EXHIBIT 4

UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF NORTH CAROLINA

NORTH CAROLINA STATE CONFERENCE OF THE NAACP, *et al.*, Plaintiffs, v. ALAN HIRSCH, in his official capacity as Chair of the North Carolina State Board of Elections, *et al.*, Defendants.	No. 1:18-cv-01034

SECOND SUPPLEMENTAL EXPERT REPORT OF MICHAEL C. HERRON

Plaintiffs' Exhibit 1063

Contents

1 Introduction **1**
- 1.1 Summary of conclusions . . . 2
- 1.2 Comparing this report's conclusions to the conclusions of my previous reports in this litigation . . . 8
- 1.3 Compensation . . . 10

2 Database matching and no-match lists **10**
- 2.1 The State Board of Elections and the Department of Transportation maintain distinct databases . . . 11
- 2.2 Using matching fields to link the State Board of Elections' registered voter database and the Department of Transportation's license database . . . 12

3 Creating a November 2023 no-match list based on the August 2019 State Board of Elections database matching algorithm **14**
- 3.1 Matching fields in the August 2019 State Board of Elections database matching algorithm . . . 15
- 3.2 Voter names versus Soundex name equivalents . . . 16
- 3.3 Implementing the August 2019 State Board of Elections database matching algorithm 16
  - 3.3.1 Step 1: create matching fields in the State Board of Elections database . . . 17
  - 3.3.2 Step 2: create matching fields in the Department of Transportation license database . . . 17
  - 3.3.3 Step 3: checking for matches . . . 17
- 3.4 Registered voters linked to deceased license records . . . 18
- 3.5 Matching rates by matching field . . . 19
- 3.6 The November 2023 no-match list based on the August 2019 State Board of Elections database matching algorithm . . . 20
  - 3.6.1 The statewide no-match rate . . . 21
  - 3.6.2 No-match rates based on race . . . 22
  - 3.6.3 No-match rates based on ethnicity . . . 24
- 3.7 A recent University of Maryland finds that almost nine percent of Americans lack driver's licenses . . . 25

4 Expanding the set of matching fields **25**
- 4.1 Matching fields from the algorithms used in 2014 and 2019 . . . 27
- 4.2 Missingness and uniqueness of matching fields . . . 29
- 4.3 Linking the State Board of Elections registered voter and Department of Transportation license databases . . . 31
  - 4.3.1 Step 1: create matching fields in the State Board of Elections database . . . 31
  - 4.3.2 Step 2: create matching fields in the Department of Transportation license database . . . 31
  - 4.3.3 Step 3: checking for matches . . . 32
- 4.4 Matching rates by matching field . . . 33

5 Analysis of the composite no-match list **34**
5.1 North Carolina contains both frequent and infrequent voters 36

6 Creating a no-ID list from the composite no-match list **38**
6.1 Residential college and university students in North Carolina 39
6.2 North Carolina voters who voted in the March 2024 primary 42
6.3 North Carolina voters who voted in a 2023 election 42
6.4 North Carolina voters who voted in the 2016 primary 43
6.5 North Carolina voters who have received a free voter identification card from the State Board of Elections 44
6.6 Missing data and anomalies 44
6.7 False positives in the reverse match procedure 47
6.8 Results of reverse matching 49

7 Analysis of the no-ID list based on the November 2023 composite no-match list **51**
7.1 Registered voters on the no-ID list 51
7.2 Access to other databases is unlikely to reverse the racial disparities in the no-ID list 54

8 Conclusion **55**

Appendix A Tables of daily counts of absentee ballot returns from the 2020 general election in North Carolina **58**

Appendix B *Curriculum vitae* of Michael C. Herron **65**

Appendix C The confidential November 2023 registered voter database **75**

Appendix D The confidential November 2023 North Carolina Department of Transportation license database **77**

Appendix E Reasons for canceling voter registrations **81**

Appendix F Identifying residential college students in the November 2023 registered voter database **82**

Appendix G Voter turnout, voter status as characterized by the State Board of Elections, race, and ethnicity **85**

Appendix H The no-match list based on the 2014 State Board of Elections database matching algorithm **88**

Appendix I The no-match list based on the 2014 Department of Justice database matching algorithm **90**

Appendix J State Board of Elections letter on requirements for college identification to be suitable for voting under SB 824 **93**

Appendix K No-ID lists from the 2014 State Board of Elections, 2014 Department of Justice, and August 2019 State Board of Elections database matching algorithms 97

1 Introduction

1 In the matter of *North Carolina State Conference of the NAACP, et al. v. Alan Hirsch* (No. 1:18-cv-01034), I have written an expert report for the purposes of preliminary injunction,[1] a rebuttal report for the purposes of preliminary injunction,[2] and a supplemental expert report.[3] The materials I relied upon when developing this second supplemental expert report are identified here in footnotes and appendices.

2 This second supplemental report and my three earlier reports in this litigation describe various *no-match lists*. Each no-match list consists of a list of North Carolina registered voters who, as of the time the list was created and based on a particular database matching algorithm, do not possess driver's licenses or other forms of North Carolina Department of Transportation photographic identification sufficient under Senate Bill 824 ("SB 824") for the purposes of voting in North Carolina.[4]

3 This present report and my three earlier reports in this litigation describe not just the raw number of North Carolina registered voters on various no-match lists but also the racial and ethnic breakdown of these individuals. In addition to statewide *no-match rates*—i..e, percentages of all North Carolina registered voters who are on each no-match list—my reports break down these rates by registered voter race and ethnicity. This has allowed—and continues to allow—me to assess the extent to which different racial and ethnic groups in North Carolina are disproportionately present on the various no-match lists considered in my reports.

4 In this second supplemental report, I offer conclusions based on new data and information. These consist of (1) a confidential database of North Carolina registered voters, dated

[1] Preliminary Expert Report of Michael C. Herron for Purposes of Preliminary Injunction, ECF No. 73-11 ("Initial Report"), served on September 16, 2019.

[2] Rebuttal Report of Michael C. Herron for Purposes of Preliminary Injunction ("Rebuttal Report"), served on November 15, 2019.

[3] Supplemental Expert Report of Michael C. Herron ("First Supplemental Report"), served on December 20, 2021.

[4] SB 824 was passed as N.C. Sess. Law 2018-144, *available at* `https://www.ncleg.gov/Sessions/2017/Bills/Senate/PDF/S824v7.pdf` (*last accessed* April 4, 2024).

November 2023 and recently produced by the North Carolina State Board of Elections (hereinafter, the State Board of Elections), (2) a confidential database of North Carolina driver's and other licenses, dated November 2023 and recently produced by the North Carolina Department of Transportation (hereinafter, the Department of Transportation), (3) lists of voters who participated in 2023 and 2024 North Carolina elections after SB 824 was reinstated as of April 2023, having previously been enjoined, and (4) a list of North Carolina registered voters who as of March 4, 2024, have a received free voter identification cards from North Carolina county boards of elections.

5 As part of my work in this litigation, Plaintiffs' Counsel requested that I prepare tables of daily counts of absentee ballot returns in North Carolina in the 2020 general election. Appendix A contains my response to this request.

1.1 Summary of conclusions

6 I use the new data and information in this litigation to create a November 2023 no-match list based on the database matching algorithm implemented by the State Board of Elections in August 2019. My new no-match list is comparable to the August 2019 no-match list produced by the State Board of Elections that I analyzed in my initial report in this litigation. Both of these no-match lists were created using the same database matching algorithm.

7 The November 2023 no-match list I create using the August 2019 State Board of Elections database matching algorithm contains roughly 650,000 registered voters in North Carolina. This represents a statewide no-match rate of roughly 8.84 percent. Therefore, according to the August 2019 State Board of Elections database matching algorithm, roughly 650,000 registered voters in North Carolina—roughly 8.84 percent of all registered voters in the state—do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. This rate

appears in Table 1.

Table 1: Summary of no-match rates, August 2019 database matching algorithm

Group	No-match rate
Statewide	8.84
Black	14.68
White	5.67
Hispanic	10.64
Non-Hispanic	7.60

8 With respect to race, the registered voters on the November 2023 no-match list created using the August 2019 State Board of Elections database matching algorithm are disproportionately Black. In particular, I find that the November 2023 Black no-match rate based on the August 2019 State Board of Elections database matching algorithm, which is defined as the percent of Black registered voters in North Carolina who are on the aforementioned November 2023 no-match list, is roughly 14.68 percent. In contrast, the white November 2023 no-match rate, which is defined as the percent of white registered voters in North Carolina who are on the aforementioned November 2023 no-match list, is roughly 5.67 percent. Thus, based on the algorithm used by the State Board of Elections to create its August 2019 no-match list, I conclude that Black registered voters in North Carolina are roughly 2.6 times more likely, and roughly nine percentage points more likely, to be on the no-match list than are white voters.

9 With respect to ethnicity, the registered voters on the November 2023 no-match list created using the August 2019 State Board of Elections database matching algorithm are disproportionately Hispanic. In particular, I find that the November 2023 Hispanic no-match rate based on the August 2019 State Board of Elections database matching algorithm, which is defined as the percent of Hispanic registered voters in North Carolina who are on the aforementioned November 2023 no-match list, is roughly 10.64 percent. In contrast, the non-Hispanic November 2023 no-match rate, which is defined as the percent of non-Hispanic registered voters in North Carolina who are on the aforementioned November 2023 no-match list, is roughly 7.60

percent. Thus, based on the algorithm used by the State Board of Elections to create its August 2019 no-match list, I conclude that Hispanic registered voters in North Carolina are 1.4 times more likely, and roughly three percentage points more likely, to be on the no-match list than are non-Hispanic voters.

10 The State Board of Elections has asserted that the algorithm it used to create its August 2019 no-match list was designed to be intentionally over-inclusive. In response to this possibility I create what I call a November 2023 *composite no-match list*. This composite no-match list is based on the new data and information in this litigation and on three separate database matching algorithms: (1) the aforementioned August 2019 State Board of Elections database matching algorithm, (2) a database matching algorithm implemented by the State Board of Elections in 2014, and (3) a database matching algorithm implemented by an expert for the United States Department of Justice, also in 2014. My use of the word "composite" in naming my composite no-match list reflects the fact that this no-match list is based on combining the products of three database matching algorithms.

11 The conclusions I draw from the November 2023 composite no-match list are more conservative than the conclusions based on the no-match list produced by the August 2019 State Board of Elections database matching algorithm (and in addition are more conservative than the conclusions from no-match lists produced by the State Board of Elections in 2014 and the Department of Justice in 2014). The North Carolina registered voters on the composite no-match list represent my best, conservative estimate of the set of North Carolina registered voters who, as of November 2023, do not possess driver's licenses or other Department of Transportation-based licenses sufficient under SB 824 for the purposes of voting in North Carolina.

12 The composite no-match list contains roughly 484,000 registered voters in North Carolina who do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. As shown in

Table 1, this corresponds to a statewide no-match rate of roughly 6.63 as of November 2023.

Table 2: Summary of no-match rates based on the composite no-match list

Group	No-match rate
Statewide	6.63
Black	11.80
White	4.15
Hispanic	8.58
Non-Hispanic	5.59

13 With respect to race, the registered voters on the composite no-match list are disproportionately Black; and with respect to ethnicity, the registered voters on the composite no-match list are disproportionately Hispanic. In particular, based on the composite no-match list I conclude that the November 2023 Black no-match rate is roughly 11.80 percent. In contrast, I conclude that the white November 2023 no-match rate is roughly 4.15 percent. Similarly, I conclude that the November 2023 Hispanic no-match rate is roughly 8.58 percent. And, I conclude that the November 2023 non-Hispanic no-match rate is roughly 5.59 percent.

14 According to the composite no-match list, Black registered voters in North Carolina are 2.6 times more likely, and roughly seven percentage points more likely, to be on this list than are white voters. Relatedly, Hispanic registered voters in North Carolina are roughly 1.5 times more likely, and roughly three percentage points more likely, to be on the composite no-match list than are non-Hispanic voters.

15 The statewide no-match rate of roughly 6.63 percent based on the composite no-match list is smaller than the statewide no-match rate of roughly 8.84 percent based on the August 2019 State Board of Elections database matching algorithm. This could reflect the over-inclusive nature of the August 2019 State Board of Elections no-match list. That said, regardless of whether one relies on no-match rates based on the August 2019 no-match list produced by the State Board of Elections or no-match rates based on the November 2023 composite no-match list, I find that

(1) there are hundreds of thousands of registered voters in North Carolina who lack Department of Transportation licenses suitable under SB 824 for voting in North Carolina and (2) there are substantial racial and ethnic disparities in access to Department of Transportation licenses suitable under SB 824 for voting in North Carolina.

16 There are forms of photographic identification beyond Department of Transportation-based licenses that under SB 824 can be used for the purposes of voting in North Carolina. I thus create what I call a *no-ID list* by removing from my composite no-match list six classes of registered North Carolina voters: (1) registered North Carolina voters whom I can identify as living in college residential facilities and thus arguably have access to forms of college identification suitable under SB 824 for the purposes of voting in North Carolina (regardless of whether the forms of identification from these institutions are approved by the State under SB 824); (2) registered voters who voted in the March 2024 primary election in North Carolina, during which SB 824 was in effect; (3) registered voters who voted in a 2023 election in North Carolina held after April 28, 2023, the date on which SB 824 was reinstated after having been previously enjoined, and thus arguably continue to have access to SB 824-permitted forms of identification; (4) registered voters who voted in the 2016 primary election in North Carolina, during which the voter identification provisions of House Bill 589 (2013) were in effect, and thus conceivably continue to have access to SB 824-permitted forms of identification (putting aside the fact there are eight years between 2016 and 2023); (5) registered voters who have received a free voter identification card from a North Carolina county board of elections; and (6) registered voters in North Carolina for whom missing data in official state records make it particularly challenging to assess whether they have access to Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina yet appear, based on partial social security numbers, to have such access.

17 My no-ID list contains roughly 402,000 registered voters. I therefore conservatively conclude that roughly 402,000 registered voters in North Carolina do not possess driver's licenses

or other forms of Department of Transportation photographic identification and may not possess any other forms of identification sufficient under SB 824 for the purposes of voting in North Carolina. My no-ID list is conservative because, among other reasons, it is based on the most conservative no-match list I develop in this report (namely, the composite no-match list) and because it assumes that every registered North Carolina voter who voted in the 2016 primary (which took place roughly eight years before the writing of this report) continues to have an SB 824-acceptable form of identification. Given the conservative nature of the no-ID list, from it I conclude that the number of North Carolina registered voters who lack access to Department of Transportation licenses suitable under SB 824 for voting and for whom no evidence exists that they have additional forms of identification is at a minimum roughly 402,000.

18 With respect to race, the registered voters on the November 2023 no-ID list are disproportionately Black; with respect to ethnicity, the registered voters on the November 2023 no-ID list are disproportionately Hispanic. In particular, I conclude that the Black no-ID rate is roughly 9.97 percent; in contrast, I conclude that the white no-ID rate is roughly 3.26 percent. Similarly, the Hispanic no-ID rate is roughly 7.76 percent; and, the non-Hispanic no-ID rate is roughly 4.47 percent.

19 In the course of my work in this litigation, I have not had access to lists of North Carolina residents who have United States passports, military identification cards, and other federal government forms of identification sufficient under SB 824 for the purposes of voting in North Carolina. However, evidence drawn from the 2020 American National Election Study shows that, within North Carolina, white residents possess passports more often than Black residents. Moreover, evidence produced by an expert for Plaintiffs in *Currie, et al. v. State of North Carolina et al.* (No. 13-CVS-1419), litigation challenging House Bill 589 (2013), found that considering United States passports, military identification cards, and veteran identification cards in an analysis of a no-match list akin to the November 2023 composite no-match list I describe in this

second supplemental report reduces the size of the no-match list by only 0.40 percentage points.[5] This expert found racial gaps in identification possession rates even after accounting for United States passports, military identification cards, and veterans identification cards. It is therefore unlikely that my having had access to lists of federal government identification holders would materially change the contents of my no-ID list and reverse the racial and ethnic disparities in it.

1.2 Comparing this report's conclusions to the conclusions of my previous reports in this litigation

20 The conclusions I draw in this second supplemental expert report, based on both the November 2023 no-match list and November 2023 no-ID list, are qualitatively similar to those that appear in earlier reports that I wrote for the purposes of this litigation.

21 These earlier reports analyze (1) a no-match list created in 2019 by the State Board of Elections using what I call the August 2019 State Board of Elections database matching algorithm and (2) a no-match list I created in 2021 using a confidential voter file produced for this litigation by the State Board of Elections and a confidential Department of Transportation database produced for this litigation by the Department of Transportation (hereinafter, the October 2021 no-match list).

22 Regarding the August 2019 State Board of Elections no-match list, I wrote the following in my First Supplemental Report:

> In my initial expert report [in this litigation, which draws on the [August]2019 State Board of Elections no-match list], I concluded that, "Among all racial groups that are tracked by the State Board of Elections, white registered voters in North Carolina have the lowest no-match rate. This means that, compared to other racial groups, white voters in North Carolina ostensibly have the highest rates of possession of drivers licenses and non-operator identification cards." ¶ 3. I concluded as well that, "Black registered voters in North Carolina have a greater no-match rate than white registered voters. From this it follows that black voters ostensibly have a lower rate of possession

[5] *See* Expert Report of Kevin Quinn, PH.D., dated January 14, 2020, served in *Holmes et al. v. Moore et al.* (18 CVS 15292) ("Quinn Report"), ¶ 51.

> of drivers licenses and non-operator identification cards than do white voters." ¶ 4. And, I found that, "Hispanic registered voters in North Carolina have a greater no-match rate than non-Hispanic registered voters. Thus, Hispanic voters ostensibly have a lower rate of possession of drivers licenses and non-operator identification cards than do non-Hispanic registered voters." ¶ 5.[6]

23 Regarding the October 2021 no-match list, I wrote the following in my First Supplemental Report that was served in December 2021:

> Using [a] record matching algorithm [that connects a confidential State Board of Elections voter file with confidential Department of Transportation data on driver's licenses and other forms of Department of Transportation identification], I identify 667,051 registered voters in North Carolina who have not been issued valid forms of Department of Transportation-administered photographic identification that are sufficient under SB 824 for the purpose of voting. These individuals constitute approximately 9.34 percent of the registered voter pool in North Carolina as of October 2021.[7]

24 Also regarding the October 2021 no-match list, I concluded that the Black no-match rate was roughly 15.88 percent and the white no-match rate, roughly 6.16 percent.[8] I similarly concluded that the Hispanic no-match rate was roughly 13.6 percent and the non-Hispanic rate, 8.06 percent.[9]

25 Thus, in all of the reports I have served in this litigation, including the present second supplemental expert report, I find that, with respect to race, Black registered voters are disproportionately less likely than white registered voters to have access to Department of Transportation forms of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. And with respect to ethnicity, I find across all of the reports I have served in this litigation, including the present second supplemental expert report, that Hispanic registered voters are disproportionately less likely than non-Hispanic registered voters to have

[6] First Supplemental Report, ¶ 6.
[7] *Id.*, ¶ 13(II).
[8] *Id.*, ¶¶ 13(III)-(IV).
[9] *Id.*, ¶¶ 13(V)-(VI).

access to Department of Transportation forms of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina.

1.3 Compensation

26 I am being paid at a rate of $550/hour for work in this litigation, the same rate that I was paid for my work in this litigation that began in 2019. My compensation is contingent neither on the results of the analyses described in this second supplemental expert report nor on the report's contents. My current *curriculum vitae* appears in Appendix B.

2 Database matching and no-match lists

27 The State Board of Elections maintains a confidential database of registered voters in North Carolina; this database is sometimes called a voter file, which is a generic term for a list of the registered voters in a state. The most recent version of the State Board of Elections registered voter database that I have is dated November 2023 and, to the best of my knowledge, the database was produced in that month. *See* Appendix C for details on this database.

28 The North Carolina Department of Transportation maintains a confidential database of driver's and other licenses that have been issued to residents of North Carolina.[10] The most recent version of the Department of Transportation license database that I have is dated November 2023 and, to the best of my knowledge, was produced in that month. *See* Appendix D for details on this database.

29 A fundamental question I address in this report is as follows: how many registered voters who appear in the November 2023 registered voter database lack Department of Transportation photographic licenses sufficient under SB 824 for the purposes of voting in North Carolina? A

[10] My use of "license" throughout this report incorporates both formal licenses and documents.

second fundamental question is, what is the distribution of race and ethnicity among these individuals?

30 To answer these questions, I prepare no-match lists. A no-match list is a list of registered voters in an State Board of Elections registered voter database who cannot be matched to a record in a corresponding Department of Transportation license database and, notwithstanding subtleties associated with the creation of the no-match list, thus can be treated as lacking Department of Transportation identification sufficient under SB 824 for the purposes of voting in North Carolina. As will be clear shortly, of the no-match lists I create, two are particularly important: the first is a no-match list that is based on the algorithm used by the State Board of Elections in August 2019 and the second is a no-match list that is intended to remedy some of the potential limitations in this algorithm.

