MASSACHUSETTS
HEALTH POLICY COMMISSION

# CONSOLIDATION AND CLOSURES IN THE MASSACHUSETTS PEDIATRIC HEALTH CARE MARKET:

## SPECIAL POLICY REPORT ON IMPLICATIONS FOR COST, QUALITY, ACCESS, AND EQUITY

**SEPTEMBER 2023**

MASSACHUSETTS
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## Introduction

One of the core responsibilities of the Massachusetts Health Policy Commission (HPC) is monitoring and reporting on the evolving structure and composition of the provider market in the Commonwealth. The HPC has assessed a number of individual changes in the pediatric market in recent years, both through the Notice of Material Change process and through review of notices of hospital service reductions and applications for Determinations of Need submitted to the Massachusetts Department of Public Health (DPH). This brief summarizes new HPC research on pediatric providers and services in the Commonwealth[1] and examines the combined impact of these individual changes by examining the structure of and trends in the market for pediatric services, considering how these both reflect, but are also distinct from, trends in the broader health care market.

The first section of this brief identifies long-term trends in pediatric hospitalizations, pediatric hospital bed closures, and changes in affiliations among providers of pediatric services. The second section focuses on providers with significant shares of the pediatric services market, how their shares have changed over time, and their prices and per-patient spending. The third section identifies the implications of a concentrated pediatrics market for access, quality, and affordability.

The HPC publishes this brief at a time of significant stress for the health care system, particularly for pediatric patients and the providers who serve them. Increasing need for behavioral health services, provider staffing shortages, pediatric bed closures, COVID-19 and other disease surges, and ongoing financial hardships for families have combined to limit patients' access to care and providers' abilities to meet community needs. The HPC also recognizes that other key services in community settings, including maternity and delivery programs, face pressures that may be similar to some of those outlined in this brief. The analyses in this report are intended to inform conversations among policymakers, provider organizations, payers, and community stakeholders seeking to improve access to affordable, high-quality pediatric care and other health care services for which community access is vital for all people across the Commonwealth.

1 This report focuses primarily on medical and surgical care provided to patients from after delivery until the age of 18 years. Labor and delivery services are generally excluded because they represent a distinct service line. The HPC acknowledges that many pediatric providers treat patients 18 years and older, particularly those with specialized congenital conditions that impact them as adults. These exclusions are intended to establish a definition of pediatric care applicable across pediatric providers.

## Key Findings

- The total volume of inpatient pediatric care has decreased over the past decade, driven by decreases for commercially insured pediatric patients. As pediatric hospital volume has declined, many providers have reduced or eliminated pediatric capacity, while a few academic medical center (AMC)-anchored provider organizations with specialized pediatric programs and a high volume of pediatric patients have expanded. These trends align with changes for pediatric services in other parts of the United States.
- Pediatric hospital services in the Commonwealth have become more concentrated over time and are now predominantly provided by two large AMC-anchored provider organizations, Mass General Brigham (which includes Massachusetts General for Children) and the Children's Medical Center Corporation (which includes Boston Children's Hospital). Pediatric physician services are primarily provided by a few large physician networks, including those affiliated with Mass General Brigham and Children's Medical Center Corporation. Recent market changes are likely to result in continued consolidation of pediatric care at the largest provider organizations.
- The hospitals with the largest volume of pediatric care in the Commonwealth have the highest inpatient commercial prices, even after adjusting for differences in patient acuity. The largest hospitals also tend to have the highest commercial outpatient hospital prices, although prices for clinic-based evaluation and management services for pediatric patients are more varied. While the largest pediatric provider organizations serve many children with high acuity and medical complexities, they also have high annual spending per patient for non-medically complex pediatric patients.
- Regionalization of pediatric care into a few large provider organizations with substantial pediatric volume may have some benefits. Regionalization may create economies of scale, ensure pediatric clinicians see sufficient patient volume to maintain clinical excellence, and ensure that patients receive care at sites prepared to provide care for pediatric patients, including appropriately sized equipment. Large, well-resourced provider organizations also have capital to invest in and support pediatric services, which can improve access to specialized care and lead to improved patient and worker satisfaction.
- However, concentration of pediatric care into a small number of large provider organizations may also negatively impact access to care. Increasingly, pediatric patients are traveling into Metro Boston for care, even for common services. For example, an increasing share of Massachusetts pediatric patients seek

emergency care for common inpatient conditions at Metro Boston hospitals instead of hospitals in their home regions. Traveling further for care is associated with increased length of stay, higher readmission rates, and health risks for patients who require medical transfer. Travel to regional hospitals can also pose additional hardships and financial burdens on caregivers, such as lost productivity, the need to pay for parking and food, and the cost of housing in cases when a child requires an inpatient stay.

- Concentration of lower-acuity pediatric care at large provider organizations may also strain those providers' ability to provide the best care to all pediatric patients that need it. Research suggests that health outcomes tend to be poorer, particularly for patients who need critical care, when pediatric emergency departments are overcrowded with patients who have non-critical, common medical needs. Concentration of hospital care at these large provider organizations can also make it more difficult to scale-up services at community sites when there are surges in pediatric acute medical need.
- Increased concentration of pediatric care at a few large provider organizations also has a cost: higher prices and higher overall spending for pediatric care. As Massachusetts patients shift to the largest pediatric providers, commercial spending will increase due to those providers' higher prices and higher average patient spending. Transferring children from community sites to regional sites and providing more routine pediatric care in AMCs instead of community hospitals may also contribute to higher spending for pediatric patients. Consumer-focused incentives for controlling spending, such as cost sharing, are unlikely to be effective, and may create greater burdens on families, in a market where higher-priced pediatric providers are the only options remaining for many types of pediatric care.
- Policymakers, provider organizations, and other stakeholders should work together to chart a path that can realize the benefits of a more regionalized model of pediatric care while also ensuring access to key services in the community and safeguarding against the risks of higher health care spending, affordability barriers for patients, and inequitable distribution of resources across geographies and demographic groups.

# I. Background: A Changing Pediatric Services Landscape

The provider landscape for pediatric services, particularly inpatient pediatric services, has shifted substantially over the past decade. Pediatric inpatient volume in Massachusetts has declined, primarily for commercial patients, as the total number of Massachusetts residents under 18 years of age has declined and more hospital care has moved to outpatient settings. Many hospitals, especially community hospitals, have reduced pediatric beds. Others have affiliated with Mass General Brigham (MGB), Boston Children's Hospital (Children's), or Tufts Medicine (Tufts) to cover pediatric services in their hospitals. This section provides details on each of these trends.

## A. The total volume of inpatient pediatric care has decreased over the past decade, driven by decreases for commercially insured pediatric patients.

In the decade prior to the COVID-19 pandemic, pediatric inpatient and outpatient volume decreased. Total discharges for Massachusetts pediatric patients decreased by approximately 37% from 2010 to 2019.[2] Bed days for Massachusetts pediatric patients decreased by 17% over the same period, as shown in **Figure I.1**, as pediatric patients admitted to the hospital tended to be more acute and have longer average lengths of stay. More recent inpatient trends are complicated by the pandemic, but data show that pediatric bed days were approximately flat from 2019 through September 2022.[3]

This decline in pediatric inpatient volume was specifically due to lower commercial pediatric volume: From 2010 to 2019, bed days for commercial pediatric patients fell by 33% (from 58% of total bed days in 2020 to 47% of bed days in 2019), while bed days for pediatric patients covered by MassHealth increased by 1% over the same period (from 40% of total bed days in 2010 to 49% of bed days in 2019).[4] This shift is observable nationwide: From 2000 to 2015, the share of non-birth-related hospital discharges for pediatric patients covered by commercial insurance decreased from 52.5% to 39.5%, whereas the share of hospital discharges for pediatric patients covered by Medicaid increased from 38.9% to 53.7%.[5] The

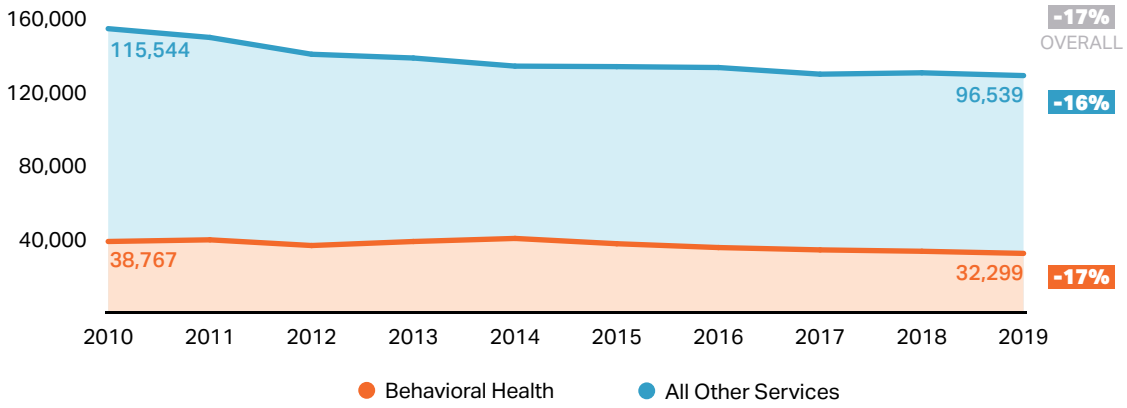
2 *See* Appendix, Figure A.2.

3 HPC analysis of CHIA hospital discharge data 2019 through September 2022. Includes bed days for Massachusetts residents ages 0-17, excluding transfers, rehabilitation stays, and discharges with a length of stay greater than 180 days. Sturdy Memorial Hospital was excluded due to missing data. *See* Appendix, Figure A.1.

4 *See* Appendix, Figures A.3 and A.4. Most Massachusetts children are covered either by MassHealth or commercial insurance, although there is a small population eligible for both Medicaid and Medicare coverage. *See* Stephanie Anthony, Kevin McAvey, and Jacqueline Marks, Blue Cross Blue Shield Foundation of Mass., The Dual Eligible Population in Massachusetts: Issue Brief (Mar. 2021), *available at* https://www.chcs.org/media/Duals_Primer_ISSUE-BRIEF_FINAL_7.pdf.

5 Ruirui Sun, Zeynal Karaca, and Herbert S. Wong, Healthcare Cost & Utilization Project, Trends in Hospital Inpatient Stays by Age and Payer, 2000-2015 (Jan. 2018), *available at* https://hcup-us.ahrq.gov/reports/statbriefs/sb235-Inpatient-Stays-Age-Payer-Trends.jsp (examining the proportion of "nonneonatal and nonmaternal inpatient stays for patients aged <18 years from 2000 to 2015" by primary payer).

**Figure I.1:** Pediatric Inpatient Bed Days at General Acute Hospitals in Massachusetts by Service Type (2010-2019)




**Source:** HPC analysis of 2010-2019 CHIA hospital discharge database.

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; and specialty behavioral health and rehabilitation hospitals. Behavioral health discharges defined as those with a primary DRG in MDC 19 or 20.

small increase in MassHealth pediatric inpatient volume in Massachusetts is likely due in part to an increase in enrollment from just over 534,000 children in 2011 to 647,000 in 2022, a 21% increase.[6]

The long-term decline in total pediatric inpatient care is likely due to a range of factors, including shifts of certain types of care from inpatient to outpatient settings[7] as well as the declining population of children in Massachusetts: The number of Massachusetts residents under 18 years of age decreased nearly 4% from 2010 to 2020.[8] At the same time, the volume of pediatric inpatient care provided at Massachusetts hospitals to patients from outside of Massachusetts increased both in absolute volume (from just under 28,500 bed days in 2010 to 38,000 bed days in 2019) and as a percentage of pediatric inpatient care (from 16% of total pediatric bed days in Massachusetts in 2010 to 23% in 2019).[9] However, nearly all growth in out-of-state pediatric inpatient volume was at two institutions: Boston Children's Hospital (which accounted for over 91% of additional out-of-state pediatric bed days) and Mass. General Hospital (which accounted for nearly all of the remaining increase in out-of-state bed days).[10]

## B. As pediatric hospital volume has declined, many hospitals have reduced or eliminated pediatric capacity, while a few provider organizations with specialized pediatric programs and a high volume of pediatric patients have expanded.

As hospital pediatric volume continued to decline, particularly among commercial patients, several Massachusetts hospitals reduced their inpatient pediatric services, closing over 200 licensed

6 Massachusetts Medicaid Policy Institute, MassHealth: The Basics–Facts, Trends and National Context at 9 (Oct. 2011), *available at* https://www.bluecrossmafoundation.org/publication/masshealth-basics-facts-trends-and-national-context; Massachusetts Medicaid Policy Institute, MassHealth: The Basics – Facts and Trends at 15 (Oct. 2022), *available at* https://www.bluecrossmafoundation.org/publication/masshealth-basics-facts-and-trends-october-2022.

7 While certain pediatric services have shifted to outpatient sites, HPC analysis of CHIA all-payer claims data indicates hospital and ambulatory facility visits by commercial pediatric patients also declined by nearly 16% between 2015 and 2018 for residents of Eastern Massachusetts. Visits were defined as a unique combination of member ID, NPI, and date of service.

