Evaluating the Quality of a National Voter Registration File Using Administrative Records

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Motivation

- Commercial voter registration records are widely used for:
  - Survey sampling frames.
  - Research on turnout, participation, and representation.
  - Policy analysis.
  - A third-party source to include in administrative record composite files.

- Despite widespread use, **systemic evidence on voter registration quality remains outdated and insufficient** (Kim et al., 2025).

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Why Data Quality Matters

- Data quality issues can introduce several types of errors:
  - Coverage error: Inclusion of “deadwood” records (e.g., deceased or outdated records).
  - Measurement error: Misclassification of demographic characteristics.

- These errors can lead to:
  - Bias in inference: Distorted turnout estimates and biased subgroup analysis.
  - Administrative inefficiencies: Increased survey costs.

- Accurate measurement of these errors provides information on the potential magnitude of the potential bias and inefficiencies being incurred.

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Contribution

- Provide first comprehensive nation-wide data quality analysis of 2020 commercial voter registration files.

- Use the Census Bureau's Person Identification Validation System (PVS) to assign registrations a unique Protected Identification Keys (PIKs).
  - PIKs enable record-linkage to federal and survey datasets available at the U.S. Census.

- Using PIKs, I produce high-quality measurements of:
  - Duplicate registrations (within and across state files).
  - Deceased records.
  - Demographic classification accuracy (race and Hispanic ethnicity).

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Data sources

- National Voter Registration File (NVRF):
  - A 2020 snapshot of all 50 state + DC commercial voter registration files.

- Administrative Records:
  - PVS to assign PIKs.
  - 2025 Census Numident provides mortality information.
  - 2020 Best Race and Ethnicity Administrative Records Composite (Best Race) file provides validated demographic characteristics from administrative and survey responses.

Together, these data enable person-level validation of almost all voter file records.

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The Commercial Voter Registration Data

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The Data: From Registration to Commercial Vendor to Census

Decentralized:

- There is no single national voter registration file (NVRF).
- Voter rolls and access are managed differently in each state.
  - Different laws and policies regarding data disclosure, list maintenance regulations, etc.
- Potential for significant variation in quality of data.

Acquisition and processing by commercial data vendors:

- Once state files are acquired the data is standardized, cleaned, and processed.

Important to emphasize:

- Measuring the quality of the commercial voter registration files.
- NOT the quality of the voter rolls in local election offices.
- Files do not contain any political party status information.

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Assigning Unique Person Identifiers

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What is a PIK?

- A Protected Identification Key (PIK) is: A unique anonymized person identifier.

- Assigned using probabilistic matching on (Wagner and Layne, 2014):
  - Demographics: Complete name, date-of-birth, and sex history and variations.
  - Geographic: Address information from administrative records.

- This enables:
  - Linking individuals across administrative datasets.
  - Identifying multiple records belonging to the same person.

- Key Difference to standard methods used:
  - Identifies all reported name changes and name variations.
  - Address data provides additional strength to the accuracy of the match.

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PIK Assignment Rates

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PIK Assignment Rate in the NVRF

	Number of registrations	Percent of registrations
Total Registrations	200,000,000	100.00
With PIKs	195,576,000	97.84
Without PIKs	4,324,400	2.16

- PIK assignment rate as high as federal administrative records (Layne, Wagner, and Rothhass, 2014).
- Indication that the quality of input data (name, date-of-birth, sex, address) is high.
- Masks considerable state-level heterogeneity.

