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PROFIT MARGINS OF PHARMACEUTICAL SUPPLY CHAIN ENTITIES ON PROVIDER-ADMINISTERED DRUGS IN OUTPATIENT AND PHYSICIAN SETTINGS

FINAL

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ABBREVIATIONS

Abbreviation	Definition
AIC	Akaike Information Criterion
AMP	Average manufacturer price
ASPE	Assistant Secretary for Planning and Evaluation, HHS
AWP	Average Wholesale Price
CI	Confidence Interval
CMS	U.S. Centers for Medicare & Medicaid Services
CPI	Consumer Price Index
FDA	U.S. Food & Drug Administration
FFS	Fee-for-Service
FSS	Federal Supply Schedule Service
GAO	U.S. Government Accountability Office
GPO	Group Purchasing Organization
HCPCS	Healthcare Common Procedure Coding System
HHS	U.S. Department of Health & Human Services
MAC	Medicare Administrative Contractor
MCO	Managed Care Organization
MDRP	Medicaid Drug Rebate Program
NDC	National Drug Code
NSP	National Sales Perspective
OIG	U.S. Office of Inspector General, HHS
OPPS	Outpatient Prospective Payment System
PBM	Pharmacy Benefit Manager
SDP	Office of Science and Data Policy, ASPE HHS
TOS	Type of Service
URA	Unit Rebate Amount
WAC	Wholesale Acquisition Cost

EXECUTIVE SUMMARY

ES.1 OVERVIEW AND METHODOLOGY

The U.S. supply chain for provider-administered outpatient drugs involves several entities, including drug manufacturers, wholesalers, healthcare providers (e.g., outpatient facilities, hospital pharmacies, doctor's offices, and standalone clinics), group purchasing organizations (GPOs), payers, and beneficiaries. For Medicare Part B and Medicaid beneficiaries, negotiations among these supply chain entities are highly complex and can involve a variety of price benchmarks combined with private negotiation. Drug manufacturers develop and sell finished drug products to wholesalers, which distribute those drugs to providers. Healthcare providers administer the drug to the beneficiary and bill the provider or healthcare plan for the cost of the drug. The patient or beneficiary pays coinsurance, which, for Part B drugs, is generally 20 percent of the drug's cost. GPOs negotiate lower net sales prices with manufacturers and wholesalers, which they offer to providers, effectively pooling the providers' purchasing power while giving manufacturers and wholesalers access to large national contracts. Net sales prices are typically confidential, as are the discounts and rebates shared among supply chain entities. Most supply chain entities are paid based on a percentage of the list price, which sometimes incentivizes the utilization of expensive brand name drugs and original biologics. These misaligned incentives, along with lack of pricing transparency, contribute to increasing drug costs in the United States. It is important to understand how net spending by payers and beneficiaries is distributed across the supply chain entities, the margins that pharmaceutical supply chain intermediaries earn, and how these vary by the characteristics of individual drugs.

In this report, we used data from IQVIA, the Centers for Medicare & Medicaid Services (CMS), the U.S. Department of Veterans Affairs (VA), and the U.S. Food & Drug Administration (FDA) to estimate the total net spending by payers and beneficiaries on separately billable outpatient drugs administered by healthcare professionals to Medicare Part B and Medicaid beneficiaries in outpatient and physician office settings. We modeled these payments by payers and beneficiaries as initial monetary inputs into a closed system of supply chain entities. These monetary inputs get distributed to supply chain members through complex flows of payments, chargebacks, rebates, etc. among those entities. By estimating these flows on a per-drug basis, we examined the share of payer and beneficiary net spending that is captured by each supply chain entity and the margins of the primary intermediaries, namely wholesalers and providers, from 2020 through 2022.[1] We also evaluated how retained shares of net spending and margins varied by a drug's primary therapeutic area, and we also compared on other characteristics like whether the drug or product is in a competitive or noncompetitive market, is a small molecule

[1] Margins, one primary focus of the report, represent the portion of revenue from pharmaceutical sales retained after accounting for acquisition costs, discounts, and rebates that impact either the acquisition cost or the sales price. Margins were not calculated for manufacturers because we did not quantify manufacturers' costs of goods for the drug. We did not estimate margins of GPOs because they do not make payments and are not paid for the full cost of the drug.

generic or a small molecule brand, is a biosimilar biologic or an original biologic, primarily treats acute or chronic conditions, and is sold at a 340B-discounted price or a non-discounted price. For Medicare drug sales, we accounted for the fact that 340B discounts are only available to some providers on certain drug units.[2] For Medicaid drug sales, we estimated the rebate paid by manufacturers to the Medicaid Drug Rebate Program.

The target population includes all payments made on behalf of Medicare Part B or Medicaid beneficiaries on separately payable provider-administered outpatient drugs. While the focus is on beneficiaries of public programs, to avoid underestimating the margins of supply chain entities, we included all payments made on behalf of these beneficiaries by the public payer, other payers (e.g., supplemental insurance), and beneficiaries themselves. We excluded groups of drugs with no sample data at all (mostly miscellaneous drugs or vaccines). This removed 12.3 percent and 27.6 percent of gross spending on Part B and Medicaid beneficiaries from the study population, respectively. The study population covered $113.9 billion and $19.9 billion in gross spending on Part B and Medicaid beneficiaries, respectively, across all three study years (2020 to 2022).[3,4] Our final sample included 2,117 drugs, which we defined as unique 9-digit National Drug Codes (NDCs). The sample covered 29.3 percent ($33.4 billion) and 27.1 percent ($5.4 billion) of the study population's gross spending on Part B and Medicaid beneficiaries, respectively.

ES.2 KEY FINDINGS

Manufacturers retained the vast majority of payers and beneficiaries' total net spending, followed by providers, then wholesalers, and lastly GPOs. Providers' share of net spending increased the most from 2020 to 2022. Manufacturers retained 74 percent to 76 percent of net spending, depending on the year, which amounted to $31 billion to $33 billion dollars per year (see Figure ES-1).[5,6] Providers retained 20 percent to 22 percent of net spending, which equated to $9 billion to $10 billion per year. This margin made up between 19 and 22 percent of providers' net sales (see Figure ES-2). They were followed by wholesalers, which retained 3 percent to 4 percent ($1 billion to $2 billion per year), at a margin percentage of 3 percent to 5 percent. GPOs retained 1 percent of total net spending ($465 million to $500 million per year). The large share that manufacturers retained is related to drug use patterns. Between 2020 and 2022, most spending was on provider-administered drugs with no competition in the market, and manufacturers that are the sole supplier of a market have more

[2] The 340B program under Medicare allows eligible "safety-net" providers, which serve low-income and underserved populations, to purchase drugs at a discounted rate. See discussion of 340B pricing in section 2.
[3] All monetary values are expressed in 2023 dollars.
[4] Our results are expressed throughout the study in terms of net spending, which is equal to gross spending less the estimated Medicaid rebates paid by manufacturers back to the payer.
[5] It should be noted that we did not account for manufacturers' costs of raw materials or research and development.
[6] The sample covers $38.7 billion in gross spending and $37.7 billion in net spending from 2020 to 2022, which include payments by Medicare Part B and Medicaid. In section ES.2, we present weighted results, which scale up the estimates from the sample to the full study population. From 2020 to 2022, the weighted gross spending in the study population was $133.8 billion and the weighted net spending was $129.9 billion.

capability to act as price-setters. However, providers saw the largest percentage increase in retained share of net spending from 2020 to 2022, at 12.5 percent. Most of the growth in net spending over this period was due to a rise in net spending on 340B-discounted drugs, which providers retained much higher shares of compared to net spending on non-340B-discounted drugs. Providers also retained more than their average on certain drug groups, including small molecule generics, on which they retained the majority of net spending (57 percent to 62 percent), and oncology drugs (21 percent to 24 percent), which had by far the highest spending of the therapeutic areas.

Net spending by payers and beneficiaries was roughly constant for the specific drug units that did not receive 340B discounts but increased 20 percent for the drug units sold at 340B-discounted prices. These 340B-discounted drug sales earned healthcare providers roughly twice the margins, on average from 2020 to 2022, compared to non-340B-discounted drug sales.[7,8] Overall, net spending rose from $42 billion in 2020 to $45 billion in 2022, and all of this increase went toward 340B drug spending, which rose from $13 billion in 2020 to $16 billion in 2022. Under the 340B program, eligible safety-net providers acquire some drugs at discounted prices, which generate higher margins for those providers. In 2020 and 2021, providers' margin percentages on 340B-discounted drugs were 58 percent and 81 percent higher, respectively, than their margin percentages on non-340B-discounted drugs. In 2022, this increased substantially, with providers earning roughly two and half times the margin percentage on 340B-discounted drugs compared to non-340B-discounted drugs. This increase was likely due to the 2022 reversal of a CMS rule that had been in effect since 2018, which lowered providers' reimbursements on 340B-discounted drugs from the average sales price (ASP) plus 6 percent to ASP minus 22.5 percent. The reversal of this rule in 2022 caused healthcare providers' reimbursements on 340B-discounted units to increase by roughly 37 percent from their then-current values, as Medicare Part B payments are primarily based on published CMS reimbursement rates. There was almost certainly not a commensurate increase in providers' acquisition costs for these drugs, because 340B-discounted drug acquisition costs are calculated using a federally mandated formula. Our findings suggest that, even though this 2018 CMS rule likely reduced providers' margins on 340B drug sales in 2020 and 2021, providers

[7] We use the terms "340B-discounted drug" and "non-340B-discounted drug" to identify the specific drug units or sales that received discounted pricing under the 340B program. It should be noted that a single drug product would generally have some sales that are 340B-discounted and others that are not. Our analysis accounts for this as well as the fact that not all drug units that 340B facilities acquire are eligible for 340B discounts (in particular, those administered to Medicaid beneficiaries).

[8] It should be noted that 340B providers comprise "health care organizations that care for many uninsured and low-income patients. These organizations include federal grantee organizations and several types of hospitals, including critical access hospitals (CAHs), sole community hospitals (SCHs), rural referral centers (RRCs), and public and nonprofit disproportionate share hospitals (DSH) that serve low-income and indigent populations. ... Hospitals use 340B savings to provide, for example, free care for uninsured patients, offer free vaccines, provide services in mental health clinics, and implement medication management and community health programs." (American Hospital Association, 2023)

still earned larger margin percentages on 340B-discounted drugs than non-340B-discounted drugs during those years, before the rule was reversed.