8 HPC analysis of American Community Survey data *available at* https://data.census.gov/. *See also* Anna Cushing et al., *Availability of Pediatric Inpatient Services in the United States*, 148 Pediatrics (2021), [hereinafter Cushing et al 2021] *available at* https://doi.org/10.1542/peds.2020-041723; Whitney P. Witt et al., *Overview of Hospital Stays for Children in the United States, 2012*, Agency for Healthcare Research and Quality (2014), *available at* https://hcup-us.ahrq.gov/reports/statbriefs/sb187-Hospital-Stays-Children-2012.pdf.

9 Most inpatient care for out-of-state patients at Massachusetts hospitals is covered by commercial payers, although the proportion covered by government programs has increased over time, from 23% of bed days in 2010 to 34% of bed days in 2019. HPC analysis of CHIA hospital discharge database. Out-of-state patients include both patients from other states and U.S. territories as well as international patients. Excludes discharges for patients aged 18 and older or with primary DRG in MDCs 14 or 15.

10 *Id.* Bed days for patients from outside of Massachusetts accounted for 29% of pediatric bed days at Boston Children's Hospital in 2010, growing to 34% in 2019, and out-of-state pediatric bed days for MGH grew from 14% to 17% of all pediatric bed days over the same time period. In 2019, Boston Children's Hospital accounted for nearly 33,000 pediatric bed days for patients from outside of Massachusetts out of the total 38,000 out-of-state pediatric bed days at Massachusetts hospitals (approximately 87%).

pediatric beds since 2017 as shown in **Figure I.2** below.[11] In most cases, such hospitals indicated that these bed reductions were due, in part, to low occupancy, coupled with the cost of maintaining beds not regularly in use.[12] Many of the hospitals that reduced pediatric beds are smaller providers outside of major urban areas, with the notable exception of Tufts Medical Center, which closed its 41 pediatric inpatient beds in 2022 and entered into a clinical affiliation with Boston Children's Hospital to provide care for its patients in the future. Many of the hospitals that closed pediatric beds also had a higher share of pediatric patients covered by MassHealth rather than commercial insurance, as compared to the Commonwealth's larger pediatric hospitals which did not close pediatric beds or even expanded during this period.

Some hospitals reduced or eliminated pediatric services being provided by their own providers, but rather than closing their pediatric units, preserved services by establishing clinical affiliations with one of the three major pediatric provider organizations in Massachusetts to staff pediatric inpatient, emergency, and/or newborn services: Children's Medical Center Corporation (Boston Children's Hospital), Mass General Brigham (Mass General for Children), and Wellforce (Tufts Medicine, now in affiliation with Boston Children's Hospital). In these cases, local pediatric clinicians often joined the larger pediatric provider system, often resulting in changes to provider prices and billing.[13] **Figure I.3** shows current clinical affiliations for hospital staffing of pediatric services between provider organizations that are not corporately integrated, along with the year in which those affiliations began.[14]

**Figure I.2:** Massachusetts Pediatric Inpatient Licensed Bed Closures (2017-2022)

| | |
|---|---|
| **2017** | Shriner's Hospital for Children – Springfield (20 beds; partial closure)<br>North Shore Medical Center (24 beds; full closure)<br>Milford Regional Medical Center (10 beds; full closure) |
| **2018** | Health Alliance Hospital (11 beds; full closure)<br>Sturdy Memorial Hospital (10 beds; full closure)<br>Harrington Memorial Hospital (11 beds; full closure)<br>Lawrence General Hospital (5 beds; partial closure) |
| **2019** | Baystate Medical Center (8 beds; partial closure)<br>Baystate Noble Hospital (6 beds; full closure)<br>Boston Medical Center (10 beds; partial closure) |
| **2020** | Falmouth Hospital (5 beds; full closure)<br>Framingham Union Hospital (21 beds; full closure)<br>Newton-Wellesley Hospital (12 beds; partial closure)<br>Shriner's Hospital for Children – Boston (13 beds; partial closure)<br>Berkshire Medical Center (9 beds; partial closure) |
| **2021** | Anna Jaques Hospital (8 beds; full closure) |
| **2022** | Tufts Medical Center (41 beds; full closure)<br>Heywood Hospital (7 beds; full closure) |

**Source:** HPC analysis of CHIA Hospital Cost Reports 2015 – 2020 and notices of service closures filed with the Massachusetts Department of Public Health Licensure Division.

**Notes:** Entries indicate whether all of a hospital's pediatric beds were closed (full closure) or whether the hospital maintained some pediatric beds (partial closure). Bed closure data after 2020 includes only full closures of pediatric services requiring notice to DPH.

**Figure I.3:** Major Pediatric Providers Staffing Hospital Pediatric Services through Clinical Affiliations

| Pediatric Provider | Boston Children's Hospital | Mass General Brigham | Tufts Medicine, in affiliation with Boston Children's |
|---|---|---|---|
| **Clinical Affiliates** | – Beverly Hospital<br>– Winchester Hospital<br>– Southcoast Hospitals Group: St Luke's and Charlton Hospital<br>– Milford Regional Medical Center<br>– South Shore Hospital<br>– Cape Cod Hospital<br>– Tufts Medical Center | Steward Health Care System:<br>– Saint Elizabeth's Medical Center<br>– Good Samaritan Medical Center<br>– Holy Family Hospital<br>– Norwood Hospital<br>– Morton Hospital | – Signature Brockton Hospital<br>– MetroWest Medical Center<br>– Lawrence General Hospital |

**Note:** Tufts Medicine provides pediatric hospital services at its clinical affiliates through a lease arrangement with Boston Children's Hospital physicians.

**Sources:** Massachusetts Registration of Provider Organizations, Mass. Health Policy Comm'n, https://www.mass.gov/service-details/ma-rpo-data (See "clinical affiliations" tabs of 2021 filings for relevant provider organizations).

11 The HPC assessed pediatric bed closures using licensed bed counts from CHIA Hospital Cost Reports 2015 – 2020, notices of service closures filed with the Massachusetts Department of Public Health Licensure Division, and news reports of closures. Data limitations and discrepancies among sources result in an approximate count of beds closed.

12 *See, e.g.*, Tufts Medical Center, Inc., 90-day Notice of Intent to Discontinue Services (April 1, 2022), *available at* https://www.mass.gov/doc/90-day-notice-of-intent-to-discontinue-services-pdf-tufts-medical-center-2022/download ("The PICU and Pediatric Unit are underutilized at the Medical Center. Average Daily Census (ADC) in the PICU ranges between 40-60% of available capacity and ADC in the Pediatric Unit ranges between 45-67% of available capacity").

13 Physicians practicing in a hospital typically bill for professional services separately from the hospital's facility bill. Physicians can usually bill according to the commercial payer contracts negotiated by their "home" provider organization even when staffing other hospitals, sometimes resulting in higher professional rates than if the service were staffed by the local hospital's physician group. However, physician billing can be structured differently under different clinical affiliations: For example, under Children's 2023 professional services agreement with Tufts Medicine, Children's physicians leased to Tufts to staff Tufts Medical Center bill under Tufts commercial payer contracts and receive Tufts rates.

14 Tufts Medicine entered a clinical affiliation in 2022, under which Tufts pediatric physicians joined a Boston Children's physician foundation and then were leased to Tufts Medicine to provide services at Tufts Medical Center and its clinical affiliate hospitals. Tufts Medicine, Notice of Material Change to the Health Policy Comm'n (June 24, 2022), as Required under Mass. Gen. Laws Ch. 6D, § 13, *available at* https://www.mass.gov/doc/tufts-medicine-cmc-mcn-07062022/download.

These trends are not unique to Massachusetts. A retrospective study of US hospitals between 2008 and 2018 found that the number of pediatric inpatient units nationwide declined by 19% and pediatric inpatient bed days had a median decline of 10% across all states.[15] Rural hospitals and units with low volume were at highest risk of closure. Simultaneously, the study found that the number of pediatric intensive care unit (PICU) beds increased by 16%, primarily at large, freestanding children's hospitals.[16]

In addition to entering into staffing arrangements such as these, the largest pediatric provider organizations have also been expanding their capacity through acquisitions and capital projects. The largest of these was a $1 billion expansion of Boston Children's Hospital's Longwood campus that was completed in 2022, which included an 11-floor clinical tower with 71 inpatient beds, 4 new operating rooms, and two MRI units; renovations to convert double-bed rooms into single-bed rooms; and the development of an outpatient hospital facility in Brookline.[17] Since 2016, Children's has also acquired three primary care pediatric practices as well as Franciscan Hospital for Children, a specialty hospital for children with complex medical needs.[18] In December 2022, Children's received approval to build new and expand existing ambulatory care sites in Waltham, Needham, and Weymouth.[19]

Prior to the COVID-19 pandemic, the total number of pediatric physicians in the Commonwealth was growing slightly over time, with the physician groups affiliated with Children's, UMass Memorial Medical System (UMass), and Boston Medical Center (BMC) gaining the most pediatric physicians between 2015 and 2018.[20] However, recent data has also highlighted that the number of pediatric physician practice locations, particularly in some regions of the state like Southeastern Massachusetts, has fallen substantially over time.[21]

The cumulative effect of these changes over the past decade is a transformation of the pediatric market in the Commonwealth. As detailed in the next section, dedicated specialized pediatric care, particularly hospital care, is increasingly provided by a few large provider organizations (primarily Children's and MGB in eastern Massachusetts and UMass Memorial Health Care and Baystate Health System in central and western Massachusetts) while smaller provider organizations have closed pediatric capacity or have affiliated with the larger, specialized provider organizations for coverage.

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15 Cushing, et al 2021, *supra* note 8.

16 The new beds in the clinical tower at Boston Children's Hospital are primarily PICU beds. *See* Mass. Health Policy Comm'n, Comment on Boston Children's Hospital Determination of Need Project Number 4-3C47 (September 27, 2016) [hereinafter HPC Comment on Boston Children's Hospital DoN] *available at* https://www.mass.gov/doc/hpc-comment-regarding-proposed-expansion-of-boston-childrens-hospital/download.

17 *Longwood Campus Renewal*, Boston Children's Hospital, https://www.childrenshospital.org/about-us/expansion-and-renewal/longwood-campus-renewal (last visited July 6, 2023); Mass. Dept. of Public Health, The Children's Medical Center Corporation Application for Determination of Need 4-3C47 (2016); *See* HPC Comment on Boston Children's Hospital DoN, *supra* note 16. Children's asserted in its application for a Determination of Need for the Longwood expansion that the additions were necessary in part to serve growing numbers of out-of-state patients, and that the project would not increase the amount of inpatient care Children's provides to Massachusetts residents. As discussed in footnote 10, *supra*, Children's volume of inpatient care for patients from outside of Massachusetts has increased over time. Data on patients using the newly opened Children's beds are not yet available, but Children's other recent expansions and affiliations increase the likelihood that the new capacity will serve both Massachusetts residents and patients from out-of-state.

18 Pediatric Physician Org. at Children's, Notice of Material Change to the Health Policy Comm'n (Aug. 13, 2016), as Required under Mass. Gen. Laws Ch. 6D, § 13, *available at* https://www.mass.gov/doc/the-pediatric-physicians-organization-at-childrens-llc/download (acquisition of Child Health Associates); Pediatric Physician Org. at Children's, Notice of Material Change to the Health Policy Comm'n (May 6, 2019), as Required under Mass. Gen. Laws Ch. 6D, § 13, *available at* https://www.mass.gov/files/documents/2019/05/08/20190507%20PPOC%20WPA%20PAB%20MCN.pdf (acquisition of North Andover Pediatric Associates and Pediatric Associates of Brockton); Children's Medical Ctr. Corp., Notice of Material Change to the Health Policy Comm'n (March 21, 2022), as Required under Mass. Gen. Laws Ch. 6D, § 13, *available at* https://www.mass.gov/doc/boston-childrens-hospital-franciscan-mcn-032122/download (acquisition of Franciscan).

19 Mass. Dept. Public Health, Determination of Need for Substantial Capital Expenditure and Substantial Change in Service at The Children's Medical Center Corporation Decision Letter (December 19, 2022), *available at* https://www.mass.gov/doc/cmcc-decision-letter-pdf/download.

20 The number of pediatric physicians reported to the HPC's Registration of Provider Organizations (RPO) program increased from approximately 3,250 in 2015 to just over 3,500 in 2018. Over this time period, Children's listed 184 net new pediatric physicians on its physician roster, UMass added 54, and BMC added 19. Mass. General Brigham lost a net 45 pediatric physicians over the same time period. Between 2015 and 2018, 94 additional net new pediatric physicians were listed on the physician rosters of multiple provider organizations, with 64 of these being listed by at least one of Children's, UMass, or BMC.

21 Data collected by Massachusetts Health Quality Partners indicates a decline of 5% in the number of pediatric practices in the Commonwealth from 2013 to 2023. *See* Jessica Bartlett, Boston Globe, *Independent pediatric practices struggling to survive*, https://www.bostonglobe.com/2023/06/03/metro/independent-pediatric-practices-are-struggling-survive/ (June 3, 2023) [hereinafter June 3 Boston Globe].

# II. Pediatric Market Concentration

Pediatric inpatient services in the Commonwealth are concentrated at two AMC-anchored provider organizations and have become more concentrated over time.

A few provider organizations now account for a majority of pediatric inpatient discharges in Massachusetts and, as shown below, pediatric care has generally been concentrating at the largest provider organizations over time. Specifically, pediatric care is increasingly concentrated at those organizations' urban hospitals with specialty pediatric programs. In 2019, for example, two provider organizations, Children's and MGB, had just under half of all pediatric inpatient discharges and 58.1% of commercial pediatric discharges for residents of the Commonwealth, as shown in **Figures II.1 and II.2**.

