

Where’s my New York State Pharmacist Job? A Dynamic Equilibrium Model of Pharmacist, Population, and Pharmacy Distribution Throughout the State

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Introduction:

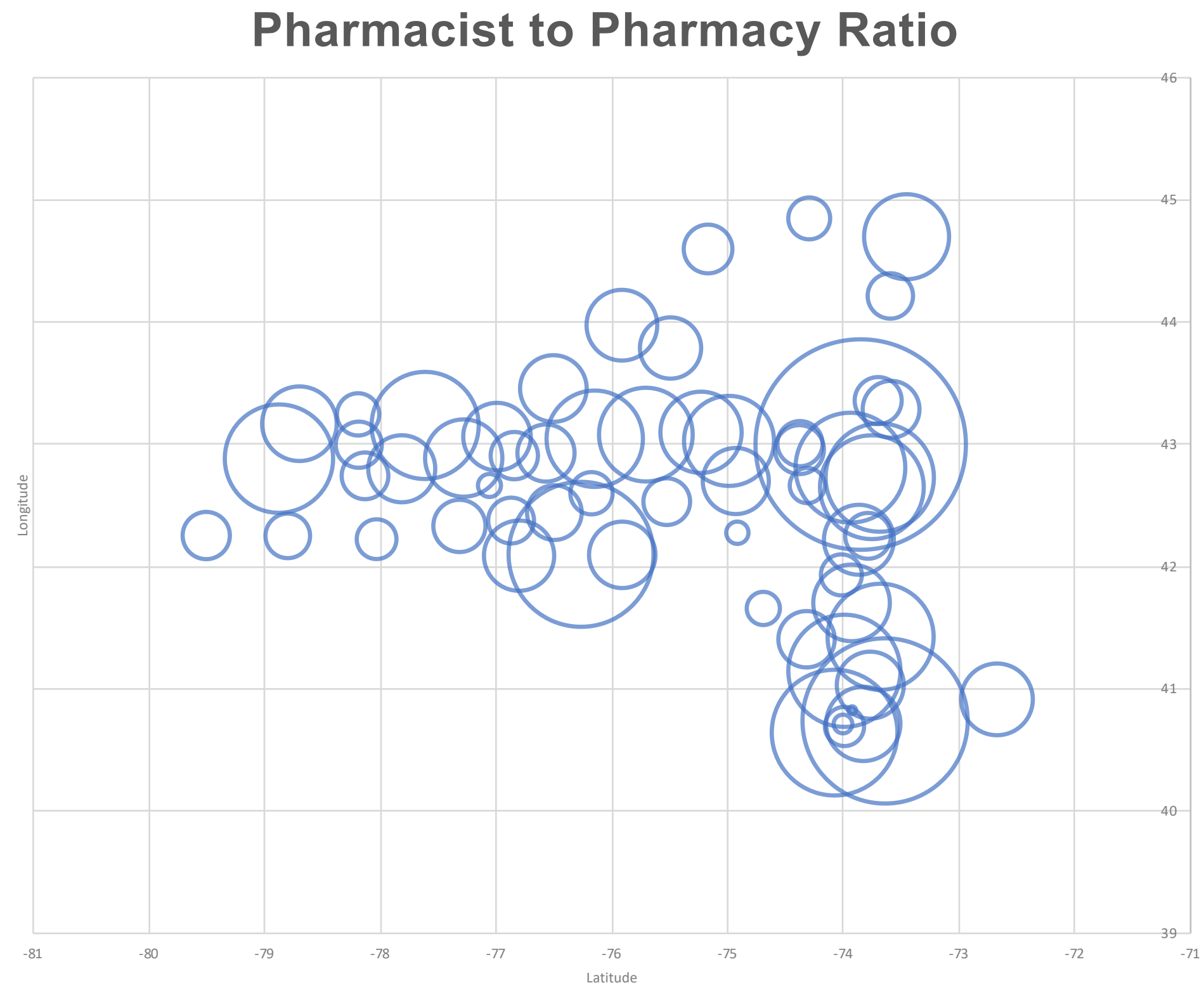
Since the development of the PharmD degree, the number of pharmacy schools and their class sizes have steadily increased throughout the United States.¹ The rise in the number of pharmacy graduates increases concern about the job market for new pharmacists (RPh). This is especially relevant in states like New York (NY), where there are eight pharmacy schools.² NY alone graduated approximately 990 pharmacists last year. While not all of these students will stay in NY or work as pharmacists, these numbers are concerning.

