Gerrymandering Politics Out of the Redistricting Process: Toward a Planning Revolution in Redrawing Local Legislative Boundaries

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Abstract

Jurisdictions in the United States are granted considerable discretion in choosing the method by which they redraw their political boundaries following a decennial census. Two common methods are allowing legislatures to redistrict or creating a citizen commission to perform the task. Yet each of these processes frequently results in gridlock and/or political gerrymandering. This paper proposes an alternative method for local jurisdictions: a "planning approach" to redistricting in which it is suggested that districts can be created through the amalgamation of neighborhoods in a process driven by professional planners. This approach lends no consideration to politics. Rather, the research presented here posits that empowering planners to lead legislative redistricting processes will aid in the reduction of politically anticompetitive behavior, thereby increasing the efficiency, effectiveness, and logic of the process. A local redistricting problem using data from Buffalo, NY, is modeled and then solved using the proposed planning framework.

Keywords: Local; Political Redistricting; Neighborhoods; Planning

Introduction

In his satirical volume *The Devil's Dictionary*, Ambrose Bierce (1911) defines politics as the "strife of interests masquerading as a contest of principles; [t]he conduct of public affairs for private advantage." Nowhere is this definition more applicable than in the act of delimiting legislative districts, often seen as an opportunity for clever politicos to use insider knowledge in ways that manipulate future electoral outcomes (Cox 2006). Bullock (2010) goes so far as to call redistricting "the most political activity in America."

Redistricting in the United States is the act of modifying legislative boundaries in response to changing population conditions. The process is informed by the decennial census and designed to make districts equal in population and more reflective of intercensal demographic shifts. In most administrative units the responsibility of redrawing the lines is granted to the legislature itself (Tolson 2010; Bullock 2010; Cox 2006). Thus there are a number of reasons to expect some form of politically anticompetitive behavior, as self-interested legislators rationally endeavor to protect their incumbency and minimize political threats (McDonald 2004).

Accordingly, a second concept that often enters the redistricting discourse goes by the well-known term '*gerrymandering*.' Named for former Massachusetts Governor Elbridge Gerry, who in 1812 reconfigured the Senatorial districts of his state to create a salamander-like district favorable to his Democratic-Republican Party (see Figure 1), gerrymandering is the practice of redrawing legislative boundaries so that the resultant political landscape features built-in electoral advantages for a specific constituency. In general, the beneficiaries of gerrymandering are incumbent elected officials and their political parties. As stated above, one reason for this is that incumbents often have the final say in redistricting matters. In the event that one party controls a (super-)majority of the legislature, that party possesses some degree of market power that enables it to engage in anticompetitive behavior analogous to the ability of a dominant firm to price its competitors out of a given market. Essentially, then, a dominant party can diminish the democratic representation and/or efficacy of its rivals. This further suggests that incumbents can minimize their likelihood of encountering political challengers by drawing districts around their traditional electoral bases of support (McDonald 2004).

Figure 1. The original "gerrymander". Levitt, J. "All About Redistricting". http://redistricting.lls.edu/why.php.

The preceding discussion provides a backdrop for public discontent with political redistricting in states and localities where the processes are legislator-driven. A recent Quinnipiac University poll shows that New York State residents prefer to keep legislators out of redistricting by a decisive 56% to 36% margin (Quinnipiac University 2011). Polls in Arizona reveal similar preferences (Public Policy Polling 2011), and the general dissatisfaction with legislative redistricting is evident in the number of nonprofit organizations established to reform the institution.

Unfortunately, reforms that call for replacing legislative redistricting institutions with citizen-driven independent commissions might not go far enough. For example, the 2011 California Citizens Redistricting Commission, a group empaneled to "end partisan gerrymandering" in the state, was found to have violated the Voting Rights Act. One citizen commissioner was so outraged by the panel's proceedings that he issued a statement condemning its decisions as being tantamount to "gerrymandering by average citizens." Johnston (1982) provides empirical evidence from Great Britain to support a conclusion that "fair redistricting" is impossible under such commissions.

Thus, both legislative and commission-based redistricting processes can produce suboptimal outcomes. Observations such as this have led to efforts to develop sophisticated, computer-based solutions to the problem of delimiting legislative boundaries (e.g., Altman and McDonald 2011). As the next section will discuss, several criteria must be considered during the redistricting process. Computer algorithms tend to optimize among these criteria better and less arbitrarily than humans, thereby increasing district efficiency and eliminating politically anticompetitive behavior. However, computer optimization often lacks sociospatial context, and computer-based solutions can therefore produce districts that jeopardize prospects for neighborhood governance strategies and common policy objectives.

This paper argues that while sociospatial context is critically important to any redistricting process, it is indispensable at local and municipal geographic scales. Municipal legislatures enact policies and allocate funding based on local, internal conditions. In this sense, districts that have common internal needs and objectives are perhaps most easily and effectually governed. I submit that a legislator who manages a district in which several heterogeneous constituencies have relatively homogeneous interests is in a somewhat better position to promote the public welfare than a legislator in a gerrymandered district, who must cater to the discordant policy wishes of many fragmented interest groups.

This paper proffers a planning-based local redistricting process in which the principal goal is to wholly preserve neighborhoods within local political boundaries. Acknowledging the shortcomings of the legislative and citizen processes noted above, this research calls for a "planning revolution" in local redistricting — that is, for an institution in which planners guide the process from start to finish. While I do not advocate the removal of legislators or any other citizens from the process, I suggest that their roles be scaled back to those of advocates and advisors acting within a large-scale, guided, and binding participatory planning exercise. I contend that the Planning Approach to Local Redistricting (PALR), as defined below, represents a sensible compromise on local redistricting: one operationalized by humans (i.e., planners and participants in the planning process) and solved by computer optimization algorithms that efficiently delimit legislative districts that retain the contextual elements of neighborhoods that make places unique. The balance of this paper is devoted to developing a framework for this approach and providing an illustration of how it might work in practice.

Background

The Political Redistricting Problem (PRP)

Briefly, the PRP is the issue of subdividing a particular geographic unit, e.g. a municipality, into mutually exclusive legislative area divisions subject to several constraints (Williams 1995). The number of districts is determined by a combination of local historical, political, and demographic factors. Note that the issue of changing the number of districts in a jurisdiction is one of reapportionment and is beyond the scope of this paper. The issue of changing the boundaries of districts is the domain of redistricting (Bullock 2010); hence the essence of the PRP and this research.