In addition to providing pediatric inpatient care in their own hospitals, Children's, MGB, and Tufts have clinical affiliations with other hospitals under which they provide staffing for all or a substantial portion of pediatric services, as discussed in **Section II.B**. In 2019, hospitals owned by these three provider organizations accounted for just under 59% of total pediatric discharges statewide. However, hospitals whose pediatric services were staffed by one of these provider organizations accounted for 73% of total

**Figure II.1:** All-Payer Pediatric Discharges at 8 Highest-Volume Provider Organizations

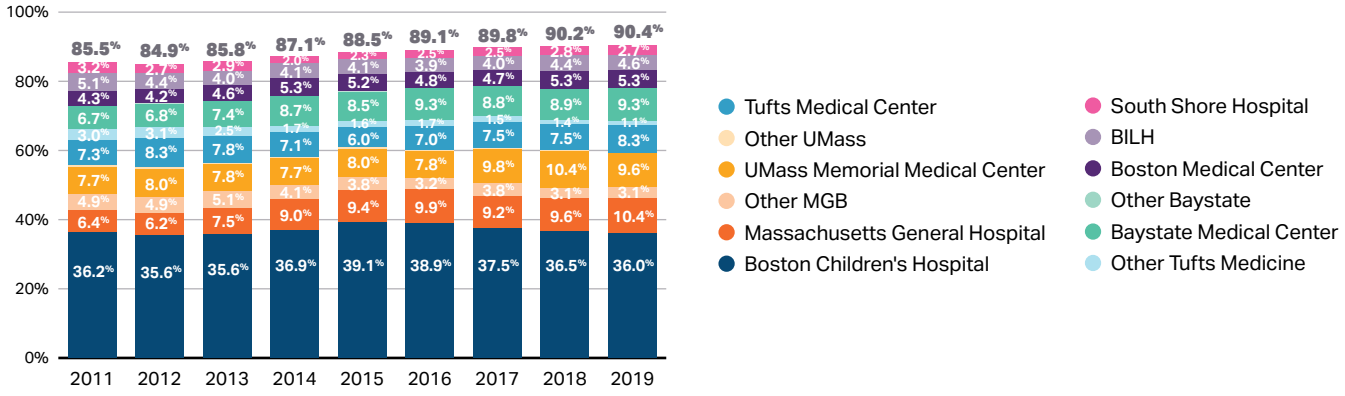
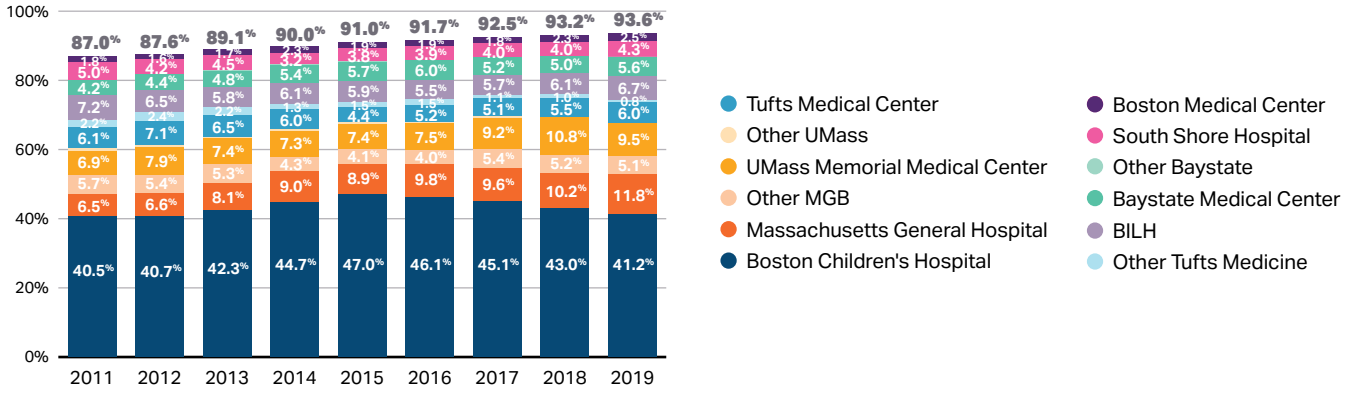



**Figure II.2:** Commercial Pediatric Discharges at 8 Highest-Volume Provider Organizations




**Source:** HPC analysis of 2011-2019 CHIA hospital discharge database.

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; non-general acute care services (MDCs 19 and 20, and lengths of stay over 180 days); and specialty behavioral health and rehabilitation hospitals. System affiliations reflect current corporate affiliations.

**Figure II.3:** Pediatric Discharge Shares for Provider Organizations with Pediatric Clinical Affiliates (2019)

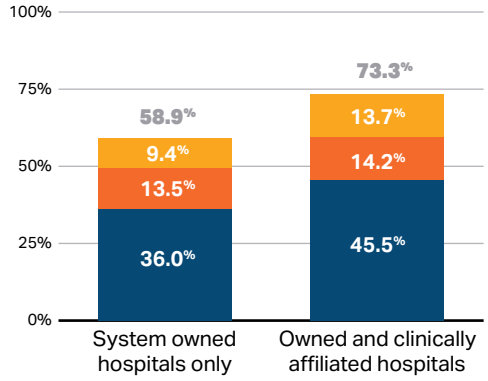
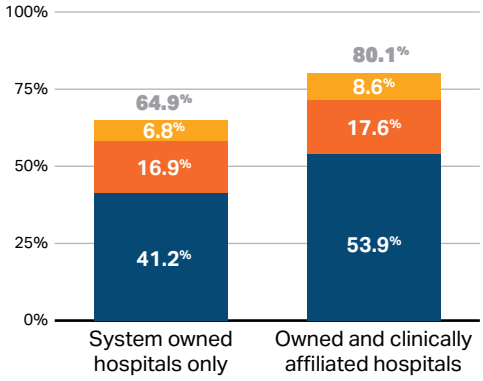




**Figure II.4:** Commercial Pediatric Discharge Shares for Provider Organizations with Pediatric Clinical Affiliates (2019)



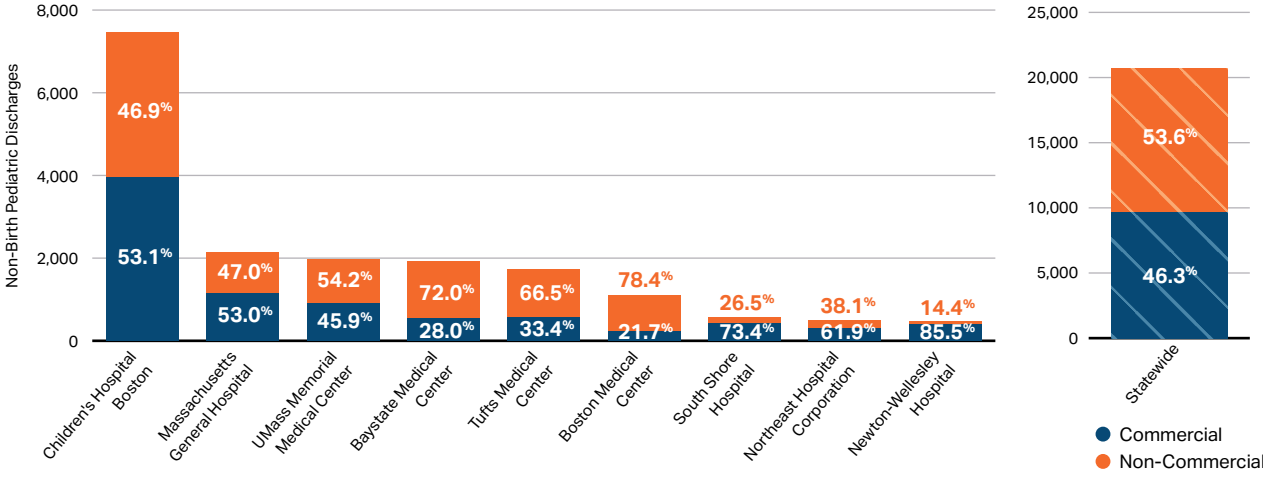

**Source:** HPC analysis of 2019 CHIA hospital discharge database.

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; non-general acute care services (MDCs 19 and 20, and lengths of stay over 180 days); and specialty behavioral health and rehabilitation hospitals. Clinically affiliated hospitals are hospitals where the pediatric service line was substantially or completely staffed by the system in 2019.

pediatric discharges statewide.[22] Commercial discharges are even more concentrated in these organizations and their affiliates: Hospitals owned by these systems accounted for approximately 65% of commercial pediatric discharges in 2019, rising to a full 80% of commercial pediatric discharges when clinically affiliated hospitals are included.[23]

Additionally, MGH and Children's have a higher commercial payer mix (i.e., a higher share of each hospital's pediatric discharges are for commercially insured patients) than the state average or the next largest providers of inpatient pediatric services, as shown in **Figure II.5**. The three largest community hospital pediatric inpatient providers, also shown in **Figure II.5**, are staffed by either MGB or Children's and also have relatively high commercial payer mixes.

**Figure II.5:** Payer Mix for Non-birth Pediatric Inpatients from Massachusetts at Top Ten Pediatric Hospitals (2019)




**Source:** HPC analysis of 2019 CHIA hospital discharge data.

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; non-general acute care services (MDCs 19 and 20, and lengths of stay over 180 days); and specialty behavioral health and rehabilitation hospitals. Excludes Southcoast due to data anomalies.

22 As discussed in Section III.D, below, pediatric discharges that would have been provided at Tufts Medical Center are likely to shift primarily to MGH and Children's now that Tufts has closed its pediatric beds.

23 HPC analysis of 2019 CHIA hospital discharge database. Includes only commercially insured patients. Excludes discharges for patients ages 18 and older; residing outside of Massachusetts; with primary DRG in MDCs 14, 15, 19, or 20; or with length of stay greater than 180 days. Clinically affiliated hospitals are hospitals where the pediatric service line was substantially or completely staffed by the system in 2019.

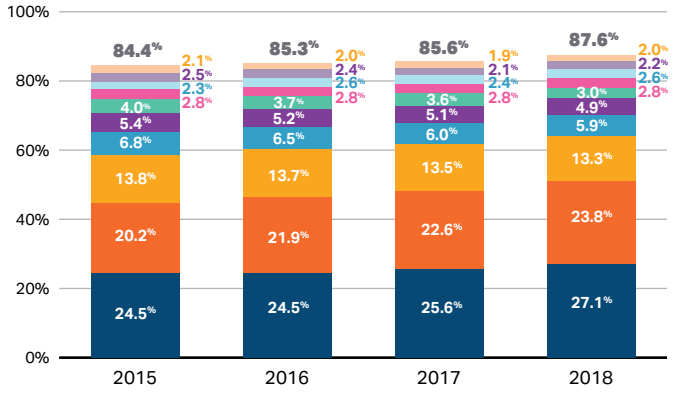
## B. Commercial pediatric outpatient care is also increasingly concentrated in a few provider organizations.

Commercial pediatric outpatient services are also primarily concentrated in a few provider organizations and have become increasingly concentrated within the largest organizations in recent years. As shown in **Figure II.6**, in 2015, the top three provider organizations accounted for 58.5% of commercial pediatric hospital and ambulatory surgery center (ASC) outpatient visits statewide, and by 2018 they accounted for 64.3% of visits.

## C. Several large physician networks deliver a majority of commercial pediatric primary care services.

Pediatric primary care services for commercial patients in the Commonwealth are also largely concentrated in a few provider organizations. The physician networks of four provider organizations, Children's, MGB, Optum, and Tufts, provided 69.6% of commercial pediatric primary care visits[24] in 2018.[25] This represents an increase from 2015, when these networks accounted for 67.4% of commercial primary care visits.[26]

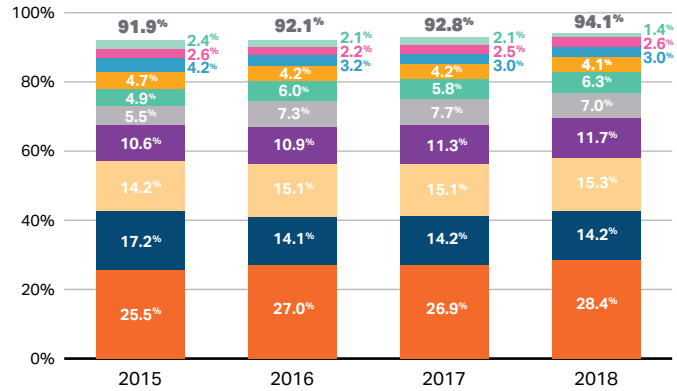
**Figure II.6:** Commercial Pediatric Outpatient (Hospital and ASC) Shares by Provider Organization




**Source:** HPC analysis of APCD 8.0.

**Notes:** Reflects pediatric outpatient shares for each system for outpatient facility (HOPD and ASC) visits. The HPC defines all services rendered to a patient on a given day at a single institution as one visit. Payers included in this analysis were the three largest commercial payers during the time period, but shares shown may not reflect overall statewide shares for providers due to regional variation in health plan enrollment.

