Biosimilar diffusion beyond market share: Geographic variation and Medicare Part B payments, 2018-2024

Abstract

Background: Biosimilars offer opportunities to reduce Medicare Part B spending, but their uptake varies across biologic products and geographic areas. Geographic comparisons based on biosimilar share may be sensitive to the drug groups included, while higher shares do not necessarily indicate greater biosimilar billing volume or lower recorded Medicare payments.

Objective: To assess geographic variation in biosimilar shares using a standardized drug-group mix and examine how changes in share compare with changes in billing volume and recorded Medicare Part B payments.

Method: We conducted a retrospective observational study using publicly available Centers for Medicare & Medicaid Services (CMS) Medicare Physician and Other Practitioners by Geography and Service data from 2018-2024. We assessed geographic variation in 2024 using an equally weighted index of biosimilar shares across eight drug groups in 14 states. Longitudinal geographic comparisons used a separate fixed sample of 14 states and seven established drug groups, comparing mean 2020-2021 with mean 2023-2024. For billing and payment analyses, we constructed separate fixed state samples for each of the seven drug groups (18-40 states per group), retaining the same states across periods and measures within each group. We compared biosimilar shares, biosimilar and reference-product billing units, total billing volume, and reconstructed Medicare payments. Payment changes were decomposed into contributions from total billing volume, biosimilar-reference-product mix, and average payment per unit.

Results: In 2024, the median biosimilar share index across 14 states and eight drug groups was 62.32%, with a 14.93-percentage-point gap between the 90th and 10th percentiles. In a separate fixed sample of 14 states and seven drug groups, the median within-state increase was 15.57 percentage points between 2020-2021 and 2023-2024, while the geographic gap narrowed from 14.98 to 13.92 points. Across the seven drug groups, biosimilar shares increased in six, although increases in share did not consistently correspond to increases in biosimilar billing units. For filgrastim, biosimilar share increased by 3.20 percentage points despite a 27.92% decline in biosimilar units, as reference-product units declined by 43.98%. Recorded Medicare payments declined in all seven groups. Lower average payments per unit contributed to declines in every group, while changes in biosimilar-reference-product mix reduced payments in five groups and increased them in two.

Conclusions: Biosimilar shares increased across the selected states, but geographic differences persisted, and higher shares did not consistently reflect greater biosimilar billing volume. Declines in recorded Medicare payments reflected changes in total billing volume and average payments per unit, while shifts toward biosimilars did not consistently contribute to payment reductions. These findings suggest that evaluating biosimilar adoption and its financial implications requires distinguishing product substitution from changes in overall billing volume and payments per unit, rather than relying on market share or aggregate payment trends alone.