Net spending on provider-administered outpatient drugs is dominated by original biologics with no market competition, which tend to be more expensive than small molecule drugs. Biologics made up only 16 percent of the unique drugs (i.e., 9-digit NDCs) in our sample yet accounted for 84 percent of all net spending in the United States from 2020 to 2022. Of the biologics reimbursed in this setting, 86 percent were original biologics with no biosimilar competition. In general, biological drugs tend to be more complex than small molecules to develop and manufacture (and more expensive to beneficiaries), which increases market entry barriers and reduces competition in biologics markets.

While manufacturers earned larger shares of net spending on small molecule brands and original biologics than on small molecule generics and biosimilars, this advantage was larger for original biologics than for small molecule brands. Manufacturers retained 77 percent to 80 percent of net spending (which amounted to $26 billion to $28 billion) on original biologics, compared to 61 percent to 67 percent ($3.4 billion to $3.9 billion) on small molecule brands. The fact that original biologics generated more value per dollar of net spending than small molecule brands is partly due to original biologics being less likely to experience market competition (for several reasons). For example, biosimilars can face higher barriers of entry than generic small molecule drugs depending on the product complexity, the patent landscape, and factors that impact uptake and utilization. In addition, while the number of approved biosimilar products is increasing, the abbreviated approval pathway for biosimilars was created in 2015, compared to 1984 for small molecule generics, which at least partly accounts for the much smaller number of approved biosimilars compared to approved generics.

Providers retained over half of payer and beneficiary net spending on small molecule generics. In almost all cases, we found that manufacturers retained the majority of net spending on provider-administered outpatient drugs. For small molecule generics, however, providers retained a larger share than manufacturers. Total net spending on small molecule generics ranged from $1.1B to $1.2B—the lowest net spending in dollar terms of all the drug groups we analyzed. Of this total, providers earned 57.0 percent to 61.8 percent ($629 million to $718 million), compared to 34.2 percent to 39.0 percent for manufacturers ($398 million to $430 million), 3.1 percent to 3.3 percent for wholesalers ($36 million to $39 million), and 0.7 percent for GPOs ($8 million).

Our results are consistent with others' findings that biosimilars are effective at reducing spending. Between 2020 and 2022, the number of biosimilars in U.S. markets doubled, and they continued to gain market share in the United States. Yet net spending on competitive biologics[9] decreased by 36 percent—even as spending rose for biologics in

[9] A competitive biologic includes any original biologic that faces biosimilar competition as well as all of its marketed biosimilars. An original biologic listed as the reference product in one or more approved 351(k) applications but that does not yet have competition (e.g., due to delayed biosimilar market entry) is considered a noncompetitive biologic.

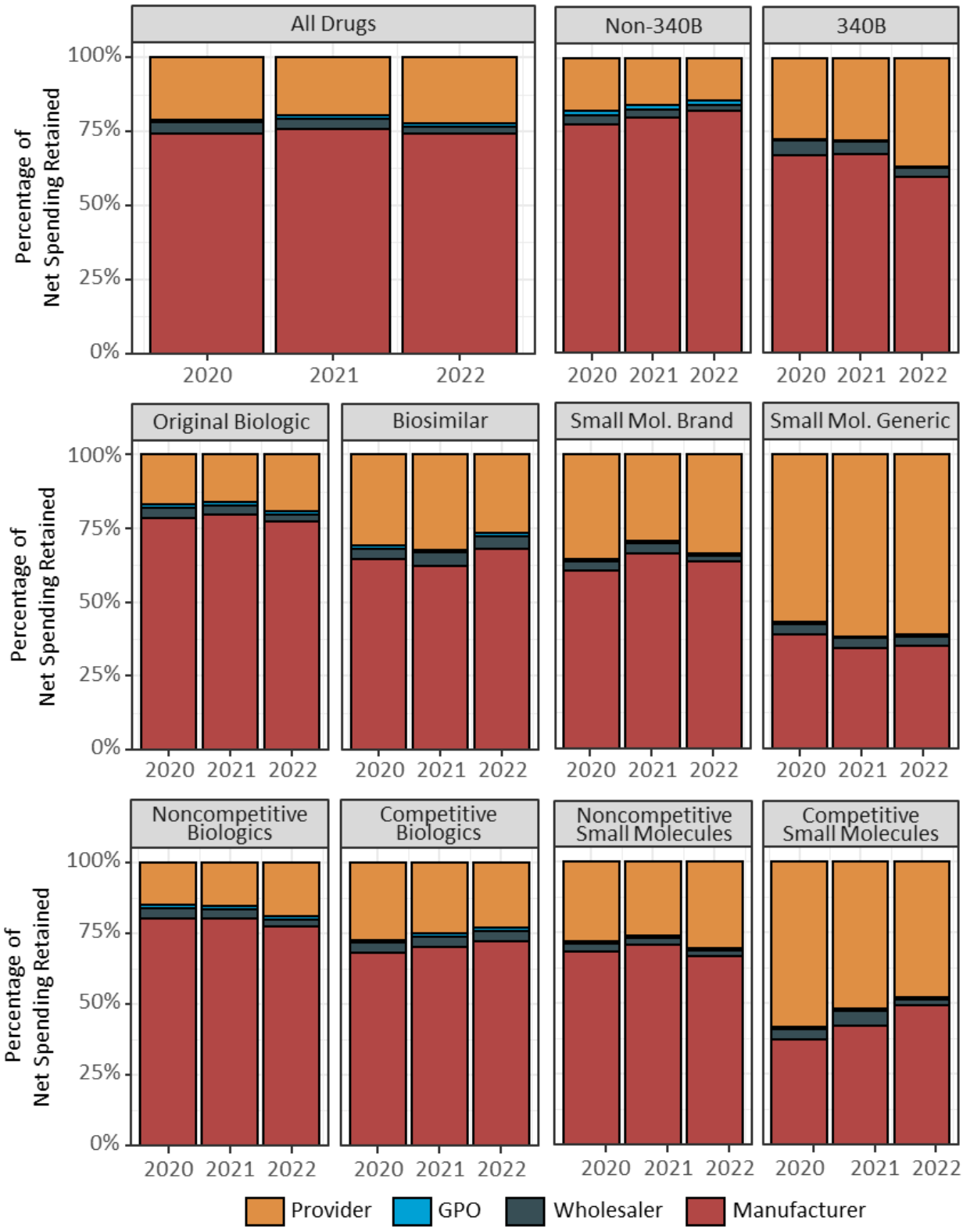
general.[10] This spending decline that we observed over the three-year study period is very similar to the average 36-month price reduction following biosimilar market entry, which ranges from about 13 percent to 42 percent and averages about 31 percent when using the IQVIA National Sales Perspective (NSP) invoice price metric (Pritchett, 2023) (estimated from Pritchett's Exhibit 17). Moreover, wholesalers and providers earned more on noncompetitive biologics than competitive biologics. Wholesalers earned margins of 4 percent to 5 percent on competitive biologics ($150 million to $220 million), compared to 3 percent to 4 percent on noncompetitive biologics ($840 million to $1.09 billion). Providers earned margins of 22 percent to 27 percent ($0.99 billion to $1.84 billion) on competitive biologics compared to 15 percent to 18 percent ($4.17 billion to $6.41 billion) on noncompetitive biologics. While wholesalers and providers had higher margin percentages on competitive biologics, the dollar amount was lower, mainly because there are many more non-competitive biologics markets.

Net spending grew 6.2 percent over the study period, which coincided with the COVID-19 pandemic. The pandemic likely had different effects on drug use patterns and spending based on a drug's therapeutic class. Medicare Part B covered the COVID-19 vaccine, as well as certain drugs for treating COVID-19, including Remdesivir. These drug products probably saw increased utilization between 2020 and 2022. However, there was likely a decrease in spending on drugs used in certain non-essential procedures, many of which were postponed to reduce the burden on healthcare facilities during this time.

Data limitations and simplifications in the model impact output estimates. We did not observe actual prices on several flows, including wholesaler net acquisition costs, 340B-discounted prices, reimbursement rates paid by Medicare Part B in outpatient settings, and reimbursement rates paid by Medicaid in any setting. We estimated these costs using other data sources. In addition, we modeled the supply chain as a closed system and estimated drug flows throughout the system by applying drug utilization data as measured by payers. This does not account for unsold products that may expire and generate additional losses for the supplier or provider. As another limitation, the single distribution channel of drug acquisition from manufacturer to wholesaler to provider to payer is also a simplification, as providers sometimes purchase drugs directly from the manufacturer. Moreover, we only measured payments triggered by a drug reimbursement. We did not quantify payments that are not made on a per-drug basis, including per-member payments to Managed Care Organizations (MCOs), Medicare Administrative Contractors (MACs), and annual membership fees that providers may pay to GPOs.