2.1 The State Board of Elections and the Department of Transportation maintain distinct databases

31 The State Board of Elections and the Department of Transportation are distinct government agencies in North Carolina, and they maintain distinct databases of registered voters and licenses, respectively. A voting-eligible resident of North Carolina can register to vote without having procured a driver's license, or other license, issued by the Department of Transportation. And a resident of North Carolina can, if satisfying Department of Transportation license-eligibility requirements, procure a driver's or other license issued by the Department of Transportation without having registered to vote in North Carolina.

32 Each registered voter in North Carolina has a unique voter identification number. However, voter registration numbers are not part of the Department of Transportation license database.

33 Driver's and other forms of Department of Transportation licenses in North Carolina are associated with unique identifying numbers. However, while driver's license numbers, and

numbers of other Department of Transportation licenses, can be used in the process of voter registration, this is not required.

34 Accordingly, there is no unique, individual-level identifier for which values appear in every record in the State Board of Elections database of registered voters *and* in every record in the Department of Transportation database of driver's and other licenses. Were such a unique, individual-level identifier to exist, linking records in the State Board of Elections database of registered voters to records in the Department of Transportation's database of driver's licenses and other licenses—and thus assessing which registered voters in North Carolina lack Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in the state—could be a relatively straightforward exercise.

2.2 Using matching fields to link the State Board of Elections' registered voter database and the Department of Transportation's license database

35 In the absence of a unique, individual-level identifier for which values appear in every record in the State Board of Elections database of registered voters and in every record in the Department of Transportation's database of driver's and other licenses, linking records across these two databases requires what are called *matching fields*. A single matching field consists of a set of individual-level identifiers that can be created in both the State Board of Elections registered voter database and in the Department of Transportation license database. If a given matching field associated with a registered voter from the State Board of Elections voter database is equal to the same matching field associated with a given license from the Department of Transportation's license database, then one can say that the registered voter can be matched to a driver's, or other, license.

36 For example, a possible matching field used in linking the registered voter database maintained by the State Board of Elections and the Department of Transportation's license database is a concatenation of an individual's first name, last name, birth date, and the last four

digits of the person's social security number. This matching field, which is in fact part of the analysis that follows, can be created for a given registered voter in the State Board of Elections database of registered voters as long as (1) the State Board of Elections database includes fields for first name, last name, birth date, and last four digits of social security number (which it does) and (2) the given registered voter has entries in the database for her first name, her last name, her birth date, and last four digits of her social security number (most, but not all, registered voters do have such entries, as will be clear shortly).

37 A similar statement applies to records in the Department of Transportation database of licenses. Namely, a matching field that is a concatenation of an individual's first name, last name, birth date, and the last four digits of the person's social security number can be created with the Department of Transportation license database if the database contains the requisite four fields (which it does) and if the licenses in the database contain values for these fields (which most do).

38 When matching fields are compared across databases, they either yield positive results (*i.e.*, matches) or negative results (*i.e.*, non-matches). With that as background, the use of a given matching field to connect registered voter records in the State Board of Elections registered voter database with license records in the Department of Transportation license database reflects a tradeoff between the risk of two types of errors: *false positives* and *false negatives*.

39 Putting aside issues of expired and revoked/suspended licenses, to which I turn later, a false positive occurs when a matching field connects a registered voter in the State Board of Elections registered voter database with a license in the Department of Transportation database that does not actually belong to the voter. In contrast, a false negative occurs when a matching field fails to connect a registered voter with a driver's or other license in the Department of Transportation database that actually does belong to the voter.

40 A database matching algorithm—which typically would depend on a collection of matching fields—can lead to excessive numbers of false positives if the matching fields used in the algorithm rely on individual identifiers that are common. As an illustration of this, consider the following example.

41 In the November 2023 State Board of Elections database of registered voters, there are 1,186 voters whose first name is "Michael" and last name is "Smith." And in the November 2023 Department of Transportation database of licenses, there are 2,272 license records associated with the first name of "Michael" and last name of "Smith." Based on a matching field that concatenates first and last names, literally all 1,186 registered voters with the name of "Michael Smith" can therefore be linked to a driver's license. The risk of connecting any particular registered voter named "Michael Smith" with a license associated with the name "Michael Smith" is that the two connected individuals may be different people who simply share a common name. A matching field that consisted solely of concatenated first and last names would risk many false positives and accordingly should not be used in an algorithm that seeks to link registered voter records in the State Board of Elections database of registered voters with license records in the Department of Transportation's license database.

42 The accuracy of a database matching algorithm that links records of registered voters in a State Board of Elections registered voter database to records in a Department of Transportation license database is thus a function of the matching fields that are incorporated in it.

3 Creating a November 2023 no-match list based on the August 2019 State Board of Elections database matching algorithm

43 In August 2019, the North Carolina State Board of Elections implemented a database matching algorithm that sought to link registered voter records in what was then the current State Board of Elections registered voter database with license records in what was then the current

Department of Transportation license database.[11]

3.1 Matching fields in the August 2019 State Board of Elections database matching algorithm

44 The August 2019 State Board of Elections matching algorithm used a set of nine matching fields, producing the August 2019 no-match list. Broadly construed, this list consists of the registered voters whom the State Board of Elections did not match to Department of Transportation license records as of August 2019.[12]

45 I analyzed the contents of the August 2019 no-match list in my Initial Report.[13] And, following the State Board of Elections, I relied on the same nine fields when I created the October 2021 no-match list using confidential voter and license databases produced for this litigation by the State Board of Elections and Department of Transportation, respectively.[14]

46 To maintain consistency with previous database matching procedures used in this litigation, I create a November 2023 version of the August 2019 State Board of Elections no-match list by implementing the August 2019 State Board of Elections database matching algorithm using November 2023 State Board of Elections and Department of Transportation databases, *i.e.*, using the new data and information in the litigation.

47 Table 3, which appears in my December 20, 2021 report (albeit with a different title) describes the matching fields used by the State Board of Elections in its August 2019 database matching algorithm.[15] Each matching field is described in one of the table's nine rows.

[11] *See* Affidavit of Brian Neesby, Chief Information Officer for the North Carolina State Board of Elections ("Neesby Affidavit") (October 30, 2019), ¶ 8 ("To perform this task, we used the voter registration database as of August 24, 2019 and the DMV database of the same date").

[12] The August 2019 database matching exercise carried out by the State Board of Elections was mandated by SB 824 ("The State Board [of Elections] is directed to create a list containing all registered voters of North Carolina who are otherwise qualified to vote but do not have a North Carolina drivers license or other form of identification containing a photograph issued by the Division of Motor Vehicles of the Department of Transportation, as of September 1, 2019"). Part I, § 1.5(b).

[13] *See* Initial Report, ¶ 1.

[14] First Supplemental Report, ¶¶ 9, 14-15.

[15] *Id.* at 10, Table 1.

Table 3: Matching fields used by the State Board of Elections in August 2019

	Name			Soundex			
Field	First	Middle	Last	Last	SSN4	DOB	License
1	✓		✓		✓	✓	
2		✓	✓		✓	✓	
3	✓			✓	✓	✓	
4		✓		✓	✓	✓	
5	✓	✓	✓		✓		
6	✓	✓	✓			✓	
7	✓	✓		✓	✓		
8	✓	✓		✓		✓	
9							✓

Note: SSN4 denotes the last four digits of an individual's social security number; and, DOB denotes an individual's birth date.

48 For example, the first matching field in Table 3 consists of voter's first name, last name, the last four digits of the voter's social security number, and the voter's date of birth. The order of the nine fields in Table 3 is not of any consequence.

3.2 Voter names versus Soundex name equivalents

49 Corresponding to the last name column in Table 3 is a column for Soundex last name. A registered voter's Soundex last name is a phonetic coding of the person's last name that reflects the sounds of the initial letters of the name (and, in principle, similarly for a registered voter's first name). For example, the Soundex coding of "Michael" is identical to the Soundex coding of "Mychal." Similarly, the Soundex coding of "Smith" is identical to the Soundex coding of "Smyth," which is also identical to the Soundex coding of "Smythe." When incorporating Soundex last names in a database matching algorithm, matching fields allow for minor spelling discrepancies and alternative name spellings across databases.

3.3 Implementing the August 2019 State Board of Elections database matching algorithm

50 Having described the nine matching fields that make up the August 2019 State Board of Elections database matching algorithm, I now carry out the following steps.

3.3.1 Step 1: create matching fields in the State Board of Elections database

51 Using the November 2023 State Board of Elections database on registered voters in North Carolina, I create the nine matching fields listed in Table 3.[16]

3.3.2 Step 2: create matching fields in the Department of Transportation license database

52 Using the November 2023 Department of Transportation database on driver's and other licenses issued to residents of North Carolina, I create the same nine matching fields listed in Table 3. In this step, I disregard suspended or revoked licenses because, per the State Board of Elections, these are not valid for the purposes of voting in North Carolina.[17]

3.3.3 Step 3: checking for matches

53 I identify all registered voters in North Carolina as of November 2023 for whom at least one of the nine State Board of Elections matching fields in the November 2023 State Board of Elections database is equivalent to a corresponding matching field in the November 2023 Department of Transportation database.

54 A match from a registered voter in the State Board of Elections database to a driver's or other license in the Department of Transportation license database is only meaningful under SB 824 if the license is unexpired based on the voter's age. The license expiration rules of SB 824 are as follows.

[16] When I say here that I create a matching field, what I mean is that I concatenate the constituent variables in a field, ensure that all letters are upper case, and remove white space and other non-alphanumeric characters. I do this for all matching fields in Table 3 and for the additional matching fields discussed later. This sort of standardization is common in database matching exercises.

[17] *See* North Carolina State Board of Elections, "Numbered Memo 2023-03," (February 23, 2024), *available at* `https://s3.amazonaws.com/dl.ncsbe.gov/sboe/numbermemo/2023/Numbered%20Memo%202023-SB~82403%20Photo%20ID%20and%20In-SB~824Person%20Voting.pdf` (*last accessed* March 16, 2024).

To identity suspended or revoked licenses, I consult the "Driver Status Codes" that are part of the Department of Transportation license database Status File. See Appendix D for details on this file. I treat the following codes as indicating a suspended or revoked license: "D" (medical cancellation), "4" (canceled), "6" (transfered-suspended), "7" (suspended), "8" (denied), and "9" (90 day renewal denied). If a single license has one ore more of these codes and also is associated with a code of "1" (active), then I conservatively treat the license as not suspended or revoked.

55 For a registered voter 65 years and older, an otherwise valid (*e.g.*, not suspended) license can under SB 824 be used for the purposes of voting in North Carolina if the license was unexpired as of the registered voter's 65th birthday.[18] For voters up to 65 years old, an otherwise valid license can under SB 824 be used for the purposes of voting in North Carolina if the license is unexpired or has been expired for at most one year.[19]

56 Temporarily putting aside the matter of registered voters who appear deceased based on license records, a subject which I address immediately below, this defines a set of registered voters in North Carolina for whom none of the nine matching fields used in the August 2019 State Board of Elections matching algorithm can be associated with corresponding matching fields in the November 2023 Department of Transportation database. I call this the November 2023 no-match list based on the August 2019 State Board of Elections database matching algorithm.

3.4 Registered voters linked to deceased license records

57 In the process of using the nine matching fields defined in Table 3 to link registered voters in the November 2023 State Board of Elections database to license records in the November 2023 Department of Transportation database, I identify some registered voters who are linked to license records that, according to the Department of Transportation, are themselves associated with deceased individuals. I treat registered voters of this type as deceased. I do not include voters I identify as deceased in subsequent calculations.

[18] "Any expired form of identification allowed in this subsection presented by a voter having attained the age of 65 years at the time of presentation at the voting place, provided that the identification was unexpired on the voter's sixty-fifth birthday." N.C. Gen. Stat § 163-166.16(a)(3).

[19] "Any of the following that is valid and unexpired, or has been expired for one year or less." *Id.*, § 163-166.16(a)(1). To the best of my knowledge, the November 2023 Department of Transportation license database was produced on November 17, 2023. For a registered voter 65 years or older, I determine a given license expiration's status by comparing the license's expiration date with the voter's birth date plus 65 years; if the license's expiration date is on this date or after, I say that the license can be used under SB 824 for the purposes of voting in North Carolina. For a registered voter not yet 65 years of age, I determine a given license expiration's status by comparing the license's expiration date with November 17, 2022; if the expiration date is this date or after, I say that the license can be used under SB 824 for the purposes of voting in North Carolina.

58 The State Board of Elections regularly cancels the registrations of voters for whom there is evidence that they are deceased. As shown in Appendix E, of the 1,077,501 voter registration cancelations in North Carolina that are listed in the public January 20, 2024 State Board of Elections registered voter database, identifying a registered voter as deceased is the most common reason for registration cancellation.[20]

3.5 Matching rates by matching field

59 Table 4 lists the nine matching fields used in the August 2019 State Board of Elections database matching algorithm.

Table 4: Match rate across matching fields used in the August 2019 State Board of Elections database matching algorithm

Field	Deceased	Matched	% Matched
1	13,319	6,389,396	87.0321
2	10,963	5,559,042	75.6973
3	13,007	6,233,956	84.9112
4	10,686	5,449,554	74.2036
5	13,453	5,552,786	75.6378
6	12,039	5,719,657	77.8958
7	14,097	5,443,085	74.1500
8	11,751	5,605,754	76.3416
9	13,411	6,263,241	85.3148

60 For each matching field, the table reports the number of matches from a registered voter to a license record that, according to the Department of Transportation, is associated with a deceased license holder ("Deceased"); the number of matches from a registered voter to a license record that, according to the Department of Transportation, is not associated with a deceased license holder ("Matched"); and the percent of non-deceased registered voters who are matched by the field ("% Matched").

[20] Appendix C describes the November 2023 State Board of Elections registered voter database that I use in developing no-match lists in this report. This database is confidential. The State Board of Elections maintains a publicly available registered voter database that does not include all of the fields present in confidential voter databases.

61 Table 4 shows that, while each matching field is identified with some deceased license holders, the number of such individuals is low compared to the number of corresponding matches. Moreover, the table shows that each matching field in the August 2019 State Board of Elections database matching algorithm matches millions of registered voters. Finally, the variability in the matching rates across the nine matching fields in Table 4 illustrates why multiple matching fields are needed in a database matching algorithm.

3.6 The November 2023 no-match list based on the August 2019 State Board of Elections database matching algorithm

62 Table 5 summarizes the composition of the November 2023 no-match list based on the August 2019 State Board of Elections matching algorithm. Racial and ethnic breakdowns are in the lower two panels of this table.

Table 5: November 2023 no-match rates, State Board of Elections 2019 database matching algorithm

Group	Voters	No-match	% No-match
Statewide	7,335,037	648,518	8.84
Race			
White	4,765,160	270,041	5.67
Black	1,467,415	215,484	14.68
Unknown race	628,926	117,668	18.71
Other	260,020	19,802	7.62
Asian	120,809	8,703	7.20
American Indian / Alaska Native	53,649	9,234	17.21
Two or more races	38,385	7,379	19.22
Native Hawaiian / Pacific Islander	673	207	30.76
Ethnicity			
Not Hispanic	5,081,480	386,147	7.60
Unknown ethnicity	1,973,875	232,611	11.78
Hispanic	279,682	29,760	10.64

Note: drops 19,705 voters matched to deceased license records.

3.6.1 The statewide no-match rate

63 Applying the August 2019 State Board of Elections matching algorithm to the November 2023 State Board of Elections and Department of Transportation registered voter and license databases, respectively, identifies roughly 649,000 registered voters in North Carolina who do not possess driver's licenses or other forms of Department of Transportation-associated photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. This corresponds to a statewide no-match rate of 8.84 percent. In my opinion, roughly 649,000 is a plausible, and thus potentially reachable, upper bound on the number of registered voters in North Carolina who do not possess a Department of Transportation license suitable under SB 824 for voting in the state.

64 In my Initial Report, I analyzed the no-match list produced by the State Board of Elections when it applied its August 2019 database matching algorithm to August 2019 State Board of Elections and Department of Transportation voter and license databases, respectively.[21] According to this no-match list, the statewide no-match rate is approximately 8.1 percent. I thus conclude that statewide no-match rates produced by applying the August 2019 algorithm to (1) August 2019 and (2) November 2023 voter and license databases from North Carolina are qualitatively similar.

65 Between September 2019 and November 2023, the electorate in North Carolina has become less white; this is shown in Table 6. While the Black percentage of the North Carolina electorate dropped roughly 1.7 percentage points between these years, the white percentage dropped roughly 2.6 percentage points.[22]

[21] See Initial Report, ¶ 1.

[22] These figures are based on the September 2019 publicly available voter file that I used in my Initial Report and the November 2023 State Board of Elections registered voter database.

Table 6: Racial composition of the North Carolina electorate, September 2019 and November 2023

Race	Voters, 2019	Percent, 2019	Voters, 2023	Percent, 2023
Black	1,458,745	21.70	1,472,537	20.02
White	4,543,251	67.59	4,776,832	64.95
Other race	719,583	10.71	1,105,373	15.03
Total	6,721,579	100.00	7,354,742	100.00

66 Similarly, between September 2019 and November 2023, the electorate in North Carolina has become more Hispanic; this is shown in Table 7.[23]

Table 7: Ethnic composition of the North Carolina electorate, September 2019 and November 2023

Ethnicity	Voters, 2019	Percent, 2019	Voters, 2023	Percent, 2023
Hispanic	198,391	2.95	279,902	3.81
Not Hispanic	5,111,544	76.05	5,095,485	69.28
Unknown ethnicity	1,411,644	21.00	1,979,355	26.91
Total	6,721,579	100.00	7,354,742	100.00

67 Given racial and ethnic changes in the North Carolina electorate, I should not expect statewide no-match rates to be constant across 2019 and 2023. In particular, insofar as Black and Hispanic no-match rates are greater than white and non-Hispanic no-match rates, respectively and as shown below, the evolution of the North Carolina electorate may explain the change in statewide no-match rates in North Carolina from September 2019 to November 2023, holding fixed the August 2019 State Board of Elections database matching algorithm.

3.6.2 No-match rates based on race

68 For each race group listed in Table 5, I calculated a race-based no-match rate by dividing the number of non-matched registered voters in the race group by the total number of registered voters of the group not identified by the 2019 State Board of Elections database matching algorithm as deceased, and then multiplying by 100. I carry out the same calculations for each ethnicity group in Table 5. It is important to divide counts of non-matched registered voters in race and ethnicity

[23]The figures in Tables 6 and 7 are based on the September 2019 publicly available North Carolina voter file that I used in my Initial Report and the November 2023 State Board of Elections registered voter database.

groups by race and ethnicity group sizes, respectively, because these groups vary in size. On this particular point, see the racial and ethnic breakdown of the November 2023 North Carolina voter pool in Appendix C.[24]

69 As shown in Table 5, the Black no-match rate based on applying the August 2019 State Board of Elections database matching algorithm to November 2023 State Board of Elections and Department of Transportation databases is approximately 14.68 percent. This figure is 2.6 times as large as the corresponding white no-match rate of 5.67 percent.

70 My Initial Report analyzed the no-match list produced by the State Board of Elections when it applied its August 2019 database matching algorithm to August 2019 State Board of Elections and Department of Transportation registered voter and license databases, respectively.[25] This report broke down its findings by race, and in particular I found a Black no-match rate of roughly 10.6 percent and a white no-match rate of roughly 6.5 percent. This corresponds to a Black-to-white ratio in no-match rates of roughly 1.6.[26]

71 Holding fixed the State Board of Elections August 2019 database matching algorithm, I now consider how Black and white no-match rates vary based on use of August 2019 registered voter and license databases versus November 2023 registered voter and license databases.

72 I note to start that 14.68 percent is greater than 10.6 percent. This means that the August 2019 State Board of Elections database matching algorithm applied to November 2023 databases returns a Black no-match rate that is *greater* than the August 2019 State Board of Elections database matching algorithm applied to August 2019 databases. I note as well that 5.67 percent is less than 6.5 percent. This means that State Board of Elections August 2019 database

[24]The ethnicity categories in the November 2023 State Board of Elections registered voter database are: "HISPANIC OR LATINO," "UNDESIGNATED", and "HISPANIC or NOT LATINO." In this report, I sometimes use the word "unknown" in place of "undesignated' when referring to registered voters who are neither characterized as Hispanic or not Hispanic.

[25]Initial Report, ¶ 1.

[26]*Id.* at 21, Table 3.

matching algorithm applied to November 2023 databases returns a white no-match rate that is *less* than the State Board of Elections August 2019 database matching algorithm applied to August 2019 databases).

73 Therefore, holding fixed an underlying database matching algorithm, between August 2019 and November 2023, the Black no-match rate increased while the white no-match rate decreased. This explains the August 2019 to November 2023 increase in the ratio of Black-to-white no-match rates of 1.6 to 2.6.

3.6.3 No-match rates based on ethnicity

74 According to Table 5, I find a Hispanic no-match rate of 10.64 percent when applying the August 2019 State Board of Elections database matching algorithm to November 2023 voter and license databases. This figure is roughly 1.4 times as large as the non-Hispanic no-match rate of 7.6 percent.

