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Implementation of Generics and Biosimilars: A Drug-Form-Level Sales-Volume Analysis of China's National Reimbursement Drug List, 2020–2024

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Abstract

Background

Generics and biosimilars can improve health-system sustainability and treatment affordability, but their value depends on actual implementation after policy access and reimbursement. In China, national volume-based procurement and National Reimbursement Drug List (NRDL) negotiation have created institutional conditions for the use of generics and biosimilars. However, whether these conditions translate into observed replacement of originator or innovative products remains unclear.

Methods

We conducted a retrospective observational structural analysis using a commercial pharmaceutical sales database covering NRDL medicines from 2020 to 2024. The analytical unit was the drug form, defined as a medicine name–dosage form combination. Generic/biosimilar uptake was defined as the sales-volume share of generics or biosimilars among the combined sales volume of originator/innovative products and generics/biosimilars. The main uptake analysis was restricted to comparable drug forms, for which both product types had positive observed sales. We described observed sales structures, compared uptake across therapeutic areas using Kruskal–Wallis and one-vs-rest Mann–Whitney tests with Benjamini–Hochberg false-discovery-rate correction, and assessed descriptive temporal trends by distribution channel.

Results

Observed sales structures varied across NRDL drug forms. Although many drug forms had observed sales of generics/biosimilars only, only a subset showed coexistence of originator/innovative products and generics/biosimilars. Among 514 comparable drug forms, uptake differed across therapeutic areas (Kruskal–Wallis H = 24.76, p = 0.016), but the effect size was small (epsilon-squared = 0.026). Sensory organ medicines were the only therapeutic area with significantly lower uptake after FDR correction, with a median uptake of 27.4% and a Hodges–Lehmann median difference of − 20.9 percentage points versus other areas (q = 0.049). Overall, 231 of 514 comparable drug forms had uptake below 50%, indicating substantial product-level heterogeneity. No stable directional difference was observed between Class A and Class B medicines. From 2020 to 2024, overall uptake increased modestly from 60.0% to 64.5%, with upward trends in hospital and online channels but not in retail pharmacies.

Conclusions

Within China’s NRDL, generic/biosimilar implementation was uneven after accounting for observed sales structures. Low uptake was most clearly concentrated in sensory organ medicines at the therapeutic-

area level, but many low-uptake signals occurred at the individual drug-form level. These findings support a stratified approach that distinguishes whether comparable sales structures have formed, evaluates uptake among comparable products, and prioritises high-volume, low-uptake drug forms for further policy and implementation assessment.

Background

Generics and biosimilars are an essential foundation for cost sustainability and equitable access in modern health-care systems[1]. When therapeutic equivalence is established, they provide equivalent treatment at substantially lower prices, thereby saving resources for health systems[2], improving the affordability of previously expensive treatments, expanding access to effective care, and contributing to overall health-system performance. However, this value can only be realised when generics and biosimilars are actually used in place of originator or innovative products, and whether such replacement occurs depends on the institutional environment in which these products are introduced[3,4].

In recent years, China has created institutional conditions for the replacement of originator products by generics and biosimilars through national volume-based procurement and negotiation for inclusion in the National Reimbursement Drug List (NRDL). Volume-based procurement exchanges guaranteed purchase volumes for lower prices, enabling generics that have passed quality and efficacy consistency evaluation to obtain assured hospital procurement volumes and directly facilitating their entry into routine use[5,6]. NRDL negotiation, by bringing high-priced originator medicines and biologics under reimbursement, establishes a payment basis for the subsequent entry and replacement of generics and biosimilars after patent expiry[7–12]. Through these two policy pathways, generics and biosimilars included in the NRDL have acquired institutional and supply-side conditions for replacing originator products. However, the existence of such institutional conditions does not necessarily mean successful implementation in clinical practice. A medicine's inclusion in the reimbursement list, reimbursement eligibility, and observable supply do not automatically imply that it replaces the originator product in real-world care[13,14].

Insufficient replacement within the NRDL may arise from two distinct and opposing mechanisms, both of which can occur within the reimbursement system. First, a comparable supply structure may not have actually formed: although a medicine is policy-accessible, the market may not show the coexistence of originator and generic or biosimilar products required for meaningful replacement. This represents a supply-side problem and points to issues related to product development, market approval, quality evaluation, and supply assurance. Second, a comparable supply structure may have formed, but generics or biosimilars may still not be sufficiently used. This represents an implementation-side problem and points to barriers related to hospital formulary access, prescribing incentives, payment constraints, and clinical trust[15–17]. These two mechanisms imply fundamentally different policy responses. Without distinguishing between them, it remains unclear at which level the gap between institutional conditions and actual use arises.

Methods

Study design and data source

This study was a retrospective observational structural analysis based on pharmaceutical sales data. We used a commercial pharmaceutical sales database covering medicines included in China's National Reimbursement Drug List (NRDL) from 2020 to 2024. The data were obtained from Yaozhi Data (Chongqing Kangzhou Big Data Co., Ltd.) and included information on medicine name, dosage form, product source, NRDL reimbursement attributes, and sales volume by distribution channel. Distribution channels were classified as hospitals, retail pharmacies, and online channels. Sales volume was measured in the smallest preparation unit and was used to reflect the relative sales structure of medicines across distribution channels; it did not represent patient counts, prescription counts, or whole-market share.