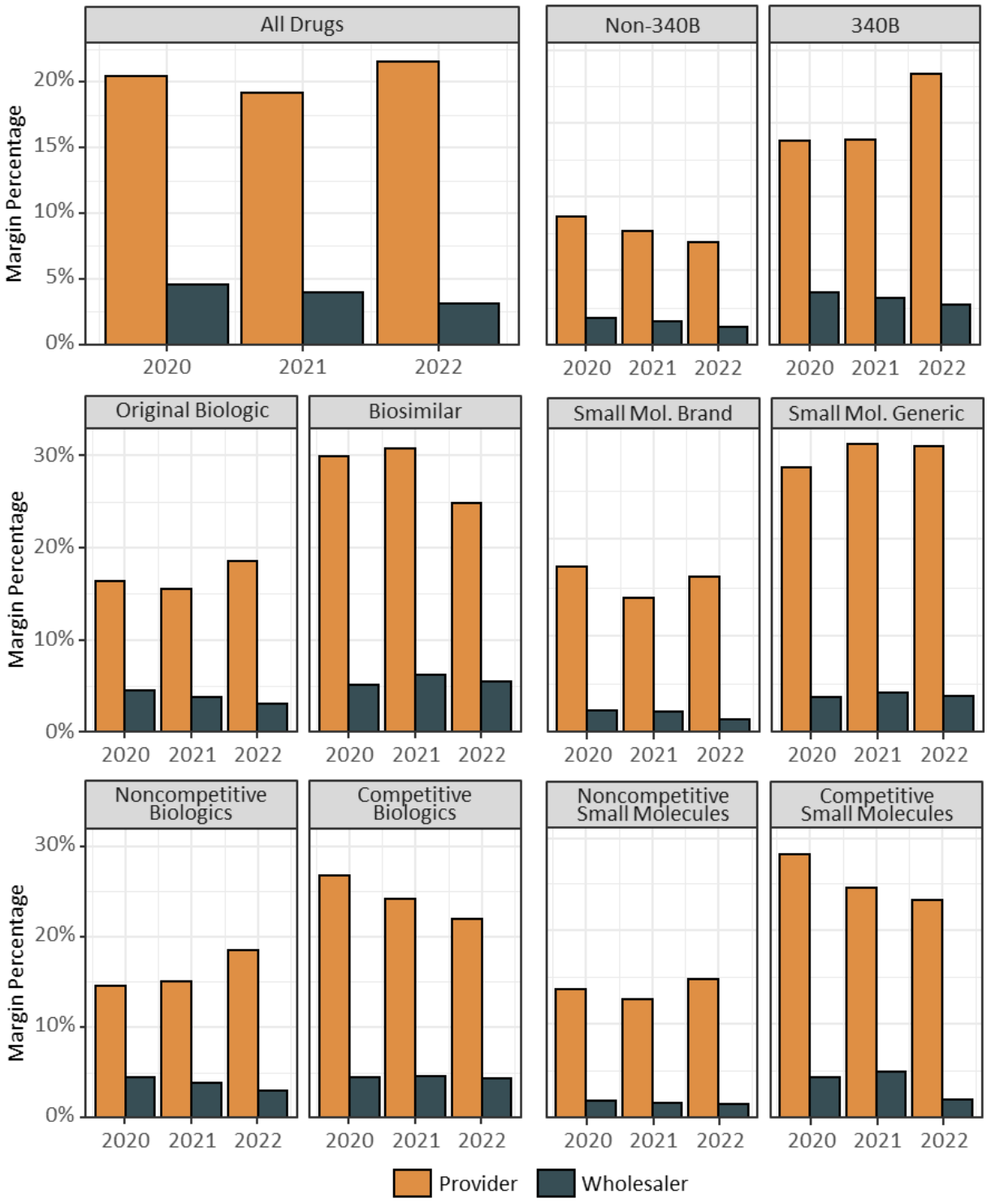
[10] Most biosimilars in our sample are oncology drugs. While some medical procedures and clinical services were canceled or delayed during the pandemic, our analysis suggests that spending on oncology drugs continued to rise from 2020 to 2022.

Figure ES-1. Distribution of Payer-Beneficiary Net Spending to Supply Chain, by Drug Groups, 2020–2022



Note: Some data columns for GPOs may be too small to see at this scale.

Figure ES-2. Providers and Wholesalers' Margins, by Drug Group, 2020–2022



Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug and thus do not have net acquisition costs or net sales prices.

1 INTRODUCTION AND STUDY OBJECTIVES

This study estimates gross and net spending by payers and beneficiaries of provider-administered drugs. It also assesses how the net spending is distributed across the members of the pharmaceutical supply chain—including providers, wholesalers, group purchasing organizations (GPOs), and manufacturers. Our focus is on prescription drugs administered by healthcare professionals to Medicare Part B and Medicaid beneficiaries in outpatient or physician office settings. We only consider individually billed drugs and excluded drugs that are billed as part of a bundled group.[11] Using public and proprietary data sources, we track the payments and quantities of individual drugs, which we define as drug products with a unique 9-digit National Drug Code (NDC), as they flow from manufacturer to patient. We also evaluate the margins earned by providers and wholesalers, both of which have a well-defined sales price and acquisition cost that can be directly compared.[12] We define margins in dollar terms as the difference between an entity's net sales price and net acquisition cost, and we also express this in percentage terms as a fraction of the net sales price. Because we calculate margins at the individual drug level, we are able to assess how certain drug characteristics affect margins and how payer and beneficiary spending is distributed to the supply chain members.

Increasing drug prices in U.S. markets have been a concern for many years. Analysis by the non-profit drug price research firm 46brooklyn shows that, among brand drugs with a price change, the median percentage change in the wholesale acquisition cost (WAC, or list price) of a drug was +7.9 percent to +9.0 percent in every year from 2012 to 2018 and +4.8 percent to +5.0 percent per year from 2019 through 2023 (46brooklyn, 2024). A study by the Assistant Secretary for Planning and Evaluation (ASPE) found that, from January 2022 to January 2023, there were over twice as many drugs with price increases (n=4,264) as there were with price decreases (n=1,599) (Bosworth, et al., 2023). While provider-administered outpatient drugs may make up a smaller fraction of total drug spending than self-administered retail drugs,[13] one study found that, from 2008-2021, "Medicare fee-for-service (FFS) Part B drug spending per enrollee grew on average at 9.2 percent annually, [which is] more than triple the rate in Part D (2.6 percent)" (Nguyen, et al., 2023).

This study aims to answer the following research questions:

1. How is total net spending by payers and beneficiaries distributed to the members of the supply chains for individually billed drugs that are administered by healthcare

[11] Roehrig and Turner estimated that, in 2020, non-retail drug spending by all payers made up 31.1 percent of all drug spending (2022). Of the 31.1 percent, our study focuses on the subset of non-retail drug spending that is separately payable. We did not analyze bundled payments for which drug costs cannot be disaggregated from other costs like diagnostic testing, therapeutic services, room fees, etc.

[12] We did not calculate margins for GPOs because they do not pay and are not paid for the full cost of the drug, which makes it difficult to define their net acquisition cost and net sales price.

[13] For example, CMS reported total spending of $481 billion in Part D in 2022 (Centers for Medicare & Medicaid Services, 2024b), compared to $43.6 billion in Part B (excluding Medicare Advantage) in 2022 (Centers for Medicare & Medicaid Services, 2024c).

professionals to Medicare or Medicaid beneficiaries in outpatient facilities and physician offices?

2. What are the margins of supply chain intermediaries (i.e., wholesalers and providers) on these outpatient drugs administered to Medicare and Medicaid beneficiaries?

3. How do the distributions of net spending and margins vary across the following drug subgroups:

    a. Generic small molecule drugs versus brand name small molecule drugs.

    b. Biosimilar biologics versus original biologics.

    c. Whether the drug or product faces competition in the market.[14]

    d. Whether the drug is or is not eligible for 340B discounted pricing.

    e. The therapeutic area of the drug.

    f. Whether the drug treats an acute condition or a chronic condition.

4. What trends have emerged in supply chain entities' margins and in the distribution of payer and beneficiary net spending to those entities from 2020-2022? Have these trends varied across the drug product subgroups listed above?

2 BACKGROUND

This study estimates the distribution of net spending by the payer and beneficiary on provider-administered drugs across four pharmaceutical supply chain entities. We briefly discuss the roles of these supply chain entities below.

2.1 Manufacturers

Drug manufacturers incur raw material and production costs of making pharmaceutical drugs, as well as the costs of research and development. Manufacturers establish the WAC or list price at which they sell a drug to wholesalers. They often pay out additional fees, discounts, and rebates to other supply chain entities, so that their net revenue from a drug is under the WAC price. Manufacturers generally have more power to set drug prices when they are the sole supplier of the drug market, which is often the case for branded drugs or original biologics.

[14] Among small molecules, we defined markets with multi-source drugs as competitive and markets with single-source drugs as noncompetitive. For biologics, we defined markets with an original biologic and at least one biosimilar competitor as "competitive" and markets in which the original biologic has no marketed biosimilars as noncompetitive.

2.2 Wholesalers

Wholesalers acquire drugs from manufacturers at their WAC price, which is offset by distribution fees and discounts that the manufacturer pays to the wholesaler, leading, in many cases, to a net acquisition cost lower than the published WAC. They sell to providers at negotiated prices, which are often based on the average wholesale price (AWP)—another price benchmark that is generally 20 percent more than the WAC for brand drugs, but varies more for generic drugs (Miller, et al., 2019).

2.3 Providers

Healthcare providers include hospital outpatient facilities, physician offices, standalone clinics, home healthcare, and other settings offering outpatient services. They acquire drugs from wholesalers or directly from manufacturers at negotiated contract prices.

The 340B Drug Pricing Program under Medicare allows eligible safety-net hospitals to purchase drugs at a discounted rate (Clark & Puthiyath, 2022). Safety-net hospitals, including critical access and disproportionate share hospitals, serve lower-income or underserved populations. The manufacturer bears this discount and will often pay it in the form of a chargeback to the wholesaler. 340B discounts include a minimum statutory discount rate of 23.1 percent for brand drugs, 17.1 percent for blood clotting factors and drugs approved only for pediatric indications, and 13 percent for generic drugs (Medicaid.gov, 2024; Dolan, 2019). These discount rates are applied to the average manufacturer price (AMP), which generally includes a wide range of rebates and discounts for drugs not primarily sold through retail pharmacies (Pew, 2017). For brand drugs, if the computed discounted price is still higher than the best price that the manufacturer offers to its most favored customer, then the 340B discount is increased further to match the best price. For both brands and generics, an additional inflationary component lowers the drug's 340B price if the drug price rises faster than the rate of inflation. Vaccines comprise the largest group of drug products excluded from the 340B program. Drug units that 340B facilities administer to Medicaid beneficiaries are generally not eligible for 340B-discounted pricing because the manufacturer already pays a rebate to the Medicaid Drug Rebate Program (Health Resources & Services Administration, 2020).

2.4 Group Purchasing Organizations

Group purchasing organizations (GPOs) negotiate contract prices with suppliers (manufacturers or wholesalers) on behalf of groups of healthcare providers. They use the combined purchasing power of their provider members to negotiate favorable pricing and terms.

Most GPOs do not charge providers a membership fee for access to GPO-negotiated prices (Mulcahy & Kareddy, 2021). They generate profits through administrative fees charged to suppliers as a percentage of the drug price (Cardinal Health Specialty Solutions, 2020; Oakley, 2022; Mulcahy & Kareddy, 2021). GPOs conduct these negotiations with both manufacturers and wholesalers, which are incentivized to join GPOs and pay the administrative fees because

they can access national contracts, which can generate large sales volume and have less administrative burden than setting up individual contracts with each provider. When a wholesaler sells a drug that is under a GPO contract price negotiated by the manufacturer, the wholesaler can use a chargeback process with the manufacturer to recoup losses if the contract sales price was lower than the wholesaler's original acquisition cost.

