates racial and ethnic disparities in pediatric pain management and opioid-sparing analgesic strategies across surgical and procedural settings.
- Independent of patient-level outcomes or procedure utilization, substantial geographic variation in pediatric regional anesthesia training infrastructure was observed.
- Major barriers to more wide-spread adoption of regional anesthetic techniques for pediatric patients included:
 - lack of specialized hospital infrastructure to support specialized peri-operative services
 - lack of familiarity with pediatric regional anesthetic blocks among providers
- Composite weighted-tier analysis showed certain states had marked concentration of training infrastructure to support pediatric regional anesthesia services.
- Meanwhile, multiple states lacked any meaningful training infrastructure.

Training Component	Data Source	Weight	Rationale
Pediatric anesthesiology fellowship programs	ACGME listings	1.0	Strongest indicator of pediatric anesthesia and regional anesthesia expertise
Pain medicine fellowship programs with pediatric exposure	APPD / institutional listings	0.5	Contributes pediatric regional expertise with variable clinical volume
RA/APM fellowship programs	ASRA Fellowship Directory	0.25	Indicates regional anesthesia expertise with inconsistent pediatric exposure

Table 1. Weighted Framework for Estimating Pediatric Regional Anesthesia Training Infrastructure:
Composite weighted framework defining pediatric regional anesthesia access based on the presence of pediatric anesthesiology training, pediatric pain medicine expertise, and regional anesthesia and acute pain medicine (RA/APM) training infrastructure. This framework conceptualizes access as a structural property of training ecosystems rather than individual provider availability.

- States classified as Tier 0 demonstrated minimal or absent pediatric anesthesiology and pediatric pain training programs, whereas Tier 4 states exhibited **co-localization and high density** of all three training components (Tables 1–2).

TABLES:

Access Tier	States	Median # RA/APM programs (Range)	Median # Pediatric Anesthesiology Fellowships (Range)	Median # Pain Fellowship (Range)	Median Composite Tier Score (Range)
Tier 4 (Very High)	5 states: CA, IL, MA, NY, TX	4 (3 - 6)	4 (3 - 8)	6 (3 - 10)	7 (6.25 - 14.5)
Tier 3 (High)	7 states: FL, MD, MN, NC, OH, PA, VA	3 (1 - 3)	2 (2 - 3)	2 (2 - 4)	4.5 (3.25 - 4.75)
Tier 2 (Moderate)	11 states: AZ, CO, CT, GA, KY, MI, MO, OR, TN, UT, WA	1 (0 - 1)	1 (1 - 2)	1 (1 - 2)	1.75 (1.75 - 2.75)
Tier 1 (Low)	13 states + DC: AL, AR, DC, IN, IA, KS, LA, ME, MS, NE, NJ, OK, SC, WI	0 (0 - 1)	1 (0 - 1)	0.5 (0 - 1)	1.125 (0.50 - 1.50)
Tier 0 (Minimal / None)	14 states: AK, DE, HI, ID, MT, NV, NH, NM, ND, RI, SD, VT, WR, WY	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0.00 - 0.00)

Table 2. Comparison of Pediatric Regional Anesthesia Training Infrastructure Between Highest and Lowest Access States:
Tiered classification of pediatric regional anesthesia access across U.S. states using the composite training infrastructure framework. States are grouped into access tiers based on the number of foundational training components present, which highlight substantial geographic heterogeneity and the presence of structurally constrained regions.

(Composite tier scores reflect training infrastructure proxies and do not represent procedure-level utilization or individual clinician practice.)

