State Surplus Land Assessment: Final Report

Adarsh Doraswamy, Jacob Gruver, Ruyu Yan, Tengzi Zhao, Waner Zhou

Summary:

Rep. Nika Elugardo introduced a bill that would make it easier for affordable public housing to be built. The bill would allow public housing authorities to borrow against unused state land and make the funding of affordable housing easier. The bill would also enable the state to sell its unused lands to make this land more readily available to developers to either create affordable land or to generate capital for building or renovating affordable housing elsewhere.

Our goal this semester was to build upon work done by previous teams by identifying plots of land that are near hospitals and universities so that they can act as partners in the development of affordable housing or lease the land to generate revenue to build affordable housing. This data will help Rep. Elugardo in convincing her colleagues that the proposed bill would be effective.

Our findings are detailed in the graphs and data below.

What the data are:

Most of the data we used was collected by students working on this project in previous semesters. Our main dataset was generated by choosing state owned parcels out of the

Metropolitan Area Planning Council(MAPC) Parcel Database. In addition to fields included in the dataset, the previous semesters' analysis gives us other generated fields, most notably, Massachusetts House District. We modified the code used to generate this to add Massachusetts Senate District and to generate the same data for a hospital and university owned parcels using a slightly modified version of last semester's program and the same dataset. We have also used a Massachusetts legislative district dataset to make visualizations and add a field to the main dataset to show state senate districts.

Final_data.csv:

Columns' name in .csv	Where we use	Usage
Mapc_id	Parcels' id	The id to identify specific parcel
Longitude, latitude	Parcels' position	The centroid of parcels in real map
Luc_1, luc_2, luc_adj_1, luc_adj_2	Land use code	The code to filter the specific category
Geometry	Contiguous land	The shape and position of the parcels
Lot_areaft	Acres of parcels	The area of parces in acres

Land_value, total_value	Assessed value of parcels	The land value and total value of parcels

Table 1. Introduction of the most important columns we used

What we got from the data:

By processing the raw data, we extracted the state owned parcels and generated a list of hospitals and universities from the MAPC parcel list. We also divided these hospitals and universities into 4 groups: charitable/private hospitals, and private/public universities.

We then used data that we analyzed to find the number and acre of parcels in four specific distances (0.5, 1, 5, 25 miles) from the targets, which, in our case, are charitable/private hospitals and private/public universities.

For each target, we assessed both their land value and total value by parcels belonging to them. We also found contiguous parcels, if possible, that share the same border with every hospital and university. Then we also assigned parcels to legislature districts and visualized our results.

The visualized data are in the pages below.

	0.5 miles	1 miles	5 miles	25 miles
private_universities	1 579 736 777	2 749 557 617	10 940 441 754	17 221 741 919
public_universities	3 147 989 472	4 433 166 332	11 692 477 507	17 469 306 719
charitable_hospitals	3 090 098 577	5 581 683 197	13 913 022 056	17 501 140 319
private_hospitals	316 971 950	1 190 182 415	12 847 522 381	16 994 344 349

Table 2. The assessed total value within specific distance

	0.5 miles	1 miles	5 miles	25 miles
private_universities	2 373	7 813	124 104	512 632
public_universities	10 814	17 015	183 572	516 241
charitable_hospitals	2 893	9 833	229 181	516 581
private_hospitals	784	4 890	144 095	431 701

Table 3. The acre within specific distance

Obstacles we faced:

- Lack of expertise in subject matter:

  In the beginning stages of the project one of the biggest obstacles we faced was the lack of knowledge we had on what the data was and how it could be used. No member of our team had worked with land and parcel data before and understanding the data we had got from previous semesters was a challenge.

- Time Constraints:

  The limited amount of time we were able to spend on this project was enough to complete some of the objectives we had set out to do but not all. Detailed below are the tasks that we would have tried to accomplish if we had had more time.

Moving Forward:

- Identifying land owned by different state departments:

  One of the tasks that we were not able to complete was to identify land owned by state and municipal agencies. This proved more difficult than initially assumed as an expert in the field advised us not to directly use the Land Use Codes as some can differ by district. Instead, one must analyse the description of what the land is being used for in each district and LUC combination and do a

fuzzy match to find out who owns the land. It's worth noting that not all districts differ in LUC codes.

- Identifying transit score of developable parcels:

  Towards the end of the project we attempted to use the WalkScore API to measure transit score, however, we were not able to make this work. Future teams could maybe retry this method or make an algorithm of their own to tackle this problem.

Data Included

In addition to the data that we have included in this report, we are also submitting a folder that contains alternate forms of the data included in the graphics of this report.

- The files titled “parcels_near_(institution type)_by_(house/senate)_district.csv” contain a list of districts, and for each one, the number of parcels within each analyzed radius of the chosen institution that exist in the district.
- The files titled “number_of_parcels_(district name).csv” show the same data, but instead of being grouped by institution type, these display all institution types and distances for one district.
  - “number_of_parcels.csv” shows the same data aggregated for the entire state instead of a single district.

- “assessed_land_value.csv” shows the total value in dollars of the land in parcels of given distances from all relevant institutions. This measure is a statewide aggregate
    - “assessed_total_value.csv” gives a similar measure for the total value of the parcels. This includes assessed land value, assessed building value, and any other assessed value associated with the parcel
- For graphics, we include two formats in the graphics folder - png images, both those included in the document and those for parcels within one mile, and twb files that can be viewed with Tableau Reader. These files have the added benefit of tooltips that show the district name and representative when moused over.

