



Independent Cost Analysis for:

**Boston Children's Hospital Determination of Need Proposed Project
DoN Application # BCH-20171411-HE**

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I. EXECUTIVE SUMMARY

A. Overview of the ICA Report

1. The Children’s Medical Center Corporation, the sole corporate member of The Children’s Hospital Corporation, doing business as Boston Children’s Hospital (“Boston Children’s” or “BCH”) has filed a Determination of Need (“DoN”) Application for project number BCH-21071411-HE on September 9th, 2021.¹ The DoN Application covers three specific projects (collectively, the “Proposed Project”).
2. With the Proposed Project, Boston Children’s proposes to expand its outpatient facility locations and the services offered at these locations as part of a coordinated strategy to consolidate ambulatory clinical capacity to better serve the needs of its patients and the community. The expansion involves renovation at one existing location and the creation of two additional locations. The capital investments and services include the addition of MRI or operating room (OR) capacity and various services, including new services at three locations (Weymouth, Waltham, and Needham).²
3. As part of the DoN application process, DPH has requested an Independent Cost Analysis (ICA) of the Proposed Project.³ FTI Consulting (FTI) was asked to provide an independent and objective analysis of the Proposed Project and the DoN Application at the direction of DoN program. While BCH has contracted and finances work conducted by FTI’s Center for Healthcare Economics and Policy, their operations and analysis are independent of BCH and BCH has no input into decisions made in this analysis with relation to methods, data, or conclusions; FTI has also conducted the ICA analyses independently of the staff of the DoN program at the Massachusetts DPH. This independent analysis and the ICA Report include assessment and analysis of specific questions and issues about the Proposed Project using and applying relevant standards to data and information.⁴

¹ The Children’s Medical Center Corporation – Hospital/Clinic Substantial Capital Expenditure. Determination of Need application materials received by the Department of Public Health for The Children’s Medical Center Corporation — Hospital/Clinic Substantial Capital Expenditure.” *Commonwealth of Massachusetts*. <https://www.mass.gov/lists/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure>.

² See Section II below for detailed summary of the Proposed Project. One of the locations (Weymouth) involves a new facility into which existing services will be re-located along with new capacity and services. According to the Application, the Proposed Project was designed to ensure it was the most cost-effective approach to achieving the objectives of BCH and the proposed components each depend on the approval of the other components and are non-severable. See, “The Children’s Medical Center Corporation DoN Application No. BCH-20171411-HE Attachments, Substantial Capital Expenditure Ambulatory Surgery Center & DoN Required Equipment Boston Children’s Hospital.” Submitted By The Children’s Medical Center Corporation. July 15, 2021. <https://www.mass.gov/doc/application-narrative-0/download>. (Application Narrative), hereinafter, CMCC DoN Application Narrative.

³ See, Letter to Donna Casey, Vice President, Strategic Business Planning & Analysis & Budget, Boston Children’s Hospital, from Lara Szent-Gyorgyi, Director, Determination of Need, Letter Dated September 9, 2021.

⁴ Specifically, the Boston Children’s Hospital (BCH) has filed a Determination of Need (DoN) Application for which an Independent Cost Analysis (ICA) is being required to assess whether the Proposed Project will be consistent with the health care cost containment goals of Massachusetts. See, “Boston Children’s Hospital Independent Cost Analysis for Determination of Need Proposed Project.” DRAFT January 14, 2021.

4. As detailed further below in Section II A, the main elements to be considered by this [ICA] analysis for the Proposed Project for elements in the Proposed Project that will be new or expanded services, are: (1) [B]ased on this analysis, is the Proposed Project consistent with the Commonwealth's efforts to meet the health care cost-containment goals, including scope and size of any impact; and (2) the effects of the Proposed Project on price and competition for healthcare services (“Price/Competition”); and (3) the effect on utilization of services and the capacity of providers to provide the relevant healthcare services (“Utilization/Capacity”). These ICA questions cover both current and future time frames.
5. FTI was also asked to evaluate specific findings and conclusions in the BCH submissions; and to present these assessments with the major elements in an ICA report along with relevant supporting data and analyses.⁵
6. In conducting its analyses, FTI had access to and made use of extensive data and information, which are summarized throughout this Report and in the Report Appendix. The Report makes use of FTI economist and professional staff experience in healthcare including in evaluating price, competition, capacity, service areas, demand and utilization forecasts, and economically appropriate modeling of healthcare and hospital elements, including outpatient services. The Report’s analysis applies these capabilities to address the specific questions of impact of the Proposed Project on price/competition, utilization/capacity, overarching goals, and consistency with Massachusetts cost containment goals. Empirical work supporting the assessment is presented in the Report and/or the Appendix along with relevant assumptions and methodologies.
7. After applying standard principles of economic analyses and specific requirements of the questions set out in the ICA to relevant data and information, FTI Consulting reached the conclusions and findings set out in Section I B.

B. Summary of Conclusions

8. For convenience, Questions 1-8 below address cost and economic impact questions for the BCH ICA for Determination of Need of the Proposed Project. Question 9 summarizes the responses to specific questions raised by the DPH about statements or questions about the proposed project and findings in the BCH Application (these are detailed in Section XIII).⁶
9. Q1: Is the Proposed Project consistent with the Commonwealth's efforts to meet the health care cost-containment goals? What would the scope and size of any impact be? The

⁵ In conducting our review of the BCH Application, we considered the documents and information provided by BCH or others to the DPH as part of the DoN application process, including publicly available information. The Report or the Report Appendix provide a complete source of data and information in this Report. Among the materials considered were several submissions by BCH to the DPH such as "The Children’s Medical Center Corporation – Multisite, # BCH-21071411-HE Application." Draft, April 4, 2022. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download>.

⁶ “Boston Children’s Hospital Independent Cost Analysis for Determination of Need Proposed Project.” DRAFT January 14, 2021.

Proposed Project offers new services, including MRI, Imaging and ASC services as well as other outpatient healthcare services including at new outpatient satellite locations in regions outside of the immediate Boston area (location of the BCH Longwood facility) and close to large pediatric populations covered by both commercial (private) and public insurance.⁷ The ICA analyses show that BCH gains limited projected share as compared to its alternatives in the defined areas, and the impact on the estimated rate of change in medical spending across services for commercial payers is below 1%. In addition, the new facilities and services provide access in locations and service areas for populations such as those covered by MassHealth.⁸

10. Q2: How (or) will this Proposed Project change utilization at higher- versus lower-priced providers, and what will be the subsequent impact on health care price/spending for commercial and public payers? The ICA analysis applied standard economic methodologies to construct service areas for the new services (e.g., MRI, ASC, and Imaging) and economic modeling to determine the likely sources of shifts of visits to the new facilities. These empirical analyses predict that the Proposed Project will shift utilization from higher priced BCH Longwood campus to lower priced BCH satellites and combines shifts from both higher and lower priced other facilities to these facilities. Modeling of current and future shares of BCH compared to alternative providers for relevant time frames (e.g., 5-10 years from opening of the facilities) inclusive of demand projections, show modest increment in BCH's shares for these services. After estimating relative prices at BCH and other providers, and accounting for demand/supply changes and shifts in sources of care, the impact is a net small increase in medical spending rate for commercial payers. For public payers, the empirical and qualitative analyses support access to services for these populations. Economic analysis of the more specialized services to be added or expanded at a specific BCH location – e.g., partial hospitalization, GI, and sleep services – show similar results.
11. Q3: How will this Proposed Project change price levels for the Applicant's relevant services, and what will be the subsequent impact on health care price/spending for commercial and public payers? Empirical analyses and economic modeling of predicted shifts of volumes for the proposed new services to facilities show that the Proposed Project is predicted to shift volumes and utilization from several sources, including the BCH

⁷ This ICA Report provides empirical and/or qualitative assessment of new services where specific facility capacity is added (e.g., ASC, Imaging, and MRI) as well as for new or expanded services such as partial hospitalization, gastroenterology ("GI"), and sleep services. Each service line is defined by reference to specific CPT codes where feasible and applies methods used in healthcare economics to evaluate relevant questions; these service line definitions are detailed in the Report and in the Report Appendix (see, e.g., Sections VI-X)

⁸ For clarity, the analyses combine data from the CHIA All-Payer Claims Database (APCD) for payers identified either as "Medicaid" or "MassHealth" into a single category, which is referenced in the report as MassHealth/Medicaid. For convenience and brevity, in some tables this category is labeled as "Medicaid" yet is inclusive of any data identified as MassHealth unless otherwise stated. As explained below, however, CHIA data limitations preclude detailed quantitative evaluation of MassHealth ACOs populations; thus, the ICA Report evaluates access to the Proposed Project for such populations using information on MassHealth ACO service areas or other sources.

Longwood (LW) campus to BCH new locations for the services involving expanded MRI and OR capacity - MRI, ASC, and imaging services. Based on analyses of CHIA All-Payer Claims Database (APCD) claims data and supplemented by BCH payments/charges data for BCH's standard charges for top commercial payers, addition of the new BCH locations and their use will tend to shift visits/procedures from higher-cost (BCH LW) to lower-cost BCH locations. The empirical analyses also model additional sources of shifts of volume to the new locations, including from both higher and lower-priced providers. Combined the estimated impact is a low net increase in medical spending for commercial payers. Empirical analyses, including modeling of shifts for populations covered by public payers supports access for the new services for public payer populations located in the service areas of the new facilities.

12. Q4: How will this Proposed Project impact the Applicant's relevant market share (looking at both statewide and at the region levels of service locations) for services and its negotiating leverage, and what will be the subsequent impact on health care price/spending for commercial and public payers? Based on application of standard economic modeling and approaches to service areas, assessment of market shares and concentration measures, and estimated shifts in location of care delivery for the relevant services, the empirical results show the Proposed Project is projected to result in only a small share (increase) change for each of the evaluated services, and for the services in the aggregate. Change in share comes in part from somewhat higher share at new lower cost locations. Shares projected for 2040, which include predicted shifts across providers supplemented by detailed demand projections, also show a small increase in BCH share relative to its alternatives in service areas. Applying these standardized approaches for constructing structural measures of share and concentration, along with an empirical assessment of shares and concentration measures in the service lines and areas with threshold measures from the literature or accepted sources, support a conclusion that Proposed Project is not likely to increase rates for commercial payers due to increased bargaining leverage.
13. Q5: To use as the basis of cost impact of utilization, evaluate the Applicant's calculation for need in the region (looking at both statewide and at the region levels of service locations). Independent analysis of Applicant's need calculations shows that BCH has evaluated its own current utilization patterns by service line, area, and for public and private payers and developed detailed pediatric population estimates for BCH. In addition, the Applicant has set out its basis and assumptions for continued need for services and accounted for the larger populations in regions outside of the immediate Boston area with utilization estimates for these areas, including areas with new BCH locations. FTI conducted independent analyses of population and utilization projections, at the state and region levels of the service locations including payer and population mix and utilization of

BCH and other providers using CHIA data and other data sources. These analyses yield results consistent with the Applicant’s calculations.⁹

14. Q6: Evaluate potential shifts in utilization of services by the patient population, including potential changes from lower cost to higher cost services/providers/provider systems or vice versa as well as potential geographic shift (e.g., urban to suburban). Based on standard economic modeling and methods applied in evaluation of healthcare market changes, FTI developed comprehensive analysis and modeling of demand and patient response to the newly available locations and specific services to evaluate and present empirically based estimates of current and future utilization and shifts in location of care. Among other findings, these show shifts from the BCH LW (and other providers) urban locations to the more suburban locations of the new facilities.¹⁰ The shifts in location do not necessarily imply urban residents shifting to suburban locations, but rather suburban residents choosing new locations that may be closer to their residences. The Report details that there are shifts both from higher to lower cost as well as lower to higher cost facilities; on balance, the net change is small.
15. Q7: Evaluate access to the Proposed Project services by MassHealth ACO participants and/or individuals in subsidized insurance products through the Health Connector Authority (“ConnectorCare products”) as appropriate. Regarding MassHealth, the new locations are projected to serve MassHealth patient populations from their service areas, with shifts from BCH LW as well as from other providers. The demand and utilization analyses indicate that the service areas of each of the new facilities include MassHealth populations. Given the limitations of the CHIA data on ACO and ConnectorCare products, we evaluated access to Proposed Project services by MassHealth ACO participants by using demographic data as well as information on the communities in the current service areas of ACO plans in which BCH participates and by comparing these areas with the service areas of the new BCH facilities. These were shown to overlap substantially, supporting a conclusion of access for MassHealth ACO participants.
16. Q8: If cost increases, who bears the change in cost? Alternatively, if savings are realized, who benefits from the savings? The empirical analyses indicate a low estimated increase in medical spending for commercial payers. Economic and healthcare studies on commercial coverage and healthcare cost trends indicate several different mechanisms by which medical spending increases may affect employers, payers, providers, and enrollees (employees). These show difficulty in assigning with any precision the specific impact on stakeholders and indicate that the potential effects of any increased costs could include increased premiums, out-of-pocket (deductibles, co-pays) and co-insurance, as well as

⁹ Section XIII includes FTI’s independent assessment of these issues.

¹⁰ For clarity, urban locations is used to refer to the immediate Boston metro area, which is the location of several facilities, including BCH Longwood. The term suburban locations are used to refer to the many towns and communities in areas outside of the immediate Boston area; these include many smaller urban areas including those with diverse populations covered by both commercial and public payers.

other factors including sharing of premium costs. Cost increases may result in shorter or longer term impact, depending on specific structures of plans and benefits, and whether and where cost changes are absorbed, and these could affect the impact across entities. This literature also indicates that realized savings can include improved access and benefits of improved outcomes, which may not be reflected in medical spend trends.

17. Q9: DPH questions concerning reimbursements, capacity, patient panel acuity, staffing, and demographics and other specific application questions. Section XIII presents responses to specific DPH questions, including on specific statements in the BCH Application Narrative and the impact of the Proposed Project on patient demographics and access; these do not suggest any inconsistency with the foregoing conclusions.

II. BACKGROUND, ASSIGNMENT, AND QUALIFICATIONS

A. Background on the Proposed Project and DoN and ICA Processes

1. Overview of the Proposed Project

18. The Children’s Medical Center Corporation (BCH) proposes to expand its outpatient facility locations as part of a coordinated strategy to consolidate ambulatory clinical capacity in order to better serve the needs of the community. As noted in the Application, almost 50% of BCH’s healthcare is delivered in outpatient settings (based on 2019 data), and the Proposed Project (as defined herein) was designed to “increase access to highly specialized, complex pediatric care for all Massachusetts residents” including at additional satellite locations such as Needham.¹¹ Additional submissions by BCH to the DPH provide further information on these facilities and responses to more detailed questions on new services or facilities.¹²
19. The expansion will involve three locations – renovation at one existing location and the creation of two additional locations. The project was designed, according to statements in the Application, to ensure it was the most cost-effective approach to achieving the objectives of BCH. The proposed components each depend on the approval of the other components and are non-severable.¹³

¹¹ “The Children’s Medical Center Corporation DoN Application No. BCH-20171411-HE Attachments, Substantial Capital Expenditure Ambulatory Surgery Center & DoN Required Equipment Boston Children’s Hospital.” Submitted By The Children’s Medical Center Corporation. July 15, 2021. <https://www.mass.gov/doc/application-narrative-0/download>. (Application Narrative). Hereinafter, CMCC DoN Application Narrative.

¹² See also the responses of BCH about expanded or new services and “The Children’s Medical Center Corporation – Multisite, # BCH-21071411-HE Application.” Draft, April 4, 2022. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download>. (The Children’s Medical Center Corporation – Hospital/Clinic Substantial Capital Expenditure – Responses II) These responses address detailed questions on MRI, Imaging, and ASCs, and provide further information and responses, for example, with regard to GI at Needham, and the partial hospitalization and sleep services at Waltham.

¹³ CMCC DoN Application Narrative. In conducting our review of the BCH Application, we considered the documents and information provided to the DPH, including publicly available information. The Appendix provides a listing of documents and materials; and we include by reference any cited in this Report. With regard to the Weymouth facility,

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20. As detailed in the DPH ICA request, the proposed project includes capital investments and services, including new services at three locations and specifically involve requests for approval for services and facilities at Waltham, Needham, and Weymouth. The planned operating room and imaging capacity expansion and expected patient volumes for these and related locations are summarized in the table below, provided as part of the application.¹⁴

2.3 Complete the chart below if there are changes other than those listed in table above.						
Add/Del Rows	List other services if Changing e.g. OR, MRI, etc	Existing Number of Units	Change in Number +/-	Proposed Number of Units	Existing Volume	Proposed Volume
+ -	Waltham OR	6	0	6	471,559	499,474
+ -	Lexington OR	4	-4	0	186,242	0
+ -	Needham OR	0	8	8	0	584,571
+ -	Longwood OR	24	0	24	2,766,251	3,300,702
+ -						
+ -	Longwood MRI	8	0	8	169,511	193,369
+ -	Peabody MRI	1	0	1	10,259	11,857
+ -	Waltham MRI	1	0	1	41,139	20,570
+ -	Needham MRI	0	1	1	0	14,500
+ -	Weymouth MRI	0	1	1	0	14,500
<div> Add additional Facility Delete this Facility </div>						

21. The proposed capacity or equipment to be added includes ORs and MRIs. As noted in the Application, “the day surgery programs planned for the Waltham Facility and the Needham Facility are part of a single coordinated plan to better address the unique surgical needs of pediatric patients. The Waltham Facility and the Needham Facility will increase accessibility for Metro West HSA patients¹⁵, but also for patients residing in the surrounding HSA regions given the locations along major transportation corridors. These settings will reduce barriers for patients and their families and improve access to the Applicant’s specialized pediatric services. The Proposed Project will add two MRI units in HSA 4, which accounted for a third of the Applicant’s MRI encounters in 2019.”¹⁶ Location of the new facilities, according to the Application, are designed in part to increase convenience for all patients including those in underserved communities.

a new location is proposed for consolidation of current and proposed services. “Such diagnostic and therapeutic hospital services will be co-located with physician office space that will house offices relocated from 541 Main Street in Weymouth, the lease for which space is expiring in 2024.”

¹⁴ Massachusetts Department of Public Health: Determination of Need: Change in Service (dated 7/15/2021 6:44am)

¹⁵ HSAs are defined by the state; FTI undertook independent development of zip code and crosswalks to these HSA and to evaluate data on utilization of pediatric services by populations in HSA or other areas. See Appendix for further detail.

¹⁶ See, e.g., DoN Application No. BCH-20171411-HE Attachments: Substantial Capital Expenditure Ambulatory Surgery Center & DoN Required Equipment Boston Children’s Hospital Table 2, page 11 provides Ambulatory Visits, Ambulatory Surgeries, and MRI Encounters for Massachusetts residents at BCH facilities in FY 2017 – FY 2019. As detailed below these were compared with data/information from the CHIA data for overall patient populations for these services and used in comparing BCH utilization and FTI estimates from the CHIA data. FTI also evaluated additional responses by BCH to DPH questions; see, e.g., BCH Response II, April 4, 2022, and conducted independent analysis of patient populations using Census data or other sources as detailed herein given CHIA data limitations.

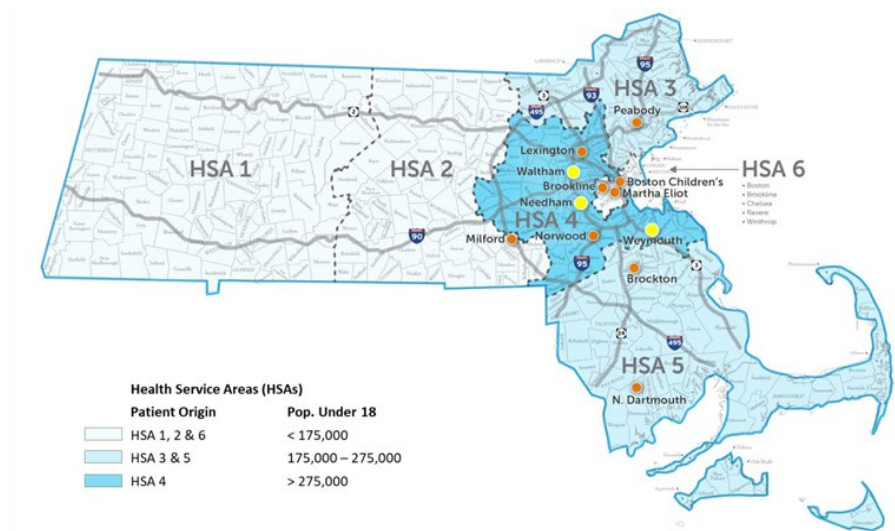
22. For convenience, this section summarizes the three facilities and the proposed changes, which form the main elements of the Proposed Project.
23. **Waltham** – The proposed project for Waltham location includes renovation and equipping of 78,395 gross square feet of space within the Hospital’s existing Waltham facility at 9 Hope Avenue, Waltham, MA 02453 (the “Waltham Facility”) “and the expansion of clinical areas including existing infusion, sleep disorders, radiology, and behavioral health services, including the establishment of a medical-psychiatric partial hospitalization program.”¹⁷
24. The Hospital currently operates clinically integrated programs in multiple locations and across the continuum of care from inpatient psychiatric and psychiatric emergency care to community-based acute treatment (“CBAT”), outpatient programs, and school-based programs and supports. At the Waltham Facility, the Hospital currently operates outpatient behavioral health programs, a CBAT program, and will be adding a 12-bed inpatient adolescent and pediatric psychiatric unit subject to previous approval. To further meet the needs of patients and families, the Proposed Project will allow the Hospital to add a med-psych partial hospitalization program at the Waltham Facility. The program will provide pediatric patients with intensive behavioral health services during the day and allow patients to return home in the evening, enhancing the Applicant’s continuum of care for behavioral health.
25. The Proposed Project, according to the Application, will also facilitate expansion of pediatric sleep services for the only pediatric sleep program in New England, addressing the need for a child in the Commonwealth to drive as far as 94 miles for sleep medicine care as reported by the American Academy of Pediatrics. As the Bailit Report notes, up to 50 percent of children have a sleep disorder, and the Proposed Project will provide greater access pediatric sleep services to communities that typically have limited access to such care.¹⁸
26. **Needham** - The Needham location would involve acquisition, construction, fit-out, and equipping of an approximately 224,000 gross square foot facility zoned for pediatric medical use at 380 First Avenue in Needham, MA 02492 (the “Needham Facility”) to

¹⁷ As noted in the Application and supporting materials: “In addition, the planned med-psych partial hospitalization program is envisioned to treat conditions such as somatic symptom and related disorders, eating disorders, and chronic medical illnesses (diabetes, seizures, etc.) complicated by psychiatric conditions like depression, anxiety, or non-adherence (commonly experienced by youth ages 12-17 years).” The Children’s Medical Center Corporation DoN Application No. BCH-20171411-HE” Substantial Capital Expenditure Ambulatory Surgery Center & DoN Required Equipment Boston Children’s Hospital; submitted July 15, 2021 (hereafter, “CMCC DoN Application”) See “Application Narrative” at <https://www.mass.gov/lists/the-childrens-medical-center-corporation-hospital-clinic-substantial-capital-expenditure>.