As should be evident, there are many ways in which a municipality or other administrative unit can be subdivided into legislative districts. Unfortunately, this observation is recognized by individuals authorized to engage in redistricting, and it creates opportunities for gerrymandering. One of the most problematic forms of gerrymandering is racial gerrymandering (e.g., O'Loughlin 1982). Racial gerrymandering is said to exist when a redistricting plan dilutes the voting strength of a minority group (O'Loughlin 1982). Vote dilution can be the result of several actions, most notably: (1) packing, or concentrating minority voters into one or a small number of districts, thereby preserving majorities of the dominant group in the large balance of the districts; (2) cracking, or splitting minority voters between many districts so that they do not constitute a voting bloc sufficient to elect their preferred candidates in any of the districts; and (3) stacking, or incorporating minority voters into a large multimember district that effectively cancels out minority votes (e.g., Bullock 2010; O'Louglin 1982). Congress passed the Voting Rights Act of 1965 to protect minority voters against redistricting and other voting rights abuses and to "counter immediate and potential barriers to…minority political participation" (US Commission on Civil Rights 1975). While this landmark law establishes several remedies to fight racial redistricting injustices, opportunities to gerrymander are ever-present in redistricting institutions dominated by rational human actors (McDonald 2004; Buchler 2010). For this reason, many researchers have proposed automated, computer-generated approaches to solving the redistricting problem.

The Need for a Computer-Based Approach

Insofar as there are many potential solutions to the PRP, some designed to systematically dilute the voting strength of particular groups, thousands of pages of research have been devoted to proposals for better redistricting practices (see Williams 1995; Altman and McDonald 2011; Cox 2006). Indeed, several dozen formulations of the PRP exist within social and computer science literature (Tasnadi 2011).

In an early computational approach, Hess et al. (1965) view the PRP as a mathematical "facility location" problem. Like the operations research problem that locates a set number of facilities and then assigns those facilities to "coverage areas" containing customers, the authors use integer programming to select "district centers" from a set of US Census Enumeration Districts. Enumeration Districts that are not selected as centers are assigned to centers by minimizing the population-weighted distances from centers to coverage sites. The key modeling constraint is that districts must have reasonably equal populations. The combination of all district centers and their "coverage areas" constitutes the redistricting plan.

Extensions of the computer-based approach include, among others: incorporation of Geographical Information Systems, or GIS (Macmillan and Pierce 1994); simulated annealing in a GIS environment (Macmillan 2001); and using the geometric properties of Voronoi and population-weighted "Voronoiesque" diagrams to automatically draw districts (Svec et al. 2007). For further discussion of such developments, see Williams (1995) and Tasnadi (2011). Rather than conducting an extensive review of PRP models, I choose to highlight an important gap. Namely, while there are attempts to operationalize "communities of interest" in PRP models (e.g., Patrick 2010), and discussions of possible representations of communities in redistricting literature (e.g., Morrill 1981; Arrington 2010; Forest 2004), these discussions occur at the state and national levels. There are far fewer conversations in the literature about redistricting strategies in municipalities and operationalization of neighborhoods therein.

Because participatory governance is most likely to occur when representative-to-constituent ratios are relatively small, communities of interest in the form of neighborhoods are assumed to play much larger roles in local than in state or federal jurisdictions. As Harrington et al. (2008) points out for the case of natural resource management, "while individually actors may have limited capacity to bring about…change,… collective arrangements between governments and communities are… [a] precondition for…participatory governance." Thus, the scale at which computational PRP models have experienced the least innovation is the same level of government at which maintaining neighborhoods within single political districts is arguably the most important. As I will show, however, it is not the design of such models that is lacking. It is a matter of providing the models with better information—a problem that is easily rectifiable through a planning revolution in local redistricting.

Redistricting Criteria and the PRP

Any given solution to the PRP must satisfy certain criteria. Optimization problems are, by definition, attempts to derive the best solution(s) to a problem, subject to a set of constraints. PRP constraints relate to the demographic, geographic, and political constructs of districts (Williams 1995). Several Supreme Court decisions have established explicit guidelines (i.e., constraints) for federal districts (Bullock 2010). In particular, it is now widely recognized (Texas Legislative Council 2011; Morrill 1972, 1981) that Congressional redistricting plans must meet the following criteria:

1. Districts must be of equal population, within a reasonable standard; and
2. A plan may not intentionally dilute the voting strength of members of a racial or ethnic minority group, as reflected in the distribution of the Voting Age Population.

In addition, redistricting plans should follow these nonpolitical guidelines:

3. Be contiguous and compact in shape;
4. Adhere to established routes of transportation;
5. Avoid unnecessary splitting of "communities of common interest"; and
6. Be consistent with natural boundaries marked by "streets, rivers, railroad lines or other permanent characteristics of the landscape" (George et al. 1997).

Historically speaking, enforcement of criterion 1 above has been flexible for sub-federal jurisdictions. As Bullock (2010) observes, "it remains possible for…localities to have plans with more [population] variation [than what is generally recommended] if they provide an acceptable explanation." In this sense, it is reasonable to conclude that an "acceptable explanation" is one that involves preserving communities of interest. To that end I argue that, while population equality must remain a principal goal of local redistricting plans, it can be traded-off for preserving communities of interest if: (a) communities are well-defined and (b) preserving well-defined communities necessitates insubstantial district population inequalities. Thus criterion 5, often the most elusive to satisfy (Arrington 2010), becomes central to the planning approach to local redistricting.

The Planning Approach to Local Redistricting (PALR): A Framework

As Arrington (2010) articulates, communities of interest can be "almost anything one chooses" and therefore are "rarely operationalized in a fashion…useful in…drawing districts." This proposition may be true in legislature- and citizen-driven redistricting processes. But the essence of the PALR is that planners often operationalize neighborhoods for planning purposes. Consequently, I argue that planners are perhaps best suited to lead decennial local redistricting efforts.

It is now commonplace for municipalities to commission, create, and adopt comprehensive plans. For example, in a 2008 planning instrument survey of jurisdictions in New York State, 92% of cities, 71% of towns, and 66% of villages indicated that they possessed written comprehensive plans (NYS Legislative Commission on Rural Resources 2008). Such plans frequently called for an inventory of "existing educational, historical, cultural, agricultural, recreational, coastal, and natural resources," together with demographic and socioeconomic trends and projections (NYS Dept. of State 2008). Common outputs of these activities are "planning community" and "neighborhood" maps, such as the one for Buffalo, NY depicted in Figure 2. Such territories are generally: contiguous; a combination of proximate areas which, loosely interpreting Tobler's (1970) First Law of Geography, tend to be clusters of areas that are more alike than others; and drawn in relation to permanent geographic features and transportation routes. In other words, the act of generating planning communities of these types tends to satisfy redistricting criteria 3–6.