75 When in my Initial Report I analyzed the no-match list produced by the State Board of Elections when it applied its August 2019 database matching algorithm to August 2019 State Board of Elections and Department of Transportation registered voter and license databases, respectively, I found a Hispanic no-match rate of roughly 11.1 percent and a non-Hispanic no-match rate of roughly 5.7 percent.[27] This corresponded to a Hispanic-to-non-Hispanic ratio in no-match rates of roughly 1.9.

76 Therefore, holding fixed the database matching algorithm, the Hispanic no-match rate decreased between August 2019 and November 2023 while the non-Hispanic no-match rate increased. This explains the August 2019 to November 2023 decrease in the ratio of Hispanic-to-non-Hispanic no-match rates of 1.9 to 1.4

[27] Initial Report at 25, Table 5.

3.7 A recent University of Maryland finds that almost nine percent of Americans lack driver's licenses

77 To contextualize my finding that, based on the August 2019 State Board of Elections database matching algorithm, roughly 8.84 percent of registered North Carolina voters lack Department of Transportation licenses suitable for voting in North Carolina, I compare this percentage to a similar percentage found in a recent University of Maryland study.

78 Namely, in a national study of access to voter identification released in January 2024, scholars at the University of Maryland concluded that slightly less than nine percent of Americans do not have a non-expired driver's license. This figure is close to, albeit slightly larger than, the statewide no-match rate I find when applying the August 2019 State Board of Elections database matching algorithm to November 2023 registered voter and licenses databases. Beyond the nine percent figure, the University of Maryland scholars also write that, "Another 12% (28.6 million) [of the individuals they sampled] have a non-expired license, but it does not have both their current address and current name."[28]

79 Barreto, Nuño and Sanchez (2009), in a study of Indiana voters, found that 13.3 percent of survey respondents lacked either a driver's license or a state-issued form of identification. This figure is substantially greater than the no-match rate of 8.84 percent, which incorporates both driver's licenses and other Department of Transportation forms of identification.

4 Expanding the set of matching fields

80 The nine matching fields used by the State Board of Elections in its August 2019 matching algorithm were described by Brian Neesby, Chief Information Officer for the North Carolina State

[28] *See* Jillian Andres Rothschild, Samuel B. Novey, and Michael J. Hanmer, "Who Lacks ID in America Today? An Exploration of Voter ID Access, Barriers, and Knowledge," *Center for Democracy and Civic Engagement, University of Maryland*, January 2024, *available at* `https://cdce.umd.edu/sites/cdce.umd.edu/files/pubs/Voter%20ID%202023%20survey%20Key%20Results%20Jan%202024%20(1).pdf` (*last accessed* March 15, 2024).

Board of Elections, as "likely" having produced an excessive number of false negatives. This, according to Mr. Neesby, was by design, and it suggests that the 2019 no-match list produced by the State Board of Elections may include some individuals who do have Department of Transportation licenses suitable under SB 824 for the purposes of voting in North Carolina.[29]

81 Ansolabehere and Hersh (2017) show that database matching using address, birth date, gender, and name is very accurate.[30] The August 2019 State Board of Elections database matching algorithm does not include any address fields and also does not include gender, possibly because the Department of Transportation license database does not contain a field for gender.[31]

82 Putting aside gender on the grounds that it is unavailable, I conclude from Ansolabehere and Hersh that it is preferable to use aspects of individuals' addresses in matching, and I note that addresses are not part of the nine August 2019 State Board of Elections matching fields. I note as well that these fields include Soundex last names for the reasons noted above but not Soundex first names. Minor spelling discrepancies and alternative name spellings can appear in first names as well as in last names, as evident in the examples I provided when discussing Soundex (*i.e.*, "Michael" versus "Mychal.")

83 In the course of critiquing the nine matching fields in the August 2019 State Board of Elections database matching algorithm, Dr. Janet R. Thornton, an expert for the Legislative Defendants in this litigation, proposed two alternative sets of matching fields.[32] First, she

[29] *See* Neesby Affidavit, ¶ 10 ("The actual number of North Carolina voters who lack DMV-issued ID is likely smaller than the distribution we created [using this algorithm]").

[30] Ansolabehere and Hersh were able to ascertain this using the fact that the databases they were comparing included full social security numbers. This allowed them to match records using address, birth date, gender, and name and then compare social security numbers – and vice versa. Ansolabehere and Hersh write that this feature of their databases "allowed [them] to determine that 98% of records that matched to [social security numbers] also matched using some combination of three of A [address], D [birth date], G [gender], and N [name]. Similarly, 98% of those that matched using ADGN [address-birth date-gender-name] were subsequently matched using [complete social security numbers]. Inspection of the data after matching reveal only a small percent of false positives" (p. 2).

[31] A variable for gender is not part of the Department of Transportation license databases that have been disclosed to me as part of this litigation, but at the same time gender appears to be an element of Department of Transportation record keeping. *See* North Carolina Department of Transportation, "Sex Designation Form," *available at* `https://www.ncdot.gov/dmv/downloads/Documents/DL-SB~824300.pdf` (*last accessed* April 3, 2024).

[32] *See* Response Report of Janet R. Thornton, Ph.D., ECF No. 96-10 ("Thornton Report").

proposed a set of 29 matching fields used previously by the State Board of Elections in a database matching algorithm it implemented in 2014.[33] And second, Dr. Thornton proposed a set of 19 matching fields used by an expert on behalf of the United States Department of Justice in a database matching algorithm also implemented in 2014.[34] Hereinafter, I refer to these sets of 29 and 19 fields as the *2014 State Board of Elections* matching fields and the *2014 Department of Justice* matching fields, respectively.[35]

84 As exemplified by the fact that different matching fields have been used in different database matching algorithms applied to North Carolina voter and license data, there is no universal consensus among scholars about which matching fields are the exact ones to use in a database matching exercise. Using too few fields can risk an excessive number of false negatives; using too many fields can risk false positives. Key to any database matching exercise is the weight placed on false negatives and false positives and the extent to which any particular matching field is prone to leading to either type of error.

4.1 Matching fields from the algorithms used in 2014 and 2019

85 There are 48 unique matching fields across the 2014 State Board of Elections, 2014 Department of Justice, and August 2019 State Board of Elections database matching algorithms. These are described in Table 8, which by design also includes the nine matching fields in Table 3.

86 For example, the first of 48 matching fields appearing in Table 8 was used in both the 2014 State Board of Elections and 2014 Department of Justice database matching algorithms. This is evident in the placement of asterisks in the top row of the table. According to this row's

[33] *Id.*, ¶ 21.
[34] *Id.*, ¶ 22.
[35] The Department of Justice expert referenced by Dr. Thornton is Dr. Charles Stewart, III. Although the results of Dr. Stewart's database matching algorithm are contained in a declaration served on February 18, 2015, they analyze State Board of Elections and Department of Transportation databases as of 2014. *See* Thornton Report, Table 3 ("Matching Criteria used by DOJ's Expert, Dr. Charles Stewart, to Identify Registered Voters Potentially Without a DMV-Issued Identification in 2014.") I thus invoke the year 2014 in my discussion of the Department of Justice database matching algorithm.

Table 8: Matching fields used in the 2014 State Board of Elections, 2014 Department of Justice, and August 2019 State Board of Elections database matching algorithms

	SBE	DOJ	SBE	First		Name		Soundex							House
Field	2014	2014	August 2019	Initial	First	Middle	Last	First	Last	SSN4	DOB	License	Zip	Address	Number
1	*	*			✓		✓					✓			
2	*	*			✓		✓			✓					
3	*						✓	✓				✓			
4	*						✓	✓		✓					
5	*	*			✓				✓			✓			
6	*				✓				✓	✓					
7	*							✓	✓			✓			
8	*	*									✓	✓			
9	*											✓	✓	✓	
10	*											✓		✓	
11	*											✓	✓		
12	*	*					✓					✓			
13	*				✓							✓			
14	*								✓			✓			
15	*							✓				✓			
16	*	*	*									✓			
17	*									✓	✓		✓	✓	
18	*									✓	✓			✓	
19	*				✓		✓				✓		✓	✓	
20	*						✓	✓			✓		✓	✓	
21	*				✓		✓				✓		✓		
22	*						✓	✓			✓		✓		
23	*	*			✓		✓				✓				
24	*						✓	✓			✓				
25	*						✓				✓		✓		
26	*								✓		✓		✓		
27	*									✓	✓		✓		
28	*									✓			✓	✓	
29	*									✓				✓	
30			*		✓		✓			✓	✓				
31			*			✓	✓			✓	✓				
32		*	*		✓				✓	✓	✓				
33			*			✓			✓	✓	✓				
34			*		✓	✓	✓			✓					
35			*		✓	✓	✓				✓				
36			*		✓	✓			✓	✓					
37			*		✓	✓			✓		✓				
38		*			✓		✓						✓		✓
39		*			✓				✓	✓			✓		✓
40		*			✓				✓		✓		✓		✓
41		*		✓			✓					✓			
42		*		✓			✓			✓	✓				
43		*		✓			✓			✓			✓		✓
44		*		✓			✓				✓		✓		✓
45		*					✓			✓	✓				
46		*					✓			✓			✓		✓
47		*					✓				✓		✓		✓
48		*								✓	✓				

Note: SSN4 denotes the last four digits of a social security number; DOB denotes birth date.

checkmarks, the matching field consists of an individual's first name, last name, and driver's license number.

87 Field 48, the last field in Table 8, was used only in the 2014 Department of Justice database matching algorithm. This field consists of an individual's last four digits of his or her social security number and the individual's birth date.

4.2 Missingness and uniqueness of matching fields

88 In the November 2023 State Board of Elections registered voter database, not all of the 7,354,742 registered voters have values for every field in the database. Of these individuals, for example, 25 are missing last names. When a field has missing values for a set of registered voters, a matching field that depends on the field cannot be created for these individuals. Therefore, for 25 registered voters in the November 2023 State Board of Elections registered voter database, all matching fields that involve last name cannot be created. When a given matching field cannot be created for a given registered voter in the November 2023 State Board of Elections database of registered voters (or a given license in the November 2023 Department of Transportation database of licenses), I say that the matching field itself is missing for this voter (or for this license record).

89 For the 48 matching fields across the 2014 State Board of Elections, 2014 Department of Justice, and August 2019 State Board of Elections database matching algorithms, Table 9 reports the number of individuals in the November 2023 registered voter database for whom requisite fields are available, meaning that the matching field is itself not missing ("Non-missing"); the number of unique, non-missing values of the matching field ("Unique"); the percent missing ("% Missing"); and, of the non-missing matching fields, the percent unique ("% Unique").

90 For example, the first matching field, which as noted earlier consists of an individual's first name, last name, and driver's license number, can be calculated for 6,577,448 registered voters in the November 2023 registered voter database. Insofar as there are 7,354,742 voters in this database, this implies that the percent missing for the first matching field of the 48 such fields in Table 9 is roughly 10.6 percent.

Table 9: Features of matching fields in the November 2023 North Carolina registered voter database

Field	Non-missing	Unique	% Missing	% Unique
1	6,577,448	6,577,401	10.5686	99.9993
2	6,925,623	6,918,410	5.8346	99.8959
3	6,577,448	6,577,393	10.5686	99.9992
4	6,925,623	6,912,709	5.8346	99.8135
5	6,577,448	6,577,392	10.5686	99.9991
6	6,925,623	6,909,153	5.8346	99.7622
7	6,577,448	6,577,384	10.5686	99.9990
8	6,577,536	6,577,450	10.5674	99.9987
9	6,577,287	6,577,230	10.5708	99.9991
10	6,577,536	6,577,478	10.5674	99.9991
11	6,577,287	6,577,220	10.5708	99.9990
12	6,577,516	6,577,452	10.5677	99.9990
13	6,577,468	6,577,340	10.5683	99.9981
14	6,577,516	6,577,443	10.5677	99.9989
15	6,577,468	6,577,331	10.5683	99.9979
16	6,577,536	6,577,377	10.5674	99.9976
17	6,925,444	6,923,950	5.8370	99.9784
18	6,925,715	6,924,219	5.8333	99.9784
19	7,354,317	7,353,659	0.0058	99.9911
20	7,354,317	7,353,012	0.0058	99.9823
21	7,354,317	7,353,298	0.0058	99.9861
22	7,354,317	7,352,386	0.0058	99.9737
23	7,354,613	7,345,595	0.0018	99.8774
24	7,354,613	7,339,754	0.0018	99.7980
25	7,354,421	7,330,696	0.0044	99.6774
26	7,354,421	7,319,965	0.0044	99.5315
27	6,925,444	6,922,938	5.8370	99.9638
28	6,925,444	6,922,685	5.8370	99.9602
29	6,925,715	6,922,916	5.8333	99.9596
30	6,925,623	6,924,641	5.8346	99.9858
31	6,435,365	6,434,487	12.5005	99.9864
32	6,925,623	6,924,683	5.8346	99.9864
33	6,435,365	6,434,528	12.5005	99.9870
34	6,435,341	6,433,987	12.5008	99.9790
35	6,784,753	6,782,017	7.7500	99.9597
36	6,435,341	6,433,910	12.5008	99.9778
37	6,784,753	6,781,055	7.7500	99.9455
38	7,354,317	7,308,337	0.0058	99.3748
39	6,925,352	6,925,087	5.8383	99.9962
40	7,354,317	7,353,055	0.0058	99.9828
41	6,577,448	6,577,388	10.5686	99.9991
42	6,925,623	6,924,161	5.8346	99.9789
43	6,925,352	6,924,963	5.8383	99.9944
44	7,354,317	7,348,723	0.0058	99.9239
45	6,925,693	6,923,905	5.8336	99.9742
46	6,925,422	6,924,625	5.8373	99.9885
47	7,354,421	7,338,714	0.0044	99.7864
48	6,925,715	6,827,886	5.8333	98.5875

91 Of the 6,577,448 registered voters in the November 2023 registered voter database who have values for the first matching field, there are 6,577,401 unique values. Therefore, the percentage of unique values for the first matching field is very close to 100. This is important because non-unique matching fields can lead to false positives, as the earlier "Michael Smith" example illustrated.

92 The uniqueness rates in Table 9 are all very close to 100 percent. This means that an algorithm combining many of the fields is unlikely to suffer from a large number of false positives.

4.3 Linking the State Board of Elections registered voter and Department of Transportation license databases

93 Parallel to my presentation of the August 2019 State Board of Elections database matching algorithm, to implement a database matching algorithm that uses the 48 fields in Table 8 to link the State Board of Elections voter registration database and the Department of Transportation license database, I carry out the following three steps.

4.3.1 Step 1: create matching fields in the State Board of Elections database

94 Using the November 2023 State Board of Elections database on registered voters in North Carolina, I create the 48 matching fields listed in Table 8.

4.3.2 Step 2: create matching fields in the Department of Transportation license database

95 Using the November 2023 Department of Transportation database on driver's and other licenses issued to residents of North Carolina, I create the 48 matching fields listed in Table 8. As before, I disregard suspended or revoked licenses because under SB 824 they are not valid for the purposes of voting in North Carolina.[36]

[36] *See* fn. 17.

4.3.3 Step 3: checking for matches

96 I identify all registered voters in North Carolina for whom at least one of the 2014 State Board of Elections matching fields in the November 2023 State Board of Elections database is equivalent to a corresponding matching field in the November 2023 Department of Transportation database. I do the same for the 2014 Department of Justice matching fields and the August 2019 State Board of Elections matching fields.

97 As in procedures that created the November 2023 no-match list based on the August 2019 State Board of Elections database matching algorithm, a match from a registered voter in the November 2023 State Board of Elections database to a driver's or other license in the Department of Transportation November 2023 license database is only meaningful under SB 824 if the license is unexpired based on the voter's age.

98 These three steps define two news sets of registered voters in North Carolina for whom none of a set of matching fields in the November 2023 registered voter database can be associated with corresponding matching fields in the November 2023 Department of Transportation database. These two sets define two corresponding no-match lists, one based on the 2014 State Board of Elections database matching algorithm and one based on the 2014 Department of Justice database matching algorithm.

99 Finally, I create a *composite no-match list*, which is a no-match list that is the intersection of the 2014 State Board of Elections, the 2014 Department of Justice, and the August 2019 State Board of Elections no-match lists. In particular, I say that a registered voter is on the composite no-match list if the registered voter is on the 2014 State Board of Elections no-match list *and* the 2014 Department of Justice no-match list *and* the August 2019 State Board of Elections no-match list.

4.4 Matching rates by matching field

Table 10: Match rate across matching fields

Field	Deceased	Matched	% Matched
1	12,607	6,170,424	84.0413
2	24,054	6,386,359	87.1181
3	12,656	6,157,618	83.8674
4	26,461	6,354,099	86.7065
5	12,292	6,015,970	81.9341
6	22,778	6,206,164	84.6453
7	12,342	6,004,434	81.7775
8	12,930	6,251,181	85.1449
9	8,868	4,708,112	64.0919
10	8,913	4,723,126	64.2967
11	11,654	5,729,686	78.0283
12	12,986	6,205,009	84.5167
13	12,997	6,226,541	84.8101
14	12,672	6,049,751	82.3984
15	13,049	6,213,873	84.6381
16	13,411	6,263,241	85.3148
17	9,019	4,847,206	65.9868
18	9,063	4,862,820	66.1997
19	9,607	4,956,788	67.4840
20	9,707	4,953,902	67.4456
21	13,016	6,071,542	82.6991
22	13,163	6,067,190	82.6415
23	15,420	6,646,016	90.5535
24	15,607	6,628,796	90.3212
25	14,073	6,091,781	82.9867
26	13,810	5,934,846	80.8459
27	14,488	5,914,438	80.5754
28	16,911	4,857,192	66.1938
29	17,874	4,872,734	66.4144
30	13,319	6,389,396	87.0321
31	10,963	5,559,042	75.6973
32	13,007	6,233,956	84.9112
33	10,686	5,449,554	74.2036
34	13,453	5,552,786	75.6378
35	12,039	5,719,657	77.8958
36	14,097	5,443,085	74.1500
37	11,751	5,605,754	76.3416
38	15,426	5,761,006	78.4951
39	10,818	5,486,119	74.7028
40	11,782	5,694,946	77.5565
41	12,848	6,198,815	84.4307
42	13,707	6,421,031	87.4677
43	11,486	5,647,404	76.9060
44	12,561	5,872,038	79.9768
45	15,098	6,427,641	87.5743
46	13,751	5,653,138	77.0078
47	12,961	5,869,145	79.9417
48	13,920	6,180,798	84.1976

100 Table 10 lists the 48 matching fields used to create the composite no-match list. For each matching field, the table reports the number of matches from a registered voter to a license record that, according to the Department of Transportation, is associated with a deceased license holder ("Deceased"); the number of matches from a registered voter to a license record that, according to the Department of Transportation, is not associated with a deceased license holder ("Matched"); and the percent of non-deceased registered voters who are matched by the field ("% Matched").

101 I earlier presented a version of Table 10 when describing the August 2019 State Board of Elections database matching algorithm. As in the earlier discussion, I note that Table 10 highlights the relatively small number of connections between registered voters and deceased license holders and the reason that database matching benefits from multiple matching fields.

5 Analysis of the composite no-match list

102 The composite no-match list is the intersection of three no-match lists generated using November 2023 voter registration and license databases: a no-match list that uses the matching fields in the 2014 State Board of Elections database matching algorithm (described in Appendix H), a no-match list that uses the matching fields in the 2014 Department of Justice database matching algorithm (described in Appendix I), and a no-match list that uses the matching fields in the 2019 State Board of Elections database matching algorithm (described earlier in this report). As an intersection of three lists, the composite no-match list is more conservative than each of its three individual component lists.

103 The contents of the composite no-match list are described in Table 11.

104 According to Table 11, there are roughly 484,000 registered voters in North Carolina who do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. This is

Table 11: November 2023 no-match rates, based on composite no-match list

Group	Voters	No-match	% No-match
Statewide	7,297,901	484,070	6.63
Race			
White	4,745,170	196,809	4.15
Black	1,457,394	171,962	11.80
Unknown race	623,057	79,795	12.81
Other	259,652	16,146	6.22
Asian	120,697	6,509	5.39
American Indian / Alaska Native	53,083	6,438	12.13
Two or more races	38,180	6,251	16.37
Native Hawaiian / Pacific Islander	668	160	23.95
Ethnicity			
Not Hispanic	5,054,876	282,401	5.59
Unknown ethnicity	1,963,824	177,700	9.05
Hispanic	279,201	23,969	8.58

Note: drops 56,841 voters matched to deceased license records.

equivalent to a statewide no-match rate of approximately 6.63 percent.

105 There is substantial racial variability in no-match rates in the composite no-match list. The Black no-match rate of 11.8 percent is 2.84 times the white no-match rate of 4.15 percent.

106 There is also substantial ethnic variability in no-match rates in the composite no-match list. The Hispanic no-match rate of 8.58 percent is approximately 1.5 times the white no-match rate of 5.59 percent.

107 As of November 2023, the roughly 484,000 voters who appear on the composite no-match list represent my best, conservative estimate of the set of registered voters in North Carolina who do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. Based on the August 2019 State Board of Elections database matching algorithm when applied to November 2023 registered voter and license databases, the number of North Carolina voters who do not possess driver's licenses or other forms of Department of Transportation photographic

identification sufficient under SB 824 for the purposes of voting in North Carolina could be as high as roughly 649,000.