¹⁸ Bailit Health. Recommendations for Boston Children’s Hospital’s 2021 DON Application. March 22, 2021. FTI’s evaluation of the Proposed Project focuses on empirical assessment of the proposed new services of MRI, imaging, and ASC services, which represent the major sources of capital and service expansion at the new facilities. FTI also analyzes the impact of the Proposed Project’s services at the Waltham facility, including the development of a new partial hospitalization program and sleep services, using available data and information.

include eight operating rooms (“ORs”) dedicated to ambulatory surgery services, as well as hospital outpatient space to include phlebotomy, physical and occupational therapy, ophthalmology, and diagnostic radiology, including one magnetic resonance imaging system (an “MRI”);¹⁹ The proposed capacity or equipment to be added at Needham includes 8 ORs and 1 MRI as well as other imaging and related services. The Proposed Project will expand availability of outpatient services and add specialized gastroenterology (“GI”) services with the addition of the Needham Facility and seeks to address current lag times for these and other services. Specifically, BCH proposes specialized services and teams to provide specific outpatient GI services at the new Needham location.¹⁹

27. **Weymouth** - This project would include leasing, construction, fit-out, and equipping of approximately 33,862 gross square feet within a building located at 200 Libbey Parkway in Weymouth, MA 02188 (the “Weymouth Facility”) to accommodate diagnostic and therapeutic hospital services including audiology, speech therapy, vision function testing, phlebotomy, echocardiography and radiology, including one new MRI.
28. New or expanded facilities are located primarily in HSA 4 or in HSA 6, which are depicted on the BCH map in the Application and shown below. FTI’s analyses show that the service areas of the new facilities are broader than HSA boundaries, due to the broad scope of patient populations already served or projected to be served by these facilities.²⁰



29. As detailed below, FTI also conducted an independent review and evaluation of BCH’s analyses of current and projected demand, demographics, utilization, and estimated need

¹⁹ See, e.g., BCH Response II, April 4, 2022 for more detailed description of services; and the Application Narrative. The proposed GI services include new services intended to provide improved access for patients including those in the area served by Needham, and underserved populations. FTI conducted independent analysis set out below of the potential impact of these expanded services at the new Needham facility on relevant cost containment goals.

²⁰ See, Section VII below for a more detailed description of FTI’s methodology for defining service areas.

for the proposed projects that were set out in the Application Narrative, supporting documents, and BCH’s responses to DPH questions.

B. The DoN and ICA Process

30. This Independent Cost Analysis Report (ICA Report) is conducted “[P]ursuant to M.G.L. c. 111, § 25C(h), the Department of Public Health (Department) will require The Children’s Medical Center Corporation to commission an Independent Cost Analysis (ICA) for Determination of Need (DoN) Application # BCH-21071411-HE.”²¹
31. As part of the DoN process: “[T]he department may also require the applicant to provide an independent cost-analysis, conducted at the expense of the applicant, to demonstrate that the application is consistent with the commonwealth’s efforts to meet the health care cost-containment goals.”²² As detailed below, this Report includes a review of cost containment goals and methodologies.
32. The DPH request letter specifically identified the key areas of analyses for this Report, including the specific questions which are set out below in Section III A.

C. Assignment and Qualifications

33. FTI was tasked to provide an independent analysis of specific questions and issues set out in the request for ICA about the Proposed Project, and to apply relevant standards and criteria to relevant data and information. We were also tasked to respond to specific requests to evaluate and validate or verify specific findings and conclusions in the BCH Application. We were asked to prepare this report and provide supporting data and information and analyses. These data sources are included in the text of the report and/or in the appendix.
34. This report was prepared by senior economists, Jeremy Nighohossian, PhD and Managing Director, and Margaret Guerin-Calvert, President and Senior Managing Director of FTI’s Center for Healthcare Economics and Policy, a business unit that specializes in healthcare economics and applied microeconomics. They were supported by Center staff experienced in healthcare analyses, including assessment of service areas, pricing and competition, capacity and utilization, and predictive modeling of changes in healthcare markets. Dr. Nighohossian and Ms. Guerin-Calvert have extensive experience in the relevant issues, healthcare and competition research, economic modeling, and data and data analytics applied in this Report, including in expert reports, testimony, or matters before or on behalf of state and federal agencies.

²¹ Letter from Lara Szent-Gyorgyi to Donna Casey, 9 September 2021. See “ICA Request Letter” at <https://www.mass.gov/lists/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure>.

1. ²² 105 CMR 100.405 (D)

III. OVERVIEW OF ICA ASSESSMENT – FTI'S ECONOMIC ANALYSES AND METHODOLOGY

A. Overview of ICA Assessment Issues

35. Boston Children's Hospital filed a Determination of Need (DoN) Application to the Massachusetts Department of Public Health (DPH) for a project (Project BCH-20171411-HE) in which BCH proposes to build two new facilities and repurpose another in order to expand the services that BCH currently provides.²³ The services under consideration for the new additions to the BCH system would include only outpatient services, and would include the addition of two new Operating Rooms, two new MRI machines and a range of outpatient services. The total value of the Proposed Project is \$435 million.²⁴
36. The DPH has required that BCH hire an outside group to conduct an Independent Cost Analysis (ICA) to assess several aspects of BCH's proposal including whether the project is consistent with the state's cost containment goals. BCH has contracted the Center for Healthcare Economics and Policy (CHEP), a segment within FTI Consulting to conduct the ICA, in consultation with DPH. While BCH finances the analysis conducted by CHEP, CHEP's analysis and operations are independent of BCH and BCH has no input into decisions CHEP makes in this analysis with relation to methods, data, or conclusions.
37. The questions set out by the DPH are organized around four main categories and a general category: Price/Competition, Utilization/Capacity, Overarching, and Project-Specific. These categories include general/overview questions on impact of healthcare cost containment goals; specific questions on utilization, pricing, market share, shifts in volume, changes in demand and detailed questions on the Proposed Project.
38. **General Questions:** Based on this analysis, is the Proposed Project consistent with the Commonwealth's efforts to meet the health care cost-containment goals? What would the scope and size of any impact be?
39. **The Price/Competition questions** seek to assess how the Proposed Project could potentially change the prices paid by private (e.g., commercial) and public payers. Potential price changes can come from three sources: actual changes in the level of price for each facility, migration of patients between facilities (within the same system) with differing price levels at the facilities, and migration of patients between providers with differing price levels. This Report evaluates each of these sources and estimate effects for all three sources for prices as well as overall costs/medical spending.
40. The **Utilization/Capacity** questions seek to confirm that BCH's projections of demand are reasonable, to evaluate and characterize the demographics and characteristics of that

²³ As part of the Proposed Project, BCH would close 4 ORs at Lexington.

²⁴ BCH DoN Application, Section 12, p 4.

demand, and to assess how subsidized insurance plans might be affected by the Proposed Project. These include several broad questions on populations and access.

41. The questions described as **Overarching Questions** seek to determine which group or groups bears the costs or realizes the savings that are estimated or determined: BCH, payers, patients, or employers.
42. The **Project-Specific** questions are ones that may be answered in the course of answering the other questions yet include request for specific outputs so that DPH can make comparisons and verifications. These questions include reporting differences in prices among different providers, shifts among specific types of providers, and the payer mix should the application be granted. Several of the questions specific to the Proposed Project are set out and addressed in Section XIII.
43. For completeness in Section XIII, the ICA Report considered questions of the impact of the Proposed Projects on current and post-project patient panel race/ethnicity breakdown; effect on patient panel acuity level; effect on staffing/recruitment; and accessibility of the project to members of MassHealth ACOs and subsidized ConnectorCare plans.

B. Economic Analysis Used in the ICA Report for Addressing Questions

44. Projecting healthcare costs into the future is a challenging exercise even without considering proposed changes in the supply of those services – such as new locations or new capacity. Many factors are necessary to incorporate into any such analysis as many factors interact with each other simultaneously to produce prices and volumes and their consequent costs.²⁵
45. Healthcare cost (or medical spending) projections can be decomposed into two core parts: prices and volumes. The approach taken in this Report is to consider each element of price and volume (e.g., visits, encounters, patients) separately, beginning by characterizing each using current data, and then projecting them forward in a *status quo* environment. Then, for both prices and volumes/utilization, the Report uses standard economic and quantitative methods used in healthcare to predict how each would be affected by the specific changes in supply (e.g., new access points and capacity for services) that have been proposed by BCH in the Proposed Project.
46. The starting point for the cost analysis is to identify the service lines to be included in the ICA analysis and to set out how these service lines will be defined for purposes of the economic and quantitative analyses. The service lines will include those identified by BCH in the DoN application for each facility with new or expanded capacity (e.g., MRIs). These service lines are defined using standard approaches applied in the evaluation of healthcare markets and consumer choice for outpatient as well as inpatient services. Section VI

²⁵ Moreover, predicting future prices and volumes are complicated by factors such as changes in supply as well as changes in demand.

provides further discussion and detail on the specific service line definitions and data used in this analysis. We note that the full range of economic analyses were able to be conducted for ASCs, Imaging, and MRI services, where sufficient data as well as measures of both capacity and projected volumes were available. Additional analyses, empirical to the extent possible and otherwise qualitative, were conducted for services such as the new partial hospitalization service line (at Waltham), and expanded sleep services (at Waltham), as well as for GI services to be added at Needham. For convenience, these service line analyses and the findings from them are presented in Section XIV and summarized in the conclusions.

47. Once service lines have been defined, the FTI analysis narrows down the universe of potential patients to only the services relevant to the Proposed Project to characterize and assess the current market for those services. Using data provided by CHIA, this approach to estimating utilization of services by patients determines the volumes associated with each service and the demographic breakdown for the state, by region, by facilities, and by payers. Sections VII, VIII and IX include description of FTI's standard methods as well as data analyses relevant to utilization and volumes by service line for these various analyses.
48. The ICA questions involve economic evaluation of current demand, as well as demand and utilization in the future, after the construction and opening of facilities among other factors. Section IX uses population projections provided by Massachusetts to project forward how volumes (utilization) are expected to evolve for each identified service line, both overall and by payer category from current levels. Projections are provided both for short term (5 years) and long term (10-15 years). The time frames for projections will use as their starting point the most recent utilization data available. This section (and others) will also evaluate projections of demand set out in the Application or BCH responses for reasonableness, and to address any specific qualitative factors that may not be reflected in current data.
49. Section IV sets out the methodology that FTI used to evaluate extensive CHIA claims data to identify the providers of each service, and where they are located. BCH may have multiple locations providing services and these are identified along with non-BCH providers offering those services. Analyses included comprehensive assessment of service lines, and service areas, and information on the proposed locations relative to current locations of both BCH and other providers. The FTI analyses will use these current locations, combined with any proposed locations for the specific services and apply econometric choice modeling to project the facilities patients will use now and after 10-15 years. The proposed facilities will be added to the choice sets of patients in order to project patient volumes at each new and current facility. These volumes will then be used to project market shares in defined geographic areas for each service. This section will also take into consideration any additional changes in utilization in the service areas, by facility, or by payer due to the population growth and utilization estimates derived in Section IX.
50. Section XI sets out the detailed analyses of pricing including at the service line and provider level, with the focus on commercial prices. For prices, while current prices will be determined for each service as defined, prices will further be determined at the facility

level. Prices will then be projected forward in an ‘under current conditions’ scenario. Then, any adjustments to prices will be considered and made after taking into account projected changes in shares and HHI using economic research that relates concentration to prices.

51. With projected prices and projected demand complete, these will be combined to project the total projected costs by each service line and in each location. These analyses and results are presented in Section XII and Section XIV.
52. As part of the ICA analysis, as requested, FTI conducted an independent assessment of BCH’s estimated calculations for need in the region or state, including its calculations of patient population, utilization of BCH outpatient services (e.g., ambulatory visits, ambulatory surgery, and MRIs), and estimated potential shifts in location of care. The FTI assessments are provided in each of the relevant sections and include assessment of the reasonableness of BCH projections and changes in demand.
53. Finally, Section XIII includes analyses of specific questions related to the Proposed Project and impact on patient panels or access. Section XIV provides the qualitative and empirical assessment of three service lines (partial hospitalization, sleep services, GI).

C. Overview of Commonwealth’s Cost Containment Goals and HPC Analyses

54. The questions that the ICA report seeks to address based on the DPH’s request is whether the Proposed Project is consistent with the Commonwealth’s efforts to meet the health care cost-containment goals . Sections VI-XII of this report presents the analytical framework and the empirical results that assess the Proposed Projects in the context of the HPC’s cost-containment goals.
55. The starting point for FTI’s independent analysis as examination of the HPC’s current statewide target benchmark for growth in total health care expenditures (THCE), which is 3.1%. This benchmark is equal to the potential gross state product (3.6%) minus 0.5 percent. Change in *THCE per state resident* is calculated using “health care spending by individuals (e.g., co-payments, co-insurance, and insurance deductibles), health insurers (e.g., claims, administrative expenses, incentive payments), the state (e.g., MassHealth), and the federal government (e.g., MassHealth and Medicare).”²⁶
56. At the state-level, since THCE is tracked on a per capita basis but unadjusted for health status, changes in population health, but not size, could drive changes in THCE at the state level. Given its focus on policy that can influence the healthcare system, HPC focuses more on factors that can be influenced by policy or market participant behavior (e.g., prices, supply-induced demand) versus external factors (e.g., shifts in underlying health status or the aging of the population).

²⁶ Massachusetts Health Policy Commission. 2021 Cost Trends Report. Sept. 2021. <https://www.mass.gov/doc/2021-health-care-cost-trends-report/download>.

57. While FTI conducted its own independent analysis, we examined recent reports from HPC on cost growth to consider the factors that HPC has identified as influencing actual trends, modes of conducting empirical analysis of cost trends and spending growth and results. By way of additional background, we considered underlying trends that may influence changes independent of a specific project. The HPC indicates in their 2021 report that recent healthcare spending growth has been driven primarily by an increase in prices. Based on their methodology and estimates, from 2015 to 2018, HPC estimated that more than 50% of spending growth from the three largest insurers in Massachusetts was estimated to have been due to changes in price (both changes in unit price and changes in provider mix).²⁷ In addition to price, growth in volume of services was also a key driver in higher spending. Hospital outpatient spending per commercial enrollee increased by 7.6% in 2019 driven largely by an increase in the number of visits. The HPC also noted that “more than 70 percent of the growth in hospital outpatient visits occurred among academic medical centers which are generally higher priced than other hospital types, contributing to price growth through changes in provider mix.”²⁸
58. In reviewing Determination of Need Applications and associated ICA reports, the HPC appears to focus primarily on commercial price and revenue impacts per year, such as in its recent review of Mass General Brigham (MGB) DoN application and the associated ICA report. We reviewed this HPC report solely to evaluate the methods and approaches used by HPC. In that review, HPC's yearly projections focused on the expected commercial revenue gain by Applicant, commercial revenue loss by other providers, and the net commercial spending impact.²⁹ To arrive at these estimates, the HPC noted among others relevant mechanisms for potential spending impact:
- Patients using/filling capacity at new locations, which the HPC notes includes diversion from the hospital and volume from other (potentially lower cost) providers,
 - Demand at existing hospital locations (adjusted for predicted acuity), where there is no accompanying plan to reduce capacity at other locations; and
 - Estimated increased prices that may be associated with increased market share.³⁰
59. We note that in reviewing Determination of Need applications, past HPC comments include empirical analysis of expansions of providers, with examination of whether expansion may shift commercial revenue away from providers that serve more MassHealth/Medicaid and historically underserved patients. These shifts could, according

²⁷ Ibid.

²⁸ Ibid.

²⁹ Health Policy Commission. Mass General Brigham Incorporated Determination of Need Applications - Massachusetts General Hospital # MGB-20121612-HE, Brigham and Women's Faulkner Hospital # MGB-20121716-HE, and Multisite # Multisite-21012113-AS Independent Cost-Analysis Comment, January 25, 2022.

³⁰ Ibid. The HPC also considered, but did not model expressly, the impact of outpatient expansion on increased referrals or inpatient utilization at the Applicant's hospitals and the relevant pricing impact of diversion if any from other providers. The HPC noted that it measured impacts in both absolute amounts and percent changes to attempt to compare the extent to which increases in one area may or may not be offset by decreases in another.

to HPC comments, exacerbate health disparities because they potentially reduce resources at facilities that serve communities with higher social needs. One of the stated HPC policy recommendations is to “enhance scrutiny and monitoring of provider expansions and ambulatory care,” particularly for higher-priced providers, because such expansions can negatively impact both cost and health equity.³¹

60. As addressed further below, the magnitude of the capacity additions or the new programs or additional services at the BCH facilities in the Proposed Project appear to involve relatively small capacity and patient volumes – that is, total expected incremental patient volumes and shifts are relatively small. Some of the increased volumes at the new facilities located outside of the immediate Boston area include shifts from BCH facilities, including Longwood, and involve both MassHealth/Medicaid and commercial volumes. In addition, the new capacity, facilities, and services are located in areas that include lower income and underserved populations and would enhance rather than detract from access. These factors suggest that Proposed Project would not tend to exacerbate health disparities and could increase rather than reduce resources at facilities to serve communities.

IV. DATA SOURCES AND RESTRICTION OVERVIEW

61. The ICA requirements and request for the FTI ICA Report involved use of several datasets and data sources for empirical analyses of the specific questions and issues. These included claims data as well as demographic, health, capacity, and trend data. For convenience, we summarize the key data sources and information used, and reference or cite to the specific data source in each of the sections or analyses below; a complete summary is provided in materials relied upon in the Appendix.

V. HEALTHCARE DELIVERY FOR PEDIATRIC SERVICES IN MASSACHUSETTS

62. To provide context for evaluation of the Proposed Project and the ICA questions, and especially to support the required empirical analyses of specific service lines, FTI conducted independent research to develop data and information on the provider alternatives available for pediatric patients in Massachusetts in settings such as hospitals and outpatient locations for ambulatory surgery services, MRI/CT and imaging, or other services offered or to be offered by the BCH outpatient locations.
63. As in many states, providers of inpatient and outpatient pediatric services in Massachusetts include both specialized healthcare providers and other providers such as community hospitals or outpatient facilities that provide some pediatric inpatient or outpatient services although usually at lower scale and/or for less acute care.³² In Massachusetts, there are very

³¹ Massachusetts Health Policy Commission. 2021 Cost Trends Report. Sept. 2021. Available at: <https://www.mass.gov/doc/2021-health-care-cost-trends-report/download>.

³² See Bailit Health. Recommendations for Boston Children’s Hospital’s 2021 DON Application. March 22, 2021. Pediatric services in Massachusetts as in other states also are differentiated from adult healthcare services by their higher proportion of Medicaid, including managed or capitated care models. <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-020-05409-w>.

large numbers of entities providing outpatient services to pediatric patients for a wide variety of outpatient services. FTI conducted independent research on the hospitals and outpatient locations that provide pediatric healthcare services in Massachusetts to supplement and complement information in the Application including CHIA data and other data sources, which are detailed in the Appendix.

64. The research identified six health systems with specialized facilities, including stand-alone children’s hospitals, full-service children’s hospitals located within the same campus or facility as the health’s systems tertiary hospital campus, or specialized pediatric departments. These systems have both hospital-based (inpatient and outpatient) and outpatient locations. The CHIA outpatient data include vast numbers of individual providers of pediatric services in the relevant service lines; with many having small numbers of patients in the relevant service lines. While each analysis in this report makes use of data on all providers of the relevant services lines, for consistency in reporting across the tables and maps we include these six health systems and their hospitals/facilities for reporting of results of analyses of pricing, share, and services: Baystate, Boston Children’s, Boston Medical Center, MassGeneral, Tufts, and UMass.³³ For consistency in reporting and exposition, where possible the tables or maps also identify the “children’s hospital” or the main pediatric facility for each of these entities although not all may be commonly known as traditional children’s hospitals. Moreover, for convenience in exposition, we refer to these as “children’s hospitals” or health systems with “children’s hospitals”.³⁴
65. FTI research included detailed examination of each of these health systems’ inpatient and outpatient facilities including review of the health system websites to develop information on their locations, types of services and outpatient facilities for each of these health systems. For example, several of these health systems provide pediatric MRI/imaging services or ASC services and networks of outpatient and physician centers with wide range of services; some (e.g., Baystate) offer partial hospitalization services. As detailed in the Appendix, FTI worked extensively with the CHIA outpatient data to identify the specific locations and entities associated with each. These providers are differentiated and not all provide all services to pediatric patients; moreover, there is change ongoing in the marketplace. This ICA Report recognizes that one of those changes is the announcement that Tufts Children’s Hospital inpatient pediatric beds would be closed (and converted to adult beds), with continuation of some of Tufts’ outpatient pediatric services. Analyses of

³³ The tables include all other providers in the reported results of analyses; although for relevant service lines, these are reported as “Other” or “All Other” because these individual providers have low volumes and often less than 1% share in a service line. The economic analyses account for the alternative provided by these entities.