**Figure II.7:** Commercial Pediatric Primary Care Visit Shares by Provider Organization




**Source:** HPC analysis of APCD 8.0 and 2018 Registration of Provider Organizations program physician rosters.

**Notes:** Reflects the later affiliations of Lahey Health, Beth Israel Deaconess Care Organization, Mount Auburn Cambridge Independent Practice Association into BILH (2019) and Reliant Medical Group and Atrius into Optum (2018 and 2022). The HPC defines all services rendered to a patient on a given day at a single institution as one visit.

24 For the purposes of this report, primary care services are defined as services delivered by physicians with a primary care specialty who derive at least 60% of their revenue from primary care visits, and at least 5% of their revenue from preventive care visits specifically. Pediatric primary care visits comprise all primary care services delivered by a physician who derives at least 70% of their revenue from patients under 18, and services delivered to patients under 18 by a physician who derives between 30 and 70% of their revenue from patients under 18.

25 Atrius and Reliant are currently owned by Optum and are presented here as a single provider organization. Reliant was acquired by Optum in April 2018, and Atrius was acquired in May 2022. The provider organizations that formed BILH in 2019 are also presented here as a single provider organization.

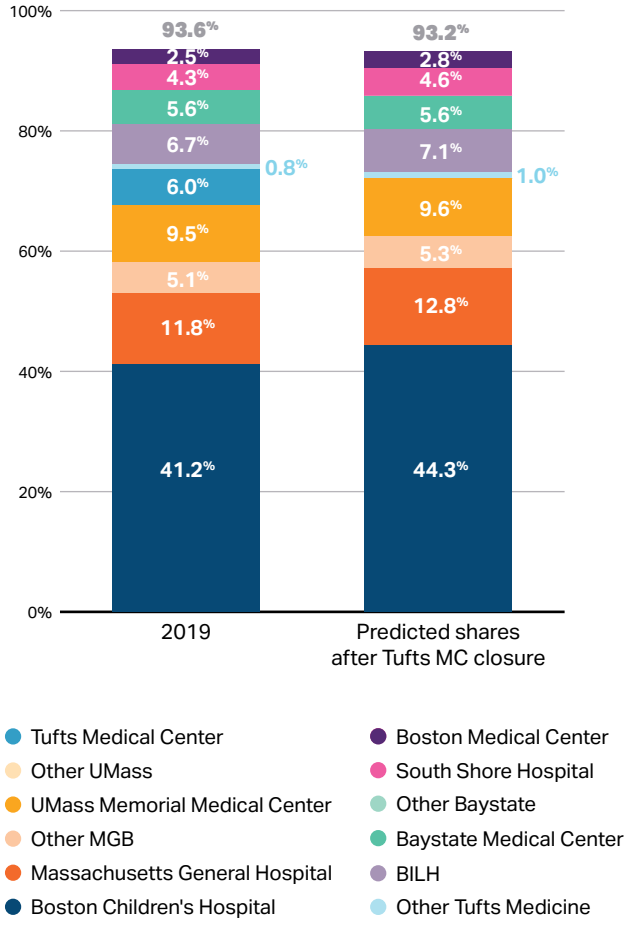
26 The number of pediatric primary care physicians (PCPs) in each network has changed over time. The HPC's assessment of RPO program physician rosters finds that Children's added approximately 100 pediatric PCPs between 2015 and 2018, with the next largest increases at UMass (approximately 40 net new PCPs) and Boston Medical Center (approximately 30 net new PCPs). Over the same time period, MGB's net pediatric PCP headcount declined by approximately 20, while Baystate's declined by just over 30 PCPs.

## D. Pediatric care will likely continue to consolidate as a result of recent market changes.

While pediatric care in Massachusetts is already highly concentrated, several changes in 2022 are likely to lead to further consolidation of pediatric services at the largest provider organizations. As described in Section I, in 2022 and 2023, Children's began to open beds in a new clinical tower on its Longwood campus, was approved to expand outpatient sites outside of Boston, and acquired Franciscan Hospital for Children. Tufts Medical Center also closed its 41 pediatric inpatient beds, established a preferred provider relationship with Children's to refer patients for inpatient care, and established a new clinical affiliation with Children's to staff many of its outpatient pediatric services.

With Tufts Medical Center no longer providing pediatric inpatient services, children who would have used Tufts for inpatient care will likely shift to other pediatrics providers, with Children's and MGB receiving the majority of this volume. **Figure II.8** shows how commercial pediatric discharge shares are likely to change as the result of the bed closures at Tufts Medical Center, based on econometric modeling.[27] Specifically, given the characteristics of commercially insured patients seen at Tufts and its competitors, an estimated 52% of Tufts' commercially insured pediatric inpatients would be expected to use Children's Hospital instead of Tufts, even in the absence of a preferred referral relationship between Tufts and Children's, increasing Children's statewide commercial discharge share by 3.1 percentage points. An additional 20% of Tufts' commercially insured pediatric inpatients would be expected to utilize the MGB system, primarily MGH, increasing MGB's share of commercial pediatric discharges by 1.2 percentage points. Given the preferred referral relationship between Tufts and Children's, however, an even greater number of patients may shift to Children's than this projection suggests. In addition to this volume shift due to the closure of Tufts' beds, the expansions and acquisitions by Children's are also likely to result in additional patients seeking pediatric care at Children's in the coming years.[28]

**Figure II.8:** Commercial Pediatric Discharge Shares by Hospital, with Projections for Diversion of Tufts MC Patients




**Source:** HPC analysis of 2019 CHIA hospital discharge database.

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; non-general acute care services (MDCs 19 and 20, and lengths of stay over 180 days); and specialty behavioral health and rehabilitation hospitals. Predicted shares after Tufts MC closure based on projections using 2019 discharge data.

27 The HPC conducted a diversion analysis using the 2019 CHIA Hospital Discharge Database to estimate where commercial pediatric patients within a 60-minute drive time of Boston City Hall would have sought care if Tufts Medical Center were no longer an option. The HPC then applied the resulting share of discharges shifting to each hospital to the total number of 2019 commercial pediatric discharges from Tufts Medical Center in order to estimate the number of discharges that would occur statewide at each other hospital in the absence of Tufts Medical Center.

28 The HPC also used 2018 CHIA All-Payer Claims Database (APCD) and Hospital Inpatient Discharge Database data to examine commercial pediatric patients' choices of hospitals for inpatient care. Adjusting for patient and hospital characteristics, the HPC found a statistically significant relationship between a hospital system's shares of commercial pediatric specialist physician visits and patient choice of hospitals of that system. Thus, the expansion of pediatric outpatient service sites may result in some additional care being referred to pediatric anchor hospitals.

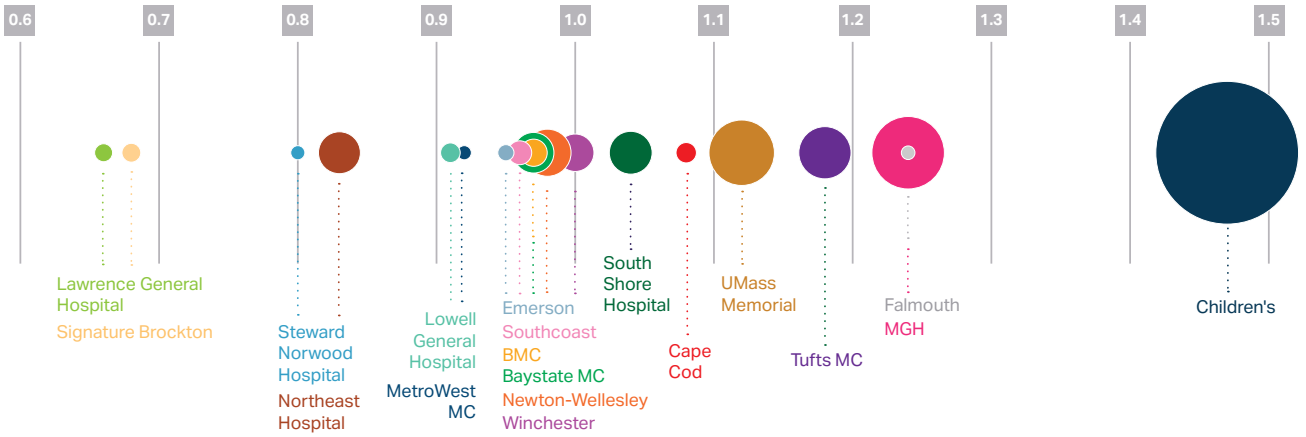
# III. Provider Price and Spending Variation for Pediatric Services

Prior HPC research has found that commercial prices for the same sets of services vary between providers, and that per-member-per-month health care spending on attributed patients varies between provider organizations.[29, 30] Commercial price variation linked to differences in market leverage across providers rather than indicia of value represents a failure of market forces to efficiently distribute health care dollars. Commercial price variation also increases health care spending because higher-priced providers tend to have larger shares of commercial volume. As described in the following section, these relationships between commercial prices and volume hold true in the pediatric space as well: The two highest-volume pediatric provider organizations in the Commonwealth also have the highest commercial prices, and increasing commercial volume to those providers is therefore likely to increase total spending due to higher prices.

## A. The largest providers of hospital-based pediatric care in the Commonwealth have the highest inpatient commercial prices, even after adjusting for differences in patient acuity.

Commercial prices for pediatric inpatient care at Massachusetts hospitals vary substantially, and the largest pediatric hospitals tend to have the highest commercial inpatient pediatric prices. The hospital with the most pediatric discharges, Boston Children's Hospital, had an average commercial price per case mix adjusted pediatric discharge in 2018 that was 47% higher than the statewide average among hospitals with significant commercial inpatient pediatric volume. The hospital with the second-highest number of discharges, MGH, had an average commercial price that was 24% higher than average.[31] Commercial prices for inpatient pediatric care at Tufts Medical Center, which has since closed its pediatric unit, and UMass Memorial Medical Center, were 18% and 12% higher than average, respectively.

**Figure III.1:** Acuity-Adjusted Commercial Hospital Prices per Pediatric Discharge Relative to Sample Average (2018)




**Source:** HPC analysis of CHIA 2018 APCD and 2018 CHIA hospital discharge database.

**Notes:** The size of each hospital's point corresponds to volume of pediatric discharges. Excludes MDCs 14 and 15, DRG 999, discharges in which the patient was transferred to another general acute care hospital, and discharges with a length of stay greater than five times the median length of stay for the DRG. Excludes hospitals with <11 discharges total across the three payers included. Excludes specialty behavioral health, rehabilitation, and service-specific hospitals, patients residing outside of Massachusetts, and providers outside of Massachusetts.

29 *See* more regarding price variation at Mass. Health Policy Comm'n., 2015 Cost Trends Report, Provider Price Variation (2015), *available at* https://www.mass.gov/doc/2015-cost-trends-report-provider-price-variation/download.

30 *See* more regarding spending variation at Mass. Health Policy Comm'n., HPC DataPoints, Issue 6: Provider Organization Performance Variation, *available at* https://www.mass.gov/service-details/hpc-datapoints-issue-6-provider-organization-performance-variation.

31 To examine inpatient pediatric prices, the HPC calculated average allowed amounts per case mix adjusted pediatric discharge for BCBS, HPHC, and THP facility claims in the 2018 APCD. The HPC excluded hospitals with missing data for any of the three payers or fewer than 11 discharges across the three payers. Hospitals' average price was adjusted for patient acuity using the average MS-DRG case weight for discharges at each hospital. Data from the 2019 CHIA hospital discharge database was used to further adjust prices by the ratio of each hospital's average MS-DRG case weight to the hospital's average APR-DRG case weight for pediatric patients. This step was designed to incorporate case weight adjustment in APR-DRGs tailored for pediatric care. Each hospital's adjusted price per discharge is normalized for payer mix among the three payers included by weighting payer-specific prices by the proportion of pediatric discharges for each payer in the sample. The HPC then divided each hospital's adjusted price by the average adjusted price within the sample to arrive at a relative pediatric inpatient price.