Analytical sample and variable definitions

The analytical sample was restricted to chemical medicines and biological products for which originator/innovative products could be clearly distinguished from generics/biosimilars. Chinese patent medicines, traditional Chinese medicine decoction pieces, and some negotiated medicines with frequently changing NRDL access status, agreement periods, or reimbursement conditions during 2020–2024 were not included in the main analysis because they lacked a stable statistical denominator. Records with unknown or unclassifiable product source were excluded from the numerator and denominator of the relevant proportions. The analytical unit was the medicine name–dosage form combination, hereafter referred to as a drug form. Therapeutic areas were classified according to NRDL categories. Reimbursement class was categorised as Class A or Class B, and product source was classified as originator/innovative products or generics/biosimilars.

Generic/biosimilar sales-volume uptake and comparable drug forms

Generic/biosimilar sales-volume uptake was defined as the proportion of generic/biosimilar sales volume among the combined sales volume of originator/innovative products and generics/biosimilars within a given analytical unit. This study used a volume-based rather than value-based measure to reduce the influence of a small number of high-priced products on the assessment of market structure. The indicator therefore represents only the relative sales-volume structure within the identified sales of originator/innovative products and generics/biosimilars.

The main uptake analysis was restricted to comparable drug forms, defined as drug forms for which both originator/innovative products and generics/biosimilars had positive observed sales during 2020–2024. In parallel, all drug forms were classified into three observed sales-structure categories: originator/innovative products only, generics/biosimilars only, and both observed. This classification was

based solely on positive sales records in the database and should not be interpreted as evidence of external regulatory approval status, NRDL access status, or complete national market availability.

Statistical analysis

Aggregate sales-volume shares were calculated by first summing the underlying sales volumes and then deriving proportions, rather than by averaging percentages. Structural missingness was presented as NA and was not imputed.

The main analysis was conducted among comparable drug forms. For each drug form, uptake was calculated after pooling data across 2020–2024 and across all distribution channels. The Kruskal–Wallis test was used to compare the distribution of uptake across therapeutic areas. One-vs-rest Mann–Whitney U tests were then performed to identify therapeutic areas with lower uptake than all other areas combined, with the Benjamini–Hochberg method used to control the false discovery rate.

Supplementary analyses included sequential lower-uptake screening, description of the observed sales structure, paired comparisons of Class A and Class B medicines at the therapeutic-area level, and descriptive temporal trends in overall, hospital, retail-pharmacy, and online uptake from 2020 to 2024. The relevant formulas, complete analytical procedures, and result tables are provided in the Supplementary Appendix.

In addition, a rheumatoid arthritis tracer analysis and an anonymous physician questionnaire were conducted as exploratory contextual supplements. These analyses were used to help interpret potential prescribing, access, and implementation barriers in the Discussion and were not treated as primary evidence for the sales-data analysis. Their methods and descriptive results are also provided in the Supplementary Appendix.

All analyses were descriptive and exploratory structural analyses and were not intended to support causal interpretation. Data cleaning, statistical analyses, and figure generation were performed using R version 4.6.

Reporting guidelines and ethics

The observational sales-data analysis was reported with reference to the STROBE reporting guideline. The supplementary mixed-methods content was reported with reference to the GRAMMS framework, and the questionnaire component was reported in accordance with recommendations for cross-sectional survey reporting.

The sales database contained aggregated product-level sales-volume information and did not include individual patient data. The physician questionnaire was anonymous. Participants were considered to have provided informed consent by completing and submitting the questionnaire after reading the study

purpose. Details regarding ethics approval, informed consent, and data use are provided in the Declarations section.

Results

Observed sales structure of originator/innovative and generic/biosimilar products

Figure 1 shows the observed sales structure of Class A and Class B drug forms included in the NRDL during 2020–2024. Overall, in both reimbursement classes, most drug forms had observed sales of generics/biosimilars only. However, comparable structures in which both originator/innovative products and generics/biosimilars were observed were more common among Class B medicines, suggesting that Class B contained a relatively broader set of drug forms eligible for uptake analysis. At the same time, the proportion of drug forms with observed sales of originator/innovative products only was also higher in Class B than in Class A, indicating that a certain proportion of Class B drug forms remained dominated by visible sales of originator/innovative products.

The figure shows the observed supply structure of drug forms by reimbursement class during 2020–2024. A drug form was defined as a drug name–dosage form combination. Each drug form was classified into one of three categories according to whether positive sales records were observed in the study database: originator/innovative products only, generic/biosimilar products only, or both observed. Drug forms with both originator/innovative and generic/biosimilar sales observed were defined as comparable drug forms and used in the main uptake analysis. Numbers inside the bars indicate the number of drug forms and their percentage within each reimbursement class. Class B refers to Class B medicines included in the main analysis and excludes negotiated medicines whose listing status, agreement period, or reimbursement restrictions changed substantially during the study period. The observed supply structure was based on positive sales records in the database and should not be interpreted as regulatory approval status or complete nationwide market availability.