³⁴ These facilities and health systems, for example, are designated as locations to which pediatric patients can be referred or transferred after stabilization at the emergency department of a local hospital “Children and their families of both Massachusetts and surrounding states are fortunate enough to have six renowned children’s hospitals strategically located across The Commonwealth.” <https://www.mass.gov/service-details/hospitals-for-children-in-massachusetts>.

the Proposed Project’s outpatient services do not make any projections based on the proposed closure.³⁵

VI. OVERVIEW OF SERVICE LINES METHODOLOGY AND ANALYSES

A. Summary of Methodology – Use of Service Lines for Analytical Framework

66. In order to evaluate the impact of the Proposed Project on overall costs, this report examines the specific services to be provided by BCH locations. The ICA Report request specifically asked that we address new services offered (e.g., MRI and imaging services and ASC services).
67. Service line definitions are used to reference the overall type or category of service provided. Even within a service line, there is some differentiation (e.g., sedated MRI) of services. Typically, service lines involve analyses that measure utilization historically, as some service lines are low-volume and may not be demanded each year at a specific facility. For the same reason, service line definitions for empirical analyses in healthcare tend to use defined sets of CPT codes for the category of service. That is the approach taken here by FTI – to use standard service line definitions and CPT codes for use with the CHIA (or other) claims data. This provides for consistent approaches and the ability to compare service lines across facilities (within a system or across systems) and across time.

B. Definition of Service Lines Used in the ICA Economic Analyses

68. Service lines used in this analysis include MRI, all imaging and ASC services. The all-imaging services is inclusive of MRI, CT, ultrasound, and all other imaging services. The corresponding CPT codes are provided in the Appendix. These service lines cover the proposed new or expanded outpatient service lines at BCH new facilities (e.g., Needham) and where new capacity is added, and thus are used for purposes of economic analyses of demand, supply, and shifts in demand/utilization with changes in supply. FTI considered the relevant service lines identified by BCH and concluded those detailed in this report are consistent with them and provide a sound basis for addressing the ICA questions.³⁶
69. A complete definition of each service line used in the analysis, including specific CPT codes defining the service line, is provided in Appendix. CPT codes and service lines make possible the use of CHIA or other claims or volume data and provide comparable metrics across different data sources and providers. We evaluated codes and service line definitions in other ICA or HPC analyses for MRI, imaging, and ASC services and concluded FTI

³⁵ See, e.g., <https://sites.tufts.edu/chsp/2022/04/08/end-of-an-era-the-closing-of-tufts-childrens-hospital-putting-inpatient-pediatric-care-in-context/>.

³⁶ These services include: Outpatient (Ambulatory) Surgery - Includes all relevant surgeries contemplated in the DoN application (medical subspecialties, anesthesia, dental, ophthalmology, orthopedic/sports, otolaryngology, plastic, general surgery, and urology). Imaging – Including diagnostic and interventional for ultrasound, MRI, and fluoroscopy (not CT). See, “# BCH-21071411-HE. The Children’s Medical Center Corporation.” October 8, 2021. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses/download>. (The Children’s Medical Center Corporation – Hospital/Clinic Substantial Capital Expenditure – Responses).

CPT codes are fully consistent and representative of the new service lines or capacity in the BCH projects in these services. We examine data on each service line at an existing BCH outpatient location and its capacity, and independently developed service area analyses to evaluate demand for services, and supply to an area by BCH and/or other providers.

70. In addition to these three service lines, to the extent possible, more detailed empirical and qualitative assessment was conducted for (1) partial hospitalization services; (2) sleep services; and (3) GI services at Needham. The results of these analyses are summarized in Section XIV.

VII. DEFINING GEOGRAPHIC AREAS OF COVERAGE FOR ICA REPORT EVALUATION

A. Overview of Methodology and Empirical Analyses of Service Areas

71. This ICA Report develops several economic analyses for independent evaluation of pricing/competition and capacity/evaluation that use geographic areas or service areas. These include analysis of the scope of area served by existing or new BCH facilities, identification of alternatives serving patient populations, utilization, share, diversion or predicted shifts from one location to another location and pricing among others.
72. Specifically, economic analyses involve assessment of individual BCH facilities (e.g., Waltham) and the patient population served by these facilities for specific services (e.g., MRIs) as well as the alternative facilities that are or could be used by that patient population – or from whom shifts to the expanded or new service could occur. Economic analysis of patient populations and alternative providers in healthcare economics often use the concept of Primary Service Areas (“PSAs”), including 75% PSAs.³⁷
73. To address the ICA questions for each of the three facilities that BCH is renovating or constructing, FTI conducted independent analysis of PSAs that adapted standard methods for evaluation of service lines and boundaries of geographic areas. This independent

³⁷ For example, some agency screening methods for healthcare and hospital transactions involve construction of PSAs for each of the parties to a transaction using discharge or visit data. There are different methodologies employed, yet the general concept includes defining the scope of the PSA based on the patient population of the entity (using zip codes and counts of patients), and identification of alternative providers based on their provision of services to patients within that geographic scope. Some providers may be physically located outside of the area, although their shares typically will be based on patient volumes in the area. PSAs are used for screening purposes and do not necessarily define antitrust markets. For more detail, see, e.g., U.S. Dept. of Justice & Fed. Trade Comm’n Statements of Antitrust Enforcement Policy in Health Care (1996), <http://www.justice.gov/atr/public/guidelines/0000.htm> for a summary of methods, which have been used as part of its screening process of transactions. The methodology therein makes use of a Primary Service Area or PSA, which is defined using discharge data at the zip code level and constructing areas based on a proportion of a hospital’s total discharges. See, Final ACO Antitrust Policy Statement at 67028. Service areas may be defined using 75% or 90% of discharges. The Statement notes these areas are used for screening and are not necessarily antitrust markets.

analysis required methods for defining and applying PSAs for facilities with existing services and for those without the specific service, including entirely new facilities.

74. We generated service areas for each of the relevant services (MRI, ASC, and all imaging) that will be added or modified at a facility. The service area analysis evaluates data based on current utilization patterns (derived from the claims data) of patients and their characteristics in a geographic area from which we expect most of the patients to emanate. For facilities that already offered a service (e.g., MRI), the service area was generated by identifying the closest ZIP codes to that facility from which 75% of the specific service line’s current visits from that facility originate.
75. For facilities that don’t yet offer the specific service (or any service), we generated service areas by determining the service areas for all similar BCH facilities (hospital satellites) that had the service according to the method described above. According to this method, the distance of the ZIP code in the service area that was farthest from the facility was considered as the radius of a circle, originating from the facility. This theoretical circle would surround the centroids of all the ZIP codes in the service area. Using the radii for the facilities that already exist and are providing the specific service, we calculated the *average* radius for these facilities and then assigned all the ZIP codes within that distance of the *new* facility as that new facility’s service area.
76. In addition to the independent analysis of pricing/competition and capacity utilization in these defined service areas, this report considers the narrative in BCH’s application, which identifies several services involved in the Proposed Project.³⁸ These are more fully delineated in BCH’s supplemental responses to DoN questions.³⁹ The BCH Application also presents utilization or other data using HSA geographic areas of coverage are determined by Massachusetts Department of Health’s Executive Office of Health & Human Services Regions.⁴⁰ These regions include 6 collections of zip-codes that are grouped into the Western, Central, Northeast, Metro West, Southeast and Boston regions.

B. Overview of BCH and Major Health System with Children’s Health Services

77. Figure 1 depicts the hospital or hospital satellite locations of health systems with facilities that include pediatric facilities or “children’s hospitals” as defined above. The map identifies the children’s hospital or pediatric facility location (with a star) as well as the other hospitals or satellites for each health system in Massachusetts (shown in Figure 1)

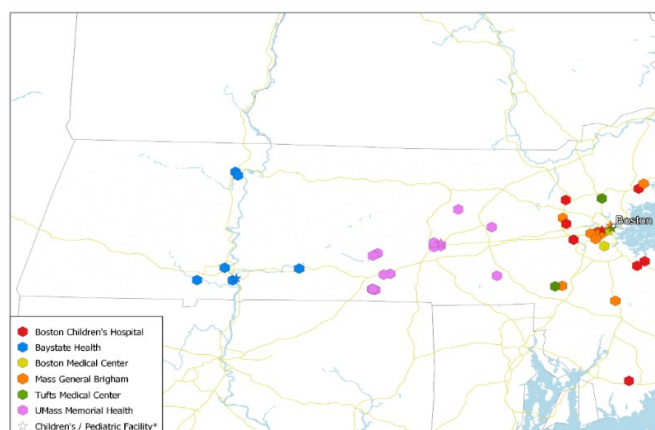
³⁸ See CMCC DoN Application.

³⁹ “The Children’s Medical Center Corporation DoN Application No. BCH-20171411-HE” Responses to DoN Questions; submitted October 8, 2021 (hereafter, “CMCC Responses”). See “Responses to DoN questions” at <https://www.mass.gov/lists/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download> and see, “The Children’s Medical Center Corporation – Multisite, # BCH-21071411-HE Application.” Draft, April 4, 2022. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download>.

⁴⁰ https://matracking.ehs.state.ma.us/eohhs_regions/eohhs_regions.html. FTI considered these service areas and the information provided for other areas by BCH and found these were consistent with those reached by FTI using the PSA analyses.

and in the Boston area (Figure 2).⁴¹ There are numerous other hospitals or outpatient locations in the state providing care to children, that are not included on the map yet are included in the empirical analyses.⁴² Boston Children's Main Campus and its satellite locations are depicted on the map; BCH and Mass General Brigham (depicted with the MassGeneral Hospital for Children as well as other facilities in the health system), have the largest number of facilities in the area. Other entities on the map include Boston Medical Center, Tufts Medical Center with its main hospital and children's hospital location, Baystate Health and UMass Memorial Health, each with have several locations, located outside of the immediate Boston area.

Figure 1: Overview of Massachusetts Health Systems with Children's Hospitals



Health System	Facility Name	City and Town
Boston Children's Hospital	Boston Children's at Waltham	Waltham
	Boston Children's at North Dartmouth	Dartmouth
	Boston Children's at Brookline	Brookline
	Boston Children's at Lexington	Lexington
	Boston Children's at Peabody	Peabody
	Boston Children's Hospital*	Boston
	Boston Children's at Weymouth (New Location)	Weymouth
	Boston Children's at Weymouth (Current Location)	Weymouth
	Boston Children's at Needham (New Location)	Needham
Baystate Health	Baystate Behavioral Health- Child Partial Hospitalization Program	Holyoke
	Baystate Brightwood HC/Centro De Sa	Springfield
	Baystate Franklin Medical Center Infusion Bus	Greenfield
	Baystate Franklin Medical Center	Greenfield
	Baystate Medical Center/Baystate Children's Hospital*	Springfield
	Baystate Noble Hospital	Westfield
	Baystate Wing Hospital and Medical Centers	Palmer
Boston Medical Center	Boston Medical Center/Boston Medical Center Pediatrics*	Boston
	Boston Med Ctr Radiology at Mattapan	Boston
	Boston Med Ctr Radiology at Whittier	Tremont
Mass General Brigham	Massachusetts General Hospital/Mass General Hospital for Children (MGHHC)*	Boston
	Mass General Waltham	Waltham
	Mass General/North Shore Ctr Opt Cr	Danvers
	Brigham And Women's Hospital	Boston
	Brigham & Women Advanced Primary Ca	Boston
	Brigham & Women Mri at W Bridgewater	West Bridgewater
	Brigham & Women's Health Care Ctr	Brookline
	Brigham & Women's/Mass Gen Hlt Care	Foxborough
	Brigham And Women's Faulkner Hospital	Boston
	Tufts Medical Center/Tufts Children's Hospital*	Boston
Tufts Medical Center	Tufts Medical Center Cancer Center	Stoneham
	Tufts Norfolk Imaging	Norfolk
	UMass Memorial Health - Harrington Hospital	Southbridge

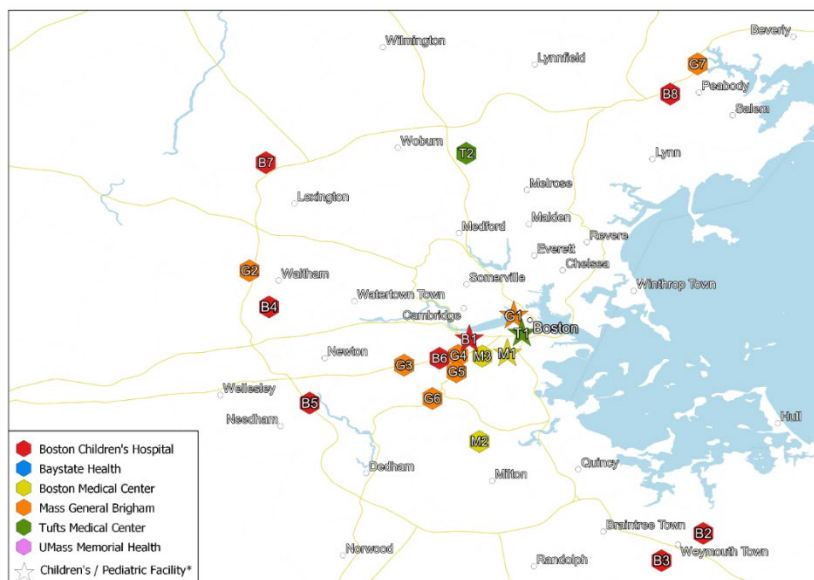
⁴¹ Note that this map includes locations for use in the analyses of services, such as ASC and MRI, using the CHIA data, and does not include the physician office locations or some pediatric clinics or centers that do not provide ASC or MRI services or are designated as physician offices. The locations are depicted for each of the 6 health systems with children's hospitals are based on independent research on these health systems and their facilities described in the Appendix. Larger maps are in Appendix.

⁴² Analyses of each of the services (e.g., MRI) included use of data on these and all other alternative providers for the specific service. These are reported on tables as "Other;" and not reported separately - the vast majority of these other providers have low volumes of the relevant service and less than one percent share.

Independent Cost Analysis for Boston Children's Hospital DoN Application #BCH 20171411-HE

Health System	Facility Name	City and Town
UMass Memorial Health	UMass Memorial Med Ctr/Mem Campus	Worcester
	UMass Memorial Med Ctr/Univ Campus/UMass Mem. Children's Medical Center*	Worcester
	UMass Mem Med Ctr Milford Radiology	Milford
	UMass Memorial Ambulatory Care Cent	Worcester
	UMass Memorial Endoscopy Center	Worcester
	UMass Memorial Med Ctr/Hahnemann	Worcester
	UMass MMC Cancer at Marlboro Hosp	Marlborough
	UMass Health Alliance - Clinton Hospital	Clinton
	UMass Memorial Health- Harrington at Charlton	Charlton
	UMass Memorial Health- Harrington at R169 rehabilitation	Charlton
	UMass Memorial Health- Harrington at Spencer	Spencer
	UMass Memorial Health- Harrington Behavioral Health	East Brookfield
	UMass Memorial Health- Harrington Behavioral Health	Southbridge
	UMass Memorial Health- Harrington Behavioral Health	Southbridge
	UMass Memorial Health- Carrington Cancer Center	Southbridge
	UMass Memorial Health- Harrington Occupational Health	Southbridge

Figure 2: Overview of Boston Area Health Systems with Children's Hospitals



Health System	Facility Code	Facility Name	City and Town
Boston Children's Hospital	B1	Boston Children's Hospital*	Boston
	B2	Boston Children's at Weymouth (New Location)	Weymouth
	B3	Boston Children's at Weymouth (Current Location)	Weymouth
	B4	Boston Children's at Waltham	Waltham
	B5	Boston Children's at Needham	Needham
	B6	Boston Children's at Brookline	Brookline
	B7	Boston Children's at Lexington	Lexington
	B8	Boston Children's at Peabody	Peabody
Tufts Medical Center	T1	Tufts Medical Center/Tufts Children's Hospital*	Boston
	T2	Tufts Medical Center Cancer Center	Stoneham
Boston Medical Center	M1	Boston Medical Center/Boston Medical Center Pediatrics*	Boston
	M2	Boston Med Ctr Radiology at Mattapan	Boston
	M3	Boston Med Ctr Radiology at Whittier	Tremont
Mass General Brigham	G1	Massachusetts General Hospital/Mass General Hospital for Children (MGHfC)*	Boston
	G2	Mass General Waltham	Waltham
	G3	Brigham & Women's Health Care Ctr	Brookline
	G4	Brigham And Women's Hospital	Boston
	G5	Brigham & Women Advanced Primary Care	Boston
	G6	Brigham & Women Faulkner Hospital	Boston
	G7	Mass General/ North Shore Ctr Opt Cr	Danvers

C. Analyses of Service Areas

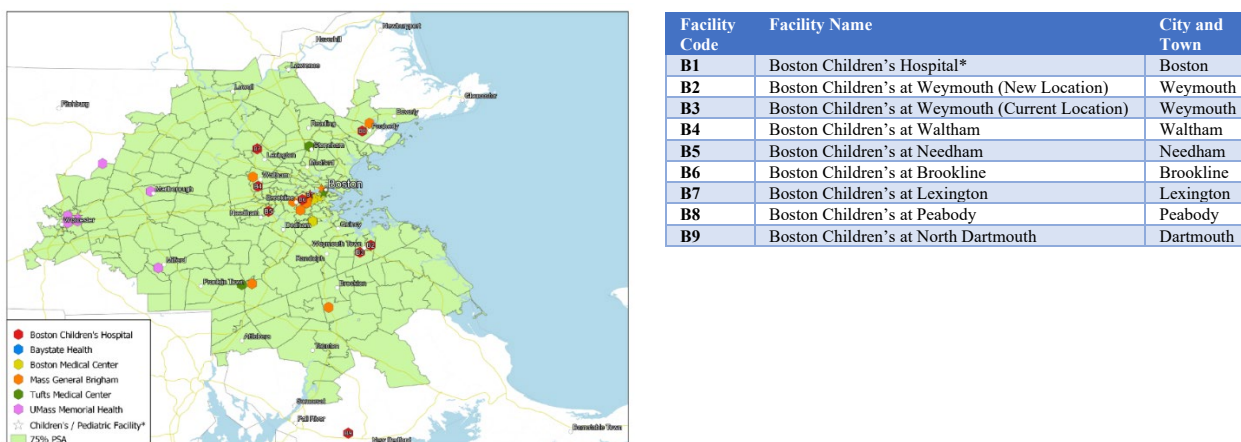
78. Applying the methodology described in VII A above, FTI defined service areas for each of the three new BCH locations for the three new services (Imaging, ASC, and MRI).

79. We note here and for each of the service areas, that there may be hospital-based outpatient or hospital satellite facilities not depicted on the map that serve as alternatives for patients in a specific service area. Moreover, facilities located physically outside of an area may be important alternatives that are used or could be conveniently used by patients and would be included in any share calculation or in analyses as a source of potential diversion.⁴³

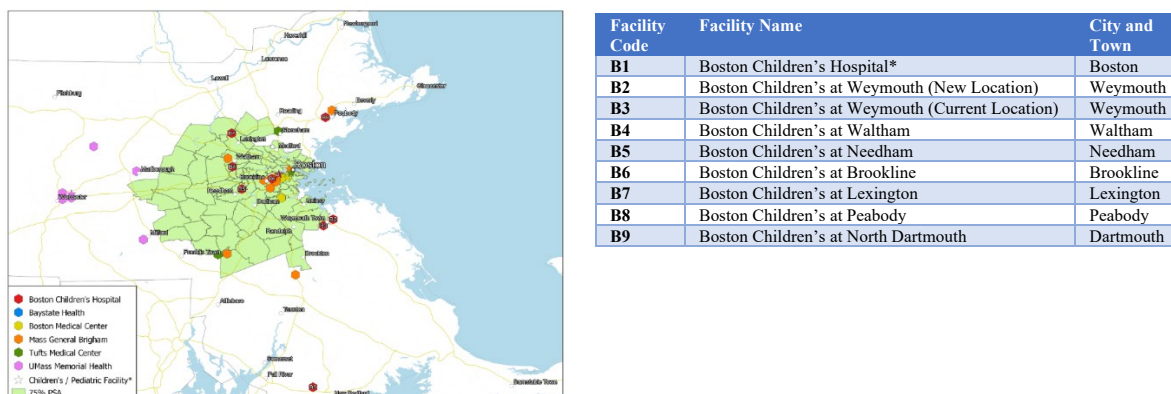
1. Needham Service Areas for Imaging, ASC Services and MRI

80. The FTI-defined Needham service areas for ASC and Imaging services are similar to each other in geographic scope (as shown in Figure 3 and Figure 4). Both service areas encompass ZIP codes in a broader western Boston area and are centered around the proposed BCH Needham location. While there are hospital-based and other outpatient alternatives located outside of the boundaries of the area, we note that the BCH Waltham facility is located in all three Needham service areas. The current and future BCH Weymouth locations are located within Needham service areas for ASC and MRI and are on the border of the Needham service area for imaging. There are six BCH facilities located physically within the Needham service areas, including BCH Waltham, BCH Needham, BCH Weymouth, BCH main campus, BCH Lexington, and BCH Brookline. There are six or more Mass General Brigham facilities, three Boston Medical Center facilities, and the Tufts facility (including the Children’s Hospitals for each) located within the Needham service areas.

