The Inaccuracy of the Supplemental Process in Identifying Movers on State Voter Lists*

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Abstract: In *Husted v. Randolph Institute* (2018), the Supreme Court of the United States held that Ohio's supplemental list maintenance process of sending confirmation cards to registrants who fail to vote over two years did not violate the National Voter Registration Act (NVRA). Since then, 19 states have adopted some form of "supplemental process" (NCSL 2025). Here, we rely on a novel dataset of changes to more than 35.5 million voter registration records to devise measures of list maintenance accuracy and compare those jurisdictions with supplemental processes to those without. Our findings suggest that mandatory supplemental processes result in less accurate identification of possible movers, unnecessarily expending county and state resources and increasing the risks that eligible voters will be disenfranchised. We also find some evidence that membership in the Electronic Registration Information Center (ERIC) mitigates the reduction in accuracy caused by a mandatory supplemental process.

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Introduction

Unlike adult citizens of most modern democracies, the majority of Americans must opt-in to register as a voter with their local government before they become eligible to cast a ballot (Sellers 2024). The process of managing these lists of voters falls to state and local authorities, and can vary drastically by locality. While perhaps once a niche profession, since the 2020 presidential race, election administration has become a hotbed of political discourse and conspiracy theory that has undermined public confidence in American elections (Stewart 2022). Frequently, the focus of these conspiracy theories becomes voter registration lists and their accuracy (E.g. see Corasaniti and Berzon 2022).

Since 1993, the general guidelines by which voter lists are to be maintained has been set by the National Voter Registration Act (NVRA), which not only requires the regular removal of ineligible records (e.g. the deceased, people who have changed residence, and, in most states, the incarcerated), but also sets some protections to ensure against undue removals. Given our nation's decentralized approach to election administration, movers – voters who change residence – present a particular challenge for election administrators, and states allow different information to be used to help identify them. Here we argue that different sources of information used to identify movers produce different levels of accuracy and that taking failure to vote as an indication of a move (i.e. using a supplemental process) yields particularly inaccurate results.

The NVRA and Voter List Maintenance in the United States

Voter list maintenance is the process of identifying and updating voter records that are outdated. Since a voter file can never be entirely up-to-date due to the frequency of deaths, eighteenth birthdays, and moves, the list maintenance process is an attempt to maintain the accuracy of voter lists while ensuring that these large databases are still manageable. This procedure is a critical element of election administration not only to ensure that every eligible voter is able to vote, and that those who are no longer eligible are removed, but also for the accuracy of election districting and data reporting. Additionally, in recent years, public attention to voting and elections has led to myths about "bloated" voter rolls, further highlighting the importance of transparency and integrity in the list maintenance process.

Modern list maintenance procedures can be traced back to the National Voter Registration Act (NVRA) of 1993, which introduced guidelines for updating voter rolls across the U.S.[1] Among these standards are the 90-day "quiet period" (which prohibits systemic removals of voter records later than 90 days before a federal election), notice requirements, and the two general election waiting period to remove inactive voters. Specifically, the NVRA provides guidance about how to identify and manage voters who move out of an election jurisdiction, which can be a difficult process to navigate.

The process begins when an election official at the state or local level receives information suggesting that a voter has moved, often from the Postal Service or another government office. These voters are then placed on a list and mailed a forwardable and returnable confirmation notice asking them if they have moved. If the voter responds before the response deadline and confirms they have moved, then the record is either removed from the voter rolls (if the voter moved out of the jurisdiction) or updated to reflect the voter's new address (if the voter moved within the jurisdiction). If the voter does not respond by the deadline, the record is placed into a waiting period, whereby they become eligible for removal should they not vote or contact election offices within two federal election cycles. If they do contact election offices or vote in that period, their record is removed from the waiting period, and they remain eligible to vote.

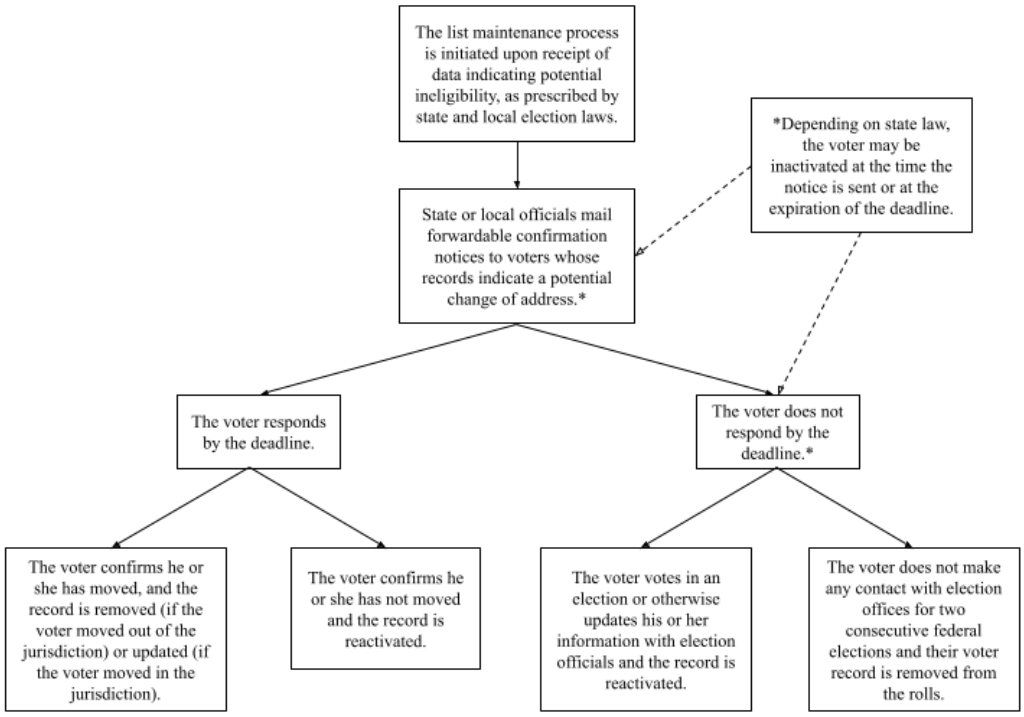
When voters are placed into the NVRA waiting period, their voter status is changed from some form of "active" to "inactive" status, although the exact label may differ[2]. Voters put into these "inactive" statuses remain eligible to vote through the waiting period. While the NVRA itself doesn't explicitly call for this change in voter status, state- and local-level implementation of the NVRA process has[3] and we find "inactive" statuses enshrined in state election law (See, for example, Arizona Revised Statute § 16-166 or Colorado Revised Statute § 1-2-302.5) as well as clearly outlined in voter procedural manuals (See, for example, the Nevada Election Procedures Manual, p 265; or the Ohio Election Officials Manual, § 4.02). The main distinction among states, in terms of "inactive" statuses, is whether they are imposed when the notice is

[1] Idaho, Minnesota, New Hampshire, North Dakota, Wisconsin, and Wyoming are exempt from the provisions of the NVRA since, at the time of its enactment, they either had no voter registration requirement for federal elections or had same-day voter registration.

[2] In Michigan, for example, the inactive status can either be a "Verify" or "Challenge" status, depending on the source that triggers the list maintenance process (See the 2024 Michigan Election Officials Manual, Chapter 2).