For these reasons this paper argues that neighborhoods delineated by planners, rather than the Census geographies typically used in PRP models, can enter into local redistricting plans as building blocks. That is, under the PALR districts are created exclusively through the aggregation of neighborhoods, thereby overlooking any existing elements of the incumbent partisan landscape. This approach promotes the criterion addressing the "unnecessary splitting of communities of interest" to the forefront of the PRP. Moreover, it makes planners—not self-interested legislators or potentially partisan citizens—the drivers of the process.

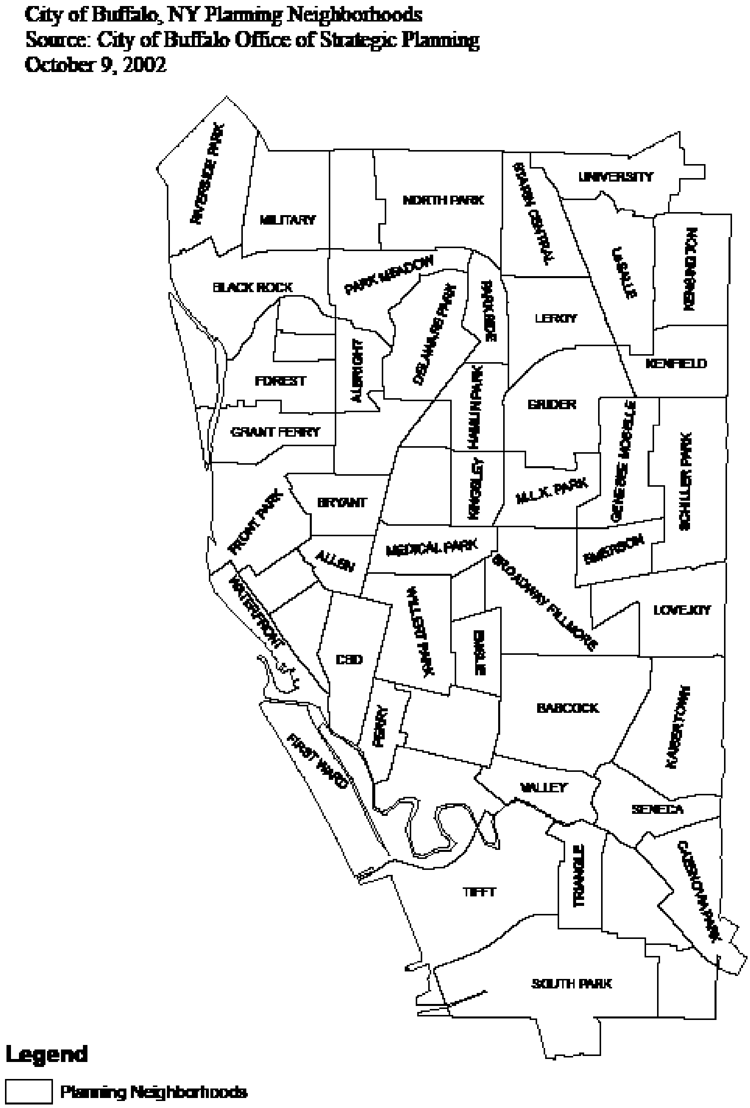

Figure 2. Planning Neighborhoods, Buffalo, NY

The PALR in Practice

Recognition of this fact alone is insufficient as a redistricting strategy; rather, it is a starting point for a strategy that has the capacity to mitigate the problems associated with gerrymandering and politically anticompetitive behavior. If planning neighborhoods are used as building blocks in the construction of legislative districts, then an optimization problem like the PRP of Hess et al. (1965) can be designed to combine neighborhoods on the bases of population, compactness, and contiguity, giving no consideration to strategic political variables. In this regard, the PALR also ex ante satisfies criterion 2 from the preceding section, and it will address 1 using optimization constraints. With respect to 2, the PALR considers the distribution of individuals of certain races or ethnicities strictly for planning purposes, and, as such, does nothing to intentionally limit the voting power of any group. Still, ex post analyses of racial group impacts from PALR-derived redistricting plans are needed. Plans that have unintentionally retrogressive effects on minority voting strength are retrogressive nonetheless, and must therefore be reevaluated.

From the above discussion, the PALR can be summarized as a three-phase framework for local redistricting (Table 1). In phase 1, municipal planners lead participatory exercises to define and delineate neighborhoods and communities of interest after the decennial census. These neighborhoods then become the building blocks or units of analysis for phase 2, at which time a legislative redistricting plan is generated that constrains districts to be compact and roughly equally populated. Phase 3, considered separately, involves ex post analyses with respect to redistricting criteria and, if necessary, plan refinements.

Methods and Data

As Table 1 shows, once neighborhood boundaries are established, the problem becomes one of locating a specific number of legislative districts through the amalgamation of planning neighborhoods. Each neighborhood contains certain well-defined geographic and demographic attributes, which allows the PRP to be stated as a basic capacitated facility location (i.e., *p*-median) problem a la Hess et al. (1965). Here the PALR framework

	Phase I	**Phase II**
Goal:	Define and delimit non-overlapping neighborhoods to be used as building blocks in the local redistricting plan.	Generate a neighborhood-based redistricting plan given the predetermined number of districts.
Facilitator(s):	Community Planners	Geographers and analysts with appropriate technical training
Participants(s):	All interested parties, *e.g.*, legislators, citizens, local organizations, *etc.*	Planners provide geographic boundaries
Activities:	▪ Create demographic, cultural, physical, and socioeconomic profiles of areas within the municipality ▪ Inventory neighborhood assets, historical characteristics, *etc.* ▪ Invite and encourage public input and "mental mapping" activities that will aid in drawing neighborhood boundaries ▪ Using all available information and appropriate planning techniques, delineate neighborhoods and compute appropriate population statistics	▪ Develop allocation models with constraints that relate to the six criteria from above ▪ Select a computer-based algorithm that is appropriate for the optimization ▪ Solve the optimization problem subject to all criteria-related constraints ▪ Establish consistent decision rules to resolve allocation and other modeling issues ▪ Combine optimization results with GIS software to map final redistricting proposal
Phase III:	▪ Perform *ex post* analyses to determine: impacts on minority vote strength; adherence to redistricting criteria; strengths and weaknesses. ▪ Refine plan as necessary.	

Table 1. The PALR Framework

is applied to the 2010 redistricting process in Buffalo, NY. The appendix presents the adopted optimization model and its constraints in detail.