5.1 North Carolina contains both frequent and infrequent voters

108 In a critique of my Initial Report in this litigation, Dr. Thornton draws attention to the State Board of Elections' classification of voters into *active* and *inactive* groups.[37] Voters labeled by the State Board of Elections as active and voters labeled by the State Board of Elections as inactive are registered voters in North Carolina and can participate in elections.[38] However, their status according to the North Carolina State Board of Elections depends on how frequently they vote:

> If a county board of elections [in North Carolina] has not had any contact with a [registered] voter for a period of two federal election cycles, then the voter will be sent a forwardable address confirmation mailing. The voter will be required to return the confirmation mailing within 30 days of the mailing. If the confirmation mailing is not returned by the voter within that time, or the mailing is returned by the U.S. Postal Service as undeliverable, then the voter's record will be marked inactive in the voter registration database.[39]

109 Nowhere in the United States is voting legally required, and a North Carolina voter being labeled as inactive by the State Board of Elections does not mean that this person is in some manner not registered. Rather, as stated unambiguously by the State Board of Elections, "**Inactive voters are still registered voters** (emphasis in original)."[40]

110 Not only may voters labeled by the State Board of Elections as inactive vote, but they actually do vote. Table 12 reports voter turnout across selected North Carolina statewide elections in the years 2011-23 broken down by voter status—active or inactive—as characterized by the State

[37] See Thornton Report. ¶¶ 17, 28, 34, 39, 81.

[38] *See*, *e.g.*, N.C. Gen. Stat § 163-82 (registration of voters).

[39] North Carolina State Board of Elections, "Voter Registration List Maintenance and Privacy," *available at* https://www.ncsbe.gov/registering/faq-SB~824voter-SB~824registration#IfIdontvotewillmyvoterrecordbepurgedfromthevoterregistrationrolls-SB~8241779 (*last accessed* February 27, 2024).

[40] *Id.*

Board of Elections. This table does not include all North Carolina elections in the period 2011-23; rather, it includes general (November) elections plus corresponding statewide primaries.[41]

Table 12: Turnout in selected North Carolina elections, 2011-23, broken down by State Board of Elections voter status

Election	Turnout	Active	Inactive
General 2011	504,910	492,165	1,080
Primary 2012	2,181,993	2,155,138	15,552
General 2012	4,540,633	4,466,872	54,121
General 2013	491,152	487,929	1,677
Primary 2014	1,026,331	1,018,338	4,104
General 2014	2,932,318	2,888,053	30,976
General 2015	420,065	416,577	2,099
Primary 2016	2,328,134	2,288,267	29,181
General 2016	4,757,665	4,657,012	79,927
General 2017	599,858	594,656	3,325
Primary 2018	956,829	948,016	6,124
General 2018	3,750,438	3,690,441	45,633
General 2019	499,779	496,193	2,519
Primary 2020	2,163,273	2,144,629	13,195
General 2020	5,540,699	5,470,294	52,031
General 2021	337,254	335,816	1,048
Primary 2022	1,432,696	1,426,559	4,938
General 2022	3,789,610	3,753,762	31,139
General 2023	515,029	513,010	1,764
Total	38,768,666	38,243,727	380,433

Note: total turnout includes voters with missing statuses.

111 Table 12 is organized as follows. The leftmost column ("Election") corresponds to a given election; to the right a column for total voter turnout ("Turnout"); and the two rightmost columns of Table 12 break down turnout by voter status as characterized by the State Board of Elections.

112 According to Table 12, there were roughly 380,000 votes cast in North Carolina elections 2011-23 by voters labeled as inactive by the State Board of Elections. As Table 12 does not include all North Carolina elections held in the time period 2011-23, this number is an undercount of the

[41] Not included in Table 12 are runoff elections, for example.

true number of votes cast in North Carolina elections 2011-23 by voters labeled as inactive by the North Carolina State Board of Elections.

113 Appendix G contains versions of Table 12 broken down by voter race (Black, white, and other) and ethnicity (Hispanic, not Hispanic, and not designated). The tables in the appendix show that North Carolina statewide elections held in the period 2011-23 have witnessed turnout by voters of all race and ethnic groups labeled as inactive by the North Carolina State Board of Elections.

114 Insofar as (1) registered voters labeled by the State Board of Elections as inactive are registered voters just like registered voters labeled by the State Board of Elections as active (2) at least 380,000 votes were cast by registered voters labeled by the State Board of Elections as inactive in elections held in the time period 2011-23, I do not distinguish the registered voters on the composite no-match list based on their active or inactive status as characterized by the State Board of Elections. Rather, I recognize that the set of eligible voters in North Carolina is composed of some voters who vote often (these are *frequent* voters) and other voters who vote less often (these are *infrequent* voters). Voting in North Carolina is not mandatory, and, insofar as my task in this litigation is, broadly construed, charactering the set of registered voters in North Carolina who do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina, I treat all registered voters equally.

6 Creating a no-ID list from the composite no-match list

115 Beyond Department of Transportation forms of identification, SB 824 allows other forms of photographic identification to be used for the purpose of voting in North Carolina. These include student identification from approved institutions and valid United States passports, among other forms of identification.

116 With this as background, I now create a no-ID list. To make this list, I remove from the composite no-match list registered voters for whom there is arguably some evidence that these individuals have forms of identification sufficient under SB 824 for the purposes of voting in North Carolina. In what follows, I describe the calculations that I implement to create my no-ID list, and thereafter I describe the composition of the no-ID list, discussing in particular how many registered voters are on it and their racial and ethnic breakdowns.

117 The calculations that I describe below are inherently limited on account of the data on which they are based and thus require inferences to address data gaps. My no-ID list analysis thus likely overstates the number of North Carolina voters who possess non-Department of Transportation forms of photographic identification suitable under SB 824 for voting in North Carolina.

6.1 Residential college and university students in North Carolina

118 SB 824 permits photographic identification from approved North Carolina colleges and universities (hereinafter, colleges) to be used for the purposes of voting in North Carolina.[42]

119 The State Board of Elections has established a set of requirements for colleges that wish their forms of identification to be used for the purposes of voting in North Carolina. These requirements are contained in a State Board of Elections letter, a copy of which appears in Appendix J.

[42] According to SB 824, "The State Board [of Elections] shall approve the use of student identification cards issued by a constituent institution of The University of North Carolina, the North Carolina Community College system, or eligible private postsecondary institution as defined in G.S. 116-280(3) every four years." N.C. Gen. Stat § 163-166.17(a). SB 824 originally required that forms of college identification be re-approved every four years. *See* N.C. Sess. Law 2018-144 § 1.2(b). However, this period has since been shortened to every two years. *See* N.C. Gen. Stat § 163-166.17(b). As of July 17, 2023, the list of approved colleges is *available at* `https://s3.amazonaws.com/dl.ncsbe.gov/Voter%20ID/July%202023%20Student%20and%20Employee%20ID%20Approvals%207.17.pdf` (*last accessed* April 3, 2024). A set of additional approved colleges as of December 22, 2023 is available at `https://s3.amazonaws.com/dl.ncsbe.gov/Voter%20ID/Dec%202023%20Student%20and%20Employee%20ID%20Approvals.pdf` (*last accessed* April 3, 2024).

120 Among other things, the State Board of Elections requires that, "The identification cards contain photographs of students obtained by the university or college or its agents or contractors, provided the photograph obtained (1) is a frontal image that includes the student's face and (2) represents a clear, accurate likeness of the student to whom the identification card is issued;"[43] that "Access to the equipment for producing the identification cards is restricted through security measures;"[44] and that "The college or university will provide to students who are issued the student identification card a copy of, or an electronic link to, a document developed by the State Board [of Elections] that details various rules pertaining to voting in North Carolina, with a particular emphasis on student voting."[45] These requirements, among others, make it clear that colleges in North Carolina must take affirmative steps if they wish their forms of identification to be used for the purposes of voting in North Carolina.

121 Moreover, State Board of Elections approval of a college's form of identification for the purposes of voting in North Carolina is not permanent. "If your card was previously approved by the State Board in 2023 or 2024, you do not need to reapply at this time. Your card is approved through December 31, 2024."[46] Rather, SB 824 requires that the State Board of Elections conduct approvals of forms of college identification every two years.[47] Accordingly, that a college's identification is approved by the State Board of Elections for one election cycle does not mean that it will be approved in the next.

122 What I am referring to here as a form of college identification can mean one of two things: (1) a regular form of college identification that is issued to all students attending an institution or (2) a special form of identification created by a college for the purposes of satisfying State Board of Elections requirements under SB 824. For example, Duke University has developed a "Duke

[43] Appendix J, Point 1 in State Board of Elections letter.
[44] Appendix J, Point 3 in State Board of Elections letter.
[45] Appendix J, Point 8 in State Board of Elections letter.
[46] Appendix J, State Board of Elections letter.
[47] SB 824 originally required that college identification be re-approved every four years. See N.C. Sess. Law 2018-144 § 1.2(b). However, this period has since been shortened to every two years. See N.C. Gen. Stat § 163-166.17(b).

Voter ID Card" that is separate from the standard Duke identification card.[48]

123 To the best of my knowledge, there are no publicly available lists of students who attend North Carolina colleges. There are also no publicly available lists of students who attend North Carolina colleges whose forms of photographic identification have been approved under SB 824 for the use of voting in North Carolina elections. And, for those colleges that have developed a special form of identification for the purposes of satisfying State Board of Elections requirements under SB 824, there are no publicly available lists of students who have these forms of identification.

124 With that as background, in Appendix F I describe procedures I use to identify college students who are registered North Carolina voters and live in college dormitories in North Carolina. To briefly summarize, my procedures search across voter registration addresses in the November 2023 State Board of Elections registered voter database for (1) names of North Carolina colleges, (2) official addresses of North Carolina colleges, and (3) addresses of dormitories in the most well-attended North Carolina colleges. Across voter registration addresses in the November 2023 State Board of Elections registered voter database I also search for what I believe are common terms associated with college dormitories, *e.g.*, the word "Hall," taking care to ensure that addresses including the word hall (*e.g.*, "Marshall") are not incorrectly flagged as being associated with a college dormitory, and various usages of the word "Campus."

125 The composite no-match list has approximately 484,000 registered voters on it. Of these individuals, my procedures in Appendix F identify 8,958 North Carolina college students who live in college dormitories.

126 The procedures I use to identify North Carolina college students who have college identification suitable under SB 824 for the purposes of voting in North Carolina are inherently limited by a lack of publicly available data. I am aware that my procedures focus on college

[48] "Duke Voter ID Card," *Duke University*, *available at* `https://dukecard.duke.edu/dukecard-SB~824requests/duke-SB~824voter-SB~824id-SB~824card/` (*last accessed* April 3, 2024).

dormitories and thus will not identify college students who do not live in these facilities. This will make my list of college students under-inclusive. On the other hand, when I identify a registered voter who is a college student in a dormitory, I assume that this individual has college identification suitable under SB 824 for the purposes of voting. This assumption will make my list of college students over-inclusive because I am neither restricting attention to students who attend State Board of Elections-approved colleges nor restricting attention to students at State Board of Elections-approved colleges who actually possess special forms of voter identification, to the extent that their colleges have developed them.

6.2 North Carolina voters who voted in the March 2024 primary

127 Having been previously enjoined, SB 824 went into effect on April 28, 2023. The March 2024 primary thus took place under SB 824, and I therefore make the conservative assumption that all registered North Carolina voters who participated in this primary have access to a form of photographic identification sufficient under SB 824 for the purposes of voting in the state.

128 I identify 23,461 registered voters on the composite no-match list who voted in the March 2024 primary.[49]

6.3 North Carolina voters who voted in a 2023 election

129 As noted above, SB 824 went into effect on April 28, 2023. I therefore make the conservative assumption that all registered North Carolina voters who participated in a 2023 election in North Carolina post-April 28, 2023, have access to a form of photographic identification sufficient under SB 824 for the purposes of voting in the state.

[49]This number is based on the March 31, 2024, statewide voter history file published by the State Board of Elections. I downloaded this file from the FTP site (`https://dl.ncsbe.gov/?prefix=data/`) maintained by the State Board of Elections on April 3, 2024. Statewide voter history files contain State Board of Elections voter identification numbers, and these also appear in the composite no-match list due to the fact that these numbers are also part of the November 2023 State Board of Elections registered voter database.

130 The 2023 North Carolina elections held after April 28, 2023 took place in September, October, and November and were municipal. I identify 9,744 registered voters on the composite no-match list who voted in at least one of these elections.[50,51]

6.4 North Carolina voters who voted in the 2016 primary

131 The 2016 primary election in North Carolina was held on March 15, 2016. At that time, a 2013 voter identification law, House Bill 589, was in effect in North Carolina.[52] This law imposed a photographic identification requirement starting with elections held in 2016 but was struck down after the March 2016 North Carolina primary. Ultimately, the only statewide election carried out in North Carolina under House Bill 589 was this primary.

132 The 2016 primary took place roughly eight years prior to the writing of this report, and the requirements in North Carolina for photographic identification in 2016 are not identical to those that exist under SB 824.[53] I nonetheless make the conservative assumption that all registered North Carolina voters who participated in the 2016 primary presently have access to a form of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina.

[50]This number is based on the January 27, 2024, statewide voter history file published by the State Board of Elections. I downloaded this file from the FTP site (`https://dl.ncsbe.gov/?prefix=data/`) maintained by the State Board of Elections on January 27, 2024.

The January 27, 2024 statewide voter history file contains a variety of election names in the field titled `election_desc`, which is an election description field. I used this field to identify elections held in 2023 after April 28, 2023.

[51]Moreover, some of the voters I identify as being on the composite no-match list and as having voted in the 2016 primary may have voted provisionally and subsequently not have had their ballots count. To the extent that this happened, my count of such voters overstates the true number of individuals who are on the composite no-match list and voted successfully in the 2016 primary.

[52]The text of House Bill 589 is *available at* `https://www.ncleg.gov/Sessions/2013/Bills/House/PDF/H589v8.pdf` (*last accessed* March 10, 2024). The forms of identification allowed by House Bill 589 are listed in § 2.1(e). Prior to the passage of House Bill 589, North Carolina state law did not impose an in-person voter identification requirement that extended beyond minimum standards required by the federal "Help America Vote Act of 2002."

[53]For example, under House Bill 589, an otherwise valid Department of Transportation license could be used for the purposes of voting in North Carolina as long as it had not been expired for more than four years.

133 I identify 54,145 registered voters on the composite no-match list who voted in the 2016 primary in North Carolina.[54] The forms of identification used by these voters may have expired or been suspended or canceled in the intervening roughly eight years between 2016 primary and November 2023. Therefore, this number likely overstates the number of 2016 primary voters who appear on the composite no-match list and continue to have access to a form of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina.[55]

6.5 North Carolina voters who have received a free voter identification card from the State Board of Elections

134 On April 4, 2024, the State Board of Elections published a list of North Carolina registered voters who, as of March 4, 2024, have received a free photographic identity card from a county board of elections. There are 10,794 such individuals.[56] I identify 1,848 individuals on the composite no-match list who have received free voter identification forms.

6.6 Missing data and anomalies

135 In her report filed in this litigation, Dr. Thornton draws attention to data missingness in the State Board of Elections registered voter database as well as what she characterizes as "anomalies in the [State Board of Elections' voter registration] data such as misspelled names, first names with just one initial, first names in the middle name field and the middle name in the first name field, as compared to the [Department of Transportation license database]. In addition, our review found that what appeared as the middle name in the DMV data was, in some instances, actually the last name among [a set of registered voters on a no-match list]".[57] Putting aside the fact that first names with one initial are incorporated in my composite no-match list by virtue of its using

[54] As in fn. 50, the source for this number is the January 27, 2024, statewide voter history file published by the State Board of Elections.

[55] *See* fn. 51 on the possibility that some of the voters I identify as being on the composite no-match list and having voted in the 2016 primary did so provisionally.

[56] The list of registered voters who have received free photographic forms of voter identification is *available at* `https://s3.amazonaws.com/dl.ncsbe.gov/Voter%20ID/2024-SB~82403-SB~82404%20Issued_Photo-SB~824IDs_to_date.csv` (*last accessed* April 4, 2024).

[57] Thornton Report, ¶ 40.

matching fields with first initials (see matching fields 41-44 in Table 8), in apparent response to her concerns about missing data and data anomalies Dr. Thornton proposes a *reverse match* algorithm that, according to her, responds to these limitations.[58] The reason I use of the word "reverse" here will be evident shortly.

136 To the best of my understanding, Dr. Thornton's reverse match algorithm operates as follows.

137 Dr. Thornton proposes what I call five reverse matching fields, all of which can be calculated for registered voters in the State Board of Elections registered voter database and license records in the Department of Transportation license database.

Reverse matching field 1. Driver's license number.
Reverse matching field 2. Birth date and first name.
Reverse matching field 3. Birth date and last name
Reverse matching field 4. Birth date and middle name according to the Department of Transportation license database and birth date and last name in the State Board of Elections registered voter database.
Reverse matching field 5. Birth date, street name, and zip code.[59]

138 Dr. Thornton's reverse match algorithm calls for calculating the five reverse matching fields across all licenses in the Department of Transportation license database and then, for each such field, identifying all database records that have unique values for the field.[60]

139 Dr. Thornton's reverse match algorithm also calls for calculating the five reverse matching fields for each voter on a no-match list (here I use the composite no-match list) and identifying all database records that have unique values for the field.[61]

[58] *Id.*, ¶ 41 ("Recognizing that a high percentage of the registered voters among [a previous no-match list] have a birth date populated, we developed methods to identify unique matches between the DMV and the [no-match list]."

[59] Thornton Report, ¶ 41.

[60] I infer Dr. Thornton's use of uniqueness based on this passage in her report: "we identified instances in the [Department of Transportation license database]" where there was only one person associated with each of the following [reverse matching fields]." Thornton Report, ¶ 41.

[61] Respectfully, it is my opinion that Dr. Thornton's report is unclear as to how it applied the five reverse matching fields to data produced by the State Board of Elections. On one hand, Dr. Thornton writes that she applied the

140 After identifying (unique) records in the Department of Transportation license database based on each reverse matching field and (unique) records of registered voters on a no-match list, Dr. Thornton's reverse match procedure calls for identifying all matches between these two. In particular, if a registered voter on an no-match list matches a record in the Department of Transportation license database based on one of the five reverse matching fields, I say that this represents a reverse match.

141 The reason that I use the adjective "reverse" here is because what I call Dr. Thornton's reverse match procedure starts with records from the Department of Transportation license database and compares them to records in a no-match list as opposed to starting with records from the State Board of Elections registered voter database and comparing them to records in Department of Transportation database.

142 In her report in this litigation, Dr. Thornton is not explicit about how she handles records in the Department of Transportation license database that are associated with license holders thought by the Department of Transportation to be deceased. In my implementation of what I consider to be Dr. Thornton's reverse match procedure, I do not include license records associated with license holders thought by the Department of Transportation to be deceased.

---

reverse match fields to lists of deceased individuals ("We applied similar criteria to match the mortality lists provided by NCSBE," Thornton Report, ¶ 43, first sentence). On the other hand, Dr. Thornton writes that she applied the five reverse fields to registered voter records from the State Board of Elections ("This manual review compared the information from DMV and *the voter registration data* by examining name, address, etc. to remove from the matches those that did not appear to be the same person (i.e., removed the false positives)" (emphasis added) Thornton Report, ¶ 43, third sentence).

I conclude for two distinct reasons that Dr. Thornton applied her five reverse fields to registered voter records from the State Board of Elections and not to mortality lists. First, if Dr. Thornton had applied the reverse fields to records of deceased individuals, I believe she would have noted that the matches she identified corresponded to voters in the State Board of Elections registered voter database who she believes are deceased; she does not do this (*see* Thornton Report, ¶¶ 44, 82). Second, if Dr. Thornton had applied the reverse fields to records of deceased voters, it would not have been relevant whether these allegedly deceased voters had expired licenses or not. It would also not have been relevant whether these allegedly deceased voters had experience with the requirements of obtaining a form of identification. However, Dr. Thornton writes the following: "In addition, while some of the [reverse] matches [in her algorithm applied to a previous no-match list in this litigation] are to those with an expired license, it is clear that these registered voters have the experience to obtain an ID." Thornton Report, ¶ 45. In my opinion, it would be nonsensical for Dr. Thornton to attempt to identify deceased registered voters, consider whether they have expired licenses, and then discuss the "experience" levels of these individuals. I therefore conclude that Dr. Thornton applied her five reverse fields to registered voter records from the State Board of Elections and not to mortality lists.

143 In her report in this litigation, Dr. Thornton is also not explicit about how her reverse match procedure handles reverse matches that, via unique reverse matching fields, link multiple and *different* license records to a single registered voter on a no-match list. To see the import of this, consider the following example: (1) a single registered voter on a no-match list has unique values of two reverse matching fields; (2) two records in the license database have unique values for the same fields; and (3) the records in the license database correspond to different license holders. Putting aside the matter of whether this example is purely speculative (it is not, as I show later), I cannot infer from Dr. Thornton's report how her procedures handle it. Given this uncertainty, I take a conservative position and treat reverse matches exemplifying the problem described in this paragraph as actual reverse matches.