[3] Although states have various different names for these statuses, all states subject to the NVRA have some equivalent "inactive" status that indicates the records are suspected of having an outdated address (see questions 13 and 13a in the 2024 EAVS policy survey).

Figure 1: The NVRA List Maintenance Process



Source: *National Voter Registration Act §8*. 1993. 52 U.S.C. §20507.

sent or after the notice deadline has expired (see figure 1).

States vary in their list maintenance practices in more significant ways than how they label their statuses. In particular, they rely on different sets of data sources to identify movers. States generally rely on combinations of data sources to determine when a voter has moved out of their election jurisdiction and to trigger the beginning of the list maintenance process. Some of the more prominent sources include National Change of Address (NCOA) data from the Postal Service, state motor vehicle data, interstate data sharing agreements (such as membership in the Electronic Registration Information Center, or ERIC), and self-reports from voters.

The NVRA also dictates that voter records cannot be removed from the rolls exclusively due to a failure to vote, i.e., prohibits "use it or lose it" policies for voter list maintenance. In 2018, the Supreme Court ruled in *Husted v. Randolph Institute* that Ohio's practice of sending confirmation notices to voters who had not voted in two years did not violate the NVRA, reasoning that the subsequent inactivation and removal of these voters is not due to non-voting alone, but additionally to failure to respond to said notice. In other words, states were free to

consider lack of voting as a potential source of information regarding a change in residency, so long as they followed the notice and waiting period requirements before removal. This opened the door for other states to adopt these "supplemental processes" for list maintenance and implement additional ways of finding outdated voter records. In what follows, we consider the utility of such an approach, by assessing the accuracy with which the supplemental process identifies movers. Our findings suggest that this process is particularly prone to falsely identifying voters as having moved, but that membership in cross state data sharing agreements may blunt some of the worst consequences.

Voter Roll Accuracy and Identifying "Deadwood"

Much of the previous research concerned with the administration of voter lists examined their accuracy at a single point in time (E.g. Ansolabehere et al. 2010; Merivaki 2020; Shino et al. 2020). In some cases, this involved assessing the data for impossible, implausible, or missing values (Ansolabehere and Hersh, 2014; Merivaki, 2020), while in others, a sample of registrants were contacted and surveyed to assess the accuracy of their voter registration records (Ansolabehere et al. 2010; Shino et al. 2020).

Perhaps unsurprisingly, due to the patchwork of state policies in place under the NVRA (Alvarez and Hall 2014; National Conference of State Legislatures 2025), these studies have consistently demonstrated rather significant heterogeneity across states (Ansolabehere and Hersh 2014; Pettigrew and Stewart 2024). But state policy isn't the whole story, as scholars have frequently found significant variation across localities within states as well (Cao et al. 2020; Merivaki 2020).

While identifying errors in registration data is crucial to ensuring that eligible voters are able to cast a ballot, these scholars (and others) also focused on a concept more proximate to the topic of this paper: that of "deadwood," or "obsolete records, usually due to a person moving or dying" (Shaw et al. 2015, p. 30). The primary objective of list maintenance efforts is to identify and remove these obsolete records from the voter rolls, yet Shaw at al. (2015) reported that, based on Catalist derived estimates[4], as many as 7.3% of all voter registration records

[4]Catalist is a political data firm that compiles voter files from all states and merges them with various other data, both commercial and public. The numbers are the result of the authors' analysis of the Catalist enhanced

may be "deadwood." As Pettigrew and Stewart (2024) make clear, identifying this "deadwood" is not only important in order to maintain the manageability of the lists over time, but also to minimize election misinformation originating from bloated rolls.

This project is specifically interested in the processes by which potential "deadwood" is identified by states and localities and, in particular, how well those processes work. To evaluate processes, we need to shift focus from examining a static snapshot of voter registration data to examining how and when records change over time. This involves matching individuals across multiple different instances of the voter registration lists taken at different points in time (Kim et al, 2020). The studies that have taken this approach apply anomaly detection methods to evaluate outlying changes for potential mal-administration or external interference (Kim et al. 2020; Cao et al. 2020, 2022). While these studies represent true innovation, their geographic and temporal limitations[5] do not make their data optimal for comparing list maintenance practices, which vary by state as well as county and unfold over two- to four-year periods.

When attempting to identify "deadwood," election officials are much better equipped when it comes to deaths than movers. Both federal and state governments, for various reasons, do a much better job of tracking deaths than relocations, and that data is generally made available to states for list maintenance purposes (NCSL 2025). Comparable government data for monitoring individual residency changes is not available to election officials. Pettigrew and Stewart (2024) show, for example, that county-level registration cancellations due to deaths correlate quite strongly with actual deaths as reported by the Centers for Disease Control, but cancellations due to change of residency do not correlate well with Internal Revenue Service estimates of the mobility rate. Without a reliable central source[6] to use, election officials turn to various different sources of information, of varying quality, to identify people who may no longer be eligible to vote in the jurisdiction because they moved.

Table 1 summarizes responses to the 2024 Election Administration and Voting Survey from all states regarding their use of different sources of information to identify potential movers.

voter lists.

[5]Cao et al. (2020) had less granularity with monthly snapshots for the lead up to the 2016 election, but they covered the whole state of Florida. Cao el al. (2022) covered the entire state of California with weekly snapshots from early May to late November, 2020. While groundbreaking works, none of these studies cover more than a single state, nor did they cover an entire election cycle.

[6]While the Social Security Administration's Death Master File (DMF) provides the central data for identifying deaths, state sources often offer more timely updates.

The most commonly accepted sources are notifications from voters themselves, notifications from other states, and information on undeliverable official state or local mailings. It is also common for states to use data from the Post Office's National Chance of Address (NCOA) list, as well as data from motor vehicle departments. Less commonly a small group of states (Connecticut, Missouri, and Pennsylvania) report the use of door-to-door canvassing, and Louisiana is the only state that uses state tax filings.

Table 1: Sources of Information Available to Identify Possible Movers (EAVS 2024)

Source of Information	**# of States**
Reports or notices from other states that a former resident has registered to vote	47
Requests from voters for removal from the voter registration roll	47
Returned official mail	47
National Change of Address (NCOA) reports	37
Motor vehicles agencies (e.g., DMV)	36
Interstate data-sharing compact (e.g., ERIC)	25
Failure to vote	24
Jury questionnaires	17
Local/county office records	17
Mail ballot applications	13
Data from other state agencies	7
Canvassing (door-to-door verification)	3
State tax filings	1

A state's decision to use or not use a source of information does not reflect that source's actual utility for determining voter eligibility. Door-to-door canvassing is an excellent source of information about whether individuals live at their address of record, but is not popular as it is tremendously inefficient and may raise security or privacy concerns. Using motor vehicle department records is a common approach, while using other state agency data appears not to be. This makes sense in that we should expect for recent movers to be more likely to interact with the DMV (to update their driver's license) compared to other agencies. A small subset of movers take initiative to contact their former elections offices directly and notify them that they've moved; however, this is uncommon, as it yields little to no personal benefit for voters. A good source, then, is one that not only can provide reliable and relevant information about movers, but is also initiated by, and accessible at scale to election administrators (see table 2).