At the outset it is important to note that the planning neighborhood data for Buffalo were generated in the early 2000s (refer to Figure 2), well before the most recent decennial census. Recall that the PALR framework (Table 1) calls on planners to facilitate post-census participatory planning exercises to delineate neighborhoods using traditional planning techniques, public input, and the most current demographic data. It is evident that decade-old planning neighborhood maps do not satisfy the currency criterion. Nevertheless, because more recent neighborhood data are not available at this time, the existing neighborhoods can serve as proxies for pedagogical and illustrative purposes. Despite the apparent setback from this data availability issue, the resultant PALR-generated plan outperforms its alternatives in several dimensions. The fact that a limited PALR plan compares favorably to alternative proposals speaks well for the potential capabilities of the framework. In this sense, the Buffalo application offers useful contributions to the redistricting discourse.

Context

Following the 2000 legislative redistricting in Buffalo, the municipality was divided into nine single-member council districts (Figure 3, the "null alternative"). In this application, I eschew reapportionment issues and adopt a status quo heuristic to determine the number of districts, p. More explicitly, I set p equal to nine. It is now possible to operationalize the model with the planning neighborhoods from Figure 2. First, the population of each neighborhood is derived from the 2010 US Census (Table 2). Next, I measure the centroid-to-centroid Euclidean distances between each pair of neighborhoods. These distance measures will help satisfy the compactness criterion. Finally, all six criteria from above are represented as constraints in an optimization model solved to locate nine compact, contiguous districts (see Appendix). For simplicity, only the demographic data and outcomes for the two most populous racial groups in Buffalo—Whites and African Americans—are presented and discussed. An actual implementation of the PALR must analyze the outcomes for all racial and ethnic groups.

Results and Discussion

Figure 4 shows the solution to the PALR optimization (Appendix). Each neighborhood centroid is either selected to be a district "center" (indicated by a triangle), or it is mapped to a district center and is therefore within that center's "coverage area" (indicated by a line between the given centroid and its respective center). Using this solution concept as the foundation of a redistricting plan, each district is mapped out within a GIS environment.

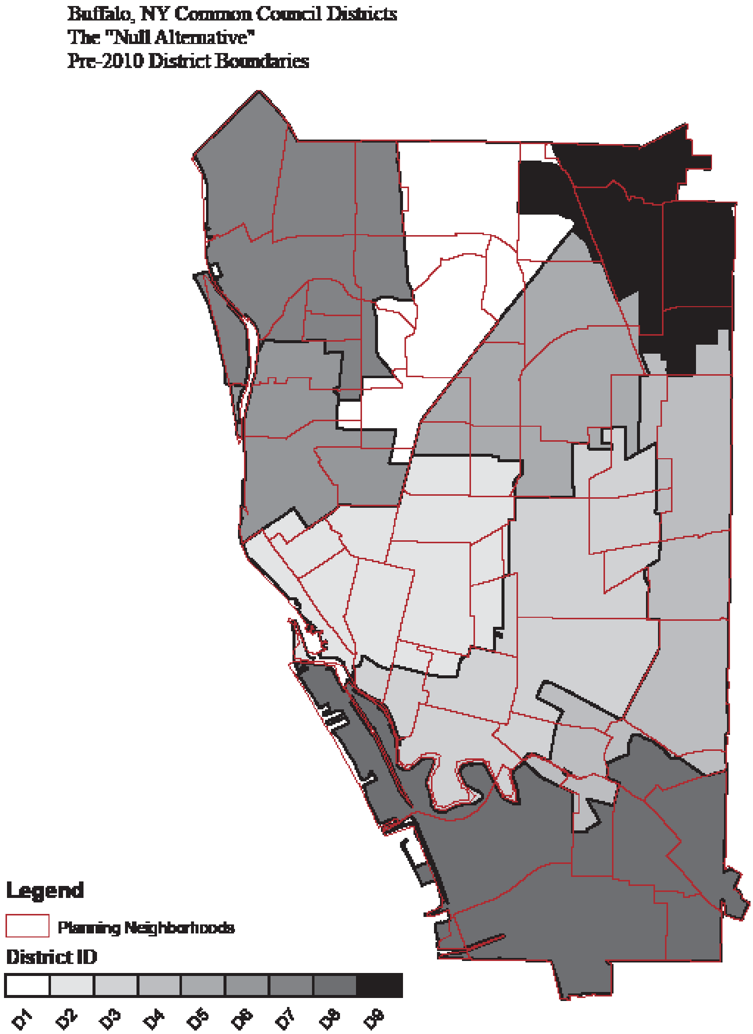

Figure 3. Current Council configuration in Buffalo, NY (City of Buffalo n.d.)

N = 55	Population	White	Black
Total	261,310	131,751	100,771
% of Total	--	50.4	38.6
Mean	4,751	2,396	1,832
Minimum	391	30	28
Maximum	14,218	10,983	8,397
Standard Deviation	3,240.5	2,356.3	2,131.1

Table 2. Descriptive statistics for total population of Buffalo planning neighborhoods

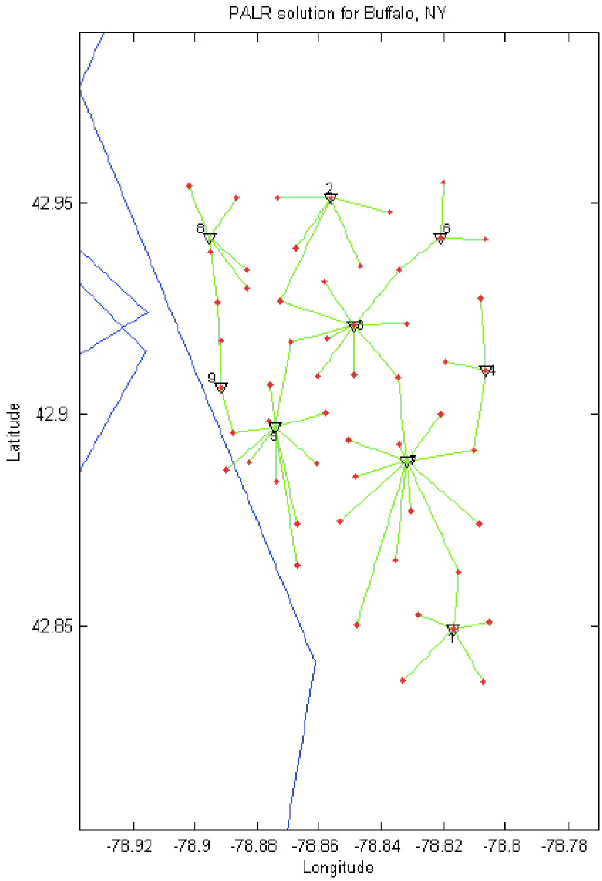

Figure 4. PALR optimization solution

The final redistricting plan is shown in Figure 5.