Figure 3: Needham Service Area, ASC

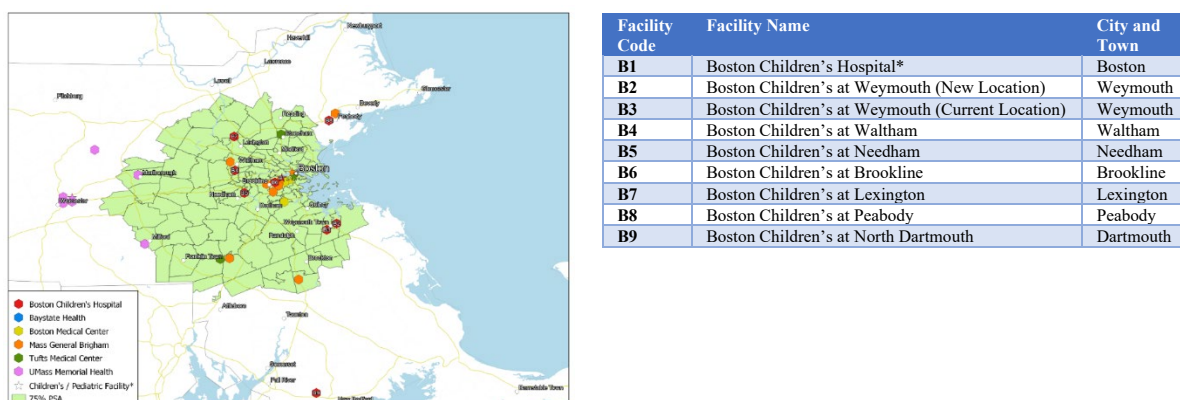


⁴³ Market share analyses will include all such facilities, including those physically located in the area, as well as providers other than the specific health systems with children’s hospitals or specialized pediatric departments. See, e.g., American Bar Association, Section of Antitrust Law, “Health Care Mergers and Acquisitions Handbook, Second Edition,” *American Bar Association* (2018) and approaches for defining the relevant geographic aspects for market definition to include locations of providers.

Figure 4: Needham Service Area, Imaging

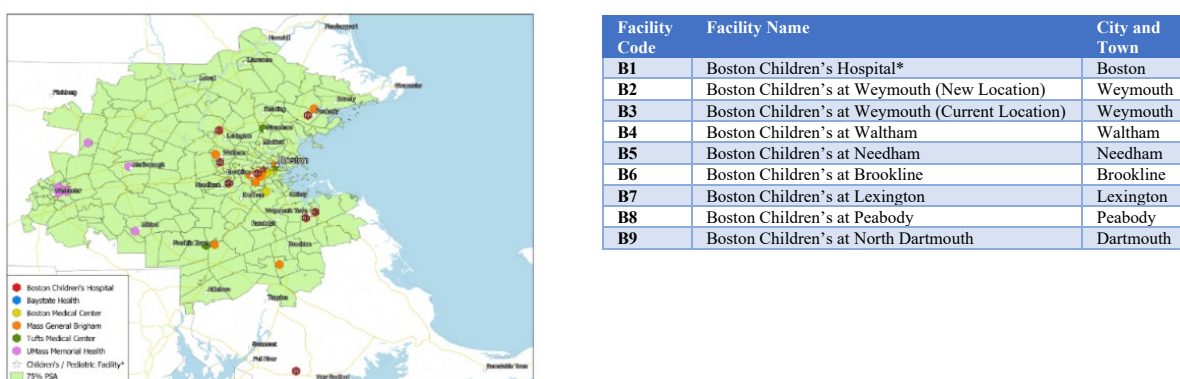
81. The Needham service area for MRI service is somewhat broader than its area for ASC and imaging, with the current and future BCH Weymouth locations located in the service area. The MRI service area also includes the physical location of one additional MGB facility, two additional Tufts facilities, and one from UMass. As noted above, there may be facilities located physically outside of the area may be important alternatives that are used or could be conveniently used by patients.
82. FTI also evaluated data and information provided by BCH to DPH in response to specific questions about criteria and factors involved in the choice of location of facilities, including new services at Weymouth and Needham in specific. We evaluated the detailed patient draw area analyses for both Waltham and Weymouth in the Excel workbook provided by BCH and compared and validated these with our service area analyses. The BCH data confirm broad draw areas for services of existing BCH facilities, indicating the general attractiveness of the location and convenience for transportation.⁴⁴
83. FTI's independent analysis of 75% service areas and diversion analyses presented in Section VII below provide confirmatory assessment of these locations and availability to serve demand for MRI, imaging, and/or ASC services from large patient populations and to serve patients that might otherwise be going to Longwood. FTI was able to conduct analysis of the Needham location with technical economic modeling used in healthcare to take into account patient preferences for types of hospital or other outpatient facilities, distance and convenience of patients to the facility, and the patient population available to the facility. We also developed service areas for existing facilities and their services.

⁴⁴ Tables 2 and 3 of the April 4, 2022 Response provides statistics from BCH data on patients for relevant services at Weymouth and Waltham. See, "The Children's Medical Center Corporation – Multisite, # BCH-21071411-HE Application." Draft, April 4, 2022. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download>. FTI has evaluated these and compared them with the FTI service areas and utilization volumes in the estimated service areas and finds they are consistent in scope and relative levels, although actual estimates vary due to the data issues with the CHIA data set out above and the differences in methodology for defining service areas for the ICA report.

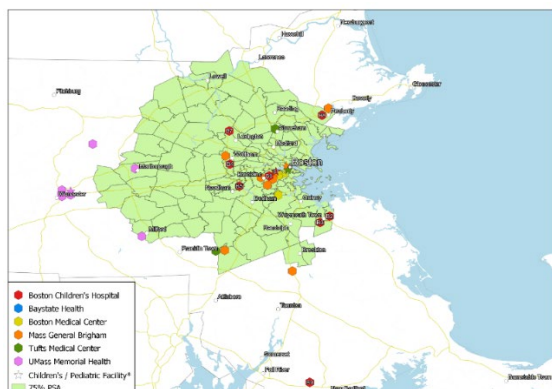
Figure 5: Needham Service Area, MRI

2. Waltham Service Areas

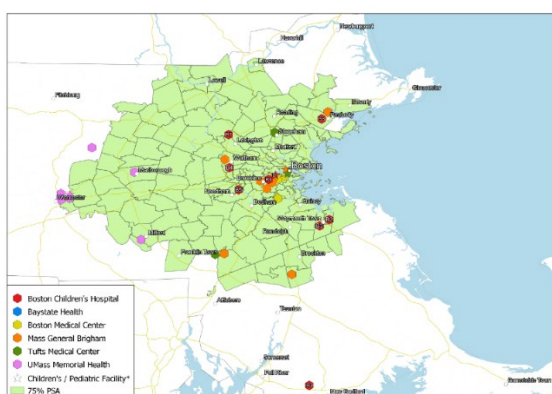
84. The Waltham service areas for ASC and Imaging services are similar to each other (shown in Figure 6 and Figure 7); these are based on current services for ASC and imaging. Both service areas are mainly to the west of Boston and are centered around the BCH Waltham location.⁴⁵ There are five BCH facilities located within the Waltham service areas, including BCH Waltham and BCH Needham. There are six or more Mass General facilities, three BMC facilities, and two Tufts facilities located physically within the Waltham service areas. The Waltham service area for MRI service is broader than ASC and imaging (shown in Figure 8), with the current and future BCH Weymouth locations physically located on the border of the service area. The MRI service area also includes one additional UMass facility physically located in the area. We note that alternative providers for patients in this service area may include hospital-based outpatient facilities or hospital satellites that are not depicted on the map or that are located physically outside of the area.

Figure 6: Waltham Service Area, ASC

⁴⁵ This area is generally inclusive of HSA 4 (Metro West) and 6 (Boston) and some of HSA 3 (Northeast).

Figure 7: Waltham Service Area, Imaging

Facility Code	Facility Name	City and Town
B1	Boston Children's Hospital*	Boston
B2	Boston Children's at Weymouth (New Location)	Weymouth
B3	Boston Children's at Weymouth (Current Location)	Weymouth
B4	Boston Children's at Waltham	Waltham
B5	Boston Children's at Needham	Needham
B6	Boston Children's at Brookline	Brookline
B7	Boston Children's at Lexington	Lexington
B8	Boston Children's at Peabody	Peabody
B9	Boston Children's at North Dartmouth	Dartmouth

Figure 8: Waltham Service Area, MRI

Facility Code	Facility Name	City and Town
B1	Boston Children's Hospital*	Boston
B2	Boston Children's at Weymouth (New Location)	Weymouth
B3	Boston Children's at Weymouth (Current Location)	Weymouth
B4	Boston Children's at Waltham	Waltham
B5	Boston Children's at Needham	Needham
B6	Boston Children's at Brookline	Brookline
B7	Boston Children's at Lexington	Lexington
B8	Boston Children's at Peabody	Peabody
B9	Boston Children's at North Dartmouth	Dartmouth

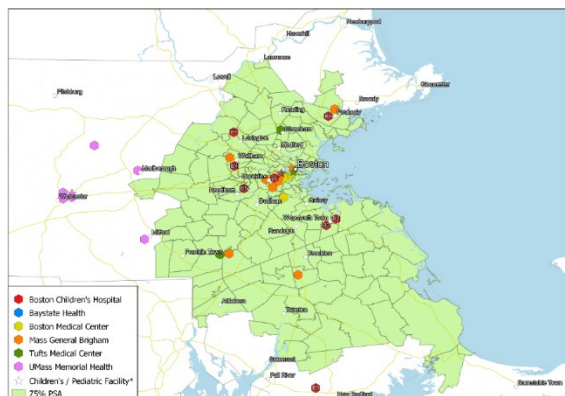
3. Weymouth Service Areas

85. The Weymouth service areas for ASC and Imaging services are shown in Figure 9 and Figure 10.⁴⁶ Both service areas cover many of the same ZIP codes, to the south and southeast of Boston and are centered around the current and future BCH Weymouth location, though the ASC service area is broader. There are five BCH facilities located physically within the Weymouth service areas, including BCH Needham. There are six Mass General facilities, three Boston Medical facilities, and one Tufts facility located physically within the Weymouth service areas. As noted above, there are several locations close to the service area, and several that may be alternatives that are not depicted on the map.
86. The current and future BCH Weymouth locations have broad draw from the east and southeast. The Weymouth service area for MRI service is broader than ASC and imaging (shown in Figure 11). The MRI service area also includes the physical location BCH

⁴⁶ Weymouth service areas for ASC and imaging services were newly defined using the methodology for new facilities or services described above.

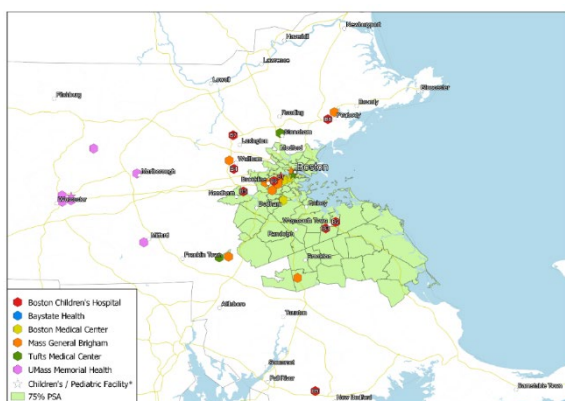
Waltham (not located physically in ASC and imaging). The MRI service area also includes the location of one additional facility from MGB and one additional facility from Tufts.

Figure 9: Weymouth Service Area, ASC



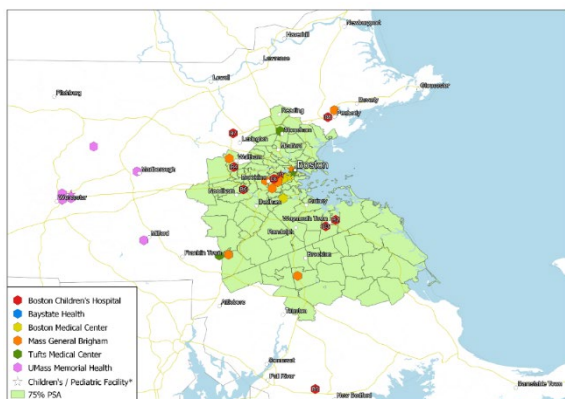
Facility Code	Facility Name	City and Town
B1	Boston Children's Hospital*	Boston
B2	Boston Children's at Weymouth (New Location)	Weymouth
B3	Boston Children's at Weymouth (Current Location)	Weymouth
B4	Boston Children's at Waltham	Waltham
B5	Boston Children's at Needham	Needham
B6	Boston Children's at Brookline	Brookline
B7	Boston Children's at Lexington	Lexington
B8	Boston Children's at Peabody	Peabody
B9	Boston Children's at North Dartmouth	Dartmouth

Figure 10: Weymouth Service Area, Imaging



Facility Code	Facility Name	City and Town
B1	Boston Children's Hospital*	Boston
B2	Boston Children's at Weymouth (New Location)	Weymouth
B3	Boston Children's at Weymouth (Current Location)	Weymouth
B4	Boston Children's at Waltham	Waltham
B5	Boston Children's at Needham	Needham
B6	Boston Children's at Brookline	Brookline
B7	Boston Children's at Lexington	Lexington
B8	Boston Children's at Peabody	Peabody
B9	Boston Children's at North Dartmouth	Dartmouth

Figure 11: Weymouth Service Area, MRI



Facility Code	Facility Name	City and Town
B1	Boston Children's Hospital*	Boston
B2	Boston Children's at Weymouth (New Location)	Weymouth
B3	Boston Children's at Weymouth (Current Location)	Weymouth
B4	Boston Children's at Waltham	Waltham
B5	Boston Children's at Needham	Needham
B6	Boston Children's at Brookline	Brookline
B7	Boston Children's at Lexington	Lexington
B8	Boston Children's at Peabody	Peabody
B9	Boston Children's at North Dartmouth	Dartmouth

VIII. IDENTIFYING AND MEASURING CURRENT PROVIDERS OF PEDIATRIC SERVICES IN RELEVANT SERVICE LINES

A. Overview – Service Lines and Utilization

87. This section provides detailed analysis of the providers for each of the relevant service lines, and measures of their utilization by patients in regions or service areas. These apply standard methodologies and a standard basis for estimating shares based on volumes in a geography and by provider (or health system).

B. Identifying and Measuring Current Providers – Shares in State/Service Areas

88. FTI worked extensively with the CHIA data and information on licensed facilities or other sources to identify specific providers of the relevant services. The Appendix provides a detailed summary of the process used to develop as much specific information as possible on the providers, including particularly the health system providers with children’s hospitals and pediatric facilities and satellites.
89. Table 1: Demographic Characteristics of Imaging and ASC Outpatient Visits for BCH and All shows the demographic information available for the BCH patients, and all patients within the service area under consideration for the Imaging and ASC outpatient services assessed in this Report. BCH patients skew somewhat younger than the overall pediatric patients in the area, and also are somewhat more likely to be insured by commercial insurance, although both the overall population and the BCH population have between 45-55% MassHealth/Medicaid.

Table 1: Demographic Characteristics of Imaging and ASC Outpatient Visits for BCH and All (Combined Service Area, Patients Aged 0 – 18)

		BCH Visits	%	BCH Visits in Service Area	%	All Outpatient Visits in Service Area	%
Age	0-5	43,646	31%	31,049	30%	132,541	26%
	6-10	29,260	21%	21,660	21%	94,485	19%
	11-15	42,515	31%	32,294	31%	152,633	30%
	15-18	23,550	17%	17,929	17%	120,861	24%
Gender	Female	71,512	48%	52,878	48%	253,520	47%
	Male	77,090	52%	57,337	52%	283,252	53%
Payer Type	Commercial	77,624	52%	60,677	55%	240,023	45%
	Medicaid	71,033	48%	49,538	45%	296,749	55%

Source: 2019 CHIA all-payer medical claim data. Numbers here are based on services considered — imaging and ASC. The data is restricted to visits from members younger than 19 years old residing in Massachusetts. The geography used as the service area for this table is all ZIP codes in any of the service areas considered within this report. This was done for comparison purposes only to represent the full area analyzed.

90. Table 2: Demographic Characteristics of Pediatric Population shows the characteristics of the pediatric population in the service area. The age distribution of the overall pediatric population is more evenly distributed than the BCH pediatric and all provider pediatric patient populations, at about 25% for each age range listed. The gender breakdowns are comparable to those for pediatric patient visits.

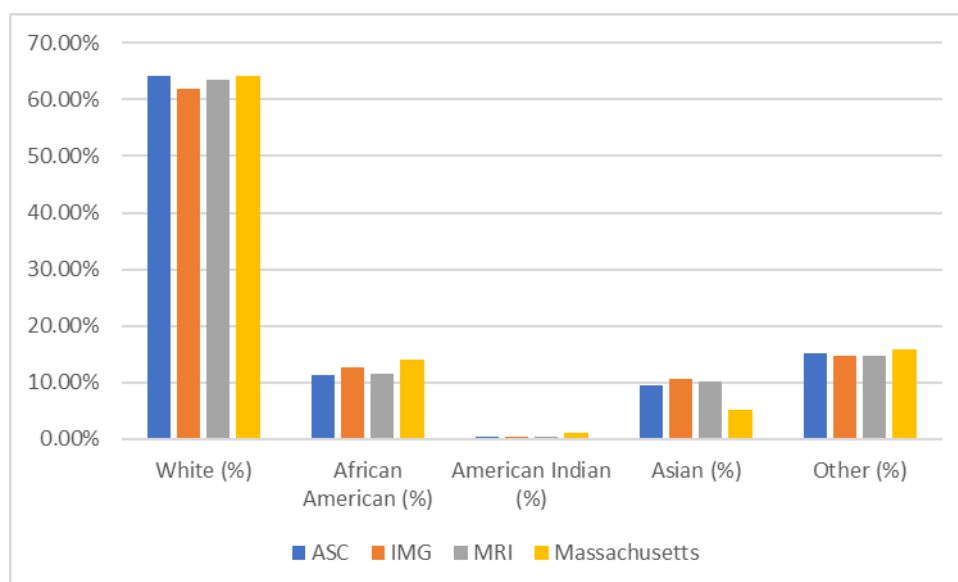
Table 2: Demographic Characteristics of Pediatric Population
(Combined Service Area, Patients Aged 0 – 18)

		2020 Population	%	2025 Projected Population	%	2040 Projected Population	%
Age	0-4	259,554	23%	264,136	24%	256,545	23%
	5-9	273,513	25%	266,663	24%	266,966	24%
	10-14	279,578	25%	282,714	25%	281,312	25%
	15-19	293,639	27%	295,208	27%	299,465	27%
Gender	F	546,291	49%	545,411	49%	542,340	49%
	M	559,993	51%	563,310	51%	561,948	51%

Source: University of Massachusetts Donahue Institute. The geography used as the service area for this table is all ZIP codes in any of the service areas considered within this report. This was done for comparison purposes only to represent the full area analyzed.

91. While the CHIA data does not include information on race of patients, to provide a summary of race for the services and pediatric populations in question, FTI used census data, and determined the race composition for children in ZIP codes that were included in any of the three facilities’ service areas (the Combined Service Area). As shown in Figure 12, approximately 62% of children in the service area are white, 13% are African American, 10% are Asian.⁴⁷

Figure 12: Pediatric Race Composition by Service



C. Measuring Share (Based on Utilization)

92. In response to the DoN program’s request with regard to price/competition, we analyzed the current market share of BCH and alternative providers. For convenience in reporting

⁴⁷ BCH’s Application Narrative provided information on its patient population in its Table 1. According to BCH’s data, in fiscal year 2019, approximately 60.4% of patients were white, non-Hispanic; 10.2% were Black, non-Hispanic, 4.2% were Asian, non-Hispanic. While White and Black proportions are similar to FTI estimates developed from Census based on the combined service area, BCH’s patient population also seems to have disproportionately fewer Asian patients than the population in the service area.

out these results, the tables show the detail on the facilities in the health systems identified offering specialized children’s healthcare services in the service areas of the three “new” BCH facilities (Waltham, Needham, and Weymouth).⁴⁸ We used the 2019 APCD all payer claims and restricted the analysis to three services: ASC, imaging, and MRI that were identified as the primary service lines for price/competition and utilization/capacity analysis.

93. As noted above, we consider and apply standardized approaches for defining service areas using 75% areas as a standard methodology for local areas, and for measuring utilization by provider for both local areas (by facility) and for the state. For each of the relevant services, we evaluated the providers, including BCH, of each service and their current patient volumes (e.g., visits) and created share tables for each service line inclusive of this information. (Consistent with the ICA request, the tables and analyses are labeled as shares, although we note that service areas may not constitute markets for antitrust purposes.) Our analyses start by including share, volume, and provider information.⁴⁹ We also evaluated information provided in the Application as appropriate.
94. In the following share tables, the service areas for the three facilities in question overlapped substantially; thus, for convenience in exposition, we provide shares for BCH and the alternatives (at the System level) for the area that encompasses all three facilities’ service areas for that service. Individual service areas for each of the three facilities by service (e.g., ASC, imaging, and MRI) do not differ substantially from this combined area and are provided in Section VII.
95. In Massachusetts, over 90% of the visits for MRI, imaging, and ASC services are Commercial and MassHealth/Medicaid patients. BCH’s payer mix is similar to the state-level payer mix as can be seen by looking at tables below.