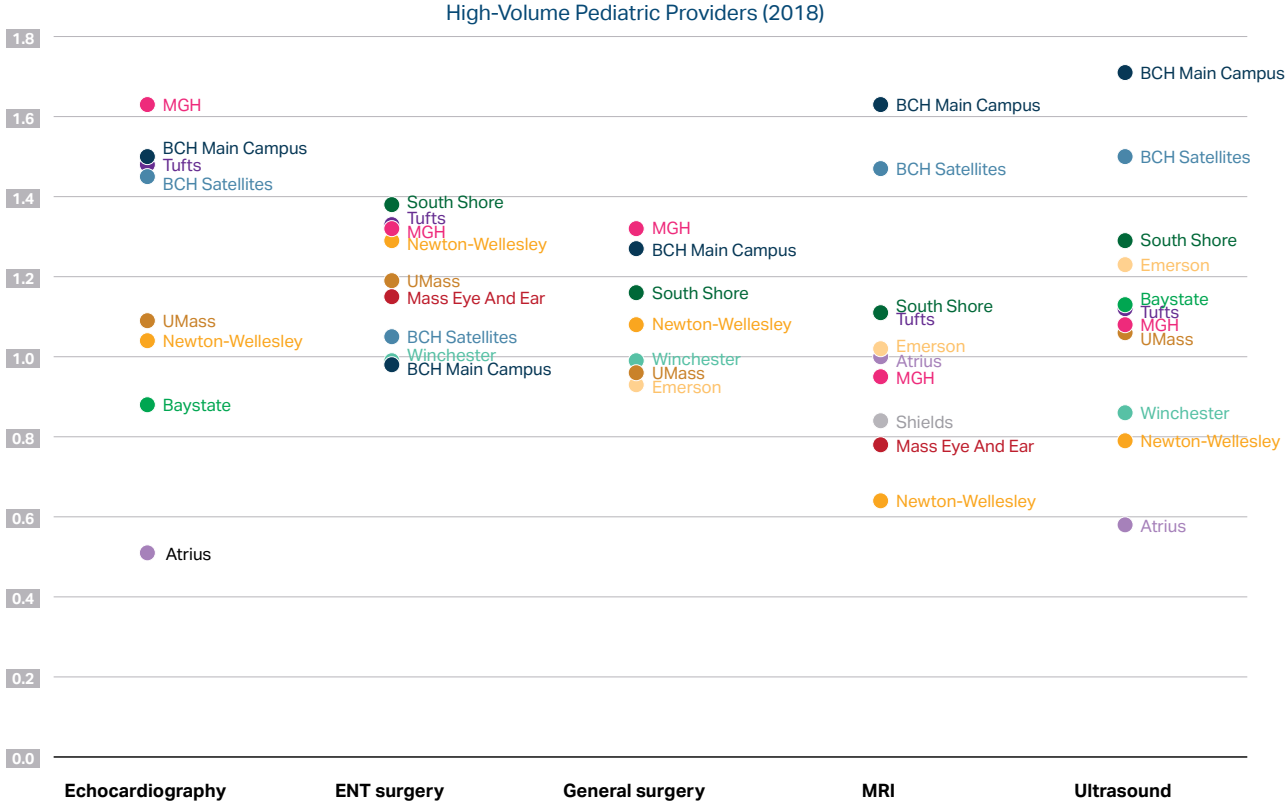
## B. The largest pediatric providers also tend to receive higher commercial prices for outpatient services.

Children's and MGB are also commonly among the highest-priced providers for a variety of outpatient procedures. **Figure III.2** below shows commercial prices relative to the statewide average for several high-volume clusters of outpatient services.[32] Prices vary substantially in each of these clusters. Where each provider falls in the rankings varies by service, but the largest providers that are gaining commercial market share tend to have high prices relative to other providers.

## C. Prices for clinic-based evaluation and management services for pediatric patients vary, with some outliers among the largest pediatric provider organizations.

Prices also vary for the most common evaluation and management (E&M) services provided by physicians in a clinic setting. For specialist physicians, Children's commercial prices are the highest in the Commonwealth by a wide margin.[33] For the three most common physician office visit codes in 2018, the largest commercial payers paid Children's specialists more than double the rates received by specialists in the second most expensive

**Figure III.2:** Commercial Outpatient Pediatric Prices Relative to Network Average by Service Cluster for High-Volume Pediatric Providers (2018)




**Source:** HPC analysis of CHIA 2018 APCD.

**Notes:** Includes BCBS, HPHC, and THP claims only. Excludes patients ages 18 and older. Service clusters composed of clinically related procedural or diagnostic CPTs. Relative prices are based on facility and professional allowed amounts for CPTs in each cluster. Limited to fee-for-service episodes of care with a facility or non-person professional claim.

32 To calculate price relativities for outpatient pediatric services, the HPC compared a provider's actual price for the most common CPT codes within each service cluster to an "expected price" representing what the provider would have been paid if it had received the average price among all providers in a payer's network for the services it provided. Providers with a higher actual-to-expected price ratio are considered more expensive than providers with a lower actual-to-expected price ratio. The relative prices in Figure III.2 represent normalized actual-to-expected price ratios such that providers with a relative price greater than 1 have higher-than-average prices, and providers with a relative price less than 1 have lower-than-average prices. *See* **Technical Appendix** for a detailed methodology description.

33 For purposes of this report, pediatric specialist physicians are defined as physicians who derive at least 70% of their revenue from patients under age 18, and who do not meet the definition of a primary care provider used in our analysis of pediatric primary care visit shares (see *supra* note 24).

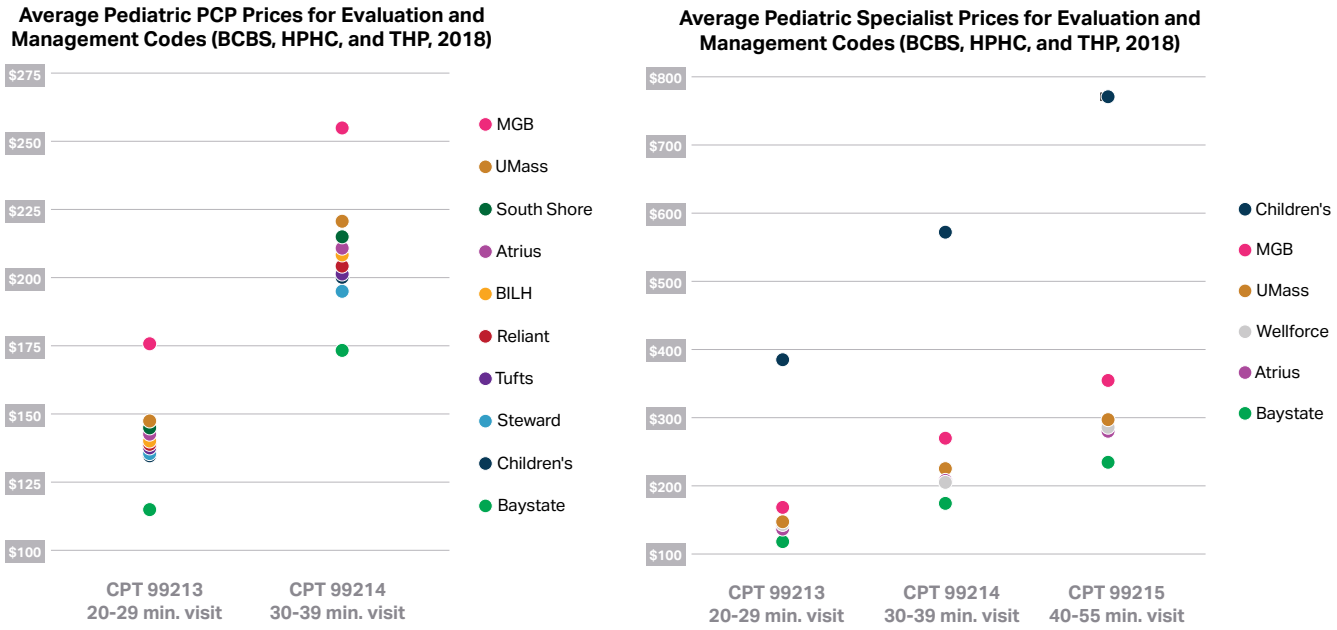
provider organization, MGB.[34] Children's specialists were paid more than triple the rates for these services than specialists in the least expensive provider organization, Baystate.

Among primary care providers, for the two most common physician office visit codes, Children's physicians were among the lower-priced providers and MGB physicians were the highest-priced of the provider networks examined. Depending on the commercial payer, MGB primary care physicians were paid 16 to 19% more than physicians in the next most expensive provider organization, UMass, and 47 to 53% more than primary care providers in the least expensive network, Baystate.

## D. The largest pediatric provider organizations serve many children with high acuity and medical complexities but have high annual commercial spending per patient for non-medically complex pediatric patients.

In addition to price variation for specific pediatric services, there is variation in overall medical spending for commercially insured pediatric patients managed by each physician network.[35] Spending for attributed patients includes the cost of all care rendered to a given patient, both in facilities and in ambulatory settings, and by providers associated with the managing network as well as by providers in other networks.[36] Because a patient's medical spending

**Figure III.3:** Commercial Physician Prices for Evaluation and Management by Physician Network (2018)




**Source:** HPC analysis of CHIA 2018 APCD and 2018 Registration of Provider Organizations program physician rosters.

**Notes:** Includes BCBS, HPHC, and THP claims only. Average revenue per CPT in clinic office site of service for patients under age 18, weighted by the total number of each payer's visits for the CPT. Specialist prices exclude psychiatrists. CPTs shown represent highest-volume E&M codes across all providers and account for 94.8% of PCP office visits and 64.2% of specialist office visits.

34 Within the MGB network, physicians receive different commercial rates depending on the nature of their affiliation with MGB, with the highest rates for physicians affiliated with MGB's AMCs. *See* Mass. Health Policy Comm'n, Review of Partners HealthCare System's Proposed Acquisitions of South Shore Hospital (HPC-CMIR-2013-1) And Harbor Medical Associates (HPC-CMIR-2013-2), Pursuant to M.G.L. C. 6D, § 13, Final Report (Feb. 19, 2014), at 32, notes 97-98, *available at* https://www.mass.gov/doc/final-cmir-report-partners-south-shore-harbor/download. As a sensitivity, the HPC compared the prices of Children's specialists to those of only the AMC-affiliated specialists within MGB's network. While Children's prices for the most common E&M codes were still more than twice those of the AMC-affiliated MGB specialists, the gap was slightly smaller.

35 For details on the methodology used to attribute patients to a physician network, see Mass. Health Policy Comm'n., 2017 Cost Trends Report at 29-30 (March 2018), *available at* https://www.mass.gov/files/documents/2018/03/28/Cost%20Trends%20Report%202017.pdf.

36 For example, spending for patients managed by Steward HealthCare includes spending on any care those patients receive at non-Steward hospitals; similarly, spending for patients of Children's does not include spending on services for patients of other networks who receive care at Boston Children's Hospital.

can depend on the complexity of their medical needs, the HPC separately examined commercial spending for medically complex and non-medically complex patients.[37] Children's and MGB manage the largest number of commercially insured pediatric patients in the Commonwealth, as shown in **Figure III.4**. Children with medical complexity account for between 3.6% (Baystate) and 5.4% (Children's) of the pediatric patients managed by the provider networks.[38] For medically complex pediatric patients, spending was highest for patients managed by UMass, with average spending 30% higher than the statewide average (1.30 times mean spending, as shown in **Figure III.4**). For pediatric patients not considered medically complex, spending was highest for patients managed by MGB and Children's, with 15% and 13% higher average spending, respectively, than the statewide average.

# IV. Implications of Pediatric Market Changes for Cost, Quality, Access, and Equity

The concentration of pediatric care at large provider organizations with specialized services can provide some benefits. Regionalization of pediatric care may create economies of scale, ensure pediatric clinicians see sufficient patient volume to maintain clinical excellence, and ensure that patients receive care at sites prepared to provide care for pediatric patients, including appropriately sized equipment.[39] Large, well-resourced organizations also have the capital to invest in and support pediatric services, which can improve access to specialized care[40] and lead to improved patient and worker satisfaction.[41]

**Figure III.4:** Prevalence and Annual Spending for Commercially Insured Children with and without Medical Complexities (CMC) by Provider Organization (2018)

| | Number of CMC | Number of Non-CMC | % CMC |
|---|---|---|---|
| Children's | 2,434 | 42,552 | 5.4% |
| MGB | 1,553 | 31,011 | 4.8% |
| Atrius | 1,010 | 21,741 | 4.4% |
| Wellforce | 1,005 | 23,129 | 4.2% |
| Steward | 574 | 13,418 | 4.1% |
| UMass | 396 | 9,238 | 4.1% |
| Lahey | 263 | 6,365 | 4.0% |
| Reliant | 224 | 5,434 | 4.0% |
| Baystate | 220 | 5,837 | 3.6% |
| BIDCO | 220 | 4,838 | 4.3% |
| South Shore | 220 | 4,509 | 4.7% |

| CMC SPENDING | MEAN | | MEDIAN | |
|---|---|---|---|---|
| | Dollars | Relative to statewide average | Dollars | Relative to statewide average |
| UMass | $37,844 | 1.30 | $17,243 | 1.20 |
| Steward | $34,651 | 1.19 | $13,435 | 0.94 |
| Children's | $31,599 | 1.09 | $14,145 | 0.99 |
| Atrius | $30,192 | 1.04 | $13,479 | 0.94 |
| Reliant | $30,020 | 1.03 | $16,191 | 1.13 |
| Wellforce | $29,349 | 1.01 | $13,908 | 0.97 |
| South Shore | $29,075 | 1.00 | $13,616 | 0.95 |
| Lahey | $28,993 | 1.00 | $15,951 | 1.11 |
| Baystate | $28,927 | 0.99 | $14,829 | 1.03 |
| MGB | $28,798 | 0.99 | $14,121 | 0.98 |
| BIDCO | $27,380 | 0.94 | $14,265 | 0.99 |

| NON-CMC SPENDING | MEAN | |
|---|---|---|
| | Dollars | Relative to statewide average |
| MGB | $1,872 | 1.15 |
| Children's | $1,834 | 1.13 |
| South Shore | $1,739 | 1.07 |
| Lahey | $1,671 | 1.03 |
| Wellforce | $1,658 | 1.02 |
| Steward | $1,647 | 1.01 |
| BIDCO | $1,644 | 1.01 |
| Atrius | $1,543 | 0.95 |
| UMass | $1,520 | 0.94 |
| Reliant | $1,518 | 0.93 |
| Baystate | $1,343 | 0.83 |

**Source:** HPC analysis of All-Payer Claims Database 8.0.

37 See more at Mass. Health Policy Comm'n., Children with Medical Complexity in the Commonwealth (Feb. 2022), *available at* https://www.mass.gov/doc/children-with-medical-complexity-in-the-commonwealth/download. Figure III.4 excludes provider groups with <100 CMC lives in observed in 2018. Statewide averages exclude provider groups with <1,000 total lives observed in 2018. Mean and median spending are reported for CMC due to outliers.

