**Improving Voter Turnout in Detroit**

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Voter turnout in 2016 was lower in Detroit than in other locations in Michigan (Gibbons 2016). Comparing 2012 to 2016, voter turnout in Detroit decreased by roughly 65,000 (Ben-Shahar 2016). Even though the turnout increased in other places in Michigan, Detroit specifically experienced an opposite effect (Reindl 2016). Additionally, we see that this is a trend, as Detroit turnout was lower than the state average for the primary election in March 2020 (Egan 2020).

**Business Problem**

The business problem we aim to solve is to increase accessibility by reducing transportation challenges and obstacles that voters face. Stakeholders include Detroit voters, political candidates, public officials, and the general population. Since this issue spans a vast group of stakeholders, we will focus on the perspective of Detroit voters for this problem. A study of Detroit proved that voter mobilization efforts in an election period can successfully increase voter turnout, as well as increase participation rates for affected voters in subsequent elections (LeRoux & Krawczyk 2014). While this study focused specifically on voter registration, it does have implications on our goal, stating, “clients’ probability of voting will increase proportionally with the level of voter engagement efforts provided by the service organization,” meaning that greater efforts, such as improving accessibility, will have even greater effects.

Based on Census data, Detroit residents have limited access to personal transportation (American FactFinder 2017). Approximately 25% of Detroit households do not have a vehicle, and 70% have fewer than two vehicles. Given that at least 60% of households are more-than-one-person households, that means, in the very best case, 10% of Detroit households rely on other forms of transportation. The Detroit Department of Transportation (henceforth referred to as DDOT) website states that they serve approximately 85 thousand riders each day. Given a Census Bureau population estimate of approximately 672 thousand, we conclude that DDOT serves 12-13% of the population. However, according to Census data (Maciag 2014), 30% of Detroiters living in poverty rely on public transportation for their commutes.

Additionally, this issue is of particular importance in a city where the racial makeup and lower income demographics indicate a lower voter turnout (Cockburn 2020). More than 40% of Detroit households report that monthly housing costs account for more than 30% of income (American FactFinder 2017). This cost structure puts great financial pressure on members of the community, who already struggle with limited transportation. Solving this business problem in Detroit is important since gaps in voter turnout have historically affected marginalized groups of people (Cockburn 2020). Increasing turnout of marginalized voters in Detroit will lead to more representative results in local elections, thus empowering citizens and bridging the gap between the government and the people.

**Analytical Problem**

The analytical problem we are trying to solve is to minimize a voter’s travel time to get to the polling location. We intend to reduce the distance from accessible transportation to polling locations and reduce time spent waiting for transportation.

***Data***

For our analysis, we hoped to use data on the following:

* Bus stop locations and routes
* Current polling locations (Election Precincts)
* Addresses for eligible voters
* City budget
* Number of buses and drivers available
* Voting statistics for previous years

We used a variety of publicly available datasets, including data from the City of Detroit website and Census population data from 2010. The Detroit data is divided into precincts, but Census population data did not include voting precincts, so we used census tracts to break our data into smaller sections. This allowed for a more in-depth analysis, which helps identify areas of greatest need when considering income and population density. Although our preliminary analysis provides evidence that this project will benefit the City as a whole, the in-depth analysis will be useful when prioritizing steps in implementation. Additionally, this will facilitate flexibility when considering budgetary limitations.

Data was unavailable for bus and driver supply and addresses for eligible voters. We had limited data on the Detroit Department of Transportation (DDOT) budget, so we will be making assumptions for all parts of this project:

1. The DDOT budget is limited, and the greatest needs should be addressed first.
2. The number of buses and bus drivers is limited, and DDOT will not be able to add Election Day buses to all existing routes.
3. SMART bus routes and stops are not relevant to this analysis because these routes serve the suburban population, generally bringing these residents to the inner city for work. Since polling locations are tied to residence, these long-distance routes are not useful to our study.
4. We are also assuming that political candidates, public officials, and the general public are interested in improving voter turnout in Detroit.

Using QGIS, a geographic information system application, we aggregated our various data sources into one file (Appendix A). We used a gradient effect to identify the census tracts with the highest voting-age population (Appendix B). These areas will be considered higher priority than low population areas. We assume that the greater the population in an area, the greater the effect our efforts will have on general voter turnout.

**Proposed Solutions**

To solve the problem of low voter turnout, we want to remove obstacles related to transportation to and from polling locations by making public transportation more accessible on this crucial day. One measure of whether public transportation is accessible is the time spent to access it. Thus, our project focuses on minimizing the time spent waiting for transportation to arrive and the time spent walking from bus stops to polling locations. We propose two feasible solutions.

***Minimize Waiting Time by Adding Buses to Existing Routes on Election Days***

**Analysis.** We studied the frequency of bus stops during a weekday, along the different routes (Bus Schedules). From this list, we sorted the routes to find which routes have the longest wait from one bus to the next. We set a limit for waiting time: we consider all routes with wait times greater than 30 minutes to be unacceptable and in need of attention. Based on this analysis, we have identified 20 routes to be considered for improvement on Election Day (Appendix C). Additionally, we used QGIS to visualize the routes that are the most troubling so give a greater view of what areas require the most attention (Appendix D).

**Recommendation.** For this solution, we recommend that DDOT assign one additional bus to each of these 20 routes on Election Day. This can be done either by leasing 20 buses on Election Day or by using buses that are in storage and scheduling normally off-shift drivers to drive the extra buses.

