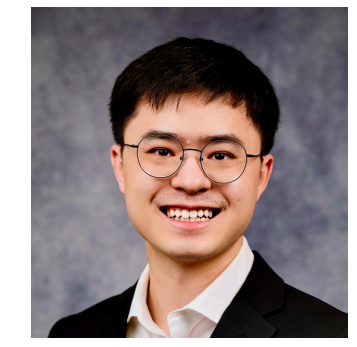


When Adherence Estimates Differ

The Impact of Data Source and Gap Handling in Real-World Medication Use Assessment

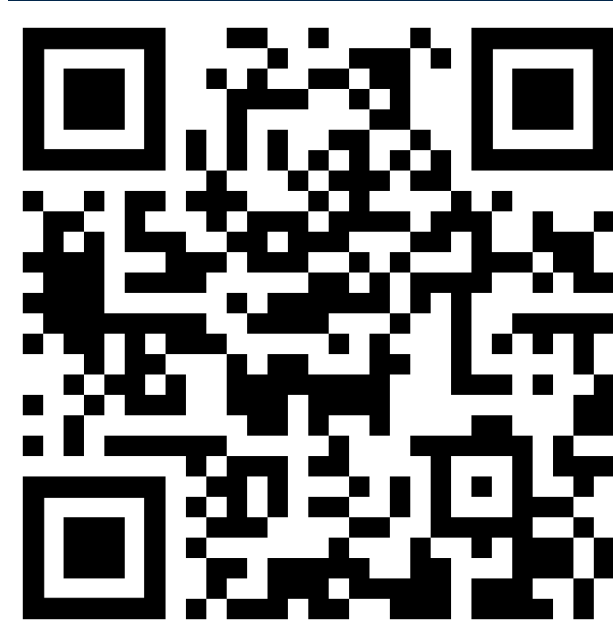


PRESENTER:
Yifan Zheng

yifzheng@umich.edu

Corey A. Lester, PharmD, PhD

Personal Website



Clinical Pharmacy Translational Science (CPTS), College of Pharmacy, University of Michigan, Ann Arbor, MI, USA

BACKGROUND

- Proportion of Days Covered (PDC), as a common adherence metric, drives CMS Star Ratings, value-based contracts, and real-world adherence research.
- Prescriptions can carry multiple timestamps: *written, filled, and sold*. Studies rarely compare them.
- Traditional PDC treats every gap as nonadherence, but many gaps are legitimate (hospitalization, regimen change, supply delay).
- We test both what we measure (data source) and how we measure it (gap rule) on the same cohort.

OBJECTIVE

Quantify how data source and gap handling change PDC and the resulting adherent/nonadherent classification.

Methods

Data

- Surescripts e-prescription transactions, 2009-2019
- Active adults from Michigan Genomics Initiative

Design

- Retrospective cohort, ≥12-mo follow-up, ≥3 fills / class
- 4 antihypertensive classes: ACEIs, ARBs, CCBs, Diuretics
- 5 source definitions × 2 PDC conceptualizations
- Cutoff PDC ≥ 0.80; Kruskal-Wallis + Dunn post hoc

Two PDC measures

EXPOSURE PDC

Traditional Medicare Star Ratings approach.

All gaps count as non-coverage, regardless of cause or length:

$$Exposure\ PDC = \frac{D_{observed} - \sum_{i=1}^n Original\ Gap_i}{D_{observed}}$$

Penalizes legitimate gaps (hospitalization, supply, regimen change).

ADHERENCE PDC

This study (novel).

Gap-adjusted using a patient-specific dynamic threshold:

$$MaxGap_i = \frac{Days\ of\ Supply_{i-1}}{Cumulative\ Adherence\ PDC_{i-1}}$$

If the original gap exceeded this MaxGap:

$$Adjusted\ Gap_i = \frac{Days\ of\ Supply_{i-1}}{Cumulative\ PDC_{i-1}} - Days\ of\ Supply_{i-1}$$