With respect to Figure 4, using the 2002 planning neighborhoods as indivisible units was problematic in that there were no contiguous configurations of neighborhoods that equalized district populations. There are a handful of instances in which a given planning neighborhood in the solution is mapped to more than one district center, as the relaxed model recognizes that neighborhood splits are necessary to satisfy strict population equality constraints for this application. Because our goal is to wholly maintain neighborhoods in a single district, this presents a challenge. However, the PALR framework anticipates such issues in phase 2 (Table 1): establish consistent decision rules to resolve allocation issues. In the case in which planning neighborhoods are mapped to multiple district centers, a decision rule is adopted at phase 3 to allocate these neighborhoods to one and only one district. For simplicity, I choose the following decision rule: If

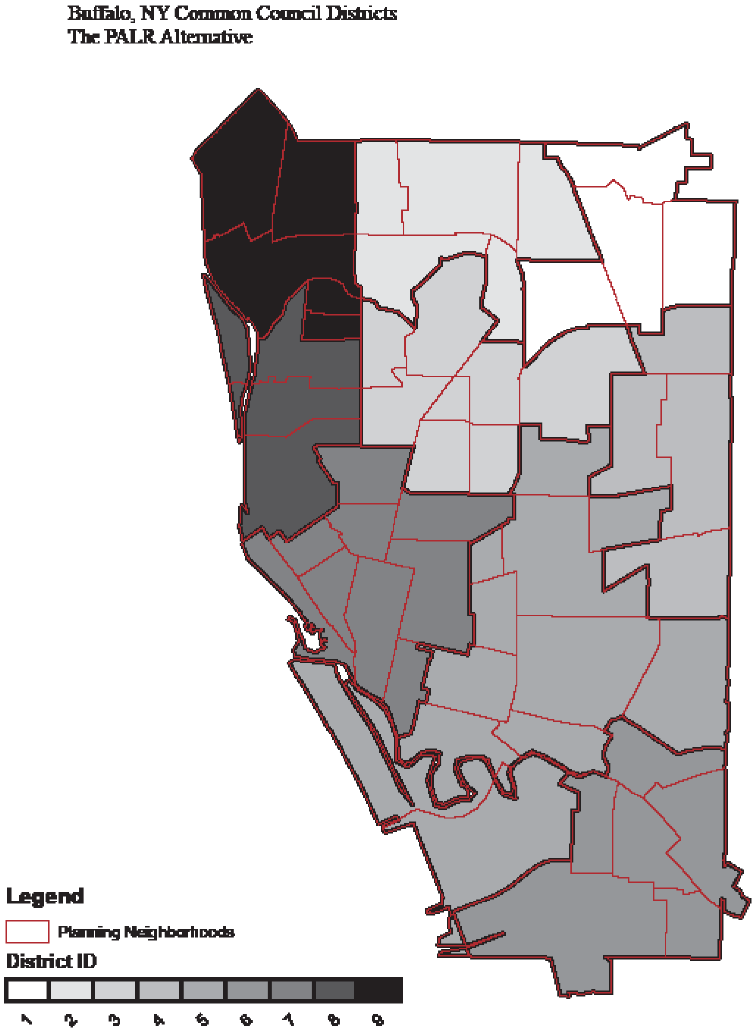

Figure 5. PALR redistricting plan

a given planning neighborhood is mapped to more than one district center, then allocate that neighborhood to the district with the smaller population.

This basic rule offers a consistent, non-arbitrary means of handling the allocation problem. For example, if the PRP solution maps neighborhood *q* to district centers *A* and *B*, compare the population of district *A* to the population of district *B*. If the population of *A* is less than that of *B*, then neighborhood *q* is assigned to A; otherwise, it is assigned to *B*. This decision rule is applied to all neighborhoods that are mapped to multiple district centers to create the plan in Figure 5.

Finally, phase 3 advises us to measure how well the PALR-generated plan adheres to the redistricting criteria. It should be evident that the population criterion is not satisfied in this application; however that should not stymie our efforts. Recall from Bullock (2010) that it is possible for courts to accept local redistricting plans that do not satisfy the equal population criterion so long as they are accompanied by "an acceptable explanation." Keeping this in mind, we will examine the other outcomes of the PALR plan to determine whether its strengths outweigh its weaknesses for this application.

Phase 3 Assessments: The PALR Plan for Buffalo, NY by the Numbers

Tables 3 and 4 present statistical abstracts of the PALR plan for Buffalo. These outcomes will be compared to the null alternative and to the alternative recommended by Buffalo's citizen advisory commission. For now, I will use the data to discuss how well the PALR plan meets each of the redistricting criteria from above.

Criterion 1: Population Equality

As expected (see Appendix), the PALR plan is malapportioned. Whereas

District	Total Population	Population Deviation (%)	White Population (%)	Black Population (%)	Area square miles	Perimeter in miles
1	30,410	4.74	20.74	69.07	3.37	11.10
2	28,973	-0.21	74.92	17.81	3.69	10.66
3	29,066	0.11	33.18	62.63	4.47	12.47
4	29,607	1.98	28.76	66.52	3.59	11.80
5	28,991	-0.14	47.55	43.75	10.55	37.06
6	30,516	5.11	90.33	3.67	4.92	13.05
7	28,375	-2.27	42.55	43.51	4.38	13.50
8	30,059	3.53	54.18	19.95	2.63	12.08
9	25,303	-12.85	62.72	18.02	3.36	8.82

$$\text{Average Compactness Ratio} = \frac{1}{9}\sum_{i=1}^{9}\frac{Perimeter_i}{2\pi\sqrt{Area_i + \pi}} = 1.87$$

Table 3. Demographic and geographic characteristics of districts in the PALR plan

District	Total VAP	White VAP (%)	Black VAP (%)
1	22,757	25.44	63.63
2	23,666	77.79	16.36
3	23,327	37.57	58.71
4	20,905	33.39	62.66
5	21,823	51.47	42.00
6	23,426	92.74	2.84
7	23,082	47.40	40.79
8	22,176	61.70	16.80
9	18,564	68.90	16.17

Table 4. Voting age population (VAP) of districts in the PALR plan

the target total population deviation is 10% (± 5%), the PALR plan has a total deviation of 17.96% (maximum – minimum). Note that the inability of the PALR to produce roughly equally populated districts is not thought to be endemic to the framework. It is necessary to keep in mind that this is an application-specific solution to an optimization model operationalized with ten-year-old planning neighborhoods. Careful post-census participatory planning will remedy the population issue.