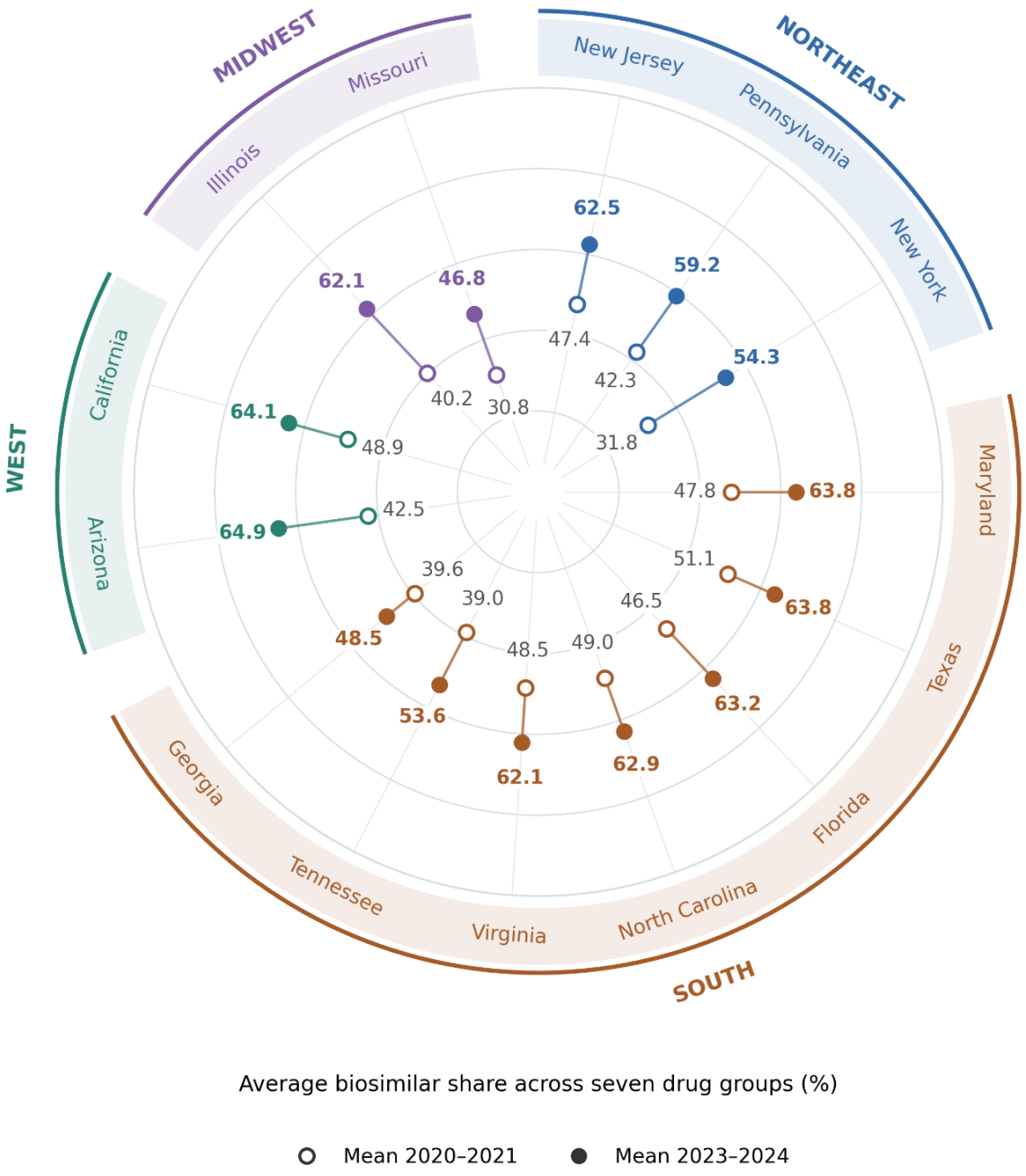
Keywords: Biosimilars; Medicare Part B; geographic variation; billing volume; recorded payments

Key Findings

The study examined geographic variation in biosimilar shares, changes in billing volume, and the components of recorded Medicare Part B payment changes. The geographic analyses compared biosimilar shares using a common drug-group mix, while the billing and payment analyses examined whether increases in biosimilar share corresponded to greater absolute billing volume or lower Medicare payments.

In 2024, the median biosimilar share index across 14 states and eight drug groups was 62.32%, with a 14.93-percentage-point difference between the 90th and 10th percentiles. Drug-group contributions to these geographic differences are examined in Supporting Figure S1. In a separate longitudinal comparison using 14 states and seven established drug groups, the index increased in every state between 2020-2021 and 2023-2024, with a median within-state increase of 15.57 percentage points (Figure 1). However, the geographic gap narrowed only modestly, from 14.98 to 13.92 percentage points. The comparison held states, drug groups, and index weights constant across periods, although differences in the publication of billing components could still affect the estimates.

Figure 1. Changes in Biosimilar Share Indices Across 14 States, 2020-2021 to 2023-2024



Notes: Open circles represent mean 2020–2021 indices, and filled circles represent mean 2023–2024 indices. Connecting lines indicate changes within states, while colors distinguish geographic regions for display purposes rather than regional averages. For each state, the annual index was calculated as the equally weighted average of seven drug-group-specific biosimilar billing-unit shares, then averaged within each two-year period. The same 14 states and seven drug groups were included in both periods. The index is not a pooled share of billing units or patients. Ranibizumab was excluded because of its later entry. The analysis uses selected published Medicare fee-for-service physician and supplier billing records by provider location rather than patient residence. Missing required billing components were not treated as zero. The estimates do not account for patient case mix or incomplete publication and do not establish the causes of geographic differences.