1. Share of MRI Visits

96. The six health systems with children’s hospitals (BCH and five other health systems) accounted for over 40% of all MRI visits for all three 75% service areas (BCH Waltham,

⁴⁸ While the share analysis accounts for all providers offering the relevant service in a specific area in the share calculation (including as “all other”), the share analysis expressly calculates and shows the share of health systems with children’s services defined in Section III above. The shares for UMASS for example, will include any outpatient visits in the specific service line provided at any UMASS facility, although a larger proportion may be at the dedicated facility’s outpatient. The “all-Other” category includes each other provider, whether community hospital or outpatient facility. As noted in the overview section, for convenience, these three BCH facilities are designated as “new” because one (Needham) is a new facility; Weymouth is a facility to be re-located and with new MRI capacity; and Waltham is to be expanded with some new services.

⁴⁹ We note that the academic literature uses similar standards or time frames/travel distance for convenience (note these are more customarily applied to inpatient claims).

https://publications.aap.org/pediatrics/article/146/5/e20201724/75358/Pediatric-Hospital-Services-Within-a-OneHour?searchresult=1&utm_source=TrendMD&utm_medium=TrendMD&utm_campaign=Pediatrics_TrendMD_0.

BCH Weymouth, and BCH Needham). BCH facilities have the largest shares across the three combined 75% service areas.

Table 3: MRI Visits and Shares by System, 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Visits	% Commercial	% Medicaid
All Visits	100.0%	55.5%	44.5%
BCH	31.4%	53.0%	47.0%
Baystate	0.0%	-	-
Boston Medical	1.6%	10.8%	89.2%
Mass General	9.3%	51.0%	49.0%
Tufts	2.2%	26.2%	73.8%
UMASS	1.5%	45.3%	54.7%
Other	54.0%	60.5%	39.5%

Source: 2019 CHIA all-payer medical claim data.

97. All payers: In the 75% service areas (shown above in Table 3: MRI Visits and Shares by System, 2019), BCH facilities accounted for 31.4% of total MRI visits, with Boston Children’s Hospital (Main Campus) contributing to 26.1% of total visits. Mass General Brigham facilities accounted for the second largest share (9.3%), with Mass General Brigham (which includes the Children’s Hospital) 6.1% of total MRI visits.
98. The share of Tufts, UMass, Boston Medical Center and Baystate Health combined was only 5.3% in the combined service area. All other entities account for 54% share and include a very large number of individual providers located across the area (and the state) that provide the MRI services to pediatric patients in the service area. The 54% share includes 1,334 unique NPI numbers, mostly made up of many individual providers, the vast majority of which have very low share. We note that the age distribution of pediatric patients in the Other category is similar to the age distribution of the identified hospitals, although many of these other entities provide MRI services to a much broader patient population (e.g., adults).⁵⁰

Table 4: MRI Visits and Shares by System, Commercial 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Commercial Visits
All Visits	100.0%
BCH	30.0%
Baystate	-
Boston Medical	0.3%
Mass General	8.6%
Tufts	1.0%
UMASS	1.2%
Other	58.8%

Source: 2019 CHIA all-payer medical claim data.

99. Commercial: In the combined service area (shown in Table 4: MRI Visits and Shares by System, Commercial 2019), BCH facilities accounted for 30.0% of commercial MRI visits.

⁵⁰ The largest individual provider in the Other category has less than 3% share - South Shore Health, and other individual providers have low share and volumes. We note that several locations in the CHIA data with separate NPIs and locations that appear to be associated or affiliated with the Shields Healthcare Group. Based on the available information these are located across the state including in the service area. As detailed elsewhere, providers in the Other category are included in the economic analyses of diversion and alternatives, and in share calculations for purposes of concentration (HHI) calculations.

Mass General Brigham facilities accounted for the second largest share (8.6%) of commercial visits. Tufts and UMass each had 1.0% and 1.2% with Boston Medical Center and Baystate Health adding small commercial volumes to a combined share for these providers of less than 3%.

Table 5: MRI Visits and Shares by System, Medicaid and MassHealth 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Medicaid Visits
All Visits	100.0%
BCH	33.1%
Boston Medical	3.2%
Mass General	10.2%
Tufts	3.6%
UMASS	1.8%
Other	48.0%

Source: 2019 CHIA all-payer medical claim data.

Note: The CHIA data does not accurately identify BCH providers for Medicaid patients. See paragraph 144.

100. Medicaid/MassHealth: In the combined 75% service area, (shown in Table 5: MRI Visits and Shares by System, Medicaid and MassHealth 2019, BCH facilities accounted for approximately 33.1% of Medicaid and MassHealth MRI visits. BCH’s share of MassHealth/Medicaid patients is somewhat higher than its share of commercial patients, while Other providers have a lower share of MassHealth/Medicaid than of commercial patients. Mass General facilities accounted for the second largest share of MassHealth/Medicaid (10.2%). Tufts share of MassHealth/Medicaid was 3.6% and Boston Medical’s share of MassHealth/Medicaid visits for MRI was 3.2%. Baystate had *de minimus* volume in the service area.
101. MRI volumes at BCH are predominantly at Waltham and BCH Main campus.
102. We also analyzed share by health system and by payer mix in the combined service area (i.e., zip codes that are in any service area of the three facilities). From a health system and payer mix standpoint, of these visits, over half were from commercial patients and around 45% of the visits from MassHealth/Medicaid patients.
103. BCH’s payer mix is similar to the state-level payer mix, with about 56% of the visits from Commercial patients. Most of BCH MassHealth/Medicaid visits, according to the All Payer Claims Data, are associated with the BCH main campus (as shown in **Table 6: BCH MRI Visits by Facility and Payer Mix, 2019**).

Table 6: BCH MRI Visits by Facility and Payer Mix, 2019 (Combined Service Area, Patients Aged 0 – 18)

Standardized Name	% Commercial	% Medicaid
BCH - Other - Individual	81.1%	18.9%
BOSTON CHILDREN'S AT LEXINGTON	100.0%	0.0%
BOSTON CHILDREN'S AT PEABODY	100.0%	0.0%
BOSTON CHILDREN'S AT WALTHAM	100.0%	0.0%
BOSTON CHILDREN'S HOSPITAL	44.6%	55.4%
BOSTON CHILDREN'S at NORTH DARTMOUTH	100.0%	0.0%

Source: 2019 CHIA all-payer medical claim data.

Note: The CHIA data does not accurately identify BCH providers for Medicaid patients. See paragraph 144.

2. Share of Imaging Visits

104. All payer: The six health systems (BCH and five other systems) accounted for around 31.2% of imaging visits for in the combined 75% service areas (BCH Waltham, BCH Weymouth, and BCH Needham). In this area, BCH facilities account for approximately 17.4% of the total (shown in Table 7: Imaging Visits and Shares by System, 2019).

Table 7: Imaging Visits and Shares by System, 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Visits	% Commercial	% Medicaid
All Visits	100.0%	46.5%	53.5%
BCH	17.4%	46.2%	53.8%
Baystate	--	50.0%	50.0%
Boston Medical	1.9%	9.1%	90.9%
Mass General	9.0%	50.4%	49.6%
Tufts	1.4%	28.4%	71.6%
UMASS	1.4%	32.8%	67.2%
Other	68.8%	47.8%	52.2%

Source: 2019 CHIA all-payer medical claim data.

Note: The CHIA data does not accurately identify BCH providers for Medicaid patients. See paragraph 144.

105. Mass General Brigham facilities accounted for the second largest share (9.0%). Tufts, UMass, Boston Medical Center and Baystate Health had a combined share of 4.7%. The remaining patients were categorized as “Other”⁵¹ The age distribution of patients in the Other category is similar to that of the identified hospitals.
106. Commercial: In the combined service areas (shown in Table 8: Imaging Visits and Shares by System, Commercial 2019), BCH facilities accounted for 17.2% of total commercial imaging visits. Mass General Brigham facilities accounted for the second largest share

⁵¹ There are over 5,000 individual providers in the Other category, the vast majority of which have very low volumes and share. As with MRI, South Shore Health has less than 3% share; and there are few other providers designated by common NPIs that have 1% or more. We note there are several locations in the CHIA data with separate NPIs and locations that appear to be associated or affiliated with the Shields Healthcare Group that are included in the Other category. Based on the available information these are located across the state including in the service area. As detailed elsewhere, providers in the Other category are included in the economic analyses of diversion and alternatives; and in the share calculations for purposes of concentration (HHIs) calculations.

(9.7%). The share of Tufts, UMass, Boston Medical Center and Baystate Health combined was 2.3%. Baystate has lower share and volumes potentially due to its distance from the service area, and Boston Medical Center has lower commercial volume.

Table 8: Imaging Visits and Shares by System, Commercial 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Commercial Visits
All Visits	100.0%
BCH	17.2%
Baystate	--
Boston Medical	0.4%
Mass General	9.7%
Tufts	0.9%
UMASS	1.0%
Other	70.7%

Source: CHIA all-payer medical claim data.

107. MassHealth/Medicaid: As shown in Table 9: Imaging Visits and Shares by System, Medicaid and MassHealth 2019, BCH facilities accounted for 17.5% of visits. Mass General Brigham facilities accounted for the second largest share of MassHealth/Medicaid (8.3%). Boston Medical facilities has 3.3% of visits. The share of Tufts, UMass, and Baystate Health combined 7.0% Visits.

Table 9: Imaging Visits and Shares by System, Medicaid and MassHealth 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Medicaid Visits
All Visits	100.0%
BCH	17.5%
Baystate	--
Boston Medical	3.3%
Mass General	8.3%
Tufts	1.9%
UMASS	1.8%
Other	67.2%

Source: 2019 CHIA all-payer medical claim data.

108. Of the imaging visits in the combined service area in 2019, over 46.5% were from commercial patients. Around 53.5% of the visits were MassHealth/Medicaid patients. BCH’s payer mix in the service area (as well as in the state) is similar to the state-level payer mix, with 46.2% of the visits from Commercial patients. Most of the BCH MassHealth/Medicaid visits were associated with the BCH main campus for reasons detailed elsewhere (see Table 10: BCH Imaging Visits by Facility and Payer Mix, 2019).

Table 10: BCH Imaging Visits by Facility and Payer Mix, 2019 (Combined Service Area, Patients Aged 0 – 18)

Standardized Name	% Commercial	% Medicaid
BCH - Other - Entity	88.0%	12.0%
BCH - Other - Individual	31.4%	68.6%
BOSTON CHILDREN'S AT BROOKLINE	100.0%	0.0%
BOSTON CHILDREN'S AT LEXINGTON	100.0%	0.0%
BOSTON CHILDREN'S AT PEABODY	100.0%	0.0%
BOSTON CHILDREN'S AT WALTHAM	100.0%	0.0%
BOSTON CHILDREN'S HOSPITAL	41.9%	58.1%
BOSTON CHILDREN'S at NORTH DARTMOUTH	100.0%	0.0%

Source: 2019 CHIA all-payer medical claim data.

Note: The CHIA data does not accurately identify BCH providers for Medicaid patients. See paragraph 144.

3. Share of ASC Visits

109. All payer: The six health systems with children's hospitals (BCH and five health systems) accounted for around 35% of all pediatric ASC visits for the combined service areas (BCH Waltham, BCH Weymouth, and BCH Needham). Mass General Brigham facilities have the largest shares and BCH facilities have the second largest shares in the combined 75% service areas,
110. In the combined service area (shown in Table 11: ASC Visits and Shares by System, 2019), Mass General Brigham facilities accounted for the largest share (15.7%). BCH facilities accounted for the second largest share (12.5% of total ASC visits). Tufts and UMASS respectively have 2.8 and 2.6% and combined, Boston Medical Center and Baystate Health have 6.7%. The remaining share comprises more than 3,500 unique NPI numbers for providers.⁵² For ASCs, the patients served by providers in the Other category were distributed primarily at the two ends of the age distribution (more in the youngest category as well as the oldest category of children, with fewer in the middle ranges 6-15). This is not expected to have an effect on alternatives or the cost estimates.

⁵² The Shriners' Hospital for Children has less than 3% share of pediatric ASC visits and is the largest individual entity as measured by unique NPI and location; all other such designated entities have shares at 2% or below with most having well below 1%. As detailed elsewhere, providers in the Other category are included in the economic analyses of diversion and alternatives; and in the share calculations for purposes of concentration (HHIs) calculations.

Table 11: ASC Visits and Shares by System, 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Visits	% Commercial	% Medicaid
All Visits	100.0%	39.4%	60.6%
BCH	12.5%	44.9%	55.1%
Baystate	--	-	-
Boston Medical	1.2%	6.8%	93.2%
Mass General	15.7%	49.5%	50.5%
Tufts	2.8%	26.3%	73.7%
UMASS	2.6%	18.4%	81.6%
Other	65.1%	37.9%	62.1%

Source: 2019 CHIA all-payer medical claim data.

111. Commercial: In the combined service areas (shown in Table 12: ASC Visits and Shares by System, Commercial 2019), BCH facilities accounted for 13.9% of commercial ASC visits. Mass General Brigham facilities accounted for the largest share (19.6%). Tufts (1.9%), UMass (1.8%), Boston Medical Center (0.2%) and Baystate Health have very low volumes.

Table 12: ASC Visits and Shares by System, Commercial 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Commercial Visits
All Visits	100.0%
BCH	13.9%
Baystate	—
Boston Medical	0.2%
Mass General	19.6%
Tufts	1.9%
UMASS	1.8%
Other	62.6%

Source: 2019 CHIA all-payer medical claim data.

112. MassHealth/Medicaid: In the combined service areas (shown in Table 13: ASC Visits and Shares by System, Medicaid and MassHealth 2019), BCH facilities accounted for 11.3% of Medicaid and MassHealth ASC visits. Mass General Brigham facilities accounted for the largest share of Medicaid and MassHealth (13.1%). The share of MassHealth/Medicaid visits at Tufts (3.4%), UMass (3.5%), Boston Medical Center (1.9%) and Baystate Health combined was 8.9%.

Table 13: ASC Visits and Shares by System, Medicaid and MassHealth 2019 (Combined Service Area, Patients Aged 0 – 18)

System	Share of Medicaid Visits
All Visits	100.0%
BCH	11.3%
Baystate	—
Boston Medical	1.9%
Mass General	13.1%
Tufts	3.4%
UMASS	3.5%
Other	66.7%

Source: The result is based on ASC claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old.

113. Of the ASC visits, approximately 39.4% were from commercial patients. MassHealth/Medicaid patients represented 60.6% of the visits.
114. BCH's payer mix is similar to the state-level payer mix, with over 44.9% of the visits from Commercial patients. Most of the BCH Medicaid/MassHealth visits are associated with the BCH main campus for reasons described elsewhere (shown in Table 14: BCH ASC Visits by Facility and Payer Mix, 2019).

Table 14: BCH ASC Visits by Facility and Payer Mix, 2019 (Combined Service Area, Patients Aged 0 – 18)

Standardized Name	% Commercial	% Medicaid
BCH - Other - Entity	100.0%	
BCH - Other - Individual	55.3%	44.7%
BOSTON CHILDREN'S AT LEXINGTON	100.0%	
BOSTON CHILDREN'S AT PEABODY	100.0%	
BOSTON CHILDREN'S AT WALTHAM	100.0%	
BOSTON CHILDREN'S HOSPITAL	38.6%	61.4%
BOSTON CHILDREN'S at NORTH DARTMOUTH	100.0%	

Source: The result is based on ASC claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old.

Note: The CHIA data does not accurately identify BCH providers for Medicaid patients. See paragraph 144.

IX. FORECASTS OF FUTURE DEMAND FOR PEDIATRIC SERVICES IN RELEVANT SERVICE LINES

A. Methodology and Overview for Current and Projected Utilization of Services

115. The ICA Report requires estimates of current as well as future demand for the service lines involved in the Proposed Project for evaluation of questions regarding capacity/utilization as well as pricing/competition. Independently derived estimates of current and projected utilization of services, by service areas, local geography or populations, which are developed in this section for those purposes (and which are applied in Section XII below, are also useful for assessing the reasonableness of BCH's estimates of demand and need for the new locations in the Application and in Responses to the DPH.

116. As detailed further, FTI’s analyses of CHIA utilization data for the state, by HSA, by payer (e.g., Medicaid) and/or for available demographic characteristics are generally consistent with BCH’s patient, visit, demographic, payer (e.g., Medicaid) or geographic characteristics set out in BCH’s responses to the DPH.⁵³
117. To estimate current as well as *future* demand for services – e.g., imaging (both MRI and all imaging) and ambulatory surgery (ASC) services -at the state or regional level as well as at the service area level, the methodology combined current population estimates and projections from the University of Massachusetts Donahue Institute (UMDI) with Massachusetts All-Payer Claims Database (APCD) utilization data for imaging, MRI, and ambulatory surgery services.
118. To estimate *current* demand for relevant services, FTI determined utilization by service line (e.g., ASC), individual patient’s ZIP code, aggregated payer category (e.g., commercial insurance, Medicaid), age group (5-year age range), and sex. These age combinations matched the population projections provided by the UMDI. Current demand is determined based on 2016 – 2019 utilization data from CHIA. Data for 2020 was excluded because of partial-year data and the impact of COVID-19.
119. And, more specifically, to evaluate demand and utilization for services and changes in them for the areas to be served by BCH’s new facilities *in the future* (e.g., 2040), FTI’s methodology used UMDI current population estimates and population projections at the city level and applied them to Massachusetts APCD encounter data to develop current and future utilization estimates. To project population at the ZIP code level into the future, the methodology used UMDI’s projections reported at the city level and mapped each city to individual ZIP codes using a crosswalk available from the US Census. If a city spanned multiple ZIP codes, its projected population was distributed according to the ZIP codes’ populations. These ZIP code level estimates provide for the ability to estimate demand and changes in future demand/utilization for the specific service areas for the new facilities.
120. The FTI methodology for the projection of future utilization assumed that service utilization rates for each service within each demographic group do not change over time and that volume changes proportionally with population. Current utilization estimates are provided for 2019 from the CHIA data. To account for demand and utilization at the point when new BCH facilities are open and operational, and then for 10 and 15 years from that

⁵³ FTI’s estimates, which are based on visits for the specific services, show largely similar distributions although specific estimates vary some from the BCH estimates, which are based on cases or patients. Differences in volumes may be due either to differences in measures or to data issues described herein with assigning visits to facilities in working with the CHIA data. BCH patient profiles are set out in the responses, as are the need assessments. See, for example, Tables 1 and 1 A in each of “# BCH-21071411-HE. The Children’s Medical Center Corporation.” October 8, 2021. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses/download>. (The Children’s Medical Center Corporation – Hospital/Clinic Substantial Capital Expenditure – Responses) and "The Children’s Medical Center Corporation – Multisite, # BCH-21071411-HE Application." Draft, April 4, 2022. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download>.

point, we projected utilization forward through 2040 and provide projections for individual years of 2025, 2030, 2035, and 2040. Further, the methodology projects future utilization using the utilization rate of services from each year of the CHIA outpatient data (2016, 2017, 2018, and 2019) individually. This methodology creates four separate projection trends, which are then averaged, to enhance the robustness of the estimates.⁵⁴

121. Around 10% of the visits were missing ZIP code information, and to avoid losing these patients in the projections, the methodology distributed their visits proportionally within groups to ensure total utilization predictions would not be underestimated.⁵⁵
122. The projected utilization of services method is based solely on the expected changes in population and the current demand pattern. It does not account for potential changes in future demand that are driven by factors such as changes in disease prevalence, treatment patterns, care-seeking behaviors, and entry or expansion of local facilities.⁵⁶

B. Estimated Changes in Population and Demographics for Use in Estimating Change

123. The UMDI population projections include projections by sex and age group at zip code level. In the state of Massachusetts, the population aged between 0 – 18 is projected to decline from 1.59 million in 2020 to 1.48 million in 2040, a slight decrease of 2.9%. During this period, the total population (inclusive of adults), on the other hand, is expected to grow by 6.4%. Table 15: Projected Population in Massachusetts, Ages 0 – 18 (2020 – 2040) shows the detail from the UMDI data to illustrate projected population by year and by age group for the pediatric population. These detailed projections were used to attempt to account for as many factors as available to estimate current and future demand for services by the relevant patient population, including by age, gender, utilization, and payer categories (e.g., Medicaid).

⁵⁴ This is not exactly the same as taking the average utilization rate for 2016-2019 and then projecting that single utilization rate forward. This is because the utilization values fall between the population numbers provided by UMBI (only 2015 and 2020) so to extrapolate projections, the starting population for each of the years 2016-2019 had to be interpolated. To provide the most robust projections and estimates, FTI decided that in order to use as much data as possible, we would apply this approach to all years we had available.

⁵⁵ Utilization was limited to Massachusetts residents as best as possible.

⁵⁶ We note that this assumption may differ to some extent from BCH's assumption about the specific mix of imaging modalities, specifically use of MRIs vs. CT for pediatric care at BCH, and the rates of change historically in MRI use vs. CT use for its patient population. In its response to DPH questions, BCH noted that it has historically increased the use of MRIs over CT for specific pediatric care circumstances, and that it projects likely increased utilization of its MRI services relative to CT. As a result, FTI's projected MRI utilization/demand estimates for the entire population may differ to some extent from those in the BCH response. FTI projections yield continued high predicted demand and utilization across the regions, particularly those in the HSAs 4 and 5, which have large pediatric populations relative to the Boston HSA population. See pp 22-23 of BCH Response for detailed summary of the literature and discussion of clinical indications for MRI use. The Children's Medical Center Corporation – Multisite, # BCH-21071411-HE Application." Draft, April 4, 2022. <https://www.mass.gov/doc/the-childrens-medical-center-corporation-hospitalclinic-substantial-capital-expenditure-responses-ii/download>.