Factors that influence pharmacists job availability include population density as well as the number of pharmacies and pharmacists in a given area. We collected population, pharmacist and pharmacy data and then used computer programming to try and predict pharmacist movement throughout the state based on the assumption that pharmacists will travel from low demand to high demand areas. Our model aims to show which areas of the state might be favorable for employment.

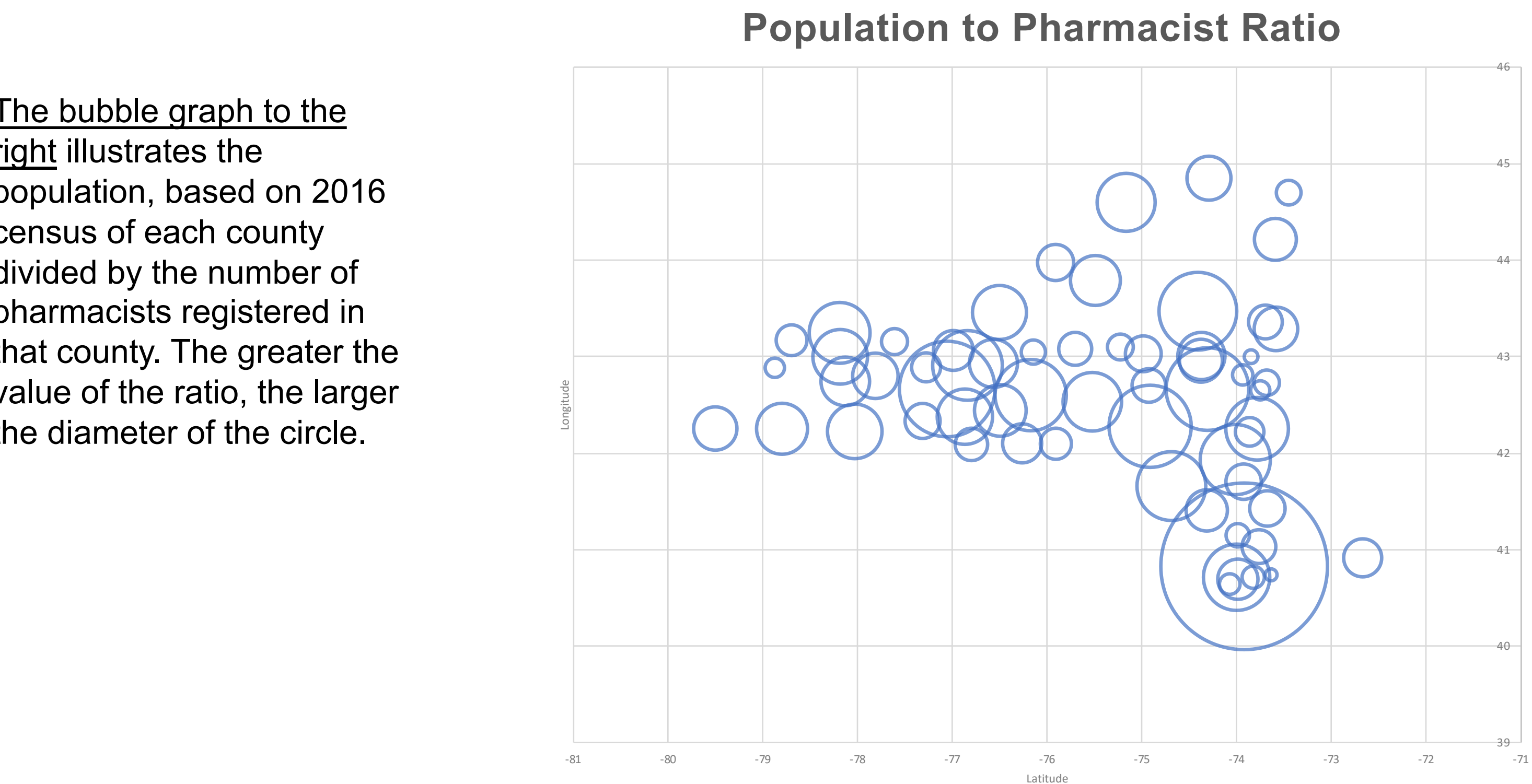
Methods:

We used computer modeling with Microsoft Excel, JavaScript, and Gephi to analyze publicly available data and illustrate trends relevant to RPh job outlook. Pharmacy data was obtained from the NYS Education Department, Office of the Profession’s website. Population and geographic data were taken from the NYS Department of Health’s website. All data collected was stratified by county. Data sets were combined and used to calculate the following: RPh per square mile, pharmacies per square mile, population to RPh, population to pharmacy, and RPh to pharmacy ratios. The latitude and longitude of each county seat were used to plot this data in Excel and Gephi. The primary outcome was to illustrate metrics indicative of RPh job outlook. The secondary outcome was to create a hypothetical model of “RPh pull” or pharmacist job tension between counties. First, JavaScript was used to calculate commuting routes between county seats located within a radius of 1.0 square longitude-latitude. RPh pull was calculated when county-A had a greater number of RPhs than county-B, and county-B had a greater number of pharmacies than county-A. The difference in the number of RPhs between counties was called RPh delta, and the difference in the number of pharmacies was called Pharmacy delta. Using Gephi, vectors demonstrating RPh pull were generated.

Results:



The bubble graph to the left illustrates the number of pharmacists registered in a county divided by the number of pharmacies in that county. The greater the value of the ratio, the larger the diameter of the circle.



The bubble graph to the right illustrates the population, based on 2016 census of each county divided by the number of pharmacists registered in that county. The greater the value of the ratio, the larger the diameter of the circle.

Results:

Pharmacist, Pharmacy, and Population Distribution by County^{3,4}

County	# of RPh	# of Pharmacies	Pop./RPh	Pharm/Sq. Mile	RPh/Sq. Mile	Pop./Pharmacy	RPh/Pharmacy
New York	842	667	1952	29.216	36.881	2464	1.262
Kings	2,152	902	1222	12.737	30.387	2915	2.386
Bronx	306	468	4757	11.116	7.268	3111	0.654
Queens	3,245	752	719	6.929	29.9	3102	4.315
Richmond	707	99	673	1.696	12.112	4808	7.141
Nassau	3,148	338	432	1.187	11.056	4028	9.314
Westchester	936	239	1041	0.555	2.174	4077	3.916
Rockland	435	68	751	0.392	2.506	4806	6.397
Suffolk	1,286	308	1161	0.338	1.41	4846	4.175
Monroe	906	148	825	0.225	1.379	5052	6.122
Erie	1,442	233	639	0.223	1.383	3953	6.189
Schenectady	232	37	666	0.181	1.134	4177	6.27
Onondaga	603	109	773	0.14	0.775	4277	5.532
Albany	487	82	634	0.157	0.932	3766	5.939
Orange	303	91	1252	0.112	0.373	4167	3.33
Putnam	91	15	1087	0.065	0.395	6593	6.067
Niagara	221	51	958	0.098	0.423	4152	4.333
Dutchess	271	61	1087	0.077	0.341	4827	4.443
Saratoga	472	40	481	0.049	0.583	5676	11.8
Broome	202	52	967	0.074	0.286	3756	3.885
Rensselaer	198	32	808	0.049	0.303	5002	6.188
Tompkins	68	21	1542	0.044	0.143	4994	3.238
Chemung	86	21	1004	0.052	0.211	4111	4.095
Oneida	282	60	820	0.049	0.233	3853	4.7
Ontario	121	27	908	0.042	0.188	4068	4.481
Ulster	87	35	2060	0.031	0.077	5121	2.486
Wayne	75	19	1211	0.031	0.124	4779	3.947
Oswego	74	19	1608	0.02	0.078	6262	3.895
Montgomery	38	13	1297	0.032	0.094	3790	2.923
Chautauqua	99	35	1308	0.033	0.093	3700	2.829
Genesee	36	13	1625	0.026	0.073	4499	2.769
Cayuga	54	16	1442	0.023	0.078	4866	3.375
Madison	70	13	1019	0.02	0.107	5487	5.385
Fulton	38	14	1417	0.028	0.077	3845	2.714
Seneca	17	6	2046	0.019	0.053	5796	2.833
Orleans	23	9	1798	0.023	0.059	4594	2.556
Livingston	47	12	1367	0.019	0.074	5355	3.917
Cortland	23	9	2090	0.018	0.046	5341	2.556
Columbia	33	12	1848	0.019	0.052	5082	2.75
Tioga	41	5	1189	0.01	0.079	9752	8.2
Jefferson	103	25	1107	0.02	0.081	4560	4.12
Clinton	103	21	787	0.02	0.099	3861	4.905
Sullivan	37	18	2022	0.019	0.038	4156	2.056
Warren	62	22	1041	0.025	0.072	2935	2.818
Washington	47	14	1315	0.017	0.057	4414	3.357
Yates	9	6	2769	0.018	0.027	4154	1.5
Greene	53	13	896	0.02	0.082	3654	4.077
Steuben	90	29	1077	0.021	0.065	3343	3.103
Wyoming	28	10	1457	0.017	0.047	4079	2.8
Otsego	58	15	1036	0.015	0.058	4006	3.867
Cattaraugus	51	19	1523	0.015	0.039	4088	2.684
Schuyler	11	4	1645	0.012	0.034	4525	2.75
Chenango	28	10	1735	0.011	0.031	4858	2.8
Schoharie	13	6	2409	0.01	0.021	5220	2.167
Allegany	29	12	1623	0.012	0.028	3923	2.417
Herkimer	57	11	1098	0.008	0.04	5692	5.182
St Lawrence	64	22	1719	0.008	0.024	5002	2.909
Delaware	19	13	2396	0.009	0.013	3502	1.462
Franklin	38	15	1327	0.009	0.023	3361	2.533
Essex	30	11	1270	0.006	0.017	3464	2.727
Lewis	18	5	1493	0.004	0.014	5373	3.6
Hamilton	2	0	2271	0	0.001	N/A	N/A
NYS	20,747	5,452	952	0.116	0.44	3,622	3.8
Total^			Statewide Average^				