Between 2020-2021 and 2023-2024, biosimilar shares increased in six of the seven drug groups, although changes in billing volume varied (Table 1). Biosimilar units increased in five groups, while reference-product units declined in all seven and total units declined in six. For filgrastim, biosimilar share increased from 82.61% to 85.81% despite a 27.92% decline in biosimilar units, while reference-product units declined more rapidly, by 43.98%. Total filgrastim units declined by 30.74%. Non-ESRD epoetin alfa showed decreases in both biosimilar share (46.63% to 35.63%) and biosimilar units (45.94%). In contrast, infliximab showed increases in biosimilar share (11.91% to 15.91%) and biosimilar units (34.96%), with little change in total billing volume (0.91%). These patterns indicate that increasing biosimilar shares did not necessarily correspond to greater absolute biosimilar billing volume.

Table 1. Changes in Biosimilar Shares and Billing Volume by Drug Group, 2020-2021 to 2023-2024

Drug group	Mean share (%) 2020-2021	Mean share (%) 2023-2024	Biosimilar units change (%)	Reference units change (%)	Total units change (%)
Bevacizumab	54.89	84.34	34.80	-69.36	-12.25
Epoetin alfa, non-ESRD	46.63	35.63	-45.94	-15.89	-29.83
Filgrastim	82.61	85.81	-27.92	-43.98	-30.74
Infliximab	11.91	15.91	34.96	-3.70	0.91
Pegfilgrastim	29.96	68.88	50.65	-69.21	-33.59
Rituximab	33.96	55.14	37.18	-43.28	-16.17
Trastuzumab	57.22	83.56	10.83	-71.76	-25.12

Notes.
Biosimilar share is defined as biosimilar billing units divided by combined biosimilar and reference-product billing units. Reported shares are the means of annual aggregate shares within each two-year period. Percentage changes in billing units compare mean annual units between periods rather than cumulative two-year totals. Within each drug group, the same states contribute to the share, quantity, and payment comparisons across periods. The state samples include 37 states for bevacizumab, 40 for non-ESRD epoetin alfa, 20 for filgrastim, 35 for infliximab, 30 for pegfilgrastim, 39 for rituximab, and 18 for trastuzumab. Billing units are molecule-specific and should not be combined across drug groups. Unpublished values required for calculation were treated as unavailable rather than zero. ESRD denotes end-stage renal disease.

Recorded Medicare Part B payments declined in all seven drug groups between 2020-2021 and 2023-2024 (Table 2). Lower average payments per unit contributed to the decline in every group, while reductions in total billing volume contributed to lower payments in six groups. Infliximab was the exception, with a small positive volume contribution of $2.55 million. Changes in biosimilar-reference-product mix reduced payments in five groups but increased payments in non-ESRD epoetin alfa ($0.27 million) and pegfilgrastim ($10.66 million). For pegfilgrastim, mean annual payments declined from $320.25 million to $101.90 million, a reduction of $218.35 million. Lower billing volume contributed $78.80 million to this decline, and lower average payments per unit contributed $150.21 million, partly offset by the $10.66 million increase associated with product mix. Thus, reductions in recorded Medicare payments reflected different combinations of billing volume, product mix, and average payments per unit rather than changes in biosimilar share alone.