One 24-passenger minibus could be rented for 18 hours in Michigan for an estimated cost of $1,885 (Metropolitan Shuttle). The resulting total cost would be $37,700 for boosting Election Day transportation accessibility. While this is the cost of using an external business, DDOT could likely negotiate a better price if it worked with partners from other departments in the City, such as Detroit Public Schools Community District to utilize school buses for this effort, rather than chartering a bus.

We recommend utilizing buses that are not normally in operation. Based on per-person operating cost, number of buses used, and number of passengers served, we calculated that the cost of adding one bus from this selection would be $827.90 (DDOT). The resulting total cost would be $16,558. Considering the two options, we reason that this is the most reasonable solution. Provided that the transportation operating budget is approximately $50 million, this lower-cost solution is attainable and feasible (Financial Plan). Such a change would increase the frequency of buses stopping along the selected routes, thus decreasing the waiting time of riders.

**Assumptions.** We assume that DDOT has already prioritized the most frequently used routes and ensured adequate coverage of routes and peak hours based on the regular needs and habits of its citizens. Due to a lack of information on how many buses are dedicated to each route on a weekday, we are unable to quantify the resulting decreased waiting time. However, based on the information we assume that it would have a notable effect.

Since this solution is temporary, it will not require the in-depth study that would normally be associated with changing bus routes and stops (Urban Bus Toolkit). Additionally, this temporary change would not be considered progress toward meeting the benchmarks laid out in the Strategic Plan for Transportation. We are also assuming that, since this is a one-day project, and the average cost of purchasing a comparable bus to add to the fleet is more than $250,000, purchasing buses and increasing the regular capacity is not a feasible solution for our problem (Colorado). We assume that all of these alternatives are not being addressed in the DDOT budget.

***Minimize Distance to Travel by Adding a Polling Location Stop on Election Days***

**Analysis.** Based on a study of transportation habits, we set a quarter-mile limit on how far we expect someone to walk when using public transportation (Watson 2015). The limitations of our available data required that we convert this distance to .0036 degrees, following a conversion chart (Approximate Metric Equivalents). Using QGIS, we created a quarter-mile buffer around the polling locations. This provides a visualization of the polling locations that will be considered for our analysis (Appendix E). Using this image, we identified 19 locations that are outside the buffer of reasonable walking distance from a bus stop (Appendix F).

Of those 19, we identified four locations--two pairs--that warrant special attention. Each pair includes two locations that are very close together and that are outside of reasonable walking distance of a bus stop. Although these locations are not in high population areas, we chose to prioritize these locations, since we can use one bus detour to solve the problem at both locations in the pair. The first pair includes Boys and Girls Clubs II and Keiden School, just 500 feet apart, and the second pair includes Heilman Recreation and Fisher Magnet Lower, located on the same block. Based on the close proximity of the locations in these pairs, we conclude that it is reasonable to assume that a detour for one of the polling locations would also benefit voters going to the other polling location. In addition to the four locations included in the pairs, there are 15 other polling locations that require attention.

Building on this list of 19, we included the population in the polling location’s Census tract and the distance from the polling location to the nearest bus stop. In order to create the opportunity for flexibility, we prioritized the 19 stops using both parameters: population (Appendix G) and distance (Appendix H).

**Recommendation.** According to Google Maps, both the polling location furthest from a bus stop (Gompers Elementary School) and the polling location closest to a bus stop (Fisher Magnet Lower) require a 2-minute car ride. We expect a similar time estimate for a bus ride, provided the implementation of such a detour on Election Day. The negligible time cost--2 minutes--leads us to focus on other factors in order to solve this problem. Therefore, we recommend that DDOT prioritize their efforts based on the population in the Census tract, rather than distance.

While we feel that this is the optimal solution, we also understand there are certainly unknown factors to consider when working with such a large organization in the government. For this reason, we include the prioritization option based on shortest to longest distance, in the event that this is a limitation to implementation by DDOT (Appendix I). By providing this alternate analysis, we assume that one of the three options for prioritizing bus detours is feasible and appropriate for use by DDOT to improve voter turnout.

**Assumptions.** We are assuming that voters in Detroit are reliant on public transportation and want to participate in voting, but are unable to do so due to the long walking distance, and resulting time spent, from public transportation to the polling location. We also assume that making the same effort in a Census tract with a higher population would be associated with a greater return on investment--more voters will turnout.

**Opportunities**

For greater insight and flexibility, we have integrated our two analyses into one visualization (Appendix J). Using a map like this would allow even more specific focus on particular areas, taking all variables into consideration: population, bus route wait time, walking distance to polling location.

We identified a number of potential opportunities, including: increasing the number of or changing the location of polling places; increasing the number of bus stops; subsidizing bus fare for election day; extending operating hours of current bus routes; organizing a community carpool system within neighborhoods or partnering with a 3rd party like Uber/Lyft; and creating additional pickup locations at public locations (universities, libraries, grocery stores, senior housing). Due to lack of data, we were unable to pursue minimizing distance from house to transportation, but this would be a very useful analysis and opportunity. The City may have access to the necessary data, and could pursue other projects similar to this analysis, but focusing on the first leg (home to bus stop walking distance), rather than the last leg (bus stop to polling location walking distance). We recommend a study, by way of a voluntary survey, wherein voters record their means of transportation, as well as the time spent getting from home or work to the polling location. Further analysis of this problem requires more data on the severity of challenges faced by voters. Additionally, we recognize that there are logistical opportunities related to polling location throughput and operations management. Waiting times in Detroit have been reported to exceed an hour, which is an additional barrier (Reindl 2016). This opportunity could be addressed with a cross-functional team, using simulation tools to model and optimize processes inside the polling locations.

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