KEY:

Yellow = Leader in column’s category.

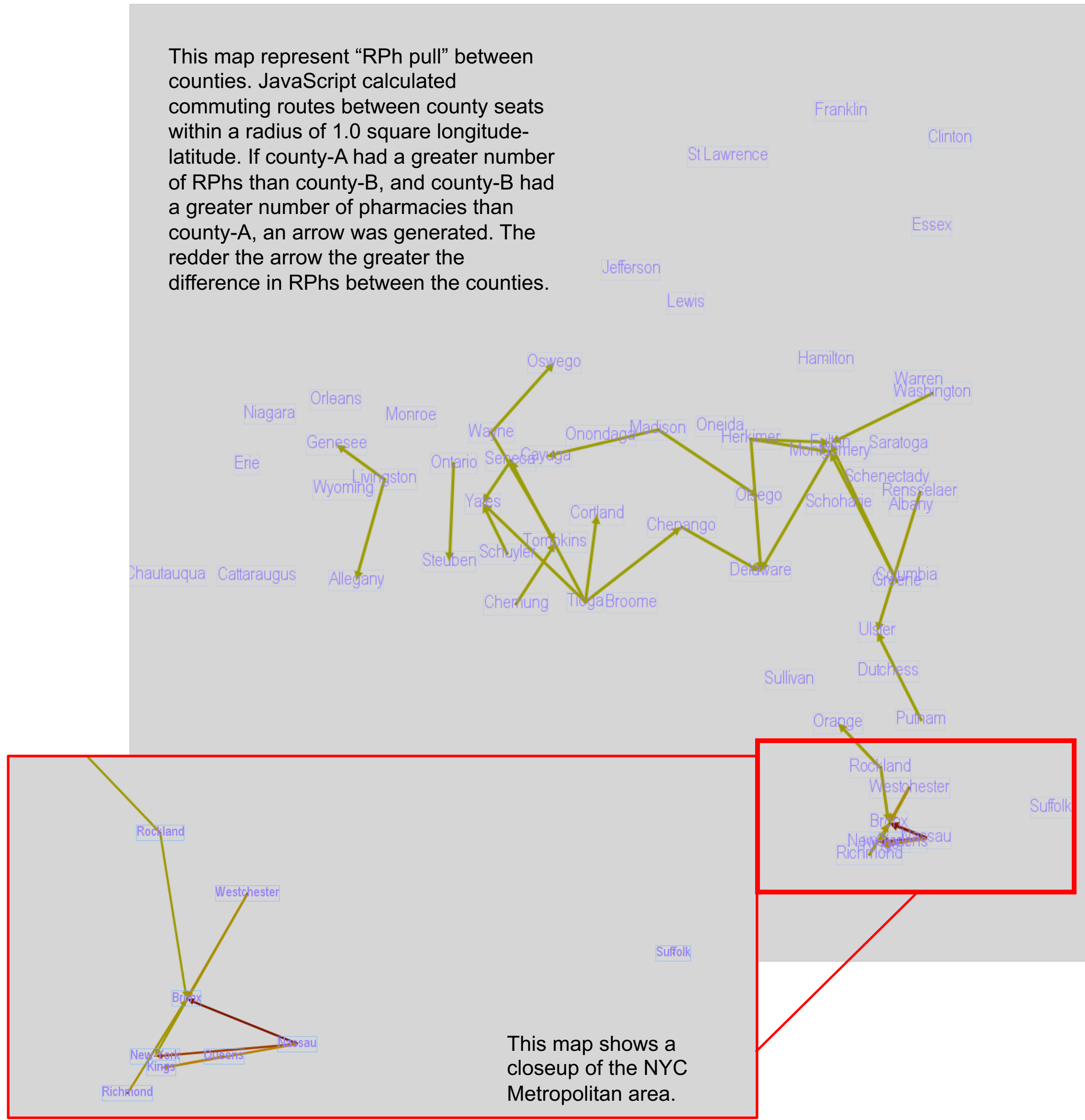
Red = Highest RPh/Pharmacy ratio. We predict this represents unfavorable conditions for employment.