Generic/biosimilar uptake among comparable drug forms

Among the 514 comparable drug forms, generic/biosimilar sales-volume uptake showed some heterogeneity across therapeutic areas. The Kruskal–Wallis test indicated an overall difference in the distribution of drug-form-level uptake across therapeutic areas ($H = 24.76$, $p = 0.016$). However, the effect size was small (epsilon-squared = 0.026), suggesting that this difference mainly reflected therapeutic-area-related structural heterogeneity rather than a strong determining effect of therapeutic area on the degree of replacement.

In the subsequent one-vs-rest Mann–Whitney tests, sensory organ medicines were the only therapeutic area that still showed significantly lower uptake after FDR correction. The median uptake in this area was 27.4%, lower than the overall level observed in other therapeutic areas. The Hodges–Lehmann median

difference was − 20.9 percentage points, with an FDR-adjusted q value of 0.049. The sequential exclusion screening analysis also identified only sensory organ medicines; after this area was excluded, no additional therapeutic area showed significantly lower uptake.

Beyond sensory organ medicines, low uptake was more evident as heterogeneity at the individual drug-form level than as consistently low replacement across entire therapeutic areas (Fig. 2). Although the median uptake of cardiovascular system medicines was relatively low, it did not reach therapeutic-area-level significance after FDR correction. Antineoplastic and immunomodulating agents, cardiovascular system medicines, nervous system medicines, and alimentary tract and metabolism medicines all contained a certain number of specific drug forms with uptake below 50%. Overall, 231 of the 514 comparable drug forms had uptake below 50%, indicating that even among drug forms with observed coexistence of originator/innovative products and generics/biosimilars, a substantial number of low-uptake products remained. The specific low-uptake drug forms and their distribution across therapeutic areas are provided in the Supplementary Appendix.

Each point represents one comparable drug form, defined as a drug name–dosage form combination for which both originator/innovative and generic/biosimilar products had positive observed sales after pooling 2020–2024 data across hospital, retail pharmacy, and online channels. The y-axis shows the generic/biosimilar sales-volume share for each drug form, calculated as generic/biosimilar sales volume divided by the combined originator/innovative and generic/biosimilar sales volume. Point size is proportional to log10(total source-unit sales + 1), and point colour indicates the generic/biosimilar sales-volume share. Horizontal black bars show medians, vertical black bars show interquartile ranges, and text labels show unweighted mean uptake within each therapeutic category. Purple shading and labels indicate categories selected by sequential lower-uptake screening. The red asterisk indicates the original full-set one-vs-rest Mann-Whitney result with lower median uptake and Benjamini-Hochberg false-discovery-rate adjusted $q < 0.05$. Sales volumes are source units and do not represent patient counts, prescription counts, treatment episodes, or whole-market share.

Reimbursement class and temporal trends

In the paired comparison at the therapeutic-area level, Class B medicines were not observed to have systematically higher generic/biosimilar sales-volume uptake than Class A medicines. Among the 14 therapeutic areas that contained both Class A and Class B comparable drug forms, Class B uptake was higher than Class A uptake in 7 areas, while Class A uptake was higher than Class B uptake in the other 7 areas. The median Class B minus Class A difference was − 0.8 percentage points. A one-sided Wilcoxon signed-rank test did not support systematically higher uptake among Class B medicines than among Class A medicines ($p = 0.335$). Therefore, no stable unidirectional relationship was observed between reimbursement class and uptake (Fig. 3).

From 2020 to 2024, the overall generic/biosimilar sales-volume uptake among comparable drug forms showed a modest upward trend. Overall uptake increased from 60.0% in 2020 to 64.5% in 2024, with a

descriptive linear trend slope of + 1.03 percentage points per year (p = 0.0027). By distribution channel, hospital uptake showed a modest increase (+ 1.14 percentage points per year, p = 0.001), and online uptake also increased (+ 1.08 percentage points per year, p = 0.012), whereas retail-pharmacy uptake did not show a clear upward trend (− 0.80 percentage points per year, p = 0.656) (Fig. 4).

Annual trend patterns varied across therapeutic areas. Therapeutic areas with more evident overall increases included dermatological medicines (+ 6.75 percentage points per year, p = 0.0025), respiratory system medicines (+ 4.59 percentage points per year, p = 0.0041), other medicines (+ 3.75 percentage points per year, p = 0.0366), and genito-urinary system and sex hormone medicines (+ 2.43 percentage points per year, p = 0.0092). In contrast, cardiovascular system medicines showed no clear overall change; although hospital uptake increased to some extent, the overall trend did not reach statistical significance. Figures for the paired comparison between Class A and Class B medicines, annual channel-specific trends by therapeutic area, and the complete slope estimates are provided in the Supplementary Appendix.

