COMMONWEALTH OF MASSACHUSETTS
HEALTH POLICY COMMISSION

TECHNICAL APPENDIX B3
PROVIDER ORGANIZATION PERFORMANCE VARIATION

ADDENDUM TO 2017 COST TRENDS REPORT

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1 Summary

This appendix describes the Health Policy Commission's (HPC) approach to the analyses contained in **Chapter 4: "Provider Organization Performance Variation"** of the 2017 Cost Trends Report.

2 Provider organizations

The analyses in Chapter 4 compare spending and utilization measures across the 14 largest provider organizations (with more than 18,000 commercial patients) in the Commonwealth. The provider organizations are listed below. The HPC also categorized the organizations into four groups by their organizational structure: provider organizations that include an academic medical center (AMC), or AMC anchored; organizations that do not include an AMC, but do include at least one teaching hospital, or teaching hospital anchored; organizations that include neither AMCs nor teaching hospitals, but include community hospitals, or community hospital anchored; and those that include no hospitals, or physician-led. Some statistics combine the teaching hospital and community hospital anchored provider organizations into an "other hospital anchored" category. For more on the definitions of hospital types, please see the Center for Health Information and Analysis FY16 Hospital Profiles Technical Appendix (http://www.chiamass.gov/assets/docs/r/hospital-profiles/2016/Massachusetts-Hospitals-Profiles-Technical-Appendix-FY16.pdf).

AMC ANCHORED
Boston Medical Center (BMC)
Beth Israel Deaconess Care Organization (BIDCO)
Partners Healthcare
Wellforce
UMass Medical Center

TEACHING HOSPITAL ANCHORED
Baystate Health
Lahey Health
Steward Health Care
Mount Auburn
Cambridge
Independent Practice
Association (MACIPA)

COMMUNITY HOSPITAL ANCHORED
South Shore Health System
Southcoast Health

PHYSICIAN-LED
Atrius Health
Reliant Medical Group
Central Massachusetts Independent Physician Association (CMIPA)

3 Patient attribution methodology

3.1 Data

The HPC used the Registration of Provider Organizations (RPO) and the SK&A Information Services, Inc. (SK&A) Office Based and Hospital Based Providers dataset along with the 2015 Massachusetts All-Payer Claims Database to attribute patients observed in the APCD to provider organizations in Massachusetts. The patient attribution methodology is listed below.

3.2 Definitions

The following steps detail how the HPC attributed patients to providers, and then providers to provider organizations.

3.2.1 Create provider file

These steps describe the creation of the provider file used in the provider attribution methodology. As described below, the member attribution process requires a file of all providers and their National Provider Identifiers (NPIs), as well as a list of only the primary care providers (PCPs) and their NPIs.

Overall provider file:

To create the overall provider file, the HPC combined 2015 RPO data with December 2015 SK&A data. After excluding any providers missing NPIs and removing duplicate entries of providers who appear in both files, the final provider file includes 27,969 providers, 21,693 from RPO and 6,276 from SK&A.

Primary care provider file:

The HPC defined primary care providers from this list as follows. For the providers in RPO, the HPC included all providers who self-report that they practice as a primary care provider, a pediatrician, or both. The HPC identified PCPs from the SK&A file by using these self-reported specialties: Family practitioner (1,362), General practitioner (78), Internal medicine (3,061), Pediatrician (1,588), IMP (50). In order to ensure internal medicine providers who are specialists in practice are not included in the PCP list, providers who identified their primary specialty as internal medicine had to also list as second or third specialties any of the other specialties (or be missing other specialties) listed above to be included in the PCP list. The PCP file also includes 940 Nurse Practitioners from SK&A (NPs are not included in the RPO data) who self-reported their primary care specialty.

The final PCP file includes 8,636 PCPs, 6,816 from RPO and 1,820 from SK&A.

3.2.2 Attribute patients to providers – using member eligibility file

The HPC then began to attribute patients to providers, starting with the 2015 APCD member eligibility file (ME) file. The ME file includes1,942,273 unique adults (ages 18 and older). 65 percent (1,254,740) of these members, primarily those in HMO plans, were already assigned to a PCP in the data as reported by payers. Patients with multiple providers assigned were attributed to the provider most frequently appearing in the data. Assigned providers were considered their patients PCP regardless of whether they were identified in the provider file as a PCP in the previous step.

3.2.3 Identify PCP visit claims in the APCD

The second step of the patient attribution hierarchy applies to adult members in the APCD who were not attributed to a PCP in step 3.2.2 above. Using the 2015 APCD medical claims, the HPC first identified visits to PCPs using medical claims with CPT codes typically used by payers and academics in performing such attribution. These included:

- 99201-99205 and 99211-99215: sick visits
- 99381-99387 and 99391-99397: well visits

These PCP visit claims are used in the next step to attribute additional patients to PCPs.