GPOs are exempted by a safe harbor provision from the Federal anti-kickback statute [42 U.S.C. § 1320a-7b(b)], which "prohibits the knowing and willful payment of 'remuneration' to induce or reward patient referrals or the generation of business involving any item or service payable by the Federal health care programs" (U.S. Department of Health and Human Services, n.d.). To be eligible for safe harbor, GPOs must either charge vendors an administrative fee of 3 percent or less or include the administrative fee in their written contract with the vendor.

Certain types of 340B facilities are prohibited from membership in GPOs, including disproportionate share hospitals, children's hospitals, and free-standing cancer hospitals (Health Resources & Services Administration, 2024).

2.5 Payers

In this study, we define total net spending to include payments made by public insurance (Medicare or Medicaid), the beneficiary, and any supplemental insurance. Drugs administered in physician offices and outpatient settings are covered under Medicare Part B—including injectables, clotting factors, and some vaccines, among others. We used Medicaid claims for the same set of separately payable drugs to calculate flows and spending under Medicaid.

Under the Medicaid Drug Rebate Program (MDRP), participating manufacturers pay states a rebate that is based on drug utilization in exchange for Medicaid coverage of their drugs (Centers for Medicare & Medicaid Services, 2024). Federal regulation stipulates how the Medicaid drug rebate is calculated. The Medicaid rebate amount per drug unit is very similar to the 340B discount per drug unit.

3 METHODOLOGY

3.1 Data Sources

To answer the research questions, we used the following public and proprietary data sources. For each source listed below, we used full year data for 2020, 2021, and 2022.

- **IQVIA National Sales Perspective (NSP).** The NSP dataset is a nationally representative database covering over 90 percent of all U.S. drug sales. Sales data are reported monthly by distribution channels (e.g., chain pharmacy, clinic, non-federal hospital, etc.). Metrics include each drug's brand status (brand, generic, branded generic), market launch date, molecule type (small molecule, original

biologic, biosimilar)[15], dosage form, therapeutic class, and sales information. We used the WAC published by manufacturers, which does not contain any discounts, and the NSP price, which is IQVIA's estimate of the average price listed on the invoice to clinics, which accounts for on-invoice discounts but does not capture off-invoice discounts. We also used the number of extended units sold—an "extended unit" in IQVIA represents the smallest measurable quantity of a drug as sold (e.g., one tablet or capsule, one mL of solution, one vial, one tube of ointment). These data helped us estimate providers' net acquisition costs.

- **Centers for Medicare & Medicaid Services (CMS) Part B Fee-for-Service (FFS) Outpatient Claims File.** The Part B FFS Outpatient file contains NDC-level data on pharmaceutical claims from outpatient settings for Medicare Part B beneficiaries **(ResDAC, 2020-2022)**. These data include the total amounts paid by Medicare, the beneficiary, and other payers (e.g., supplemental insurance) to the provider. The FFS Outpatient file also lists the amount of drug administered, the drug product's 11-digit NDC, and the drug product's Healthcare Common Procedure Coding System (HCPCS) code. We used these data to estimate total Part B outpatient drug spending as well as reimbursement rates for specific outpatient drugs.

- **CMS Medicare Part B FFS Carrier Claims File.** The Part B FFS Carrier file contains data on pharmaceutical claims from physician offices for Medicare Part B beneficiaries **(ResDAC, 2024)**. The data include the total payment amount, the amount of drug administered, and the drug product's HCPCS code. We used these data to estimate total Part B physician office drug spending by HCPCS and the provider's 340B status. Drug-level prices were not available in this file.

- **CMS Medicaid Other Services (OT) Claims Files.** The Medicaid OT file contains data on pharmaceutical claims from outpatient facilities and physician offices for Medicaid beneficiaries **(ResDAC, 2020-2022)**. This includes the total payment amount, along with the drug's HCPCS code and 11-digit NDC. We used these data to estimate total Medicaid drug spending in outpatient settings and physician offices.

- **CMS Part B HCPCS-NDC Crosswalks.** Quarterly, CMS posts a crosswalk of 11-digit NDCs and their corresponding HCPCS information **(Centers for Medicare & Medicaid Services, 2020-2022)**. The list of 11-digit NDCs covers all drugs for which CMS has calculated and published a Part B reimbursement rate.[16] The crosswalk files list each drug's corresponding HCPCS code, standardized dosage per billing unit, and total number of billing units (i.e., dosages) per 11-digit NDC shelf package. We used the HCPCS in these crosswalks to identify the universe of spending on Part B drugs. We

[15] Original biologics refer to biologics approved through the 351(a) pathway. Biosimilars are biologics approved through the 351(k) pathway.

[16] These reimbursement rates are published in separate Average Sales Price (ASP) files (Centers for Medicare & Medicaid Services, 2020-2022).

also used dosage and package information in the crosswalks to convert prices and utilization to consistent units within and across datasets.[17]

- **CMS Medicaid Drug Rebate Program Drug (MDRP) Product Data.** CMS publishes a list of 11-digit NDCs in the MDRP **(Medicaid.gov, 2020-2022)**. Each product is identified as (1) a single-source drug, a non-innovator multi-source drug, or an innovator multi-source drug; and (2) a clotting factor or exclusively pediatric drug. We used this dataset when calculating Medicaid rebates and 340B prices.

- **U.S. Department of Veterans Affairs Federal Supply Schedule (FSS) Drug Pricing File.** The VA FSS drug pricing files provide data on maximum prices that drug manufacturers may charge for direct federal purchases made by the Department of Veterans Affairs, the Department of Defense, the Public Health Service, and the Coast Guard **(U.S. Department of Veterans Affairs, Office of Procurement, Acquisition and Logistics, 2023)**.[18] We used the VA FSS prices to estimate wholesalers' net acquisition costs, as described in more detail in section 3.3.

- **U.S. Food & Drug Administration (FDA) NDC Directory.** The NDC Directory contains information about finished drugs marketed in the United States, as provided to FDA in mandatory biannual submissions from registered drug manufacturing establishments. This information includes the first two segments of the drug's NDC number, application number and type, prescription status, dosage form, and strength. Where needed, we converted the NDC numbers listed in the NDC Directory to the standardized 9-digit format used by CMS for billing **(Maryland Department of Health, n.d.)**. We used these data to identify products' strength, application type (New Drug Application, Abbreviated New Drug Application, or Biologics License Application), and brand or generic status in cases where the drug was listed in IQVIA as "branded generics" or "other."

3.2 Universe and Sample of Drug Spending

Our study covered drugs administered by healthcare professionals to Medicare Part B and Medicaid beneficiaries in outpatient or physician office settings (excluding Medicare Advantage).[19] We limited the study to HCPCS codes listed in the CMS Part B HCPCS-NDC Crosswalk files (Centers for Medicare & Medicaid Services, 2020-2022) and only considered

[17] In this study, we use both "utilization" and "drug quantity" to refer to the amount of the drug administered, for which the payer and beneficiary submit payments (i.e., spending) that get distributed through the supply chain.
[18] The VA negotiates this price with manufacturers on behalf of direct federal purchasers. The price is determined through negotiation, but statute imposes certain limitations. For example, "[d]uring a multiyear contract period, an FSS price may not increase faster than the net price charged to the most-favored commercial customer" (Congressional Budget Office, 2021).
[19] As stated above, we studied all outpatient settings. This included, for example, "hospital outpatient departments, rural health clinics, renal dialysis facilities, outpatient rehabilitation facilities, comprehensive outpatient rehabilitation facilities, Federally Qualified Health Centers and community mental health centers" (ResDAC, 2020-2022).

separately payable drug claims that were not bundled with other medical services. For more information on the inclusion criteria, see APPENDIX A.

To define the size of the universe and the sample, we used gross spending by the payer(s) and beneficiary, which we estimated using the claims data. Figure 1 shows that the full target population represented $129.9 billion in gross spending on Medicare Part B beneficiaries across all three years of the study period (2020 to 2022) and $27.5 billion in gross spending on Medicaid beneficiaries. We also defined a slightly narrower study population that excluded drug groups or strata[20] with no data in the sample. The study population included 87.7 percent of in-scope Medicare Part B drug spending ($113.9 billion) and 72.5 percent of in-scope Medicaid drug spending ($19.9 billion).

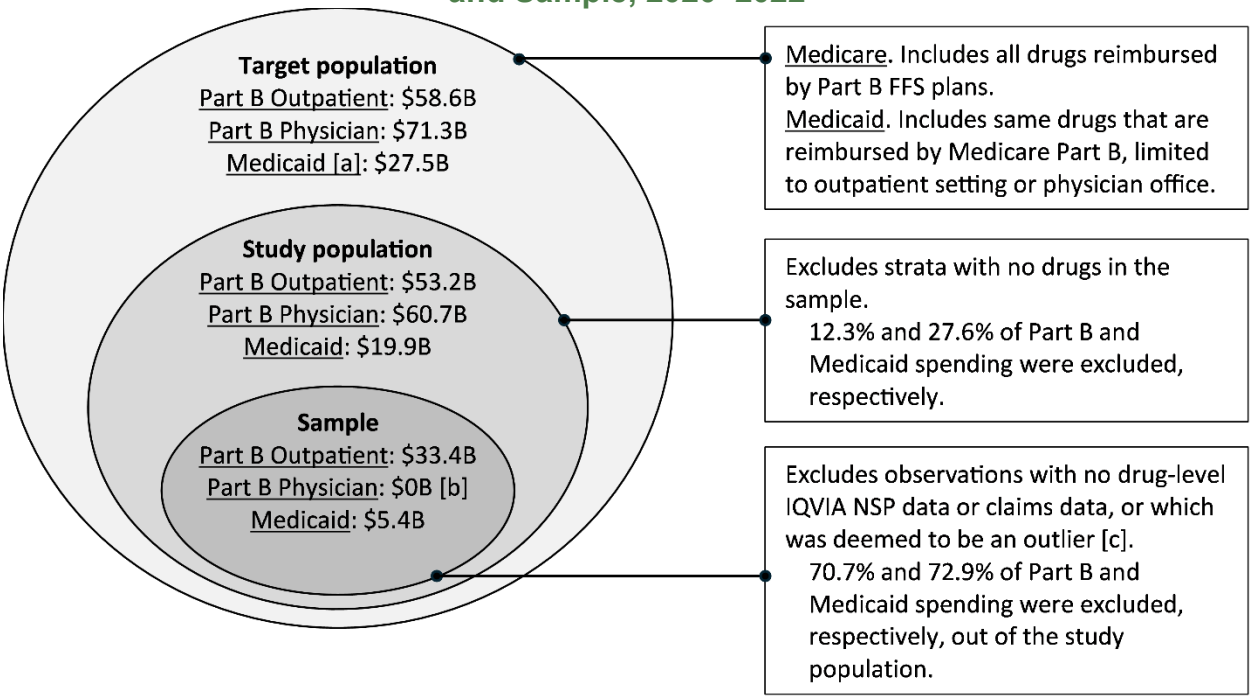
Sample selection was based on data availability, which led to a final sample that covered 29.3 percent ($33.4 billion) of spending by the Medicare Part B study population and 26.8 percent ($5.4 billion) of spending by the Medicaid study population. The Medicare Part B sample data drew exclusively from outpatient settings because NDCs are only available in the Medicare Part B FFS Outpatient file and are unavailable in the Medicare Part B FFS Carrier file. We were, however, able to use strata-level spending totals in the Carrier file when calculating weights, such that the weighted results cover both outpatient and physician office spending on Medicare Part B beneficiaries. This approach requires an assumption that, in Medicare Part B, outpatient reimbursement rates are the same as physician reimbursement rates. This is a reasonable assumption because all payments in Medicare Part B are primarily based on published CMS ASP files (Centers for Medicare & Medicaid Services, 2020-2022).