The figure shows the uptake share of generics and biosimilars among comparable drug forms by therapeutic area and reimbursement class. The position of each point indicates reimbursement class, the colour represents the generic/biosimilar sales-volume share, and the point size represents the number of drug forms in the corresponding analytical stratum. Uptake shares were calculated after aggregating underlying sales volumes over 2020–2024, rather than by averaging percentages across individual drug forms. Comparable drug forms were defined as drug name–dosage form combinations in which both originator/innovative and generic/biosimilar products had observed positive sales. Class B refers to Class B medicines included in the main analysis and excludes negotiated medicines. The figure describes the structural relationship between reimbursement class and generic/biosimilar uptake and should not be interpreted causally.

Annual generic/biosimilar uptake was calculated among comparable drug forms, defined as drug name–dosage form combinations with positive observed sales of both originator/innovative and generic/biosimilar products. Uptake was calculated as the generic/biosimilar sales volume divided by the combined originator/innovative and generic/biosimilar sales volume. The black line shows overall uptake across all distribution channels; blue, green, and orange lines show hospital, retail pharmacy, and online channels, respectively. Slopes were estimated using simple linear models of annual uptake on calendar year and are expressed as percentage-point changes per year, not relative percent changes. Trend estimates are descriptive and should not be interpreted as causal effects of reimbursement, procurement, or channel-specific policies. Sales volumes are source units and do not represent patient counts, prescription counts, treatment episodes, or whole-market share.

Discussion

Using sales data for medicines included in China’s NRDL from 2020 to 2024, this study systematically characterised the observed sales structure and sales-volume replacement of generics and biosimilars at

the drug-form level. The main findings were as follows. First, the observed sales structure of drug forms within the NRDL was not uniform. Only a subset of drug forms had observed sales of both originator/innovative products and generics/biosimilars, indicating that whether a comparable sales structure had formed and the degree of uptake after such a structure had formed should be analysed separately. Second, among comparable drug forms, generic/biosimilar sales-volume uptake showed some heterogeneity across therapeutic areas, but the overall effect size was small. Sensory organ medicines were the only therapeutic area that still showed significantly lower uptake after FDR correction. Third, low uptake was not confined to a single therapeutic area. Cardiovascular system medicines, antineoplastic and immunomodulating agents, nervous system medicines, and alimentary tract and metabolism medicines all included a certain number of specific drug forms with uptake below 50%, suggesting that the problem should be located more precisely at the level of individual products. Fourth, no stable unidirectional difference was observed between Class A and Class B medicines, while overall uptake and hospital uptake showed only modest upward trends from 2020 to 2024.

Previous studies on the underuse of generics and biosimilars have often interpreted lower use shares directly as insufficient clinical adoption and further attributed this to factors such as physician trust, patient acceptance, hospital access, or payment incentives[15,18–21]. However, the present study shows that not all drug forms within the NRDL had formed an observed sales structure in which originator/innovative products and generics/biosimilars coexisted. Without making this distinction, a low share may conflate two different phenomena: one in which no comparable sales structure was observed in the database, and another in which both product types were observed but the sales-volume share of generics/biosimilars remained low.

Among comparable drug forms, the distribution of uptake differed statistically across therapeutic areas, but the effect size was small, indicating that therapeutic area explained only part of the variation in replacement. Sensory organ medicines represented the clearest therapeutic-area-level signal of low uptake in this study. Their median uptake was substantially lower than that of other therapeutic areas, and they remained the only significantly low-uptake area identified in the sequential screening analysis. This suggests that sensory organ medicines may warrant priority in subsequent product-level verification and analysis of barriers to clinical replacement.

At the same time, this study also shows that low uptake is not simply a matter of several therapeutic areas being uniformly low. Although the median uptake of cardiovascular system medicines was relatively low, it did not reach therapeutic-area-level significance after FDR correction. Antineoplastic and immunomodulating agents, cardiovascular system medicines, nervous system medicines, and alimentary tract and metabolism medicines all included a certain number of drug forms with uptake below 50%. This indicates that means or medians calculated at the broad therapeutic-area level may obscure heterogeneity at the level of individual products. For these therapeutic areas, a more appropriate next step would not be to simply label the entire area as having insufficient implementation, but rather to identify key high-volume, low-uptake products by considering sales volume together with the specific medicine name and dosage form. The distributional analysis in the Supplementary Appendix further

supports this interpretation of product-level heterogeneity. Drug-form-level uptake among antineoplastic and immunomodulating agents clearly deviated from a unimodal distribution, suggesting a possible polarised pattern within this area, in which some products may be close to complete replacement whereas others may remain dominated by originator/innovative products.

This study did not observe a stable directional difference in uptake between Class A and Class B medicines at the therapeutic-area level. The numbers of therapeutic areas in which Class B uptake was higher than Class A uptake and in which Class B uptake was lower than Class A uptake were the same, and the paired difference was close to zero. This suggests that reimbursement class itself cannot sufficiently explain differences in the sales-volume share of generics/biosimilars. Regarding temporal trends, overall uptake among comparable drug forms increased modestly from 2020 to 2024, with similar upward trends observed in hospital and online channels, whereas retail-pharmacy channels did not show a clear increase. These findings suggest that the sales-based replacement structure of generics and biosimilars within the NRDL improved during the study period, but the magnitude of improvement was limited and varied across distribution channels and therapeutic areas.