As mentioned, the supplemental process uses whether someone has voted as its source of information regarding movers. Not voting, however, can be indicative of any number of things:

Table 2: The Utility of Sources of Information for Identifying Possible Movers

Accessible at Scale	Reliably Relevant to Relocation: Yes	Reliably Relevant to Relocation: No
Yes	Returned mail, NCOA, DMV, interstate compacts	Supplemental Process, Non-DMV agencies, state tax filings
No	Voter self-report, canvassing, other states, local records, mail ballots	Jury questionnaire

an affirmative decision to abstain, personal conditions that make casting a ballot difficult or impossible, simply forgetting, or that the person has moved out of the jurisdiction. Because the supplemental process only focuses on this last possibility, it does not reliably provide relevant information. Furthermore, because it is relatively easy for administrators to know the turnout history for every registered voter, the supplemental process is accessible at scale. This particular combination of an easily tapped, scalable source of poor or irrelevant information is perhaps the least desirable, as it maximizes the opportunities for mistakes by broadly proliferating likely inaccuracies. For this reason, we argue that, all else equal, jurisdictions that employ a supplemental process will have higher numbers of inaccurately identified movers on their voter rolls than jurisdictions that do not.

A supplemental process, however, is not usually the exclusive means of identifying movers, and the other sources used could easily condition the consequences of a supplemental process. Here we focus on membership in the Electronic Registration Information Center (ERIC). ERIC is the preeminent interstate compact and data sharing arrangement meant to secure full and accurate voter rolls across member states. As many states already do, ERIC uses NCOA and DMV data to assess the voter rolls for potential movers. Unlike individual states, however, they can also confirm cross-state movers by matching voters to other member states' voter and motor vehicle data. ERIC also provides continuous updates and reports throughout the election cycle to proactively identify movers before a notice is returned undeliverable or a registrant has failed to vote. This means that while a registrant who voted in the most recent previous general

election and subsequently moved would not be caught by a supplemental process until the next cycle, they would likely be identified prior via ERIC, especially if the mover obtained a drivers license or registered to vote in another member state.

Therefore, because ERIC provides much more relevant information on movers, we hypothesize that ERIC member states should have more accurately identified potential movers than those states who are not members. Furthermore, states may engage in a supplemental process and also be members of ERIC. Where these two sources are both in use, we argue that continuous updates from ERIC after the implementation of the supplemental process should more accurately identify others in and above non-voters who have moved.

We might ask why, given the protections in the NVRA, a scattershot approach would be problematic. The notification and waiting period requirements, after all, are meant as safeguards against disenfranchising voters incorrectly identified as "deadwood." Unfortunately, while these safeguards may frequently work, they will sometimes fail: notices may get lost in the mail, or voters may fail to return them. Furthermore, the implementation of these safeguards costs time and money, and state and local election offices frequently carry the burden of their execution. Inaccurately identifying movers also means unnecessarily sending out a series of first-class, returnable notices to eligible voters at significant cost to local taxpayers.

To investigate our hypothesis about the impact of supplemental processes, we use the VoteShield granular voter record change data for 18 states, covering the period from the 2017-18 cycle through the 2023-24 cycle. We introduce a new measurement strategy to assess the accuracy in identifying potential movers that builds on Huber et al. (2021). We now turn to discussing these data and our measurement strategy, before directly considering our hypothesis.

Data & Methods

The data for our measures of accurate and inaccurate inactivations come from VoteShield. VoteShield is a project of the non-profit Protect Democracy that analyzes public voter files and absentee ballot files to identify and flag unexpected changes that could undermine election administration or public confidence.[7] Since its inception in 2017, VoteShield has tracked changes

[7] `https://www.voteshield.us/`

to public voter files and made these data accessible at no cost to election officials. As of late 2025, VoteShield reviews 24 public state voter files on either a weekly or monthly basis.[8]

This extensive scope, relatively long time-series, and granularity make VoteShield data particularly suitable for assessing list maintenance processes. Additionally, VoteShield facilitates this analysis through the production of what is referred to as our "modifications table." The modifications table updates every time a new public voter file is received in a state, recording all changes to any field for any record in the voter file, as well as any new additions (registrations) or subtractions (removals or cancellations). Table **??** shows the structure of the state-specific modifications table. Each row includes the voter ID, the date of the voter file before (*pre_date*) and after (*post_date*) the change, the change type (often the name of the column that was updated, or simply "registration" or "removal"), and the changed column's value both before (*pre_value*) and after (*post_value*) the modification.

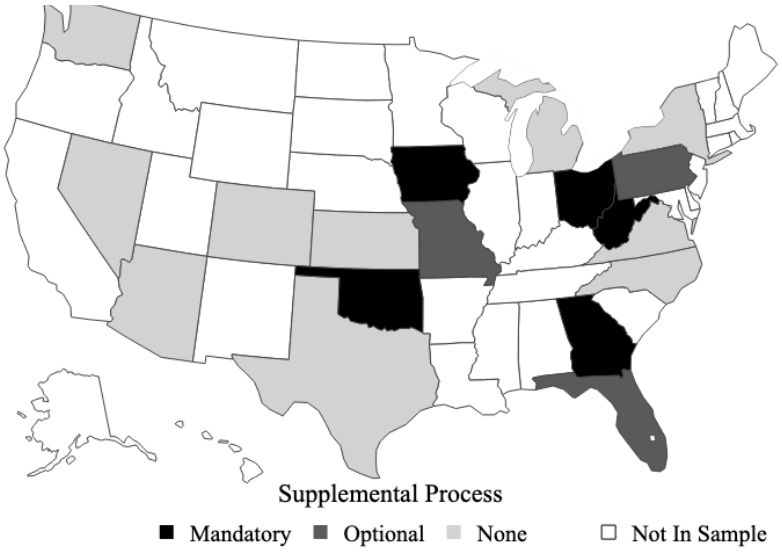
Table 3: Example Snippet of a VoteShield Modifications Table

voter_id	*pre_date*	*post_date*	*change_type*	*pre_value*	*post_value*
1234	2025-11-01	2025-11-07	status	active	inactive
2345	2025-11-01	2025-11-07	last name	smith	johnson
3456	2025-11-01	2025-11-07	status	inactive	active
3456	2025-11-01	2025-11-07	address line 1	123 old street	234 new street
3456	2025-11-01	2025-11-07	address line 2	oldtown, AA	newtown, BB
3456	2025-11-01	2025-11-07	zip code	11111	22222
4567	2025-11-01	2025-11-07	registration	NaN	NaN
5678	2025-11-01	2025-11-07	removal	NaN	NaN

Of the 26 states that VoteShield reviews, there are 18 that are suitable for our analysis. Those states not included in our sample either (1) were onboarded too recently and thus do not have a full cycle of list maintenance in our system, or (2) their public voter file does not consistently provide the data we need to evaluate list maintenance. Figure 2 shows the 18 states in our sample, along with whether they employ an optional or mandatory supplemental process based on the National Conference of State Legislatures (2025) and our own survey of the relevant election laws or rules.

[8]We also obtain quarterly files from two non-NVRA states: New Hampshire and Wisconsin.

Figure 2: Supplpemental Processes among Sample States



Measuring the Accuracy of Inactivations

When an election official inactivates a voter, they are declaring that they have reason to believe the voter no longer lives at their address on file, and are thus placing them in the NVRA waiting period for eventual removal. To evaluate the accuracy of this initial determination that they are a likely mover, we follow a similar approach to that used by Huber el al. (2021). In their piece, they examine the subsequent turnout of voters placed on Wisconsin's "supplemental movers poll book," which functions as a kind of inactive status in Wisconsin since they are not subject to the NVRA. The authors argued that voters who cast ballots despite being labeled as movers were, in fact, incorrectly identified as movers from the outset. We extend this logic by considering four distinct paths down which an inactivated voter record may proceed, and how each reflects on the accuracy of the initial inactivation.