Table 15: Projected Population in Massachusetts, Ages 0 – 18 (2020 – 2040)

Age	2025	2030	2035	2040	% Change (2025 - 2040)
0-4	347,535	343,599	337,930	335,009	-2.7%
5-9	358,925	362,490	359,562	354,652	-5.3%
10-14	389,270	375,817	379,939	377,309	-3.1%
15-19	415,715	414,021	405,367	412,782	-0.7%
Total	1,511,445	1,495,927	1,482,798	1,479,752	-2.9%

Source: UMDI population projections

C. Projected Changes in Utilization of Services Over Time

124. The next sections make use of these estimates and methodology to estimated current and future demand for (1) all imaging services; (2) ASC services, and (3) MRI services. Future demand estimates are applied to forecast any additional changes in volume or share of facilities in a service area beyond the shifts due to opening of the new facilities.⁵⁷

1. Changes in Imaging Utilization

125. Utilization projections were developed by area, service, and payer (e.g., Medicaid). Application of the methodology results in initial projections that the total utilization of imaging services by pediatric patients across all regions in the state will decline by 2.4% between 2025 – 2040. These estimated changes in utilization of imaging services vary considerably across geographies. For purposes of future demand projections, geographies are defined as one of the six HSAs used in Massachusetts.⁵⁸ Geography is based on the patient's location. Table 16: Projected Utilization of Imaging Services by HSA, Ages 0 – 18 (2025 – 2040) shows that Metro West, Northeast and Southeast HSAs, which are areas in which BCH has most of its locations represent nearly 60% of total volumes in 2019.

Table 16: Projected Utilization of Imaging Services by HSA, Ages 0 – 18 (2025 – 2040)

HSA	2019	2019 Share of Total	2025	2030	2035	2040	% Change (2025 - 2040)
Boston	74,116	9.4%	80,476	84,654	87,255	87,359	8.6%
Southeast	161,279	20.5%	153,981	150,177	145,789	143,659	-6.7%
Metro West	169,428	21.5%	163,438	158,528	157,753	159,447	-2.4%
Northeast	161,781	20.6%	155,749	153,761	151,136	150,007	-3.7%
Central	120,777	15.3%	115,532	112,889	110,789	110,352	-4.5%
Western	99,628	12.7%	95,157	92,625	91,095	91,089	-4.3%
Total	787,010	100.0%	764,333	752,634	743,817	741,913	-2.9%

Source: The result is based on all imaging claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

126. Table 16: Projected Utilization of Imaging Services by HSA, Ages 0 – 18 (2025 – 2040) shows projected utilization of imaging by HSA and overall. **Overall demand for imaging is high for the base year of 2019 across most regions, and is projected to decline only**

⁵⁷ Note that changes in patient acuity are not determined or reported. Patient acuity, while a standard metric in inpatient analysis and readily available through DRG weights has no standard definition in outpatient services. Because there was no standard value provided in CHIA, and no broadly accepted method of determining this for outpatients, estimated changes in patient acuity are not considered here.

⁵⁸ See, above for discussion of HSAs and Appendix for further information on HSA definition. New facilities are added for example in HSA 4, Metro West.

*slightly by just under 3% over the 15-year period.*⁵⁹ Patients in the Boston HSA represent about 10% of imaging visits (across all providers), and the Boston HSA volume is less than half the volume of each of the Metro West, Northeast, or Southeast HSAs; yet the Boston HSA is projected to have a large demand increase of 8.6%. All other regions are expected to experience a decline, ranging from -2.4% in Metro West to -6.7% in the Southeast.

127. We note that the estimates and forecasts are presented as total utilization estimates for the HSA for the specific service (e.g., MRI). BCH presents estimates of visits per 1,000 pediatric population for the HSAs in which the new BCH facilities are located, which indicate lower levels of utilization per population in some regions.⁶⁰
128. To address questions about utilization by various segments of the population, FTI also evaluated utilization by payer type and projected that the utilization of imaging services for the 0 – 18 group will experience a decline across all payer types. The rates of decline are consistent among payer types, ranging from -2.8% for Medicaid and MassHealth to -3.1% for All Other. Table 17: Projected Utilization of Imaging Services by Payer, Ages 0 – 18 (2025 – 2040) displays projected utilization by payer category. ***Medicaid plus MassHealth (public payer) represents about 53.0% of total volumes in 2019 and commercial (private) represents 46.6%.*** These estimates are generally consistent with BCH estimates of payer mix, and as demonstrated below show substantial Medicaid/MassHealth volumes in the areas in which the new facilities are to be located.

⁵⁹ This estimate, which covers all populations, differs to some extent from the projections in the BCH Narrative and Response to DPH questions; the BCH projections for individual facilities appear well-supported and reasonable for the assumptions and support provided by BCH.

⁶⁰ With regard to access and the need for services (and the location of additional service locations), FTI considered BCH's response to the DPH: "The siting of the proposed Project is in HSA 4: Metro West with utilization markedly lower than Boston... Underserved areas like Framingham will have easier access to BCH's our proposed sites in Waltham and Needham. Underserved residents in Quincy, Brockton and Randolph will have improved access to BCH services in both Weymouth and Needham. Table 4 demonstrates that residents of nearby underserved communities of Brockton, Quincy, and Randolph access both locations. 30% of the existing patients who reside in these communities seek care in Waltham. Expansion of services in nearby Weymouth is designed to improve access to these communities." The FTI utilization projections are based on total volumes per zip code or HSA or other region. We note that BCH reports estimated visits per population across all services and concludes that HSA 6 has a higher average utilization per 1,000 pediatric population. "The highest utilization per 1,000 is HSA 6: Boston at 926.4 visits per 1,000. While there is no reason to expect that the disease burden or need for the specialized pediatric care provided by the Hospital varies across HSAs, the data reflect that patients outside of Boston face increased burdens accessing care from Boston Children's due to geographic barriers. Furthermore, as demonstrated by the response to Question 2, BCH's Satellites service patients across the State." FTI's assessment of overall population estimates by age and by zip code, current utilization of ASC, MRI, and Imaging services for both BCH and total pediatric utilization of these services use different measures of patient volumes. FTI evaluated these measures and compared with the pediatric population and found that for MRI and imaging the estimated utilization/1000 pediatric population were consistent with the BCH calculations.

Table 17: Projected Utilization of Imaging Services by Payer, Ages 0 – 18 (2025 – 2040)

Payer Category	% Change (2025 - 2040)
Medicaid	-3.0%
Commercial	-2.8%
Other	-3.1%
Total	-2.9%

Source: The result is based on all imaging claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

129. For greater detail by area, FTI projected utilization of imaging services by HSA and by payer category for the 0 – 18 group. Table A1: Projected Utilization of Imaging Services by HSA and Payer, Age Group 0 – 18 (2025 – 2040) shows projected utilization by HSA and by payer type. While there is some projected decline across most of the regions, overall utilization and demand for pediatric MRI is projected to be high across all, with the largest volumes in the HSAs immediately outside of Boston. Boston remains the only area with projected growth, with all payers experiencing a growth rate of approximately 8.3% or higher. The utilization for Medicaid and MassHealth population is projected to have some decline due to population change and mix in Central (-5.4%), Metro West (-2.8%), and Southeast (-7.9%). In the Western region, the Commercial population is projected to decline (-5.1%).
130. In sum, the utilization results show a high level of utilization demand in 2019 as the base year, and a predicted slight decline in overall utilization of imaging services in the state of Massachusetts from 2025 – 2040. This decline is driven primarily by the projected population decline in Massachusetts for the 0 – 18 age group. Among the different regions in Massachusetts, Boston is the only region with an expected growth in utilization.

2. Projected Changes in Ambulatory Surgery (ASC) Utilization

131. Total utilization of ambulatory surgery service for the 0 – 18 age group is shown across the areas for 2019 and is projected to decline by 3.0% between 2025 – 2040. The estimated slight rate of decline is similar to the decline in the 0 – 18 population. The changes in utilization of ambulatory surgery services vary across geographies. The Boston region is expected to experience an increase of 2.9%. On the other hand, all the other regions are expected to experience a decline in utilization, ranging from -1.9% in Metro West to -5.9% in Southeast. Table 18: Projected Utilization of Ambulatory Surgery Services by HSA, Ages 0 – 18 (2025 – 2040) shows projected utilization by HSA.

Table 18: Projected Utilization of Ambulatory Surgery Services by HSA, Ages 0 – 18 (2025 – 2040)

HSA No.	HSA	2025	2030	2035	2040	% Change (2025 - 2040)
6	Boston	13,364	13,621	13,731	13,747	2.9%
5	Southeast	17,929	17,569	17,163	16,881	-5.9%
4	Metro West	19,544	19,260	19,102	19,172	-1.9%
3	Northeast	19,936	19,622	19,263	19,092	-4.3%
2	Central	13,283	12,948	12,698	12,635	-4.8%
1	Western	13,546	13,305	13,100	13,092	-3.2%
Total		97,602	96,325	95,057	94,619	-3.0%

Source: The result is based on ASC claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

132. We projected the utilization of ambulatory surgery services for the 0 – 18 group will experience a decline across all payer types. The rates of decline across payers vary. The utilization for Medicaid and MassHealth group will experience the smallest decline (-2.2%), while the utilization for All Other group will experience the largest decline (-5.0%). Table 19: Projected Utilization of Ambulatory Surgery Services by Payer, Ages 0 – 18 (2025 – 2040) shows projected utilization by payer category. The largest numeric declines are in commercial, although the overall reduction is modest. The predicted utilization shows substantial volumes split between Medicaid/MassHealth and Commercial, indicating ongoing demand for ASC services by Medicaid and MassHealth populations.

Table 19: Projected Utilization of Ambulatory Surgery Services by Payer, Ages 0 – 18 (2025 – 2040)

Payer Category	% Change (2025 - 2040)
Medicaid	-2.2%
Commercial	-4.1%
Other	-5.0%
Total	-3.1%

Source: The result is based on ASC claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

133. Projected utilization of ambulatory surgery services was also estimated by both HSA and by payer category for the 0 – 18 group. Table A2: Projected Utilization of Ambulatory Surgery Services by HSA and Payer, Age Group 0 – 18 (2025 – 2040) presents projected utilization by HSA and by payer category. Within Boston, utilization for MassHealth/Medicaid and Commercial are expected to increase. In the Central region, all payer categories are projected to decline ranging from -4.4% for MassHealth to -8.4% for All Other. The Metro West region are projected to decline for all payer categories except for All Other (+11.5%). The Northeast region is projected to decline across all payer categories, with Medicaid and MassHealth experiencing the smallest drop, only -2.7%. The Southeast region is also projected to decline for all payer categories, ranging from -5.3% for Medicaid and MassHealth and -6.7% for Commercial. The Western region is projected

to have stable utilization for All Other (0.0%) and slight for Medicaid and MassHealth (-2,4%) and Commercial (-5.4%).

134. In sum, the utilization results show a high level of utilization demand in 2019 as the base year, and a predicted slight decline in overall utilization of ASC service in the state of Massachusetts from 2025 – 2040. This decline is driven primarily by the projected population decline in Massachusetts for the 0 – 18 age group. Among the different regions in Massachusetts, Boston is the only region with an expected growth in utilization.

3. Projected Changes in MRI Utilization

135. Total utilization of MRI service for the 0 – 18 age group is shown for current demand (2019) and is projected to have a slight decline by 2.8% between 2025 – 2040. The estimated slight rate of decline is similar to the decline in the 0 – 18 population.⁶¹ The changes in utilization of MRI services vary across geographies. The Boston region is expected to experience a large increase of 9.1%. On the other hand, all the other regions are expected to experience a decline in utilization, ranging from -3.3% in Northeast to -6.1% in Southeast. Table 20: Projected Utilization of MRI Services by HSA, Ages 0 – 18 (2025 – 2040) shows projected utilization by HSA. Metro West is the area in which both Needham and Waltham are located; these are the two largest regions for MRIs.

Table 20: Projected Utilization of MRI Services by HSA, Ages 0 – 18 (2025 – 2040)

HSA No.	HSA	2025	2030	2035	2040	% Change (2025 - 2040)
6	Boston	6,981	7,342	7,600	7,619	9.1%
5	Southeast	11,848	11,557	11,250	11,127	-6.1%
4	Metro West	16,015	15,201	15,077	15,387	-3.9%
3	Northeast	12,463	12,266	12,090	12,048	-3.3%
2	Central	8,071	7,889	7,757	7,748	-4.0%
1	Western	6,760	6,574	6,473	6,479	-4.1%
Total		62,138	60,829	60,247	60,408	-2.8%

Source: The result is based on MRI claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

136. We projected that the utilization of MRI services for the 0 – 18 group will experience a decline across all payer types. Table 21: Projected Utilization of MRI by Payer, Ages 0 – 18 (2025 – 2040) shows projected utilization by payer category. Payer mix for MRIs is similar to imaging and to ASCs with about 50% in Medicaid/MassHealth. The rates of decline vary slightly across payers. The utilization for Medicaid and MassHealth group is projected for the smallest decline (-2.4%), while the utilization for Commercial is projected for a somewhat greater decline (-3.1%).

⁶¹ As assumed above, the projections assume no additional changes in treatment modalities for imaging between 2019 and future years.

Table 21: Projected Utilization of MRI by Payer, Ages 0 – 18 (2025 – 2040)

Payer Category	% Change (2025 – 2040)
Commercial	-3.1%
Medicaid	-2.4%
Other	-4.5%
Total	-2.8%

Source: The result is based on MRI claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

137. Projected utilization of MRI services is also provided by HSA and by payer category for the 0 – 18 group. Boston is projected to have a large increase in utilization across all payer categories, ranging from 8.9% for Medicaid/MassHealth and 9.5% for Commercial. Other regions will experience a decline in utilization across all payer categories. In the Central region, all payer categories will experience a decline ranging from -2.9% for Commercial to -5.4% for Medicaid and MassHealth. The Metro West regions will also experience a decline for all payer categories, from -3.2% for Medicaid and MassHealth to -5.3% for All Other. The decline in Northeast ranges from -2.3% for Medicaid/MassHealth and -4.3% for Commercial. The Southeast region will overall experience the sharpest decline, ranging from -4.4% for Commercial to -7.7% for Medicaid and MassHealth. The decline in Western region ranges from -3.8% for Medicaid and MassHealth and -4.6% for Commercial. Table A3: Projected Utilization of MRI by HSA and Payer, Age Group 0 – 18 (2025 – 2040) presents projected utilization by HSA and by payer category.
138. In sum, the utilization results show a high level of utilization demand in 2019 as the base year, and a predicted slight decline in overall utilization of imaging services in the state of Massachusetts from 2025 – 2040. This decline is driven primarily by the projected population decline in Massachusetts for the 0 – 18 age group. Among the different regions in Massachusetts, Boston is the only region with an expected growth in utilization. We note that the same caveats and assumptions apply to MRI as to imaging and ASCs.

D. Discussion of Results of Projected Demand/Utilization

139. In sum, the projected demand by Massachusetts pediatric residents for imaging, ASC and MRI services at the regional (HSA), more local geographies, and the state level show high levels of current and projected future demand for these services. The projected mix of demand by payer shows that Medicaid/MassHealth will continue to account for about half of demand and utilization. These trend projections as well as levels address the ICA questions that require consideration and projections of likely demand for services in future and for services from BCH (as well as other providers) including by payer. The methods used in this section by FTI involved standard methods for estimating current utilization and demand and forecast models for future demand – and provide a basis for estimating the proportion of the patient population that likely will come to BCH for specific services at the new locations. As noted, the projected utilization rates and growth rates in specific regions (e.g., a BCH service area) may differ from those based on other geographies and

do not account for trends such as increased migration of families between and among regions.

X. PREDICTING DEMAND AND CHOICE MODELING PATIENT PREFERENCES FOR PEDIATRIC SERVICE PROVIDERS

140. The prior section developed estimated the projected demand for the relevant services currently and for years up to and including 2040. This section provides FTI's econometric methodology and use of data to estimate patient choice of facility and location for care in the future when new facilities are available in addition to current facilities for each of these services.
141. To generate estimates of how the change in health care providers (e.g., the addition of Needham facility with its MRI and ORs and services) will affect patient volumes at these and current facilities, patient choice modeling commonly used in healthcare settings (and that FIT uses here) is applied to historic claims data. Patient choice modeling allows researchers to use past patient behavior to predict how patients will behave when faced with new choices. In merger review, these models are often used as part of the economic analysis to elucidate mergers' potential effects on prices, but these models can also be used to explore expansion or contraction of hospital systems or facilities.⁶²
142. **Changes in Capacity involved in the Proposed Project:** For this analysis and response to the ICA questions, patient choice modeling is used to predict the effects of BCH's proposed changes, closing outpatient ORs at Lexington, opening them at Needham, and then adding MRIs at Needham and Weymouth facilities. For ASCs, both the closure and opening of ORs in different geographic locations will potentially cause patients to shift their volumes among all the facilities offering ASC services. Similarly, for MRIs and other imaging services, the new options will likely appeal to patients living close to the new facilities and will draw from hospitals that currently serve them.⁶³ As the analysis looks over time, this economic modeling approach predicts use of locations for "new" patient demand in an area based on the model. Below, the steps taken to undertake this analysis are described in detail.

⁶² See, e.g., Capps, Cory, David Dranove, and Mark Satterthwaite. "Competition and market power in option demand markets." *RAND Journal of Economics* (2003): 737-763.

⁶³ The patient choice modeling, also called discrete choice modeling or CDC has become standard approach in many healthcare analyses as part of the overall economic analysis and makes specific assumptions for tractability. While these assumptions, including ones about network configurations, are ones that may be explored and modeled more extensively in specific hospital transactions or matters, for purpose of the modeling with the CHIA data for the ICA questions, we make the standard assumptions, and detail them in the Methodology section. Similarly, we did not model additional downstream or secondary effects of shifts or of changes in referral patterns from the new outpatient locations to BCH inpatient or of demand at existing locations. We note that BCH reports high levels of capacity utilization at BCH Longwood and long wait times for MRI and BCH predicts that some capacity could go for improved times including for high acuity services (e.g., sedated MRIs) not offered at the satellites. See, BCH Response II.

A. Methodology

143. Using the CHIA All-Payer Claims database, the data is first restricted to CPT codes within the specified service line. The data is then further restricted to claims with a member and provider in Massachusetts from 2019 claims. Then, claims that are indicated as an emergency visit are flagged and assigned a payer category based on Insurance product type (“Payer Type”)⁶⁴. A procedure complexity weight determined by CPT code is then added to each claim⁶⁵.
144. In the CHIA data, all non-commercial BCH patients appear to be recorded as going to BCH Longwood, which was considered inaccurate, and not reflective of real-world choices. Including these patients in the regression dataset according to the original data would bias the hospital effects for BCH facilities because BCH Longwood would appear much more appealing to these patients, and other BCH facilities would appear less so. To address this issue, all patients for these payers who chose any BCH facility were excluded from the dataset that characterizes the model and generates the choice parameters. Additionally, all BCH facilities were removed from the choice sets for all patients who are members of these payer categories.⁶⁶ The effect of these changes is that the model parameters (the patient preferences) are estimated based on all commercial patients and all non-commercial, non-BCH patients but not on non-commercial BCH patients. These patient preferences are then applied to the patients who were removed from the dataset in order to predict which hospital they went to in the *actual world*. In this way, the patients whose choices were unrealistic (all having gone to the Longwood campus and none going to BCH hospital satellites), were re-apportioned according to preferences identified from all the other patients.
145. The diversion regression is a conditional logistic regression of the choice of hospital made on drive time, drivetime squared, drivetime interacted with CPT weight, drivetime interacted with emergency flag, facility fixed effects, facility-CPT weight interaction fixed effects. The resulting coefficients represent how patients weighed each of the factors and decided to which facility to go. For each patient-facility combination, drivetime to the facility is calculated by using the drivetime in minutes between the patient’s and facility’s ZIP code. Facility fixed effects and facility fixed effects interacted with CPT weights are also included in the model.
146. Because of the many locations presented in the CHIA data, an additional option beyond those in the choice set must be included (the “Outside Option”). To accommodate the

⁶⁴ These payer types are “Commercial”, “Medicaid”, “Mass Health”, and “All Other”.

⁶⁵ For inpatient diversions analyses, DRG-Weights calculated by the CMS would typically be used. Since the data used in this analysis is outpatient, DRG codes are typically not reported and hence DRG-weights cannot be used. CPT-Weights are calculated by taking the average charged amount for each CPT code in each facility and then averaging the charged amount for the relevant CPT code among all the facilities in Massachusetts.

⁶⁶ While these patients are not included in estimating regression coefficients, they are included in the prediction step. Additionally, BCH facilities are presented as a choice in the prediction step for non-commercial patients as well.

outside option encapsulating multiple facilities, drivetimes to the outside option for the panel choice data set are calculated by taking the average drivetime from each ZIP code to all the outside option’s ZIP code weighed by the number of times that combination occurs in the data. A similar approach is used for facilities that did not have or had inconsistent facility location information in the CHIA data.

147. To predict volumes at facilities once the new facilities/services are added, the coefficients estimated in the previous step were applied to the same patient data but with two new choices added—representing the new services being provided at existing or new facilities. Because the new facilities would have no fixed effect, the fixed effects for the new facilities are imputed as the mid-point between the average fixed effect among all BCH facility fixed effects and the fixed effect for the BCH Longwood campus.⁶⁷ The two new BCH facilities are then added to the panel-choice data set. Using the coefficients generated from the model, visit probability predictions are calculated for each patient and each facility.