38 The HPC also examined the distribution of patient acuity by assigning patients to acuity quartiles based on the Johns Hopkins ACG® System (© 1990, 2017, Johns Hopkins University) and observed similar results. The largest pediatric networks have high shares of high-acuity patients. However, they also have high shares of lower acuity patients, and there is minimal variation in the proportion of patients in each network that are higher acuity versus lower acuity.

39 Urbano L. Franca and Michael L. McManus, *Trends in Regionalization of Hospital Care for Common Pediatric Conditions*, 141 Pediatrics (2018), [hereinafter Franca and McManus 2018] *available at* https://doi.org/10.1542/peds.2017-1940; Craig D. Newgard et al., *Evaluation of Emergency Department Pediatric Readiness and Outcomes Among US Trauma Centers*, 175 JAMA Pediatrics 947 (2021), *available at* https://doi.org/10.1001/jamapediatrics.2021.1319; Stefanie G. Ames et al., *Emergency Department Pediatric Readiness and Mortality in Critically Ill Children*, 144 Pediatrics (2019), *available at* https://doi.org/10.1542/peds.2019-0568.

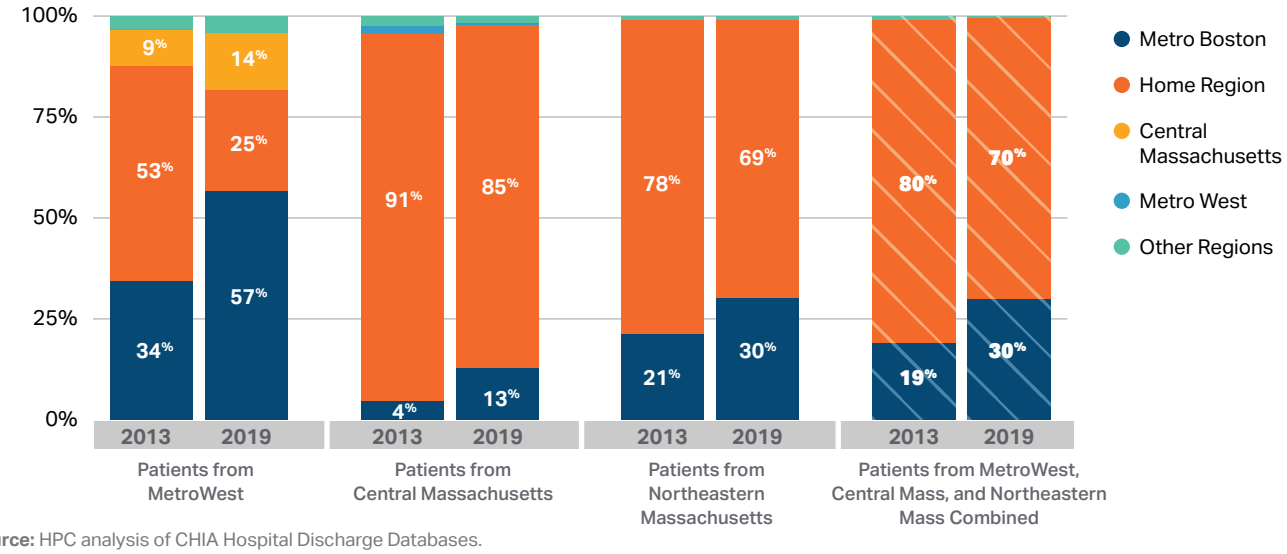
40 Children's has, for example, added needed psychiatric beds for adolescents and is expected to propose a significant addition to capacity at Franciscan Hospital for Children, while MGB's McLean Hospital serves as a statewide resource for adolescent behavioral health needs.

41 Thomas C. Tsai et al., *Patient Satisfaction and Quality of Surgical Care in US Hospitals*, 261 Annals of Surgery 2 (2015), *available at* https://doi.org/10.1097%2FSLA.0000000000000765; Jeannie M. Cimiotti et al., *Nurse reports on resource adequacy in hospitals that care for acutely ill children*, 36 Journal for healthcare quality 25 (2014), *available at* https://doi.org/10.1111/j.1945-1474.2012.00212.x.

These factors have made Massachusetts' largest pediatric provider organizations destinations not only for Massachusetts residents but also patients from around the country and across the world seeking highly specialized pediatric care.[42] Most specialty children's hospitals, including those in Massachusetts, are also well-regarded for their quality outcomes for children with critical illness, although some national studies find that most community sites perform equally well for low-acuity pediatric care.[43] Primary care quality metrics for patient management, including rates of well visits and immunizations, also indicate that Massachusetts provider networks with the highest number of attributed pediatric patients tend to perform at or above statewide average performance.[44] Representatives of major Massachusetts pediatric provider organizations have also emphasized that pediatric specialists must see sufficient numbers of patients and cases within their specialty to maintain clinical expertise, which may be challenging for providers practicing only at smaller, community sites of care.

However, other aspects of concentration of pediatric care may negatively impact access and quality. While pediatric patients with more severe conditions have always required specialized care at regional children's hospitals and AMCs, inpatient care for common pediatric conditions has also shifted to these institutions over time. Multiple studies have documented increases in regionalization for common pediatric conditions such as appendicitis and asthma at specialty children's hospitals.[45] Similarly, in Massachusetts, an increasing share of pediatric patients have been receiving emergency care for common inpatient conditions at Metro Boston hospitals as opposed to their home region. As shown below in **Figure IV.1**, the proportion of pediatric patients with the most common pediatric conditions from Central Massachusetts, Metro West, and Northeastern Massachusetts admitted through emergency rooms in Metro Boston increased from 19% in 2013 to 30% in 2019.[46]

**Figure IV.1:** Changes in Use of Local Hospitals for Pediatric Emergency Admissions for Common Conditions




**Source:** HPC analysis of CHIA Hospital Discharge Databases.

**Notes:** Excludes discharges for patients ages 18 and older; residing outside of Massachusetts; with primary DRG in MDCs 14, 15, 19, or 20; or with length of stay greater than 180 days. Only includes patients indicated as being admitted through an emergency room with one of the top 10 DRGs provided to pediatric patients at community hospitals in Massachusetts: Bronchitis and simple pneumonia with and without medical complexity (DRGs 203; 202; 194; 195); gastroenteritis (392), nutritional disorders (641), otitis media and upper respiratory infection without medical complexity (153), urinary tract and kidney infections (690), cellulitis (603), and appendectomy without medical complexity (343).

42 *See* footnote 10, *supra*, for information about the increasing volume of inpatient care provided by Massachusetts hospitals to out-of-state patients.

43 Jose H. Salazar et al. *Regionalization of the surgical care of children: a risk-adjusted comparison of hospital surgical outcomes by geographic areas*, 156 Surgery 467 (2014), *available at* https://doi.org/10.1016/j.surg.2014.04.003; J M Tilford et al., *Volume-outcome relationships in pediatric intensive care units*, 106 Pediatrics 289 (2000), *available at* https://doi.org/10.1542/peds.106.2.289; Linda Dynan et al., *Differences in quality of care among non-safety-net, safety-net, and children's hospitals,* 131 Pediatrics 304 (2013), *available at* https://doi.org/10.1542%2Fpeds.2012-1089.

44 *See* CTR. For Health Info. & Analysis, A Focus on Provider Quality: Selected Clinical Measures, 2018 and 2020 (July 2022), *available at* https://www.chiamass.gov/a-focus-on-provider-quality-selected-clinical-measures/. The Pediatric Physicians' Organization at Children's (11,013), Mass General Brigham (6,389), Atrius Health (5,071), and New England Quality Care Alliance (4,115) had the highest number of attributed pediatric primary care patients.

45 Franca and McManus 2018, *supra* note 39; Anna M. Cushing et al., *Trends in Regionalization of Emergency Care for Common Pediatric Conditions* 145 Pediatrics (2020), *available at* https://doi.org/10.1542/peds.2019-2989.

46 No meaningful changes were observed during this time period for patients from Western Massachusetts, Cape Cod and the Islands, Metro South, or the South Coast.

The concentration of care at pediatric specialty hospitals can pose access challenges for children and their families who need to travel greater distances for care. As shown in **Figure IV.2**, pediatric patients residing outside of Metro Boston who were admitted through the emergency room for common conditions experienced increases in average drive time to the hospital between 2013 and 2019, with patients in Central Massachusetts and MetroWest experiencing the greatest increase in drive times.[47] Reported declines in the number of pediatric physician practices in some parts of the Commonwealth suggest that patients may also face increased travel barriers for non-hospital care.[48]

Increased drive times are associated with increased length of stay, higher readmissions rates, and health risks for patients who require medical transfer.[49] Longer drive times can also pose additional hardships and financial burdens on caregivers, such as lost productivity, the need to pay for parking and food, and the cost of housing in cases when a child requires an inpatient stay.[50] As the HPC highlighted in a recent report on children with medical complexity, distance to care can be a particular barrier to access for children with the most complex medical needs due to the challenges of caring for these children in community settings and the concentration of pediatric specialists in urban centers.[51]

Concentration of pediatric care at a few major hospitals may also strain those hospitals' ability to provide the best care. Some studies suggest that health outcomes tend to be poorer, particularly for patients who need critical care, when pediatric emergency departments are overcrowded with patients who have non-critical, common medical needs.[52] From an emergency preparedness perspective, concentration of pediatric hospital care at regional hospitals can make it more difficult to scale-up services at community sites when there are surges in pediatric acute medical need.[53]

**Figure IV.2:** Changes in Average Patient Drive Time to Hospital for Pediatric Emergency Admissions for Common Conditions

| Patient Residence | Average Drive Time 2013 (mins) | Average Drive Time 2019 (mins) | % Change |
|---|---|---|---|
| **Cape and Islands** | 29.6 | 36.3 | 23% |
| **Central Massachusetts** | 18.8 | 24.6 | 31% |
| **Metro Boston** | 21.9 | 20.5 | -6% |
| **Metro South** | 23.6 | 25.7 | 9% |
| **Metro West** | 22.6 | 27.0 | 19% |
| **Northeast Massachusetts** | 18.0 | 19.9 | 10% |
| **South Coast** | 15.3 | 16.1 | 5% |
| **Western Massachusetts** | 17.4 | 20.4 | 17% |

**Source:** HPC analysis of CHIA Hospital Discharge Databases.

**Notes:** Excludes discharges for patients ages 18 and older; residing outside of Massachusetts; with primary DRG in MDCs 14, 15, 19, or 20; with length of stay greater than 180 days; and specialty behavioral health and rehabilitation hospitals. Drive times were calculated using Google API from hospital zip-code to patients' zip-codes. See Mass. Health Policy Comm'n, Addendum to 2013 Cost Trends Report: Technical Appendix B3: Regions of Massachusetts (Jan. 2014), *available at* https://www.mass.gov/doc/b3-regions-of-massachusetts/download for more information on HPC regions.

47 Patient drive times increased in all regions outside of metro Boston from 19.7 minutes to 22.7 minutes (a 15% increase) for common inpatient admissions through the ED. Patients in Central Massachusetts experienced the greatest increase in drive times, from 18.8 min in 2013 to 24.6 min (a 31% increase), followed by patients in MetroWest, who had drive times of 22.6 min in 2013 to 27 min in 2019 (19% increase). HPC analysis of CHIA Hospital Discharge Databases, conducted for MA residents <18 discharged from acute care hospitals. Sample excluded MDC 14, 15, 19, 20 and inpatients with a length of stay >180 days. Drive times were calculated using Google API from hospital zip-code to patients' zip-codes.

48 *See* June 3 Boston Globe, *supra* note 21.

49 Scott Lorch et. al., *Use of Prolonged Travel to Improve Pediatric Risk-Adjustment Models*, 44 Health Servs. Research 519-41 (Apr. 2009), *available at* https://pubmed.ncbi.nlm.nih.gov/19207591/; Rajender K. Gattu et al., *Consideration of Cost of Care in Pediatric Emergency Transfer-An Opportunity for Improvement* 33 Pediatric Emergency Care 334 (2017), [hereinafter Gattu et al 2017] *available at* https://doi.org/10.1097/pec.0000000000000805; Atsushi Kawaguchi et al., *Effects of Medical Transport on Outcomes in Children Requiring Intensive Care*, 35 Journal Of Intensive Care Medicine 889 (2020), *available at* https://doi.org/10.1177/0885066618796460.

50 Nicholas M. Mohr et al., *Potentially avoidable pediatric interfacility transfer is a costly burden for rural families: A cohort study*, 23 Academic Emergency Medicine 885 (2016), *available at* https://doi.org/10.1111/acem.12972.

51 Mass. Health Policy Comm'n, Children With Medical Complexity In The Commonwealth at 15 (Feb. 2022), *available at* https://www.mass.gov/doc/children-with-medical-complexity-in-the-commonwealth/download.

