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One Person, How Many Votes? Measuring Prison Malapportionment

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**ONE PERSON, HOW MANY VOTES? MEASURING PRISON
MALAPPORTIONMENT**

*Ian Bollag-Miller**

“One-person, one-vote” is a fundamental principle of democracy. In practice, however, vote distribution among population groups is often less than equal. Even in established democracies, prison malapportionment—the distribution of legislative seats by counting incarcerated people in their prisons’ districts rather than their home districts—is one example of a practice that distorts voter representation. Prison malapportionment allows less populous districts that house prisons to maximize their voting power at the expense of more densely populated districts from which many incarcerated people previously lived. While there has been significant scholarship on the causes and effects of prison malapportionment, there is no standard method for quantifying the level of distortion that results from the phenomenon. As such, no comparative study of prison malapportionment exists in the international context.

This Article presents a method to measure malapportionment that isolates the deviation from “one-person, one-vote” that arises specifically from prison malapportionment. This formula, “PMAL,” facilitates comparative analysis of prison malapportionment among various jurisdictions. It also aids in predicting and evaluating the success of reform efforts.

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INTRODUCTION

In Walker County, Texas, incarcerated individuals without the right to vote represent 12 percent of the population in the state’s thirteenth legislative district.¹ This means that eighty-eight actual residents of Walker County have the effective voting power of a group of one-hundred voters residing in a legislative district without a prison.² This phenomenon is known as prison gerrymandering or prison malapportionment.³ Put differently, prison malapportionment refers to the practice of counting incarcerated individuals as residents of the district where their prison is located. This practice increases the voting strength of their prison’s district at the expense of the individual’s home district.⁴ Is this practice fair? Is it necessary? Is it legal? If not, what can be done? Just how serious and widespread is the problem?

Since the 2010 Census, prison malapportionment has come under greater scrutiny in the United States.⁵ The resulting scholarship and advocacy produced some legislative reforms at the state level.⁶ But despite the growing conversation concerning prison

¹ See Prison Gerrymandering Project, *Fixing Prison-based Gerrymandering After the 2020 Census: Texas*, PRISON POL’Y INITIATIVE, <https://www.prisonersofthecensus.org/50states/TX.html> [https://perma.cc/V7WK-PW4E] (last visited Oct. 20, 2022). For a general overview of the United States’ “long history” of felon disenfranchisement, see *One Person, No Vote: The Laws of Felon Disenfranchisement*, 115 HARV. L. REV. 1939, 1940 (2002).

² See Prison Gerrymandering Project, *supra* note 1.

³ “Gerrymandering” and “malapportionment” are often used synonymously. However, they are distinct in that gerrymandered districts can have equal populations but disparate voting power, while malapportioned districts have equal voting power but different population sizes. See Mitchell N. Berman, *Managing Gerrymandering*, 83 TEX. L. REV. 781, 785 (2005). A more detailed discussion of the terminological distinction is provided. See *infra* Part I.A.

⁴ See Julie A. Ebenstein, *The Geography of Mass Incarceration: Prison Gerrymandering and the Dilution of Prisoners’ Political Representation*, 45 FORDHAM URB. L.J. 324, 325 (2018).

⁵ See Nathaniel Persily, *The Law of the Census: How to Count, What to Count, Whom to Count, and Where to Count Them*, 32 CARDOZO L. REV. 755, 787-90 (2011) (predicting that the way the U.S. Census counts prisoners would be “the subject of much debate surrounding the 2010 Census.”).

⁶ See, e.g., Janai Nelson, *Counting Change: Ensuring an Inclusive Census for Communities of Color*, 119 COLUM. L. REV. 1399, 1432 (2019) (finding that “New York, California, Maryland, Delaware, and over 200” localities amended their census practices to address the issue).

malapportionment in the United States, there has not been a parallel discussion of the phenomenon in other countries. Why not?

On one level, this disparity makes sense: the United States is, by far, the nation with the largest incarcerated population, both in terms of the total number of prisoners and prisoners per capita.⁷ Yet, as of 2012, at least forty other countries restricted voting rights of incarcerated individuals on some level.⁸ And, at least in theory, many other countries with some level of prisoner disenfranchisement—that use population data to apportion legislative representation—should exhibit some level of prison malapportionment. Why, then, has the international and comparative discussion been so limited?

This Article addresses a key gap in the existing scholarship and policy debate: there is no widely utilized method for calculating the level of prison malapportionment. In response to this deficiency, this Article presents such a formula, which is adapted from a generally accepted method to measure malapportionment. Such a broadly applicable measure will allow for standardized comparative studies. In turn, this Article's proposed formula may help facilitate discussion about the political, legal, and practical causes of, as well as reform opportunities for, prison malapportionment.