To further understand potential prescribing and implementation barriers in the implementation of generics and biosimilars, this study additionally conducted a physician questionnaire survey. The survey results showed that clinicians paid particular attention to practical factors in prescribing decisions, including patient affordability, evidence on efficacy and safety, hospital formulary access, reimbursement level, and patient preferences. Because the questionnaire used convenience sampling and respondents were mainly physicians from tertiary hospitals, its findings cannot be considered representative of prescribing behaviour among physicians nationwide. However, they provide contextual information for interpreting the low-uptake patterns observed in the sales data.

Taken together, the sales-data analysis and questionnaire findings suggest that promoting the implementation of generics and biosimilars should not rely solely on a single aggregate uptake measure, nor should it adopt a one-size-fits-all approach that ignores product type, therapeutic area, and use setting. First, it is necessary to distinguish whether drug forms have formed a comparable observed sales structure. For products without such a comparable structure, policy attention should focus more on supply, access, quality evaluation, NRDL inclusion, and improvements in availability. Second, for products that have formed a comparable structure but still show low uptake, further assessment is needed to determine whether low uptake is concentrated in specific therapeutic areas, individual drug forms, or distribution channels. Finally, for high-volume but low-uptake products, product-level verification should be prioritised, including assessment of price differences between originator products and generics/biosimilars, hospital formulary availability, prescribing scenarios, clinical evidence supporting replacement, stability of long-term patient treatment, and physician and patient acceptance of replacement. Such a stratified strategy may be more targeted than simply expanding reimbursement coverage or uniformly promoting replacement.

Limitations

This study has several limitations. First, sales data reflect product-level sales-volume structures and cannot be equated with patient counts, prescription counts, treatment pathways, or clinical outcomes. Second, the observed sales structure of drug forms was based on whether positive sales records were observed in this database, rather than on external regulatory approval status, NRDL access status, or complete national market availability. Therefore, categories such as “originator/innovative products only” or “generics/biosimilars only” should not be interpreted as indicating lack of approval, lack of reimbursement listing, or complete replacement. Third, sales volumes in retail and online channels may be affected by sample coverage, scaling estimates, and incomplete capture of specialty pharmacy channels. Fourth, to ensure consistency of the multi-year panel, this study excluded some negotiated medicines with frequently changing NRDL status or reimbursement conditions. Therefore, findings regarding Class B medicines should not be extrapolated to all Class B medicines or to recently negotiated innovative medicines and biological products. Fifth, drug forms within the same therapeutic area were not fully independent. Different dosage forms under the same generic name and multiple generic names within the same therapeutic area may be correlated. Therefore, the statistical tests were mainly used for structural screening and prioritisation rather than for strict patient-level inference. Sixth, this study used a retrospective observational design, and all findings represent descriptive structural associations rather than causal relationships. Future studies could combine prescription data, reimbursement claims data, hospital formulary data, and more complete channel information to further validate the mechanisms underlying the low-uptake therapeutic areas and specific products identified in this study.

Conclusions

After distinguishing observed sales structures, this study showed that the replacement of originator/innovative products by generics and biosimilars within the NRDL was not evenly distributed. Sensory organ medicines represented the clearest therapeutic-area-level signal of low uptake, but more low-uptake problems were distributed at the level of individual drug forms and require further localisation according to sales volume and product characteristics. No stable directional relationship was observed between reimbursement class and uptake, and overall uptake and hospital uptake increased only modestly from 2020 to 2024. These findings suggest that promoting the implementation of generics and biosimilars should move from aggregate uptake assessment toward a stratified strategy based on identifying observed sales structures, evaluating replacement among comparable products, and locating specific low-uptake drug forms.

Abbreviations

FDR
false discovery rate
GRAMMS
Good Reporting of A Mixed Methods Study
NA

not available

NRDL

National Reimbursement Drug List

STROBE

Strengthening the Reporting of Observational Studies in Epidemiology

Declarations

Ethics approval and consent to participate

The medicine sales database used in this study contained aggregated product-level sales information and did not include individual patient-level data. The study protocol, including the anonymous physician survey, was reviewed by the Ethics Committee of China Pharmaceutical University and was determined to be exempt from ethical review (Exemption No. CPU20260451). The physician survey was conducted in accordance with the Declaration of Helsinki and relevant institutional guidelines and regulations. Before participation, all respondents were informed of the study purpose and the voluntary and anonymous nature of participation. Electronic informed consent to participate was obtained from all respondents; completion and submission of the questionnaire constituted consent to participate.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

LS and LT conceived and designed the study. LS conducted the data analysis and drafted the manuscript. LW and LH contributed to data organisation, analysis checking, and manuscript revision. DZ contributed to study design, interpretation of findings, and critical revision of the manuscript. LT supervised the study and critically revised the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available. Data may be made available from the corresponding author on reasonable request, subject to data-use restrictions and permission from the data provider where applicable.

