

A Critical Analysis of Participatory Budgeting in Cambridge, MA

Alex Cabral
Harvard University
acabral@g.harvard.edu

Fatima Mbaye
Harvard University
fatoumatambaye@college.harvard.edu

Michael Cheng
Harvard University
michaelcheng@college.harvard.edu

Abstract—In this paper, we examine the Participatory Budgeting program in Cambridge, MA. Using the voting and project proposal data as well as open data sets and reports published by the City of Cambridge, we analyze the participatory budgeting process, voter behavior and satisfaction, the City of Cambridge’s finances related to participatory budgeting, and the distribution of projects across the city to identify key problems and how well the city is meeting its own goals. We share our findings, identify key problems, and make suggestions on how the program could be improved. Some key problems are that budget delegates are not choosing diverse projects, that voter turnout is low and not representative of the city, that the city is not allocating enough money for PB projects, and that winning projects are not evenly spread across the city’s neighborhoods. Our recommendations include using sortition to select budget delegates, increasing Cambridge’s participatory budgeting funding by drawing from the city’s existing budget surpluses, and designing a mechanism to prioritize projects for underserved communities.

I. INTRODUCTION

Participatory budgeting (PB), a process where residents decide how to allocate part of a government’s budget, is endorsed by the World Bank and increasingly in use in many cities around the world [9], [11], [14]. Although participatory budgeting can have positive impacts by giving citizens more agency in decision making, there are those who question its effectiveness. Some common critiques include the low participation rate in many city programs, with the highest-income citizens tending to be the voters [10], [15], [16]; citizens’ abilities to choose worthwhile projects that the city will actually implement [12], [15], [16]; and potential biases and social justice disservices in project selection [12], [15].

In this project, we analyze the participatory budgeting program in Cambridge, MA through a critical lens guided by the formerly listed common critiques. In addition, we provide analysis of the participatory budgeting process and outcomes in comparison to the city’s listed goals for the PB program.

For our analysis we used five years of individual voting records, various city open data sets, the city’s published websites and guides for the PB program, and prior written evaluation reports. With these data, we examined how well the money was spent compared to other potential projects or usual city planning; how well those who voted were represented in the chosen projects; the potential social justice outcomes of the selected projects and how those compare with non-chosen projects; and how well the city is meeting its own goals.

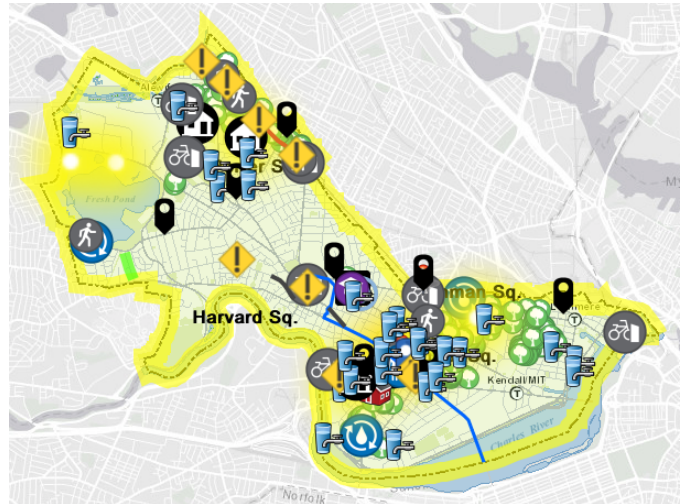


Fig. 1. Map of all Winning PB Projects in Cambridge from 2014 through 2019, from City of Cambridge GIS

Our findings pointed us to a number of key issues with the PB program in Cambridge. In particular, we found that budget delegates are not choosing diverse projects, that voter turnout is low and not representative of the city, that the city is not allocating enough money for PB projects, and that winning projects are not evenly spread across the city or the various committees set up by the city.

From these findings we propose several key solutions – increasing the PB budget, using sortition to form the budget delegation, devising a method to ensure that winning projects span more of the city and its citizens’ desired changes, and providing better data on PB to allow for increased transparency and analysis in the future.

We expect that this project will provide a number of contributions, both to the city of Cambridge and to participatory budgeting research more broadly. We have already begun conversations with the PB team at Cambridge, and thus, our findings may help to influence how PB is conducted in the city. In addition, we expect that the analyses we conduct can be replicated in other cities that use participatory budgeting and have open data sources. Finally, we could not find a lot of existing research around measuring social justice through participatory budgeting, and so anticipate that our work can help to propel that line of research.

II. OVERVIEW OF PARTICIPATORY BUDGETING IN CAMBRIDGE, MASSACHUSETTS

Participatory budgeting was first introduced in Cambridge in 2014 and has run annually since that year. The entire process includes three main phases – idea collection, proposal development, and voting – described briefly in this section.

A. Idea Collection

In a designated month each year, community members of all ages, including non-residents, may submit ideas for participatory budgeting projects. To be eligible for consideration, a project must meet the following criteria:

- Be a capital project that requires infrastructure improvements
- Be a one-time expenditure that costs less than an amount set by the PB budget each year
- Benefit the public
- Be implementable by the City of Cambridge on city property

In the first PB cycle, 380 ideas were submitted and in 2019, over 1600 ideas were submitted for consideration.