3.2.4 Attribute patients to providers – using PCP visits in the medical claims

Using the PCP visit claims identified above in step 3.2.3, the HPC attributed patients to the provider they saw the most frequently for PCP visits. Only claims with PCPs who matched the provider file were included. An additional 299,899 adult patients were attributed using this step.

3.2.5 Attribute patients to providers – using pharmacy claims

The HPC used the 2015 APCD pharmacy claims to attribute some of the remaining patients to providers. Merging the pharmacy claims with the provider file, the HPC attributed patients to the provider who wrote the most prescriptions within the year. An additional 29,337 adult members were attributed in this step.

3.2.6 Combine attributed patient files to create final file

In total, 1,583,976 unique adult members (82 percent of all adult members) were attributed to providers in the RPO and SK&A provider file. The HPC then assigned providers to their larger provider organizations, based on information in RPO and SK&A. A small number of providers were associated with two provider organizations; in these cases, the providers were randomly assigned to a provider organization. Of the adults attributed to a provider, 89 percent (1,404,015 adults) were attributed to providers in the 14 largest provider organizations in Massachusetts (with at least 18,000 attributed commercial patients). The HPC excluded patients missing key data, resulting in a final patient sample of 1,355,527 adults (or 86 percent of those attributed using the patient attribution methodology).

3.3 Analyses

3.3.1 Spending measures

Spending estimates are calculated by summing all claims lines attributed to individual members over the course of a year. A small portion of these individual claim lines do not have accurate price estimates because they are paid under capitation (rather than fee-for-services) so prices do not reflect actual transaction amounts, but instead often reflect estimates provided by payers. The HPC performed several tests analyses that suggest that total amounts paid for care across all claims do accurately reflect amounts paid in the aggregate, including comparing our spending estimates to reported total medical expenditure (TME) amounts reported to CHIA for patients in HMO or POS plans – the latter do not rely on summation of individual claim lines, but include total payments to providers by payers on behalf of members in HMO or POS plans.

Risk adjustment

Risk scores are assigned to each patient in the APCD using the Johns Hopkins Adjusted Clinical Groups Case-Mix System (ACG®) software. The spending measures presented in Chapter 4 are adjusted by the average risk score of the provider organization's attributed patient population.

Categories of spending

Total spending is categorized into inpatient, outpatient, professional, and pharmacy spending using the Health Care Cost Institute (HCCI) methodology. This methodology allows the HPC to further subset spending into lab and radiology categories, which may sum spending for procedures in multiple sites of service. Some similar services may be billed in EITHER the

professional or hospital outpatient categories, depending on the site of care used by, or the billing practices of, a particular provider organization.

Income deciles

Patients fall into different income deciles depending on the average household income of their zip code of residence, from the U.S. Census' American Community Survey data. For more information on this source, see **Technical Appendix D: Data Sources**. Below are the income thresholds for the income deciles.

Decile	Threshold
1	$15,558-$41,864
2	$41,938-$50,108
3	$50,250-$58,324
4	$58,542-$63,548
5	$63,625-$71,790
6	$71,797-$77,949
7	$78,099-$85,521
8	$85,556-$93,307
9	$93,904-$109,804
10	$110,241-$199,519

3.3.2 Utilization measures

The HPC compared the 14 provider organizations across several utilization measures: emergency department (ED) utilization, avoidable ED utilization, hospital utilization, and avoidable hospital utilization.

Emergency Department Utilization

An emergency department (ED) visit is defined as at least one medical claim for a patient on one day, with a site of service equal to "23," or emergency department.

To identify avoidable ED visits, the HPC ran the NYU Center for Health and Public Service Research Billings algorithm ("Billings") on the ED medical claims to categorize each patient's primary diagnosis code. Avoidable visits include Billings categories of non-emergent and emergent, primary care treatable.

Hospital Utilization

A hospital visit is defined as an inpatient visit, comprised of inpatient facility claims occurring at an acute care hospital in Massachusetts for the same patient and any professional claims billed during the within the same dates for the same patient.

To identify avoidable hospital utilization, the HPC adapted the Agency for Healthcare Research and Quality's (AHRQ) Prevention Quality Indicators (PQIs) methodology for insurance claims data. For more information on the composite PQI, which is the measure used in Chapter 4, see **Technical Appendix C1: Hospital Utilization**.

The hospital utilization and avoidable hospital utilization measures represent inpatient claims in 2014 for adult patients attributed to provider organizations in 2015 and are risk and health status adjusted.

Risk and health status adjusted

All utilization rates reported in Chapter 4 are adjusted for patient risk score, age (categorized as 18-34, 35-49, 50+), gender, median income of patient zip code, area deprivation index of patient zip code (https://www.hipxchange.org/ADI), whether the patient's insurance plan is an HMO or point of service (POS) plan, and whether the patient's firm is self or fully-insured. Adjustments were performed using multiple linear regression with indicator variables with each of the 14 provider organizations.