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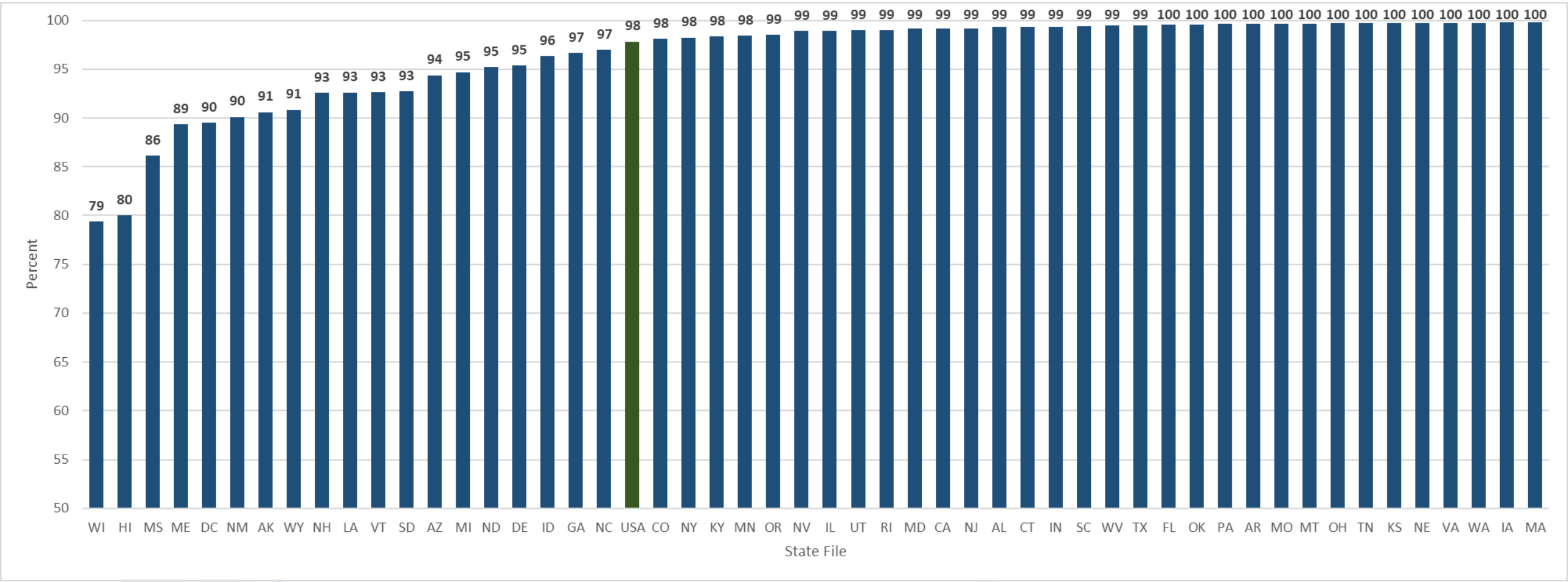
Percent of Registrations Assigned a PIK, by State



- High variation in PIK assignment (and quality) across states.
- Driven by data disclosure limitations.

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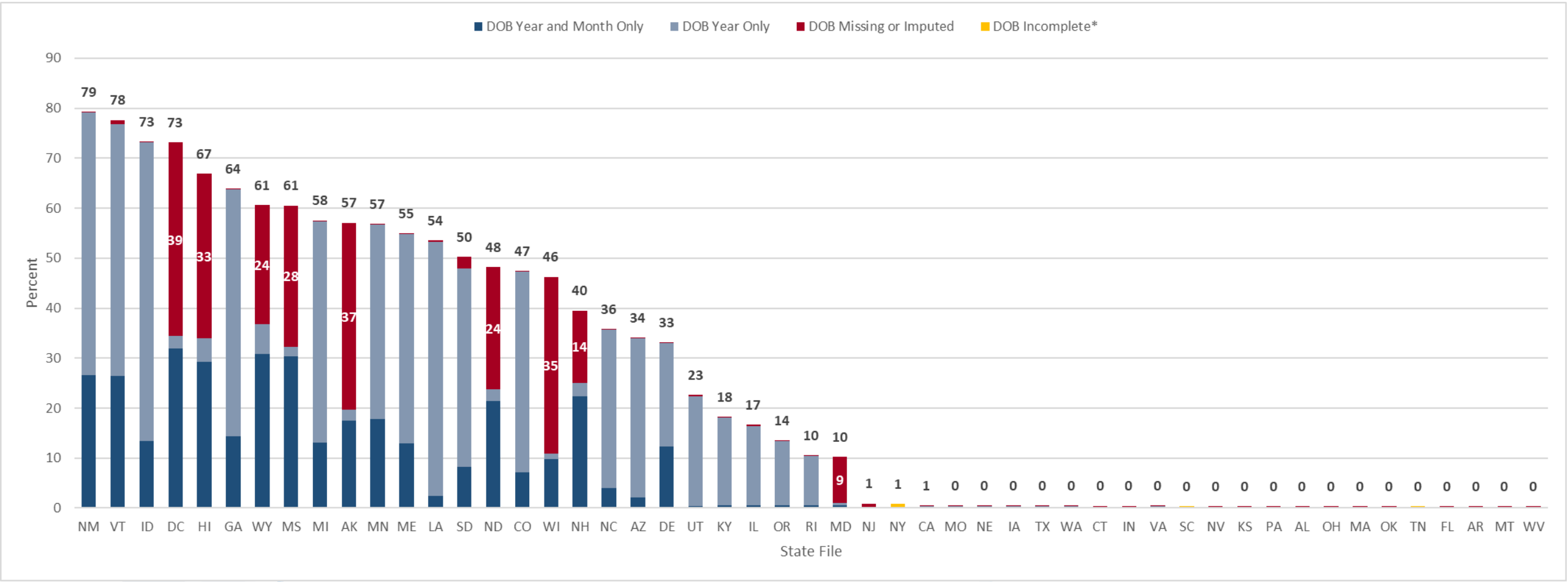
Percent of Registrations with Incomplete Date-of-Birth, by State