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Figures

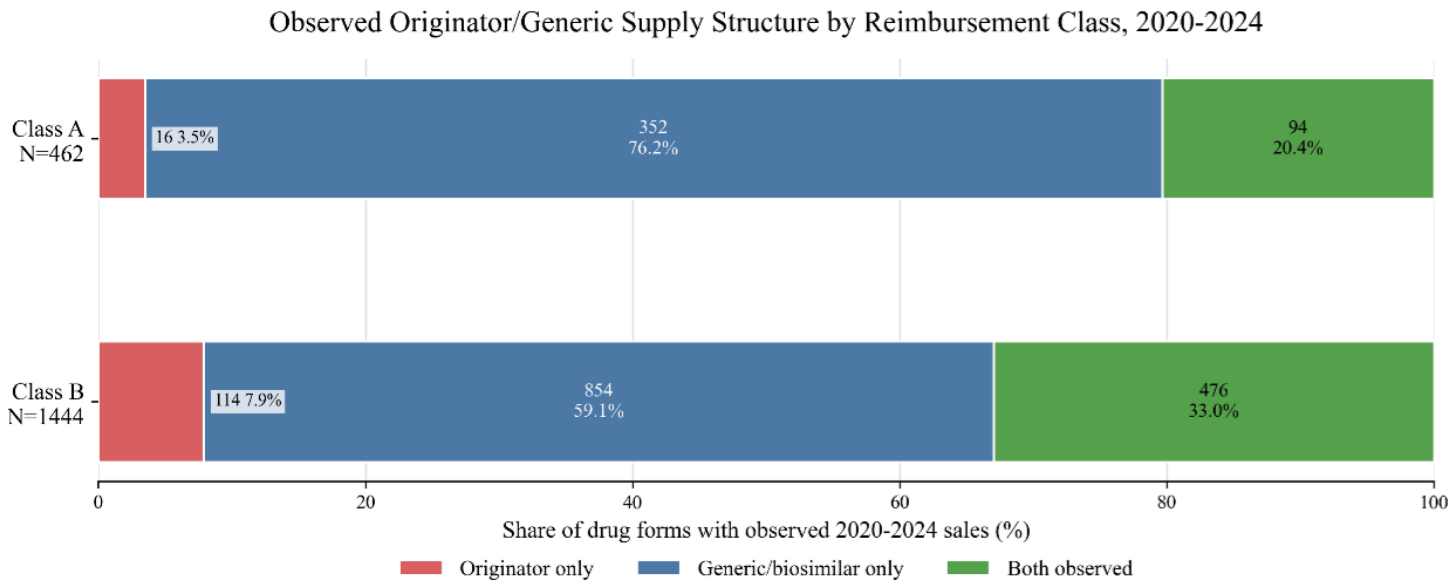
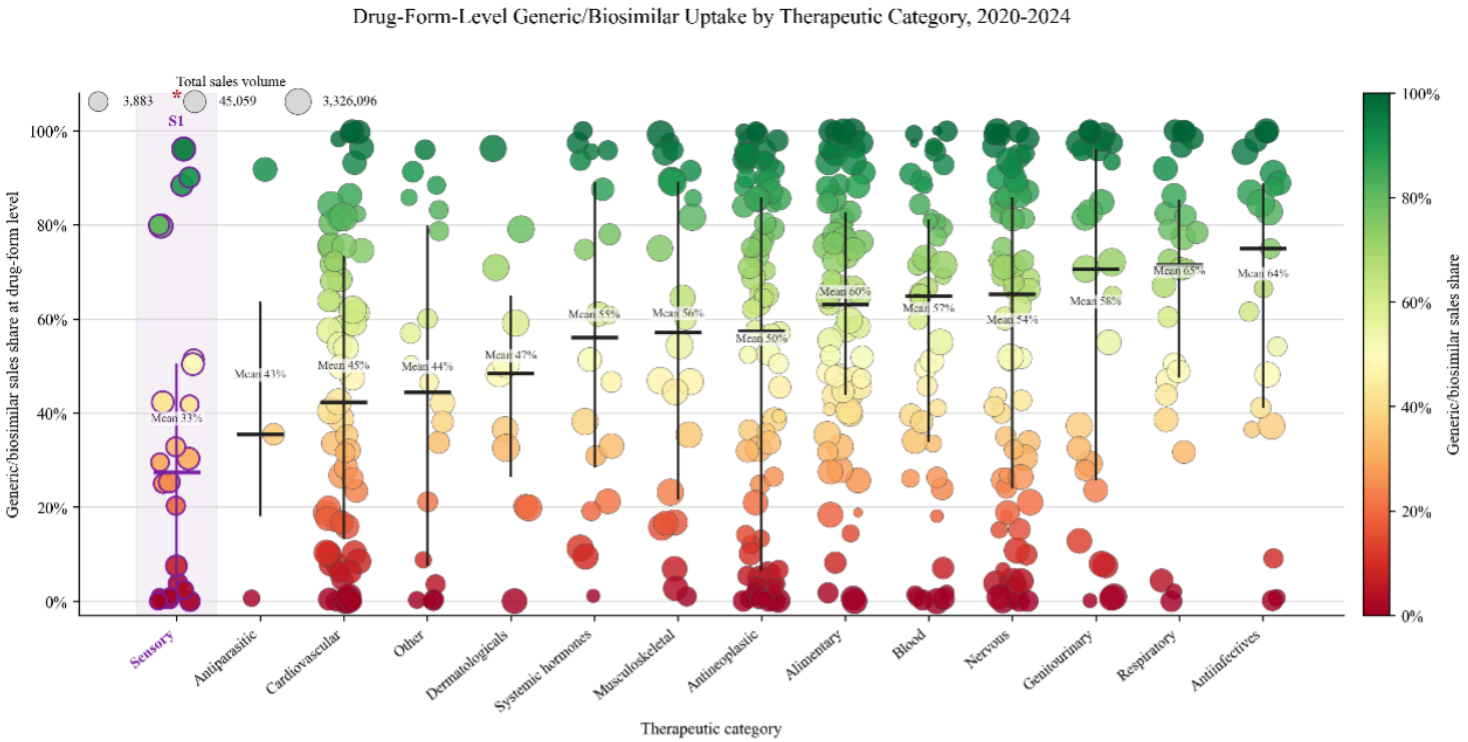