Graphs with data about parcels near private universities

Sen Dist	Count of parcels 1
Second Middlesex	77
Hampshire, Franklin and ..	48
Hampden	42
First Middlesex and Norfo..	35
Norfolk and Plymouth	35
Middlesex and Suffolk	28
First Worcester	26
First Suffolk and Middlesex	16
Second Worcester	15
Fourth Middlesex	11
Second Bristol and Plymo..	11
First Hampden and Hamp..	10
Norfolk and Suffolk	10
First Essex and Middlesex	9
Norfolk, Bristol and Middl..	9
Norfolk, Bristol and Plym..	5
Second Essex	5
Second Middlesex and No..	4
Berkshire, Hampshire, Fra..	1
Bristol and Norfolk	1
Cape and Islands	0
Fifth Middlesex	0
First Bristol and Plymouth	0
First Essex	0
First Middlesex	0
First Plymouth and Bristol	0
Middlesex and Worcester	0
Plymouth and Barnstable	0
Plymouth and Norfolk	0
Second Essex and Middles..	0
Second Hampden and Ha..	0
Second Plymouth and Bris..	0
Second Suffolk and Middl..	0
Third Essex	0

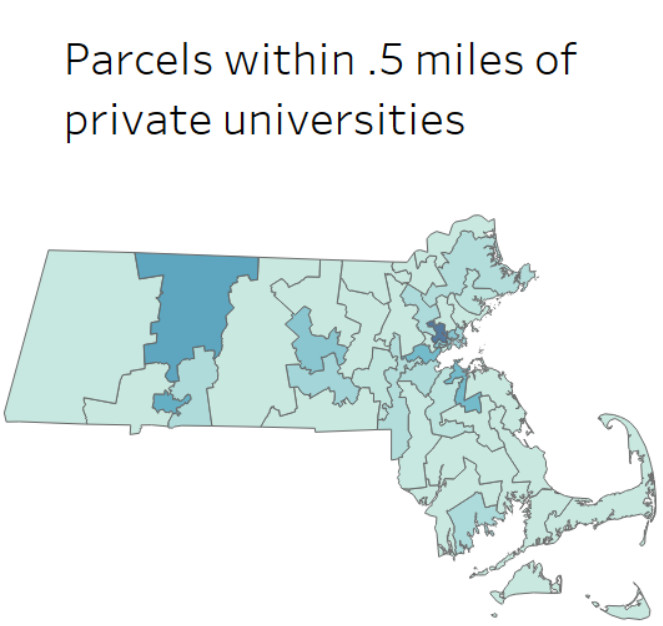

Figure 1. Parcels Within 0.5 Miles of Private Universities For Senate District

Second Middlesex, Hampshire, Franklin, and Worcester contains most of the parcels near private universities.

Sen Dist	Count of parcels 1
First Worcester	555
Second Bristol and Plymo..	390
Hampshire, Franklin and ..	383
First Plymouth and Bristol	358
Second Middlesex and No..	332
Norfolk, Bristol and Plym..	249
Norfolk and Suffolk	248
Norfolk, Bristol and Middl..	247
Hampden	233
Second Worcester	224
First Hampden and Hamp..	221
First Middlesex and Norfo..	216
Second Essex	216
Bristol and Norfolk	211
Berkshire, Hampshire, Fra..	201
Worcester, Hampden, Ha..	198
First Suffolk and Middlesex	188
Second Middlesex	176
Norfolk and Plymouth	174
Second Plymouth and Bris..	157
Third Essex	135
Middlesex and Suffolk	132
Second Suffolk and Middl..	127
First Essex and Middlesex	113
Middlesex and Worcester	89
Second Hampden and Ha..	88
Second Essex and Middles..	79
Fourth Middlesex	72
Third Middlesex	50
Worcester and Middlesex	49
Plymouth and Barnstable	46
Fifth Middlesex	38
Worcester and Norfolk	19
Plymouth and Norfolk	14

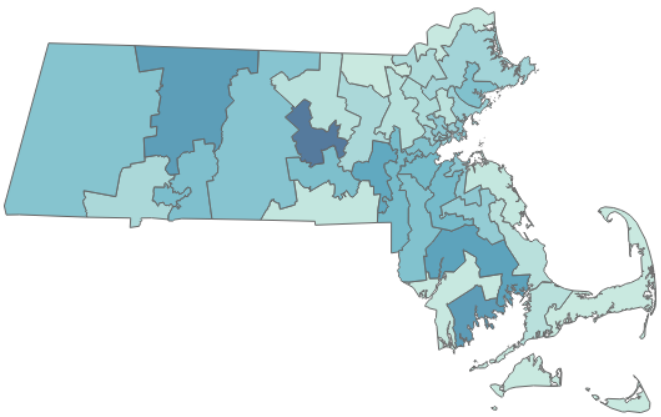

Figure 2. Parcels Within 5 Miles of Private Universities For Senate District

Rep Dist	Count of parcels 1
11th Hampden	35
25th Middlesex	31
1st Hampshire	30
2nd Norfolk	25
11th Middlesex	18
29th Middlesex	17
27th Middlesex	17
24th Middlesex	17
26th Middlesex	16
12th Middlesex	16
34th Middlesex	14
13th Worcester	11
9th Bristol	10
3rd Hampshire	10
1st Norfolk	10
13th Essex	10
11th Norfolk	10
10th Hampden	10
8th Suffolk	9
16th Worcester	9
15th Worcester	8
7th Norfolk	6
9th Worcester	5
6th Essex	5
2nd Hampshire	5
21st Middlesex	5
14th Norfolk	5
10th Norfolk	5
8th Hampden	3
6th Hampden	3
2nd Berkshire	3
1st Worcester	3
14th Worcester	3
14th Bristol	3