Part I provides a general overview of malapportionment and prison malapportionment. Specifically, Part I presents a brief survey of the existing research in the context of the United States, including a short discussion of enacted and proposed reform efforts. Part II discusses common features of existing methods for measuring general malapportionment. Part III then adapts one of the malapportionment formulae to present the prison malapportionment formula, PMAL. Additionally, Part III applies the PMAL formula to a hypothetical example of a state with a significant level of prison malapportionment. Lastly, this Article offers general conclusions about the PMAL formula, suggests potential applications, and identifies areas for future research.

⁷ See Statista Research Department, *Countries with the Largest Number of Prisoners per 100,000 of the National Population, as of May 2021*, STATISTA, <https://www.statista.com/statistics/262962/countries-with-the-most-prisoners-per-100-000-inhabitants> [<https://perma.cc/VR2D-B8FZ>] (last visited Oct. 20, 2022) (prisoners per capita); Statista Research Department, *Countries with the Largest Number of Prisoners as of July 2021*, STATISTA, <https://www.statista.com/statistics/262961/countries-with-the-most-prisoners> [<https://perma.cc/FB9N-S25B>] (last visited Oct. 20, 2022) (total number of prisoners).

⁸ See *International Comparison of Felon Voting Laws*, PROCON.ORG, <https://felonvoting.procon.org/international-comparison-of-felon-voting-laws> [<https://perma.cc/XX9T-5YHV>] (last visited Oct. 20, 2022).

I. MALAPPORTIONMENT AND PRISON MALAPPORTIONMENT

A. *Malapportionment*

The principle of “one-person, one-vote” has become a central tenet of liberal democracy.⁹ In a system of universal suffrage, the idea that each vote should count equally reflects a fundamental notion of political equality and electoral fairness. In one voting rights case, the U.S. Supreme Court opined as follows:

How then can one person be given twice or 10 times the voting power of another person in a statewide election merely because he lives in a rural area or because he lives in the smallest rural county? Once the geographical unit for which a representative is to be chosen is designated, all who participate in the election are to have an equal vote . . . [t]his is required by the Equal Protection Clause of the Fourteenth Amendment . . . [t]he idea that every voter is equal to every other voter in his [s]tate, when he casts his ballot in favor of one of several competing candidates, underlies many of our decisions.¹⁰

In reality, courts usually tolerate some level of deviation from the one-person, one-vote principle.¹¹ Some scholars have even queried whether equal voting power is in fact an essential feature of the democratic political tradition.¹² But while full equality of voting power is unlikely in a multi-district, winner-take-all electoral system,¹³ violations of the one-person, one-vote principle can, and should, still be adjudicated at least “as a matter of math.”¹⁴

⁹ For a historical account of the transition of the concept of political representation from a feudal landholder’s obligation to a principle of popular sovereignty, see James A. Gardner, *One Person, One Vote and the Possibility of Political Community*, 80 N.C. L. REV. 1237, 1244-51 (2002).

¹⁰ *Gray v. Sanders*, 372 U.S. 368, 379-80 (1963).

¹¹ Indeed, Supreme Court precedent has “saddled the one person, one vote doctrine with several vulnerabilities, including loose, uneven standards that apply to different types of apportionment cases, insurmountable burdens of proof, and equivocation about the Court’s own ability to adjudicate redistricting claims because of the partisanship that permeates the redistricting process.” Stephanie Cirkovich, *Abandoning the Ten Percent Rule and Reclaiming One Person, One Vote*, 31 CARDOZO L. REV. 1823, 1825 (2010).

¹² See, e.g., Alan L. Clem, *Problems of Measuring and Achieving Equality of Representation in State Legislatures*, 42 NEB. L. REV. 622, 625-26 (1963).

¹³ See Lani Guinier, *Groups, Representation, and Race-Conscious Districting: A Case of the Emperor’s Clothes*, 71 TEX. L. REV. 1589, 1595-96 (1993).

¹⁴ *Rucho v. Common Cause*, 139 S. Ct. 2484, 2501 (2019). Notably, at least one federal appeals court has declined to find an equal protection violation in a system

Deviation from the one-person, one-vote principle is called malapportionment. In other words, malapportionment is the unequal population distribution across voting districts with equal voting power, creating a system where some lesser populated districts significantly influence electoral outcomes more than other more populous districts.¹⁵

The term *malapportionment* is related to and often used interchangeably with *gerrymandering*. Gerrymandering is the “practice of dividing a geographical area into electoral districts, often of highly irregular shape.”¹⁶ The focus of gerrymandering, as opposed to malapportionment, is usually on the effects of drawing irregular territorial boundaries of electoral districts—rather than counting individuals within a district.¹⁷ Both concepts concern deviation from the one-person, one-vote principle. As such, they usually involve the same legal and political criticisms and justifications. But because this Article’s focus is on population distribution—rather than territorial demarcation—the term malapportionment is generally favored over gerrymandering.