- States with high share of completely missing information more likely to have lower share of PIK assignment

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Measuring Duplicate Registration Records

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Number of Persons in the NVRF

	Number of Persons	Percent of Persons
Total Persons	188,297,700	100.00
Unique PIKs	181,228,950	96.25
Unduplicated PIKs	7,069,050	3.75

- Unique PIK: person was found in only one voter registration.
- Unduplicated PIK: person was found in more than one registration (within or across state files).

- Identify 188.3 million unique individuals in the NVRF.

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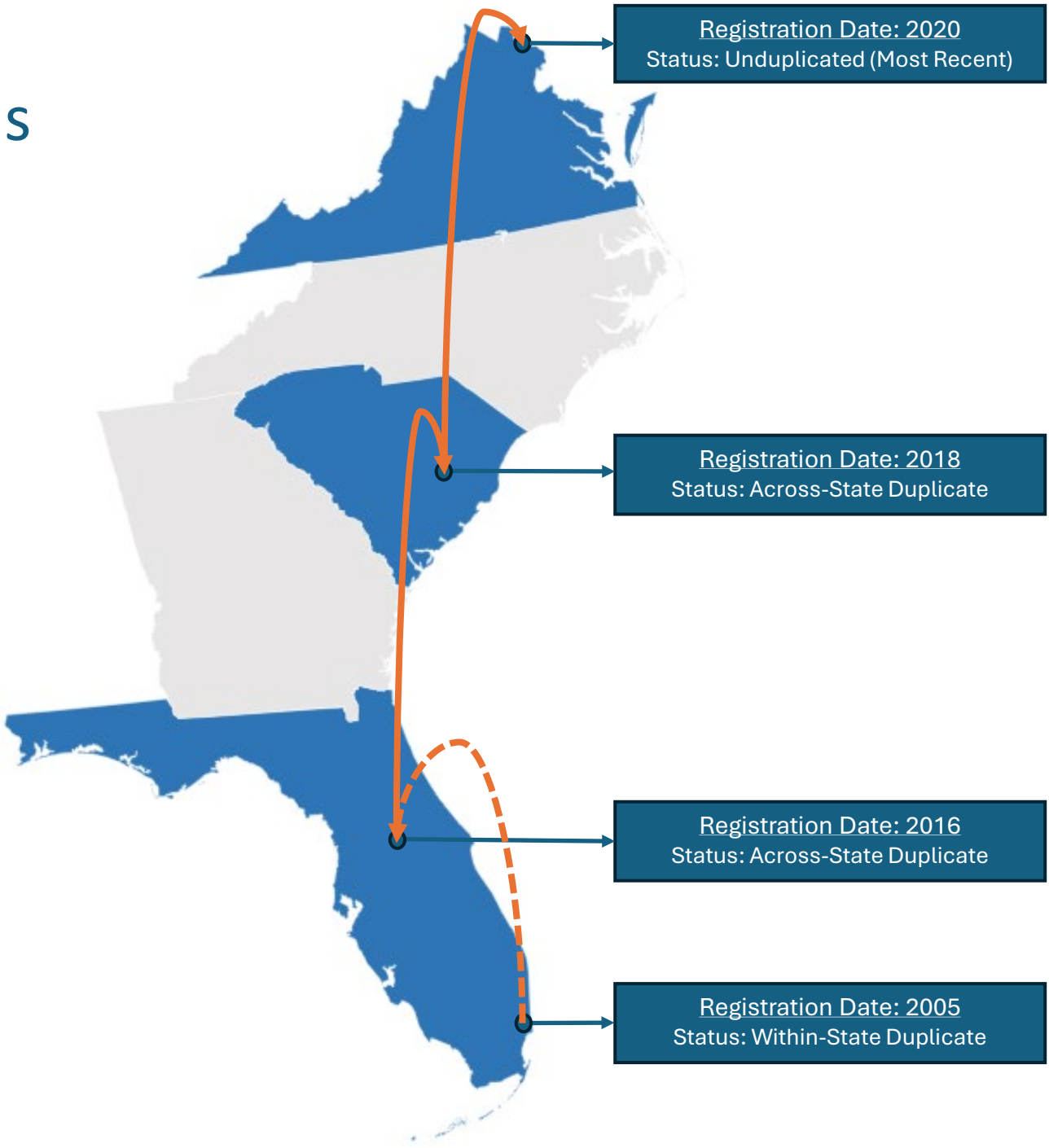
Measuring Duplicate Registrations

