8 Conclusion

In the process of arriving at the Minimum Difference from The Mean and Standard Deviation Cutoff algorithms, we formulated several other algorithms to focus on the same variables (range, variance, and total score) in different ways. One such version used the idea that a recipient shouldn't compare his or her scores in the matchings with those of the other recipients, but instead with the possible scores available to him or her in the original graph. In this algorithm, we tried to adjust the values in the matrices by changing each column depending on what values were available to each recipient. In doing so, the hope was that we would establish a multidimensional form of equity that took into consideration the potential for each recipient. We found the minimum value of each column and subtracted these values plus 1 from each respective column. However, the manipulations we made prior to running the Hungarian Algorithm had no effect, and we produced identical results to running the Hungarian Algorithm alone. Although the execution did not pan out, there may still be effective ways to capture this comparison. This algorithm represented one of several we developed which did not produce significant results; however, we encourage further examination of these ideas.

Additionally, as the medical field progresses, we will understand more about the viability of different matches. We might find that there is a "breaking point" such that, for example, donor-recipient pairs with a score greater than 12 have a much lower chance of success than those with a score less than 12. This might argue for modifying the Standard Deviation Cutoff Algorithm to double all scores greater than 12. We need to continue to develop dynamic algorithms that have the capability to evolve and incorporate new information.

We have focused on the problem of allocating live donor kidneys to patients in need of a kidney transplant, but we believe this idea of balancing equity and optimality in matchings has applications in a wide variety of other fields. There exist many situations, both within and outside of medicine, that require the allocation of limited special resources, and they range from financial aid disbursement to providing relief services following a natural disaster. Cases such as these often carry strong ethical implications and the option of constructing a matching that is close to optimal while being more uniformly equitable can be desirable. We hope that this examination has served as the introduction to a much larger discussion of incorporating equity into kidney paired donation and other forms of unique resource allocation modeling.