Modern democracies generally disfavor unequal vote distribution. In the United States, the majority view of this phenomenon considers it antidemocratic.¹⁸ From former Republican President Ronald Reagan to former Democratic President Barack Obama, prominent politicians across the political spectrum have condemned the practice.¹⁹

It is important to note, however, that not all unequal voting power results from political ill-will. For example, when it comes to

with prison malapportionment. *See Davidson v. City of Cranston*, 837 F.3d 135, 137 (1st Cir. 2016) (holding that the City of Cranston, Rhode Island did not violate the Equal Protection Clause by counting prisoners as residents of one of the City’s six wards).

¹⁵ *See* Berman, *supra* note 3, at 785.

¹⁶ *Gerrymandering*, BLACK’S LAW DICTIONARY (11th ed. 2019).

¹⁷ One familiar example is North Carolina’s oddly shaped twelfth congressional district, which “snake[s] over 160 miles across the state from Charlotte to Durham to join together as many Black voters as possible.” Mac Brower, *Gerrymandering Deep Dive: North Carolina*, DEMOCRACY DOCKET (Sept. 28, 2021), <https://www.democracydocket.com/news/gerrymandering-deep-dive-north-carolina> [<https://perma.cc/L9FJ-2FKL>].

¹⁸ *See, e.g.*, Dan Balz, *Gerrymandering is the Root of All Evil. Or is It?*, WASH. POST (Jan. 29, 2018, 2:23 PM), https://www.washingtonpost.com/politics/gerrymandering-is-the-root-of-all-political-evil-or-is-it/2018/01/27/c12af98a-02e9-11e8-9d31-d72cf78dbee_story.html [<https://perma.cc/MBH7-39GB>] (“Partisan gerrymandering is often seen as the root of much of what is wrong with current politics[;] . . . [m]ost Americans recoil at the contorted shape of some districts and see malevolent hands at work.”).

¹⁹ *See Americans are United Against Partisan Gerrymandering*, BRENNAN CTR. FOR JUST. (Mar. 15, 2019), <https://www.brennancenter.org/our-work/research-reports/americans-are-united-against-partisan-gerrymandering> [<https://perma.cc/JL82-YQNJ>].

malapportionment—though not gerrymandering—the relative voting strength of districts can change because of natural population shifts.²⁰ Of course, districts can also be intentionally malapportioned to decrease the voting influence of historically marginalized populations.²¹ However generated, malapportionment should be seriously scrutinized because of its impact on the representativeness of the democratic system.²²

B. Prison Malapportionment

Prison malapportionment, in particular, directly influences how representative a democratic system functions in practice. In the United States, the Census Bureau ordinarily compiles its residency data using the “usual residence rule,” which counts where individuals live and sleep most of the time.²³ This rule counts individuals living in group arrangements like military barracks, dormitories, and prisons as residing in such facilities.²⁴ States then rely on this data to draw their electoral districts. Thus, unless specific statutes provide otherwise, states count incarcerated people as residents of their prison’s district—rather than their home district.²⁵

The beneficiaries of this application of the usual residence rule are almost universally rural, white, and conservative districts.²⁶ By contrast, those most harmed by prison malapportionment tend to be densely-populated urban districts with larger minority

²⁰ See, e.g., William S. Bailey, *Reducing Malapportionment in Japan’s Electoral Districts: The Supreme Court Must Act*, 6 PAC. RIM L. & POL’Y J. 169, 174 (1997) (discussing Tokyo’s rapid population growth after the Second World War and its impact on voting weight disparities).

²¹ See, e.g., *Shaw v. Reno*, 509 U.S. 630 (1993) (rejecting an attempt to create a Black-majority legislative district to ensure the election of at least two Black representatives); *United Jewish Orgs of Williamsburgh, Inc. v. Carey*, 430 U.S. 144, 161 (1977) (rejecting the proposition that “racial criteria may never be used in redistricting or that they may be used, if at all, only as a specific remedy for past unconstitutional apportionments.”).

²² See Dale E. Ho, *Captive Constituents: Prison-Based Gerrymandering and the Current Redistricting Cycle*, 22 STAN. L. & POL’Y REV. 355, 359-60 (2011).

²³ See *id.* at 359.

²⁴ See *id.* (citing Pub. L. No. 94-171, 89 Stat. 1023).

²⁵ See *id.* at 359.