B. Proposal Development

After the ideas are collected, citizen volunteers called Budget Delegates research, evaluate, and prioritize the submitted proposals. The Budget Delegates develop final project proposals via research, site visits, community assessments, and consultations with city workers. [1].

Since 2016, there have been 50+ budget delegates each year who work in five different committees – Community Resources, Environment, Parks and Recreation, Streetsmarts, and Youth and Technology (though in 2018, Youth and Technology was not included as a committee). The committees work separately on their respective proposals then work together to narrow down the list of submissions to 20 final proposals (16 in 2020, likely due to lower available funds because of COVID-19) based on a judgement of need, impact, and feasibility. The City Manager then gives a final approval of the list before it is realized for voting.

C. Voting

Voting generally occurs over a one-week time period in early December. All Cambridge residents age 12 and older, and all 6th graders, are eligible to vote for up to five projects from the list of 20 approved projects. Voters do not rank their choices, but rather select the projects they approve. Most voting occurs online, though residents can also vote in person at City Hall. In 2020, the in-person voting was replaced with phone voting due to the COVID-19 pandemic.

D. Goals

The city has identified five goals aligned with the PB program [4]:

- 1) *Expand and Diversify Civic Engagement*: Ensure that all community members have a voice in the development and improvement of their city, especially marginalized

communities, reticent voters, and people with limited opportunities to engage in the political process.

- 2) *Have Meaningful Social and Community Impact*: Use PB as a tool to effect meaningful social change in the community. PB in Cambridge should be mission-driven and results-oriented.
- 3) *Promote Sustainable Public Good*: Make sustainable decisions that promote the long-term future and wellbeing of Cambridge residents.
- 4) *Create Easy and Seamless Civic Engagement*: Enable the community to be involved without barriers or frictions. Create a welcoming space for residents to become engaged, fostering a "contagious" civic environment.
- 5) *Promote Civic-mindedness*: Help residents imagine themselves as civic actors and educate each other about their needs and lives. Provide youth with the opportunity and experience to become life-long voters and community leaders.

III. DATA

For this project, we used publicly available data sets from the city's open data platform. The data sets we used include:

- Participatory Budgeting Ideas Submitted by Community Members¹
- Final Ballot Projects²
- American Community Survey 2013–2017 Estimates by Neighborhood: Basic Demographics³

We also got access to the individual PB voting data from 2016 through 2020 from the Stanford Crowdsourced Democracy Team, who manages the online platform used for Cambridge PB voting. This data set is not complete because it only includes the online votes, and not the in-person or phone votes. However, by comparing the total votes posted on the Cambridge PB website to the votes included in the data, we found that over 90% of voters were represented each year in our dataset.

In addition, we found two previously published reports evaluating the city's PB program in 2014 and 2016 [13], [18]. These reports were written by university students in the Boston area and released by the city.

Finally, we consulted the city's website for the PB program and the Budget Delegate guides for each year. The city maintains a separate web page for each PB cycle, so we were able to find information for the prior winning projects, budget delegations, committees, etc.

IV. METHODS

To conduct our analyses, we read through the city's websites, budget delegate guides, and the previously written reports evaluating Cambridge's PB process. We also downloaded

¹<https://data.cambridgema.gov/Budget-Finance/Participatory-Budgeting-Ideas-Submitted-by-Communi/54vd-wdqj/data>

²<https://data.cambridgema.gov/Budget-Finance/Participatory-Budgeting-Final-Ballot-Projects/uhwd-9y6q/data>

³<https://data.cambridgema.gov/Neighborhood-Census-Data/American-Community-Survey-2013-17-Estimates-by-Neil/jabj-v7kz>

the open data sets and used a combination of Excel and various python packages (such as pandas and matplotlib) to combine data sets, analyze the results, and plot our findings.

V. RESULTS AND DISCUSSION

From our analysis, we had a number of findings surrounding the PB process in Cambridge. The results and our analyses of them are presented in this section, broken into various subsections – budget delegates and final proposals, voter turnout and behavior, winning project distribution, and finances.

A. Budget Delegates and Final Proposals

Because the budget delegates play such a substantial role in the PB process in Cambridge, we chose to examine their role and demographics and how the final project proposals may be biased from that.

1) *Budget Delegates*: The budget delegates – who narrow down the submitted ideas into the final proposals – are all volunteers from the city [1]. In both prior PB evaluation reports, the authors found that the budget delegates were not representative of the city as a whole, and rather were mostly older, white, female, high-income, and native English speakers. For reference, nearly 30% of Cambridge residents were born outside of the United States and nearly 13% have incomes below the poverty line [8].

2) *Final Project Proposals*: When comparing the final project proposals to the submitted project ideas (through 2017, which is all that is included in the city’s open data), we found that there does seem to be a bias in the selection, likely from the lack of representation in the budget delegation.

First, we found that the final project proposals were often city-wide initiatives rather than targeted projects. For example, many projects were related to planting trees, updating trash cans, and painting bike lines throughout the city. In addition, we found that many of the social justice initiatives represented in the final proposal selection were centered around accessibility.

Another interesting finding was that the final proposals were not equally distributed across the five (four in 2018) committees. We expected to see that each of the committees has equal representation in the final list, but found that Youth and Technology projects – many of which were centered around underserved areas – were often left off in lieu of additional Environment and Streetsmarts projects.