When selecting data for the sample, not all failed matches were due to omissions in IQVIA NSP. NDCs in the claims data may have contained typographical errors, outdated codes, or other product codes besides the FDA-issued NDC. Moreover, we relied on the published CMS NDC-HCPCS Crosswalk files to identify the relevant NDCs to analyze in IQVIA NSP. Some of the drugs that were dropped from the sample thus may have been missing in IQVIA NSP, while others likely had invalid NDCs or were not in our IQVIA NSP dataset because they were not listed in the CMS NDC-HCPCS Crosswalk file. HCPCS codes starting with Q (temporary codes), C (new, unclassified, or miscellaneous drugs), and J (non-oral and chemotherapy drugs) had more coverage, with the sample containing 65.8, 67.5, and 71.2 percent, respectively, of the study population of gross spending on those drugs. HCPCS codes starting with A (ambulatory services), P (pathology and lab services), or 9 (vaccines) had less coverage, with the sample containing 25.5, 29.0, and 39.4 percent, respectively, of the study population of gross spending

[20] We partitioned the full target population of drug spending into strata defined by unique combinations of year, payer (Medicare or Medicaid), provider type (outpatient or physician), HCPCS code, and 340B discount status. Of the HCPCS codes with no sample data, miscellaneous drugs made up 43 percent (n=87 HCPCS codes), vaccines made up 12 percent (n=24), chemotherapy drugs made up 9 percent (n=18), radiopharmaceuticals made up 8 percent (n=17), clotting factors made up 8 percent (n=16), stem cell therapies made up 5 percent (n=10), and immunoglobulins made up 4 percent (n=5). See Appendix A.2 for more details.

on those drugs. While these limitations reduced the sample size, the results reported in section 4 use weights to scale up the estimates from the sample to the study population.

Figure 1. Reimbursements and Payments to Target Population, Study Population, and Sample, 2020–2022



Note: All monetary values expressed in 2023 dollars. All spending estimates represent gross spending by payers and beneficiaries during the full study period from 2020 through 2022. Of the strata excluded from the study population due to lack of data, most drugs are classified as miscellaneous or vaccines.
[a] Medicaid values include spending at both outpatient settings and physician offices.
[b] We did not have drug-level data for this setting because the Medicare Part B FFS Carrier file does not have 9-digit NDCs. Some NDCs in the claims data that did not match to IQVIA NSP may have had typographical errors.

3.3 Analytic Framework

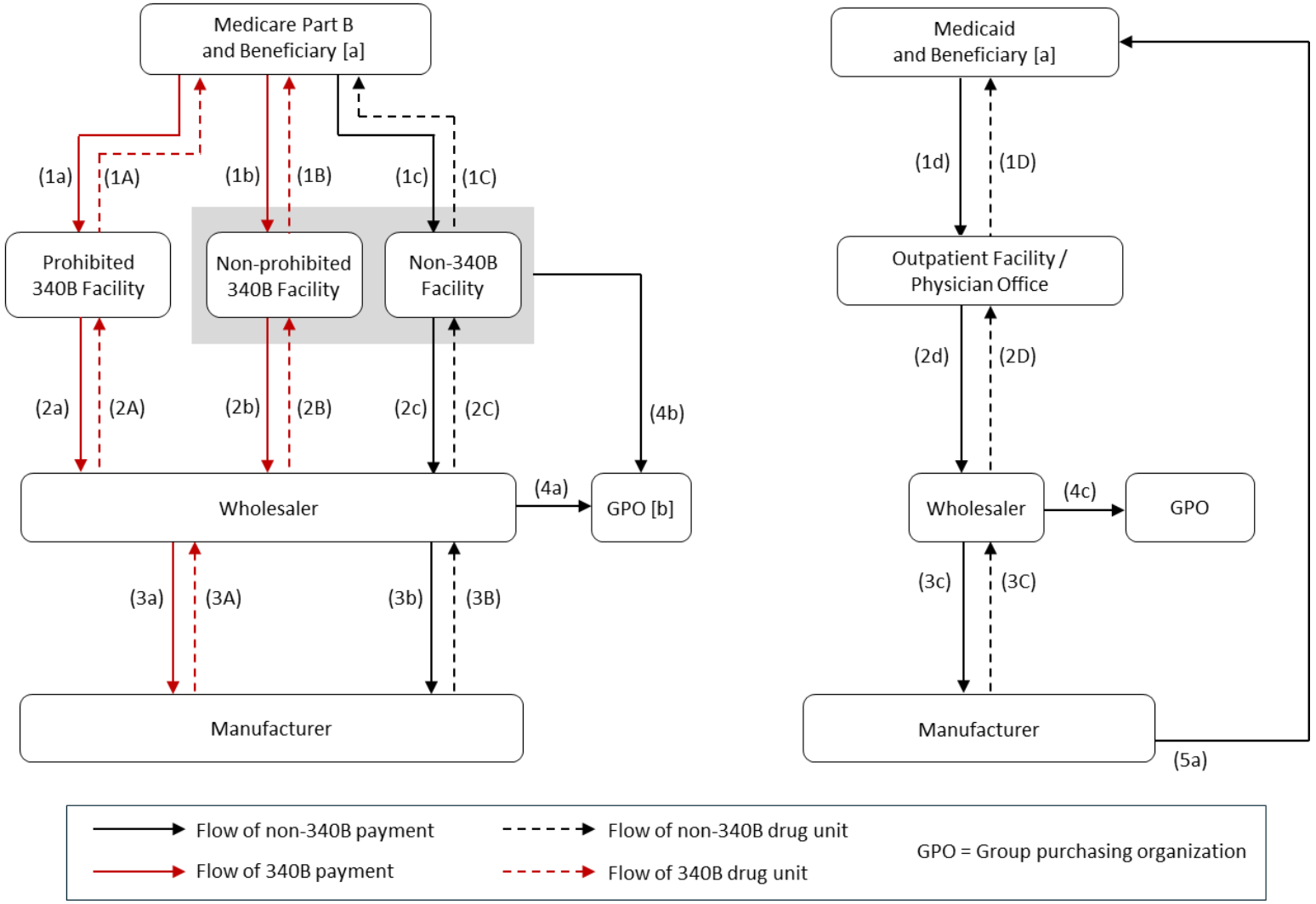
3.3.1 Modeled Payment Flows and Supply Chain Intermediaries

Our stylized model of payment and drug flows is shown in Figure 2. Flows of payment are indicated by lowercase letters and solid lines; flows of drug product are indicated by uppercase letters and dotted lines. In this stylized model, the supply chain members form a closed system, with money entering when the payer and the beneficiary pay for the drug product.[21] All of this monetary input then gets distributed among the various supply chain members. We similarly assumed that the quantity of drug being sold is conserved at each stage of the supply chain, such that every unit of drug acquired by the wholesaler is sold to a provider,

[21] While our study is limited to Medicare Part B and Medicaid beneficiaries, claims submitted to these public payers often include additional spending by third-party payers. To capture the full reimbursement price to healthcare providers and to avoid underestimating their margins, we summed all payments listed on the claim, including other payers and the beneficiary.

etc. The distinction between gross spending and net spending is relevant for Medicaid claims, because gross spending by Medicaid is offset by rebates that manufacturers pay to the federal government and state agencies.

Figure 2. Modeled Payment and Drug Flows



[a] To avoid underestimating margins, we summed all payments by the public payer, the beneficiary, and any other payers (e.g., supplemental insurance).
[b] The GPO payment 4a is only triggered by drug flows 2B and 2C; prohibited 340B facilities are not permitted to participate in GPOs and include disproportionate share hospitals, children's hospitals, and free-standing cancer hospitals. Contractually, the GPO serves as an intermediary between the provider and the wholesaler or manufacturer. This is not reflected in the figure because payments to (or by) the GPO are not for the full cost of the drug.