²⁶ See Michael Skocpol, Note, *The Emerging Constitutional Law of Prison Gerrymandering*, 69 STAN. L. REV. 1473, 1476 (2017). Some states, however, have enacted legislative reforms to count incarcerated people at their home addresses—including in California, Colorado, Connecticut, Delaware, Illinois, Maryland, Nevada, New Jersey, New York, Virginia, and Washington. See Prison Gerrymandering Project, *supra* note 1. For a list of enacted legislation at the state level, see Prison Gerrymandering Project, *Legislation*, PRISON POL’Y INITIATIVE, <https://www.prisonersofthecensus.org/legislation.html> [<https://perma.cc/4YTL2DG6>] (last visited Oct. 20, 2022).

populations.²⁷ Resources tend to be diverted away from already-underfunded neighborhoods of Black and Latinx communities and given to these malapportioned districts.²⁸ The result is a self-perpetuating cycle of poverty, which often leads to increased criminality; in this regard, prison malapportionment is itself a “physical manifestation of mass incarceration.”²⁹

Moreover, many public officials admit they do not view incarcerated individuals, many of whom are originally from other districts, as constituents.³⁰ For example, one Colorado countywide commissioner remarked that the incarcerated people in his district “can’t vote; and if they complain forever there’s a good chance I will never hear about it; there is a reason why they are in there, a reason why they don’t vote, a reason why they don’t pay taxes.”³¹ Two other representatives of districts with large prison populations in New York and Florida explained that even when they do hear from incarcerated individuals, their real attention is directed to the corrections workers with whom they have strong relationships.³² In Waupun, Wisconsin, where one-in-four people are incarcerated, the elected officials who represent two majority-incarcerated districts reported that they have never visited the prisons in their districts.³³

Nevertheless, elected officials who represent districts with high levels of prison populations rely on these over-counted, under-represented incarcerated “residents” for their political power. At the same time, they are unaccountable to those who are incarcerated, and are more likely to support policies that sustain or increase mass incarceration.³⁴

²⁷ See, e.g., Jonathan Lai, *How ‘Prison Gerrymandering’ Shifts Political Power from Urban Pennsylvanians of Color to White, Rural Ones*, PHILA. INQUIRER (July 11, 2019), <https://www.inquirer.com/politics/pennsylvania/prison-gerrymandering-pa-2021-redistricting-census-20190725.html> [<https://perma.cc/C8YP-MJQW>].

²⁸ See Nelson, *supra* note 6, at 1429-30.

²⁹ Molly Danahy & Danielle Lang, *Distortion in the Census: America’s Oldest Gerrymanderer?*, 49 U. MEM. L. REV. 1065, 1076 (2019).

³⁰ See John C. Drake, Note, *Locked Up and Counted Out: Bringing an End to Prison-based Gerrymandering*, 37 WASH. U. J.L. & POLY 237, 260 (2011).

³¹ Jonathan Tilove, *Minority Prison Inmates Skew Local Populations as States Redistrict*, PRISON POL’Y INITIATIVE (Mar. 12, 2002), <http://www.prisonpolicy.org/news/newhousenews031202.html> [<https://perma.cc/85NY-TFEV>].

³² See *id.*

³³ See Hansi Lo Wang & Kumari Devarajan, *‘Your Body Being Used’: Where Prisoners Who Can’t Vote Fill Voting Districts*, NAT’L PUB. RADIO: CODE SWITCH (Dec. 31, 2019), <https://www.npr.org/sections/codeswitch/2019/12/31/761932806/your-body-being-used-where-prisoners-who-can-t-vote-fill-voting-districts> [<https://perma.cc/D94R-F7N4>].

³⁴ See Drake, *supra* note 30, at 260.

Fortunately, public support for reform to end prison malapportionment is on the rise.³⁵ Several states have considered or enacted reforms to eliminate or minimize prison malapportionment.³⁶ The leading reform proposition is to count incarcerated people based on their residence prior to incarceration, rather than the district in which they are held.³⁷ This proposal has considerable support: many state constitutions define residency in a way that would exclude prisons.³⁸ To date, at least four states and over 200 localities have enacted reforms to this effect.³⁹ Another proposal considers incarcerated people as having no address, thus excluding them from any count.⁴⁰ Still another would simply restore incarcerated individuals' right to vote.⁴¹

Although the Census Bureau elected not to adapt the usual residence rule as it applies to incarcerated populations in the 2020 Census, the Bureau did receive over 77,000 public comments in support of the reform.⁴² These comments included the following proposals: (1) counting only prisoners serving long-term sentences at the place of incarceration; (2) counting prisoners at their pre-incarceration home address; and (3) an ad hoc approach considering the circumstances of individual prisoners.⁴³ As efforts to reform prison malapportionment continues, a common method for tracking their effectiveness would be highly beneficial.

³⁵ Garret Fisher et al., *Prison Gerrymandering Undermines Our Democracy*, BRENNAN CTR. FOR JUST. (Oct. 22, 2021), <http://www.brennancenter.org/our-work/research-reports/prison-gerrymandering-undermines-our-democracy> [https://perma.cc/Z23J-TU7Z].

³⁶ See Prison Gerrymandering Project, *supra* note 1.