We also found that many project proposals were repeatedly on the ballot. This was true for proposals that had previously won and lost. In particular, projects around trees, water fountains, trash cans, and electric vehicle charging stations all appeared on the ballot multiple times. Considering the hundreds and sometimes over 1000 ideas submitted, it was puzzling to find that in successive years the same projects might be selected for the ballot again.

We believe there are two potential reasons for this issue. First, budget delegates are allowed to campaign for their own ideas. Thus it is possible that some delegates volunteer to help push their own idea forward. In addition, the budget delegates

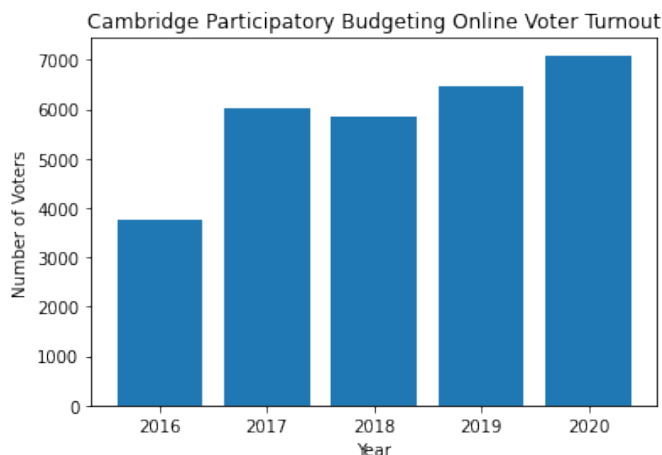


Fig. 2. Yearly Number of Online Voters

may simply be the same volunteers year after year and may not recognize the need for other ideas that are submitted, especially if those ideas come from community members that have different priorities than those in the budget delegation. Hence, diversity in the budget delegation is key to driving project diversity as well.

B. Voter Behavior and Satisfaction

From prior research [10], [15], [16] we anticipated that we would find a low voter turnout for participatory budgeting. However, we also wanted to dig into the voter behavior and satisfaction to examine potential utility function improvements to tie into work that we covered in the class. This subsection describes our findings around voters.

1) *Voter Turnout*: Although voter turnout has generally increased with each iteration of the PB cycle, the turnout for participatory budgeting elections has typically been very low, even though participatory budgeting elections are held online. From 2015 to 2020, between 4,184 and 7,602 people voted in each Participatory Budgeting election, even though in 2020 68,795 people, who are at least the age of 16, were registered to vote in Cambridge [6]. Considering that all Cambridge residents age 12 and older, regardless of citizenship, can vote in participatory budgeting elections, this means that (taking the number of people registered to vote in Cambridge as a conservative estimate for the denominator) the voter turnout ranged between 6.1% and 11.1%. In contrast, during the same time period voter turnout in municipal elections ranged between 25.3% and 31.0% and Cambridge voter turnout in the 2020 U.S. Presidential Election was 80.0% [5].

2) *Voter Demographics*: Although the city does not collect demographic information about voters in the PB process, the previously released evaluation reports included surveys to collect this information from voters [13], [18]. In the 2016 PB cycle, the author found that the PB voters were overwhelmingly white, highly-educated, high-income, and female compared to the overall population [13]. In addition, both reports found that there were not many young voters

participating, even though many preteens and teenagers are eligible to vote.

Despite the increased voter turnout in the past few years, we are skeptical that the demographics of participatory budgeting voters have changed to a significant extent since 2017. Both prior reports found that most people in Cambridge discover PB through word-of-mouth, thus it is likely that people tell their peers and colleagues, who are generally of the same income and education level.

3) *Voter Behavior*: To examine the city’s goals around civic engagement and civic mindedness, we examined the number of projects and amount of money that voters approve. Our intuition is that citizens who are more engaged may choose to vote for more projects, as they take time to read about and vote for more potential changes around the city.

We found that a large number of voters – over 90% – vote for five projects (the maximum allowed) each year. We also found that voters can submit a vote for 0 projects, which may represent a bug in the online voting portal. However, this information could also be a feature allowing the city to see how many residents were interested in participating in PB but uninspired by the voting options. Table 1 in the Appendix shows the voter project count breakdown in percentage of voters for the years 2016 through 2020.

Ultimately, although the city may benefit by asking or encouraging voters to vote for more projects or to allocate their votes differently, the city budgeting office told us that they want to keep PB voting simple to encourage participation and avoid the need for translators or extra explanation around the process.

4) *Voter Satisfaction*: In reaching the goal of civic engagement and civic mindedness, it seems important that voters are satisfied with the results of the PB elections, especially because so few eligible voters participate.

To calculate the voter satisfaction, we counted the number of winning projects that each voter approved and divided that by the total number of votes the voter made.

We found that the mean and median satisfaction scores were around 0.5 or higher (so 50% satisfaction or more) for each of the years 2016 through 2020. In 2018, the mean satisfaction was just below 0.5, and overall the mean and median satisfaction was lower that year than the others we analyzed.