Orange = Next highest RPh/Pharmacy ratio, still unfavorable.

Green = Lowest RPh/Pharmacy ratio, may be a favorable area to seek employment.

Results:

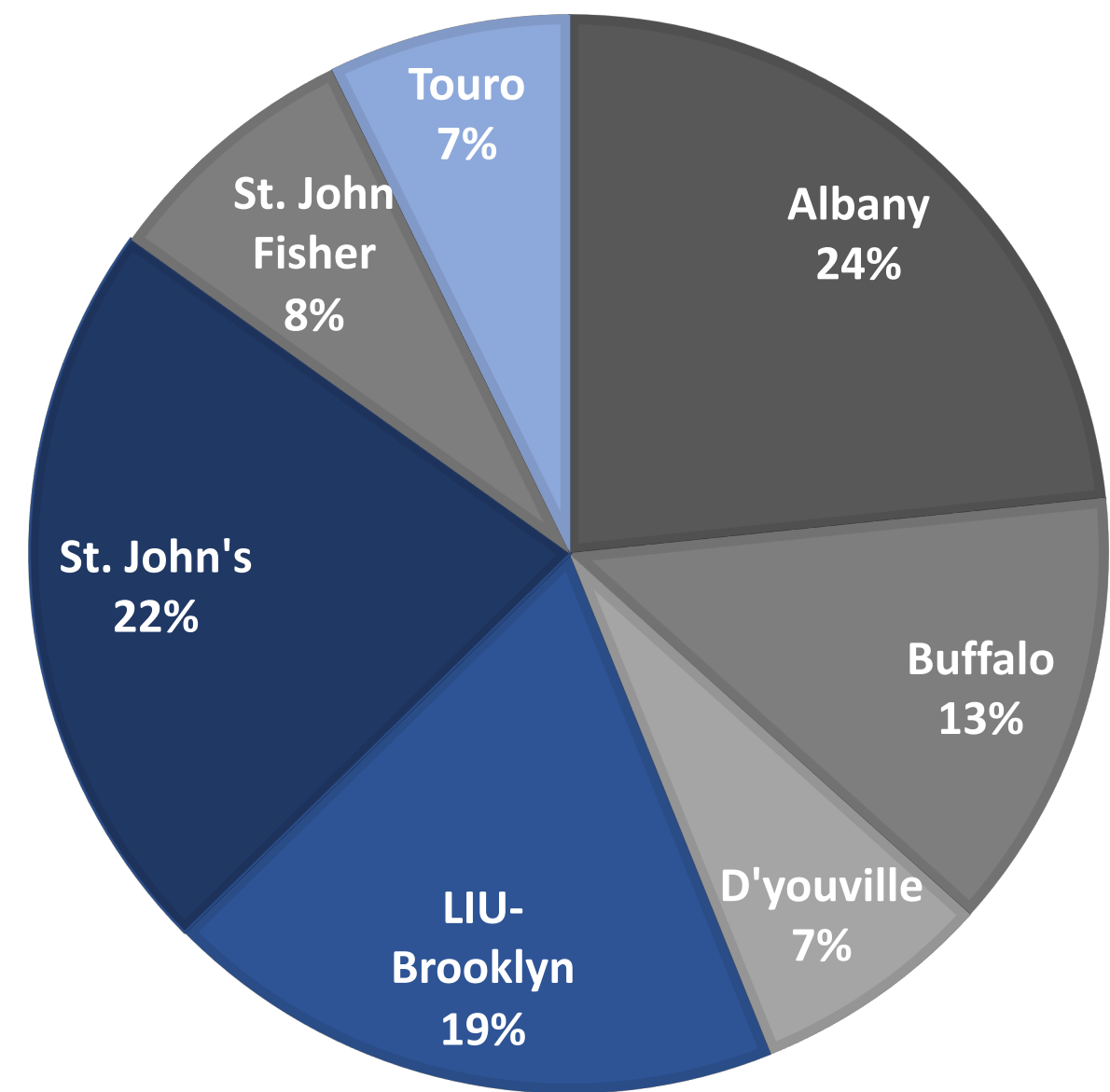
Gephi Model of Pharmacist Movement



New Graduates Added to the Workforce⁵⁻⁹

Pharmacy School	County	Students Graduated in 2018
Albany	Albany	~232
Buffalo	Erie	132
D’youville	Erie	~72
LIU-Brooklyn	Kings	186
St. John’s	Queens	221
St. John Fisher	Monroe	~78
Touro	New York	72
Total	NYS	993

DISTRIBUTION OF 2018 PHARMACY GRADUATES



Conclusions:

Our model provides a visual representation of RPh, pharmacy, and population distribution in NYS. In addition, Gephi vectors illustrate job tension from a given county to nearby counties. This analysis could be used for market research and to help graduates target their job search efforts. Our model has numerous limitations, including the failure to dichotomize between hospital and community pharmacies, and the fact that hospitals often employ a greater number of pharmacists. Another limitation is that not all registered RPhs work in pharmacies, and that RPhs may not always work in the county listed on their registration. Additionally, our Gephi analysis only includes counties within one square latitude or longitude. Further analysis of state data is needed to understand the value of these trends.

References:

1. Brown DL. A looming joblessness crisis for new pharmacy graduates and the implications it holds for the academy. *American journal of pharmaceutical education*. 2013;77(5):90-90.