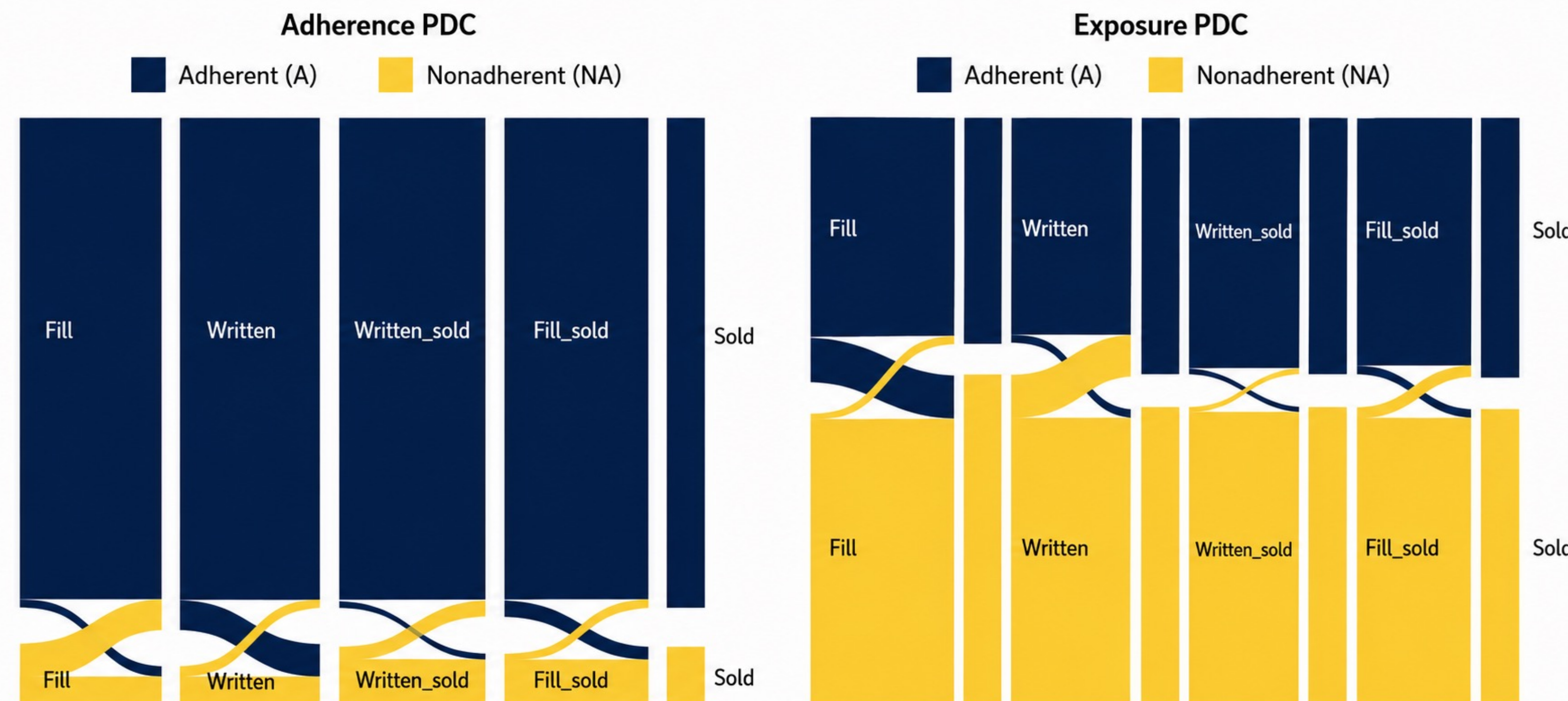
Excludes only excess gap; observation window adjusted accordingly.

Same patient. Same pills. Three timestamps. Up to 15.4% patients were reclassified by adherence status.