Even in 2018, over 97% of voters had a satisfaction score greater than 0. In examining the voters who had a score of 0, we found that there was no common thread except that they voted for projects that simply did not win. Voters had a pretty even distribution of the number of projects they voted on, and ultimately the number of voters with 0 satisfaction was so low that we chose to focus on other issues in the PB process.

C. Distribution of Winning Projects and Funds

In this subsection, we analyze the distribution of participatory budgeting proposals and projects across the city of Cambridge and discuss the possible impact of those projects

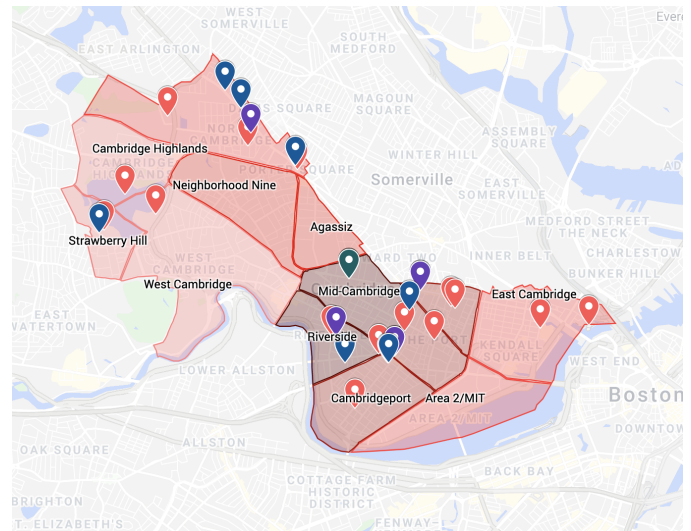


Fig. 3. Distribution of Completed Projects over Population Density

on Cambridge neighborhoods. First, we must consider the demographics of Cambridge and its neighborhoods.

1) *Cambridge Demographics*: Cambridge is a relatively small city with about 110,893 residents and the population has remained around this number since 2013 [8]. The population is also majority white and educated, with about 66.9% identifying as white and 76.4% having attained at least a Bachelor’s degree [8]. The high educational attainment of Cambridge’s population is not necessarily unsurprising given that two major universities are situated within the city boundaries. It is also important to note that the median household and family incomes of the City of Cambridge, \$88,976 and \$118,034 respectively, are higher than both those of the national average and the state of Massachusetts [8].

However, as expected, this high income is not equally distributed across the city. On one end, the neighborhoods of Area 2/MIT, West Cambridge, and Cambridgeport have the highest median household incomes in the city, with median incomes of at least \$99,000 [8]. On the other end, the lowest median household income of \$67,700 was in the neighborhood of Riverside, which is right next to West Cambridge and where many of Harvard College’s undergraduate housing is situated [8].

2) *Project Distribution across Cambridge*: When considering the distribution of winning participatory budgeting projects across Cambridge, we decided to only consider the distribution of completed projects across the city. This is because even after a project wins funding, the installment locations and amount of money allocated to the projects can change. Because the city begins implementing winning projects at the beginning of the next fiscal year, projects can take a few years to complete. As of today, the most recent project to be completed is from Cycle 4, the 2017 cycle, and it is the only project from that cycle to have been completed. We also excluded citywide projects from consideration, which we assumed would have to benefit all or most neighborhoods.

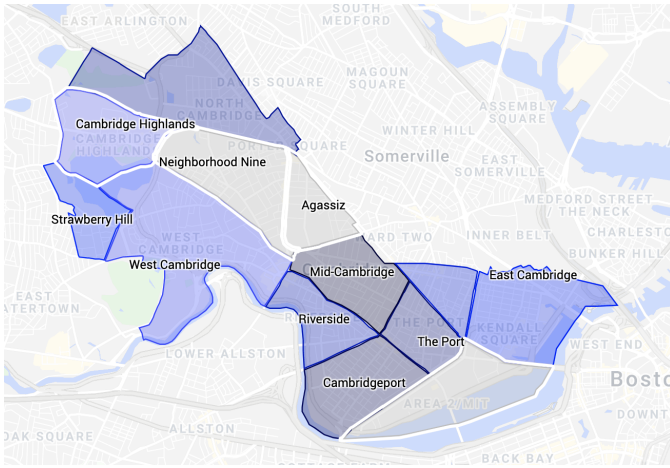


Fig. 4. Distribution of Project Spending across Cambridge Neighborhoods

We found that of the completed projects, the majority were concentrated in and along the borders of the central Cambridge neighborhoods, which include Mid-Cambridge, Riverside, Cambridgeport, The Port, and Wellington-Harrington, as well as the neighborhood of North Cambridge. Considering that population is most dense around central Cambridge area, it makes sense that most of the projects would be concentrated in those neighborhoods. We also found there were three neighborhoods in which no completed projects were located: Area 2/MIT, Neighborhood Nine, and Agassiz. The reason for this disparity is not clear; however, it is important to note that all three neighborhoods house a university or parts of a university within its boundaries and are in the middle range of population density across Cambridge. This can more clearly be seen in Fig. 3, on which completed projects from cycles 1 to 4 are mapped on top on a map of population density per neighborhood in Cambridge. The darker the shade of red within the boundaries, the more dense the population in the neighborhood.