52 Holly E. Depinet et al., *The effect of emergency department crowding on reassessment of children with critically abnormal vital signs*, 21 Academic Emergency Medicine 1116 (2014), *available at* https://doi.org/10.1111/acem.12478; Marion R. Sills et al., *Emergency department crowding is associated with decreased quality of care for children*, 57 Annals Of Emergency Medicine 191 (2011), *available at* https://doi.org/10.1016/j.annemergmed.2010.08.027; Antonia S. Stang et al., *Crowding measures associated with the quality of emergency department care: a systematic review*, 22 Academic Emergency Medicine (2015), *available at* https://doi.org/10.1111/acem.12682.

53 Christy Anthony et al., *Factors associated with preparedness of the US healthcare system to respond to a pediatric surge during an infectious disease pandemic: Is our nation prepared?* 12 American Journal Of Disaster Medicine 203 (2017), *available at* https://doi.org/10.5055/ajdm.2017.0275; Irini N. Kolaitis, et al., *How Suboptimal Consolidation of Care During the COVID-19 Pandemic Can Teach Us to Do Better* 11 Hospital Pediatrics E156 (2021), *available at* https://doi.org/10.1542%2Fhpeds.2021-006081.

As a result of the COVID-19 pandemic, Massachusetts hospitals collaborated to triage acute care across specialty and community sites for adults, and even to reverse triage certain low acuity care to home-based and outpatient settings. The opportunity to triage pediatric care in this way is more limited because there are fewer pediatric providers and less pediatric capacity in terms of equipment and beds at community hospitals.[54] Some pediatric hospitals in the Commonwealth are responding to capacity concerns by expanding, but it is not clear that these expansions will be sufficient to alleviate the strain on these large providers as community hospitals close pediatric services.

Finally, increased concentration of pediatric care into a few large providers has a cost: higher prices and higher overall spending for pediatric care. As Massachusetts patients shift to the largest pediatric provider organizations, commercial spending will increase due to those providers' higher prices and average patient spending, as described in **Section III**. National literature indicates that while average medical spending per patient is lower for pediatric patients as compared with adults, spending grew faster for children than adults between 2016 and 2019.[55] Transferring children from community sites to specialized children's hospitals and AMCs and providing more routine pediatric care in AMCs instead of community hospitals may also contribute to higher spending for pediatric patients.[56] The higher cost of pediatric hospital care at these sites may also create affordability barriers for families, particularly for those with significant cost-sharing, including those enrolled in increasingly popular high-deductible health plans.[57] Consumer-focused incentives for controlling spending, such as cost sharing, are unlikely to be effective, and may create greater burdens on families, in a market where higher-priced pediatric providers are the only options remaining for many types of pediatric care.

54 Gabor D. Kelen et al., *Effect of Reverse Triage on Creation of Surge Capacity in a Pediatric Hospital* 171 Jama Pediatrics (2017), *available at* https://doi.org/10.1001/jamapediatrics.2016.4829.

55 Joseph L. Dieleman et al., *US Spending on Personal Health Care and Public Health, 1996-2013,* JAMA (2016), *available at* https://jamanetwork.com/journals/jama/fullarticle/2594716; Health Care Cost Institute, Children's Health Services 2020 Report (September 2022), *available at* https://healthcostinstitute.org/annual-reports/children-s-health-services-2020-report.

56 *See*, e.g., Gattu et al 2017, *supra* note 49.

57 Alison Galbraith, Marema Gaye, Anna Sinaiko, *The Price of Admission—The Financial Burden of Out-of-Pocket Hospital Costs for Children*, 177 JAMA Pediatrics No. 5 at 456-458 (May 2023) (discussing implications of a study by Carlton et al. finding mean out-of-pocket cost per hospitalization was $1313 and exceeded $3,000 for 14% of hospitalizations, with children in high-deductible health plans having higher out-of-pocket costs per hospitalization).

# V. Next Steps: Promoting affordable access to high-quality pediatric care in a changing and increasingly concentrated market

Massachusetts is a regional, national, and international destination for high-quality advanced pediatric care. However, the concentration of pediatric health care in Massachusetts, including for common conditions, into a few large, specialized, high-cost provider organizations has created affordability and other accessibility challenges for patients and their families. Demographic trends and current market incentives are likely to drive further consolidation of care. Policymakers, provider organizations, and other stakeholders must therefore work together to chart a path that can realize some of the benefits of a more regionalized model of pediatric care while also ensuring access to key services in the community and safeguarding against the risks of higher health care spending, affordability barriers for patients, and inequitable distribution of resources across geographies and demographic groups.

The HPC recommends the following areas of focus for collaboration in achieving these goals:

**1. Define and build consensus around a set of lower-acuity pediatric care that should be available in community settings.** The complexity of certain types of pediatric care, coupled with relatively low case volume, makes it impossible to provide all pediatric services in all locations. However, the closure of community pediatric services has resulted in more routine pediatric care being routed to specialized pediatric providers, increasing costs and barriers to access. Collaboration among patients, provider organizations, payers, and policymakers could build consensus on the types of pediatric care that can safely and effectively be provided in community settings and the types of care that must be handled in more advanced settings like specialized pediatric hospitals and AMCs. While these definitions are likely to change over time as clinical practices and other technology change, greater consensus will allow the state and other stakeholders to engage in health planning activities for pediatrics, including identifying regional gaps in care, assessing whether advanced care resources are being used efficiently, and supporting investments and innovations that promote access to community-based pediatric care.

**2. Enhance data collection and develop outcomes-focused assessments of health disparities.** In order to address geographic gaps in care and population-based inequities, providers and policymakers should enhance and expand upon existing

data collection efforts. In order to assess disparities in health outcomes for children, Massachusetts needs better patient demographic information (race/ethnicity, language, disability status, sexual orientation, gender identity, and more) included in all relevant existing data resources, such as via payer reporting into the Massachusetts All-Payer Claims Database, hospital reporting into the Case Mix dataset, and government data collection via surveys, such as the Behavioral Risk Factor Surveillance System, the Massachusetts Health Insurance Survey, and others. All payers, providers, and government agencies should be required collect the data recommended by the Health Equity Technical Advisory Group of the Executive Office of Health and Human Services Quality Measurement Alignment Taskforce and that compliance be monitored.[58] In addition, the Commonwealth should conduct new data collection efforts, updated on a regular basis, specifically focused on assessing variation in health outcomes for children that allow for assessment using demographic criteria such as race, ethnicity, income level, disability status, sexual and gender orientation, geography, and other factors that might reasonably be related to differential health outcomes.

**3. Expand the use of telehealth, remote consultation, and remote patient monitoring to support pediatric services outside of urban centers.** The Commonwealth's largest pediatric provider organizations already use telephone, video conferencing, patient portals, and electronic health record systems to support their clinical affiliates and patients. Access to these technologies for both providers and patients, including broadband/digital infrastructure, should be further expanded and streamlined in order to overcome barriers to pediatric care for families living far from specialized pediatric hospitals and AMCs. Such expansions have the potential to support routine pediatric care in community settings as well as extend the ability for community clinicians to provide higher-acuity care through consultation with academic specialists.

**4. Constrain excessive provider prices for pediatric care and limit affordability barriers to access.** Prices continue to be a primary driver of health care spending growth in Massachusetts, and there is significant variation in commercial prices for Massachusetts pediatric providers even after accounting for differences in patient acuity. Higher prices for the largest pediatric providers will continue to drive increases in spending as more pediatric patients shift to those providers. Prices for pediatric care tend to be lower for smaller and independent community providers, many of which serve more vulnerable patient populations, including a higher proportion of public payer patients. Lower commercial prices and lower commercial payer mix can result in these community providers struggling to maintain pediatric services that are already expensive to provide relative to services for adults. Because of the level of existing consolidation and highly specialized nature of pediatric services, competitive forces are not likely to meaningfully constrain prices. The Legislature should therefore consider action to restrain price growth for the highest-priced providers in order to ensure consolidation does not continue to increase price and spending variation. Policymakers should also address affordability barriers to care that directly impact families. These include options outlined in the HPC's 2022 Cost Trends Report, such as limiting the ability of outpatient sites to bill as hospital departments and promoting the development of alternatives to high-deductible health plans in order to avoid impeding access and perpetuating inequities. Stakeholders should also moderate the costs of accessing increasingly regionalized care for patients, including both public and private funding for patient transportation to care hubs.

**5. Enhance financial incentives for providing appropriate pediatric care in community settings.** Provider organizations have cited lower patient volumes and revenue margins for pediatric services compared to services for adults as reasons for discontinuing dedicated pediatric services or affiliating with larger provider systems that have greater financial resources. Payers could consider primary care and/or pediatric care sub-capitation or focused rate enhancements for specific services or geographies to support existing providers of community-based services or to encourage providers to fill identified gaps in care. The state could also consider developing special funding mechanisms to promote investments in pediatric clinical workforce development, telehealth implementation, or other initiatives to support access to care.

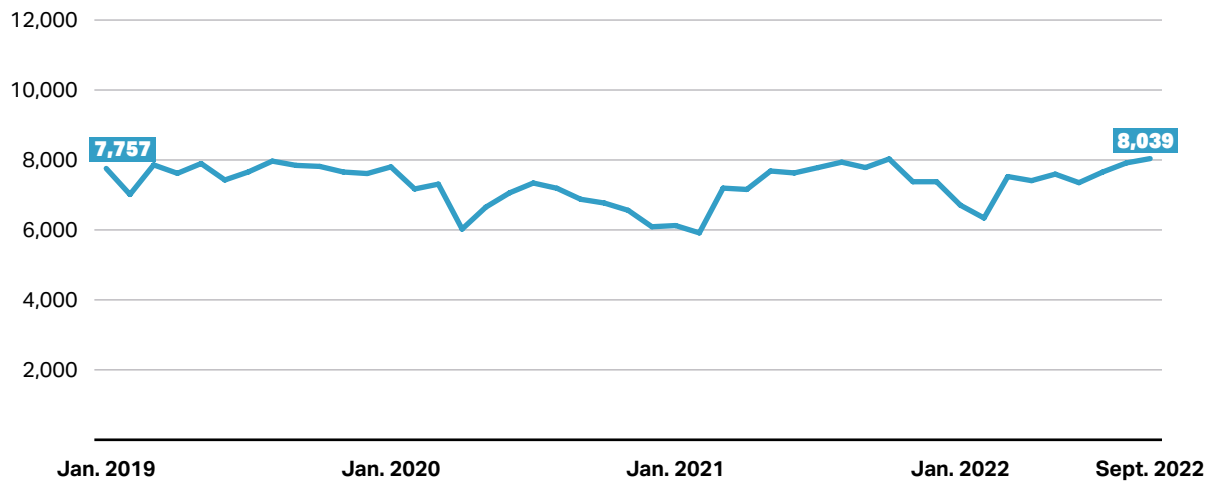
The HPC looks forward to supporting collaborative dialogue to discuss these and other specific, data-driven policy options to foster an affordable, high quality, accessible and equitable system for pediatric care in the Commonwealth.

58 Mass. Exec. Office Of Health & Human Servs., Massachusetts Quality Measure Alignment Taskforce Health Equity Data Standards March 2023 Update, *available at* https://www.mass.gov/doc/eohhs-qmat-health-equity-data-standards-updated-march-2023/download (Last visited July 18, 2023).

# Technical Appendix

## A. Pediatric Hospital Utilization

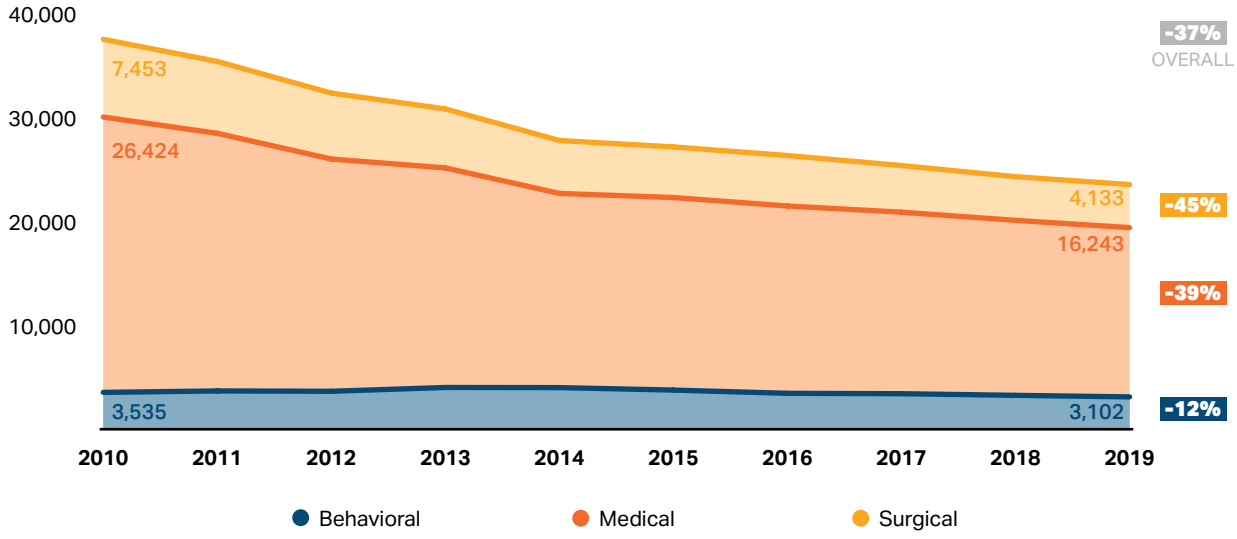
**Figure A.1:** Statewide Pediatric Discharges at General Acute Care Hospitals for 2019 Through September 2022




**Source:** HPC analysis of CHIA hospital discharge databases.

**Notes:** Includes discharges for patients aged 0-17 years. Excludes discharges for patients residing outside of Massachusetts, discharges for rehabilitation or with length of stay longer than 180 days, and transfers. Excludes discharges at Sturdy Memorial Hospital due to missing data.