Table 2. Decomposition of Changes in Recorded Medicare Part B Payments, 2020-2021 to 2023-2024

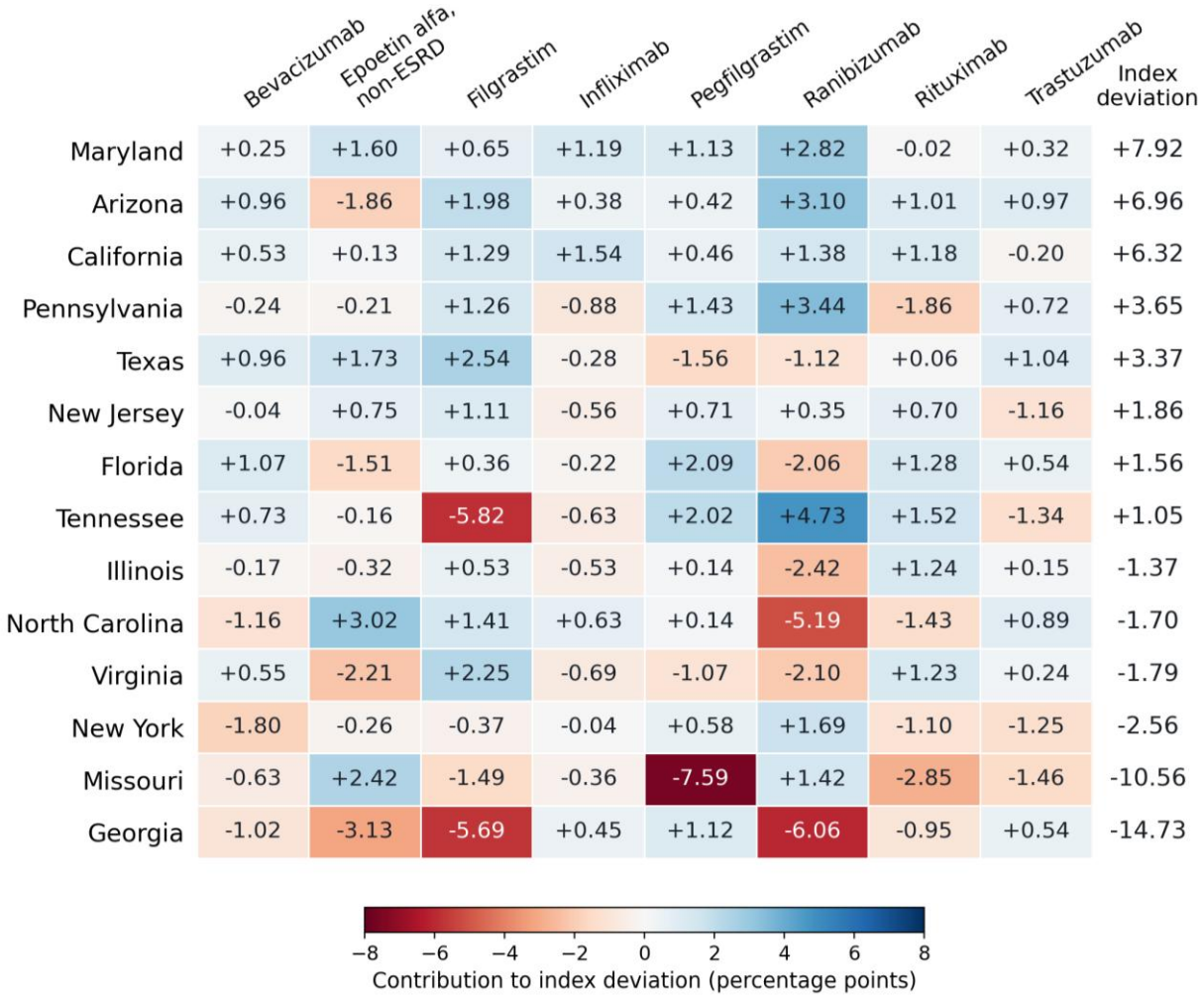
Drug group	Mean payment, 2020-2021 ($ millions)	Mean payment, 2023-2024 ($ millions)	Volume contribution ($ millions)	Biosimilar/reference-product mix contribution ($ millions)	Average payment per unit contribution ($ millions)	Total payment change ($ millions)
Bevacizumab	327.21	196.10	-34.94	-32.05	-64.12	-131.11
Epoetin alfa, non-ESRD	84.41	50.10	-23.24	0.27	-11.34	-34.31
Filgrastim	16.95	8.80	-4.71	-0.37	-3.08	-8.15
Infliximab	343.33	233.37	2.55	-1.14	-111.37	-109.96
Pegfilgrastim	320.25	101.90	-78.80	10.66	-150.21	-218.35
Rituximab	563.91	299.46	-75.56	-45.40	-143.50	-264.46
Trastuzumab	144.07	53.10	-27.48	-14.56	-48.93	-90.97