Table 4 presents the four possible paths. The first possibility is that the voter's record is removed or canceled, rendering them ineligible. This could occur either by the voter responding to a notice confirming that they have moved out of state (1a) or because they do not respond to any notice or vote during the waiting period and are subsequently removed pursuant to the NVRA (1b). In situation 1a, we have confirmed that the voter has moved, and in 1b we do not have affirmative confirmation, but we do have a long period of inactivity suggesting a likely mover. The second possibility is that the voter responds to the notice affirming that they

have moved within the state, they update their address, and are accordingly reactivated. This response also constitutes a confirmed mover. The third possibility is that the voter responds to the notice, casts a vote, or otherwise makes contact with the election office, resulting in their reactivation, but they do not change their address. In this instance we can confirm that the voter was not a mover and that they remained eligible at their original address. Finally, we have the very uncommon possibility that a voter will remain inactive beyond the waiting period without being removed. We believe that this usually occurs as a result of some oversight of special circumstances, but still probably suggest the accurate identification of movers, given the long period of inactivity.

Table 4: Categorizing Inactivations Based on Subsequent Activity

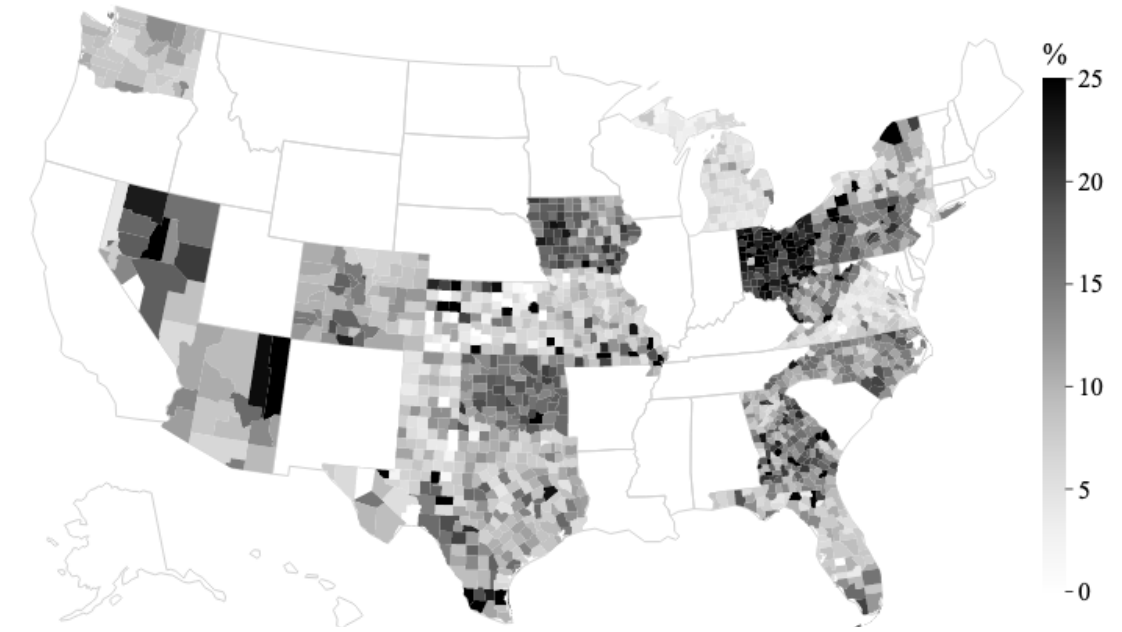
	Post-Inactivation Actions	**Description**	**Actual Mover?**
1.	The record is removed/canceled.	**1a.** The voter responds to the notice, affirms that they have moved out of the state and their record is removed.	**Confirmed yes**
		1b. Voter does not respond to notices, vote, or update their record in 2 cycles and is removed pursuant to the NVRA.	**Likely yes**
2.	The record is reactivated with an updated address.	The voter responds to the notice, affirms they have moved in-state, updates their record with their new address and is subsequently reactivated.	**Confirmed yes**
3.	The record is reactivated without an updated address.	The voter responds to the notice, casts a vote, or otherwise contacts the election official without updating their record and is reactivated.	**Confirmed no**
4.	Neither reactivated nor removed; the record remains inactive beyond the 2 election cycle waiting period.	The record remains inactive and is not removed, most-likely due to an oversight or other complication.	**Likely yes** (uncommon)

With possibility three, we find the subset of inactivations that are most important to this analysis (reactivations without address changes), those that we can confirm were inactivated incorrectly, and in fact do not correspond to movers. The subsequent analysis will be highly concerned with the prevalence of reactivations without address changes, and under which conditions they are more or less common.

We set about deriving these measures empirically from the VoteShield modifications data by first retrieving every instance of a record being inactivated for all 18 states across the study period. This amounts to more than 35.5 million records. We then identify any subsequent reac-

tivations, removals, or address changes for those initial inactivations, thereby building a history of the relevant post-inactivation changes. With this history of changes we can then classify each inactivation into one of the four categories: removed, reactivated with address change, reactivated without address change, and remains inactive (table 4). Of crucial importance we can derive the percent of all inactivations that were inaccurate or confirmed non-movers ("reactivated without address change"). Figure 3 shows this percent at the county-level for the 2021-2022 election cycle.

Figure 3: The Percent of Inactivations that are Reactivated without an Address Change by County (2021-2022 Cycle)

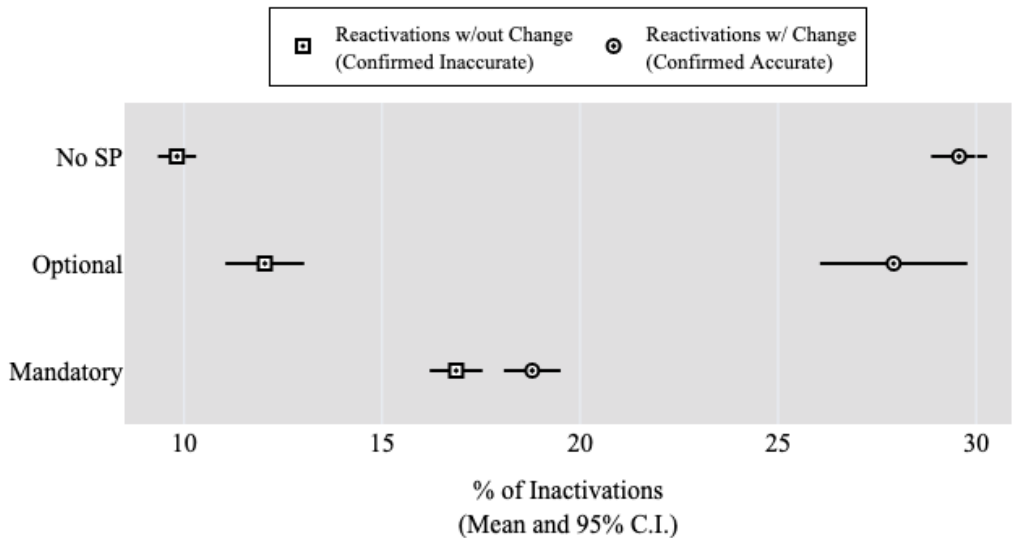


Analysis

As an initial step in assessing our hypothesis that supplemental processes decrease the accuracy of inactivations, we can take the county-level data and group it into states without a supplemental process, with an option supplemental process (OSP), or with a mandatory supplemental process (MSP). Figure 4 presents the average percentage of inactivations that were subsequently reactivated with and without address changes for each of these groups in the 2021-2022 election cycle. The figure suggests that, on average, those jurisdictions with a MSP have a significantly smaller proportion of confirmed address changes among their inactivations than jurisdictions with either no supplemental process or an optional one. Furthermore, those same

MSP jurisdictions show, on average, a significantly higher percentage of confirmed inaccurate inactivations (reactivations without address changes). All of this suggests that when MSP jurisdictions inactivate voter records, they are more likely to have inaccurately identified movers.