³⁷ See Rebecca Harrison Stevens et al., *Handcuffing the Vote: Diluting Minority Voting Power Through Prison Gerrymandering and Felon Disenfranchisement*, 21 ST. MARY'S L. REV. ON RACE & SOC. JUST. 195, 203 (2019).

³⁸ See Ho, *supra* note 22, at 364 (surveying state legislation and constitutional provisions defining "residence").

³⁹ See Nelson, *supra* note 6, at 1432.

⁴⁰ Peter Wagner, Exec. Dir., Prison Pol'y Initiative, Testimony before the Arizona Redistricting Comm'n (Oct. 25, 2011), http://www.prisonersofthecensus.org/testimony/Wagner_AZ_10-25-2011.pdf (last visited Oct. 20, 2022).

⁴¹ Sanya Mansoor & Madeleine Carlisle, *When Your Body Counts but Your Vote Does Not: How Prison Gerrymandering Distorts Political Representation*, TIME (July 1, 2021, 3:19 PM), <https://time.com/6077245/prison-gerrymandering-political-representation> [https://perma.cc/W9VV-GTWA].

⁴² Final 2020 Census Residence Criteria and Residence Situations, 83 Fed. Reg. 5527 (Feb. 8, 2018) (to be codified at 15 C.F.R. ch. 1).

⁴³ See *id.*

II. MEASURING MALAPPORTIONMENT

A. Existing Malapportionment Measurement Methods

Political scientists have proposed and debated measurements for legislative malapportionment for at least the last half-century.⁴⁴ A basic feature of most malapportionment measurements is the comparison of an *existing* apportionment arrangement (i.e., the status quo) to an *ideal* apportionment arrangement.⁴⁵ This is an application of the Lorenz curve, a graphical principle developed originally for the field of economics to illustrate income inequality and wealth distribution.⁴⁶ Such methods vary, of course, in how they define both the status quo and the ideal apportionment arrangement they envision.

For example, a measure might compare the malapportionment of a district to the average level of malapportionment for *all* districts in the system—using the system’s average malapportionment level as the ideal.⁴⁷ Another might measure the deviation of the status quo arrangement from a system of “perfect” apportionment, or the one-person, one-vote ideal.⁴⁸ Still another might measure how close to 50 percent of the popular vote is required to elect 50 percent of the system’s legislature.⁴⁹ Other measurements might define the status quo as an individual district’s population,⁵⁰ or by creating groups with a certain population characteristic—like rural versus urban—to measure the relative voting power of each subgroup.⁵¹

For present purposes, the essential feature of any malapportionment measure is that it compares a defined status quo apportionment arrangement to a defined ideal apportionment arrangement.

⁴⁴ See generally Glendon Schubert & Charles Press, *Measuring Malapportionment*, 58 AM. POL. SCI. REV. 302 (1964).

⁴⁵ See, e.g., Olivier de Mouzon et al., *One Man, One Vote Part 2: Measurement of Malapportionment and Disproportionality and the Lorenz Curve* (Toulouse Sch. of Econ., Working Paper No. 20-1089, 2022), <https://ideas.repec.org/p/tse/wpaper/124204.html> [<https://perma.cc/M8GN-NNPS>] (last visited Oct. 20, 2022).

⁴⁶ See Thitethep Sitthiyot & Kanyarat Holasut, *A Simple Method for Estimating the Lorenz Curve*, 8 HUMAN. & SOC. SCI. COMM’NS, at 2-3 (2021).

⁴⁷ See Clem, *supra* note 12, at 628.

⁴⁸ *Id.* at 628-29.

⁴⁹ *Id.* at 629 (citing Manning J. Dauer & Robert G. Kelsay, *Unrepresentative States*, 44 NAT’L MUNIC. REV. 571-75 (1955)).

⁵⁰ *Id.* at 629-30. This is the method employed by Justices Clark and Harlan in *Baker vs. Carr*, 369 U.S. 186 (1962).

⁵¹ See Clem, *supra* note 12, at 629 (citing PAUL T. DAVID & RALPH EISENBERG, *DEVALUATION OF THE URBAN AND SUBURBAN VOTE: A STATISTICAL INVESTIGATION OF LONG-TERM TRENDS IN STATE LEGISLATIVE REPRESENTATION* (1961)).