Figure 1

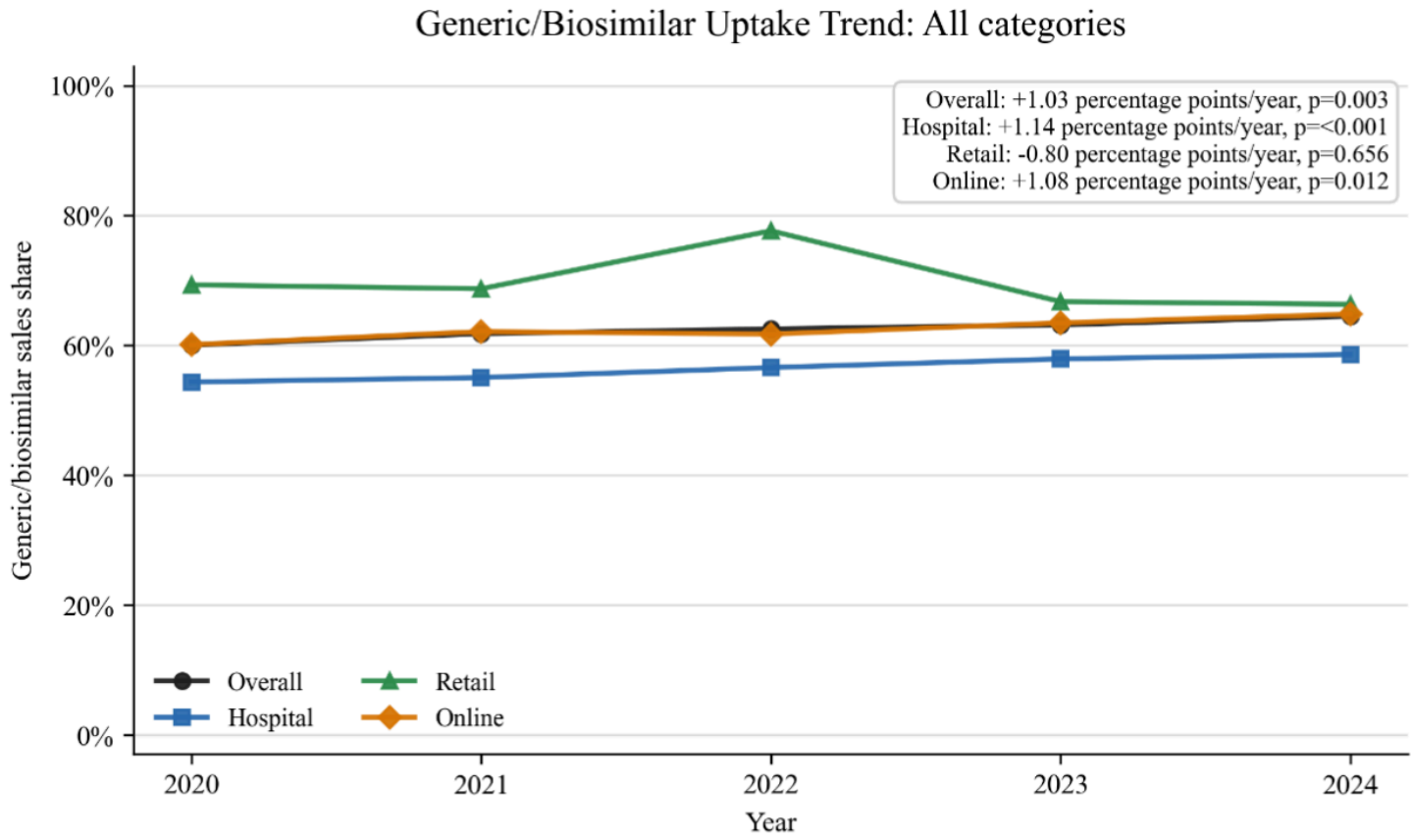
Observed supply structure of originator/innovative and generic/biosimilar products by reimbursement class, 2020–2024



Note: Each point is one comparable drug form with both originator/innovator and generic/biosimilar positive sales observed after pooling 2020-2024 and all channels. Point size is proportional to log10(total source-unit sales + 1); colour follows the generic/biosimilar sales-share scale used in the preceding figures. Vertical lines show IQRs, horizontal bars show medians, and labels show unweighted mean uptake. Purple outlines/labels indicate categories selected by sequential lower-uptake screening; S labels show screening order. Red asterisks indicate the original full-set one-vs-rest Mann-Whitney result with lower median uptake and BH-FDR q<0.05. Sales volumes are source units and do not represent patient counts.