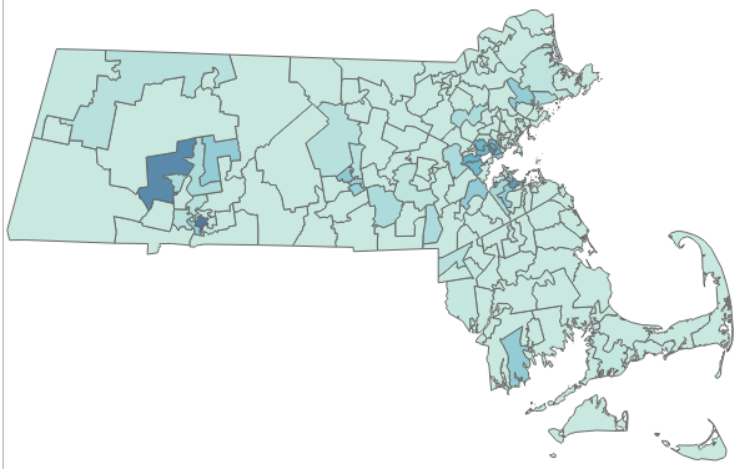

Figure 3. Parcels Within 0.5 Miles of Private Universities For House District

Rep Dist	Count of parcels 1
3rd Bristol	344
1st Worcester	293
14th Worcester	251
5th Middlesex	187
3rd Hampshire	156
9th Bristol	150
2nd Franklin	147
19th Suffolk	142
11th Norfolk	138
2nd Hampshire	129
10th Hampden	126
11th Bristol	124
7th Middlesex	122
6th Norfolk	119
24th Middlesex	118
9th Plymouth	105
1st Hampshire	101
13th Norfolk	94
7th Worcester	93
13th Essex	92
14th Bristol	92
7th Essex	89
12th Middlesex	86
1st Franklin	83
2nd Norfolk	83
14th Norfolk	82
11th Worcester	81
3rd Berkshire	78
11th Essex	77
26th Middlesex	76
13th Bristol	73
1st Bristol	71
4th Bristol	65
4th Essex	65

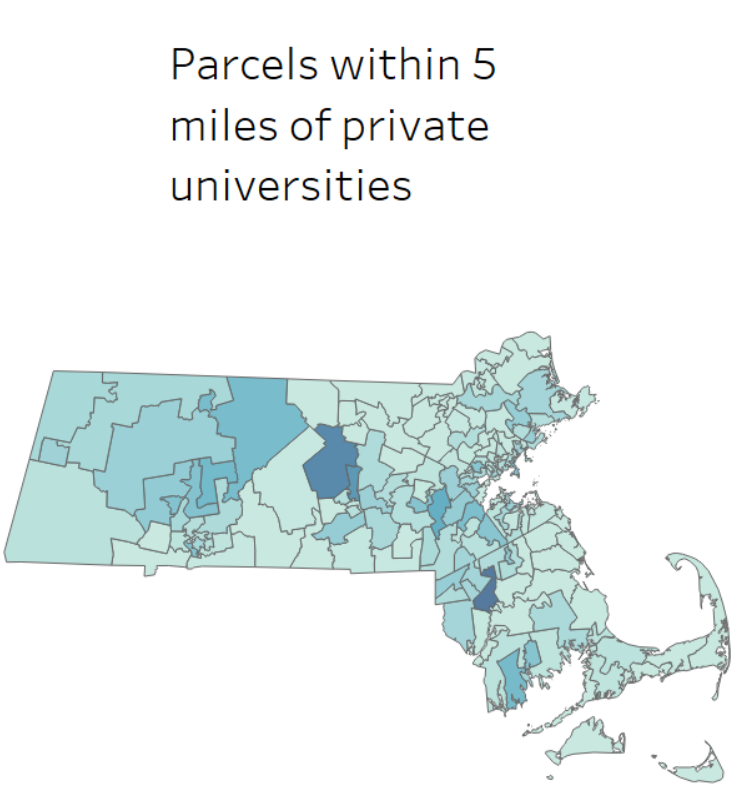

Figure 4. Parcels Within 5 Miles of Private Universities For House District

Graphs with data about parcels near public universities

Sen Dist	Count of parcels 1
First Middlesex	207
First Plymouth and Bristol	110
Hampshire, Franklin and ..	65
Worcester and Middlesex	50
Second Essex	38
First Worcester	36
Second Middlesex and No..	33
Third Essex	33
Hampden	27
Berkshire, Hampshire, Fra..	26
Second Plymouth and Bris..	25
First Bristol and Plymouth	17
Bristol and Norfolk	13
First Middlesex and Norfo..	13
Cape and Islands	11
Middlesex and Suffolk	11
Third Middlesex	9
First Hampden and Hamp..	6
Middlesex and Worcester	5
Second Bristol and Plymo..	5
Second Hampden and Ha..	5
Fourth Middlesex	4
First Essex and Middlesex	3
Second Essex and Middles..	3
Second Worcester	3
First Essex	1
Plymouth and Barnstable	1
Fifth Middlesex	0
First Suffolk and Middlesex	0
Norfolk and Plymouth	0
Norfolk and Suffolk	0
Norfolk, Bristol and Middl..	0
Norfolk, Bristol and Plym..	0
Plymouth and Norfolk	0

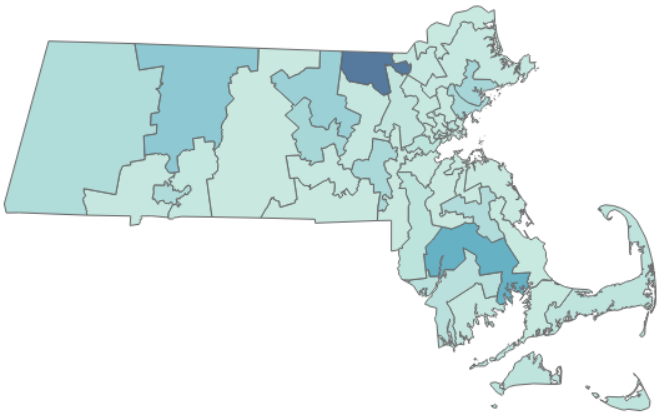

Figure 5. Parcels Within 0.5 Miles of Public Universities For Senate District

First Middlesex, First Plymouth and Bristol contain most of the parcels near public universities.