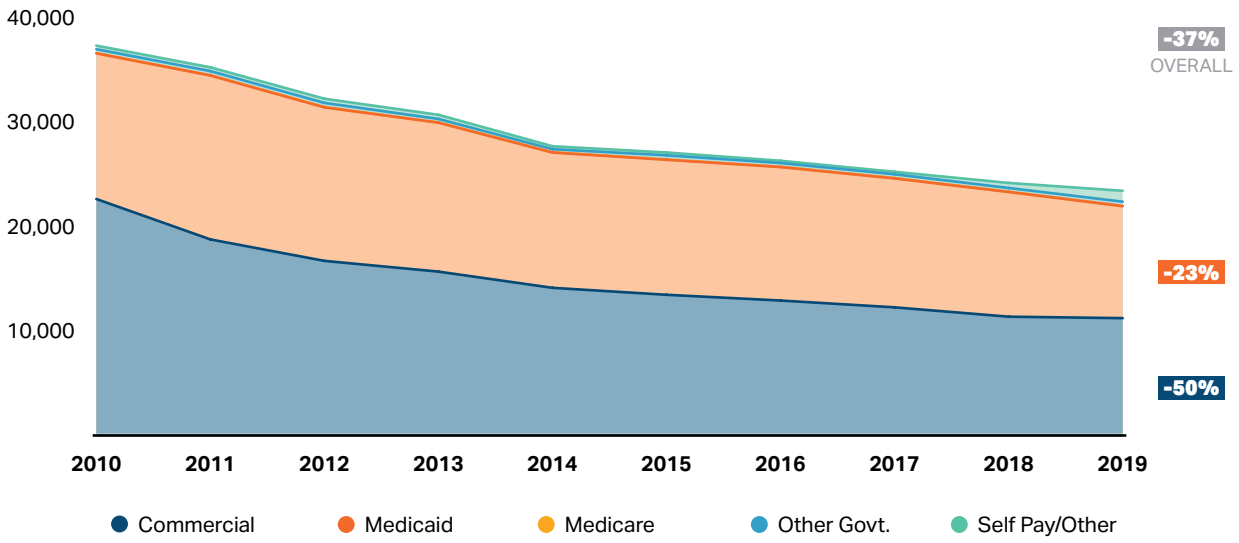
**Figure A.2:** Statewide Pediatric Discharges by Service Type at General Acute Care Hospitals, Excluding Deliveries (2010-2019)




**Source:** HPC analysis of 2010-2019 CHIA hospital discharge databases.

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; and specialty behavioral health and rehabilitation hospitals. Behavioral discharges defined as those with a primary DRG in MDC 19 or 20.

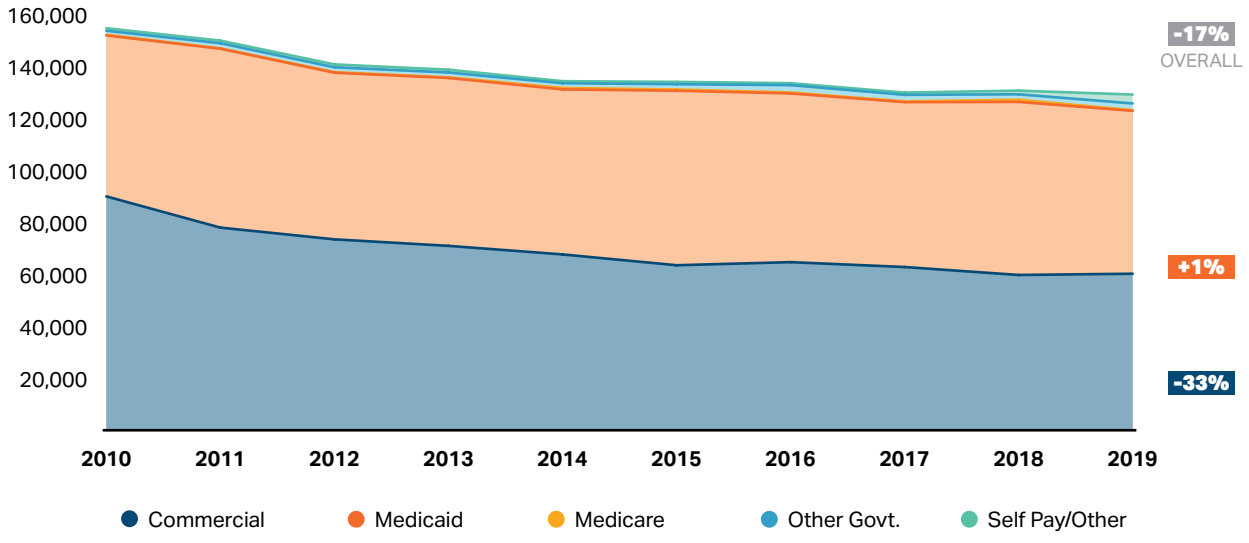
**Figure A.3:** Statewide Pediatric Discharges by Payer Type at General Acute Care Hospitals (2010-2019)




**Source:** HPC analysis of 2010-2019 CHIA hospital discharge database

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; and specialty behavioral health and rehabilitation hospitals.

**Figure A.4:** Statewide Pediatric Bed Days by Payer Type at General Acute Care




**Source:** HPC analysis of 2010-2019 CHIA hospital discharge database

**Notes:** Excludes discharges for patients ages 18 and older; patients residing outside of Massachusetts; newborn, labor, and delivery services; and specialty behavioral health and rehabilitation hospitals

## B. Cluster Price Methodology Description

To examine prices in outpatient service lines, the HPC defined clusters of Current Procedural Terminology (CPT) codes. The CPT Codebook published by the American Medical Association includes approximately 300 clinical categories, which the HPC aggregated into 42 categories that parallel major specialties and subspecialties in clinical care. The HPC then further refined these categories into relevant clusters based on descriptions of the proposed projects and the guidance of clinical experts. We counted all claims from a given provider on the same day for a single patient as a visit so long as they included a facility or non-person professional claim with a CPT within the relevant cluster.

To calculate average prices per service for services in outpatient clusters, the HPC examined prices per visit for outpatient services using the 2018 APCD. We used only claims for BCBS, HPHC, and THP due to greater confidence in data integrity for these payers. Claims paid under global payment arrangements or other non-fee-for-service methods were not included in price calculations. The HPC identified allowed amounts for all facility and professional claims associated with visits by patients under the age of 18 at a given provider for the five highest-volume CPT codes in each cluster. We then divided by the number of facility and professional claims and added the per-visit facility and professional allowed amounts to create a price per visit. Each payer, provider, and CPT code combination with fewer than 3 facility claims were excluded from the analysis, and any remaining instances where a provider had fewer than 20 total facility claims for a given service cluster and payer were also excluded.

For each payer separately, an average cluster price was calculated for each provider by weighting the provider's average allowed amount per CPT code by its facility claim volume for each CPT code within the cluster. An "expected" cluster price for each provider was also calculated by weighting the CPT network average price by the provider's facility claim volume for each CPT within the cluster. The CPT network average price was calculated for each CPT code by weighting each provider's average allowed amount per CPT code by its facility claim volume for the CPT code.

Next, blended all-payer actual and expected cluster prices were calculated for each provider by weighting the provider's actual and expected cluster prices for each payer by its volume of facility claims in the cluster for each payer. Each provider's average actual cluster price was then divided by its average expected cluster price. The resulting ratio was then divided by the average (mean) ratio among all providers in order to calculate each provider's relative price for the cluster.

The methodology described above accounts for different service and payer mixes across providers by comparing each provider's actual prices to an expected price based on each provider's service and payer mix for the relevant service line. Sensitivities comparing providers' average and expected prices using normalized service and payer mixes across all providers yielded similar relative price results.

**Highest-volume CPT codes in each service cluster:**

| Cluster | CPT Code | CPT Code Description |
|---|---|---|
| Echocardiography | 93303 | Echo transthoracic |
| | 93306 | Tte w/doppler complete |
| | 93320 | Doppler echo exam heart |
| | 93325 | Doppler color flow add-on |
| | 93321 | Doppler echo exam heart |
| ENT surgery | 30520 | Repair of nasal septum |
| | 42820 | Remove tonsils and adenoids |
| | 42830 | Removal of adenoids |
| | 69436 | Create eardrum opening |
| | 30140 | Resect inferior turbinate |
| General surgery | 12001 | Rpr s/n/ax/gen/trnk 2.5cm/< |
| | 12002 | Rpr s/n/ax/gen/trnk2.6-7.5cm |
| | 10060 | Drainage of skin abscess |
| | 10120 | Remove foreign body |
| | 44970 | Laparoscopy appendectomy |
| MRI | 70551 | Mri brain stem w/o dye |
| | 72148 | Mri lumbar spine w/o dye |
| | 73221 | Mri joint upr extrem w/o dye |
| | 73721 | Mri jnt of lwr extre w/o dye |
| | 70553 | Mri brain stem w/o & w/dye |
| Ultrasound | 76856 | Us exam pelvic complete |
| | 76870 | Us exam scrotum |
| | 76700 | Us exam abdom complete |
| | 76705 | Echo exam of abdomen |
| | 76770 | Us exam abdo back wall comp |

**Cluster definitions:**

| Service line | Definition |
|---|---|
| **Echocardiography** | CPT codes used were 93303-93355. |
| **Otolaryngology (ENT) surgery** | The HPC defined orthopedic surgery based on the relevant AMA CPT category, but limited its analyses to those visits that include ICD-9 codes that meet the "narrow" surgery flag definition from the Healthcare Cost and Utilization Project (HCUP), defined as "[a]n invasive therapeutic surgical procedure involving incision, excision, manipulation, or suturing of tissue that penetrates or breaks the skin; typically requires use of an operating room; and also requires regional anesthesia, general anesthesia, or sedation to control pain."[59] CPT codes used were 30000-31599, 40490-40899, 41000-41599, 42000-42999, 69000-69020, 69105-69799, 69801-69979, 69990, 92502-92526, 92531-92534, 92540-92548, 92601-92633, 92640, 92700 that meet the "narrow" surgery flag definition from HCUP. |
| **General surgery (narrow)** | The definition of services falling within the category of general surgery may vary broadly depending on the staffing structure and degree of specialization within a given provider organization. The HPC defined a set of general surgery CPT codes with a relatively narrow interpretation of general surgery, representative of services that would commonly be provided by general surgeons even in settings with greater surgical subspecialization. CPT codes used were 10021, 10060, 10080, 10120, 10140-10160, 11008, 11012-11201, 11450, 11462, 11470, 11770-11771, 12001-12004, 12020-12034, 12041-12044, 15850-15852, 19000-19020, 19081-19105, 19120-19294, 19301-19303, 20612, 21920, 21930, 22902-22904, 23065, 23075, 23330, 24065, 24075, 25065, 25075, 27040, 27047, 27323, 27327, 27613, 27618, 36555-36558, 36560, 36561, 36565, 36568-36570, 36571, 36573, 36578-36590, 36595-36597, 38100-38129, 38300, 38500-38505, 38740-38745, 38747-38760, 39503, 43279-43288, 43320-43327, 43330, 43332-43333, 43338-43340, 43400-43405, 43500-43502, 43520, 43605-43641, 43651-43653, 43800-43840, 43850-43880, 44005-44050, 44110-44125, 44130, 44139-44144, 44147-44151, 44160-44206, 44210, 44213, 44300-44312, 44320-44340, 44602-44625, 44680, 44701-44705, 44800-44850, 44900-44970, 45000-45108, 45190, 45300-45320, 45900-45990, 46020-46060, 46080-46261, 46320-46500, 46600-46615, 46705, 46751, 46900-46948, 47001, 47100, 47350, 47562-47564, 47600-47610, 48000, 48100, 49000-49002, 49013-49040, 46062-49084, 49185-49203, 49250-49326, 49402-49407, 49418-49424, 49491-49501, 49505-49572, 49580-49582, 49585-49590, 49600-49611, 49650-49657, 60000, 60280-60281."" |
| **MRI** | Starting with the relevant CT and MRI imaging AMA CPT categories, the HPC further excluded certain codes not commonly used for outpatient diagnostic imaging. CPT codes used were 70336, 70540, 70542-70549, 70551-70555, 70557-71552, 71555, 72141-72142, 72146-72149, 72156-72159, 72195-72198, 73218-73223, 73225, 73718-73723, 73725, 74181-74183, 74185, 75557, 75559, 75561, 75563, 75565, 76376-76377, 76390-76391, 76498, 77021-77022, 77046-77049, 77058-77059, 77084 |
| **Ultrasound** | CPT codes used were 76506-76999. |

59 *See* Surgery Flag Software, Healthcare Cost and utilization Project, *available at* https://www.hcup-us.ahrq.gov/toolssoftware/surgflags/surgeryflags.jsp (last visited Jan. 24, 2022).