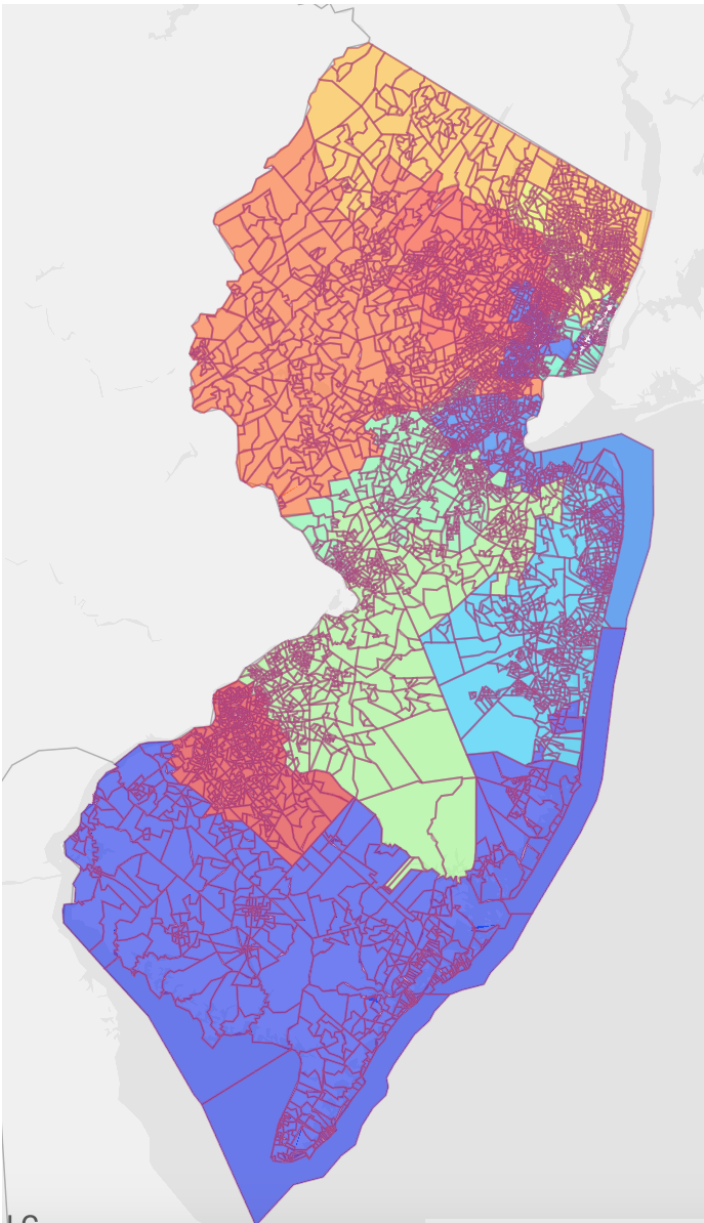


Team 7: Assignment 2 Redistricting New Jersey

Unfair Map:



Un	0			
1	738,470	-4.54%	✓	✓
2	771,223	-0.31%	✓	✓
3	903,551	16.8%	✓	✓
4	765,015	-1.11%	✓	✓
5	774,821	0.16%	✓	✓
6	775,527	0.25%	✓	✓
7	784,479	1.41%	✓	✓
8	801,393	3.59%	✓	✓
9	768,383	-0.67%	✓	✓
10	746,114	-3.55%	✓	✓
11	769,843	-0.48%	✓	✓
12	684,197	-11.55%	✓	✓
	773,585	28.36%	✓	✓

Dem	Rep	Oth
0%	0%	0%
59.38%	38.86%	1.77%
43.85%	54.33%	1.83%
54.75%	43.58%	1.67%
35.95%	62.41%	1.64%
53.06%	45.28%	1.67%
57.33%	40.72%	1.95%
46.71%	51.33%	1.95%
74.44%	23.71%	1.85%
58.84%	39.36%	1.8%
80.7%	17.95%	1.35%
54.66%	43.78%	1.56%
63.57%	34.62%	1.81%
55.07%	43.19%	1.74%

Unfair Map (how unfairness was computed):

The map above is the unfair map that we created. In order to create an unfair space, we focused on picking a district that had a split population between democrats and republicans. The district that we decided to focus on was District 3, which in the current assignment of New Jersey is 53.39% Democrats and 44.95% Republicans. We decided to favor the democratic party and make the district completely leaning towards Democrats. In order to do this, we added precincts that had a population of Democrats which was larger than its population of Republicans. Further, to maintain contiguity of the map, we looked at neighboring precincts to flip since flipping precincts on the border would not break contiguity. This resulted in 2,574 precincts moved to create a difference of ten percent in our map. The final unfair map has eight districts that are majority Democratic, two Republican, and two split. In comparison, the current assignment has: seven Democratic, two Republican, and two split.