Sen Dist	Count of parcels 1
First Middlesex	523
Hampshire, Franklin and ..	451
Second Bristol and Plymo..	399
First Worcester	386
Second Middlesex and No..	383
Berkshire, Hampshire, Fra..	328
First Plymouth and Bristol	266
First Bristol and Plymouth	256
Worcester and Middlesex	254
Worcester, Hampden, Ha..	243
Hampden	229
Second Essex	221
First Middlesex and Norfo..	214
First Suffolk and Middlesex	214
Second Hampden and Ha..	196
Norfolk, Bristol and Middl..	193
Second Plymouth and Bris..	190
Third Essex	174
Second Middlesex	173
Cape and Islands	158
Second Worcester	142
First Essex and Middlesex	138
Middlesex and Suffolk	132
Middlesex and Worcester	132
Second Suffolk and Middl..	127
Third Middlesex	122
Norfolk and Suffolk	101
Plymouth and Barnstable	95
Bristol and Norfolk	92
First Hampden and Hamp..	82
Fourth Middlesex	62
First Essex	59
Second Essex and Middles..	42
Norfolk, Bristol and Plym..	27

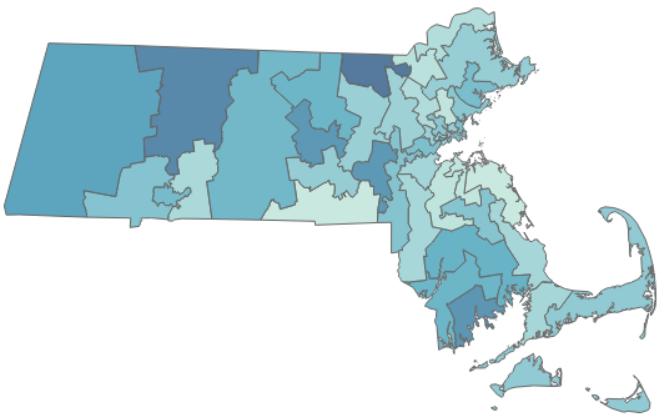

Figure 6. Parcels Within 5 Miles of Public Universities For Senate District

Rep Dist	Count of parcels 1
18th Middlesex	122
8th Plymouth	81
3rd Worcester	45
16th Middlesex	42
3rd Hampshire	33
6th Middlesex	33
11th Essex	30
2nd Plymouth	29
7th Essex	28
10th Hampden	26
14th Worcester	26
10th Plymouth	25
17th Middlesex	24
13th Essex	19
8th Bristol	18
1st Franklin	17
1st Berkshire	16
14th Norfolk	13
2nd Middlesex	12
2nd Suffolk	12
1st Barnstable	10
13th Worcester	9
14th Bristol	8
7th Hampden	6
10th Essex	5
2nd Berkshire	5
2nd Bristol	5
3rd Berkshire	5
10th Middlesex	4
22nd Middlesex	4
2nd Hampshire	4
11th Worcester	3
12th Worcester	3
13th Middlesex	3

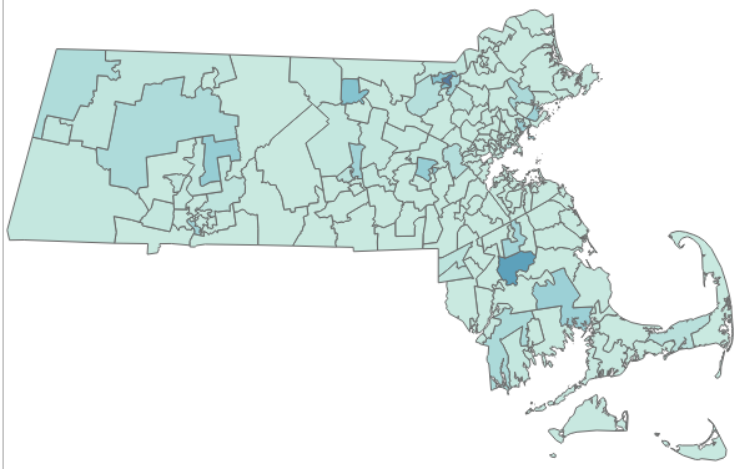

Figure 7. Parcels Within 0.5 Miles of Public Universities For House District

Rep Dist	Count of parcels 1
1st Franklin	261
1st Worcester	217
17th Middlesex	191
5th Middlesex	186
8th Plymouth	185
14th Worcester	170
7th Middlesex	163
19th Suffolk	155
9th Bristol	154
8th Bristol	150
18th Middlesex	133
10th Hampden	126
11th Bristol	126
24th Middlesex	118
2nd Berkshire	111
5th Worcester	109
16th Middlesex	108
9th Plymouth	105
4th Hampden	104
11th Essex	97
3rd Worcester	97
13th Essex	93
7th Essex	89
12th Middlesex	86
2nd Middlesex	84
3rd Hampshire	84
13th Norfolk	83
14th Norfolk	82
2nd Barnstable	80
3rd Berkshire	80
1st Berkshire	79
14th Bristol	77
26th Middlesex	76
13th Bristol	74