Table 1. Definitions and Estimation Methods for Payment Flows [a]

Flow	Description	Estimation Method
Medicare Part B		
1a, 1b, 1c	Provider's net sales price for Medicare beneficiary.	Calculated from Medicare FFS Outpatient claims data.
2a	Provider's net acquisition cost on 340B-discounted drugs, and wholesaler's net sales price.	Calculated as 3a + (2c – 3b) based on the assumption that 340B-discounted drugs generate the same margin to wholesalers as non-340B-discounted drugs.
2b	Provider's net acquisition cost on 340B-discounted drugs, and wholesaler's gross sales price.	Equal to flow 2a.
2c	Provider's net acquisition cost on non-340B-discounted drugs, and wholesaler's gross sales price.	Calculated as the average IQVIA NSP price to clinics.
Not shown	Wholesaler's net sales price on drug flows 2B and 2C.	Calculated as 2b – 4a and 2c – 4a, respectively.
3a	Wholesaler's net acquisition cost on 340B-discounted drugs.	Calculated as (i) 13% × 3b, for most generics; (ii) the minimum of 17.1% × 3b or the lowest NSP invoice price to any sales channel, for blood clotting factors and pediatric drugs; and (iii) the minimum of 23.1% × 3b or the lowest NSP invoice price to any sales channel, for most brand drugs.
3b	Wholesaler's net acquisition cost on non-340B-discounted drugs.	Calculated as either the average or predicted VA FSS price.
4a, 4c	GPO's administrative fee on flow 2B or 2C (flow 2A generates no GPO fee).	Calculated as 1.7175% × 2b or 1.7175% × 2c, respectively.
4b	Membership fees, which some GPOs assess to healthcare providers.	Not estimated (assumed to be zero).
Medicaid		
1d	Provider's gross sales price for Medicaid beneficiary.	Assumed to equal flow 1c.
2d	Provider's net acquisition cost and wholesaler's gross sales price.	Equal to flow 2c.
3c	Wholesaler's net acquisition cost on non-340B-discounted drugs.	Equal to flow 3b.
4a	GPO's administrative fee on flow 2D.	Calculated as 1.7175% × 2d.
5a	Medicaid rebate	Calculated as 3b – 3a based on the assumption that the Medicaid unit rebate amount is equal to the 340B-discounted unit rebate amount.
Not shown	Net spending	Calculated as 1d – 5a.

[a] Drug quantities (flows 1A, 1B, 1C, and 1D) were estimated using Medicare and Medicaid claims data. Other drug product flows conserve the total amount in the system, such that (i) 1A = 2A, (ii) 1B = 2B, (iii) 1C = 2C = 3B, (iv) 1D = 2D = 3C, and (v) 3A = 2A + 2B.

Flows 1a, 1b, 1c, and 1d show the payment by the payer(s) and beneficiary to the provider, representing the provider's sales price. For Medicare beneficiaries, we estimated the provider's sales prices (1a, 1b, and 1c) and the quantity of drug sold (1A, 1B, and 1C) using the sample of Medicare Part B FFS claims data. In the case of Medicare Part B, drug-level spending and utilization (i.e., drug quantity administered) were available for outpatient claims but not physician office claims. We therefore assumed that physician offices were reimbursed at the

same rates as outpatient facilities (Centers for Medicare & Medicaid Services, 2020-2022).[22,23] For Medicaid reimbursements (flows 1d and 1D), drug-level spending was available for both outpatient and physician offices, but the quantity of drug administered was not. Thus, we assumed that the prices reimbursed by Medicaid were equal to those reimbursed by Medicare Part B.[24] To estimate the quantity of drug sold to Medicaid beneficiaries, we divided the total payments by the observed Medicare Part B outpatient price.[25] To avoid underestimating providers' sales prices, we calculated total payment as the sum of all payments made by the public payer, the beneficiary, and any other payer(s). In the case of Medicare payments (flows 1a, 1b, and 1c), we considered three types of providers: disproportionate share 340B facilities, which are prohibited from participating in a GPO ("prohibited 340B facility"); non-disproportionate share 340B facilities, which are permitted to participate in GPOs ("non-prohibited 340B facility"); and non-340B facilities.[26] For the Medicaid reimbursements (flows 1d and 1D), we did not distinguish on the basis of 340B status because providers are not eligible to receive 340B discounts when acquiring drugs administered to Medicaid beneficiaries. Thus, in this study, references to "340B-discounted drugs" only refer to the specific units of the drug sold to the provider at 340B-discounted prices. A single drug generally will have some 340B-discounted sales and some non-340B-discounted sales, and our analysis accounts for this.

Flows 2a, 2b, 2c, and 2d represent the provider's acquisition cost and the wholesaler's sales price. Flows 2a and 2b show 340B-discounted drug sales paid by the wholesaler to the provider. Flows 2c and 2d are for non-discounted drug sales on units that are not eligible for 340B discounted pricing. Non-340B facilities generally pay a higher price to acquire drugs that are administered to Medicare beneficiaries (flow 2c), as do all facilities when purchasing drugs that are administered to Medicaid beneficiaries (flow 2d). We estimated the provider acquisition cost of non-340B-discounted drugs (flows 2c and 2d) as the average IQVIA NSP invoice price paid by clinics.[27] For the provider's acquisition cost of 340B-discounted drugs

[22] This is a reasonable assumption as Medicare Part B primarily reimburses based on the average sales prices (ASPs) (Centers for Medicare & Medicaid Services, 2020-2022), which are publicly available and are the same for outpatient facilities and physician offices.

[23] We used the sample weights to account for physician office drug spending and quantities sold. Although drug-level data were not available in the FFS Carrier claims data file, total spending by year, HCPCS, and 340B status were available. We included total dollars spent at physician offices in the appropriate strata when estimating the universe of Medicare Part B drug spending. See APPENDIX A for more details.

[24] This is a reasonable assumption. For example, a Congressional Budget Office report found that, in the retail drug setting, the pre-rebate standardized price to Medicare Part D was $525 for top-selling brand drugs, compared to $517 for Medicaid (Congressional Budget Office, 2021).

[25] To impute Medicaid prices, we matched 11-digit NDCs in the Medicaid claims sample to 11-digit NDCs in the Medicare Part B FFS Outpatient sample. For records that did not have a matching 11-digit NDC, we matched instead on 9-digit NDC and used the weighted average provider sales price per quantity of drug (i.e., per quantity of the 9-digit NDC).

[26] For each claim, the listed facility's 340B status was determined by matching to HRSA's public listing of 340B facilities (Health Resources & Services Administration, 2024).

[27] The IQVIA NSP dataset provides different invoice prices by distribution channel. The "clinic" channel captures all outpatient facilities and physician offices. For n=8 drugs, sales in clinics were not captured in NSP. In these cases, we substituted the average NSP invoice price in non-federal hospitals (n=4), mail pharmacies (n=3), or long-term care facilities (n=1).

(flows 2a and 2b), we used the estimated 340B-discounted wholesaler acquisition cost (flow 3a, discussed below) and added the usual wholesaler margin on non-340B-discounted units:

$$(\text{flow 2a in \$}) = (\text{flow 2b in \$}) = (\text{flow 3a in \$}) + \big((\text{flow 2c in \$}) - (\text{flow 3b in \$})\big) \quad (1)$$

Because we modeled the supply chain as a closed system, the quantity of drug sold to the provider (flows 2A, 2B, 2C, and 2D) is equal to the quantity sold to the payer and beneficiary (flows 1A, 1B, 1C, and 1D, respectively).

Flows 3a, 3b, and 3c show the wholesaler's net acquisition cost, which equals the manufacturer's sales price. The wholesaler's net acquisition cost is distinct from the WAC (i.e., the list price) that manufacturers publish, which is often higher than the price wholesalers actually pay. We estimated the non-340B-discounted manufacturer sales price (flows 3b and 3c) using the VA FSS pricing data. VA prices reflect actual discounts that manufacturers give to direct purchasers, making them appropriate for estimating the actual net acquisition costs of wholesalers, which also make discounted purchases from manufacturers. Because only some of the drugs in our sample had VA FSS prices, we developed a linear model to predict the average markup between the wholesaler's net acquisition cost and the wholesaler's net sales price and used this model to estimate non-340B-discounted manufacturer sales prices. This model accounted for the drug's status as brand or generic, the year, the drug's IQVIA NSP invoice price, and the drug's WAC price. See Appendix A.4 for full details. For the non-340B-discounted flows, the quantities of drug sold to the wholesaler (flows 3B and 3C) are equal to the quantities sold to the provider (flows 2C and 2D, respectively).

To estimate the wholesaler's net acquisition cost of 340B-discounted drugs (flow 3a), we applied the minimum statutory 340B discount rate to our estimate of the manufacturer's sales price on non-340B-discounted units (flow 3b), which approximates the AMP (see equation 2).[28] For brand drugs, we also considered the lowest available IQVIA NSP price to any distribution channel in a given year, and we used this price if it yielded a larger 340B discount than the statutory discount rate.[29] We did not estimate the inflation component of 340B drug pricing due to lack of data. We used CMS data on the MDRP to identify each sampled drug's discount as 13 percent, 17.1 percent, or 23.1 percent (Dolan, 2019).

[28] Like the AMP, our estimate of the manufacturer's net sales price on non-340B-discounted units represents payment to the manufacturer for the drug, after accounting for discounts to the wholesaler. The AMP, however, is not shown in Figure 2 because it may include other discounts we have not estimated (e.g., rebates to the PBM on drugs that are sold in both retail and non-retail settings).

[29] We generally expected the NSP price to be higher than the best price offered by the manufacturer, as the NSP price reflects wholesaler markups and does not account for off-invoice discounts or rebates that may be offered by the manufacturer. Nonetheless, when a lower NSP price is available, it improves the estimate of the 340B discount.

$$(\text{flow 3a}) = \begin{cases} (\text{flow 3b}) \cdot (1 - 0.13), & \text{if generic} \\ \min\{(\text{flow 3b}) \cdot (1 - 0.231), \text{best NSP price}\}, & \text{if brand} \\ \min\{(\text{flow 3b}) \cdot (1 - 0.171), \text{best NSP price}\}, & \text{if blood factor/pediatric} \\ \text{not applicable} & \text{if vaccine} \end{cases} \quad (2)$$

We capped all wholesaler net acquisition costs at the listed WAC, both for 340B-discounted units and non-340B-discounted units. This led to a slight reduction in the estimate of the net wholesaler acquisition cost for less than one percent of observations.

The quantity of a 340B-discounted drug sold to the wholesaler (flow 3A) is equal to the sum of flows 2A and 2B. The quantities of non-340B-discounted drugs sold to the wholesaler (flows 3B and 3C) are equal to the quantities sold to the provider (flows 2C and 2D, respectively).