The population balance was attempted to be maintained by capping the number of precincts added to District 3 at 2500 which resulted in a high population for District 3 and a lower population for District 12. This large number of precincts flipped was to ensure that District 3 would lean entirely towards Democrats. So while there was a tradeoff between population balance and creating a new Democratic district, the population deviation was not over twenty percent. Our map would be considered gerrymandering since we are purposely creating a larger district by only adding Democratic precincts which would not be considered fair or legal.

What are their advantages?

1. This map creates an advantage for Democrats. Due to the increase in democratic precincts in District 3 and the overall increase in Democratic districts, this would allow democrats to win a majority in the state regardless of the outcome of the split districts due to the winner taking all system.
2. Another advantage increased minority representation in District 3. The current minority percentage in this district is 34.12% while the new minority percentage is 36.61%.
3. The overall major advantage of our map is creating an overall favoring for Democrats in the state of New Jersey.
4. There are five majority-minority districts in our map as well.

What are their drawbacks?

1. A disadvantage to the map would be that since the population is skewed towards Democrats by a large percentage, there would be no way for Republicans to be able to compete.
2. Another drawback of our map is that it does not take into account keeping together communities of interest. However, there is not a significant difference between the percentages of minorities between our unfair map and the current assignment of precincts.

3. The districts are not very compact which can be considered a drawback, however, compact district does not always mean fair districts depending on a state's political geography.

Who is advantaged or penalized by the map?

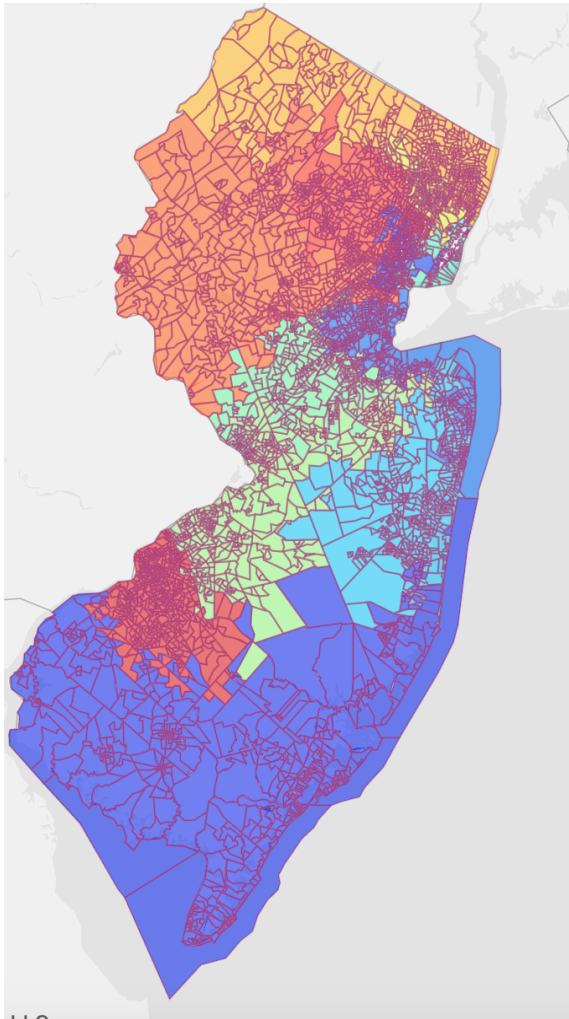
Republicans are penalized as their populations were spread out to more democratic districts to suppress their voting power. With the migration of the democratic precincts, the voting power of Republicans became less since there was an increased amount of Democratic precincts which changed the leaning of the whole district. Democrats are advantaged in this map, as their voting power is the one that is being increased.

Another thing to consider in our data is that the percentage of Democrats in District 12 (the district that precincts were flipped from) became less than it was in the current assignment, however, it did not drop below the point needed to create a split district. Overall, District 12 is still a very Democratic district. Minorities are also advantaged by this map because minority representation is more than 50 percent which means the power of minorities is not minimized.

Would the map be a reasonable option for adoption by the legislatures?