6.7 False positives in the reverse match procedure

144 Before turning to results of Dr. Thornton's five-matching field reverse match procedure, I comment on why this procedure is at risk of false positives, *i.e.*, finding matches between Department of Transportation records and registered voters on a no-match list that connect a license holder with a registered voter other than the license holder.

145 For the top ten most popular names in the 1970s, Table 13 reports for each name the number of days in the period January 1, 1970, to November 17, 2005, and the percent of days in this period (13,104 days long), on which, according to the November 2023 State Board of Elections registered voter database, there was a single registered North Carolina voter of that name born on that day.[62]

146 For example, the most popular male name of the 1970s was "Michael." In the November 2023 registered voter database, there are 1,255 days on which a single "Michael" was

[62] *See* Social Security Administration, "Popular names of the period 1970s," *available at* `https://www.ssa.gov/oact/babynames/decades/names1970s.html` (*last accessed* March 12, 2024). Note that November 17, 2005, is 18 years prior to November 17, 2023, the effective date of the November 2023 State Board of Elections registered voter database.

Table 13: Rates at which popular names appear in the November 2023 North Carolina registered voter database

	Male			Female		
Rank	Name	Days, one birth	Percent days	Name	Days, one birth	Percent days
1	Michael	1,255	9.58	Jennifer	2,450	18.70
2	Christopher	1,513	11.55	Amy	3,228	24.63
3	Jason	3,292	25.12	Melissa	3,417	26.08
4	David	2,724	20.79	Michelle	3,784	28.88
5	James	2,247	17.15	Kimberly	3,462	26.42
6	John	2,700	20.60	Lisa	2,789	21.28
7	Robert	3,053	23.30	Angela	3,078	23.49
8	Brian	3,743	28.56	Heather	3,428	26.16
9	William	2,247	17.15	Stephanie	3,953	30.17
10	Matthew	2,418	18.45	Nicole	4,497	34.32

Note: includes voters with birth dates between January 1, 1970, and November 17, 2005.

born. The most popular female name of the 1970s was "Jennifer." In the November 2023 registered voter database, there are 2,450 days on which a single "Jennifer was born.

147 As noted above, the second reverse matching field is a combination of first name and birth date. With that as background, Table 13 implies that matches based on this reverse matching field will risk false positives. According to the November 2023 State Board of Elections registered voter data based, almost ten percent of the days in the period January 1, 1970, to November 17, 2005, have a single "Michael" birthday. Similarly, close to 20 percent of the days in the period January 1, 1970, to November 17, 2005, have a single "Jennifer" birthday. This means that North Carolina license holders named "Michael" and "Jennifer" are easily reverse matched to registered voters named "Michael" and "Jennifer," respectively. As the evidence below shows, they are so easily reverse matched, they are often false positives.

148 In summary, Table 13 draws attention to the risk of false positives when reverse matching fields involve only first names and birthdays. I return to the consequences of this risk shortly, after presenting reverse matching results.

6.8 Results of reverse matching

149 Of the composite no-match list's roughly 480,000 registered voters, roughly 40,000 were reverse matched.

150 Are these roughly 40,000 reverse matches correct? Given the risk for false positives in the reverse match procedure that I have already identified, I now consider whether there is evidence that the roughly 40,000 reverse matches are accurate. For this, I turn to Table 14.

Table 14: Validating SSN4s on reverse-match procedure, composite no-match list

Reverse field	Same SSN4	Different SSN4	Missing SSN4	Total	Percent same
1	8	0	1	9	100.00
2	74	9,035	7,352	16,461	0.81
3	68	6,342	2,044	8,454	1.06
4	22	10,579	3,250	13,851	0.21
5	50	754	6,510	7,314	6.22

151 Table 14 classifies every reverse matched registered voter on the composite no-match list in one of three distinct ways. Given a reverse match between a license from the November 2023 Department of Transportation license database and a registered voter record from the composite no-match list, if both the corresponding license record and registered voter record contain social security numbers (meaning, last four digits thereof), then these four-digit numbers are either the same ("Same SSN4") or different ("Different SSN4"). If either of these two social security numbers is missing, then the reverse match can be said to have at least one missing society security number ("Missing SSN4").[63]

[63] Matching field 16 in Table 8 is driver's license number. Moreover, the first reverse matching field in Dr. Thornton's reverse matching algorithm is also driver's license number. The reason that there is a very small number of reverse matches in Table 14 based on driver's license numbers is because the November 2023 State Board of Elections registered voter database and the November 2023 Department of Transportation license database do not always agree on birthdates. For example, a registered voter on the composite no-match list may have a matched driver's license that, according to the State Board of Elections, is expired according to the birthday field in the State Board of Elections. However, for the reverse match, I use license holder birthdates in the Department of Transportation database to determine whether a license is expired or not. There are very few reverse matches based on driver's license numbers only, and none of the qualitative conclusions I draw based on the reverse match procedure depend on these matches.

152 For the purposes of the reverse match procedures, I define a validated reverse match between the Department of Transportation license database and a voter on the composite no-match list when there is agreement between social security numbers (last four digits thereof) in a license record and in the State Board of Elections registered voter database.

153 Table 14 indicates that, when a reverse match is made using a driver's license number, then the probability of a validated reverse match is 100 percent.

154 However, Table 14 also implies that, when a reverse match is made using first name and birthday, the probability of a successful reverse match is less than one percent. In other words, when social security numbers (last four digits thereof) allow me to evaluate a reverse match, I find that most reverse matchs are incorrect, *i.e.*, are false positives.

155 I earlier described a possible complication in the reverse matching procedure by which multiple, and different, license holders are reverse matched to a single registered voter on the composite no-match list. I identify seven cases of this complication. In these cases, matching license holders have different social security numbers (last four digits thereof). I conservatively treat these cases as validated reverse matches since at least one of the different social security numbers matches a registered voter's social security number.

156 In summary, the reverse match procedure I have described here, drawn from Dr. Thornton's report in this litigation, identifies a relatively small number of matches between registered voters and license records that, based on social security numbers (last four digits thereof), are correct. I call these validated reverse matches, and I identify 136 of these on the composite no-match list.

157 Along with these validated reverse matcheds, the reverse match procedure also produces (1) reverse matches that are false positives and (2) reverse matches whose accuracy cannot be assessed. Except in the unusual case where reverse matches are made using driver's license

numbers, given that the false positive rate of the reverse match procedure is very high when it can be calculated, it is my judgement that the reverse matches whose quality cannot be assessed should be treated as consisting almost entirely of false positives.

7 Analysis of the no-ID list based on the November 2023 composite no-match list

158 I now create a November 2023 no-ID list based on the composite no-match list by removing from this no-match list six classes of registered voters: (1) registered voters who live in college residential facilities; (2) registered voters who voted in the March 2024 primary election in North Carolina; (3) registered voters who voted in a 2023 election in North Carolina held after April 28, 2023; (4) registered voters who voted in the 2016 primary election in North Carolina; (5) registered voters who have received a free voter identification from the State Board of Elections; and (6) registered voters in North Carolina for whom a validated reverse match can be made per the reverse match procedure described above. These six classes of registered voters arguably have forms of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina.

7.1 Registered voters on the no-ID list

159 With respect to the three classes of registered voters who voted in either the 2016 primary, the elections of 2023, or the 2024 primary, there are 72,924 total such voters who are on the composite no-match list. Of these voters, there are 44,398 who voted *only* in the 2016 primary, there are 3,933 who voted *only* in a 2023 election, and there are 12,234 who voted *only* in the 2024 primary. Of these three distinct categories of voters, the class most questionable regarding possession of photographic identification suitable under SB 824 for the purposes of voting in North Carolina is also the largest, that associated with the 2016 primary. This class is the most questionable regarding possession of identification suitable under SB 824 for the purposes of voting in North Carolina because the 2016 primary took place roughly eight years

ago as of the writing of this report.

160 Earlier in this report I noted that, on April 4, 2024, the State Board of Elections published a list of 10,794 North Carolina registered voters who starting in 2019 have received free forms of voter identification from North Carolina county boards of election. There are 5,931 voters on this list who participated in the 2016 primary in North Carolina. At the very least, this raises doubts about whether all 2016 primary voters should as of November 2023 be assumed to have forms of voter identification suitable under SB 824 for voting in North Carolina elections. Put another way, it is hard to imagine why almost six thousand voters who participated in the 2016 primary subsequently acquired free forms of voter identification—unless at least some of them needed these forms of identification to vote in North Carolina.

161 My choice of the composite no-match list as the basis for my no-ID list is a conservative choice, and this follows from the fact that the composite no-match list is the most conservative no-match list presented in this report. Therefore, the contents of the no-ID list are themselves conservative. The no-ID rates that follow represent lower bounds on the rates at which North Carolina voters do not have Department of Transportation forms of voter identification, and may in addition lack other forms of identification, suitable under SB 824 for voting in North Carolina.

162 Notwithstanding this point, the contents of the no-ID list created using the composite no-match list as the base are described in Table 15.

163 According to Table 15, there are roughly 402,000 registered voters in North Carolina who, based on subtractions of registered voters from the composite no-match list, do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina and for whom I have no evidence that they possess any other forms of identification sufficient under SB 824 for the purposes of voting in North Carolina. The statewide no-ID rate based on the no-ID list that itself

Table 15: No-ID rates based on composite no-match list

Group	Voters	No-match	% No-match
Statewide	7,297,901	402,283	5.51
Race			
White	4,745,170	154,766	3.26
Black	1,457,394	145,317	9.97
Unknown race	623,057	71,796	11.52
Other	259,652	14,622	5.63
Asian	120,697	4,929	4.08
American Indian / Alaska Native	53,083	5,426	10.22
Two or more races	38,180	5,287	13.85
Native Hawaiian / Pacific Islander	668	140	20.96
Ethnicity			
Not Hispanic	5,054,876	225,963	4.47
Unknown ethnicity	1,963,824	154,650	7.87
Hispanic	279,201	21,670	7.76

Note: drops 56,841 voters matched to deceased license records.

is based on the composite no-match list is roughly 5.51 percent. The figure of 402,000 registered voters represents a conservative lower bound due to, among other reasons, the no-ID list's being based on the conservative composite no-match list and the assumption I made when creating it regarding voters who participated in the 2016 North Carolina primary. Thus, the number of registered voters in North Carolina who lack identification suitable under SB 824 for the purposes of voting could be higher than the number of registered voters on the no-ID list.

164 There is substantial racial and ethnic variability across no-ID rates based on the no-ID list.

165 With respect to race, the registered voters on the no-ID list are disproportionately Black. In particular, the Black no-ID rate is roughly 9.97 percent, which is more than *three* times the white no-ID rate of roughly 3.26 percent. Moreover, the Black no-ID rate is roughly 6.7 percentage points greater than the white no-ID rate.

166 With respect to ethnicity, the Hispanic no-ID rate is roughly 7.76 percent, which is approximately 1.7 times the non-Hispanic no-ID rate of roughly 4.47 percent. Moreover, the

Hispanic no-ID rate is roughly 3.3 percentage points greater than the non-Hispanic no-ID rate.

167 Similar no-ID lists based on the 2014 State Board of Elections, 2014 Department of Justice, and August 2019 State Board of Elections database matching algorithms are described in Appendix K. The conclusions I draw from my no-ID lists are all qualitatively similar: there are hundreds of thousands of registered voters in North Carolina who do not possess driver's licenses or other forms of Department of Transportation photographic identification sufficient under SB 824 for the purposes of voting in North Carolina and for whom I have no evidence that they possess any other forms of identification sufficient under SB 824 for the purposes of voting in North Carolina. Of these hundreds of thousands of registered North Carolina voters, there are disproportionately many Black voters and disproportionately many Hispanic voters.

7.2 Access to other databases is unlikely to reverse the racial disparities in the no-ID list

168 During my participation in this litigation, I have not had access to databases on federal forms of identification sufficient under SB 824 for the purposes of voting in North Carolina. It is thus useful for me to consider whether the white-Black racial differences I have identified would change were I have had such access. I believe they would not.

169 Consider whether passports might reverse Black-white no-ID rates based on the no-ID list. The 2020 American National Election Study (ANES), a representative survey of Americans across the United States, surveyed 264 individuals in North Carolina.[64] Among other things, the ANES asked its respondents whether they have a non-expired United States passport. Of non-Hispanic white respondents in the 2020 ANES, roughly 47 percent reported that they do; of non-Hispanic Black respondents, roughly 34 percent reported having a non-expired United States passport.[65] Since, according to the 2020 ANES, white individuals in North Carolina possess passports *more*

[64]Data for the 2020 ANES are *available at* `https://electionstudies.org/data-SB~824center/2020-SB~824time-SB~824series-SB~824study/` (*last accessed* March 15, 2024).

[65]The ANES variables I use in these calculations are as follows: respondent state (state_pre), respondent race (V201549x), unexpired passport possession (V201590), and weight (V200010a).

often than Black individuals, it is unlikely that my having access to a list of North Carolina passport holders would reverse the white-Black racial disparity in the November 2023 no-ID list.[66]

170 Dr. Kevin Quinn served as an expert witness for plaintiffs in *Currie, et al. v. State of North Carolina et al.* (No. 13-CVS-1419), litigation challenging House Bill 589, a piece of legislation that I have discussed earlier in this report. In the HB 589 case, Dr. Quinn constructed a no-match list using Department of Transportation data, akin to the composite no-match list I have described in this report. In addition, Dr. Quinn in *Currie* was given access to matching results for United States passports, United States military identification cards, and United States veteran identification cards. According to Dr. Quinn, "[A]dditional matches [based on United States passports, military identification cards, and veteran identification cards] reduced the overall no-match percentage by 0.40 percentage points. Further, a sizable racial disparity in ID possession remained after these additional matches were counted."[67]

171 Based on 2020 ANES and Dr. Quinn's report in *Currie*, I conclude that it is unlikely that my having access to lists of federal government identification holders would reverse the Black-white racial disparity I find in the November 2023 no-ID list.

8 Conclusion

172 Based on new data and information in this litigation, this second supplemental expert report describes a no-match list that is my best, conservative estimate of the set of registered voters in North Carolina who, as of November 2023, do not possess driver's licenses or other forms of Department of Transportation-associated photographic identification sufficient under Senate Bill 824 for the purposes of voting in this state. The number of such registered voters is 484,000 (corresponding to a statewide no-match rate of 6.63), and these individuals are disproportionately

[66] The 2020 ANES only surveyed three Hispanic individuals in North Carolina, and thus it is not possible to use this survey to compare Hispanic and non-Hispanic unexpired passport possession rates among residents of North Carolina.

[67] *See* Quinn Report, ¶ 48.

Black and disproportionately Hispanic.

173 If I remove from the most conservative no-match list I describe in this report as many North Carolina registered voters who are college students as I can identify, registered voters who voted in the 2024 March primary in North Carolina, registered voters who voted in a 2023 election in North Carolina held after April 28, 2023, registered voters who voted in the 2016 primary election in North Carolina, registered voters who have received a free voter identification card from a North Carolina county board of elections and registered voters in North Carolina for whom partial social security numbers imply that they have photographic identification sufficient under SB 824 for the purposes of voting in North Carolina, I end up with a set of 402,000 registered voters (corresponding to a statewide no-ID rate of 5.51). I have no evidence that these registered voters, who are disproportionately Black and disproportionately Hispanic, possess any forms of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina.

174 The figure of 402,000 registered voters represents a conservative lower bound of the number of registered North Carolina voters who do not possess any forms of photographic identification sufficient under SB 824 for the purposes of voting in North Carolina. This reflects the assumptions I have made in calculating the number 402,000, particularly the assumption that all North Carolina voters who participated in the 2016 primary continue, roughly eight years after this election, to have identification suitable under SB 824 for the purposes of voting. Moreover, another reason that the figure of 402,000 registered voters represents a conservative lower bound lies in the fact that the basis for it is the most conservative no-match list I describe in this report.

175 I reserve the right to update or supplement this report based on new data, *i.e.*, a list of driver's or other licenses that were revoked or suspended since November 2023.

References

Ansolabehere, Stephen and Eitan D. Hersh. 2017. "ADGN: An Algorithm for Record Linkage Using Address, Date of Birth, Gender and Name." *Statistics and Public Policy* 4(1):1–10.

Barreto, Matt A., Stephen A. Nuño and Gabriel R. Sanchez. 2009. "The Disproportionate Impact of Voter-ID Requirements on the Electorate–New Evidence from Indiana." *PS: Political Science & Politics* 42(1):111–116.

Appendices

A Tables of daily counts of absentee ballot returns from the 2020 general election in North Carolina

176 In the body of this second supplemental report, I noted that Plaintiffs' Counsel requested that I prepare tables of daily counts of absentee ballot returns in North Carolina in the 2020 general election. Counsel requested in particular that I break down counts of absentee ballots returned by mail by voter race and ethnicity.

177 To accomplish this task, I downloaded from the FTP site of the North Carolina State Board of Elections a file named "absentee_20201103.zip." This zip file, when unpacked, contains an ASCII file with information on ballots cast by North Carolina voters in the 2020 general election. There are 5,110,577 lines in the ASCII file, the top line of which is a header.

178 I focused attention on lines in the ASCII file that correspond to absentee ballots returned by mail. I identified these by consulting the fields `ballot_req_delivery_type` and `ballot_rtn_dt`. I treat as an absentee ballot returned by mail any ballot for which (1) `ballot_req_delivery_type` takes on the value "MAIL" and (2) `ballot_rtn_dt` is not empty.

179 After I identified all absentee ballots returned by mail by North Carolina voters in the 2020 election, I broke down daily counts of these ballots by voter race (based on the field in the ASCII file named race) and ethnicity (based on the field ethnicity).

180 I made html tables of my daily counts of absentee ballots returned by mail, broken down by voter race and ethnicity, and emailed these tables to Counsel.

181 The html race table is as follows.

BALLOT RETURN DATES AND RACE, 2020 GENERAL ELECTION

Return date	Total	Black	White	Other	Black %	White %	Other %
August 24	1	0	1	0	0.00	100.00	0.00
September 04	21	2	16	3	9.52	76.19	14.29
September 05	2	0	1	1	0.00	50.00	50.00
September 07	4	1	3	0	25.00	75.00	0.00
September 08	1,585	239	1,237	109	15.08	78.04	6.88
September 09	3,468	585	2,649	234	16.87	76.38	6.75
September 10	7,329	1,384	5,358	587	18.88	73.11	8.01
September 11	10,279	1,836	7,579	864	17.86	73.73	8.41
September 12	5,816	702	4,501	613	12.07	77.39	10.54
September 13	127	37	82	8	29.13	64.57	6.30
September 14	22,779	3,647	17,056	2,076	16.01	74.88	9.11
September 15	15,358	2,536	11,497	1,325	16.51	74.86	8.63
September 16	24,462	3,915	18,200	2,347	16.00	74.40	9.59
September 17	19,143	3,387	13,845	1,911	17.69	72.32	9.98
September 18	18,654	3,209	13,722	1,723	17.20	73.56	9.24
September 19	4,733	676	3,508	549	14.28	74.12	11.60
September 20	344	80	239	25	23.26	69.48	7.27
September 21	30,483	5,071	22,338	3,074	16.64	73.28	10.08
September 22	18,881	3,143	13,784	1,954	16.65	73.00	10.35
September 23	26,458	4,289	19,184	2,985	16.21	72.51	11.28
September 24	23,930	4,229	16,977	2,724	17.67	70.94	11.38
September 25	18,718	2,840	13,609	2,269	15.17	72.71	12.12
September 26	6,872	1,002	4,964	906	14.58	72.24	13.18
September 27	586	121	400	65	20.65	68.26	11.09
September 28	25,123	4,306	18,024	2,793	17.14	71.74	11.12
September 29	8,505	1,572	5,974	959	18.48	70.24	11.28
September 30	28,458	4,319	20,269	3,870	15.18	71.22	13.60
October 01	15,450	2,434	11,132	1,884	15.75	72.05	12.19
October 02	21,516	3,554	15,177	2,785	16.52	70.54	12.94
October 03	9,407	1,584	6,366	1,457	16.84	67.67	15.49
October 04	1,485	529	772	184	35.62	51.99	12.39
October 05	25,898	4,376	18,055	3,467	16.90	69.72	13.39
October 06	11,909	1,982	8,268	1,659	16.64	69.43	13.93
October 07	25,102	3,745	17,627	3,730	14.92	70.22	14.86
October 08	21,202	3,886	14,169	3,147	18.33	66.83	14.84
October 09	22,583	3,621	15,565	3,397	16.03	68.92	15.04

