COMMONWEALTH OF MASSACHUSETTS
HEALTH POLICY COMMISSION

TECHNICAL APPENDIX B3
REGIONS OF MASSACHUSETTS

ADDENDUM TO 2013 COST TRENDS REPORT

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Summary

The Commission has defined a set of 15 geographic regions for use in cost trends analysis.[i] These regions are used for analyses for which it is useful to explore geographic variation within Massachusetts (e.g. prevalence of chronic disease, concentration of high-cost patients). Definitions are based on zip codes and are expected to be changed infrequently, to allow measurement of trend over time.

[i] These regions were established to provide an intermediate region set allowing for a level of detail in between the Dartmouth Atlas's 3 Hospital Referral Regions (HRRs) and 66 Hospital Service Areas (HSAs) in Massachusetts.

Methodology

1 Approach to definition

Hospital Service Areas (HSAs) defined by the Dartmouth Atlas were rolled up into 15 regions based on patterns of patient travel for inpatient care. HSAs are a commonly used national region definition and were themselves defined by the Dartmouth Atlas based on aggregations of zip codes.[ii] We used the 2011 MHDC inpatient discharge database and excluded the top quartile of DRGs by CMS case weight from analysis. [iii]
Our algorithm, described below, sequentially merged small regions into larger neighboring regions based on where residents of those regions traveled for inpatient care.

2 Overview of algorithm

1. Initial regions were defined as the set of Dartmouth Atlas Hospital Service Areas (HSAs), including all Massachusetts HSAs and the portions of two Rhode Island HSAs that are contained within Massachusetts boundaries.

2. Each region that did not have a hospital was merged into the neighboring region to which its residents sent the plurality of their inpatient volume.
3.
4. Regions were placed through rounds of merges until the number of regions was stable (i.e., no more merges happened given the constraints described). In each round:
    a. Each region was allowed to participate in at most one merge per round.
    b. Regions were sorted by number of discharges received by hospitals located in the region.
    c. Subject to several balancing constraints (described below), merges were considered for each region, beginning with the largest and proceeding in order of decreasing size. Merges used the following logic:
        i. For each considered region, the neighboring smaller region whose residents send the greatest number of discharges to the considered region was identified.
        ii. If the neighboring smaller region sent a meaningful proportion of its volume to this larger considered region, the regions were merged.[iv] If not, the next neighboring region was analyzed.
        iii. If no neighboring region sent a meaningful proportion of its volume to the larger region, no merge was performed.

Balancing constraints: Three constraints were imposed to balance region sizes

- Regions were limited to a certain proportion of total inpatient volume in the state[v]

[ii] For more information, see the Dartmouth Atlas of Health Care: http://www.dartmouthatlas.org/data/region/
[iii] We excluded DRGs that were in the top 25 percent of DRGs ranked by case-weight, to limit the effect of high-complexity cases in determining patient traffic
[iv] At least ten percent of its volume.
[v] No more than 36 percent. Since Boston starts with ~28 percent of discharges, this threshold was set to allow the region containing Boston to include surrounding HSAs that send much of their volume to Boston

- Once regions reached a certain total population, they no longer participated in merges as 'smaller' regions.[vi]
- Each region was allowed to participate in at most one merge per round

Adjustment for islands: The region set generated by this approach results in separate regions for two island areas, Nantucket and Oak Bluffs, since neither sends a significant proportion of its inpatient volume to neighboring regions. We made manual adjustment to the algorithmically generated regions to combine the islands with the Cape into a single region.

3 Results

15 regions were generated:

Region ID	Region name	Population (000s)	Hospitals
A	Berkshires	133	3
B	Pioneer Valley / Franklin	685	9
C	Central Massachusetts	745	8
D	West Merrimack / Middlesex	674	6
E	East Merrimack	259	3
F	Upper North Shore	65	2
G	Metro West	328	4
H	Metro Boston	1,524	22
I	Lower North Shore	390	4
J	Norwood / Attleboro	323	3
K	Metro South	402	3
L	South Shore	402	3
M	Fall River	143	2
N	New Bedford	196	2
O	Cape and Islands	244	4

[vi] Regions above 300,000 people in population (based on 2011 ACS 3-year estimate). Note that some of the final regions had populations below 300,000; these regions were limited by a different merging constraint.

4 Application of definitions

Analyses presented at the region level were performed at zip-code levels and aggregated to region-level figures using a crosswalk of Massachusetts zip codes to regions.