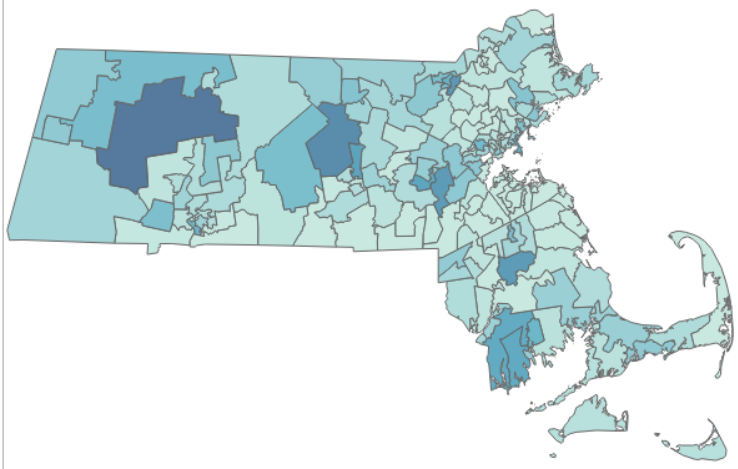

Figure 8. Parcels Within 5 Miles of Public Universities For House District

Graphs with data about parcels near private hospitals

Sen Dist	Count of parcels 1
Hampden	26
First Bristol and Plymouth	18
First Middlesex	13
Norfolk and Plymouth	11
Hampshire, Franklin and ..	10
First Essex	9
First Worcester	9
Norfolk and Suffolk	9
Second Middlesex	8
Worcester and Middlesex	8
First Hampden and Hamp..	6
Second Suffolk and Middl..	6
Bristol and Norfolk	5
First Essex and Middlesex	5
Plymouth and Barnstable	5
Second Essex	5
Second Bristol and Plymo..	4
Second Middlesex and No..	4
Third Middlesex	3
Fifth Middlesex	2
First Plymouth and Bristol	2
Middlesex and Worcester	2
Norfolk, Bristol and Plym..	2
Worcester and Norfolk	2
First Suffolk and Middlesex	1
Second Essex and Middles..	1
Berkshire, Hampshire, Fra..	0
Cape and Islands	0
First Middlesex and Norfo..	0
Fourth Middlesex	0
Middlesex and Suffolk	0
Norfolk, Bristol and Middl..	0
Plymouth and Norfolk	0
Second Hampden and Ha..	0

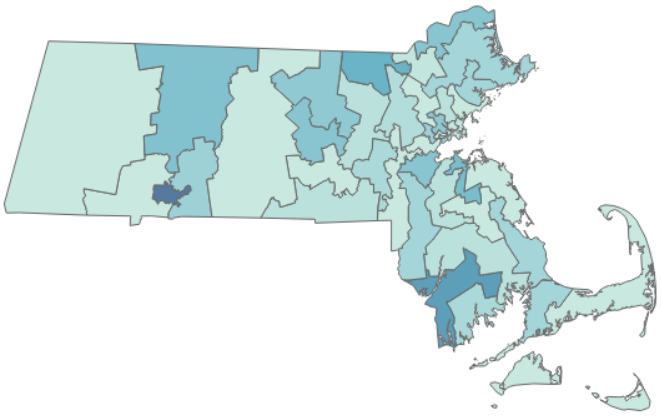

Figure 9. Parcels Within 0.5 Miles of Private Hospitals For Senate District

Hampden, First Plymouth and Bristol contain most of the parcels near private hospitals.

Sen Dist	Count of parcels 1
First Middlesex	496
First Worcester	468
Second Bristol and Plymo..	415
Second Middlesex and No..	400
Bristol and Norfolk	348
Middlesex and Worcester	307
First Essex and Middlesex	269
First Plymouth and Bristol	260
Norfolk and Suffolk	255
Hampden	232
Worcester and Middlesex	223
First Suffolk and Middlesex	214
Second Essex	209
Worcester, Hampden, Ha..	208
First Bristol and Plymouth	196
Third Middlesex	194
Norfolk, Bristol and Plym..	192
Norfolk and Plymouth	188
Hampshire, Franklin and ..	176
Second Middlesex	176
Second Plymouth and Bris..	162
Second Worcester	159
First Essex	154
First Hampden and Hamp..	154
Worcester and Norfolk	151
Third Essex	148
Norfolk, Bristol and Middl..	140
Plymouth and Barnstable	134
Middlesex and Suffolk	132
Second Essex and Middles..	128
Second Suffolk and Middl..	127
First Middlesex and Norfo..	123
Fourth Middlesex	89
Fifth Middlesex	56

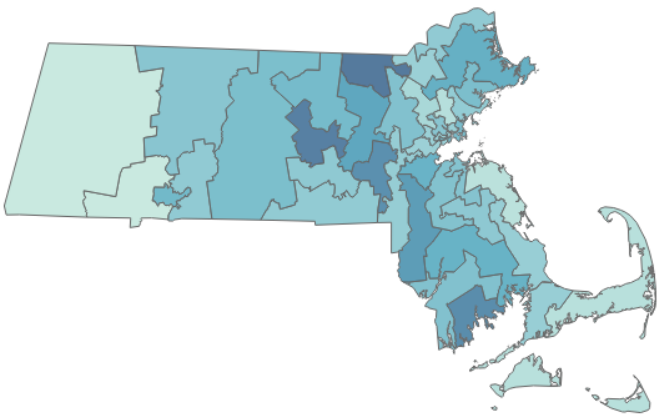

Figure 10. Parcels Within 5 Miles of Private Hospitals For Senate District

Rep Dist	Count of parcels 1
7th Bristol	18
10th Hampden	16
16th Middlesex	14
24th Middlesex	11
2nd Berkshire	10
11th Hampden	10
2nd Norfolk	9
12th Norfolk	8
15th Worcester	8
3rd Essex	6
7th Hampden	6
12th Essex	5
1st Bristol	5
2nd Essex	5
5th Barnstable	5
10th Bristol	4
2nd Worcester	4
35th Middlesex	3
3rd Worcester	3
7th Middlesex	3
9th Worcester	3
14th Middlesex	2
15th Essex	2
31st Middlesex	2
5th Bristol	2
5th Norfolk	2
6th Norfolk	2
8th Middlesex	2
18th Essex	1
19th Middlesex	1
19th Suffolk	1
1st Middlesex	1
6th Middlesex	1
14th Worcester	1