Figure 4: Average Percent of Reactivations with and without Address Changes by Supplementary Process Type (2021-2022)

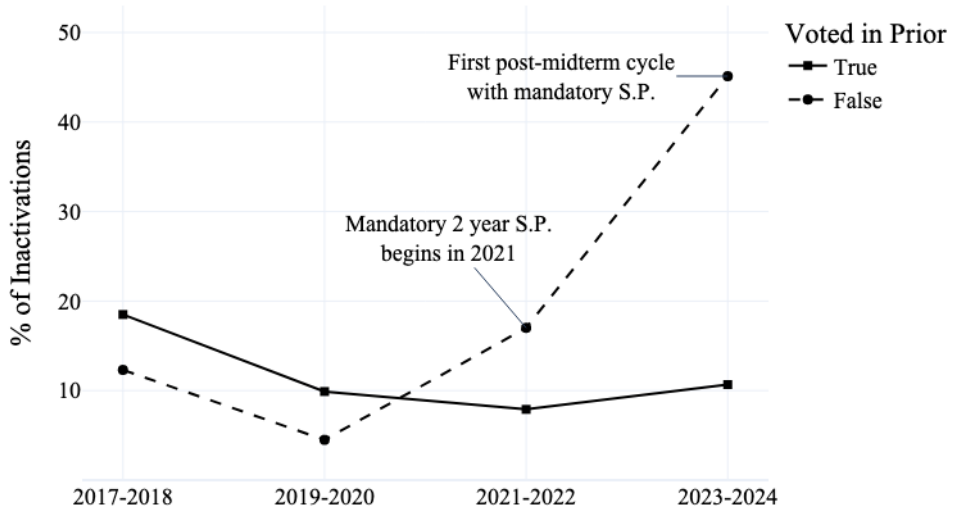


Note: State-level averages for the 2021-2022 cycle are presented in appendix table A1.

In addition to looking at group averages, Iowa presents an interesting case for consideration as it adopted a MSP, similar to Ohio's, in the Spring of 2021 (Akin 2021). To take advantage of this, we consider the eventual fates of inactivations before and after the implementation in Iowa. However, states with supplemental processes typically do not rely on them exclusively; they may inactivate voter records for various other reasons beyond failure to vote. To account for this, we not only examine inactivations before and after adoption of the supplemental process, but also compare voters and non-voters. While the set of inactivations who did not vote in the previous election may not exclusively be due to the supplemental process, they are likely dominated by those that were. And among those who did vote in the previous election, by definition, none could have been due to the supplemental process (except those possibly included in error). The result of this analysis is presented in figure 5, where we see that at most 20% of inactivated voters who cast a ballot in the previous election were reactivated without an address change, and that this peak occurred before the adoption of a MSP. This is not the case for inactivated voters *who did not cast a vote*, however. This group experienced a drastic increase in the percent of reactivations without address changes after the adoption, from about 5% in the year prior,

to nearly 45% in the most recent cycle.

Figure 5: The Accuracy of Supplemental Process Inactivations in Iowa: Rates of Reactivations without Address Changes

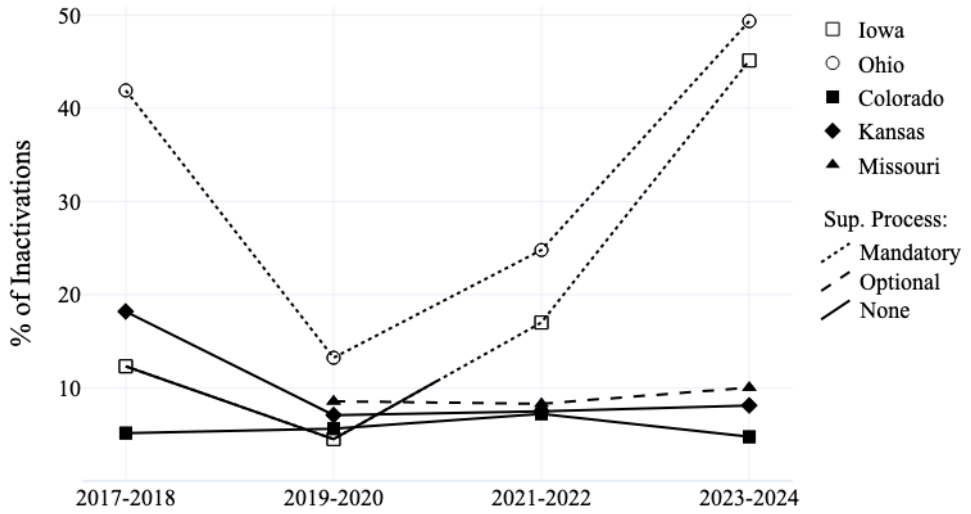


While figure 5 is certainly suggestive that the supplemental process in Iowa reduced the accuracy of their inactivations quite drastically, it is entirely possible that this pattern is driven by unrelated temporal shocks that most states may be subject to regardless of their list maintenance practices. Figure 6 replicates figure 5 across five states. What we find is that the states without a MSP did not experience any significant increases in inaccurate inactivations post-2020, but both MSP states–Iowa and Ohio–did.

Temporal shocks are not the only complications we must consider. To further control for potential confounders, we model the accurate percent of a county's inactivations as a function of relevant county-level demographic and socioeconomic indicators as well as state-level policy, importantly including the presence of a MSP.[9] We initially obtained data on the presence of a supplemental process from the National Conference of State Legislatures (NCSL 2025), and augmented these reports with an independent investigation of relevant state election law and procedures to determine whether they were mandatory or optional. Because the results of figures 4 and 6 suggest that the MSP is where we see significant differences, we focus only on those supplemental processes in the models that follow. The other state-level policy variables include whether list maintenance is done at the county, state, or both levels (bottom-up vs

[9]Appendix table A2 includes a full list of variables, their sources, and our expectations for their impact.

Figure 6: Reactivations without Address Changes for Non-voters in Five States by Election Cycle



top-down vs hybrid), the number of sources of information used to identify movers, whether they inactivate records before or after the initial notice deadline, and membership in ERIC.