Notes:
Payments represent reconstructed mean annual nominal Medicare payments for published billing records. Each drug group uses the same fixed state sample and comparison periods as Table 1. Payment changes are decomposed into contributions from total billing volume, biosimilar–reference-product mix, and average payment per billing unit. Negative contributions indicate reductions in recorded payments, while positive contributions indicate increases. Components may not sum exactly to the reported total because of rounding. Changes in average payments per unit may reflect changes in product and claim composition and should not be interpreted solely as changes in manufacturer prices. The decomposition identifies arithmetic contributions to observed payment changes, not causal effects or savings attributable to biosimilar adoption or Medicare payment policy.

Supporting Analyses

The 2024 geographic analysis showed variation in the contributions of individual drug groups to each state's biosimilar share index (Supporting Figure S1). All 14 states had some drug-group shares above the corresponding 14-state averages and others below them. Maryland's index was 7.92 percentage points above the 14-state mean, with the largest positive contributions from ranibizumab (2.82 points) and non-ESRD epoetin alfa (1.60 points). In contrast, Georgia's index was 14.73 points below the mean, with ranibizumab (-6.06 points) and filgrastim (-5.69 points) accounting for the largest negative contributions. These differences show that a relatively high or low overall biosimilar share index does not necessarily reflect consistently high or low shares across individual drug groups.

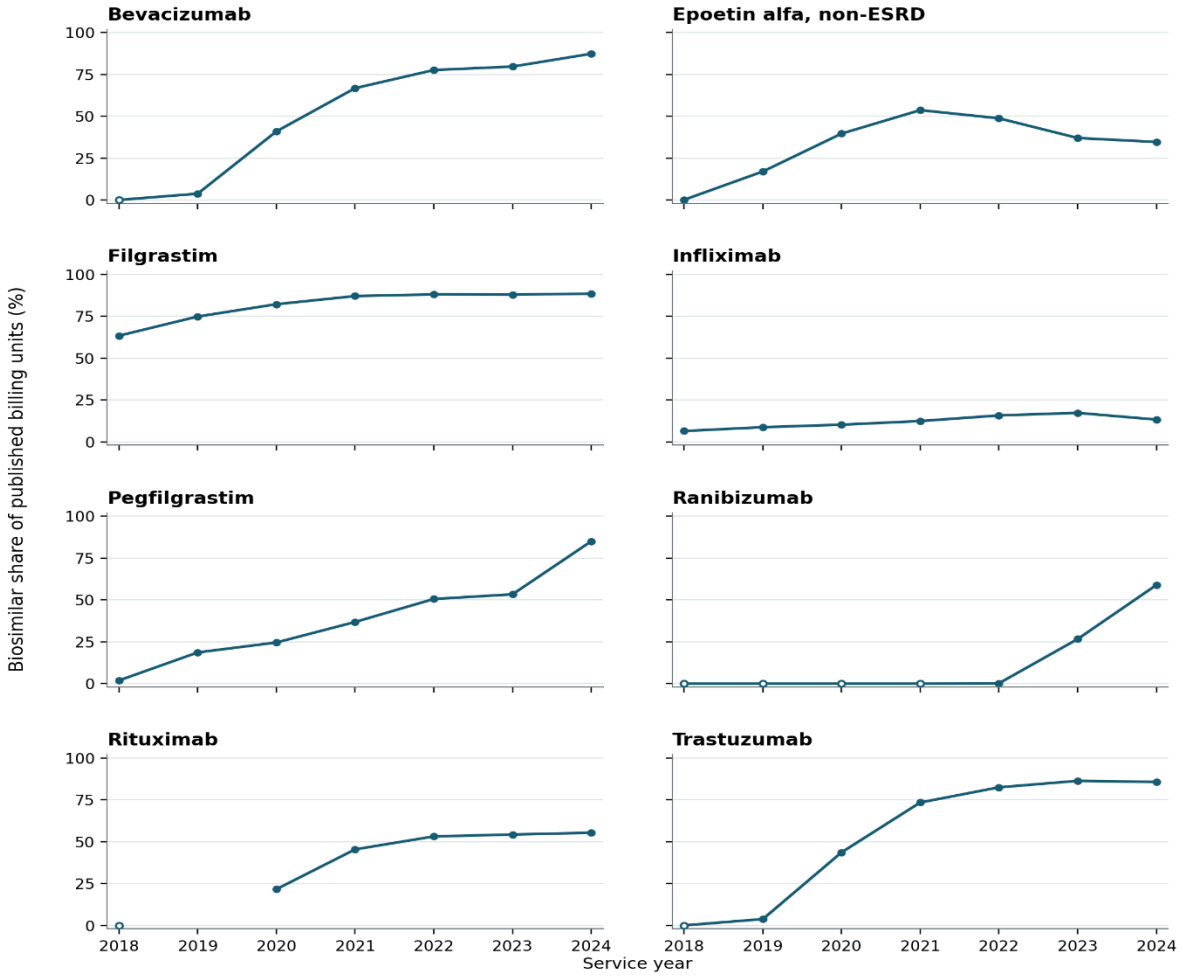
Supporting Figure S1. Drug-Group Contributions to Geographic Variation in Biosimilar Shares, 2024