Criterion 2: Minority voting strength

Because retrogression with respect to minority voting strength requires comparisons to the status quo, the bulk of this discussion will occur below. Here I will state only that the PALR model features three majority African American districts with respect to voting age population (VAP), and two districts in which African American VAP is sufficiently large (> 40%). The PALR plan created three districts with a majority of African Americans, which is roughly proportional to the group's relative size in the electorate, insofar as African Americans account for 35% of citywide VAP, and 35% times nine districts is approximately equal to three.

Criteria 3–6

Little discussion is needed regarding these criteria. As articulated above, planners are assumed to tacitly adopt criteria 3–6 as part of their standard neighborhood-delineation exercises. The only criterion here that requires further elaboration is compactness. I have chosen to quantify compactness as the average plan-wide ratio of a given district's perimeter to the minimum perimeter necessary to enclose the district's area (Pounds 1972). This measure is calculated in the bottom row of Table 3. A value of 1 indicates that all districts are as compact as possible. Increases in this value indicate less district compactness. While more sophisticated compactness measures exist (Altman 1998), this concept is sufficiently parsimonious and allows for convenient comparisons.

PALR Performance Compared to the Null and Proposed Alternatives

Figure 3 above illustrates the null alternative—the nine existing Buffalo council districts. It is this arrangement that was used as the starting point for the Buffalo Citizens' Commission on Reapportionment, an advisory citizen-driven redistricting panel tasked with recommending a plan to the legislature. The Commission's recommended plan (the "proposed alternative") is designed to be as similar to the null alternative as possible, and it is depicted in Figure 6. The logic behind the proposed alternative was to stretch the boundaries of underpopulated null alternative districts until all districts had total populations within ± 5% of the target. Voting age Population was not a consideration, and planning neighborhoods played a minimal role (Buffalo Citizens Commission on Reapportionment 2011). Tables 5 and 6 summarize the null and proposed alternatives.

Comparing the PALR outcomes to those of the null and proposed alternatives yields some interesting observations. First note that the proposed alternative has a total deviation of 11.86%. This is meaningfully

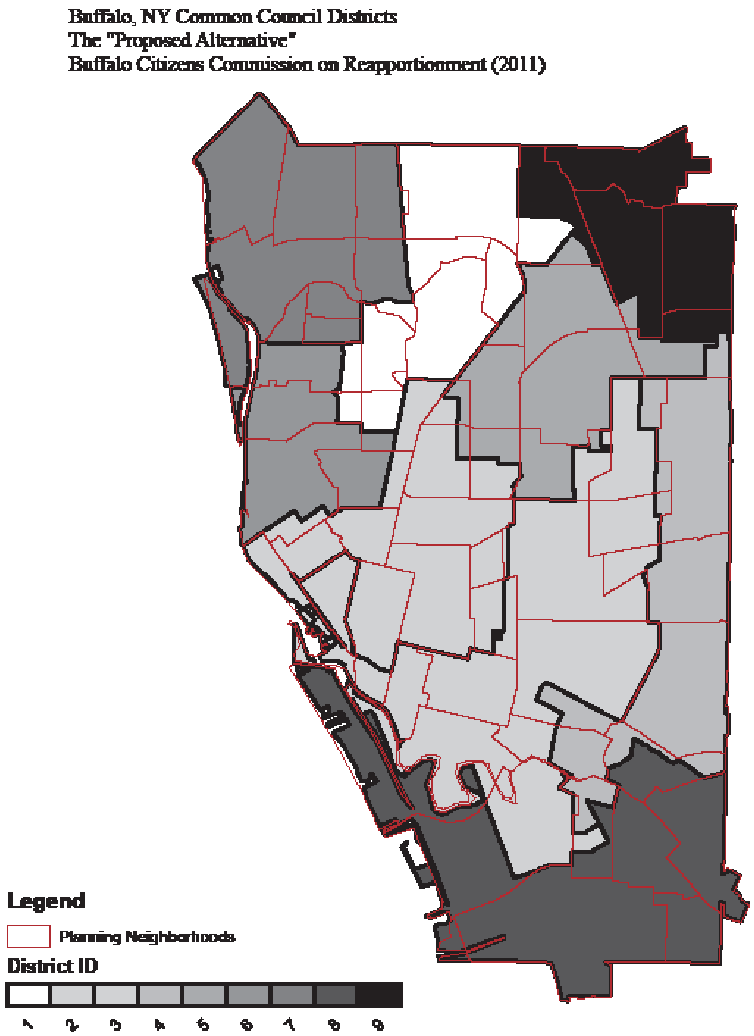

Figure 6. Proposed alternative

less than that of the PALR (17.96%). But while the commission's plan outperforms the PALR with respect to this criterion, it does not fall within the target 10% level.

Concerning minority voting strength, the results appear to be mixed. African Americans comprise 35.6% of Buffalo's VAP. In terms of strict proportionality, this implies that a redistricting plan should provide for at least three districts with majority African American VAP. The null, proposed, and PALR alternatives all satisfy this requirement. Yet the null and proposed alternatives seem to go a step further: each creates an additional plurality African American VAP district. Because the null

District		Total Population	Deviation (%)	White Population (%)	Black Population (%)	Area	Perimeter
1	*Null*	*31,373*	*8.05*	*75.83*	*17.19*	*4.00*	*12.26*
	Proposed	29,791	2.61	80.47	12.77	3.87	10.76
2	*Null*	*27,990*	*-3.60*	*30.15*	*56.84*	*4.59*	*12.25*
	Proposed	29,266	0.80	31.57	57.69	4.55	16.24
3	*Null*	*20,022*	*-31.04*	*39.46*	*50.12*	*5.96*	*18.53*
	Proposed	27,941	-3.77	40.44	47.60	7.95	29.03
4	*Null*	*28,849*	*-0.64*	*52.27*	*42.35*	*4.67*	*18.01*
	Proposed	27,583	-5.00	54.32	40.26	4.50	16.62
5	*Null*	*26,335*	*-9.30*	*9.65*	*86.48*	*3.88*	*10.52*
	Proposed	27,576	-5.02	10.05	85.73	3.75	11.28
6	*Null*	*32,036*	*10.34*	*54.45*	*21.18*	*2.44*	*9.26*
	Proposed	31,021	6.84	54.57	20.95	2.36	8.87
7	*Null*	*33,605*	*15.74*	*66.59*	*16.52*	*4.95*	*14.46*
	Proposed	30,115	3.72	64.30	17.74	4.62	12.52
8	*Null*	*29,369*	*1.15*	*90.40*	*3.67*	*7.20*	*30.35*
	Proposed	27,800	-4.25	90.82	3.45	6.20	29.84
9	*Null*	*31,721*	*9.25*	*24.06*	*66.28*	*3.28*	*10.65*
	Proposed	30,207	4.04	26.31	63.69	3.18	9.66
		Average Compactness (null): 1.97			Average Compactness (proposed): 2.07		