- Duplicate registrations when a PIK appears more than once in the NVRF.
- Person may have multiple registrations within and across state files.
- Unduplicated registration: registration is the most recent registration.
- Across-state duplicate: Registrations are the most recent registrations found in another other states.
- Within-state duplicate: All other duplicate registrations.



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Not real data, for illustrative purposes only.

Across-State Duplicate Registration Records

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Distribution of States per PIK (Across State duplicates)

Number of States	Number of PIKs	Percent
1	182,300,000	96.84
2	5,744,000	3.05
3	190,000	0.10
4	11,000	0.01
5 or more	3,100	0.00

- Pew Center on the States, 2012: 2.7 million persons registered in more than one state in 2011.
- Dahl et al., 2023: Using Law of large numbers, predicts 3.1% of registered persons in 2020 have cross-state duplicates.

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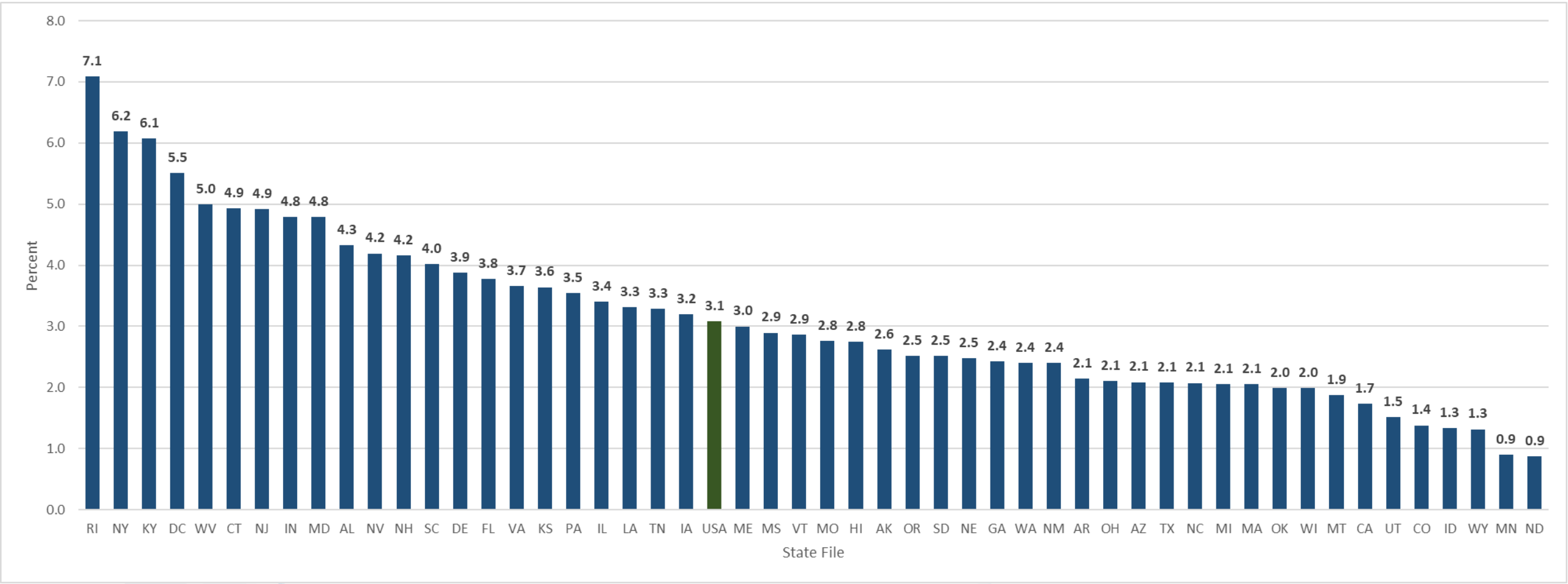
Percent of Across-State Duplicate Registration, by State



- Represents individuals who have moved but remain registered in their prior state(s).
- ~8X Difference in across-state duplicates between lowest and highest states.