Note. Each cell represents the difference between a state's drug-group-specific biosimilar share and the corresponding 14-state mean, divided by eight to reflect equal weighting. The eight contributions sum to the state's deviation from the overall mean index of 61.01%, which differs from the median index of 62.32%. Contributions are expressed in percentage points of the index and do not represent changes in billing volume, patient uptake, or causal effects. The analysis uses the 14-state, eight-group 2024 sample rather than the seven-group longitudinal sample in Figure 1. All 112 state-by-drug-group observations are subject to the limitations of partial publication.

Annual biosimilar billing shares followed different patterns across drug groups between 2018 and 2024 (Supporting Figure S2). Some groups experienced relatively steady increases, while others showed slower growth, stabilization, or declines following earlier increases. For example, non-ESRD epoetin alfa share increased through 2021 before declining through 2024, whereas filgrastim share increased earlier in the study period and changed relatively little in later years. These patterns indicate that differences between 2020-2021 and 2023-2024 do not necessarily reflect continuous increases in biosimilar shares throughout the intervening years. The annual estimates provide context for the main period comparisons, although changes in published billing records may also contribute to year-to-year differences.

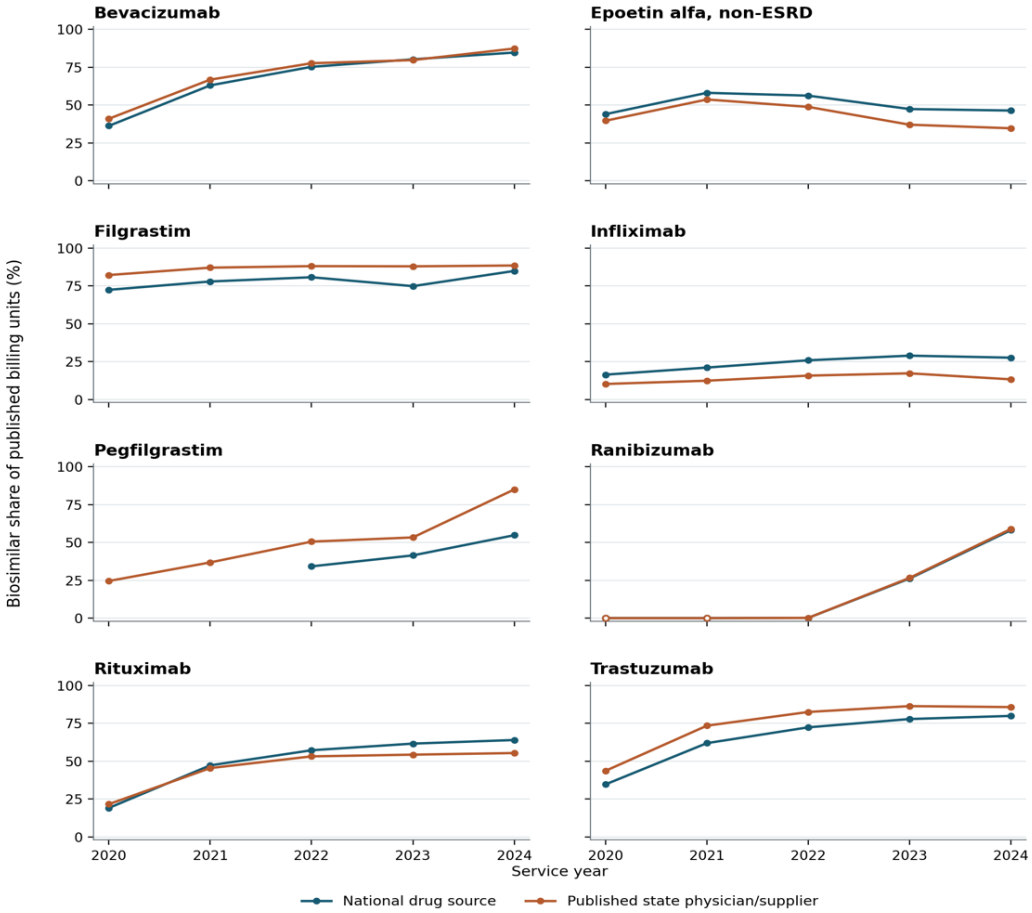
Supporting Figure S2. Annual Trends in Biosimilar Billing Shares, 2018-2024



Note. Annual shares were calculated using available published Medicare fee-for-service physician and supplier billing records from the 50 states and District of Columbia. Shares represent biosimilar billing units relative to combined biosimilar and reference-product units, rather than shares of patients, administrations, or treatments. Missing required billing components were not treated as zero. Hollow markers at zero indicate years in which no biosimilar code was active under the study's fixed code map and do not establish that biosimilars were not used clinically. Unlike the main analyses, these annual series do not use fixed state samples. The states, codes, and published billing components contributing to each annual estimate may differ over time, limiting direct longitudinal comparability.