We estimate two sets of models. The first is purely additive and considers the presence of a supplemental process and membership in ERIC in isolation. The second model interacts these two independent variables to allow us to assess the impact of the coexistence of both conditions. Table 5 shows the distribution of our sample states across the combination of the presence of a mandatory supplemental process and membership in ERIC. Because we are testing the effects of both county- and state-level variables on a county-level outcome, we make use of hierarchical linear models with random-intercepts for each state-election cycle. The advantage to this approach is that it addresses the within-state-cycle correlation among units resulting from group-level unobserved heterogeneity by allowing the intercept to vary by state (Rabe-Hesketh and Skrondal 2012). This approach also corrects for downward-biased uncertainty estimates for state-level covariates in standard pooled models (Bickel 2007). Given that we are interested in the effects of state-level variables—specifically relating to the presence of a MSP and membership in ERIC–these models are the most appropriate.

Table 6 presents the results of our additive and interactive models with the percent of inactivations that were accurate at the county-election cycle as the dependent variable. The coefficients for the controls mostly conform to our expectations, with two small exceptions. First,

Table 5: Number of Sample States by Group and Cycle

Group*	2017-2018	2019-2020	2021-2022	2023-2024	Total
MSP Only	3	2	1	4	10
ERIC Only	4	8	10	6	28
Both	2	3	4	1	10
Neither	5	5	3	7	20
Total	14	18	18	18	68

*Groups denote the presence of a mandatory supplemental process (MSP), ERIC membership, both in combination, or neither.

the size of the jurisdiction appears, all else equal, to have a positive relationship with accuracy, but a very small impact (the coefficient for 1,000 voters is smaller than 0.001). Second, many of the policy controls had no discernible effect when controlling for other factors. Specifically, the top-down versus bottom-up distinction, the total number of sources used, and the state's inactivation timing had no significant impact on the outcome.

Table 6: County and State-level Predictors of the Accurate Percent of Inactivations by Cycle

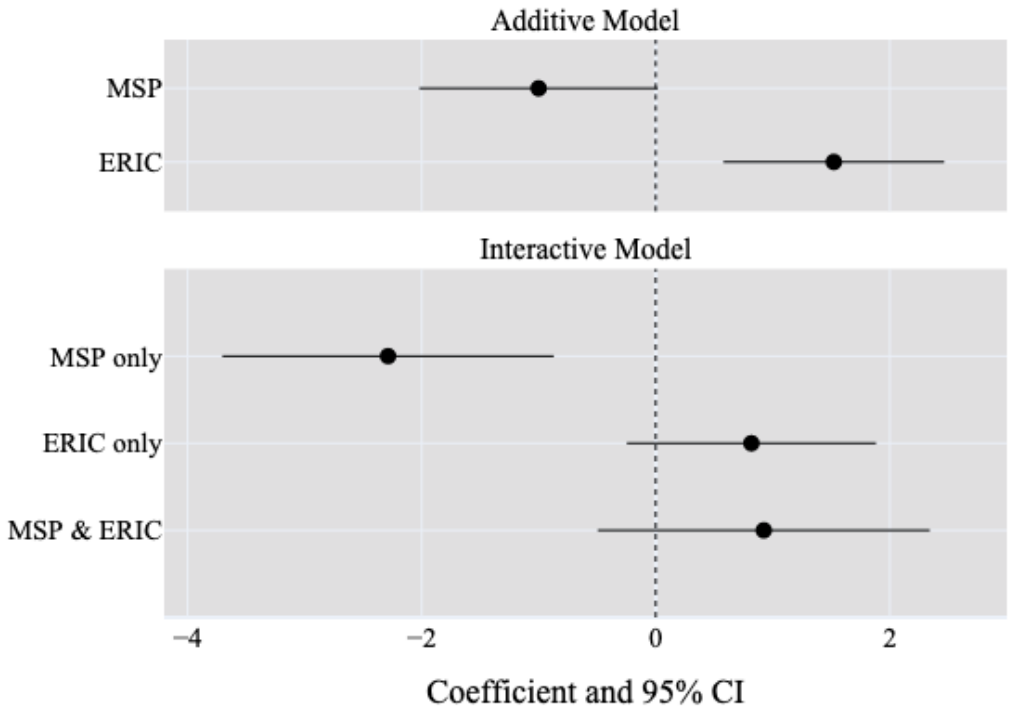
	Coef.	**(Std.Err.)**	**Coef.**	**(Std.Err.)**
Intercept	2.757**	(1.320)	3.110**	(1.274)
Inactivated %	0.563***	(0.005)	0.563***	(0.005)
Cycle Trend	-0.850***	(0.231)	-0.826***	(0.222)
Midterm	-1.394***	(0.509)	-1.372***	(0.488)
Voters (1,000s)	0.000	(0.000)	0.000	(0.000)
Under 40	0.020***	(0.004)	0.020***	(0.004)
College Students	0.017***	(0.005)	0.017***	(0.005)
Non-White	-0.006***	(0.001)	-0.006***	(0.001)
Renters	0.018***	(0.003)	0.018***	(0.003)
Top Down	1.666	(1.984)	1.279	(1.908)
Hybrid	0.646	(0.530)	0.805	(0.512)
Sources	0.009	(0.074)	0.001	(0.071)
Pre-Notice	-0.505	(0.493)	-0.493	(0.473)
MSP	-1.001*	(0.520)		
ERIC	1.522***	(0.481)		
MSP Only			-2.287***	(0.722)
ERIC Only			0.817	(0.543)
Both			0.923	(0.724)
State-Cycle Group Var.	3.469	(0.560)	3.186	(0.515)
N groups	68		68	
N observations	5,786		5,786	
Log-Likelihood	-8,804.541		-8,801.647	
BIC	17,756.357		17,759.230	
AIC	17,643.083		17,639.292	

Note. Table entries are from multi-level mixed effects linear models with random intercepts for each state-election cycle. Variable descriptions and sources can be found in appendix table A2.
*** p < 0.01; ** p<0.05; * p<0.1

Turning to our primary explanatory variables, in the additive model (top panel in figure 7) we find that the coefficient for ERIC membership is positive and statistically significant, and

the magnitude suggests that membership is worth about 40% of a standard deviation increase in accuracy. The coefficient for the MSP is negative, as expected, but just fails to reach statistical significance at the 95%-level with a p-value of approximately 0.054. Although we don't have the desired confidence, we still find these results highly suggestive that our initial hypothesis that MSP reduces inactivation accuracy holds some water.

Figure 7: The Impact of Mandatory Supplemental Processes (MSP) and ERIC Membership on the Percent of Records Accurately Inactivated



Note: The estimates in the figures are from multi-level mixed effects linear models with random intercepts for each state-election cycle. Controls are included in the models, but not shown here. The full models can be found in table 6.

If we change our baseline of comparison in order to consider the potential impact of the coexistence of a MSP with ERIC membership by turning to the interactive model (top panel in figure 7), we see a somewhat more complex relationship. First, compared to having neither a MSP or ERIC membership (the category excluded from the model), having only MSP has a statistically significant negative effect on the accuracy of inactivations. Substantively, the coefficient represents more than a 50% standard deviation's reduction in the accurate percent of inactivations. While both ERIC membership alone and MSP with ERIC membership yield positive coefficients, neither are statistically different from zero ($\alpha = 0.05$), suggesting that, all things equal, those jurisdictions may not be all that different from jurisdictions with neither

MSP nor ERIC membership. However, the coefficient for MSP alone is not only statistically different from zero, but also statistically different from the coefficients for the other two groups, most importantly from that for MSP and ERIC membership combined. This suggests that while a MSP will likely reduce the accuracy rate, introducing a scalable source of reliably relevant information (ERIC membership) may offset that reduction in accuracy.