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Within-State Duplicate Registrations

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Distribution of Number of Registrations per PIK-State Pairs

Num. of Registrations within State	Num. of PIK-State Pairs	Percent
1	193,200,000	99.39
2	1,175,000	0.60
3	13,500	0.10
4	650	0.01
5 or more	300	0.00

- States are better at dealing with duplicates caused by within-state moves.

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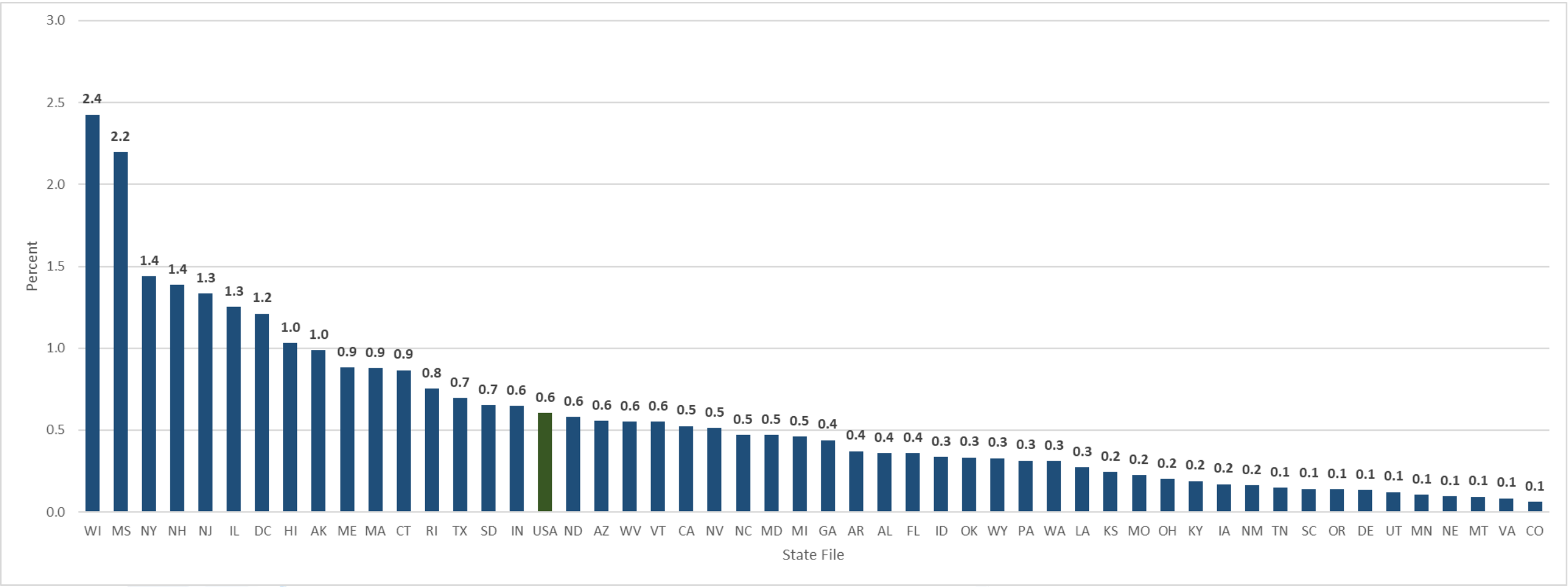
Percent of Within-State Duplicate Registration, by State



- Variation reflects differences in interstate mobility and list maintenance practices.
- Wisconsin and Mississippi state files are outliers.

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Deceased Registration Records

Deceased Registrations, by Period of Death

	Number	Percent of registrations
Total Registrations	200,000,000	100.00
Deceased as of 12/31/2020	2,176,000	1.09
Died before snapshot date	1,164,000	53.49
Died after snapshot date	1,012,000	46.51

- Snapshot date is based on the date the state file was pulled by the commercial vendor.
- Pew (2012) recorded 1.8 million records no linger living but still registered in 2011.