Table 5. Demographic and geographic characteristics of the null and proposed alternatives

District		VAP	White VAP (%)	Black VAP (%)
1	*Null*	*26,154*	*78.50*	*15.78*
	Proposed	24,916	82.78	11.66
2	*Null*	*21,752*	*34.16*	*54.59*
	Proposed	23,482	35.82	54.85
3	*Null*	*14,968*	*43.35*	*48.67*
	Proposed	20,807	44.57	45.98
4	*Null*	*20,981*	*58.47*	*37.25*
	Proposed	20,108	60.64	35.04
5	*Null*	*19,773*	*12.00*	*84.76*
	Proposed	20,548	12.43	84.05
6	*Null*	*24,329*	*61.44*	*18.61*
	Proposed	23,426	61.70	18.26
7	*Null*	*25,510*	*72.45*	*14.63*
	Proposed	22,420	70.28	15.91
8	*Null*	*22,522*	*92.84*	*2.86*
	Proposed	21,363	93.13	2.68
9	*Null*	*23,737*	*29.02*	*60.48*
	Proposed	22,656	31.57	57.54

Table 6. Voting age population (VAP) of the null and proposed alternatives

plan exhibits this feature, one could argue that any alternative must do so as well, and failure to draw a plurality district might be seen to be retrogressive (i.e., African Americans will be worse off without it). But a closer look at the PALR alternative suggests that the plan, rather than being retrogressive, has the capacity to strengthen the efficacy of African American voters in Buffalo. Explicitly, the majority African American districts in the PALR plan are more evenly distributed. The PALR model breaks up the packed district from the null and proposed plans (District 5), which each have an 84% African American VAP. Further, it creates three strong majority-minority districts and two formidable minority-influence districts. The latter districts have African American VAPs of 40% or greater. Whether minority voters would successfully elect their preferred candidates in these districts remains unclear, though there is empirical evidence (e.g. Kousser 1992 at Table 2) to suggest that the relative size of the minority VAP cohorts in these influence districts creates the possibility of electing as many as five minority candidates under the PALR proposal.

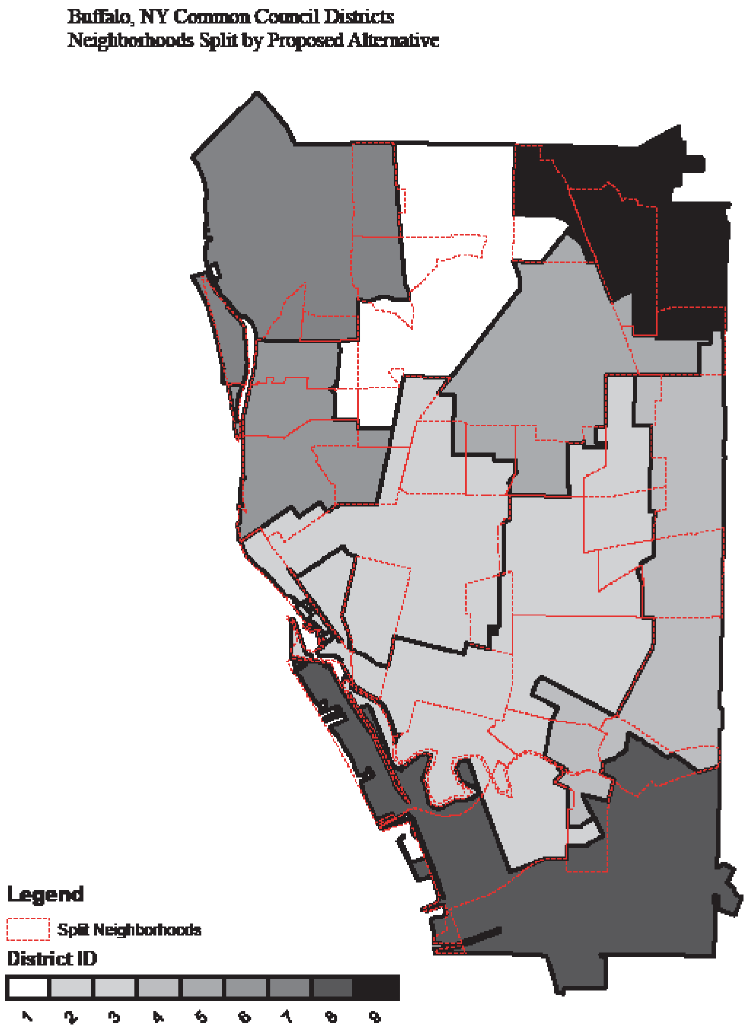

Figure 7. Proposed alternative neighborhood splits

Finally, consider criteria 3–6 from above. All plans produce contiguous districts, but those in the PALR have noticeably smoother edges. That is, the PALR districts consistently follow boundaries delineated by planners, while the null and proposed districts have more jagged, somewhat arbitrary edges. Furthermore, as given in Tables 3 and 5, the PALR districts are 5.1% more compact than the null districts and 9.7% more compact than the Commission's districts. Together with the assumption that planners respect natural and physical boundaries in their neighborhood-definition processes, these observations support the conclusion that the PALR produces districts with comparatively superior geographic attributes.

Our primary area of concern, however, is the communities of interest criterion. By definition, the PALR wholly preserves all 55 Buffalo planning neighborhoods (Figure 2) in single political districts. No neighborhoods are split by council boundaries. Overlaying the planning neighborhoods onto the Commission's map shows that this objective is not met in the alternative proposal (Figure 7). In particular, 27 of the 55 neighborhoods stretch into multiple districts, and four are represented by at least three council members.

As I have argued throughout this article, participatory governance and common policy objectives are crucially important at the local level. Recognizing that this is the case, and further recognizing that planners are perhaps best suited to operationalize communities of common interest, the PALR produces a neighborhood-based redistricting proposal for Buffalo, NY that outperforms the citizen-proposed alternative in several dimensions (Table 7).