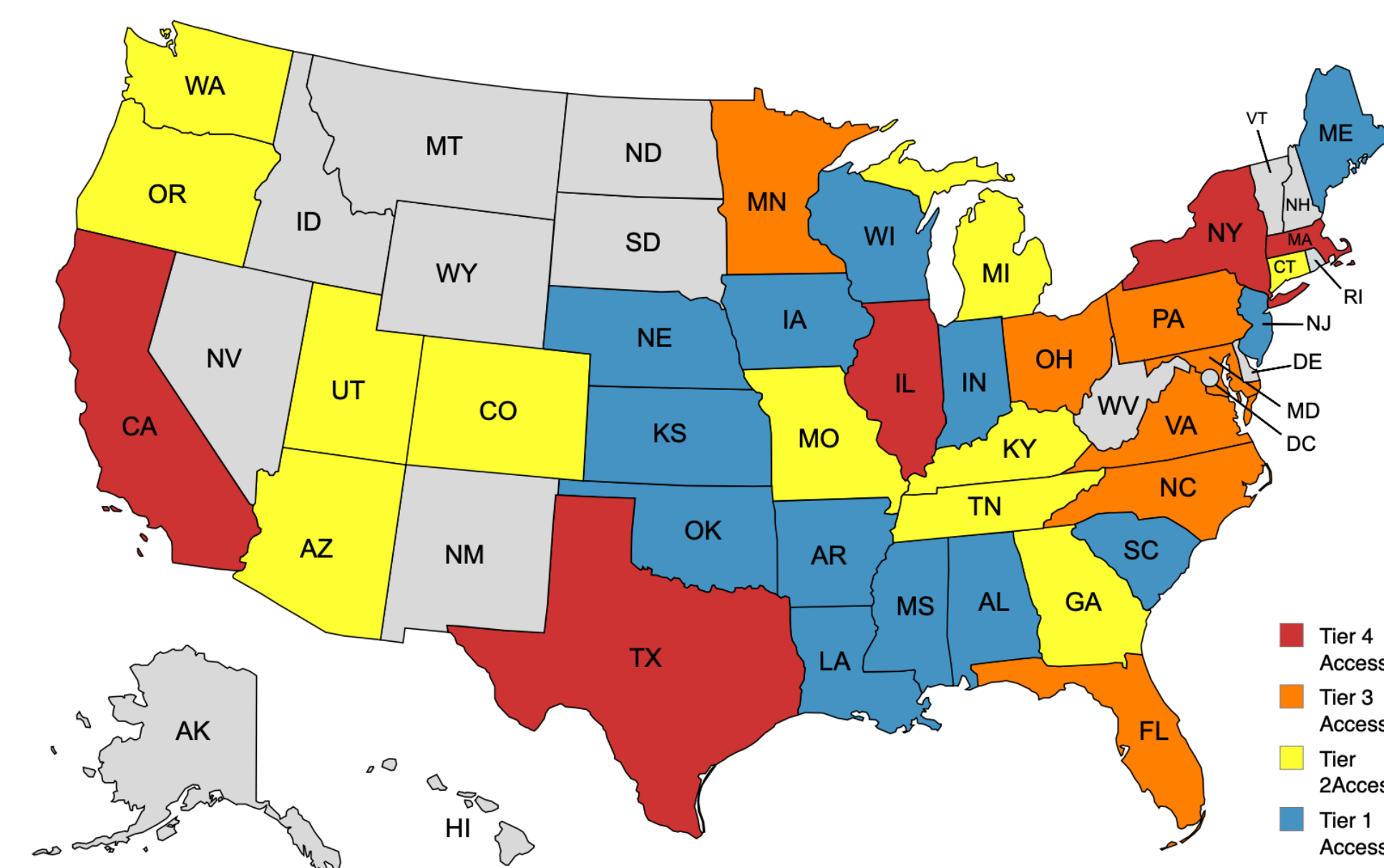


Fig 1. Topographic Illustration Comparing Pediatric Regional Anesthesia Training Infrastructure Between Highest and Lowest Access States using Composite Weighted Framework.

DISCUSSION

- Children in racial and ethnic minorities have several risk factors contributing to disparities in access to regional anesthetic care, which include:
 - Decreased access to specialized hospitals
 - Decrease in both overall and opioid-sparing analgesia
- From the healthcare perspective, specialized pediatric regional anesthetic care can be facilitated by:
 - Medical centers that can support specialized peri-operative services
 - Increased training infrastructure to increase familiarity with advanced pediatric block techniques
- Medical centers with fellowship training in pediatric pain often have adequate exposure and infrastructure to support pediatric block services.
- However, observed geographic clustering of pediatric regional anesthesia fellowship training infrastructure suggests that training distribution and location of specialized medical centers can be a determinant to access of advanced opioid-sparing analgesic block techniques.
- Although racial and ethnic disparities in pediatric pain management are well documented, this analysis does not establish a causal relationship between training distribution and patient-level disparities.
- This underscores the need for future studies linking workforce infrastructure with utilization patterns and clinical outcomes.

CONCLUSION

Geographic disparities in pediatric regional anesthesia training infrastructure are pronounced in the United States and may contribute to inequities in access to advanced peri-operative pain management for children. These structural differences may intersect with previously described racial and ethnic disparities in pediatric pain care, underscoring the importance of equitable and intentional distribution of pediatric anesthesia and pain training resources.

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