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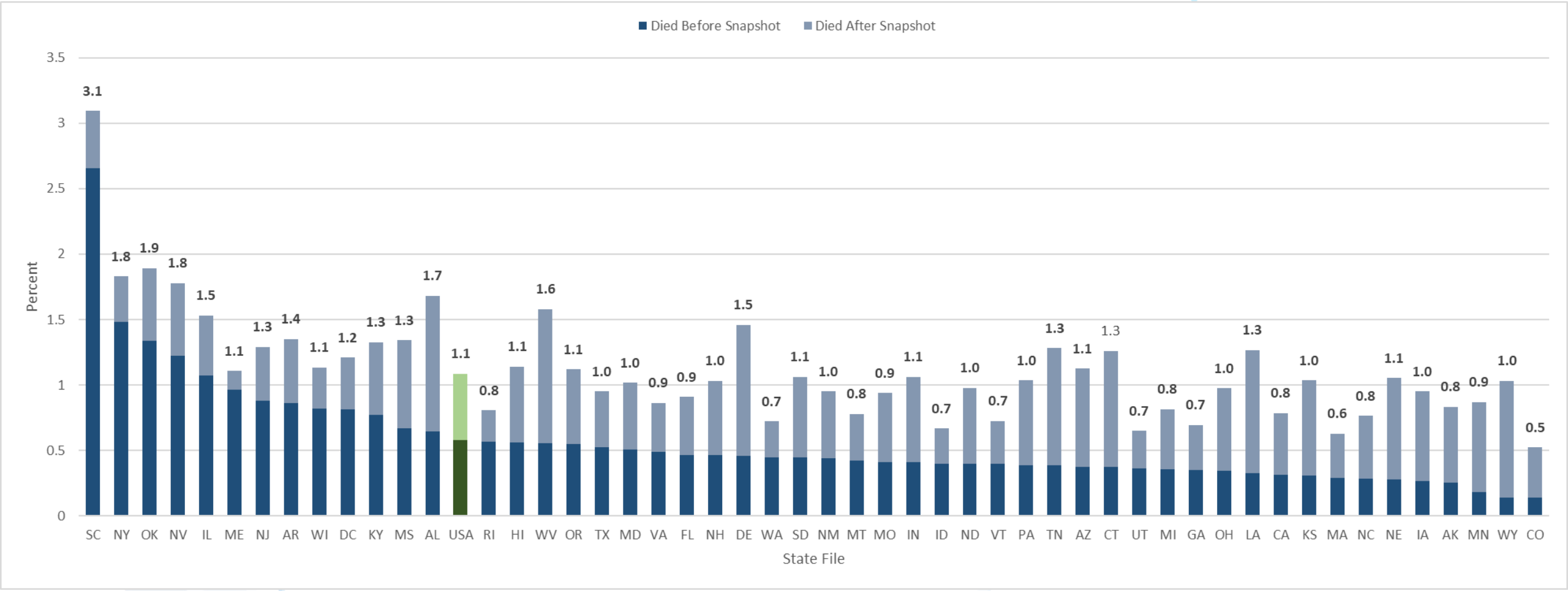
Percent of Deceased Registrations, by State



**South Carolina is a clear outlier in the share of records linked to deceased individuals.

Quality of Race and Ethnicity

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Quality of Vendor Ethnicity Variable in NVRF

- The vendor uses name and address information to assign one of a 100 different ethnic categories to each registration.
- To ease comparison, I crosswalk the 100 ethnic categories to match the Census racial and Hispanic ethnicity categories.
- Compare race and Hispanic ethnicity in the Census Best Race File separately.
- Critical variable used for;
  - Validating survey responses.
  - Producing subgroup analysis on turnout, participation, and representation.