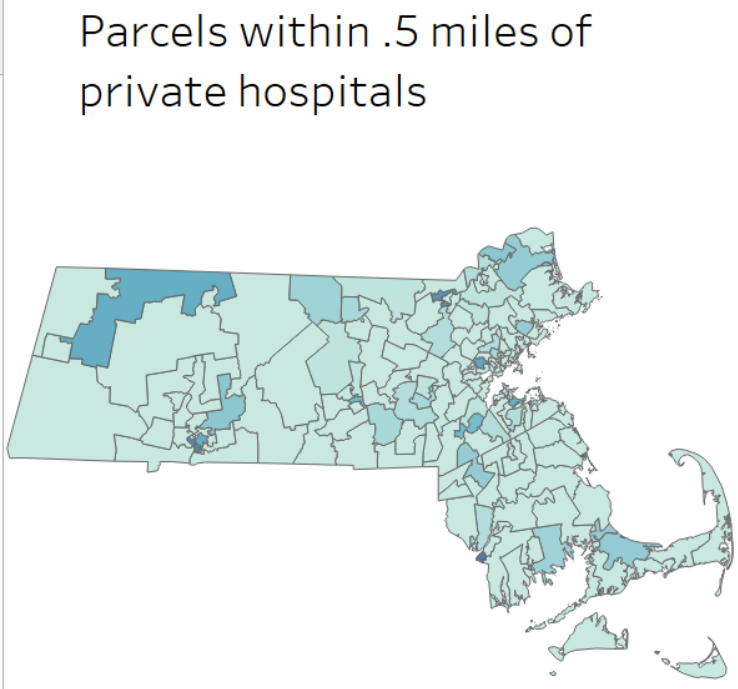

Figure 11. Parcels Within 0.5 Miles of Private Hospitals For House District

Rep Dist	Count of parcels 1
14th Worcester	223
17th Middlesex	191
7th Middlesex	163
1st Worcester	162
5th Middlesex	158
19th Suffolk	155
9th Bristol	151
2nd Essex	145
11th Norfolk	138
18th Middlesex	133
1st Franklin	131
11th Bristol	126
10th Hampden	126
6th Norfolk	120
24th Middlesex	118
4th Bristol	110
16th Middlesex	108
9th Plymouth	105
3rd Bristol	104
2nd Worcester	97
3rd Worcester	97
1st Bristol	93
1st Essex	91
8th Middlesex	90
7th Essex	89
1st Middlesex	89
8th Bristol	88
4th Middlesex	86
13th Norfolk	84
11th Worcester	83
2nd Norfolk	83
3rd Barnstable	81
12th Middlesex	81
5th Barnstable	80

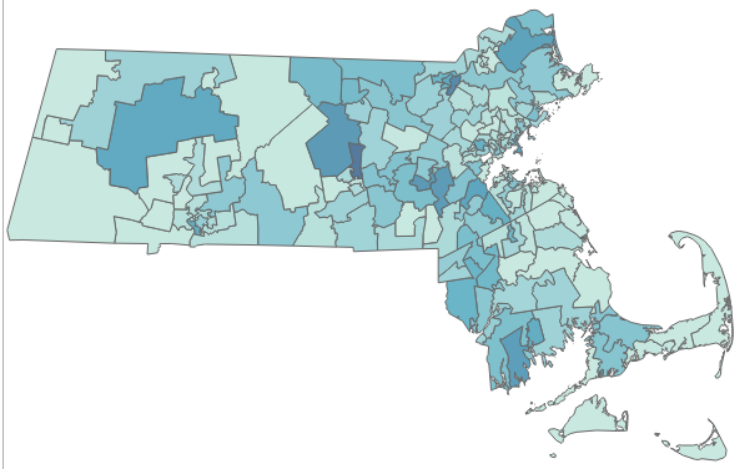

Figure 12. Parcels Within 5 Miles of Private Hospitals For House District

Graphs with data about parcels near charitable hospitals

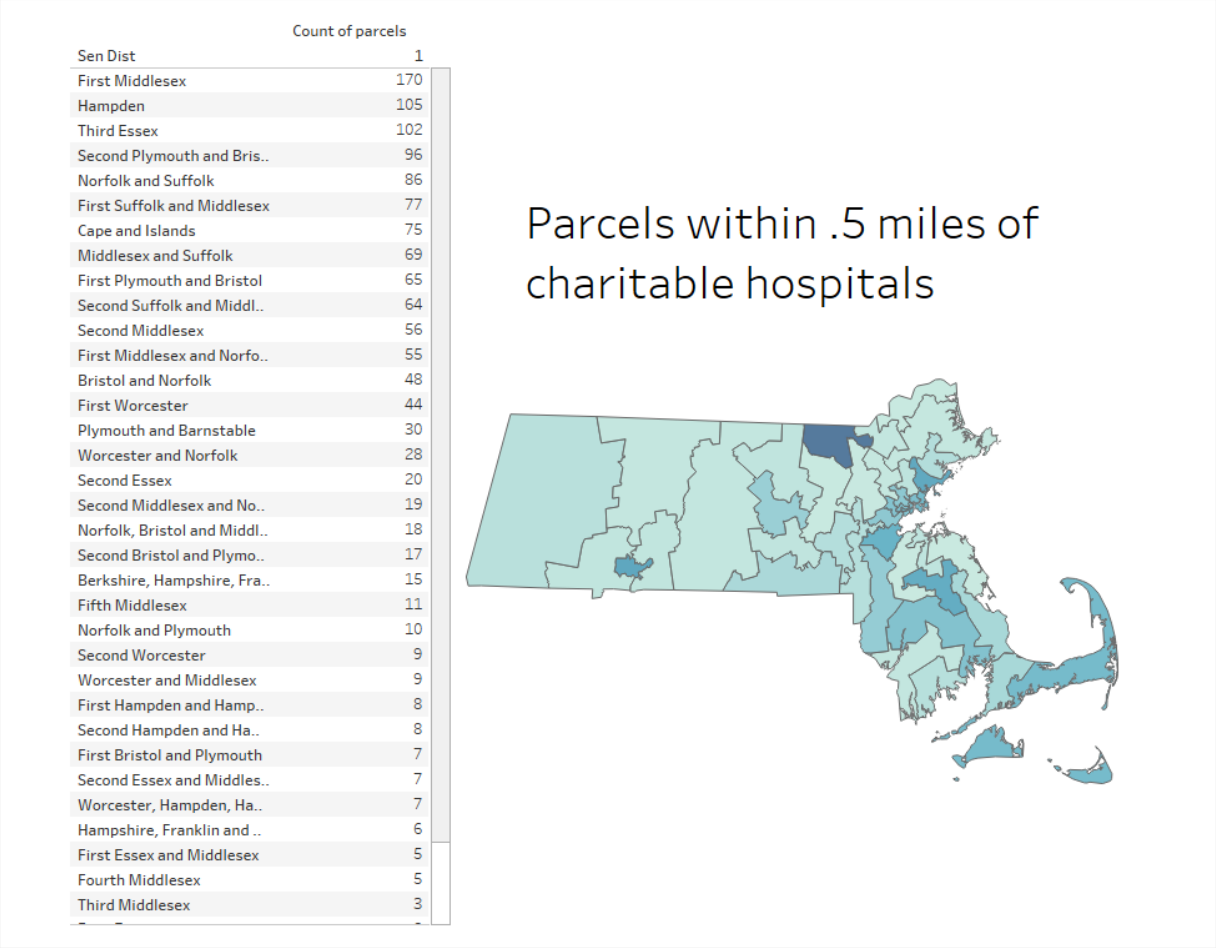

Figure 13. Parcels Within 0.5 Miles of Charitable Hospitals For Senate District

First Middlesex, Hampden, and Third Essex contain most of the parcels near charitable hospitals