Discussion

Accurately identifying registrants who have moved out of the jurisdiction is one of the most challenging tasks that election officials in the U.S. face. While legal safeguards exist in the NVRA to help blunt the worst effects of list maintenance mistakes, they are not infallible. In fact, when dealing with the sheer number of records involved in list maintenance efforts, you only need a small percentage to slip through the cracks to potentially amount to disenfranchising thousands. Furthermore, unnecessarily including eligible voters in the list maintenance process costs administrators time and tax payers money, whether those voters are eventually disenfranchised or not. We have argued that accurately identifying movers at the outset can greatly alleviate these burdens, and that accuracy is going to be tied to the sources of information made available to administrators.

Our analysis has supported the contention that a mandatory supplemental process hinders accuracy. This is perhaps not surprising given that failure to vote is not, logically, a great indicator of whether a voter has moved. Interestingly, there is some evidence that membership in ERIC mitigates the reduction in accuracy caused by a mandatory supplemental process. For practitioners, we believe that these findings suggest that they rely more heavily on sources of information that are reliably connected to relocation, as opposed to the more scattershot approach. We also hope that this work encourages scholars to further pursue questions in this area.

That election administration has become a contentious political issue makes it all the more important that scholars continue to pursue rigorous research in this field. In particular, research on voter registration and list maintenance can serve officials to promote best policies and practices and identify those that are less optimal to avoid. For example, we believe there is an

opportunity to expand on the excellent work done by Huber et al. (2020) to better understand the individual-level predictors of being inaccurately inactivated. Confirmation of their findings that racial minorities were disproportionately identified incorrectly as movers in Wisconsin could be tested more broadly across other states. One might also seek to better understand under which conditions race and ethnicity are more or less prone to association with inaccurate inactivations, in order to devise strategies for more equitable outcomes.

We also think it is crucial that further work be done to assess the accuracy and efficiency of interstate data sharing agreements like ERIC. The ease and frequency of interstate migration in the United States, combined with decentralized election administration, in theory, make these types of agreements particularly important. Short of centralizing voter registration across all states or the expenditure of significant state and local resources on private solutions, it's hard to imagine any other arrangement can fill the blind spots created by state siloing.

Questions of this sort are of incredible salience and crucial importance; answers to which should serve to advance the study of election administration and support the hard work that election administrators do around the county. We hope that our work will encourage others to take up questions that can help these practitioners better accomplish their mission of providing free, fair, and secure elections for all eligible voters.

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Appendix: A Brief Validation of the VoteShield Data

When examining long-term trends in election administration, the most common source of data is the Election Assistance Commission's Election Administration and Voting Survey (Stewart III 2018, 2019). These surveys are performed every election cycle, and ask local election officials, usually at the county-level, to report information on general undertakings over the previous cycle. While an invaluable source of information, Stewart III (2019) shows that EAVS does have some significant shortcomings, especially when it comes to reporting the removal of movers. The VoteShield data has two distinct advantages over EAVS data. The first is that VoteShield can see individual record changes over significantly shorter periods.[10] Second, while there is a lack of uniformity in EAVS responses across or even within states due to differing interpretations, policies, or practices (Stewart III 2019), with the disaggregated VoteShield data we can impose a uniform measurement strategy across all jurisdictions, avoiding some of these complications.

This is not to say that we expect for VoteShield and EAVS to be entirely unrelated; they should still broadly be reflecting the same data-generating process. Thus, EAVS presents us with the opportunity to briefly evaluate the validity of aggregate VoteShield modifications data. When we compare the percentage[11] of a county's voter rolls that were removed after the NVRA waiting period, as reported in EAVS, with the percentage of inactive removals for the same period from VoteShield, we find a very high correlation ($r = 0.911$, $p < 0.001$). From figure A1, we can see that on average VoteShield sees more inactive removals than counties report NVRA removals, but this is unsurprising given that some of the inactive removals observed by VoteShield resulted from causes unrelated to their inactivation (for example, an inactive voter might be removed due to death). There are also a number of instances where counties are inconsistent over time on distinguishing between NVRA removals and those removed for "residency" in EAVS, resulting in a number of instances of severe under-counts of NVRA removals (the observations at the very bottom of figure A1).

[10] The interval between files ("file cadence") in the VoteShield data varies between one week and one month. In some states, where available, we collect files as frequently as twice a week in the 90 days leading up to the election.

[11] Percentages are used, as correlations among raw numbers would reflect the size of the county rather than voter record removals.

The degree of correspondence between EAVS and VoteShield varies quite a bit from state to state. In figure A2, we show the correlation between EAVS and VoteShield on two different measures, percent inactivated[12] and percent inactive (NVRA) removed[13]. As we would hope, most states find themselves in the upper right quadrant, indicating strong positive correlations on both dimensions. A few exceptions exist. In Iowa and New York, we saw significant under-reporting of NVRA removals, suggesting a different interpretation of what qualifies as such a removal.[14] In Washington, we see a similar issue with the reporting of inactivation notices.

In all, our comparison to the EAVS data unfolded as expected. By-and-large, we see strong levels of correlation in most states. In those instances where the correlations are particularly weak or non-existent, we find county responses to the EAVS that suggest differing interpretations or missing data. As a result, we have strong confidence that the changes reported in the VoteShield modifications data reflect the type and number of actual changes to voter registration records.

[12]In EAVS, this is the percent of active voters sent notices. In VoteShield, this is the percent of active voters who experienced a change of status to inactive.

[13]In EAVS, this is the percent of voters reported removed for "failed to respond to a sent confirmation notice and failed to vote in the two most recent federal elections." In VoteShield, it is the percent of voters who were removed while in an inactive status

[14]Iowa and New York also make up the bulk of the observations at the bottom of figure A1.

Appendix Tables & Figures

Figure A1: Comparing EAVS and VoteShield Estimates: Inactive Removals for all Counties

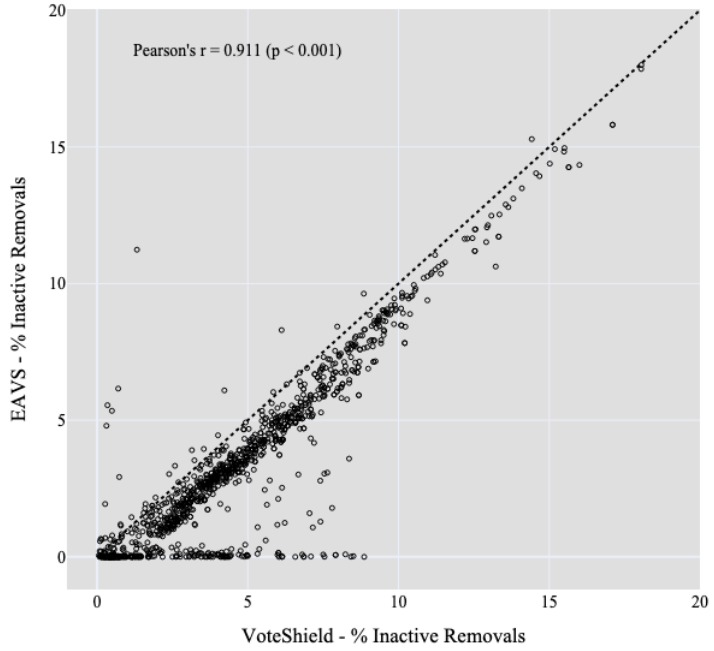

Figure A2: Comparing EAVS and VoteShield Estimates: County-level Correlation for Inactivations and Removals