B. MAL

In the early 2000s, political scientists David Samuels and Richard Snyder observed that despite the rapid spread of democracy in the last few decades of the twentieth century, there remained a dearth of quantitative analysis examining the implementation of representative democracy.⁵² In particular, they found that scholarship lacked meaningful ways to evaluate the levels of malapportionment in the newly established democracies.⁵³

To fill the gap, Samuels and Snyder sought to conduct the first “cross-national, comparative study” of malapportionment in electoral systems.⁵⁴ To do so, they created a simple but effective formula to calculate malapportionment: the MAL formula.⁵⁵ The first step in the MAL formula takes “the absolute value of the difference between each district’s seat and population shares.”⁵⁶ The number of values produced in this first step corresponds to the number of districts in the electoral system at issue. The second step adds all of the absolute values together and divides that total by two. The result, the MAL value, represents the electoral system’s deviation from perfect apportionment. Expressed in mathematical terms, the formula is:

$$\text{MAL} = 1/2 \sum |s_i - v_i|$$

Here, sigma (Σ) represents the sum of all districts (i); (s_i) represents the percentage of the total seats allocated to the district; and (v_i) represents the district’s percentage of the electorate’s total population.⁵⁷ Using the formula’s variables, the MAL number is calculated in the following way:

1. Calculate the absolute value of the difference between each district’s share of the total available seats (s_i) and its share of the total population (v_i);

⁵² David Samuels & Richard Snyder, *The Value of a Vote: Malapportionment in Comparative Perspective*, 31 B.J. POL. S. 651, 651-52 (2001).

⁵³ *Id.*

⁵⁴ *Id.* However, Samuels and Snyder did note the plethora of existing literature exploring apportionment in the United States. *Id.* at 653 n.8.

⁵⁵ *See id.* at 655.

⁵⁶ *Id.*

⁵⁷ In their description of the formula, Samuels and Snyder would permit either the use of the district’s total population or the total number of registered voters in the district. *Id.* Because Part II.C accounts for incarcerated individuals without the right to vote, this Article favors the use of total population, not registered voters.

2. Total the absolute values of the differences between share of seats and share of population (Σ); and
3. Divide the total by two.

In a perfectly apportioned system, the sum of the absolute value of $s_i - v_i$ would be zero because each district's share of the available seats would be exactly equal to its share of the total population. By calculating the absolute value, the formula measures the entire electoral system's deviation from perfect apportionment. The MAL formula, therefore, creates a straightforward, easily replicable process for quantifying a system's total deviation from the one-person, one-vote ideal.⁵⁸

Lastly, it is important to note that calculating malapportionment in single-tier electoral systems—like the United States—is straightforward.⁵⁹ By contrast, multi-tier systems—such as in Germany, Mexico, or Japan—are “more complex because territorial units are allocated seats on different bases according to the rules for each tier.”⁶⁰

C. PMAL

With slight modifications, the MAL formula can be adapted to measure specific *types* of malapportionment—such as prison malapportionment. For example, where an *initial* MAL value counts disenfranchised incarcerated individuals in their prison's district, an *adjusted* MAL value can be calculated to count incarcerated persons in their home districts. These two values (the initial and adjusted MAL values) can be compared to measure the distortion in voting power that results from prison malapportionment. Recalling the previous discussion of common features of malapportionment measurements,⁶¹ the initial MAL is the status quo, and the adjusted MAL is the ideal apportionment

⁵⁸ Samuels and Snyder used this formula to calculate the malapportionment levels in a seventy-eight-country sample. *Id.* at 659-62.

⁵⁹ Specifically, a single-tier electoral system is one where each voter votes once and there is one set of elected representatives. See *Electoral System Tiers and Hybrid Systems*, ACE ELECTORAL KNOWLEDGE NETWORK, <https://aceproject.org/ace-en/topics/es/esd/esd05> [https://perma.cc/4BB3-Y3K9] (last visited Oct. 20, 2022). Samuels and Snyder note that in single-tier systems, “all electoral districts are *primary*, that is, they cannot be divided into smaller districts to which seats are allocated.” Samuels & Snyder, *supra* note 52, at 656 n.16. By comparison, multi-tier systems have secondary districts that can be divided into two or more primary districts. *Id.*

⁶⁰ *Id.*

⁶¹ See *supra* Part I.A.

arrangement. The resulting measure of distortion is the PMAL value. In mathematical terms,⁶² the formula is:

$$\text{PMAL} = |\text{initial MAL} - \text{adjusted MAL}|$$

Employing the formula is as follows:

1. The initial MAL value is calculated exactly as described in Part II.B.
2. The prison population of each district is then reallocated. For a reform that counts incarcerated individuals as residents of their home districts, the prison population is redistributed accordingly.⁶³ To evaluate the effect of removing incarcerated people from the count entirely, the prison population would simply be subtracted from the initial population used in the MAL calculation. This is a manipulation of the initial MAL's v_i variable to account for the reallocation resulting from counting the prison population. For the adjusted MAL, this is expressed as z_i .
3. The adjusted MAL value is then calculated in the same manner as the initial MAL, with the substitution of z_i for v_i . The formula for the adjusted MAL value is therefore: $\text{MAL} = 1/2 \sum |s_i - z_i|$
4. The absolute value of initial MAL minus adjusted MAL is taken, producing the value of the PMAL value for that system.