B. Predicted Volumes for ASC, MRI, and Imaging Services

148. The following tables show from which facilities the patients choosing to utilize the new facilities are drawn (e.g., the source of the shift or diversion). For ASC, Imaging and MRI services, respectively, 47%, 20%, and 29% of the proposed new BCH satellite outpatient facilities’ visits are taken from other BCH facilities. More specifically, 14%⁶⁸, 16% and 24% of the new facility visits for the 3 service lines come from the BCH Longwood facility. These tables show shifts across all payer categories and report the estimate volume of visits/procedures that are estimated to shift. Supplemental tables in the appendix show these diversion shares and volumes by payer category. Mass General (the location of MGfC) and the collection of facilities in the Outside Option represent the two next largest sources of patients shifting to the new BCH facilities.⁶⁹ These estimated diversions or shifts provide estimates of the volume of patients. Specifically, Table 22: Diversions to New BCH Facilities for Ambulatory Surgery Center Services, Table 23: Diversions to New BCH Facilities for Imaging Services, and Table 24: Diversions to New BCH Facilities for MRI Services show the diversion to the new facilities for 2019 patient data.

⁶⁷This calculation is used because the expected quality of service (among other factors that influence patient choice that aren’t included in the model) from the new facilities are expected to be similar to the other BCH facilities.

⁶⁸ Because BCH Lexington’s ORs are being closed, the tables below show the net diversion including patients diverted from BCH Lexington. 14% refers to the share of visits to the new facilities from BCH Longwood excluding BCH Lexington.

⁶⁹ We note that these econometrically derived projections of diversion from across BCH to the new facilities are consistent with projections made by BCH in its Application Narrative and its Response about expected shifts of patients from Longwood to the new facilities. The FTI estimates are more robust and complete in that they account for services used, demand factors and patient preferences including travel time, and account for shifts from other health systems. FTI projections also provide estimates by populations (e.g., Medicaid) though these are not reported.

Table 22: Diversions to New BCH Facilities for Ambulatory Surgery Center Services (MA, Patients Aged 0 – 18)

System	Share of Net New Visits Diverted to New Facilities
BCH	47%
Baystate	2%
Boston Medical	1%
Mass General	9%
Tufts	2%
UMASS	3%
Outside Option	36%
Total	~800

Source: The result is based on ASC claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

Table 23: Diversions to New BCH Facilities for Imaging Services (MA, Patients Aged 0 – 18)

System	Share of Net New Visits Diverted to New Facilities
BCH	20%
Baystate	0%
Boston Medical	2%
Mass General	10%
Tufts	2%
UMASS	4%
Outside Option	62%
Total	~12,400

Source: The result is based on all imaging claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

Table 24: Diversions to New BCH Facilities for MRI Services (MA, Patients Aged 0 – 18)

System	Share of Net New Visits Diverted to New Facilities
BCH	29%
Baystate	1%
Boston Medical	2%
Mass General	9%
Tufts	2%
UMASS	4%
Outside Option	53%
Total	~2,400

Source: The result is based on MRI claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from members younger than 19 years old residing in Massachusetts.

149. To project how these diversions change over time in order to respond to questions concerning future utilization and capacity, as well as medical spending, the results above were combined with the population projections from Section IX to generate estimates of

diversion through 2040. The results are reported in Table 25: Projected Diversions to New BCH Facilities for Ambulatory Surgery Services, Table 26: Projected Diversions to New BCH Facilities for Imaging Services), and Table 27: Projected Diversions to New BCH Facilities for MRI Services, respectively. These shares stay consistent when combining the diversion results with the geographic changes modelled in the projections data. BCH has a slightly increasing trend in the projected diversion shares to the new facilities. These results are consistent by payer category as well.⁷⁰

Table 25: Projected Diversions to New BCH Facilities for Ambulatory Surgery Services (MA, Patients Aged 0 – 18)

System	Visits Diverted to New Facilities 2019	Visits Diverted to New Facilities 2025	Visits Diverted to New Facilities 2030	Visits Diverted to New Facilities 2035	Visits Diverted to New Facilities 2040
BCH	47.1%	47.2%	47.3%	47.2%	47.2%
Baystate	1.8%	1.8%	1.7%	1.7%	1.7%
Boston Medical	0.7%	0.7%	0.7%	0.7%	0.7%
Mass General	9.4%	9.5%	9.5%	9.6%	9.6%
Tufts	1.7%	1.8%	1.8%	1.8%	1.8%
UMASS	3.0%	3.0%	3.0%	3.0%	3.0%
Outside Option	36.3%	36.0%	36.0%	36.0%	36.0%

Source: The result is based on ASC claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from commercial members younger than 19 years old residing in Massachusetts.

Table 26: Projected Diversions to New BCH Facilities for Imaging Services (MA, Patients Aged 0 – 18)

System	Visits Diverted to New Facilities 2019	Visits Diverted to New Facilities 2025	Visits Diverted to New Facilities 2030	Visits Diverted to New Facilities 2035	Visits Diverted to New Facilities 2040
BCH	19.6%	19.9%	19.9%	20.0%	20.0%
Baystate	0.4%	0.4%	0.4%	0.4%	0.4%
Boston Medical	1.6%	1.7%	1.7%	1.7%	1.7%
Mass General	10.0%	10.1%	10.2%	10.2%	10.2%
Tufts	1.4%	1.5%	1.5%	1.5%	1.5%
UMASS	4.0%	4.0%	3.9%	3.9%	3.9%
Outside Option	62.8%	62.4%	62.4%	62.3%	62.2%

Source: The result is based on all imaging claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from commercial members younger than 19 years old residing in Massachusetts.

⁷⁰ Additional Payer tables are provided in the Appendix.

Table 27: Projected Diversions to New BCH Facilities for MRI Services (MA, Patients Aged 0 – 18)

System	Visits Diverted to New Facilities 2019	Visits Diverted to New Facilities 2025	Visits Diverted to New Facilities 2030	Visits Diverted to New Facilities 2035	Visits Diverted to New Facilities 2040
BCH	28.9%	29.2%	29.2%	29.3%	29.4%
Baystate	1.1%	1.1%	1.1%	1.1%	1.1%
Boston Medical	1.7%	1.7%	1.7%	1.7%	1.7%
Mass General	8.8%	8.9%	8.9%	8.9%	8.9%
Tufts	2.0%	2.0%	2.0%	2.1%	2.1%
UMASS	4.0%	4.0%	4.0%	4.0%	4.0%
Outside Option	53.5%	53.1%	53.1%	53.0%	52.9%

Source: The result is based on MRI claims from the 2019 CHIA all-payer medical claim data. The data is restricted to visits from commercial members younger than 19 years old residing in Massachusetts.

150. **Consistency with BCH Analyses:** We find that these predicted shifts are generally consistent with the analysis and assessment in the BCH submissions to the DPH, including the recent April 4, 2022 submission of the expected draw of the new locations and the likelihood that they could serve patients from Longwood or broader areas. That submission examined the current patient draw of facilities, the overall population in the area, and the location of patients relative to the current or proposed new site. Limited analysis could be conducted for Needham by BCH given that it is a completely new site. FTI’s independent analysis of service areas, and econometric modeling providing projections of changes in patient choice and shifts among facilities that use empirically sound estimates of patient preferences provides a more robust way to predict sources of diversion.

XI. PRICES OF PEDIATRIC SERVICES IN RELEVANT SERVICE LINES

A. Overview of Pricing Analyses

151. The ICA assessment and questions involves evaluation of current pricing by service line and potential impact of the Proposed Project on prices and medical spending. This section of the ICA Report evaluates estimates of pricing for commercial claims for BCH and other major facilities that offer a similar suite of services.
152. For this analysis, where the proposed changes are for hospitals offering pediatric services, the payers considered were commercial, Medicaid and Massachusetts Health. Prices were estimated for all three categories of payers, but primarily for commercial payers, as those would be the most likely to be affected by changes in shares and, if any, in bargaining power. These prices are used in conjunction with the volume predictions to project total health care costs in Section XIII.
153. To isolate relevant prices, a number of restrictions were implemented in accordance with previous empirical work using CHIA’s claims data. Claims fitting these following criteria were dropped:
- denied claims

- payments made on capitated, bundled, per-episode basis (among others)
 - duplicate claims
 - claims with negative or zero allowed amount
 - claims where the allowed amount was less than 10% or more than 100% of the charged amount
154. Once the restrictions had been applied, allowed amounts were used to determine prices. Relative prices are based on Medicaid prices.⁷¹ To estimate relative prices, the average allowed amount for Medicaid claims across all providers in state for that service was determined in each year. The allowed amounts were then divided by the average Medicaid allowed amount.
155. Second, these prices relative to Medicaid were then divided by the average across all commercial claims to compare facilities and systems to each other. By taking prices relative to Medicaid at the service level, differences in case mix among facilities should be controlled for, however, we note that these do represent averages across systems, combining satellite facilities with major campuses.⁷² Across all three service lines at the system level, based on this methodology, BCH, has the highest estimated average price of the six systems. UMASS and Other both have the lowest relative prices for MRIs, although we note that the Other category is a composite of many individual MRI providers. For all imaging services the systems not expressly identified and in the Other category in the aggregate have the lowest relative prices. Baystate has the lowest average relative price for ASC services.
156. Looking at individual hospitals, based on this methodology, Boston Children's Longwood campus's relative prices are consistently higher than Waltham's, but lower than BCH Peabody's. Longwood's prices are higher than at the Lexington campus. BCH Longwood's ASC prices are higher than the UMASS University campus, but lower than Tufts. Its MRI and imaging average relative price is higher than Tufts and UMASS.⁷³
157. We also conducted analysis of relative pricing within the BCH system for MRI and Imaging services using the BCH payments data, which are publicly available on BCH's website. Gross charges and payments were available for commercial payers, (e.g., BCBSMA, Harvard Pilgrim, Tufts) that permitted estimation of differences by CPT code

⁷¹ While there is also a Managed Medicaid category in CHIA data, they represented a very small percentage of claims and were not included in price determination analysis.

⁷² Differences in the product mix within the services line or in the health/complexity of the patient are among the several factors that could influence the average and relative prices of services at specific locations and the comparison of prices. See, Geweke, John, Gautam Gowrisankaran, and Robert J Town. "Bayesian Inference for Hospital Quality in a Selection Model." *Econometrica* 71, no. 4 (2003): 1215-38.

⁷³ These estimates are based on the available data. We note that BCH estimated differences between charges at the BCH satellites and two community hospitals in the BCH Response of April 4, 2022, which directionally showed that the BCH satellites were lower cost. The FTI results reflect a broader range of hospitals and locations and indicate that there are some that are estimated as lower cost and others that are higher cost, and for a variety of factors, as shown in this section.

between Longwood and SAT for imaging and MRI codes for outpatient services. The estimates average differences across all CPT codes in the service line as well as for individual CPT codes indicate that BCH offers lower payments at the satellite locations compared to the Longwood campus for both MRI and Imaging services. The FTI calculated results are similar to the estimated differences provided by BCH for various services for the top commercial payers in the BCH Response of April 4, 2022 to DPH.⁷⁴ These results are consistent with a view that shifts of volumes from BCH Longwood to BCH satellite facilities should reduce costs for the specific services.

Table 28: Relative Prices for Systems in Analysis

System	Facility	MRI	ASC	Imaging
BCH	All Visits	1.97	1.36	2.02
Baystate	All Visits	0.91	0.58	1.47
Boston Medical	All Visits	1.27	1.14	1.26
Mass General	All Visits	0.93	1.01	1.06
Tufts	All Visits	1.43	1.58	1.82
UMASS	All Visits	0.66	0.84	1.56
Other	All Visits	0.67	0.94	0.72

Source: Massachusetts All-Payer Claims Database. Statewide claims, commercial, 2019.

Table 29: Relative Prices for Selected Facilities

Facility	MRI	ASC	Imaging
BOSTON CHILDREN'S HOSPITAL	2.09	1.41	2.09
BOSTON CHILDREN'S AT WALTHAM	1.67	1.08	2.02
BOSTON CHILDREN'S AT LEXINGTON	2.48	0.97	2.38
BOSTON CHILDREN'S at NORTH DARTMOUTH	3.73	2.16	3.98
BOSTON CHILDREN'S AT PEABODY	2.14	1.43	2.44
BCH - Other – Entity	1.63		0.94
BCH - Other – Individual	0.70	0.89	0.87
Massachusetts General Hospital	1.4	0.93	1.14
TUFTS MEDICAL CENTER	1.43	1.62	1.82
UMASS MEMORIAL MED CTR/UNIV CAMPUS	0.33	0.77	1.57

Source: Massachusetts All-Payer Claims Database. Statewide claims, commercial, 2019.

XII. FORECASTED IMPACTS OF PROPOSED PROJECT ON SHARES, PRICES, AND SPENDING

A. Change in Shares

158. The next step in the empirical analysis of impact on pricing/competition and well as capacity/utilization, and evaluation of impact on cost containment goals is estimating the change in market share for BCH compared to other entities for current shares due to the estimated diversion of patients. These estimates are provided for the service areas for the specific services.

⁷⁴ We were not able to make direct extensive comparisons on CPT codes for ASC services between Longwood and Satellites yet note that for many CPT codes in the BCH public data, that BCH appears to have lower listed payments at satellite locations compared to Longwood.

159. Table 30: Change in Shares for ASC, Commercial, Table 31: Change in Shares, MRI, Commercial, and Table 32: Change in Shares, IMG, Commercial report current and projected service area shares for each service line for commercially-insured visits. *For ASC, BCH's share of visits increases by less than 1 percentage point and for Imaging (inclusive of MRI services), by 2 percentage points. The largest change in shares is for MRI, where BCH's new facilities increase BCH's total share of MRI visits, yet by less than 4 percentage points.* These shifts of patients mostly come from the Outside Option, as described above.

Table 30: Change in Shares for ASC, Commercial (Combined Service Area, Patients Aged 0 – 18)

System	Original 2019 Visits Share	New 2019 Visits Share	Change in Share
BCH	13.20%	13.83%	0.63%
BOSTON CHILDREN'S HOSPITAL	11.18%	11.07%	-0.11%
BCH – Other	0.98%	0.97%	-0.01%
BOSTON CHILDREN'S AT WALTHAM	0.53%	0.52%	-0.01%
BOSTON CHILDREN'S AT LEXINGTON	0.45%	0.00%	-0.45%
BOSTON CHILDREN'S AT PEABODY	0.05%	0.05%	0.00%
BOSTON CHILDREN'S at NORTH DARTMOUTH	0.01%	0.01%	0.00%
BCH Needham	0.00%	1.21%	1.21%
Baystate	2.38%	2.36%	-0.02%
Boston Medical	1.00%	0.99%	-0.01%
Mass General	14.39%	14.27%	-0.12%
Tufts	2.65%	2.63%	-0.02%
UMASS	5.20%	5.16%	-0.04%
Outside Option	61.19%	60.76%	-0.43%

Source: Massachusetts All-Payer Claims Database. Combined service area claims, commercial, 2019.

Table 31: Change in Shares, MRI, Commercial (Combined Service Area, Patients Aged 0 – 18)

System	Original 2019 Visits Share	New 2019 Visits Share	Change in Share
BCH	29.9%	33.6%	3.66%
BOSTON CHILDREN'S HOSPITAL	24.6%	23.3%	-1.38%
BOSTON CHILDREN'S AT WALTHAM	3.1%	3.0%	-0.17%
BCH – Other	1.3%	1.2%	-0.09%
BOSTON CHILDREN'S AT PEABODY	0.8%	0.7%	-0.03%
BOSTON CHILDREN'S AT LEXINGTON	0.1%	0.1%	-0.01%
BOSTON CHILDREN'S at NORTH DARTMOUTH	0.05%	0.04%	0.00%
BCH Needham	0.0%	2.9%	2.91%
BCH Weymouth	0.0%	2.4%	2.42%
Baystate	0.9%	0.9%	-0.05%
Boston Medical	1.8%	1.7%	-0.10%
Mass General	9.7%	9.2%	-0.50%
Tufts	2.3%	2.2%	-0.12%
UMASS	4.3%	4.1%	-0.20%
Outside Option	51.0%	48.3%	-2.70%

Source: Massachusetts All-Payer Claims Database. Combined service area claims, commercial, 2019.

Table 32: Change in Shares, IMG, Commercial (Combined Service Area, Patients Aged 0 – 18)

System	Original 2019 Visits Share	New 2019 Visits Share	Change in Share
BCH	19.0%	21.2%	2.14%
BOSTON CHILDREN'S HOSPITAL	14.9%	14.5%	-0.46%
BCH – Other	2.3%	2.2%	-0.07%
BOSTON CHILDREN'S AT WALTHAM	1.3%	1.3%	-0.04%
BOSTON CHILDREN'S AT PEABODY	0.3%	0.3%	-0.01%
BOSTON CHILDREN'S AT LEXINGTON	0.2%	0.2%	-0.01%
BOSTON CHILDREN'S at NORTH DARTMOUTH	0.01%	0.01%	0.00%
BOSTON CHILDREN'S AT BROOKLINE PLAC	0.01%	0.01%	0.00%
BCH Weymouth	0.0%	1.2%	1.23%
BCH Needham	0.0%	1.5%	1.50%
Baystate	0.3%	0.3%	-0.01%
Boston Medical	1.7%	1.6%	-0.05%
Mass General	10.2%	9.9%	-0.29%
Tufts	1.5%	1.4%	-0.04%
UMASS	4.7%	4.6%	-0.10%
Outside Option	62.7%	61.1%	-1.66%

Source: Massachusetts All-Payer Claims Database. Combined service area claims, commercial, 2019.

B. Projected Shares

160. Table 33: Projected Shares for BCH by Year shows the projected market shares to 2040 within the combined service areas for each service line. ***The visit shares do not change significantly from those projected for 2019 based on diversion estimates, with the change in total BCH’s visits share only increasing less than 1 percentage point - between 0.2 and 0.3 percentage points across all 3 service lines.*** These “out-year” estimated changes are driven by changes in patient population, not utilization or facility location. This implies that the estimated population shifts taking place in Massachusetts between 2019 and 2040 are distributed geographically and in other dimensions in ways that lead to some increased utilization of the Longwood campus. A simple example is that population growth around the Longwood campus is growing faster (or declining less slowly) than in other areas.⁷⁵ We note that the projected market shares provide estimates for the share of the new locations at Needham and Weymouth for the services that are added there, consistent with their ability conveniently to serve populations.
161. Table 33: Projected Shares for BCH by Year focuses on the diversions and projected market shares for commercial patients as these shares would be the most relevant when assessing impacts on changes in health expenditures both through redistribution among differently priced facilities and through changes, if any in negotiating power for hospitals. These same analyses were conducted for patients covered by Medicaid and Mass Health.

⁷⁵ We note that the estimated changes however are small.

The projected shares were substantially similar to those for commercial, suggesting that the effect of the new facilities would be similar for these patients as for commercial patients.

Table 33: Projected Shares for BCH by Year (Combined Service Area, Patients Aged 0 – 18)

	Service	Original 2019 Share	New 2019 Share	Projected 2025 Share	Projected 2030 Share	Projected 2035 Share	Projected 2040 Share
Commercial	ASC	14.3%	14.9%	15.2%	15.2%	15.3%	15.3%
	Imaging	19.1%	21.2%	21.6%	21.6%	21.7%	21.7%
	MRI	30.2%	33.9%	34.2%	34.2%	34.3%	34.3%
Medicaid	ASC	14.9%	15.5%	15.7%	15.9%	16.0%	16.0%
	Imaging	20.5%	22.5%	22.8%	23.0%	23.2%	23.2%
	MRI	31.8%	35.2%	35.7%	35.9%	36.0%	36.0%

Source: Massachusetts All-Payer Claims Database. Combined service area claims, 2019.

C. Change in Prices

162. The ICA requests include estimated or predicted changes in prices, which are set out above based on forecasted changes in site of care.

1. Effect of Changes in Shares on Bargaining Leverage and Prices

163. In order to respond to the ICA questions concerning the impact of changes in market share on price, we referred to the economic literature on healthcare and that associates price increases due to changes in market shares with the Herfindahl-Hirschman Index (HHI) measure of concentration. This literature covers a wide range of factors involved in assessing bargaining power in healthcare but provides a means to construct empirical estimates of the relationship between changes in HHI and price for purposes of evaluation of the ICA questions.⁷⁶ Table 34 reports the changes in HHI by service type for the service area based on the projected market shares found in previous section. For these HHIs, since it would be inappropriate to count the outside option as either a single competitor or as individual competitors, the outside option was split evenly to be a number of individual firms each with slightly under 5%. HHIs were then calculated based on the 6 major systems

⁷⁶ There are many caveats to this literature, including about estimating effects from concentration and share measures, or about inferences to be drawn about bargaining power or price effects from changes in structural measures for the services subject to negotiation. See, e.g., Garmon, Christopher. "The accuracy of hospital merger screening methods." *The RAND Journal of Economics* 48, no. 4 (2017): 1068-1102. Healthcare also is characterized by differentiated products, and where many factors make price comparisons complex. As noted by Haas-Wilson and Garmon "In a market with differentiated products, different price levels are neither necessary, nor sufficient, to demonstrate the exercise of market power." See Deborah Haas-Wilson and Christopher Garmon, "Hospital Mergers and Competitive Effects: Two Retrospective Analyses," *International Journal of the Economics of Business* 18, no. 1 (2011): 17-32. Additional discussion of competitive effects modeling in healthcare provided at: Guerin-Calvert, Margaret E. "Competitive effects analyses of hospital mergers: Are we keeping pace with dynamic healthcare markets?" *The Antitrust Bulletin* 59, no. 3 (2014): 505-513; and two other articles in the same volume, Capps, Cory S. "From Rockford to Joplin and back again: The impact of economics on hospital merger enforcement." *The Antitrust Bulletin* 59, no. 3 (2014): 443-478; and May, Sean, and Monica Noether. "Unresolved questions relating to market definition in hospital mergers." *The Antitrust Bulletin* 59, no. 3 (2014): 479-503.

plus an assumed 11 to 13 providers representing the providers that comprise the outside option. Consequently, the numbers in Table 34: HHIs and Changes in HHI should be considered overestimates of actual concentration and changes in concentration. Even so, the highest change is for MRI which increases by 214. *Because the HHIs and changes in HHIs determined for ASC and all imaging services are below the Department of Justice’s thresholds,⁷⁷ modifications to price due to changes in concentration were not undertaken and changes in health care costs are assumed to be entirely driven by patient redistribution among facilities whose prices may differ. Stated alternatively, the changes in share and concentration levels do not demonstrate a concentration/share basis of concern about increased pricing or bargaining power by BCH.*

Table 34: HHIs and Changes in HHI

Service	HHI (2019)	HHI (2025)	2019-2025 change in HHI	HHI (2040)	2019-2040 change in HHI
ASC	710	726	+16	729	+19
MRI	1278	1492	+214	1497	+220
All Imaging	794	871	+77	876	+82

Source: Massachusetts All-Payer Claims Database. Statewide claims, commercial, 2019.