THE QUESTION · Three timestamps for prescriptions

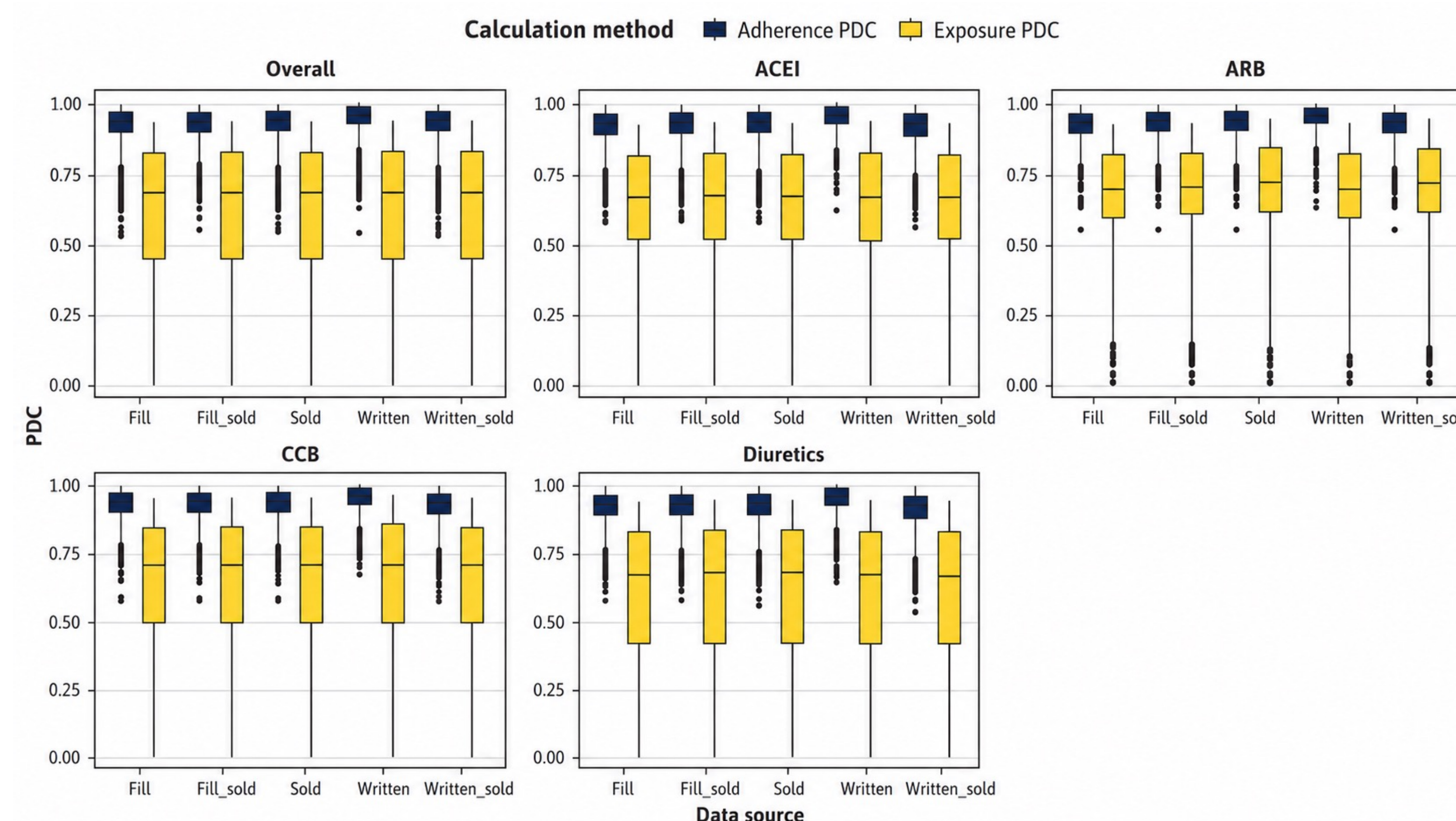


KEY FINDING · Adherence status is not stable across sources



Adherence PDC: >94% classification concordance across all data sources.
Exposure PDC: up to 15.4% of patients reclassified when switching fill → written.

PDC DISTRIBUTION · By source and drug class



Exposure PDC

- Median 0.747-0.794 (IQR 0.487-0.940) across sources; Kruskal-Wallis p < 0.001
- Dunn + Bonferroni: written-date PDC differs from sold, fill_sold, written_sold (p < 0.001)