October 10	8,058	1,318	5,407	1,333	16.36	67.10	16.54
October 11	3,108	330	2,180	598	10.62	70.14	19.24
October 12	11,596	2,097	8,030	1,469	18.08	69.25	12.67
October 13	17,851	3,221	12,166	2,464	18.04	68.15	13.80
October 14	28,250	4,355	19,330	4,565	15.42	68.42	16.16
October 15	26,423	4,530	17,412	4,481	17.14	65.90	16.96
October 16	31,130	5,220	20,992	4,918	16.77	67.43	15.80
October 17	14,429	2,368	9,676	2,385	16.41	67.06	16.53
October 18	5,139	1,064	3,157	918	20.70	61.43	17.86
October 19	34,548	5,436	23,226	5,886	15.73	67.23	17.04
October 20	21,564	3,555	14,143	3,866	16.49	65.59	17.93
October 21	37,472	4,856	25,530	7,086	12.96	68.13	18.91
October 22	29,043	4,185	19,394	5,464	14.41	66.78	18.81
October 23	27,303	3,608	18,379	5,316	13.21	67.31	19.47
October 24	13,674	1,977	8,813	2,884	14.46	64.45	21.09
October 25	2,991	516	1,744	731	17.25	58.31	24.44
October 26	28,864	3,551	19,390	5,923	12.30	67.18	20.52
October 27	16,682	2,571	10,576	3,535	15.41	63.40	21.19
October 28	32,649	3,955	21,362	7,332	12.11	65.43	22.46
October 29	28,317	3,605	18,375	6,337	12.73	64.89	22.38
October 30	23,730	3,405	14,872	5,453	14.35	62.67	22.98
October 31	17,708	2,441	10,792	4,475	13.78	60.94	25.27
November 01	6,911	1,032	4,055	1,824	14.93	58.67	26.39
November 02	20,774	2,989	13,103	4,682	14.39	63.07	22.54
November 03	22,594	3,570	13,519	5,505	15.80	59.83	24.36
November 04	6,072	802	3,854	1,416	13.21	63.47	23.32
November 05	5,546	823	3,294	1,429	14.84	59.39	25.77
November 06	1,591	233	963	395	14.64	60.53	24.83
November 07	113	19	69	25	16.81	61.06	22.12
November 08	2	1	1	0	50.00	50.00	0.00
November 09	1,367	132	912	323	9.66	66.72	23.63
November 10	346	61	213	72	17.63	61.56	20.81
November 11	75	14	45	16	18.67	60.00	21.33
November 12	601	132	341	128	21.96	56.74	21.30
November 13	17	5	8	4	29.41	47.06	23.53
November 16	6	2	2	2	33.33	33.33	33.33
November 17	1	0	1	0	0.00	100.00	0.00
November 19	2	0	1	1	0.00	50.00	50.00

November 23	4	0	1	3	0.00	25.00	75.00
November 30	2	1	1	0	50.00	50.00	0.00

182 The html ethnicity table is as follows.

BALLOT RETURN DATES AND ETHNICITY, 2020 GENERAL ELECTION

Return date	Total	Hispanic	Not Hispanic	Not designated	Hispanic %	Not Hispanic %	Not designated %
August 24	1	0	1	0	0.00	100.00	0.00
September 04	21	0	16	5	0.00	76.19	23.81
September 05	2	0	1	1	0.00	50.00	50.00
September 07	4	0	2	2	0.00	50.00	50.00
September 08	1,585	12	1,245	328	0.76	78.55	20.69
September 09	3,468	46	2,791	631	1.33	80.48	18.19
September 10	7,329	117	5,556	1,656	1.60	75.81	22.60
September 11	10,279	158	7,880	2,241	1.54	76.66	21.80
September 12	5,816	120	4,520	1,176	2.06	77.72	20.22
September 13	127	4	101	22	3.15	79.53	17.32
September 14	22,779	313	17,404	5,062	1.37	76.40	22.22
September 15	15,358	201	12,017	3,140	1.31	78.25	20.45
September 16	24,462	388	18,800	5,274	1.59	76.85	21.56
September 17	19,143	341	14,662	4,140	1.78	76.59	21.63
September 18	18,654	294	14,282	4,078	1.58	76.56	21.86
September 19	4,733	73	3,530	1,130	1.54	74.58	23.87
September 20	344	5	282	57	1.45	81.98	16.57
September 21	30,483	489	23,364	6,630	1.60	76.65	21.75
September 22	18,881	361	14,616	3,904	1.91	77.41	20.68
September 23	26,458	520	20,158	5,780	1.97	76.19	21.85
September							

24	23,930	440	18,074	5,416	1.84	75.53	22.63
September 25	18,718	374	13,997	4,347	2.00	74.78	23.22
September 26	6,872	152	5,098	1,622	2.21	74.19	23.60
September 27	586	3	476	107	0.51	81.23	18.26
September 28	25,123	468	18,832	5,823	1.86	74.96	23.18
September 29	8,505	182	6,486	1,837	2.14	76.26	21.60
September 30	28,458	594	21,328	6,536	2.09	74.95	22.97
October 01	15,450	293	11,603	3,554	1.90	75.10	23.00
October 02	21,516	421	16,008	5,087	1.96	74.40	23.64
October 03	9,407	233	7,007	2,167	2.48	74.49	23.04
October 04	1,485	23	1,157	305	1.55	77.91	20.54
October 05	25,898	560	19,008	6,330	2.16	73.40	24.44
October 06	11,909	305	8,804	2,800	2.56	73.93	23.51
October 07	25,102	577	18,435	6,090	2.30	73.44	24.26
October 08	21,202	488	15,462	5,252	2.30	72.93	24.77
October 09	22,583	559	16,460	5,564	2.48	72.89	24.64
October 10	8,058	206	5,922	1,930	2.56	73.49	23.95
October 11	3,108	71	2,192	845	2.28	70.53	27.19
October 12	11,596	233	8,624	2,739	2.01	74.37	23.62
October 13	17,851	354	12,969	4,528	1.98	72.65	25.37
October 14	28,250	713	20,576	6,961	2.52	72.84	24.64
October 15	26,423	722	18,942	6,759	2.73	71.69	25.58
October 16	31,130	825	22,243	8,062	2.65	71.45	25.90
October 17	14,429	364	10,351	3,714	2.52	71.74	25.74
October 18	5,139	161	3,721	1,257	3.13	72.41	24.46
October 19	34,548	859	24,348	9,341	2.49	70.48	27.04
October 20	21,564	599	15,078	5,887	2.78	69.92	27.30
October 21	37,472	1,073	26,153	10,246	2.86	69.79	27.34
October 22	29,043	838	20,313	7,892	2.89	69.94	27.17
October 23	27,303	797	18,924	7,582	2.92	69.31	27.77
October 24	13,674	449	9,207	4,018	3.28	67.33	29.38
October 25	2,991	116	1,958	917	3.88	65.46	30.66
October 26	28,864	875	19,465	8,524	3.03	67.44	29.53

October 27	16,682	542	11,379	4,761	3.25	68.21	28.54
October 28	32,649	1,062	21,490	10,097	3.25	65.82	30.93
October 29	28,317	910	18,838	8,569	3.21	66.53	30.26
October 30	23,730	805	15,466	7,459	3.39	65.17	31.43
October 31	17,708	558	11,342	5,808	3.15	64.05	32.80
November 01	6,911	231	4,473	2,207	3.34	64.72	31.93
November 02	20,774	643	13,359	6,772	3.10	64.31	32.60
November 03	22,594	761	14,532	7,301	3.37	64.32	32.31
November 04	6,072	198	3,868	2,006	3.26	63.70	33.04
November 05	5,546	174	3,480	1,892	3.14	62.75	34.11
November 06	1,591	67	1,012	512	4.21	63.61	32.18
November 07	113	3	70	40	2.65	61.95	35.40
November 08	2	0	2	0	0.00	100.00	0.00
November 09	1,367	35	898	434	2.56	65.69	31.75
November 10	346	9	227	110	2.60	65.61	31.79
November 11	75	2	56	17	2.67	74.67	22.67
November 12	601	19	395	187	3.16	65.72	31.11
November 13	17	0	12	5	0.00	70.59	29.41
November 16	6	0	4	2	0.00	66.67	33.33
November 17	1	0	1	0	0.00	100.00	0.00
November 19	2	0	1	1	0.00	50.00	50.00
November 23	4	2	1	1	50.00	25.00	25.00
November 30	2	0	1	1	0.00	50.00	50.00

B *Curriculum vitae* of Michael C. Herron

Michael C. Herron

Dartmouth College
6227 Silsby Hall
Hanover, NH 03755-3547

Phone: +1 (603) 646-2693
Mobile: +1 (603) 359-9731
Email: michael.c.herron@dartmouth.edu

Academic appointments

William Clinton Story Remsen 1943 Professor, Program in Quantitative Social Science, Dartmouth College. July 2021-present.

William Clinton Story Remsen 1943 Professor, Department of Government, Dartmouth College. July 2013-June 2021.

Chair, Program in Quantitative Social Science, Dartmouth College. July 2015-June 2020, July 2021-present.

Visiting Scholar, Hertie School of Governance, Berlin, Germany. August 2016-July 2017.

Chair, Program in Mathematics and Social Sciences, Dartmouth College. July 2014-June 2015.

Professor, Department of Government, Dartmouth College. July 2009-June 2013.

Visiting Professor of Applied Methods, Hertie School of Governance, Berlin, Germany. August 2011-August 2012.

Associate Professor, Department of Government, Dartmouth College. July 2004-June 2009.

Visiting Associate Professor, Department of Government, Harvard University. July 2008-January 2009.

Visiting Associate Professor, Wallis Institute of Political Economy, University of Rochester. September 2006-December 2006.

Visiting Assistant Professor, Department of Government, Dartmouth College. July 2003-June 2004.

Assistant Professor, Department of Political Science, Northwestern University. September 1997-June 2004.

Faculty Associate, Institute for Policy Research, Northwestern University. September 2002-June 2004.

Education

PhD Business (Political Economics), Stanford University, January 1998.
Dissertation: Political Uncertainty and the Prices of Financial Assets
Committee: David Baron, Darrell Duffie, Douglas Rivers, and Barry Weingast

MS Statistics, Stanford University, June 1995.

MA Political Science, University of Dayton, August 1992.

BS Mathematics and Economics, with University Honors, Carnegie Mellon University, May 1989.

Case 1:18-cv-01034-LCB-LPA Document 317-4 Filed 05/17/24 Page 70 of 104

Fellowships

Elizabeth R. and Robert A. Jeffe 1972 Fellowship, Dartmouth College. September 2010-June 2011.

Fulbright Scholar Program fellowship for research and teaching at the Heidelberg Center for American Studies, Heidelberg University, September 2009-February 2010 (declined).

Post-doctoral Research Fellow, Center for Basic Research in the Social Sciences, Harvard University. September 2000-August 2001.

Publications

Journal articles

"Evaluating a New Generation of Expansive Claims about Vote Manipulation" (with Justin Grimmer and Matthew Tyler). Forthcoming, *Election Law Journal*.

"Allegations Made against Dominion Voting Systems and the 2020 Presidential Election in Wisconsin." *Election Law Journal* 22(3): 247-67. 2023.

"The Racial Politics of Early In-Person Voting in Georgia" (with Daniel A. Smith). *Journal of Election Administration Research & Practice* 1(2): 27-46. 2022.

"Auditing the 2020 General Election in Georgia: Residual Vote Rates and a Confusing Ballot Format" (with David Cottrell, Felix E. Herron, and Daniel A. Smith). *Election Law Journal* 21(1): 1-18. 2022.

"Vote-by-mail ballot rejection and experience with mail-in voting" (with David Cottrell and Daniel A. Smith). *American Politics Research* 49(6): 577-590. 2021.

"Voting lines, equal treatment, and early voting check-in times in Florida" (with David Cottrell and Daniel A. Smith). *State Politics & Policy Quarterly* 21(2): 109-138. 2021.

"Postal Delivery Disruptions and the Fragility of Voting by Mail: Lessons from Maine" (with Daniel A. Smith). *Research & Politics* 8(1): 1-12. 2021.

"Voting by Mail and Ballot Rejection: Lessons from Florida for Elections in the Age of the Coronavirus" (with Anna Baringer and Daniel A. Smith). *Election Law Journal* 19(3): 289-320. 2020.

"Early voting changes and voter turnout: North Carolina in the 2016 General Election" (with Hannah L. Walker and Daniel A. Smith). *Political Behavior* 41(4): 841-869. 2019.

"Mail-in absentee ballot anomalies in North Carolina's 9th Congressional District." *Election Law Journal* 18(3): 191-213. 2019.

"Relative age effects in American professional football" (with Jack F. Heneghan). *Journal of Quantitative Analysis in Sports* 15(3): 185-202. 2019.

"Mortality, Incarceration, and African-American Disenfranchisement in the Contemporary United States" (with David Cottrell, Javier M. Rodriguez, and Daniel A. Smith). *American Politics Research* 47(2): 195-237. 2019.

"Pedagogical Value of Polling Place Observation By Students" (with 31 co-authors). *PS: Political Science & Politics* 51(4): 831-847. 2018.

"All in the family: German twin finishing times in the 2016 women's Olympic marathon" (with David Cottrell). CHANCE 31(3): 20-28. 2018.

"An Exploration of Donald Trump's Allegations of Massive Voter Fraud in the 2016 General Election" (with David Cottrell and Sean J. Westwood). *Electoral Studies* 51(1): 123-142. 2018.

"Student Sorting and Implications for Grade Inflation (with Zachary D. Markovich). *Rationality and Society* 29(3): 355-386. 2017.

"Race, *Shelby County*, and the Voter Information Verification Act in North Carolina" (with Daniel A. Smith). *Florida State University Law Review* 43: 465-506. 2016.

"Precinct Resources and Voter Wait Times" (with Daniel A. Smith). *Electoral Studies* 42(2): 249-263. 2016.

"A Careful Look at Modern Case Selection Methods" (with Kevin M. Quinn). *Sociological Methods & Research* 45(3): 458-492. 2016.

"Precinct Closing and Wait Times in Florida during the 2012 General Election" (with Daniel A. Smith). *Election Law Journal* 14(3): 220-238. 2015.

"Race, Party, and the Consequences of Restricting Early Voting in Florida in the 2012 General Election" (with Daniel A. Smith). *Political Research Quarterly* 67(3): 646-665. 2014.

"The Effects of House Bill 1355 on Voter Registration in Florida" (with Daniel A. Smith). *State Politics & Policy Quarterly* 13(3): 279-305. 2013.

"Blacks, Hispanics, and Whites: A Study of Race-based Residual Vote Rates in Chicago." *American Politics Research* 41(2): 203-243. 2013.

"Alvin Greene? Who? How did he win the United States Senate nomination in South Carolina?" (with Joseph Bafumi, Seth J. Hill, and Jeffrey B. Lewis). *Election Law Journal* 11(4): 358-379. 2012.

"Souls to the Polls: Early Voting in Florida in the Shadow of House Bill 1355" (with Daniel A. Smith). *Election Law Journal* 11(3): 331-347. 2012.

"Leapfrog Representation and Extremism: A Study of American Voters and their Members in Congress" (with Joseph Bafumi). *American Political Science Review* 104(3): 519-542. 2010.

"Economic Crisis, Iraq, and Race: A Study of the 2008 Presidential Election" (with Seth J. Hill and Jeffrey B. Lewis). *Election Law Journal* 9(1): 41-62. 2010

"Prejudice, Black Threat, and the Racist Voter in the 2008 Presidential Election" (with Joseph Bafumi). *Journal of Political Marketing* 8(4): 334-348. 2009.

"Voting Technology and the 2008 New Hampshire Primary" (with Walter R. Mebane, Jr., and Jonathan N. Wand). *William & Mary Bill of Rights Journal* 17(2): 351-374. 2008.

"Ballot Formats, Touchscreens, and Undervotes: A Study of the 2006 Midterm Elections in Florida" (with Laurin Frisina, James Honaker, and Jeffrey B. Lewis). *Election Law Journal* 7(1): 25-47. 2008.

"Gerrymanders and Theories of Lawmaking: A Study of Legislative Redistricting in Illinois" (with Alan E. Wiseman). *Journal of Politics* 70(1): 151-167. 2008.

"Estimating the Effect of Redistricting on Minority Substantive Representation" (with David Epstein, Sharyn O'Halloran, and David Park). *Journal of Law, Economics, and Organization* 23(2): 499-518. 2007.

"Did Ralph Nader Spoil Al Gore's Presidential Bid? A Ballot-Level Study of Green and Reform Party Voters in the 2000 Presidential Election" (with Jeffrey B. Lewis). *Quarterly Journal of Political Science* 2(3): 205-226. 2007.

"Assessing Partisan Bias in Voting Technology: The Case of the 2004 New Hampshire Recount" (with Jonathan N. Wand). *Electoral Studies* 26(2): 247-261. 2007.

"Term Limits and Pork" (with Kenneth W. Shotts). *Legislative Studies Quarterly* 31(3): 383-404. 2006.

"Black Candidates and Black Voters: Assessing the Impact of Candidate Race on Uncounted Vote Rates" (with Jasjeet S. Sekhon). *Journal of Politics* 67(1): 154-177. 2005.

"Government Redistribution in the Shadow of Legislative Elections: A Study of the Illinois Member Initiatives Grant Program" (with Brett A. Theodos). *Legislative Studies Quarterly* 24(2): 287-312. 2004.

"Studying Dynamics in Legislator Ideal Points: Scale Matters." *Political Analysis* 12(2): 182-190. 2004.

"Logical Inconsistency in EI-based Second Stage Regressions" (with Kenneth W. Shotts). *American Journal of Political Science* 48(1): 172-183. 2004.

"Overvoting and Representation: An examination of overvoted presidential ballots in Broward and Miami-Dade Counties" (with Jasjeet S. Sekhon). *Electoral Studies* 22: 21-47. 2003.

"Using Ecological Inference Point Estimates as Dependent Variables in Second Stage Linear Regressions" (with Kenneth W. Shotts). *Political Analysis* 11(1): 44-64. 2003.

"Cross-contamination in EI-R" (with Kenneth W. Shotts). *Political Analysis* 11(1): 77-85. 2003.

"A Consensus on Second Stage Analyses in Ecological Inference Models" (with Christopher Adolph, Gary King, and Kenneth W. Shotts). *Political Analysis* 11(1): 86-94. 2003.

"The Butterfly Did It: The Aberrant Vote for Buchanan in Palm Beach County, Florida" (with Jonathan N. Wand, Kenneth W. Shotts, Jasjeet S. Sekhon, Walter R. Mebane, Jr., and Henry E. Brady). *American Political Science Review* 95(4): 793-810. 2001.

"Interest Group Ratings and Regression Inconsistency." *Political Analysis* 9(3): 260-274. 2001.

"Leadership and Pandering: A Theory of Executive Policymaking" (with Brandice Canes-Wrone and Kenneth W. Shotts). *American Journal of Political Science* 45(3): 532-550. 2001.

"Law and Data: The Butterfly Ballot Episode" (with Henry E. Brady, Walter R. Mebane, Jr., Jasjeet S. Sekhon, Kenneth W. Shotts, and Jonathan N. Wand). *PS: Political Science & Politics* 34(1): 59-69. 2001.

"Cutpoint-Adjusted Interest Group Ratings." *Political Analysis* 8(4): 346-366. 2000.

"Estimating the Economic Impact of Political Party Competition in the 1992 British Election." *American Journal of Political Science* 44(2): 326-337. 2000.

"Artificial Extremism in Interest Group Ratings and the Preferences versus Party Debate." *Legislative Studies Quarterly* 24(4): 525-542. 1999.

"Post-Estimation Uncertainty in Limited Dependent Variable Models." *Political Analysis* 8(1): 83-98. 1999.

"Measurement of Political Effects in the United States Economy: A Study of the 1992 Presidential Election" (with James Lavin, Donald Cram, and Jay Silver). *Economics & Politics* 11(1): 51-81. 1999.

"The Influence of Family Regulation, Connection, and Psychological Autonomy on Six Measures of Adolescent Functions" (with Melissa R. Herman, Sanford M. Dornbusch, and Jerald R. Herting). *Journal of Adolescent Research* 12(1): 34-67. 1997.

Case 1:18-cv-01034-LCB-LPA Document 317-4 Filed 05/17/24 Page 73 of 104

Book chapters

"Wait Times and Voter Confidence: A Study of the 2014 General Election in Miami-Dade County" (with Daniel A. Smith, Wendy Serra, and Joseph Bafumi). In *Races, Reforms, & Policy: Implications of the 2014 Midterm Elections*, Christopher J. Galdieri, Tauna S. Sisco, and Jennifer C. Lucas, eds. Akron, OH: University of Akron Press. 2017.

"A Dynamic Model of Multidimensional Collective Choice" (with David P. Baron). In *Computational Models in Political Economy*, Ken Kollman, John H. Miller, and Scott E. Page, eds. Cambridge, MA: The MIT Press. 2003.

"Law and Data: The Butterfly Ballot Episode" (with Henry E. Brady, Walter R. Mebane Jr., Jasjeet Singh Sekhon, Kenneth W. Shotts, and Jonathan Wand). In *The Longest Night: Polemics and Perspectives on Election 2000*, Arthur J. Jacobson and Michel Rosenfeld, eds. Berkeley: University of California Press. 2002.

Book reviews

The Timeline of Presidential Elections: How Campaigns Do (and Do Not) Matter, Robert S. Erikson and Christopher Wlezien. *Political Science Quarterly* 128(3): 552-553. 2013.

Voting Technology: The Not-So-Simple Act of Casting a Ballot, Paul S. Herrnson, Richard G. Niemi, Michael J. Hanmer, Benjamin B. Bederson, and Frederick C. Conrad. *Review of Policy Research* 25(4): 379-380. 2008.