D. Total Medical Spending

1. Estimated Impact on Medical Spending

164. The estimated utilization demand from Sections IX and X and the price analysis described in Section XI were combined to project the total health care costs under the changes outlined by BCH. The following tables isolate the changes in health care costs for commercial only in each of the service lines. Commercial was isolated because it is for these patients that changes in market shares might affect prices or that shifts in location of care may affect total health care expenditures. While Medicaid and MassHealth patients will also shift, as shown in Section X, total health care costs for these patients are less like to be affected due to patient choice.
165. While there are predicted volume changes for public payers, healthcare cost trend analyses tend to focus on commercial payers because these are the payers for whom there may be potentially significant changes in health care expenditures due to larger current differences in prices between facilities. Consequently, we focus on commercial patients in the analysis below.
166. For this analysis, commercial prices were determined by first isolating payments based on the same restrictions described above in Section X. Further, commercial prices were averaged within a facility and procedure when there were more than ten visits for that procedure in 2019. If there were fewer than ten in 2019, then an inflation-adjusted average price was determined using 2016-2019 data as long as there were at least 10 visits across

⁷⁷“Mergers involving an increase in the HHI of less than 100 points are unlikely to have adverse competitive effects and ordinarily require no further analysis.” Horizontal Merger Guidelines. U.S. Department of Justice and the Federal Trade Commission. Issued August 19, 2010.

the four years. In the event that there were ten or fewer visits for a procedure across all four years in a facility, the average commercial price for that procedure was determined for all facilities in that year and then it was multiplied by the relative price of that facility. For example, if Mass General's commercial prices, on average were 120% higher than all commercial prices, and on average, across all facilities a service cost \$100, then Mass General's price for that service would be estimated to be \$120.

167. This methodology produced prices for each service provided in the claims data. For the new facilities, the price was estimated to be the average price of that service across the BCH hospital satellites that offer it.
168. These prices were then matched to each of the visits in the results of the diversion model. With the projected visits already available, the prices were applied to the visits to determine how total commercial costs would change under the new provision of health services.
169. As of 2025, the change in health care costs (spending) for MRI services is projected to be an increase of 4%. This is caused by the new facilities estimated to be drawing disproportionately from hospitals and other providers that have lower prices than the new facilities. This increase will not materially change by 2040 due to assumed demographic shifts. We note that this is not risk or health adjusted by payer. This projection includes changes in volumes both at hospital outpatient providers and office-based physicians.
170. ASCs are predicted to have an increase in healthcare costs for the same reason—patients that currently go to less expensive facilities will shift to the new facilities that are higher cost. Like MRI, the change due to the proposed changes in healthcare providers will not shift substantially over time according to population trends.
171. Like MRIs, total commercial spend on imaging services is estimated to increase, though by not as much as MRIs—less than 2%.
172. In dollar figures, the change in commercial spending on ASC is approximately \$1.32/visit; for imaging services, approximately \$3.50/visit; and for MRI approximately \$32.70/visit, going from average of \$773 to \$806.
173. Conclusion: As shown in Table 35: Estimated Changes in Healthcare Costs, when taken together, the overall change in healthcare costs (spending) due to the proposed changes will be an increase in costs of 1.25%, combined, for both imaging and ASC services. This is well below the cost-containment goals set out above.⁷⁸

⁷⁸ We note that the cost containment goals are set out on a per capita basis. At the service area level, demand is predicted to be relatively steady through 2040 across the patient population. For imaging services, utilization will fall for a period and then start rising while for ASC services utilization will decline slightly, which suggests that the per capita estimates for the service area population would vary only slightly from these estimates. We note that Medicaid utilization of imaging services is projected to increase through 2040.

Table 35: Estimated Changes in Healthcare Costs

Year	Change in Healthcare costs – MRI Services	Change in Healthcare costs – ASC Services	Change in Healthcare costs – All Imaging Services	Combined Change – Imaging + ASC Services
2025	+4.26%	+0.12%	+1.92%	+1.25%
2030	+4.26%	+0.12%	+1.92%	+1.25%
2035	+4.24%	+0.12%	+1.91%	+1.24%
2040	+4.22%	+0.12%	+1.89%	+1.23%

Source: Massachusetts All-Payer Claims Database. Statewide claims, commercial, 2019.

2. Impact on Stakeholders from Change in Costs or Realized Savings

174. The empirical analyses indicate a low increase in medical spending for commercial payers. This section considers the potential impacts across stakeholders in Massachusetts from this change and concludes that the allocation among stakeholders and the overall impact depends on several factors. The economics and healthcare literature, including the extensive industry and government studies on impact and allocation of healthcare expenditure increases, indicate some difficulty in assigning with any precision the specific impact on each of the stakeholders involved in commercial insured care. Standard economic literature on commercial health plans indicate that increased healthcare costs can impact commercial health plans, employers, employees or enrollees; and these can be reflected in increased premiums, out-of-pocket (deductibles, co-pays) and co-insurance, as well as other costs.⁷⁹ Cost effects can be direct or indirect, including compensation or other effects; and vary by the nature and mechanisms affecting any cost-pass through. Cost increases may result in shorter or longer-term impact, depending on specific structures of plans and benefits, and whether and where cost changes are absorbed, and these affect the impact across stakeholders.

XIII. ADDITIONAL QUESTIONS

175. DPH has also asked FTI to consider several additional questions specific to this particular proposed project. We address those in the following sections.

A. Questions on the Impact of the Proposed Project

176. Specifically, this ICA Report considered the impact of the Proposed Project on:
177. (1) *Current and post-project patient panel race/ethnicity breakdown*: The CHIA outpatient data do not include data on race/ethnicity to use to address the impact of the Proposed Project on BCH’s current and post-project patient panel. To evaluate this question, FTI

⁷⁹ Among other sources of information on healthcare expenditures, premiums and out-of-pocket costs and other trends in employer-based and other coverage of healthcare, see, e.g., the 2021 Kaiser Family Foundation annual health benefits survey, “Employer Health Benefits: 2021 Annual Survey.” *Kaiser Family Foundation* (November 2021). <https://files.kff.org/attachment/Summary-of-Findings-Employer-Health-Benefits-2021.pdf>.

used Census and other demographic data on the BCH patient population for the defined service areas and for the overall population for the area to be served by the new facilities/locations. These data, which are reported above in Figure 12 and the supporting analyses, show that approximately 62% of children in the combined service areas for the new facilities are white, 13% are African American, 10% are Asian. These are consistent with and further supported by the BCH Application data which included detailed data by race/ethnicity and other characteristics of the current patient panel served by BCH including at the satellite locations.

178. (2) *Effect on patient panel acuity level*: The CHIA data have limitations on available data on patient acuity for outpatient services (e.g., no direct acuity information for the facilities/procedures proposed or for the patients), which meant that FTI could not provide direct measurement or predictions of changes in acuity level. (This contrasts to some extent with inpatient claims data where DRGs provide some proxy for acuity of service (yet not necessarily of patient)). Reviewing the additions of capacity and the types of services to be provided, it does not appear that patient acuity for the BCH patient panel overall would change substantially either with substantially higher or lesser acuity. The BCH application narrative sets out that the Proposed Project seeks to provide capacity and access to services at the most convenient and appropriate locations. The Longwood facility will continue to serve a large patient population from a broad service area and will continue to provide some services that are not available at the satellite facilities. While overall acuity may not change significantly, the additional facilities provide BCH with more capacity to shift procedures to lower cost settings when appropriate.
179. (3) *Effect on staffing/recruitment*: Available information on the Proposed Project in the Application Narrative and review of the BCH responses on staffing at the new locations or for expanded services do not indicate any significant economic impact on overall recruitment or staffing; and with plans in place consistent with prior expansions of BCH satellite locations to attract sufficient staff to enable services to be provided.
180. (4) *Accessibility of the project to members of MassHealth ACOs and subsidized ConnectorCare plans*: While the CHIA data provide sufficient data to identify MassHealth plans and patients covered by MassHealth, the data do not provide sufficient data and information to differentiate and reliably identify ACO patients as distinct from other MassHealth patients. The data do show substantial coverage of MassHealth patients in the service areas for the new facilities and services. To further develop information on the ACO participant access question, we evaluated information on the ACO plans in which BCH participates, and their service areas as identified in MassHealth ACO enrollment guides. These demonstrated substantial overlap between the BCH ACO service areas and the service areas defined for the relevant services.
181. The Tufts Health Together with Boston Children's ACO (THT with BCH ACO) is one of 13 MassHealth ACO health plans and a large number of providers, including numerous

hospitals and other service providers.⁸⁰ The defined service areas for this ACO include 34 “service areas” (cities) spanning almost all of HSAs 2 – 6 (Central, Northeast, Metro West, Southeast, and Boston), and the northwest and southeast regions of HSA 1 (Western).⁸¹ The service areas defined as part of the economic analysis of the new BCH facilities described in Section VII, overlap almost entirely with the service areas of the ACO. Furthermore, the 34 listed “service areas” of THT with BCH ACO includes each of three new BCH facilities. BCH Needham and BCH Waltham is included in the Waltham “service area”. BCH Weymouth is included in the Quincy “service area”. These factors support a conclusion that the Proposed Project supports access for ACO participants.

B. Needham Facility Reimbursement Rates

182. The DPH posed two questions concerning the Needham facility’s reimbursement rates for services: “While the application states the Needham facility will provide a more accessible and less costly location for certain procedures currently performed in the Longwood Medical Area, it does not cite any specific cost savings by having the services performed at this or other satellite locations. Can these locations be established as entities that are reimbursed at a lower rate? What would the differential (if applicable) between functioning under the hospital license or (1) Contract rate for a free-standing ASC? (2) Differential between potential physician rates to be used for the ASC physicians? “The Application states the Hospital’s rate for MRI is 20% lower than Boston rates – Confirm the statement about BCH’s rate being 20% lower is accurate.”
183. In addressing these questions, FTI reviewed the recent submission by BCH of April 4, 2022 and responses to these questions, and concludes that these responses provide BCH’s proposed approaches with regard to the Needham facility as a satellite facility and also its current reimbursement or rate practices with regard to relative rates at Longwood as compared to satellites. In addition, FTI used the BCH payments data that are publicly available for MRI for Longwood vs. SAT and concluded that the 20% difference is supported by this analysis. The assessment using CHIA data further support the conclusion.

⁸⁰ The list of 13 MassHealth ACO health plans is available on Mass.gov/MassHealth at <https://www.mass.gov/service-details/accountable-care-partnership-plan>. Network provider are from the Enrollment Guide and January 1, 2022 the Tufts Health Together with Boston Children’s ACO Provider Directory, available at: <https://tuftshealthplan.com/documents/microsites/tufts-health-together-with-boston-children-s/tufts-health-together-with-boston-childrens-provid>. A summary of covered benefits and programs is available on the website of Tufts Health Together with Boston Children’s ACO at: <https://tuftshealthplan.com/public-plan/childrens-aco/visitor/whats-covered>.

⁸¹ The 34 service areas of the Tufts Health Together with Boston Children’s ACO Provider Directory are identified in the **2021 MassHealth Enrollment Guide**, as of January 1, 2022 available at <https://www.mass.gov/doc/masshealth-enrollment-guide-2/download> (p.20). This page (p. 20) lists these 34 service areas for this ACO: Adams Attleboro Barnstable Beverly Boston Brockton Fall River Falmouth Framingham Gardner-Fitchburg Haverhill Holyoke Lawrence Lowell Lynn Malden Nantucket New Bedford Northampton Oak Bluffs Orleans Plymouth Quincy Revere Salem Somerville Southbridge Springfield Taunton Waltham Wareham Westfield Woburn Worcester, and a more detailed lists of the individual cities that are included within these 34 service areas is provided at page 36.

C. Sources of Demand for New Facilities and Shifts in Site of Care

184. DPH also posed two questions concerning the sources and cost impact of shifts in the location of care provided at the new facilities “By service line / areas (as BCH has identified by location), to what extent will volume generated at BCH be new volume, or be a shift from current BCH facilities, versus a shift in volume from other providers, taking into account expected demographic changes and existing service capacity at BCH and other regional providers? And what are the cost implications of any shifts? Analyze shift from inpatient or hospital-based facility to outpatient setting for the following: (1) Shift from non-BCH hospital-based providers to BCH clinics; (2) Shift from other outpatient sites to BCH clinics; and (3) Shift from other community hospitals to new sites. And “What are the cost implications of all shifts (short term and long term)?”
185. The detailed analysis provided in this ICA report indicates that the estimated volumes at the new facilities will be a combination of shift in volumes from BCH facilities, particularly Longwood, and some shift from other facilities already serving the service areas of the new facilities; some demand and patient population for the new facilities come from projected new demand for the service area. The cost implication is addressed in the following section.

D. Relative Prices of New Locations to Existing Pediatric Providers

186. The DPH posed the question of “How will the overall prices of these locations compare with those of existing pediatric providers and how would any change in prices be anticipated to impact Massachusetts’ health care cost containment goals (factoring in potential shifts identified in questions 2 and 3)?”
187. The detailed analysis sets out the comparison of relative prices for these locations, which depending on the comparator are sometimes above and sometimes below the comparator. Taking into consideration all new services and the aggregate impact, the cost implications in terms of medical spend are for a small increase in overall average spend for commercial insurers in the shorter term as well as projected over the longer term (through 2040) yet below the current estimated cost-containment goal.

E. Impact on BCH Payer Mix

188. The DPH expressly asked “How is the Payer Mix at BCH projected to change as a result of the Proposed Project, particularly distribution of Commercial/Medicaid/Medicare mix (as appropriate)?”
189. FTI has reviewed the BCH answers to these questions including its April 4, 2022 response (II) to the DPH. The analyses set out in this ICA report indicate that payer mix is not anticipated to change substantially or adversely and that there will continue to be a mix of Medicaid/MassHealth and commercial patients at BCH across both the HSAs and service areas. Analysis in this report reaches the same conclusions based on the similar shares of diversions between public payers and commercial payers. These are provided in Section XII B including the analyses provided in Table 33.

Table 36: Projected Shares for BCH by Year (Combined Service Area, Patients Aged 0 – 18)

	Service	Original 2019 Share	New 2019 Share	Projected 2025 Share	Projected 2030 Share	Projected 2035 Share	Projected 2040 Share
Commercial	ASC	14.3%	14.9%	15.2%	15.2%	15.3%	15.3%
	Imaging	19.1%	21.2%	21.6%	21.6%	21.7%	21.7%
	MRI	30.2%	33.9%	34.2%	34.2%	34.3%	34.3%
Medicaid	ASC	14.9%	15.5%	15.7%	15.9%	16.0%	16.0%
	Imaging	20.5%	22.5%	22.8%	23.0%	23.2%	23.2%
	MRI	31.8%	35.2%	35.7%	35.9%	36.0%	36.0%

Source: Massachusetts All-Payer Claims Database. Combined service area claims, 2019.

XIV. ADDITIONAL ANALYSES OF SERVICE LINES (PARTIAL HOSPITALIZATION, SLEEP SERVICES, GI)

190. In addition to the services analyzed in the sections above (ASC, MRI, and Imaging), three services were identified in BCH’s Application as important additions to healthcare service provision for pediatric patients in the BCH service areas (see Section II above for more detail). Unlike the services above, however, these services are described more as expansions of current service provision than addition of new services or locations, or ones that do not include significant and definitive additions of space or equipment or were not accompanied by projections from BCH on additional volumes. Consequently, different methods were applied to these services to estimate the effect on Massachusetts healthcare costs and consistency with its goals.

A. Sleep Medicine

191. BCH indicates in its application that it plans to expand the existing sleep services program currently offered at BCH Waltham. The Application identifies a small number of providers that offer sleep services and stresses the importance of expanding capacity for both commercial and MassHealth/Medicaid patients to provide closer and more convenient locations and to meet needs, including for broader patient populations for these services.

192. FTI attempted to investigate providers and alternatives for these services using the CHIA data. In 2019, however, based on the available CHIA data and the defined service line, there were only very small volumes of pediatric visits for sleep services in the combined service area.⁸² Most of the providers’ volumes were too low to report. The data indicate existence of some competition for these services both for commercial and MassHealth/Medicaid patients from providers other than BCH, and that BCH provides services to MassHealth/Medicaid patients.

193. Volumes are sufficiently small that FTI does not expect expansion of these services at the Waltham location as part of its program expansion to have a significant impact on costs, and without definitive descriptions of expansion, changes in cost would be due to

⁸² See appendix for list of CPT codes used to identify Sleep Medicine visits.

geographic and demographic population trends. These are not provided here as they are not illustrative of the cost effects due specifically to the project described in the DoN.

B. Gastroenterology (GI) Services

194. BCH also describes its plans to add GI services at its new Needham facility with expanded specialty care and services. BCH's application indicates there are a small number of providers that offer these services and stresses the importance of expanding capacity for both commercial and MassHealth/Medicaid patients and patients typically underserved or with access issues in some of the communities around Boston. Goals of the expansion include potentially increasing availability at the Needham location as an alternative to the BCH Longwood facility.
195. FTI attempted to investigate providers and alternatives for GI services using the CHIA data, which also had somewhat limited volumes. In 2019, based on the available CHIA data and across the full range of CPT, there were more than 4,000 pediatric visits for gastroenterology in the combined service area.⁸³ Most provider's volumes were too low to report; the data confirm that BCH provides these services to both commercial and MassHealth/Medicaid patients. Facilities that were not specifically identified made up under 40% of gastroenterology procedures, and the largest other provider than BCH was Mass General. These results indicate existence of competition for these services both for commercial and MassHealth/Medicaid patients.
196. FTI applied the same methodology for estimating diversion and sources of diversion to the new Needham facility for GI services as used for ASC services. The analysis shows that about a quarter of Needham's gastroenterology visits are expected to come from BCH, primarily from Longwood, reflecting the opportunity to serve patients at the Needham location potentially at lower cost. Of the other sources of diversion, approximately 20% of new visits are expected to be drawn from Mass General and about 36% from the several provider systems in the Other category.
197. The estimated diversion would predict reduced costs for gastroenterology services, by virtue of attracting patients to Needham from higher cost providers, by approximately 0.66% by 2040. The resulting estimated changes in share are not large enough to have an impact on concentration that could be associated with potential effect on prices.

C. Partial Hospitalization Program

198. BCH's Application includes expansion of specialized psychiatric services, including specifically the addition of a partial hospitalization program (PHP) at Waltham to complement the inpatient behavioral health program there. Through research, FTI was unable to identify in the CHIA data a specific set of procedures that uniquely characterize a Partial Hospitalization Program as it did for the other services, such as ASCs and

⁸³ See appendix for list of CPT codes used to identify GI visits in the service area; these codes were used to approximate GI services potentially to be offered at Needham.

Imaging. As an alternative, FTI identified a set of providers in the greater Boston area that based on the research appear to offer such a PHP.⁸⁴ FTI used the 2019 CHIA data and CPT codes for all psych procedures, and attempted to match these providers' in the data; their associated procedures made up less than 0.1% of all outpatient behavioral procedures for pediatric patients in the area.

199. Consequently and consistent with the other research evidence, these programs were determined to be very small and the addition of another provider (BCH at Waltham) would be unlikely to have a consequential impact on costs. Moreover, based on the literature, patients for a PHP could come from different sources that could have cost reducing as well as possible neutral or increasing effects—inpatient visits or ED visits which would tend to lower costs or other outpatient providers of similar programs or alternative types of care which might increase costs. It is also somewhat difficult to determine which services are close substitutes for the PHP. Some studies have shown PHPs are effective treatment programs for adolescents.⁸⁵ Cost estimates are difficult to make because the program itself would be new to BCH. It is FTI's expectation that the small size of programs would on balance not materially increase costs of treating patients and could provide benefits for patients including those covered by commercial and MassHealth/Medicaid.

⁸⁴ More detail on the Partial Hospitalization Programs is provided in the Appendix. We note that these programs are few in number, especially those that work with adolescents and that they do not seem to be large in scale. Additional research of the Regional Guides for the Massachusetts Behavioral Partnership identified Adolescent Partial Hospitalization Programs; these are limited in number, and for example include Baystate Medical Center (Western Region); Harbour Counseling Services, Henry Heywood Hospital, Walden Behavioral Care, and Wayside Youth and Family Support (Central Region); Boston Center HRI Clinics, Inc., Bournewood Hospital, and Walden Behavioral Care (Metro Boston Region); Salem Hospital and Walden (Northeast Region); and Justice Resource Institute, McLean, and Pembroke Hospital (Southeast Region).

⁸⁵ A. Stephen Lenz, et. al. "Evaluation of a Partial Hospitalization Program for Adolescents." *Counseling Outcome Research and Evaluation* (2014). DOI: 10.1177/2150137813518063. https://www.researchgate.net/profile/A-Lenz/publication/274468465_Evaluation_of_a_Partial_Hospitalization_Program_for_Adolescents/links/553d814a0cf2c415bb0f66d1/Evaluation-of-a-Partial-Hospitalization-Program-for-Adolescents.pdf.