Biosimilar share trends were compared across two public Medicare data sources (Supporting Figure S3). Among the six drug groups with complete period comparisons, both sources showed the same direction of change between 2020-2021 and 2023-2024, although the magnitudes differed. Non-ESRD epoetin alfa share declined in both sources, while shares increased in the other five groups. Filgrastim showed a similar pattern of increasing share despite declining biosimilar billing volume. In the national drug-spending data, filgrastim share increased by 4.71 percentage points while biosimilar units declined by 29.71%. The corresponding changes in the state-level data were an increase of 3.57 percentage points in share and a 28.15% decline in biosimilar units. These findings suggest that the divergence between biosimilar share and absolute billing volume was not limited to the fixed state samples used in the primary analysis.

Supporting Figure S3. Comparison of Biosimilar Share Trends Across Two Medicare Data Sources



Note. The state-level source includes available published physician and supplier billing records from the 50 states and District of Columbia, whereas the national drug-spending source also includes hospital outpatient claims. The sources differ in covered settings, code availability, and publication rules, and their estimates are not directly interchangeable. Pegfilgrastim was excluded from complete period comparisons because the national source lacked the required reference-product component for 2020–2021. Missing components were not treated as zero. National gross drug spending includes Medicare payments and beneficiary liability, whereas Table 2 reports reconstructed Medicare-only payments. Differences between the sources should not be interpreted as evidence of missing claims, shifts between care settings, or clinical substitution.