D. Hypothetical: PMAL in Practice

1. Freedonia

Consider this hypothetical to illustrate the application of the PMAL formula to determine the level of prison malapportionment in the fictional country of Freedonia. Suppose Freedonia has a single-chamber legislature with 100 members. There are four states in Freedonia: Appleville, Bananaberg, Cherryton, and Dateford.

⁶² Expressed in complete and unreduced terms, the formula is:

$$\text{PMAL} = |(1/2 \sum |s_i - v_i|) - (1/2 \sum |s_i - z_i|)|.$$

⁶³ In effect, this would reduce the population of the prison's district, and increase the population of the incarcerated persons' home districts, thereby reducing the level of malapportionment.

Freedonia's most populous city is in Dateford, the country's smallest state by area. There are two prisons in Freedonia: (1) Figbury Prison, located in Appleville, which houses 2,000 incarcerated individuals; and (2) Grapeham Prison, located in Bananaberg, which houses another 1,000. Assume both are at full capacity. In Freedonia, incarcerated individuals cannot vote. In its census, Freedonia follows the usual residence rule and counts incarcerated individuals where they sleep most of the time.⁶⁴

Table 1 below reflects the populations of the states of Freedonia, the number of legislative seats they elect in the Freedonian legislature, and the relative shares of each:

Table 1: Freedonia Population and Seat Share by State

State	Population	Percentage of Population	Seats in Legislature	Percentage of Seats
Appleville	10,000	10%	10	10%
Bananaberg	20,000	20%	20	20%
Cherryton	30,000	30%	30	30%
Dateford	40,000	40%	40	40%

2. MAL Application: Freedonia

Is Freedonia's electoral system malapportioned? Using the figures in Table 1, the MAL value for Freedonia is calculated as follows:

(1) Calculate the absolute value of the difference between each district's allocated seats and its share of the total population of the country.

$$\text{Appleville: } |10 - 10| = 0$$

$$\text{Bananaberg: } |20 - 20| = 0$$

$$\text{Cherryton: } |30 - 30| = 0$$

$$\text{Dateford: } |40 - 40| = 0$$

⁶⁴ See Ho, *supra* note 22, at 359 (explaining the application of the usual residence rule in the U.S. Census).

(2) Total the absolute values of the differences between states and total population for each district.

$$0 + 0 + 0 + 0 = 0$$

(3) Divide the total by two.

$$0 / 2 = 0$$

Thus, according to the MAL formula, Freedonia appears to be a perfectly apportioned system; its MAL value is 0.

3. PMAL Application: Freedonia

Now, consider the impact of Freedonia's prison malapportionment, using Table 2 below.

Table 2: Freedonia Prison Populations

Prison	Prison Population	Home States of Prison Population
Figbury Prison (Appleville)	2,000	Dateford: 1,500 Cherryton: 400 Appleville: 100
Grapeham Prison (Bananaberg)	1,000	Dateford: 500 Cherryton: 300 Bananaberg: 200

If Freedonia's population of incarcerated individuals is reallocated so that those individuals count in their home districts, the share of relative seats and population for each state is as follows:

Table 3: Freedonia Post-Reallocation Population Share by State

State	Population	Percentage of Population
Appleville	8,100 (-1,900)	8.1%
Bananaberg	19,200 (-800)	19.2%
Cherryton	30,700 (+700)	30.7%
Dateford	42,000 (+1,700)	42%

The adjusted MAL value is calculated using the population figures from Table 3 and the seat share figures from Table 1.

(1) Calculate the absolute value of the difference between each district's allocated seats and its share of the total country population.⁶⁵

$$\text{Appleville: } |10 - 8.1| = 1.9$$

$$\text{Bananaberg: } |20 - 19.2| = 0.8$$

$$\text{Cherryton: } |30 - 30.7| = 0.7$$

$$\text{Dateford: } |40 - 41.7| = .02$$

(2) Total the absolute values of the differences between states and total population for each district.

$$1.9 + 0.8 + 0.7 + 2.0 = 5.4$$

(3) Divide the total by two. This is the adjusted MAL.

$$5.4 / 2 = 2.7$$

(4) Finally, calculate the PMAL.

$$|0 - 2.7| = \mathbf{2.7}$$

4. Observations About Freedonia's PMAL

Understandably, it is easy to misconceive Freedonia as perfectly apportioned. Indeed, according to the traditional definition, it is—a malapportionment figure of zero signifies a perfectly apportioned system.⁶⁶ Here, however, it is important to observe that many politicians do not purport to represent their prison populations in the same way they do their non-incarcerated constituents.⁶⁷ Can an electoral system be perfectly apportioned—or even democratic—if its electoral representatives do not consider themselves as representing a meaningful portion of their district's population? The first step in exploring this question, and others like it, is to understand just how distorted the representation is.