This uneven distribution of projects was significant to us because project proposals submitted by people were distributed across all neighborhoods of the city. The high number of proposals centering around the central Cambridge neighborhoods was expected as they were the most densely populated neighborhoods, meaning that many more people were living in those neighborhoods compared to other Cambridge neighborhoods. However, there were many more projects distributed across other less densely packed neighborhoods than the map of completed projects would have us believe. That there are neighborhoods of Cambridge that have yet to see individual neighborhood benefits from participatory budgeting projects beyond just citywide projects after more than 5 years is surprising. However, it is possible that these neighborhoods will end up seeing some benefit from the set of projects that have received funding but have not yet been implemented.

3) *Impact on Cambridge Neighborhoods:* If we define the impact on a neighborhood to be the amount of money that is spent in implementing a project, or part of a project as

is usually the case, in one neighborhood, we can assert that the impact of the Cambridge's participatory budgeting is not equally or proportionally distributed across the city. This is apparent when you map the total implementation costs of completed projects in each neighborhood as seen in Fig. 4, with the darker blue indicating more money. In total, about \$1,411,400 has been spent on completed projects, excluding citywide projects, and most of that money is concentrated in the Central neighborhoods of Mid-Cambridge, The Port, and Cambridgeport, with the neighborhoods of North Cambridge making up the next highest tier. What is deceptive about Fig. 4 is that it makes it seem as though the different tiers are not separated by a lot when in reality, 37.6%, 21.5%, and 15.9% of the money spent was spent in the neighborhoods of Cambridgeport, Mid-Cambridge, and The Port respectively, while in North Cambridge, in the next tier of neighborhoods, only 9.9% of the budget went there.

If the allocation of the participatory budgeting spending was allocated according to the population size in each neighborhood, the difference in money spent in each neighborhood would be much smaller. In fact, Mid-Cambridge, The Port, Cambridgeport, and North Cambridge would be allocated about 12%, 6%, 11%, 13% of the money respectively. Every neighborhood in Cambridge would be guaranteed a portion of the budget, meaning that each neighborhood would see some benefit, or impact, from the participatory budgeting program.

In addition, the majority of the spending is currently concentrated in the areas where the median household income are around the overall median household income of Cambridge, which is \$88,976. However, this correlation is not a strong one given that the two neighborhoods that see no participatory budgeting spending out of the money spent on completed projects also have median household incomes around that of the overall median.

A more compelling observation is that less money has been spent in the neighborhoods with the highest and lowest median incomes. In the neighborhoods with a median income above \$100,000, less than 1% of spending so far has been spent there. This could be attributed in some part to the proportion the city's population living in those neighborhoods, given that Cambridgeport has a median income of about \$99,000, is home to a higher percentage of the city's residents and has received a large proportion of spending. On the opposite end of the spectrum, Riverside, which has been allocated only about 7% of the money, has the lowest medium income, \$67,700, but its population size is very comparable to that of Cambridgeport's. Thus, this disparity in spending cannot be completely explained by income or population size, which brings the point to mind that perhaps it might be a question of the type of projects being proposed in the different neighborhoods or neighborhood participation.

4) *Distribution of Winning Projects across Committees:* Finally, we examined the types of projects that typically win based on their associated committee from the budget delegation. We found that projects from the Environment committee comprise of over 40% of the winning projects

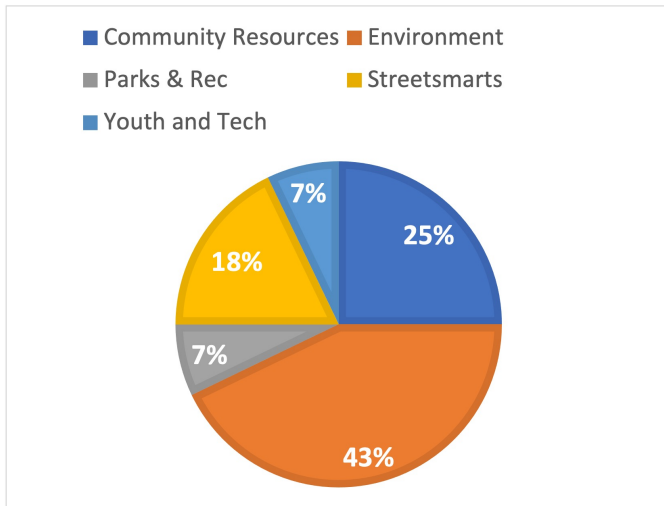


Fig. 5. Winning Project Distribution by Committee, 2017-2020

from 2017 through 2020 (the years that documented each project’s committee). In comparison, Parks & Rec and Youth and Technology projects were only 7% each.

This breakdown is likely caused by the large representation of high-income and highly-educated voters who prioritize issues such as solar panels and rain gardens. However, it exposes a huge flaw in the PB process, as it results in the allocation of funds to projects that reflect a need in wealthy parts of the city and for privileged populations, rather than the city as a whole. As one of the voters in 2017 stated, “I thought my god, we are toying with kinetic tiles when we’ve got hungry kids. Made me feel a little ashamed of my town, as if there are many people quite clueless about a completely different segment of Cambridge that doesn’t dream of solar energy at night but who might be going to bed hungry.” [13].

D. How Participatory Budgeting Fits Into Cambridge’s Finances

In this section, we analyze the City of Cambridge’s 2020-21 annual budget report and other budgetary documents to understand how participatory budgeting fits into the City’s broader finances.