Our group believes that there would be no reason to adopt our map. The reason is because due to the unfairness, there would be a clear advantage to Democrats which can be seen by the size of District 3 and if we examine the edge precinct they are mostly Democratic precincts which could suggest gerrymandering. New Jersey would be mainly a democratic state with only about four districts that are not fully democratic and two of those could lean towards democrats because of the split voting majority in them.

Fair Map:



Un	0			
1	793,156	2.53%	✓	✓
2	789,597	2.07%	✗	✓
3	781,565	1.03%	✗	✓
4	771,369	-0.29%	✓	✓
5	821,766	6.23%	✗	✓
6	763,737	-1.27%	✗	✓
7	793,364	2.56%	✗	✓
8	817,986	5.74%	✗	✓
9	732,214	-5.35%	✗	✓
10	754,018	-2.53%	✗	✓
11	731,512	-5.44%	✗	✓
12	732,732	-5.28%	✗	✓
	773,585	11.67%	✗	✓

```
New Jersey Fair Assignment Contiguity Check
District 1 True
District 2 True
District 3 True
District 4 True
District 5 True
District 6 True
District 7 True
District 8 True
District 9 True
District 10 True
District 11 True
District 12 True
```

- Although, our map does not show contiguity in DRA. With the contiguity function provided, our map is considered contiguous because of the corner districts.

Fair Map (how fairness was computed):

The map above is the fair map we created by using a flipstep algorithm. In order to create contiguous districts, our algorithm looked at border precincts to flip and after every flip the algorithm also uses the `isDistrictContiguous` function to check the contiguity of every district and will revert the flip if contiguity is broken in at least one district. Further, in order to maintain a balanced population, the algorithm attempts to flip the same number of precincts from each district if it can do so in order to maintain a balanced population. The overall population deviation was about eleven percent because one district has a population which is a little higher than the rest. However, we think this is because this is where the algorithm was able to flip the most precincts. The total number of precinct flips was 657 which was needed to create a ten percent significantly different map than the current one. The main factor that was taken when considering fairness was flipping about the same number of precincts to create a balanced population. We believe our algorithm was able to accomplish this because we still had five

districts that were majority minority which meant we were able to keep minority communities intact.

What are their advantages?

1. The advantages of our map is that there are three split majority districts which can allow those districts to swing between Democrats and Republicans. There are two Republican districts and the rest are Democratic which is expected because New Jersey is considered a Democratic state.
2. The population balance is also an advantage of our map. The greatest population difference is about six percent.
3. The average map-wide Democratic two-party vote share is 56.04%, the Republican 43.96% this can also be considered a favor to Democrats considering the number of Democratic districts compared to Republican.

What are their drawbacks?

There are no major drawbacks with our map. However, the most noticeable drawback is compactness since we did not create our algorithm to take into consideration compactness and only took into consideration population and contiguity. The compactness rating of our map could be improved to create more compact districts while still maintaining population balance and contiguity.

Who is advantaged or penalized by the map?

There is no party that is advantaged on the fair map. The purpose of the fair map was to create fairness between the parties and make sure that the population is evenly distributed between all districts. If a district was skewed towards a party, there was a movement to ensure that the skew would go away and everything would be neutral.

Minorities have good representation in this map by having five minority majority districts which also allow them to have voting power. The major consolidation of our map was to consider population and move about the same number of precincts from each district.

Would the map be a reasonable option for adoption by the legislatures?

Since this is a fair map and contiguous it is able to be adopted by legislatures. The difference between this map and the current map is a 10%+ difference, but there is not a significant difference that is worth changing the current layout. There could be a concern regarding the population distribution which would cause the legislatures to not adopt this map, however, there is no other major reason to not consider this map to be a reasonable option for adoption.

How would you improve your maps if you had more time? or, what other approach would you have tried.

If we had more time, we would improve our maps by trying to create more balanced districts in terms of population and creating districts that are more compact. I would have also liked to take into consideration communities of interest. While I was making the algorithm for creating a fair map, I wanted to only flip only precincts with a population between 200 to 400 people in order to create districts that are more equal in population. However, I could not do this with the time constraint. I also wanted to create an algorithm that would fix the population deviation in the unfair map by going through the neighboring precincts again after the initial flips were made and to flip Republican precincts to the district I initially took precincts from. This would have created a more balanced population, however, I was not successful in creating an algorithm for that in time. Lastly, I also would have tried a flood fill algorithm which was the algorithm I initially attempted to implement, however, my maps were not successful. Overall, I would have liked to improve my maps by creating more complex algorithms that would have taken population balance into consideration better.