Sen Dist	Count of parcels 1
First Plymouth and Bristol	758
Worcester, Hampden, Ha..	638
First Middlesex	440
Second Bristol and Plymo..	418
First Worcester	415
Cape and Islands	410
Second Middlesex and No..	400
Worcester and Middlesex	364
Berkshire, Hampshire, Fra..	356
Worcester and Norfolk	311
Bristol and Norfolk	308
Hampshire, Franklin and ..	306
Plymouth and Barnstable	297
Norfolk and Suffolk	236
First Bristol and Plymouth	235
Hampden	233
Second Essex	221
First Middlesex and Norfo..	216
First Suffolk and Middlesex	214
Norfolk, Bristol and Middl..	212
Second Worcester	210
Second Hampden and Ha..	200
Norfolk and Plymouth	196
Third Middlesex	180
Second Middlesex	176
Second Plymouth and Bris..	174
Third Essex	174
First Hampden and Hamp..	170
Middlesex and Worcester	141
Middlesex and Suffolk	132
Second Essex and Middles..	129
Second Suffolk and Middl..	127
First Essex and Middlesex	124
Norfolk, Bristol and Plym..	119

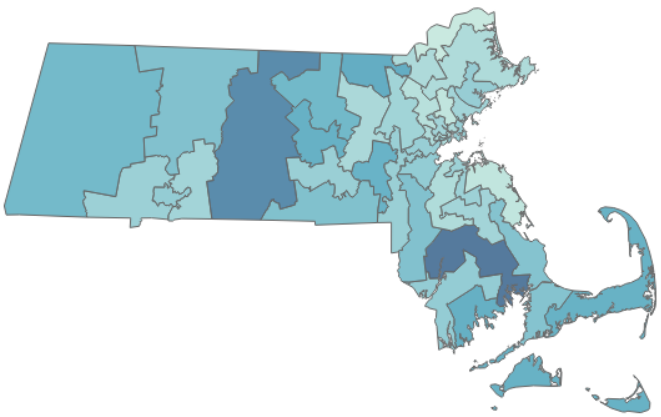

Figure 14. Parcels Within 5 Miles of Charitable Hospitals For Senate District