In FY21, Cambridge plans expenditures of 715.3 million dollars, of which \$467.3 million (65.3%) will go to salaries and wages, \$162.0 million (22.7%) will go to other ordinary maintenance, \$81.3 million (11.4%) will go to extraordinary expenditures, and \$4.6 million (0.6%) will go to travel and training [6].

In FY21, Cambridge expects to raise 715.3 million dollars in revenue. \$507.5 million (70.9%) will come from taxes, \$93.4 million (13.1%) from charges for services, \$54.6 million (7.6%) from intergovernmental revenue, \$22.7 million (3.2%) from licenses and revenues, \$26.6 million (3.7%) from miscellaneous revenue, and \$10.5 million (1.5%) from fines and forfeits [6].

Through the Participatory Budgeting process, Cambridge voters are only voting on the allocation of a tiny fraction of

Less than 0.2% of Cambridge’s annual expenditures go toward participatory budgeting (Cambridge, MA expenditures, FY21)

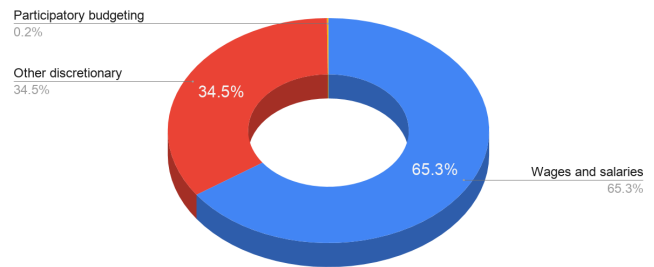


Fig. 6. Distribution of Cambridge, MA city government expenditures in FY21. Note that “other discretionary” represents all discretionary spending, excluding participatory budgeting.

Cambridge’s budget. In PB Cycle 7, 7,250 residents voted on allocating \$525,000 worth of city funds for FY22. This means that the Participatory Budgeting process allocated only 0.07% of the City’s total expenditures and 0.2% of the city’s discretionary spending [3]. On average, each voter allocated \$72.4 dollars.

The amount of money that voters were asked to allocate during PB Cycle 7, which ran in Fall 2020, was smaller than during most other cycles (during the first 5 cycles, the average amount allocated was \$725,200), presumably because of budgetary uncertainty during the COVID-19 pandemic. In Cambridge’s FY21 budget the City declared plans to allocate an average of \$1,000,000 per year toward Participatory Budgeting in fiscal years 2022-25, and to fund these allocations by drawing on property tax revenues [6]. The largest amount of money that voters were ever asked to allocate was \$1,125,000, which was allocated by 7,602 voters during Participatory Budgeting Cycle 6 [2]. Nevertheless, on average each voter only allocated \$148.0 dollars and the total amount allocated to participatory budgeting was only 0.16% of the City’s total expenditures.

After FY20, Cambridge had \$207.7 million in surplus cash that could be readily spent [6]. Furthermore, in FY16-19 Cambridge’s budget (and actual spending) gave the city a surplus between \$9-20 million per year. In FY20 Cambridge ran a \$38.9 million deficit due to pandemic-related expenses, and in FY21 Cambridge chose to balance its budget exactly in the face of unexpected revenue impacts from the COVID-19 pandemic. Some of Cambridge’s budget surpluses or free cash could conceivably be spent on expanding participatory budgeting, if the political will to do so existed.

Compared to other items in Cambridge’s budget, Participatory budgeting does not represent a significant expenditure at all. Recall that in the most recent participatory budgeting cycle, Cambridge allocated \$525,000 to 7 participatory budgeting projects, ranging from water bottle fill stations to planting 100 trees. The latter project would be impressive if not for the fact that the city already planned to plant 950 trees in

public spaces in FY21 [6]. Furthermore, the City increased its spending on tree planting from \$595,000 to \$795,000 between FY19 and FY20 through the regular budgeting process, putting into question whether participatory budgeting actually made a project that would not have otherwise happened (planting 100 trees) happen [6]. Furthermore, through the regular municipal budget process, \$800,000 was spent on building a more sustainable roof at the Morse School and \$2.7 million was spent on urban forestry [6].

Perhaps the most surprising fact about Cambridge's participatory budgeting process is that more money is spent on employee wages at the City's Budget Subdivision than on actual projects that voters chose; only 40.1% of funds related to participatory budgeting (including staff, advertising, etc) during PB Cycle 7 in Fall 2020 actually went to voter-selected projects [6]. In FY21, Cambridge's Budget Office had 4 employees who were paid \$672,710 in salaries and wages. These employees were responsible for preparing the city's budget, complying with general accounting practices, expanding outreach efforts to different locations citywide to increase the number and diversity of residents who vote in the City's Participatory Budgeting process, collecting and vetting project proposals, and running the election. When adding costs for "other ordinary maintenance" and "travel and training," Cambridge's Budget office planned to spend \$782,810 on logistics and wages, even though only \$525,000 was allocated to actual projects during PB Cycle 7. Although the workers at the Budget office have a multitude of tasks in addition to participatory budgeting and we do not advocate wage cuts, this finding underscores how small of a proportion of city funds that voters actually control through the Participatory Budgeting process.