Though obviously an oversimplification, the Freedonian example reflects some of the common features of prison malapportionment. For example, its most populous state (Dateford)

⁶⁵ An absolute value is always displayed as positive (or zero) because it is a measurement of the distance between two real numbers.

⁶⁶ Samuels & Snyder, *supra* note 52, at 667.

⁶⁷ See Drake, *supra* note 30, at 260.

sends many Datefordians to prisons in other less-populous rural states.⁶⁸ As a result, the states of Appleville and Dateford have the most significant deviations from perfect apportionment. Notably, this is consistent with the general prison malapportionment trend of benefiting rural, less-populated districts at the expense of densely populated, urbanized districts.⁶⁹

III. CONCLUSIONS

A. *Limitations*

A few key assumptions and limitations of the foregoing example and the PMAL formula should be noted. First, the PMAL formula as presented in this Article only works in a single-tier electoral system—like the United States.⁷⁰ Second, it assumes that all incarcerated individuals are completely disenfranchised, regardless of the crime for which they were convicted.⁷¹ To study systems where only certain convictions result in the removal of an incarcerated individual's right to vote, the post-adjustment population share variable (z_i) would need to be altered accordingly. And third, the formula requires information about incarcerated people that may not be easily accessible. For example, confidentiality issues or poor record-keeping may be serious barriers to obtaining the necessary information to reallocate incarcerated individuals to their home districts.

B. *Benefits and Potential Applications of PMAL*

Snyder and Samuels observed a lack of international comparative scholarship of malapportionment—despite an established body of research in the United States.⁷² In the prison malapportionment context, there is a similar wealth of U.S.-focused

⁶⁸ See Persily, *supra* note 5, at 788-89 (explaining that most inmates are displaced from urban communities and incarcerated in prisons in rural areas).

⁶⁹ *Id.* at 788 (stating that in twenty-one counties in the U.S., over 20 percent of the population is in prison).

⁷⁰ See Samuels & Snyder, *supra* note 52, at 656-57 (discussing MAL in the context of multi-tiered electoral systems—such as those in Germany, Mexico, and Japan). See also *supra* notes **Error! Bookmark not defined.-Error! Bookmark not defined.** and accompanying text.

⁷¹ Even in the United States, the extent of prisoner disenfranchisement varies as a matter of state law. See 10 A.L.R.6th 31 (2006). As a practical matter, however, in the United States, even individuals convicted of misdemeanors and pre-trial detainees, who have not formally lost the right to vote, are almost entirely disenfranchised during the extent of their incarceration. See Robin Fisher, Comment, *Ballot Access Behind Bars*, 89 FORDHAM L. REV. ONLINE 86, 88-93 (2020).

⁷² Samuels & Snyder, *supra* note 52, at 652-53.

scholarship and dearth of comparative study. In the same way that the MAL formula facilitated subsequent quantitative research on the levels of malapportionment throughout the world,⁷³ PMAL can help promote further research on prison malapportionment.

First, the simplicity of the PMAL formula is important. While certain statistical concepts like chi-squares and standard deviations are relatively comprehensible by those without a background in statistics,⁷⁴ the accessibility of the field may legitimately be questioned when it comes to concepts like inverse coefficients of variation, skewness, and kurtosis. Regardless of an individual's familiarity with statistical analysis, a simple, effective formula has great benefits. It can reduce the burden of a large-scale study like those conducted by Snyder and Samuels—which is especially useful in a comparative study.

Furthermore, in the same way that the MAL formula was adapted to measure prison malapportionment, the PMAL formula can be adapted to isolate any number of other types of malapportionment. If a single variable can be isolated (in the PMAL formula, population share), a comparison between an initial malapportionment level and the subsequent level of malapportionment after the variable is adapted will demonstrate the level of deviation attributable to that specific issue.

The PMAL formula can also be applied to predict the effects of various potential reform efforts. The Freedonia hypothetical, for example, explored the proposal of reallocating incarcerated individuals to their home districts for the purpose of seat allocation. Furthermore, the PMAL measure could also be used to explore the effect of not counting incarcerated people (i.e., removing them from the pre-adjustment population share) or restoring their right to vote (i.e., adding these individuals to the pre-adjustment share for the district of the prison).

Finally, research using the PMAL formula can assist in public education and policy advocacy about the serious issue of prison malapportionment. Understanding the scope of a problem is the first step in solving it. Grounding the discourse around prison malapportionment in a comprehensible and quantifiable measure can help ensure all participants are speaking the same language.

⁷³ See, e.g., Richard Snyder & David J. Samuels, Legislative Malapportionment in Latin America, Historical and Comparative Perspectives, in 4 FEDERALISM AND DEMOCRACY IN LATIN AMERICA (Edward L. Gibson, ed.) (2004) (implementing the MAL formula for a comparative study of legislative malapportionment in Latin America).

⁷⁴ Schubert & Press, *supra* note 44, at 311-12.