2. American Association of Colleges of Pharmacy. Pharmacy School Locator. 2018; <https://www.aacp.org/resources/school-locator>. Accessed Jan 2, 2018.
3. New York State Office of the Professions: License Statistics. <http://www.op.nysed.gov/prof/pharm/pharmcounts.htm> Accessed Nov, 2018.
4. New York State Department of Health: Population and Land Area by County. https://www.health.ny.gov/statistics/vital_statistics/2016/table02.htm. Accessed Nov, 2018.
5. Albany College of Pharmacy and Health Sciences. Post Graduate Placement and Education: Spring 2018 Graduates. https://www.acphs.edu/sites/default/files/files/post_graduate_placement_and_education.pdf. Accessed Jan 4, 2019
6. University at Buffalo School of Pharmacy and Pharmaceutical Sciences. Accreditation and Assessment: Graduation Rates – Classes of 2013-2018. http://pharmacy.buffalo.edu/about-us/accreditation-assessment.html#title_4. Accessed Jan 4th, 2019.
7. Long Island University School of Pharmacy. PharmD Quality Indicators. <http://liu.edu/Pharmacy/Academic-Programs/PharmD/Quality-Indicators>. Accessed Jan 4th, 2019.
8. St. John’s University School of Pharmacy and Health Sciences. Program Outcomes. <https://www.stjohns.edu/academics/schools-and-colleges/college-pharmacy-and-health-sciences/programs-and-majors/doctor-pharmacy>. Assessed Jan 4th, 2019.
9. Touro College of Pharmacy. Press Release: Touro College of Pharmacy Graduates Seventh Class. <https://tcop.touro.edu/news--events/press-releases/tcop-seventh-commencement-52518.php>. Accessed Jan 4, 2019.