Adherence PDC

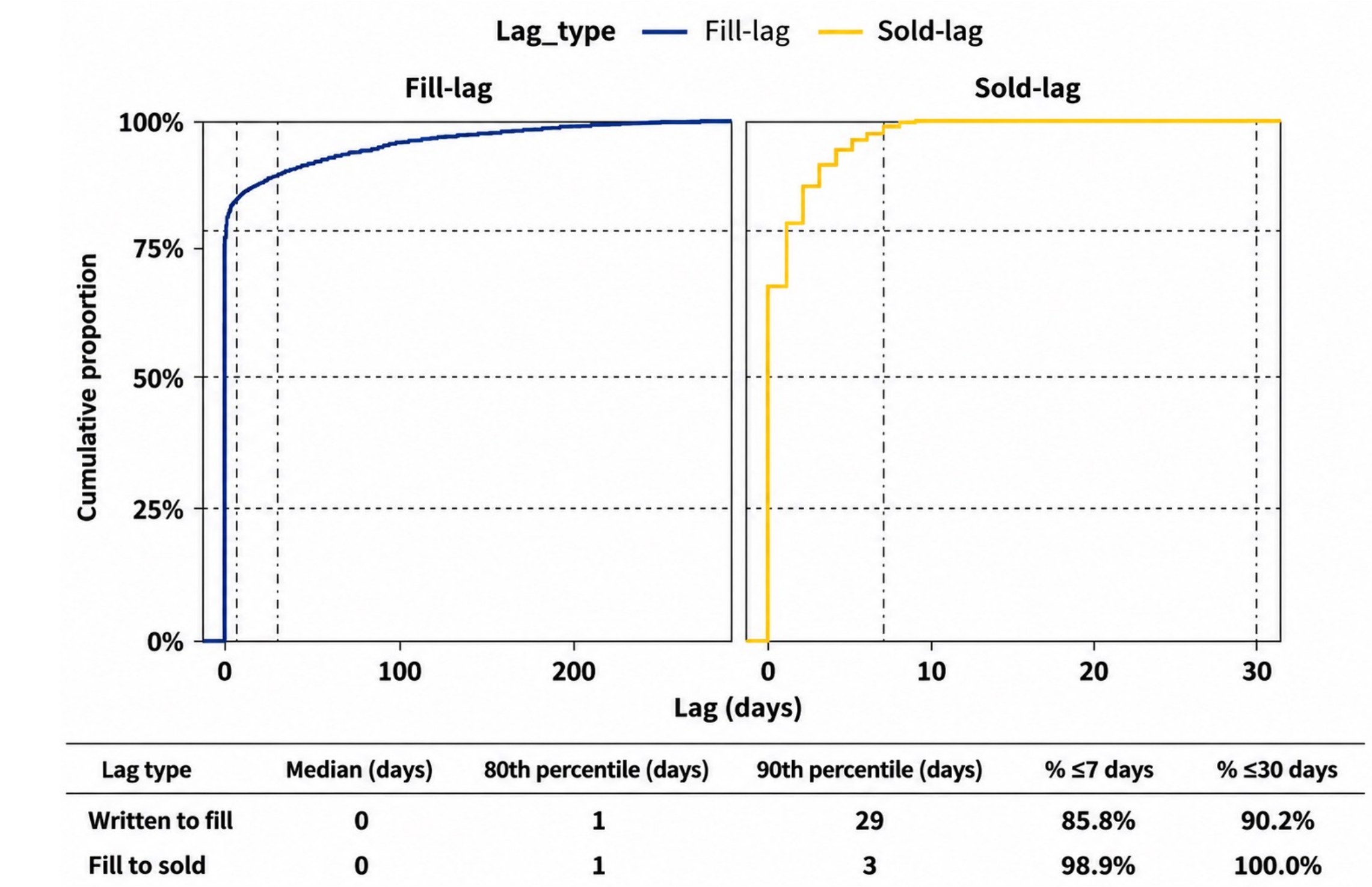
- Median 0.959-0.977 (IQR 0.910-0.988) across sources; Kruskal-Wallis p < 0.001 but driven by a single contrast.
- Dunn + Bonferroni: only the written date differs from all others (p < 0.001); fill, sold, and combinations not different (p > 0.05)

KEY RESULTS

STUDY COHORT

Characteristic	Value
Cohort size	
Number of patients	7,226
Number of medication fills	230,445
Mean fills per person, mean (SD)	32 (29)
Median fills per person, median (IQR)	24 (11-42)
Mean follow-up window, months	40.2-43.3
Data scope	
Number of distinct RxNorm concept unique identifiers	165
Average patient observation window, mean (SD), months	
Based on Rx fill dates	41.9 (33.4)
Based on fill + sold dates	41.9 (33.3)
Based on medication sold dates	40.2 (32.7)
Based on Rx written dates	43.3 (33.2)
Based on written + sold dates	42.0 (33.4)
Medication class distribution, % of fills	
Angiotensin-converting enzyme inhibitors (ACEIs)	30.8
Angiotensin II receptor blockers (ARBs)	15.4
Calcium channel blockers (CCBs)	21.7
Diuretics	32.1

PRESCRIPTION LAG TIMES



DISCUSSION

- Method:** Adherence PDC is more source-agnostic compared to Exposure PDC
- When to use which:** Adherence PDC for chronic-coverage & cross-source RWE research; Exposure PDC for cumulative doing drug and when matching regulatory benchmarks.
- Policy:** Fill-date Exposure PDC (CMS Star Ratings, HEDIS, VBC) may misclassify ≥ 15% of patients.
- Future:** Validate against cardiovascular outcomes: only outcome anchoring proves decision-relevance.

Abbreviations. CMS, Centers for Medicare & Medicaid Services; HEDIS, Healthcare Effectiveness Data and Information Set; IQR, interquartile range; RWE, real-world evidence; SD, standard deviation; VBC, value-based contract.