Other publications

"In two political battlegrounds, thousands of mail-in ballots are on the verge of being rejected" (with Daniel A. Smith). *The Conversation*, October 23, 2020. Available at `https://theconversation.com/in-two-political-battlegrounds-thousands-of-mail-in-ballots-are-on-the-verge-of-being-rejected-148616`.

"Rejected mail ballots pile up in Florida" (with Daniel A. Smith). *Tampa Bay Times*, October 16, 2020. Available at `https://www.tampabay.com/opinion/2020/10/16/rejected-mail-ballots-pile-up-in-florida-column`.

"Minor postal delays could disenfranchise thousands of Florida vote-by-mail voters" (with Daniel A. Smith). *Tampa Bay Times*, August 14, 2020. Available at `https://www.tampabay.com/opinion/2020/08/14/minor-postal-delays-could-disenfranchise-thousands-of-florida-vote-by-mail-voters-column`.

"Want to know how many people have the coronavirus? Test randomly" (with Daniel N. Rockmore). *The Conversation*, April 13, 2020. Available at `https://theconversation.com/want-to-know-how-many-people-have-the-coronavirus-test-randomly-135784`.

"If more states start using Ohio's system, how many voters will be purged?" (with Daniel A. Smith). *The Washington Post*, Monkey Cage, June 17, 2018.

"Do we have a right not to vote? The Supreme Court suggests we don't" (with Daniel A. Smith). *New York Daily News*, June 12, 2018.

"Nearly 4 million black voters are missing. This is why" (with David Cottrell, Javier M. Rodriguez, and Daniel A. Smith). *The Washington Post*, Monkey Cage, April 11, 2018.

"We can't find any evidence of voting fraud in New Hampshire" (with David Cottrell and Sean Westwood). *The Washington Post*, Monkey Cage, February 28, 2017.

"We checked Trump's allegations of voter fraud. We found no evidence at all" (with David Cottrell and Sean Westwood). *The Washington Post*, Monkey Cage, December 2, 2016.

"High ballot rejection rates should worry Florida voters" (with Daniel A. Smith). *Tampa Bay Times*, October 28, 2012.

"Logistic Regression." *The Encyclopedia of Political Science*, George Thomas Kurian, James E. Alt, Simone Chambers, Geoffrey Garrett, Margaret Levi, and Paula D. McClain, eds., Washington, D.C.: CQ Press. 2010.

"Using XEmacs Macros to Process ASCII Data Files." *The Political Methodologist* 13(2): 13-18. 2005.

"Ohio 2004 Election: Turnout, Residual Votes and Votes in Precincts and Wards" (with Walter R. Mebane, Jr.), in "Democracy At Risk: The 2004 Election in Ohio," report published by the Democratic National Committee. 2005.

"Poisson Regression." *The Encyclopedia of Social Science Research Methods*, Alan Bryman, Michael Lewis-Beck, and Tim Futing Liao, eds. Thousand Oaks, CA: Sage Publications, 2003.

"Pork barrel race to the bottom" (with Brett A. Theodos). *Illinois Issues* 29(2): 22-23. 2003.

"Teaching Introductory Probability Theory." *The Political Methodologist* 10(2): 2-4. 2002.

"Ballot cost Gore thousands of votes" (with Henry E. Brady and Jonathan N. Wand). *The San Diego Union-Tribune*, p. G3, November 19, 2000.

Work in progress

"The Social Dilemma of Overarming" (with Feng Fu and Daniel Rockmore).

"Evidence from Maine on the effect of the COVID-19 pandemic on methods of absentee ballot delivery."

"Election Administration Harms and Ballot Design: A Study of Florida's 2018 United States Senate Race" (with Michael Morse, Marc Meredith, Daniel A. Smith, and Michael D. Martinez).

Public testimony

Special Committee on Voter Confidence, New Hampshire Secretary of State. September 7, 2022.

"Voting in America: The Potential for Polling Place Quality and Restrictions on Opportunities to Vote to Interfere with Free and Fair Access to the Ballot," Subcommittee on Elections, Committee on House Administration, United States House of Representatives. June 11, 2021.

Awards

Elizabeth Howland Hand-Otis Norton Pierce Award for outstanding undergraduate teaching, Dartmouth College, 2020-21.

Best Paper Award, State Politics and Policy Section, 2013 Annual Meeting of the American Political Science Association. *Getting Your Souls to the Polls: The Racial Impact of Reducing Early In-Person Voting in Florida* (with Daniel A. Smith).

Grants

Committee for Scholarly Innovation and Advancement Awards, Dartmouth College, February, 2014. Project title: "The Dynamics of Voting Lines in Miami-Dade County." Financial support: $32,000.

The Rockefeller Center for Public Policy and the Social Sciences, Dartmouth College, May, 2006. Project title: "Large Scale Survey of Americans in Multiple Congressional Districts." Financial support: $8,500.

National Science Foundation, SES-041849, July, 2004. Project title: "A Ballot-Level Study of Intentional and Unintentional Abstention in Presidential Election Voting." Financial support: $65,749.

Nelson A. Rockefeller Center for the Social Sciences, Dartmouth College, January, 2004. Project title: "Intentional Invalid Votes in Leon County, Florida." Financial support: $1,115.

American Enterprise Institute, August, 1999. Project title: "Tenure in Office and Congressional Voting" (with Kenneth W. Shotts). Financial support: $182,500.

University Research Grants Committee, Northwestern University, February, 1999. Project Title: "Representation, Policy Uncertainty, and Divided Government." Financial support: $4,087.

Stanford University Graduate School of Business, 1997-1998 Academic Year. Dissertation Research Grant.

Recent conference presentations

"Identifying Turnout Effects of Saturday Early Voting," 2023 Election Sciences, Reform, and Administration conference, University of Georgia.

"Evaluating a New Generation of Expansive Claims about Vote Manipulation," 2023 Annual Meeting of the Midwest Political Science Association, Chicago, IL.

"Who stands next to whom?," 2022 Annual Meeting of the Midwest Political Science Association, Chicago, IL (remote presentation).

"Auditing the 2020 General Election in Georgia: Residual vote rates and a confusing ballot format," 2021 Annual Meeting of the Southern Political Science Association (remote presentation).

"Ballot design, voter intentions, and representation: A study of the 2018 midterm election in Florida," 2019 Annual Meeting of the American Political Science Association, Washington, DC.

"Ballot design, voter intentions, and representation: A study of the 2018 midterm election in Florida," Election Sciences, Reform, and Administration conference, 2019, University of Pennsylvania.

"Did ballot design oust an incumbent senator? A study of the 2018 midterm election in Florida," Congressional Elections & the Presidency: Politics in 2018, March 30, 2019, Saint Anselm College, Manchester NH.

Invited seminars

University of Iowa, 1999
Boston University, 2000
Dartmouth College, 2000
Harvard University, 2000
University of Minnesota, 2000
University of Rochester, 2000
University of Wisconsin, Madison, 2000
Yale University, 2000
Columbia University, 2001
University of California, Berkeley, 2002
University of Illinois, 2002
Brown University, 2003
Temple University, 2003
University of Chicago, 2003
New York University, 2004
Princeton University, 2004
University of Michigan, 2005
George Washington University, 2006
Emory University, 2006
Harvard University, 2007
Loyola Law School, 2007
Columbia University, 2007
University of Chicago, 2007
Yale University, 2007
Stanford University, 2008
Columbia University, 2008
Northwestern University, 2008
Princeton University, 2008
Duke University, 2009
Hertie School of Governance, 2010
Emory University, 2010
University of Mannheim, 2011
University of Heidelberg, 2011
University of Passau, 2012
University of Göttingen, 2012
Freie Universität Berlin, 2012
Laval University, 2012
University of Montreal, 2012
Middlebury College, 2013
University of Illinois, Champaign, 2013
University of Illinois, Chicago, 2013
University of Wisconsin, Madison, 2013
Yale University, 2014
University of Virginia, 2015
University of California, San Diego, 2015
American University, 2015
Massachusetts Institute of Technology, 2015
Princeton University, 2015
University of California, Los Angeles, 2016
The Ohio State University, 2016
Freie Universität Berlin, 2016
Deutsch-Amerikanisches Institut, Nürnberg, 2017
Universität Bonn, 2018
Freie Universität Berlin, 2018
Northwestern University, 2018
Northwestern University, 2018
University of Salzburg, 2019
Universität Bonn, 2019
Freie Universität Berlin, 2019
Humboldt University, 2019
University of North Carolina, Charlotte, 2019
Freie Universität Berlin, 2022
Bard Berlin, 2022
Bard Berlin, 2024

Professional activities

Division Chair, Representation and Electoral Systems, 2017 Annual Meeting of the Midwest Political Science Association.

Associate Editor, *Research & Politics*. November, 2016-present.

Editorial Board, *American Politics Research*, September, 2015-present.

Editorial Board, *Political Analysis*, January 2010-December 2023.

Editorial Board, *USENIX Journal of Election Technology and Systems*, March 2013-June 2016.

Editorial Board, *American Political Science Review*, 2010-2012.

Editorial Board, *American Journal of Political Science*, 2006-2009.

"Race, Voting Procedures, and New Developments in Voting Rights," panel organized for the 2013 Annual Meeting of the Midwest Political Science Association.

Division Chair, Formal Theory, 2007 Annual Meeting of the American Political Science Association.

Co-editor, *The Political Methodologist*, Fall 2004-Spring 2006.

Case 1:18-cv-01034-LCB-LPA Document 317-4 Filed 05/17/24 Page 77 of 104

Publications Committee, Society for Political Methodology, 2005-2006, 2015-present.

Dartmouth College activities

Advisory Committee for Investor Responsibility, 2023-24.
Faculty Coordinating Committee, 2023-24.
Vice-Chair, Committee of Chairs, 2023-24.
Day of Caring Planning Committee, Fall 2022.
Committee on Organization & Policy, Fall 2022.
Assistant professor search committee, Program in Quantitative Social Science, September 2021-March 2022.
Title IX Council, Fall 2021-Fall 2022.
Committee on Priorities, Fall 2019-Spring 2022.
Chair, American Politics Search Committee, Department of Government, August 2018-March 2019.
Chair, Committee on Priorities, July 2015-June 2016.
Committee on Priorities, July 2013-June 2015.
American politics search committee, Department of Government, August 2014-December 2014.
Research Computing Director search committee, October 2013-October 2014.
Senior Search Committee, Department of Government, 2013.
Research Computing Advisory Committee, Spring 2013.
Chair, American Politics Search Committee, Department of Government, 2012-13.
Recruitment Planning Committee, Department of Government, 2010 and 2012-13.
Committee on Standards, 2008-10.
Task Force on Collaboration and Social Software, 2007-08.
Biostatistics search committee, Dartmouth Medical School, 2006-07.
Research Computing Oversight Committee, 2006.
Council on Computing, 2005-07.
Clement Chair search committee, Department of Government, 2005-06.

Northwestern University activities

Program Committee, Mathematical Methods in the Social Sciences, 2001-02.
American Politics Search Committee, Department of Political Science, 2000-01, 2001-02.
Formal Theory Search Committee, Department of Political Science, 1997-98.

Teaching interests

Statistical methods: introductory and applied statistics, research design, computing in R.
American politics: representation, election irregularities, election administration.
Political economy: game theory.

Case 1:18-cv-01034-LCB-LPA Document 317-4 Filed 05/17/24 Page 78 of 104

Reviewer for

American Journal of Political Science
American Political Science Review
American Politics Quarterly
American Politics Review
British Journal of Political Science
Cambridge University Press
Chapman & Hall
Congress & the Presidency
Du Bois Review
Economics & Politics
Election Law Journal
Electoral Studies
Emerging Markets Finance & Trade
Interest Groups & Advocacy
Int'l Journal of Environmental Research and Public Health
John Wiley & Sons, Inc.
Journal of Legal Studies
Journal of Money, Credit and Banking
Journal of Politics
Journal of Public Economics
Journal of Quantitative Analysis in Sports
Journal of Race, Ethnicity, and Politics
Journal of Theoretical Politics
Journal of Women, Politics & Policy
Legislative Studies Quarterly
The National Science Foundation
Nonprofit Policy Forum
Perspectives on Politics
Policy Studies Journal
Political Analysis
Political Behavior
Political Geography
Political Research Quarterly
Political Science Quarterly
Political Science Research and Methods
Political Studies
Politics & Gender
Politics, Groups, and Identities
Polity
Prentice Hall Higher Education Group
Proceedings of the National Academy of Sciences
Public Administration
Public Choice
Public Opinion Quarterly
PS: Political Science and Politics
Quarterly Journal of Economics
Quarterly Journal of Political Science
Race and Social Problems
Science Advances
The Social Science Journal
Social Science Quarterly
Sociological Methods & Research
The Sociological Quarterly
Springer
State Politics & Policy Quarterly
Time-Sharing Experiments for the Social Sciences
The University of Michigan Press
W. W. Norton & Company
World Politics

Foreign language

German: C1 (telc Prüfung, Ausstellung July 27, 2017).

Other employment

Intelligence Analyst and Military Officer, United States Air Force, Foreign Technology Division, Wright-Patterson Air Force Base, 1989-1992.

C The confidential November 2023 registered voter database

183 The November 2023 confidential registered voter database, or voter file, consists of two separate text files. These files are titled, "HIGHLYCONFIDENTIAL_VOTER_REG_11-17-2023_Counties_1-50.csv" and "HIGHLYCONFIDENTIAL_VOTER_REG_11-17-2023_Counties_51-100.csv." I refer to these two files collectively as the November 2023 State Board of Elections registered voter database.

184 The November 2023 State Board of Elections registered voter database was delivered to me via FedEx on an encrypted USB drive. North Carolina State Board of Elections General Counsel Paul Cox verbally provided me with the password to decrypt the USB drive. Each row of the November 2023 confidential voter file corresponds to a single North Carolina registered voter.

185 There are 7,354,742 registered voters listed in the November 2023 confidential voter file. Plaintiff's Counsel provided me with an Excel spreadsheet, "LitigationDataHeadings_NCSBE-105469.xlsx," that describes the layout of the file. This file lists only registered voters whom the North Carolina State Board of Elections designates as either active or inactive; it does not include individuals whose registrations have been canceled.

186 A key field in the November 2023 registered voter database is that which corresponds to voters' North Carolina voter identification numbers, called `ncid` in the file. I verified that there were no duplicated voter identification numbers in the voter file and that there are no records with missing voter identification numbers.

187 Table 16 reports the racial breakdown of the registered voters in the November 2023 State Board of Elections registered voter database.

188 White registered voters (roughly 4.8 million) are the largest racial group of registered voters in North Carolina. The next largest group is Black registered voters (roughly 1.5 million).

Table 16: Racial composition of November 2023 State Board of Elections registered voter database

Race	Registered voters
White	4,776,832
Black	1,472,537
Unknown race	631,291
Other	260,201
Asian	120,867
American Indian / Alaska Native	53,906
Two or more races	38,435
Native Hawaiian / Pacific Islander	673
Total	7,354,742

189 Table 17 reports the ethnic breakdown of the registered voters in the November 2023 State Board of Elections registered voter database.

Table 17: Ethnic composition of November 2023 State Board of Elections registered voter database

Ethnicity	Registered voters
Not Hispanic	5,095,485
Unknown ethnicity	1,979,355
Hispanic	279,902
Total	7,354,742

190 There were roughly five million non-Hispanic registered voters in North Carolina as of November 2023. Putting aside registered voters whose ethnicities are not listed in the November 2023 State Board of Elections registered voter database, as of November 2023 there were roughly 280,000 thousand Hispanic registered voters in the North Carolina.

D The confidential November 2023 North Carolina Department of Transportation license database

191 The North Carolina Department of Transportation provided me with a set of ascii files that contain details on driver's licenses and related forms of identification that have been issued to residents of North Carolina. I downloaded these files from a secure website, and the set of files I downloaded constitutes the November 2023 Department of Transportation database. The files were accompanied by an Excel spreadsheet ("DMV Systems Data Dictionary NOV23.xlsx") that describes the files' contents and their layouts.

192 *Citizen file*. To the best of my knowledge, the citizen file that is part of the November 2023 Department of Transportation license database consists of a list of North Carolina residents who have been issued licenses administered by the Department of Transportation. The November 2023 citizen file has 15,749,449 lines, each line corresponding to a single individual. From this file I extracted the following variables: license number, first name, middle name, last name, birth date, last four digits of social security number, and date upon which a corresponding license holder passed away (if any).

193 For the purposes of this second supplemental expert report, I say that a record in the Department of Transportation citizen file is associated with ash deceased license holder if the record's deceased date field is not empty. Of the citizen file's 15,749,449 records, there are 2,013,255 with non-empty deceased dates.

194 *Status file*. To the best of my knowledge, the status file that is part of the November 2023 Department of Transportation license database consists of codes that describe the statuses of licenses that have been issued to residents of North Carolina. The file has 16,165,908 lines, each of which corresponds to the status of a single license. From the status file, I extracted license numbers and status codes.

195 Status codes of licenses are listed in Table 18 along with descriptions based on documentation provided by the Department of Transportation (the aforementioned Excel spreadsheet describes the status codes).

Table 18: License status codes in November 2023 North Carolina Department of Transportation database

Status	Description	Count
1	Active	9,641,854
E	Inactive	3,427,552
B	Deceased	2,007,806
7	Suspended	601,789
A	Eligible for reinstatement	389,168
D	Medical cancellation	56,551
4	Canceled	35,621
9	90 day renewal denied	5,486
-	Missing	54
8	Denied	27
All		16,165,908

196 The Department of Transportation documentation on its database includes a status code of six, which corresponds to, "Transfered - suspended." There were no status codes of six in the status file provided to me by the Department of Transportation, and the code of six thus does not appear in Table 18. There are also 54 status codes in the status file that are blank. None of the conclusions in this report are qualitatively sensitive to these 54 missing status codes.

197 There are more status codes (16,165,908) than there are unique license codes (15,665,548) in the status file. It is my understanding that this reflects the fact that a single North Carolina resident can be issued multiple licenses by the Department of Transportation.[68]

198 *Driver ID file*. To the best of my knowledge, the driver ID file that is part of the 2023 Department of Transportation license database consists of codes that describe important license

[68] This was noted in an email sent to me on November 22, 2021 by Mr. Neil Dalton of the North Carolina Department of Justice ("No, the two status code entries are associated with the same customer but for two different issuances (e.g., a regular license issuance and a CDL permit issuance).")

features. From this file I extracted license numbers, license expiration dates, and group codes. I verified that there are no duplicated license numbers in the driver ID file.

199 Table 19 reports group codes, their descriptions, and their counts in the driver ID file. There are 14 licenses with missing group codes, and this has no qualitative consequences for this report.

Table 19: License group codes in November 2023 North Carolina Department of Transportation database

Description	Group code	Count
Driver's license	[Blank]	12,984,640
ID card	I	2,166,982
Permit	P	209,861
Full provisional, level 3	3	173,269
Limited learner, level 1	1	133,012
limited provisional, level 2	2	81,922
Motorcycle license	M	391
Temporary permit	T	25
-	Missing	14
Motorcycle permit	4	1
All		15,750,117

200 There are 84,569 license numbers in the North Carolina Department of Transportation's driver ID file that do not appear in the status file. I cannot determine the statuses of these licenses.

201 *Residential address file*. To the best of my knowledge, the Department of Transportation's residential address file that is part of the November 2023 Department of Transportation license database consists of addresses for license holders in North Carolina. The file has 15,750,094 lines, each of which corresponds to an address of a North Carolina license holder. Table 20 lists the variables that I use from the provided status file.

202 To infer the house number of a given residential address, I extract the leading digits, if any exist, from each first address line, *i.e.*, from the field named `address1` in the Department of

Table 20: Key fields in the Department of Transportation's residential address file

Field description	Name in address file
Driver's license number	drivers_license_number
First line of address	address1
Second line of address	address2
Five digit zip code	zip5

Note: fields listed in the order that they appear in residential address file.

Transportation's residential address file. In some cases, this requires extract fractional house numbers like "1/2."[69]

203 There are 668 license numbers in the residential address file that do not appear in the citizen file. And, there are 26 license numbers in the citizen file that do not appear in the residential address file. These two numbers are very small compared to the millions of license numbers in both of these files and are qualitatively inconsequential to the conclusions of this report.

[69]There are 20 residential addresses in the Department of Transportation residential address file that appear to include minor errors. These addresses appear in the following lines in the address file: 2559678, 2605339, 3016060, 3191053, 3417398, 6195796, 6291416, 6739119, 6821262, 7129687, 8339317, 9620217, 9922542, 11983529, 12266264, 12419644, 12682025, 12922113, 13839213, and 15559449. I fixed these errors manually, and none of the conclusions in this report depend qualitatively on the 20 address errors mentioned in this footnote.

E Reasons for canceling voter registrations

204 Table 21 lists the reasons for voter registration cancelation in the January 10, 2024 public State Board of Elections voter registration database.[70]

Table 21: Reasons for removal from North Carolina voter file, January 20, 2024

Reason	Count	Percentage
Deceased	468,355	43.47
Removed After 2 Fed General Elections In Inactive Status	170,493	15.82
Verification Returned Undeliverable	153,072	14.21
Moved From State	132,854	12.33
Moved From County	102,154	9.48
Felony Conviction	11,343	1.05
Moved Within State	10,915	1.01
Request From Voter	9,170	0.85
Unavailable Essential Information	6,100	0.57
Felony Sentence Completed	5,299	0.49
Duplicate	4,061	0.38
Temporary Registrant	2,578	0.24
Administrative	1,065	0.10
Removed Due To Sustained Challenge	21	0.00
Confirmation Not Returned	15	0.00
Removed Under Old Purge Law	3	0.00
Unverified	3	0.00
Total	1,077,501	100.00

Note: includes voter registrations denied (159,216) and removed (918,285).