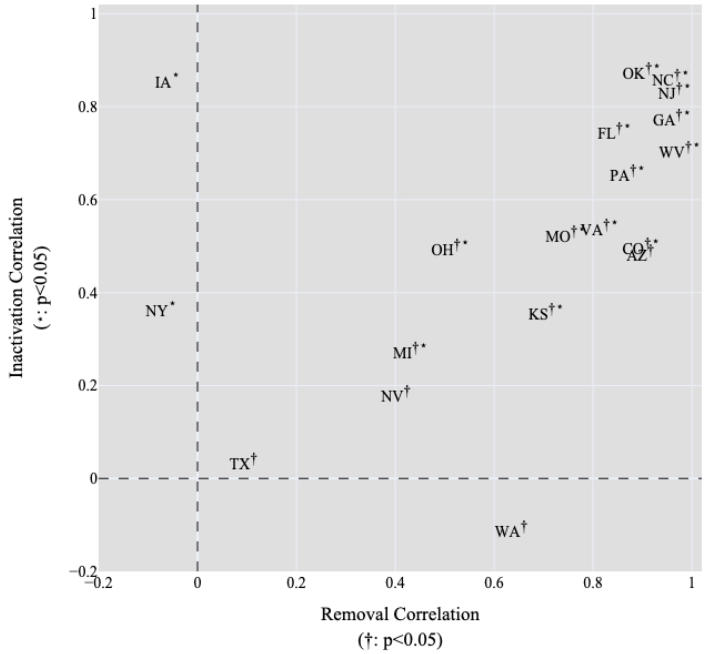

Table A1: State Average Percent of Inactivations by Eventual Outcomes (2021-2022 Cycle)

Supplemental Process?	State	Percent Inactivated	Percent Reactivated, Address Change	Percent Reactivated, No Address Change	Percent Removed	Percent Remaining Inactive
None	**Total**	**8.247** *(4.712)*	**29.571** *(10.604)*	**9.82** *(7.252)*	**54.961** *(16.443)*	**5.649** *(12.745)*
	Arizona	9.132 *(2.599)*	27.57 *(7.396)*	13.381 *(5.889)*	54.031 *(14.745)*	5.018 *(13)*
	Colorado	11.008 *(2.507)*	37.526 *(8.118)*	11.476 *(3.641)*	49.396 *(7.447)*	1.602 *(5.415)*
	Kansas	5.658 *(8.096)*	27.898 *(14.537)*	11.436 *(16.347)*	36.962 *(27.624)*	23.704 *(24.77)*
	Michigan	8.919 *(3.691)*	21.937 *(8.831)*	5.75 *(2.235)*	65.004 *(10.22)*	7.309 *(4.7)*
	Nevada	10.282 *(5.066)*	27.252 *(11.432)*	10.712 *(7.748)*	51.329 *(20.203)*	10.707 *(19.053)*
	North Carolina	10.458 *(3.02)*	25.795 *(6.577)*	13.336 *(3.574)*	60.33 *(6.949)*	0.539 *(0.679)*
	Texas	8.414 *(3.768)*	34.987 *(8.536)*	10.291 *(5.642)*	51.15 *(9.865)*	3.572 *(5.802)*
	Virginia	3.636 *(1.544)*	21.972 *(5.294)*	5.51 *(2.574)*	72.13 *(6.015)*	0.388 *(0.534)*
	Washington	9.93 *(2.536)*	33.559 *(6.765)*	9.127 *(2.127)*	56.982 *(6.604)*	0.331 *(0.319)*
Optional	**Total**	**7.747** ***(3.305)***	**27.919** ***(15.017)***	**12.036** ***(8.034)***	**57.755** ***(13.711)***	**2.291** ***(4.322)***
	Florida	6.721 *(3.164)*	15.476 *(5.552)*	9.61 *(4.795)*	73.339 *(9.563)*	1.576 *(6.543)*
	Missouri	8.682 *(3.539)*	40.754 *(11.792)*	10.869 *(9.165)*	47.859 *(8.961)*	0.518 *(0.543)*
	Pennsylvania	7.154 *(2.532)*	18.138 *(5.812)*	16.482 *(6.764)*	59.306 *(7.532)*	6.074 *(2.561)*
Mandatory	**Total**	**11.921** ***(5.799)***	**18.791** ***(7.99)***	**16.869** ***(7.432)***	**60.3** ***(12.608)***	**4.039** ***(8.328)***
	Georgia	9.3 *(3.744)*	24.943 *(6.054)*	14.682 *(6.669)*	59.914 *(9.705)*	0.46 *(1.356)*
	Iowa	21.112 *(3.052)*	21.99 *(5.076)*	16.15 *(4.156)*	60.186 *(7.857)*	1.673 *(2.25)*
	Ohio	11.906 *(1.814)*	15.212 *(6.852)*	22.965 *(3.994)*	50.764 *(7.454)*	11.059 *(5.09)*
	Oklahoma	9.394 *(1.421)*	10.743 *(4.048)*	15.753 *(3.289)*	70.535 *(5.338)*	2.969 *(2.455)*
	West Virginia	6.418 *(4.024)*	12.12 *(4.738)*	16.287 *(14.516)*	62.592 *(24.324)*	9.001 *(19.985)*

Table A2: List of Variables and Sources

Variable Name	Description	Source	Count	Mean (std)	Min	Max	Expectation
Accurate % (DV)	Accurate inactivations as a percent of total registration records	VoteShield	5,786	4.987 (3.724)	0	30.265	+
Inactivated %	Inactivated records as a percent of total registration records.	VoteShield	5,786	7.527 (5.598)	0.002	63.85	
Cycle Trend	Election cycle (linear trend)	VoteShield	5,786	3.562 (1.142)	1	5	?
Midterm	Is it a post-midterm election cycle?	VoteShield	5,786	0.561 (0.496)	0	1	–
Voters (1,000s)	Total registered voters in the county in thousands	VoteShield	5,786	76.755 (190.679)	0.109	2871.713	–
Under 40	Percent under 40 years old	Census, ACS 5 year estimates	5,786	29.63 (5.71)	3.704	69.348	+
College Students	Percent actively attending a post-secondary institution	Census, ACS 5 year estimates	5,786	4.933 (3.892)	0	51.969	+
Non-White	Percent non-white	Census, ACS 5 year estimates	5,786	18.981 (15.386)	0.176	88.479	+
Renters	Percent renting	Census, ACS 5 year estimates	5,786	24.582 (8.901)	0	78.397	+
Sources	Total number of sources used to identify movers	EAVS	5,786	11.145 (3.187)	4	17	+
Top Down	Is the state a top-down system for list maintenance purposes?	EAVS	5,786	0.015 (0.122)	0	1	–
Hybrid	Is the state a hybrid system for list maintenance purposes?	EAVS	5,786	0.413 (0.492)	0	1	–
Pre-Notice	Does state law call for inactivating before (1) or after (0) the notice return deadline?	State election law and procedure	5,786	0.5 (0.5)	0	1	–
MSP	Does the state require the use of a supplemental process?	NCSL & state election law and procedure	5,786	0.299 (0.458)	0	1	–
ERIC	Is the state a member of ERIC?	Democracy Maps	5,786	0.501 (0.5)	0	1	+