Figure 2

Drug-form-level generic/biosimilar uptake by therapeutic category among comparable drug forms, 2020–2024



Dots show annual uptake among comparable drug forms. Slopes are from simple linear trends of uptake on calendar year and are expressed as percentage-point changes per year, not percent growth rates. Trend estimates are descriptive only.

Figure 3

Annual generic/biosimilar uptake trends among comparable drug forms by distribution channel, 2020–2024

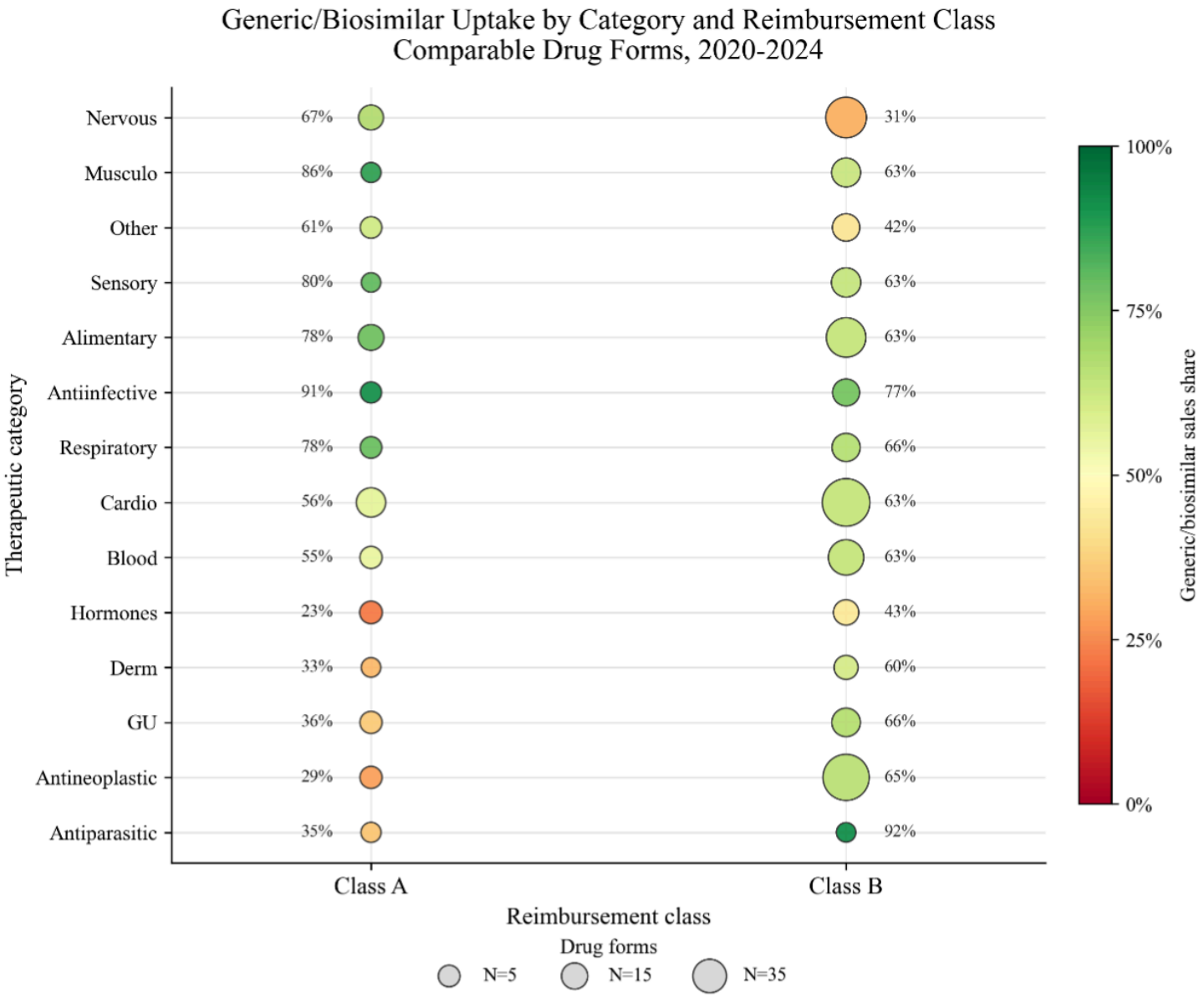


Figure 4

Generic/biosimilar uptake by therapeutic area and reimbursement class among comparable drug forms, 2020–2024

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryAppendix.docx