VI. RECOMMENDATIONS FOR PARTICIPATORY BUDGETING IN CAMBRIDGE

Our key recommendations to make Participatory Budgeting in Cambridge more effective are as follows:

- Allocate more money to the Participatory Budgeting program's budget
- Use sortition to create the budget delegate committee that selects which projects will go to a vote
- Define a function to compute project need to assist the budget delegates
- Select a utility function that prioritizes projects to help underserved communities
- Collect and share more data around Participatory Budgeting

These recommendations, which we detail further below, are designed to solve the key problems that we identified in Cambridge's participatory budgeting process.

First, allocating more money to the participatory budgeting program's budget is critical if Cambridge wants participatory budgeting to be taken seriously. Cambridge's limited budget for participatory budgeting, representing no more than 0.2% of Cambridge's total budget each year, limits the scale of projects that can be accomplished and prevents many types

of projects from being feasible (although tree planting and other environmental projects that frequently win are certainly important, the current budget impedes other worthy projects).

In contrast, Paris currently allows residents to allocate 5% of the city budget, or roughly 100 million euros, through participatory budgeting, but the city plans to increase this proportion to 26% by 2026 [17]. As a result, many of the projects that win in Paris tend to be on a larger scale. For instance, in 2019 Paris residents voted to spend €3 million on detailed air and noise quality sensors throughout Paris' neighborhoods and the installation of anti-noise coverings in public spaces. In the same year Paris residents voted to spend €5 million to clean up 3 of Paris' public canals and make them open for public swimming [7]. These kinds of creative projects are impossible when barely \$1 million a year is spent on several projects in Cambridge. Although Cambridge may not be able to raise its participatory budgeting spending to 5% of the city budget immediately (in 2021 5% of Cambridge's expenditures is \$35.8 million), as discussed earlier Cambridge routinely runs budget surpluses and can conceivably spend several million more dollars per year on participatory budgeting while still running budget surpluses. Increasing spending might also help raise voter turnout; roughly 10 percent of Paris' population participates each year, which is substantial considering Paris' large, transient population [17].

Second, Cambridge should consider using sortition to build the budget delegate committee that selects which projects go to a vote. As discussed earlier, the existing budget delegate committees overrepresent Cambridge residents who are white, highly-educated, high-income, and female, and have a dearth of underrepresented minority groups. This is a problem for Cambridge's goal of expanding and diversifying civic engagement, especially considering that the budget delegates have immense relative power; they are responsible for cutting over 1500 ideas down to 20 final proposals to be voted on. If Cambridge wants to make budget delegate committees more representative of Cambridge's population, then Cambridge could consider using sortition. As discussed in class, sortition algorithms can select a reasonably representative panel from an overall population. Using sortition could help diversify Cambridge's participatory budgeting process.

Third, Cambridge should consider creating an objective function to define a project's need when it is reviewed by budget delegates. Currently, the process of identifying need seems to be completely subjective based on the budget delegate committee. However, as we found, the budget delegates are not representative of the city as a whole, and thus they cannot determine the necessity of every project. In addition, the delegates sometimes choose projects that have already been voted down or can also campaign for their own project ideas. To avoid these biases and to limit the subjectivity of the process, having an objective need function could help propel forward ideas that truly help underserved communities.

Fourth, Cambridge should consider designing a mechanism that prioritizes projects that help underserved communities. Cambridge could implement a different utility function that

mathematically makes it more likely that projects in under-served communities will win, or use one of the fair-division algorithms discussed in class to more fairly divide funds geographically. Cambridge could even impose a minimum quota that at least one project will be funded in every neighborhood (or design another appropriate rule). Cambridge could look to Paris’ participatory budgeting program, which guarantees that at least 30% of the funds allocated toward participatory budgeting goes toward working-class areas. Paris’ program works by allocating funds both on a city-wide scale and on a neighborhood-by-neighborhood scale; each neighborhood is allocated a set amount of funds that can only be used for projects in that neighborhood. A quota scheme like this might rectify the geographic imbalances in Cambridge’s participatory budgeting program [17].

Finally, Cambridge should update their practices around data collection and sharing for their PB program. Having more information about voter and budget delegate demographics would help the city and future researchers see how well the program is reaching and engaging minority groups in the city. In addition, there has not been any update to the idea submission data set since 2017, making it difficult to track the issues that citizens care about and the projects that budget delegates are not selecting. This is particularly important, as the city has specifically called out analyzing the participatory budgeting program as one of their civic innovation challenges⁴.

VII. CONCLUSION

In this paper, we presented our findings from a deep dive into Cambridge’s Participatory Budgeting program, the implications of funding, the potential social justice impacts, and how well the city is meeting its own goals. We identified a number of key problems with participatory budgeting in Cambridge and proposed solutions to address these issues.

Our research findings demonstrate a clear need for further research to improve the participatory budgeting process. Further research on the theoretical mechanisms of participatory budgeting should focus on how sortition can be used to select budget delegates and how a project need function can be defined to assist project delegates.

Within Cambridge, it would be helpful to conduct research on voter demographics (such as which neighborhoods voters are from) which we had to infer from prior reports because that data is not collected by the city. Such research would allow the City of Cambridge to determine civic engagement across different neighborhoods and demographic groups, which would help determine where efforts to increase engagement should be targeted.