Conclusions

"If you are failing to plan, you are planning to fail." Tariq Siddique

To date neither legislature- nor citizen-driven processes have been capable of resolving the political redistricting problem in a way that practicably reduces the incentives and opportunities to gerrymander legislative boundaries. Several mathematical optimization problems designed to eliminate gerrymandering are available, but redistricting institutions across the US continue to be dominated by individual actors whose self-interested behavior potentially leads to politically anticompetitive outcomes.

(Bold text signifies better performance by the given plan)

Criterion	Citizen Commission	PALR
Roughly Equal Populations	**NO**	NO
Majority African American VAP Districts	3	3
Plurality African American VAP Districts	1	0
African American VAP Influence Districts (>40%)	0	**2**
Total of African American Majority, Plurality, and Influence VAP Districts	4	**5**
More Compact Districts	NO	**YES**
Smooth Boundaries	NO	**YES**
Number of Community Splits	27 of 55	**0 of 55**
Number of Communities Split Between More Than 2 Districts	4	**0**

Table 7. PALR vs. Citizen Commission

This paper argues that gerrymandered districts do more than tip the electoral scales in favor of those actors driving the process. In the local case, gerrymandering that divides neighborhoods with common policy interests can produce legislative districts that are relatively more difficult to govern than those in which many policy interests are held in common. Such disunity reduces the potential for participatory governance, which, I contend, is a precursor to an uneven distribution of favorable policy outcomes.

In response to this dilemma, this paper calls for a planning revolution in local redistricting. If municipalities are committed to ending gerrymandering, then redistricting institutions should be retooled to allow for preservation of neighborhoods within single political districts. Because delineating neighborhoods is outside the purview of most legislators and citizens, the most effective local redistricting institutions for preserving communities of interest will be led by planners. As opposed to merely aggregating census blocks to equalize district populations and potentially create electoral advantages, planners are capable of carefully facilitating participatory processes that produce meaningful neighborhood units. These neighborhoods, in turn, can act as the building blocks for apolitical local redistricting plans derived through non-arbitrary, mathematical methods of optimization.

As with any policy proposal or theoretical framework in its infancy, the PALR has several challenges that it must overcome. First, the time and staffing (i.e., planner) requirements imply that small jurisdictions might not have sufficient resources to adopt the PALR. To this I would argue that the resources needed should be roughly proportional to the size of the jurisdiction. Second, the PALR does not provide exact guidelines for neighborhood size. This is intentional. Census geographies are convenient for redistricting in that they are small, easily aggregated units. Legislators and citizens who lead redistricting efforts are not experts with respect to which census block belongs to which neighborhood—but planners do have expertise in this arena. Also, there should not be a single target neighborhood size or population, rather the definition of planning neighborhoods should be left to planners. Finally, the PALR is not specific as to which allocation algorithm should be adopted in Phase 2. Many PRP models are available to non-arbitrarily optimize district configuration without considering political variables. To the extent that a PRP model can be developed that best combines planning neighborhoods into districts, I encourage future research. For now, I claim that the flexibility of the framework makes it a suitable laboratory for innovation.

In the application of the PALR to Buffalo, NY, the neighborhood-based proposal exhibits marked advantages over the citizen-driven proposal. This is true despite the choice to use planning neighborhoods that were mapped in the early 2000s, before the availability of current census data. Although the PALR model failed to produce a plan that satisfies the criterion of roughly equal populations, the fact that no planning neighborhoods were split, and that minority voting strength is potentially enhanced, presumably makes a strong case for judicial acceptance of the plan. Inasmuch as this restrictive and barebones application has proven to be meritorious, one can reasonably conclude that a proper implementation of the PALR framework—one that is driven by planners from start to finish following a decennial census—is likely to produce a redistricting plan that not only satisfies all of the key criteria, but does so in a way that cannot be replicated by alternative institutions managed by legislators or citizens alone. In this regard I claim that the case for a planning-based local redistricting institution is both practical and profitable; for, in governance as in business, municipalities that fail to plan are planning to fail.

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Appendix

The objective of a general *p*-median problem is to locate *p* facilities to cover a specific range of sites, such that the population-weighted distances between facilities and their coverage sites are minimized (Church and Murray 2009). In the problem above, equation (1) is a restatement of this objective function for political districts. The constraints in (2) are allocation conditions to ensure each planning community is within a district. Constraints in (3) limit allocations for all neighborhoods to those that have been chosen as district "centers," as in Hess et al. (1965). Constraint (4) states that there must be exactly *p* districts. Equations (5) and (6) restrict district populations to an allotted amount. Because there is no contiguous configuration of the 2002 planning neighborhoods for which nine districts fall within the target v (± 5% of the ideal population), these constraints were relaxed and v was permitted to float. The final pair of constraints gives the binary requirements that each community can be located only once and that each community is either chosen to be a district center or it is not.

The particular form of this PRP is selected for simplicity and convenience. Note that phase 2 of the PALR does not mandate an optimization problem of this exact form. Rather, the PALR is a framework that calls for any apolitical assignment problem to be used at phase 2. To that end, readers are encouraged to experiment with the algorithms available in the Better Automated Redistricting (BARD) software package (Altman and McDonald 2011). For our purposes, more important than the exact modeling procedure is the unit of analysis that informs the model: planning neighborhoods.

$$\min Z = \sum_{i=1}^{n} \sum_{j=1}^{m} w_i d_{ij} X_{ij} \qquad (1)$$

s.t.

$$\sum_{j=1}^{m} X_{ij} = 1 \; \forall \, i \in I \qquad (2)$$

$$X_{ij} \leq Y_j \; \forall \, i \in I \; and \; j \in J \qquad (3)$$

$$\sum_{j=1}^{m} Y_j = p \qquad (4)$$

$$\sum_{i} w_i X_{ij} \leq (1+v)\frac{\sum_i w_i}{p} \qquad (5)$$

$$\sum_{i} w_i X_{ij} \geq (1-v)\frac{\sum_i w_i}{p} \qquad (6)$$

$$Y_j \in [0,1] \qquad (7)$$

$$X_{ij} \in [0,1] \qquad (8)$$

where:

i is an index of planning neighborhoods and I is the set of all neighborhoods

j is an index of potential district centers and J is the set of all neighborhoods

w_i is the population of neighborhood i

d_{ij} is the centroid to centroid distance of neighborhood i from center j

p is the number of districts to be drawn

v is the maximum allowable population variation

$$Y_j = \begin{cases} 1 \text{ if neighborhood } j \text{ is selected as a district center} \\ 0 \text{ otherwise} \end{cases}$$

$$X_{ij} = \begin{cases} 1 \text{ if neighborhood } i \text{ is covered by center } j \\ 0 \text{ otherwise} \end{cases}$$

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