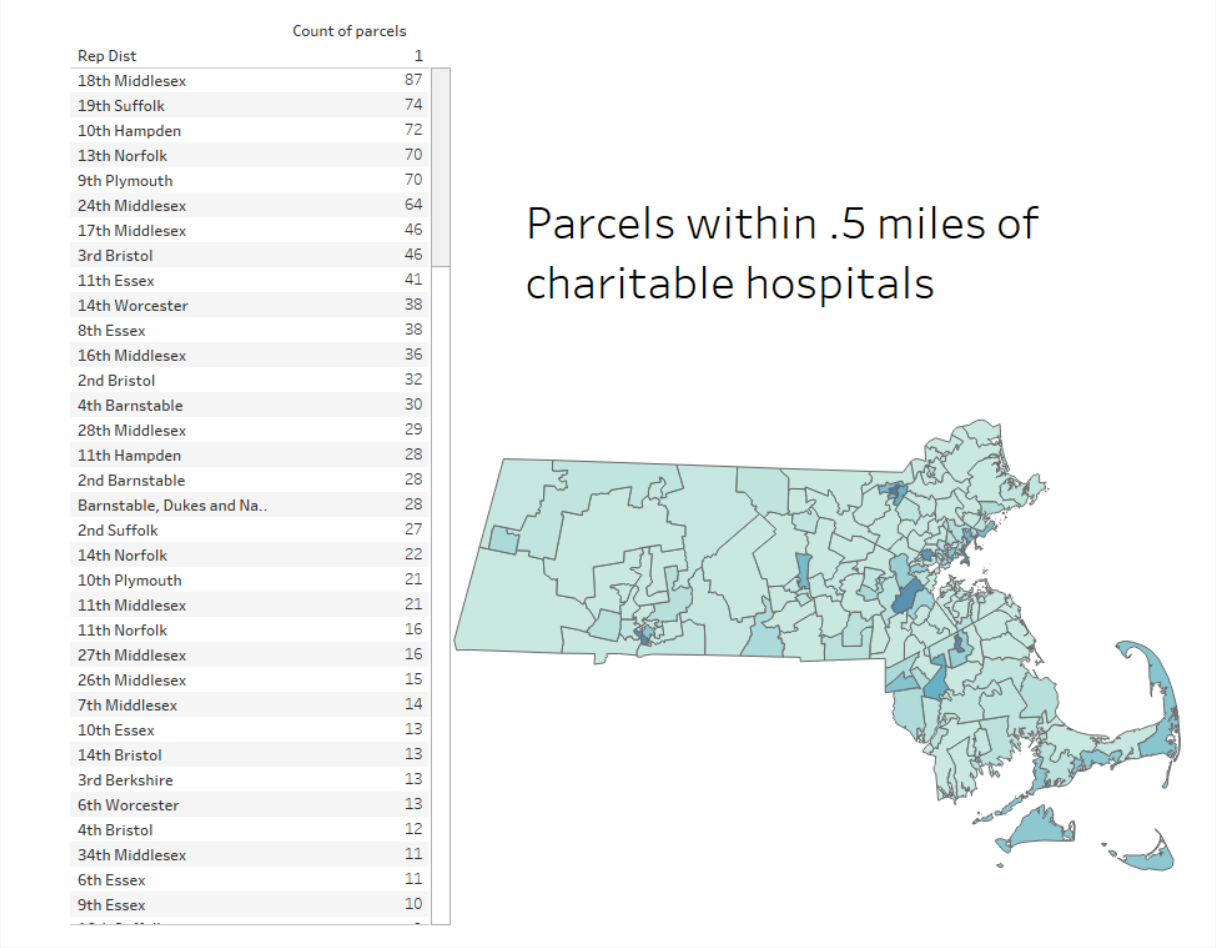

Figure 15. Parcels Within 0.5 Miles of Charitable Hospitals For House District

Rep Dist	Count of parcels 1
3rd Bristol	354
2nd Franklin	254
12th Worcester	208
17th Middlesex	191
5th Middlesex	186
14th Worcester	186
7th Middlesex	163
19th Suffolk	155
2nd Worcester	152
9th Bristol	149
4th Barnstable	143
5th Worcester	138
18th Worcester	138
4th Bristol	138
11th Norfolk	137
18th Middlesex	133
1st Worcester	127
10th Hampden	126
11th Bristol	126
1st Franklin	124
2nd Plymouth	123
12th Bristol	121
24th Middlesex	118
1st Bristol	112
16th Middlesex	108
2nd Hampshire	105
9th Plymouth	105
3rd Barnstable	103
1st Hampshire	102
4th Hampden	102
8th Bristol	101
Barnstable, Dukes and Na..	100
1st Plymouth	99
7th Worcester	97

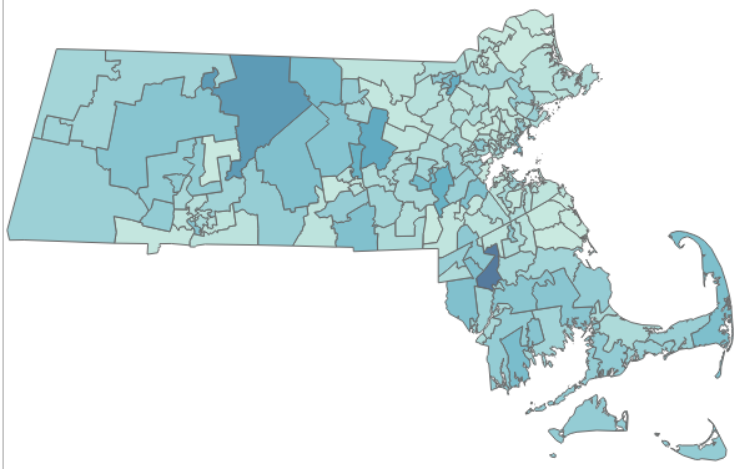

Figure 16. Parcels Within 5 Miles of Charitable Hospitals For House District

Map of all parcels contiguous to any type of institution

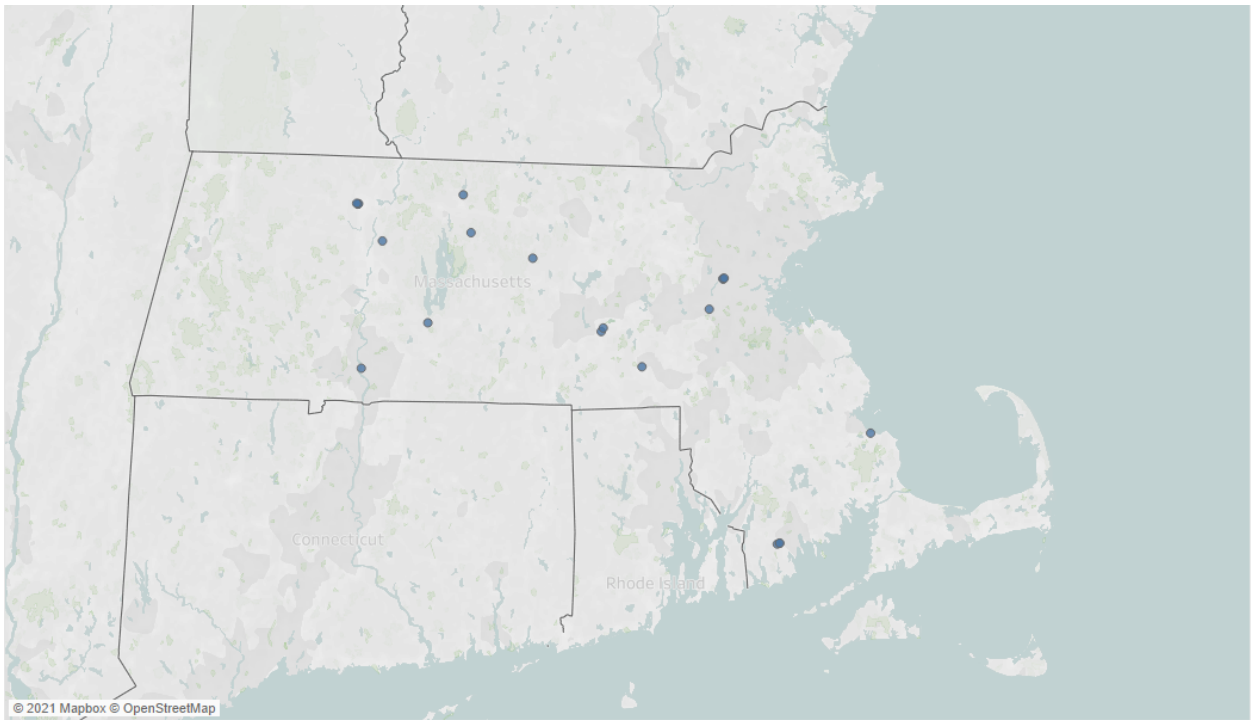

Figure 17. Map of Contiguous Parcels