GPOs negotiate lower prices with suppliers on behalf of healthcare providers and receive an administrative fee per drug unit sold, which is typically paid by the supplier (Cardinal Health Specialty Solutions, 2020; Oakley, 2022; Mulcahy & Kareddy, 2021). Contractually, GPOs are positioned between the provider and the wholesaler (or manufacturer). Figure 2 does not represent GPOs in this manner, however, because payments to or by the GPO do not typically cover the full cost of the drug. For this reason, GPOs are shown to the side, with flows 4a and 4c representing only the GPO administrative fee that is assessed per drug and which we assume is paid by the wholesaler.[30] We estimated these payments to GPOs (flows 4a, 4c) at 1.7175 percent of the provider's acquisition cost. This estimate is based on a report by the U.S. Government Accountability Office (GAO) stating that GPOs retain 1.22 to 2.25 percent of the provider's purchase price (U.S. Government Accountability Office, 2010) and a report on GPOs that the average administrative fee is 1.7 percent (Scott, et al., 2014).[31] This cost reduces wholesalers' net sales price by a small amount in our stylized model.

Transactions with GPOs do not represent a sale or acquisition of a drug as there is no flow of the drug product, and payments 4a and 4c do not represent the full cost of the drug to any entity. For these reasons, we did not estimate GPOs' margins and only estimated the dollar amounts they retained, out of the total spending by the payer and beneficiary. We assumed GPOs were paid administrative fees on all Medicare drugs sold to non-340B and nonprohibited 340B facilities, and also on all Medicaid drugs. In addition to these administrative fees that suppliers pay to GPOs on a volume basis, some GPOs also require healthcare providers to pay an annual membership fee (flow 4b). We did not estimate these membership fees because they are not typically applied on a per-drug basis, and they are not imposed by all GPOs.

[30] In our stylized model, we assumed the wholesaler pays all of the GPO administrative fees. In reality, these per-drug fees are likely paid both by wholesalers and manufacturers, but the impact of these flows is small because they represent relatively low dollar amounts.

[31] The two point estimates from these sources are therefore (1.22+2.25)/2 = 1.735 percent and 1.7 percent. The average of these point estimates is 1.7175 percent.

The Medicaid drug rebate (flow 5a) was estimated using the same methodology as the 340B price discount, such that 5a was equal to the difference between the non-340B price (flow 3b) and the 340B price (flow 3a):

$$(5a) = (3b) - (3a) \tag{3}$$

Prices and drug quantities were expressed in different units in different datasets (e.g., per package, per HCPCS dosage, per mg of API, per vial). There were also inconsistencies in the units of measurement within a single dataset. Therefore, for each drug in the sample, we selected a single harmonized unit of measurement and converted all prices in all datasets to that unit.[32] All monetary values were adjusted to 2023 dollars using the medical care consumer price index (CPI) for all urban consumers (U.S. Bureau of Labor Statistics, 2024).

3.3.2 Sample Weights

To estimate the margins and spending presented in section 4, we applied weights to our sample data that scale up from the sample to the study population. To compute the weights w_{jc}, we compared total payer and beneficiary spending in the sample s to the total spending in the study population S. These calculations were stratified by unique combinations of (a) HCPCS code j and (b) year, payer, provider type, and 340B discount status, collectively indexed by c. The weights were assigned to all sampled NDCs i in the stratum jc. By definition, the weighted sum of spending in the sample $w_{jc} \cdot s_{ijc}$ on all NDCs i in a given stratum jc yields the total spending S_{jc} for that stratum jc in the full study population:

$$\sum_i s_{ijc} \cdot w_{jc} = S_{jc} \tag{4}$$

$$w_{jc} = \frac{S_{jc}}{\sum_i s_{ijc}} = \frac{S_{jc}}{s_{jc}}, \qquad \text{where } s_{jc} \equiv \sum_i s_{ijc} \tag{5}$$

Two sets of weights were developed—one for Medicare Part B drug spending and another for Medicaid drug spending. For the Medicare Part B spending, we only had drug-level data for the outpatient settings, and the weights scale up from the Medicare Part B outpatient sample to the total Medicare Part B drug spending in both outpatient settings and physician offices.

3.3.3 Definition of Retained Share of Net Spending and Margins

Gross spending refers to payments by the payer(s) and beneficiary for a drug or group of drugs. Net spending is the total gross spending minus the Medicaid drug rebate (flow 5a). For a given drug i, each supply chain member $x = \{$provider, wholesaler, GPO, manufacturer$\}$ retains

[32] If the drug had a strength expressed as a fraction (e.g., 1 mg/100 mL), then we expressed the drug quantity in terms of the denominator unit (e.g., mL). In almost all other cases, we expressed the drug quantity in terms of the numerator unit.

some amount E_{ix} of the payer and beneficiary's net spending $\sum_x E_{ix}$ to cover their costs and profits. We calculated the retained amount of net spending as the difference between (a) all drug-level payments made to the entity x (i.e., all inflows) for the drug i and (b) all drug-level payments made by the entity x (i.e., all outflows) for the drug i. Dividing by the total spending yields the share $\%E$ that entity x retains of the total payer and beneficiary spending $\sum_x E_{ix}$.

$$E_{ix} = (\text{payment inflows})_{ix} - (\text{payment outflows})_{ix} \tag{6}$$

$$\%E_{ix} = \frac{E_{ix}}{\sum_x E_{ix}} \tag{7}$$

For a group of drugs $i \in I$, the amount and percentage of payer and beneficiary net spending retained by supply chain entity x was calculated using weighted sums:

$$E_{Ix} = \sum_{i \in I} (\text{payment inflows})_{ix} \cdot w_i - (\text{payment outflows})_{ix} \cdot w_i \tag{8}$$

$$\%E_{Ix} = \frac{\sum_{i \in I} E_{ix} \cdot w_i}{\sum_x \sum_{i \in I} E_{ix} \cdot w_i} \tag{9}$$

In this report, "margin" refers to the difference between the net sales price s and net acquisition cost a for a given intermediary x = {provider, wholesaler} and a drug i. We used net prices to account for discounts between the selling entity and buying entity. Margins were computed both in dollar terms M and as a percentage of the net sales price $\%M$. The formulas below show the unweighted calculation of the margin and margin percentage for a number of units u that were sold.

$$M_{ix} = (s_{ix} - a_{ix})u_i \tag{10}$$

$$\%M_{ix} = \frac{(s_{ix} - a_{ix})u_i}{s_{ix}u_i} \tag{11}$$

To calculate weighted population estimates of the margins or margin percentages for an entity x across all drugs i in a given group I, we summed the weighted total margin dollars and the weighted total net sales dollars:

$$M_{Ix} = \sum_{i \in I} (s_{ix} - a_{ix})u_i w_i \tag{12}$$

$$\%M_{Ix} = \frac{\sum_{i \in I} (s_{ix} - a_{ix})u_i w_i}{\sum_{i \in I} s_{ix} u_i w_i} \tag{13}$$

3.3.4 Drug Groups

When analyzing results, we considered spending and margins on all drugs, but we also considered various subgroups of drugs, including:

- Generic small molecule drugs versus branded small molecule drugs,
- Biosimilars versus original biologics,
- Competitive versus noncompetitive drugs,
- 340B-discounted drugs versus non-340B-discounted drugs,[33]
- Oncology drugs versus other therapeutic areas, and
- Drugs treating acute conditions versus chronic conditions.

For small molecules, we assigned each drug's brand-generic status as reported in IQVIA. For biologics, we used the FDA Purple Book to determine whether each product was an original biologic approved through the 351(a) pathway or a biosimilar approved through the 351(k) pathway (U.S. Food & Drug Administration, 2024). We also used the Purple Book to identify each biosimilar's reference product, i.e., the original biological product licensed under section 351(a) against which a proposed biosimilar product is evaluated.

For small molecules, we identified competitive and noncompetitive drugs using the multi-source and single-source designations from CMS, respectively (Medicaid.gov, 2020-2022). If a drug changed status in a given year, we assigned the most frequent designation in the sample data. For biologics, we defined competitive products to include any marketed biosimilar and its 351(a) reference biological product. Noncompetitive biologics included any original biological product that did not have competition from one or more marketed biosimilars. We identified the year when biosimilar competition began (Cardinal Health, 2024), and if the first biosimilar entered the market in July or later, we assigned the next calendar year as the first year of biosimilar competition, in order to characterize the competitive status that existed for the majority of the calendar year.

For Medicare spending, we classified each facility on the claim as being a non-340B facility, a disproportionate share 340B facility, or a nondisproportionate share 340B facility. To identify facilities' 340B status, we matched the Medicare provider number or National Provider ID on the claim to the Office of Pharmacy Affairs 340B covered entities list (Health Resources & Services Administration, 2024). As stated previously, disproportionate share 340B facilities are prohibited from participating in GPO contracts, and drugs administered in those facilities do not

[33] As described in section 3, non-340B-discounted drug purchases are made both by 340B facilities (for drugs they administer to Medicaid beneficiaries) and by non-340B facilities. Purchases by both types of providers contribute to the total spending on non-340B-discounted drugs.

generate margins for GPOs (Health Resources & Services Administration, 2024). Nondisproportionate share 340B facilities and non-340B facilities can participate in a GPO.

For Medicaid, we classified all drug spending as non-340B-discounted because providers do not receive 340B price discounts when buying units that are administered to Medicaid beneficiaries.[34]

We used the IQVIA NSP major class variable to identify oncology drugs, immune modulators, and all others therapeutic areas. Similarly, we used the IQVIA NSP acute-chronic variable to determine the type of condition treated. A few drugs were not classified as acute or chronic by IQVIA and we did not include them in the analysis of acute and chronic conditions.

3.4 Monte Carlo Analysis

We conducted a Monte Carlo analysis to quantify the sampling error in our data and generate empirical 95 percent confidence intervals for our main results. We resampled the original dataset 10,000 times, and for each resample, we recalculated the weights and the primary outputs of the analysis. Each resampled dataset was constructed by randomly drawing from the original dataset with replacement until an equally sized dataset was acquired. For each analytic output (e.g., margins, retained portion of net spending), we calculated the 2.5th and 97.5th percentiles across the 10,000 estimates and used these to form a 95 percent confidence interval.