[70] I downloaded this database on January 26, 2024 from the North Carolina State Board of Elections FTP site. *See* fn. 50.

F Identifying residential college students in the November 2023 registered voter database

205 To identify college students who are registered voters in North Carolina and live in college residential facilities, I employ the following approach.

206 I take the list of 55 colleges in North Carolina that appear in the 2024 college guide of *US News & World Report*.[71] For each of these institutions, I determined main college address from the U.S. Department of Education's Database of Postsecondary Institutions and Programs.[72] If a registered voter's registration address is equivalent to one of the 55 official college addresses, I say that the registered voter is a college student who lives in a college residential facility.

207 For the North Carolina residential colleges with top 11 enrollment according to *College Simply*, I gathered the addresses of all the dormitories I could identify.[73] Then, if a registered voter's registration address is equivalent to one of these addresses, I say that the registered voter is a college student who lives in a college residential facility. Table 22 lists the colleges and the websites from which I gathered dormitory address information.

208 I gathered the names of the 72 North Carolina colleges listed in *college ai*.[74] If the name of one of these colleges appears in the residential street name of a registered North Carolina voter, then I say that the registered voter is a college student who lives in a college residential facility.

209 In addition, I say that the registered voter in North Carolina is a college student who lives in a college residential facility if (1) the word "Hall" (preceded by a space) appears at the end of a

[71] These 55 colleges are listed at `https://www.usnews.com/best-SB~824colleges/nc` (*last accessed* February 22, 2024).

[72] The database is *available at* `https://ope.ed.gov/dapip/#/home` (*last accessed* February 22, 2024). I adjust town names as needed, *i.e.*, the town of Mount Olive is sometimes recorded as Mt. Olive.

[73] *See* `https://www.collegesimply.com/colleges/rank/colleges/largest-SB~824enrollment/state/north-SB~824carolina` (*last accessed* February 27, 2024) for college enrollments sorted by enrollment. I do not incorporate community colleges that lack residential facilities in my list of colleges top-enrolling colleges in North Carolina.

[74] *See* `https://college.ai/Colleges/North-SB~824Carolina-SB~824Colleges.html` (*last accessed* February 27, 2024).

Table 22: Top 11 residential colleges in North Carolina based on enrollments

Institution	Website
NC State Raleigh	https://housing.dasa.ncsu.edu/residential-SB-824communities/on-SB-824campus-SB-824housing
UNC Chapel Hill	https://housing.unc.edu/live/resident-SB-824resources/mail-SB-824packages/whats-SB-824my-SB-824address
UNC Charlotte	https://housing.charlotte.edu/housing-SB-824options/residence-SB-824halls
East Carolina University	https://housing.ecu.edu/our-SB-824neighborhoods-SB-824and-SB-824halls
Appalachian State University	https://housing.appstate.edu
UNC Greensboro	https://hrl.uncg.edu/view-SB-824the-SB-824residence-SB-824halls
NC A&T State	https://www.ncat.edu/campus-SB-824life/student-SB-824affairs/departments/housing-SB-824and-SB-824residence-SB-824life/housing/residence-SB-824halls/index.php
UNC Wilmington	https://uncw.edu/seahawk-SB-824life/dining-SB-824housing/housing/residence-SB-824halls
Duke University	https://postoffice.duke.edu/addressing-SB-824mail/dormitory-SB-824street-SB-824addresses
Western Carolina University	https://www.wcu.edu/experience/life-SB-824on-SB-824campus/residential-SB-824living/residence-SB-824halls/index.aspx
Wake-Forest University	https://rlh.wfu.edu/housing/halls

registered voter's street name and the voter's town is in the list of college towns in the *college ai* list; (2) the word "Dorm" (preceded by a space) appears at the end of a registered voter's street name and the voter's town is in the list of college towns in the *college ai* list; (3) the word "Dormitory" (preceded by a space) appears at the end of a registered voter's street name and the voter's town is in the list of college towns in the *college ai* list; (4) any of the words "West Campus," "East Campus," "North Campus," or "South Campus" appears in a registered voter's street address; (5) the word "College" appears in a registered voter's town; or (6) the word "University" appears in a registered voter's town.[75]

[75]The pattern matching described in this paragraph and throughout the analysis of college student addresses is done independently of case.

G Voter turnout, voter status as characterized by the State Board of Elections, race, and ethnicity

210 Table 23 is a version of Table 12 from the body of this report, broken down by voter race.

Table 23: Turnout in selected North Carolina elections, 2011-23, broken down by race and State Board of Elections voter status

		Active			Inactive		
Election	Turnout	Black	White	Other	Black	White	Other
General 2011	504,910	114,859	364,530	12,776	382	635	63
Primary 2012	2,181,993	340,982	1,740,689	73,467	3,754	10,801	997
General 2012	4,540,633	1,022,627	3,200,461	243,784	18,647	31,497	3,977
General 2013	491,152	119,633	353,838	14,458	741	837	99
Primary 2014	1,026,331	192,943	796,508	28,887	1,211	2,550	343
General 2014	2,932,318	611,189	2,158,020	118,844	12,232	16,688	2,056
General 2015	420,065	94,358	308,078	14,141	663	1,280	156
Primary 2016	2,328,134	424,950	1,755,749	107,568	8,017	18,506	2,658
General 2016	4,757,665	959,392	3,359,289	338,331	19,593	53,254	7,080
General 2017	599,858	151,733	414,783	28,140	1,439	1,619	267
Primary 2018	956,829	199,074	707,679	41,263	1,934	3,447	743
General 2018	3,750,438	732,870	2,689,995	267,576	16,364	24,736	4,533
General 2019	499,779	123,359	344,698	28,136	1,035	1,245	239
Primary 2020	2,163,273	448,595	1,530,215	165,819	4,599	7,071	1,525
General 2020	5,540,699	1,017,832	3,660,028	792,434	17,171	28,788	6,072
General 2021	337,254	55,259	258,907	21,650	278	657	113
Primary 2022	1,432,696	259,725	1,084,009	82,825	1,260	3,201	477
General 2022	3,789,610	621,522	2,777,615	354,625	8,312	18,536	4,291
General 2023	515,029	120,694	350,546	41,770	674	871	219
Total	38,768,666	7,611,596	27,855,637	2,776,494	118,306	226,219	35,908

Note: total turnout includes voters with missing statuses.

211 Table 24 is a version of Table 12 from the body of this report, broken down by voter ethnicity.

Table 24: Turnout in selected North Carolina elections, 2011-23, broken down by ethnicity and State Board of Elections voter status

		Active			Inactive		
Election	Turnout	Hispanic	Not Hispanic	Undesignated	Hispanic	Not Hispanic	Undesignated
General 2011	504,910	1,938	440,296	49,931	4	856	220
Primary 2012	2,181,993	12,522	1,876,848	265,768	189	12,228	3,135
General 2012	4,540,633	60,006	3,615,255	791,611	1,141	40,478	12,502
General 2013	491,152	2,633	431,689	53,607	13	1,351	313
Primary 2014	1,026,331	3,927	902,443	111,968	30	3,410	664
General 2014	2,932,318	25,264	2,432,600	430,189	461	23,478	7,037
General 2015	420,065	2,749	366,468	47,360	24	1,701	374
Primary 2016	2,328,134	28,310	1,922,985	336,972	834	22,153	6,194
General 2016	4,757,665	93,177	3,698,210	865,625	1,990	61,210	16,727
General 2017	599,858	5,883	504,901	83,872	55	2,572	698
Primary 2018	956,829	7,326	814,000	126,690	75	4,957	1,092
General 2018	3,750,438	67,056	2,963,768	659,617	1,260	33,665	10,708
General 2019	499,779	5,540	414,392	76,261	54	1,894	571
Primary 2020	2,163,273	36,216	1,713,651	394,762	410	9,611	3,174
General 2020	5,540,699	131,961	3,947,289	1,391,044	1,883	37,931	12,217
General 2021	337,254	3,580	267,576	64,660	14	769	265
Primary 2022	1,432,696	13,660	1,159,377	253,522	92	3,603	1,243
General 2022	3,789,610	67,106	2,857,392	829,264	938	21,834	8,367
General 2023	515,029	7,747	404,093	101,170	60	1,278	426
Total	38,768,666	576,601	30,733,233	6,933,893	9,527	284,979	85,927

Note: total turnout includes voters with missing statuses.

H The no-match list based on the 2014 State Board of Elections database matching algorithm

212 Table 25 describes the North Carolina registered voters on the no-match list that I create by applying the 2014 State Board of Elections matching algorithm to the November 2023 State Board of Elections and Department of Transportation registered voter and license databases, respectively. I implemented this algorithm using the 29 matching fields that are so indicated in Table 8 (see the column labeled "SBE 2014").

Table 25: November 2023 no-match rates, State Board of Elections 2014 database matching algorithm

Group	Voters	No-match	% No-match
Statewide	7,305,838	509,088	6.97
Race			
White	4,749,516	208,684	4.39
Black	1,459,813	179,589	12.30
Unknown race	623,996	83,849	13.44
Other	259,697	16,639	6.41
Asian	120,710	6,818	5.65
American Indian / Alaska Native	53,235	6,823	12.82
Two or more races	38,201	6,515	17.05
Native Hawaiian / Pacific Islander	670	171	25.52
Ethnicity			
Not Hispanic	5,060,907	298,978	5.91
Unknown ethnicity	1,965,687	185,321	9.43
Hispanic	279,244	24,789	8.88

Note: drops 48,904 voters matched to deceased license records.

213 The top row of Table 25 shows the statewide no-match rate from the 2014 State Board of Elections matching algorithm. According to this algorithm, as of November 2023 there were roughly 509,000 North Carolina registered voters who did not have driver's or other licenses issed by the North Carolina Department of Transportation that under SB 824 are sufficient for the purposes of voting in North Carolina. This is equivalent to a statewide no-match rate of approximately 6.97 percent.

214 Below the statewide row of Table 25 are two panels, the first of which breaks down North Carolina registered voters by race and the second of which breaks down North Carolina registered voters by ethnicity.

215 As shown in the race panel of Table 25, there is substantial racial variability in no-match rates. In particular, the Black no-match rate of 12.30 percent is roughly 2.8 times as large as the white no-match rate of 4.39 percent. Of the different race groups listed in Table 25, the white no-match rate rate is the lowest.

216 The ethnicity panel in Table 25 includes three categories: Hispanic, Not Hispanic, and unknown. The Hispanic no-match rate of 8.88 percent is roughly 1.5 times as large as the non-Hispanic no-match rate of 5.91 percent.

I The no-match list based on the 2014 Department of Justice database matching algorithm

217 This appendix contains the no-match list produced by applying the Department of Justice 2014 database matching algorithm to November 2023 registered voter and license databases. This no-match list is summarized in Table 26.

Table 26: November 2023 no-match rates, Department of Justice 2014 database matching algorithm

Group	Voters	No-match	% No-match
Statewide	7,320,387	496,133	6.78
Race			
White	4,756,234	199,928	4.20
Black	1,463,250	175,658	12.00
Unknown race	627,738	84,151	13.41
Other	259,965	16,485	6.34
Asian	120,795	6,649	5.50
American Indian / Alaska Native	53,398	6,649	12.45
Two or more races	38,338	6,448	16.82
Native Hawaiian / Pacific Islander	669	165	24.66
Ethnicity			
Not Hispanic	5,069,509	287,405	5.67
Unknown ethnicity	1,971,235	184,082	9.34
Hispanic	279,643	24,646	8.81

Note: drops 34,355 voters matched to deceased license records.

218 The composition of the no-match list based on my applying the Department of Justice 2014 database matching algorithm to November 2023 registered voter and license databases produced by the State Board of Elections and Department of Justice, respectively, are qualitatively similar to the composition of the no-match list based on the 2014 State Board of Elections database matching algorithm.

219 According to the 2014 Department of Justice database matching algorithm, the statewide no-match rate in North Carolina is 6.78 percent. This is based on roughly 496,000 non-matched registered voters.

220 Also according to the 2014 Department of Justice algorithm, the Black no-match rate is 12.00 percent, which is roughy 2.9 times as high as the white no-match rate of 4.2 percent. And, the Hispanic no-match rate of 8.81 percent is roughly 1.6 times as large as the non-Hispanic no-match rate of 5.67 percent.

J State Board of Elections letter on requirements for college identification to be suitable for voting under SB 824

NORTH CAROLINA
STATE BOARD OF ELECTIONS

P.O. Box 27255
Raleigh, NC 27611
(866) 522-4723
www.ncsbe.gov

Dear College or University Official,

Today, I am announcing the next opportunity to submit your institution's student identification card for approval for voting in North Carolina. The State Board of Elections will accept applications from April 1, 2024 through June14, 2024. Please read this message carefully to help ensure your students are best equipped to participate in our state's elections.

Student identification cards issued by North Carolina's public or private universities and colleges, and employee identification cards issued by state and local government entities or charter schools, are valid forms of photo identification for voting when approved by the State Board.[1] **This document provides an overview of the approval process for student identification cards only.** A public college or university, including a community college, is a state or local government entity for photo ID purposes and may seek approval of both student and employee identification cards, but the entity must submit a separate approval form for employee identification cards.

If your card was previously approved by the State Board in 2023 or 2024, you do not need to reapply at this time. Your card is approved through December 31, 2024.

Before your institution's identification cards can be used for voting in North Carolina, the State Board of Elections must confirm that the cards meet certain legal requirements. **To request approval for use in the 2024 general election, a signed Student Identification Approval Form (attached to this letter) and digital image of the student identification card must be received by the State Board of Elections on or before June 14, 2024.** The State Board will review these submissions in June 2024 and then publish a list of approved student identification cards. Cards approved by the State Board during this submission round will remain valid for use as a voter's photo ID through December 31, 2024.

The State Board will approve a student identification card for voting if the following criteria are met:[1]

1. The identification cards contain photographs of students obtained by the university or college or its agents or contractors, provided the photograph obtained (1) is a frontal image that includes the student's face and (2) represents a clear, accurate likeness of the student to whom the identification card is issued. If the photograph is one not produced

[1] N.C.G.S. § 163-166.17(a)(1).

by the university or college or its agents, the university or college shall certify in detail the process used by the university or college to ensure the photograph is that of the student to whom the identification card is issued and shall certify that the process is designed to confirm the identity of the student to whom the identification card is issued.

2. The identification cards are issued after an enrollment or other process that includes one or more methods of confirming the identity of the student using information that may include, but is not limited to, the social security number, citizenship status, and birthdate of the student.

3. Access to the equipment for producing the identification cards is restricted through security measures.

4. Misuse of the equipment for producing the identification cards would be grounds for student discipline or termination of an employee.

5. University or college officials would report to law enforcement any misuse of student identification card equipment that they have knowledge of.

6. ID cards issued by the university or college during the approval period will contain an expiration date.

7. The university or college will provide copies of student identification cards to the State Board to assist with training purposes.

8. The college or university will provide to students who are issued the student identification card a copy of, or an electronic link to, a document developed by the State Board that details various rules pertaining to voting in North Carolina, with a particular emphasis on student voting.

Previously Approved Student Identification:

Previously approved student identification cards may not require an entirely new request for approval. If your institution's student identification cards (1) were approved by the State Board on or before March 15, 2019,[2] (2) contain an expiration date, and (3) have had no changes to the card since its approval, you may select the "Statement of No Changes" box on the Student Identification Approval Form.[3] No new digital image is required for an approved card with no changes.

[2] For a list of IDs approved on March 15, 2019, visit https://dl.ncsbe.gov/?prefix=Voter%20ID/.

[3] N.C.G.S. § 163-166.17(b); N.C. Sess. Law 2019-22, § 6.(a).

If your institution's student identification card was approved by the State Board of Elections on or before March 15, 2019, but the card did not contain an expiration date, that approval expired December 31, 2020, and a new request must be submitted.[4]

If your institution's student identification card was first approved on November 1, 2019,[5] or on November 26, 2019,[6] that approval expired December 31, 2020, and you will need to submit a new approval request.

2023 Application Instructions:	**1. Complete and sign the attached form** The Student Identification Approval Request Form must be signed by the chancellor, president, or registrar of the university or college.[7] The Student Identification Approval Form must be submitted to VoterID@ncsbe.gov by **June 14, 2024.**
	2. Submit images of the ID Card Submit high-resolution sample images (suggested 300 dpi or higher), in PDF, JPG, PNG, or Word format, of the front and back of the identification card(s). If the back of the identification card is designed to be blank, please note that with your application. If you are submitting a "Statement of No Changes," these images are not required. The images must be included with the approval request form submitted to VoterID@ncsbe.gov by **June 14, 2024.**

If your identification card is approved, the State Board will provide instructions on how to inform the State Board of any changes to the approved identification, pursuant to state law.[8]

Digital Identification Cards and Mobile Credentials

During the previous application period, several institutions expressed interest in seeking approval of digital identification cards and mobile credentials. While the State Board has not ruled on the approval of any digital identification cards or mobile credentials, we encourage institutions to

[4] N.C. Sess. Law 2019-22, § 5.

[5] For a list of IDs approved on November 1, 2019, visit https://dl.ncsbe.gov/?prefix=Voter%20ID/.

[6] For a list of IDs approved on November 26, 2019, visit https://dl.ncsbe.gov/?prefix=Voter%20ID/.

[7] N.C.G.S. § 163-166.17(a)(1).

[8] N.C.G.S. § 163-166.17(d).

apply for their approval in addition to the institution's physical identification cards. In addition to completing and signing the Student Identification Approval Request Form, please include with your application additional documentation describing how the digital identification cards or mobile credential meets each of the requirements of N.C.G.S. § 163-166.17.

If you have any questions or need assistance, please contact VoterID@ncsbe.gov or 919-814-0700. Thank you, in advance, for helping to promote the civic participation of your student body.

Sincerely,

Karen Brinson Bell
Executive Director
North Carolina State Board of Elections

K No-ID lists from the 2014 State Board of Elections, 2014 Department of Justice, and August 2019 State Board of Elections database matching algorithms

221 This appendix contains three tables, all of which are analogous to Table 15 in the body of this report. In particular, in this appendix, Table 27 describes the contents of the no-ID list based on the 2014 State Board of Elections database matching algorithm, Table 28 describes the contents of the no-ID lists based on the 2014 Department of Justice database matching algorithm, and Table 29 describes the contents of the no-ID list based on the August 2019 State Board of Elections database matching algorithm.

Table 27: No-ID rates based on 2014 State Board of Elections database matching algorithm

Group	Voters	No-match	% No-match
Statewide	7,305,838	417,225	5.71
Race			
White	4,749,516	161,056	3.39
Black	1,459,813	149,432	10.24
Unknown race	623,996	75,306	12.07
Other	259,697	14,969	5.76
Asian	120,710	5,153	4.27
American Indian / Alaska Native	53,235	5,659	10.63
Two or more races	38,201	5,501	14.40
Native Hawaiian / Pacific Islander	670	149	22.24
Ethnicity			
Not Hispanic	5,060,907	234,093	4.63
Unknown ethnicity	1,965,687	160,787	8.18
Hispanic	279,244	22,345	8.00

Note: drops 48,904 voters matched to deceased license records.

Table 28: No-ID rates based on 2014 Department of Justice database matching algorithm

Group	Voters	No-match	% No-match
Statewide	7,320,387	412,397	5.63
Race			
White	4,756,234	157,022	3.30
Black	1,463,250	148,330	10.14
Unknown race	627,738	75,855	12.08
Other	259,965	14,935	5.75
Asian	120,795	5,056	4.19
American Indian / Alaska Native	53,398	5,593	10.47
Two or more races	38,338	5,461	14.24
Native Hawaiian / Pacific Islander	669	145	21.67
Ethnicity			
Not Hispanic	5,069,509	229,587	4.53
Unknown ethnicity	1,971,235	160,513	8.14
Hispanic	279,643	22,297	7.97

Note: drops 34,355 voters matched to deceased license records.

Table 29: No-ID rates based on 2019 State Board of Elections database matching algorithm

Group	Voters	No-match	% No-match
Statewide	7,335,037	495,070	6.75
Race			
White	4,765,160	185,385	3.89
Black	1,467,415	167,489	11.41
Unknown race	628,926	104,947	16.69
Other	260,020	17,354	6.67
Asian	120,809	6,546	5.42
American Indian / Alaska Native	53,649	6,979	13.01
Two or more races	38,385	6,190	16.13
Native Hawaiian / Pacific Islander	673	180	26.75
Ethnicity			
Not Hispanic	5,081,480	269,057	5.29
Unknown ethnicity	1,973,875	199,494	10.11
Hispanic	279,682	26,519	9.48

Note: drops 19,705 voters matched to deceased license records.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully submitted,

Executed on: 4/5/2024

Michael C. Herron