Further research should also examine cities besides Cambridge: Do similar challenges appear in other cities’ participatory budgeting programs? How do those cities tackle issues of social justice and equitable allocation of funds?

Overall, we hope that our work will not only help to improve the PB process in Cambridge but also encourage other cities

and researchers to examine their local initiatives with a critical lens.

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VIII. APPENDIX

⁴<https://data.cambridgema.gov/General-Government/Civic-Innovation-Challenge-Inventory/x96z-hdnh>

Number of Votes	0	1	2	3	4	5
2016	0.371451	1.512337	0.981693	1.936853	3.528787	91.668878
2017	0.215875	1.012953	0.680837	1.610761	3.304550	93.175025
2018	0.255929	0.938406	0.597168	1.535574	2.968777	93.704146
2019	0.201457	0.526887	0.495893	1.193243	2.928870	94.653649
2020	0.296025	0.451085	0.718917	2.100367	3.904708	92.428897

TABLE I
PERCENTAGE OF VOTERS WHO VOTED FOR NUMBER OF PROJECTS, 2016-2020

Satisfaction Score	0.0	0.2	0.25	0.33	0.4	0.5	0.6	0.66	0.75	0.8	1.0
2016	1.8109	9.0279	0.4793	0.5326	25.9387	1.8375	36.4314	0.9853	1.0918	17.4700	4.3941
2017	0.8820	5.0590	0.4992	0.5325	21.3513	1.3479	39.0247	0.6989	1.3812	24.0139	5.2088
2018	2.2750	12.3332	0.7697	0.5987	33.2192	1.4368	33.6469	0.547383	0.7868	12.1792	2.2066
2019	0.6055	5.3416	0.2950	0.2950	24.3478	1.3975	36.9254	0.5124	1.1024	24.2236	4.9534
2020	0.3534	3.2659	0.4100	0.4524	18.1535	1.5269	40.0537	0.9896	1.6965	26.8485	6.2491

TABLE II
PERCENTAGE OF VOTERS WHO HAD CERTAIN SATISFACTION SCORES, 2016-2020

Neighborhood	Money Spent	Percentage of Money
East Cambridge	\$32,800.00	2.33%
Area 2/MIT	\$0	0%
Wellington-Harrington	\$58,350.00	4.13%
The Port	\$224,350	15.9%
Cambridgeport	\$303,350	21.49%
Mid-Cambridge	\$530,833.33	37.61%
Riverside	\$91,833.33	6.51%
Agassiz	\$0	0%
Neighborhood Nine	\$0	0%
West Cambridge	\$7,500.00	0.53%
North Cambridge	\$139,333.33	9.97%
Cambridge Highlands	\$500.00	0.04%
Strawberry Hill	\$22,500.00	1.59%

TABLE III
MONEY SPENT AND PERCENTAGE OF MONEY SPENT ON COMPLETED PROJECTS PER NEIGHBORHOOD, CYCLE 1-4

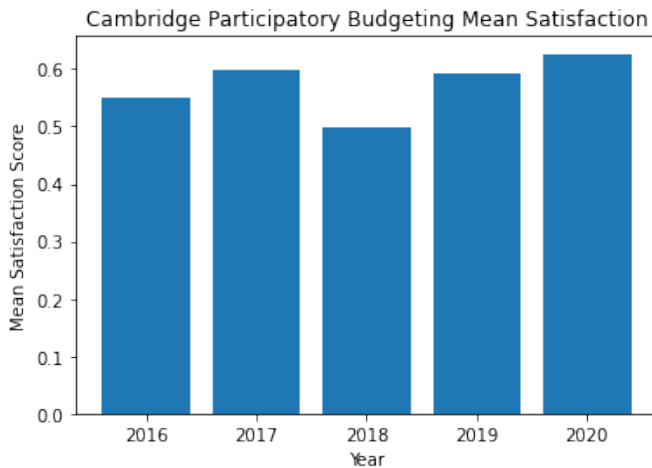


Fig. 7. Mean Satisfaction Scores, 2016-2020

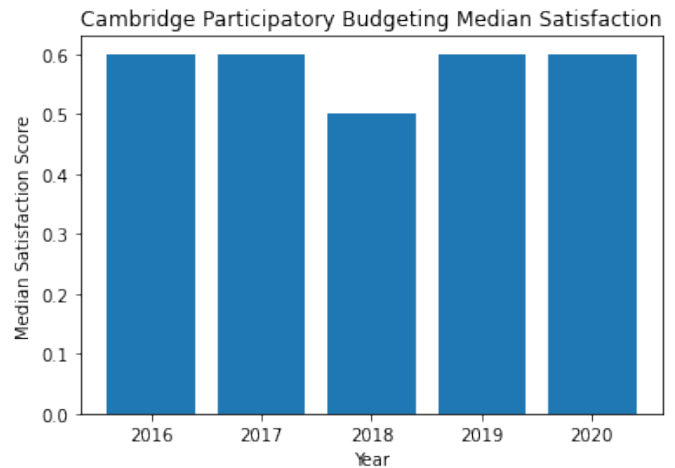


Fig. 8. Median Satisfaction Scores, 2016-2020