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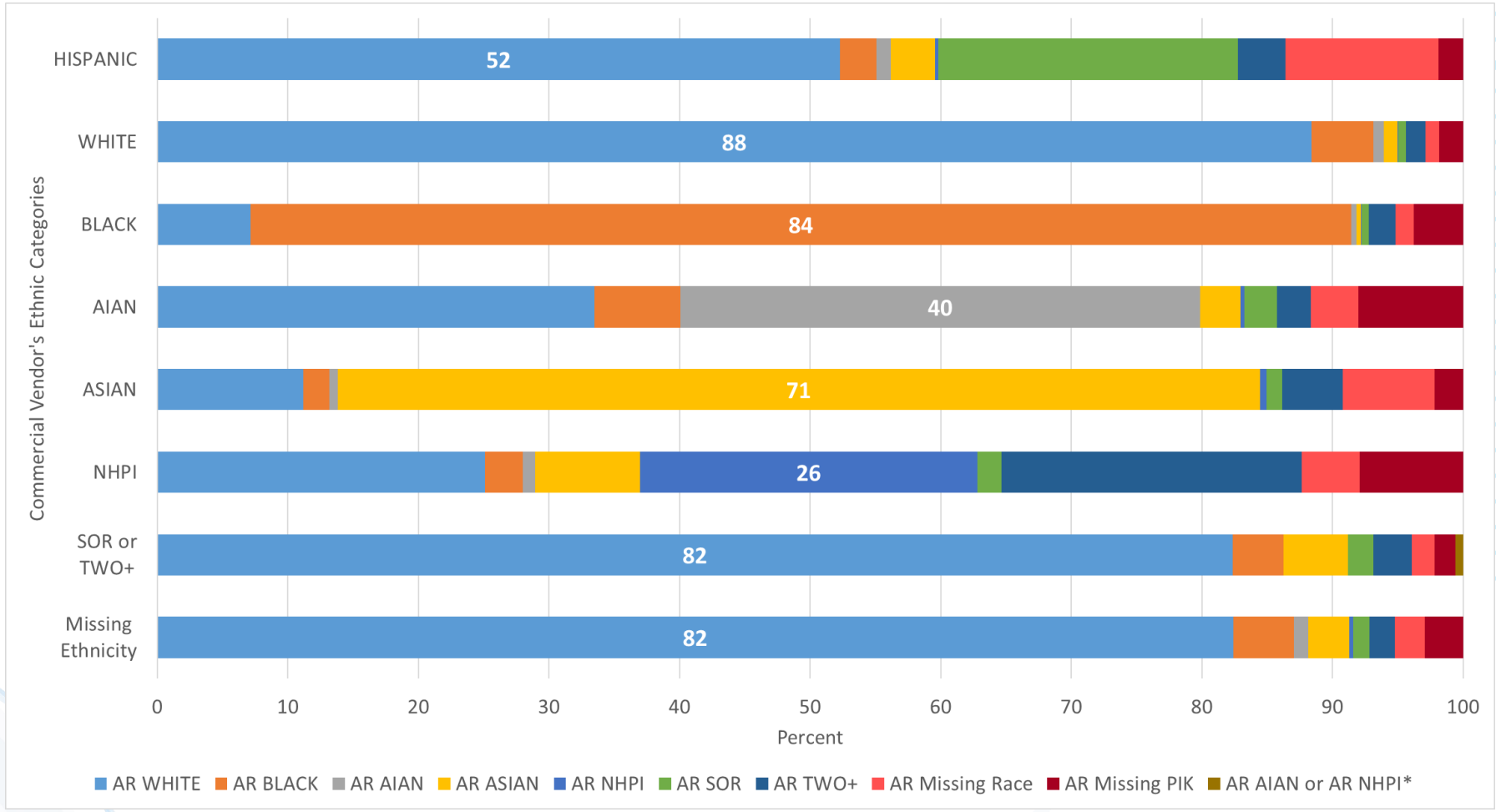
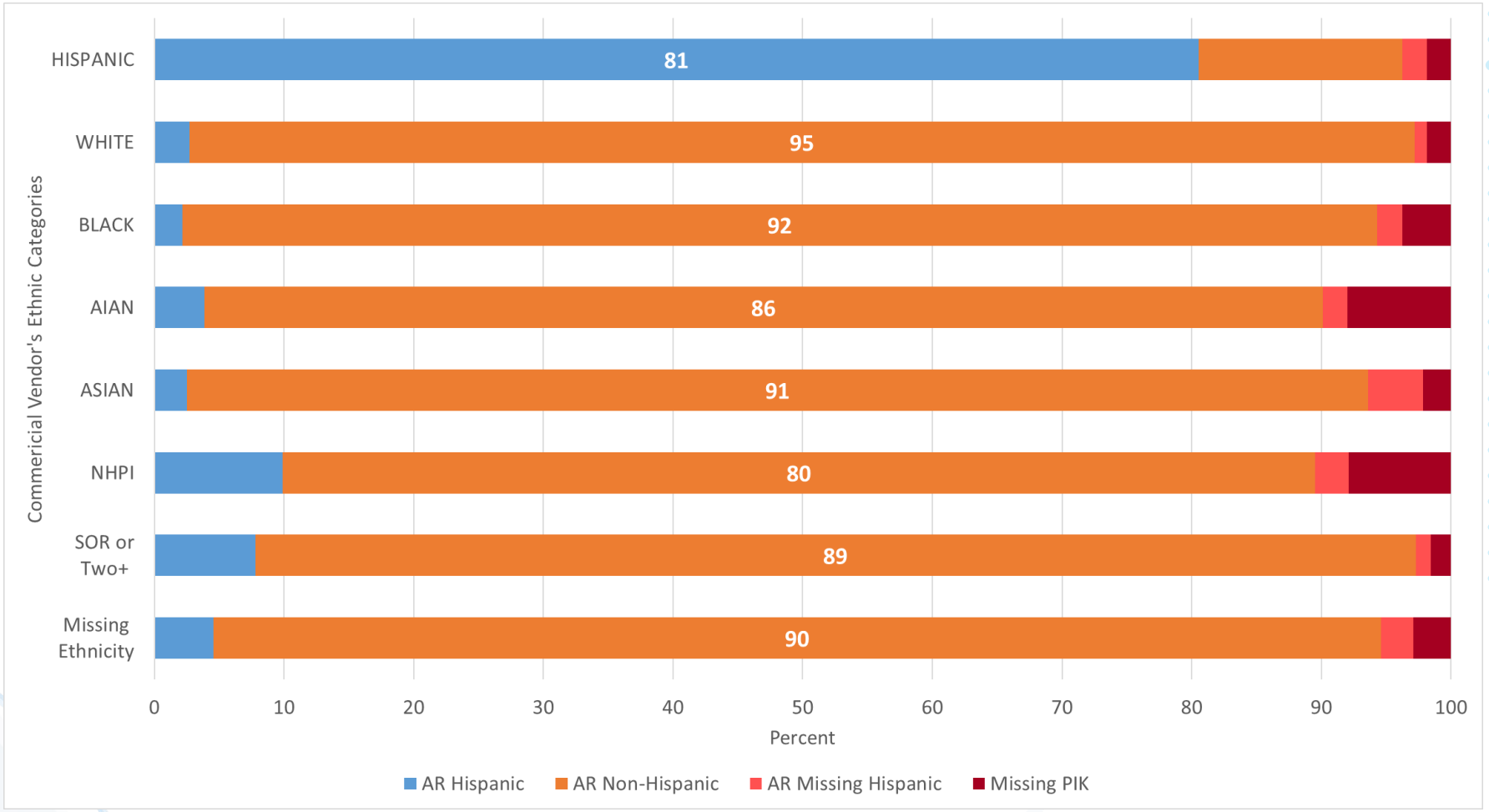
“Best Race” breakdown by NVRF Ethnicity Categories



- Registrations with Vendor provided AIAN, ASIAN, NHPI, have low match rates with AR race response.
- AIAN and NHPI have lowest PIK assignment rates.

“Best Hispanic Ethnicity” breakdown by NVRF Ethnicity Categories



- Hispanic/Non-Hispanic match rates are broadly consistent across vendor provided ethnic groups.
- Yet, only 81% of Hispanics in registration file have a matching Hispanic ethnicity in the AR.

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Remarks and Implications for Research

This paper provides the first national evaluation of commercial voter file quality using linked administration records:

- Find considerable heterogeneity in duplicates and deceased records across state files.
- Vendor provided ethnic categories have considerable mismatch to AR-based race/ethnicity.

These findings have several implications:

- Duplicate and deceased registrations can reduce the efficiency of survey sampling frames.
- Misclassification of race and ethnicity can bias subgroup analysis.
- Gaps between record-based and survey-based estimates may be driven by ineligible records.
- Careful evaluation of voter registration data when used for research and surveys needed.

Limitations:

- High PIK assignment rate but still not complete (who are the un PIK'd registrations?)
- Focus on only 2020 snapshot. Next step is every year available.

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Thank you!

- Questions:
  - Email andres.f.mira@census.gov

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