4 RESULTS

4.1 Overview of Sample

Across all three study years, the sample contained a total of 2,117 drugs, 528 HCPCS codes, and $38.7 billion in gross spending. This included 1,778 small molecule drugs ($5.6 billion in gross spending) and 339 biologics ($33.1 billion). Among small molecules, the sample contained 349 brand drugs ($5.0 billion in gross spending) and 1,429 generic drugs ($0.6 billion). The biologics in the sample included 310 original biologics ($31.3 billion in gross spending) and 29 biosimilars ($1.8 billion). Over the full study period, we observed 249 noncompetitive or single-source small molecule drugs ($4.1 billion in gross spending) and 1,538 competitive or multi-source small molecule drugs ($1.5 billion). We also observed 293 noncompetitive biologics ($27.4 billion in gross spending) and 46 competitive biologics ($5.7 billion).[35] There were 519 oncology drugs in the sample ($23.7 billion in gross spending), compared to 1,598 drugs for other therapeutic areas ($15.0 billion). In the sample, 1,644 drugs were classified as treating acute conditions ($29.5 billion in gross spending), 467 drugs were classified as treating

[34] For units sold to Medicaid beneficiaries, manufacturers pay rebates to the Medicaid Drug Rebate Program. These same units are not eligible for 340B discounts to prevent manufacturers from paying duplicate discounts (Health Resources & Services Administration, 2020).

[35] The sum of competitive and noncompetitive drugs is more than the total number of drugs because, during the study period, some drugs changed from having a competitive status to a noncompetitive status (or vice versa).

chronic conditions ($9.1 billion), and 6 drugs were unclassified ($0.1 billion). Table B-1 shows the characteristics of the sample for each year in the study period.

Table 2. Sample Characteristics, 2020–2022

Drug Group	Spending in Sample (Billion 2023 $)	Number of Drugs	Number of Unique HCPCS Codes
All drugs	$38.72	2,117	528
Acute drugs	$29.50	1,644	399
Chronic drugs	$9.08	467	132
340B-discounted drugs	$26.43	2,030	525
Non-340B-discounted drugs	$12.30	1,319	436
Competitive biologics (reference products and biosimilars)	$5.73	46	26
Non-competitive biologics (original biologics only)	$27.37	293	169
Multi-source small molecules	$1.49	1,538	233
Single-source small molecules	$4.13	249	150
Biosimilars	$1.81	29	17
Original biologics	$31.29	310	178
Small molecules, brand	$5.03	349	204
Small molecules, generic	$0.59	1,429	218
Oncology drugs	$23.7	519	142
Non-oncology drugs	$15.0	1,598	387

Note: Six drugs had an unclassified condition type (neither acute nor chronic). See Table B-1 for sample characteristics by year.

4.2 Study Population Results for All Drugs

To generate results for the entire study population, we weighted the drug-level estimates in our sample, following the procedure described in section 3.3.2 to obtain proper weights for each drug group. Hence, this section presents weighted estimates for the full study population that we derived by scaling up our sample data through appropriate weighting.

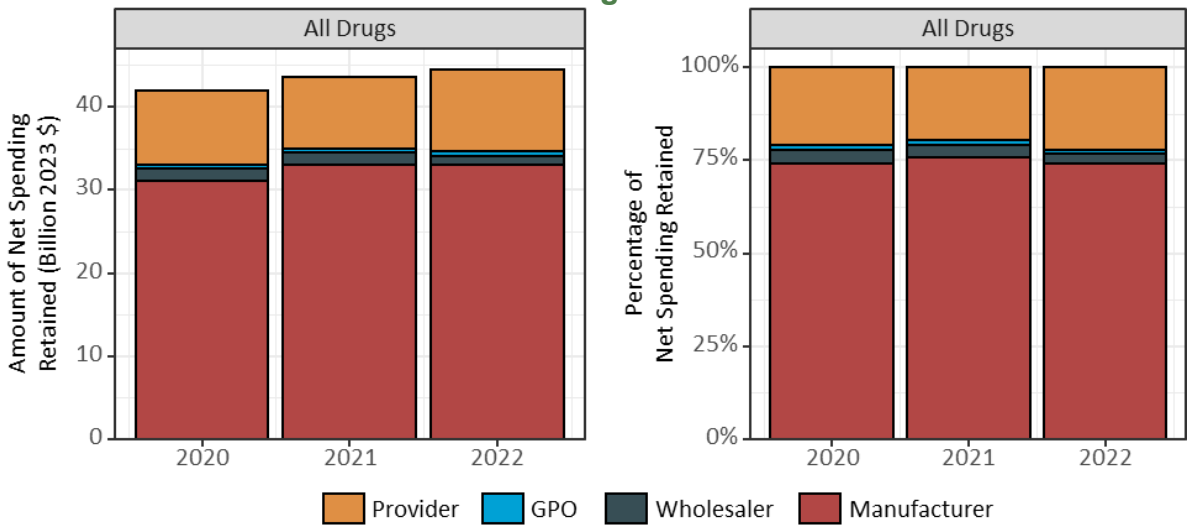
Total net spending by payers and beneficiaries grew by 6.2 percent from 2020 to 2022, rising from $41.9 billion to $44.5 billion.[36] Across all drugs, manufacturers consistently retained the largest share of annual net spending, at 74.2 percent to 75.8 percent ($31.1 billion to $33.0 billion) depending on the year (see Figure 3). GPOs retained 1.1 percent of net spending ($465 million to $500 million), wholesalers retained 2.5 percent to 3.6 percent ($1.1 billion to $1.5 billion), and providers retained 19.8 percent to 22.2 percent ($8.6 billion to $9.9 billion). Provider margins ranged from 19.1 percent to 21.5 percent of annual net sales (see Figure 4), while wholesaler margins were substantially lower (3.2 percent to 4.5 percent).[37] From 2020 to

[36] All dollar amounts are adjusted to 2023 dollars.

[37] As stated previously, margins were not estimated for manufacturers because their acquisition costs are not known and do not represent the purchase of a finished drug product. GPO margins are not estimated because they are not paid and do not make payments for the full cost of the drug.

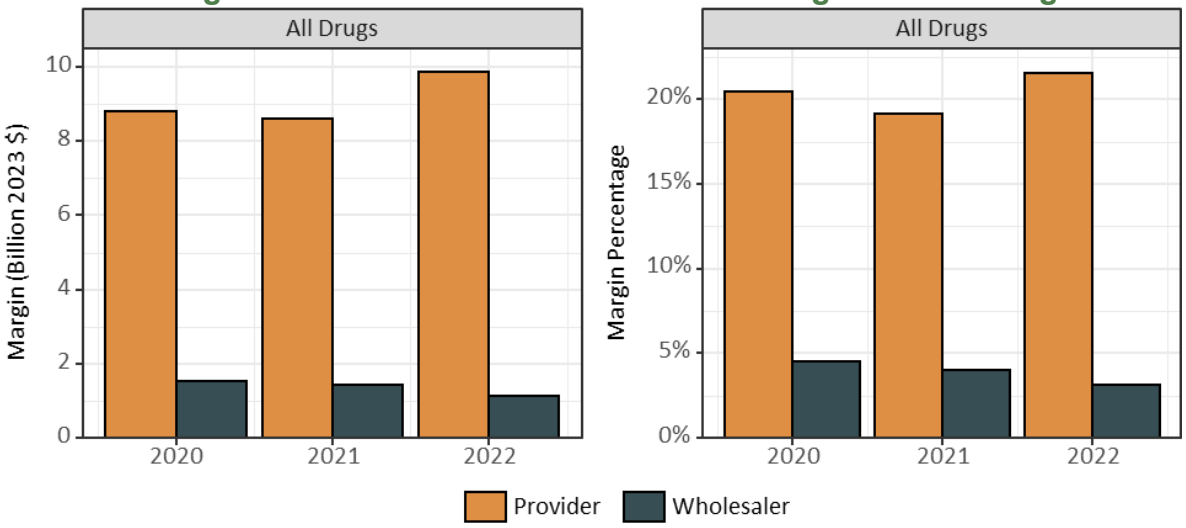
2022, providers' total dollar margins across all drugs increased by 12.5 percent, from $8.8 billion to $9.9 billion. In comparison, wholesalers' dollar margins dropped from $1.5 billion to $1.1 billion, a decrease of 26.2 percent. Manufacturers captured $1.9 billion or 72.7 percent of the growth in net spending from 2020 to 2022, which is very similar to their average share of payer and beneficiary spending over the three years.

Figure 3. Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs



Note: Some data columns for GPOs may be too small to see at this scale.

Figure 4. Providers and Wholesalers' Margins on All Drug



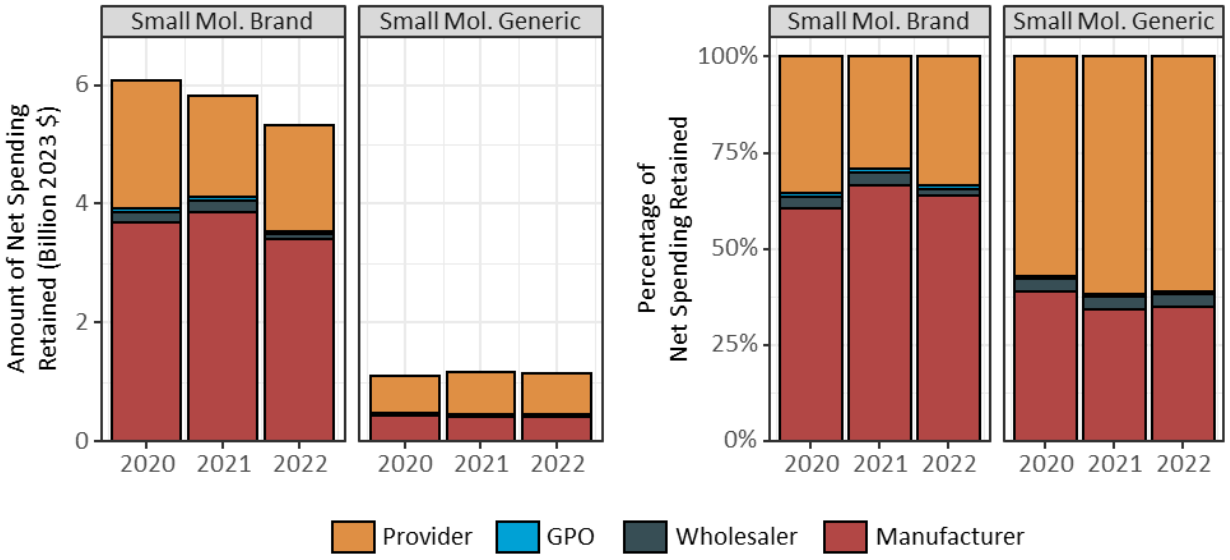
Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay for or receive payment for the full cost of the drug.

4.3 Small Molecule Brands vs. Generics and Original Biologics vs. Biosimilars

4.3.1 Small Molecule Drugs

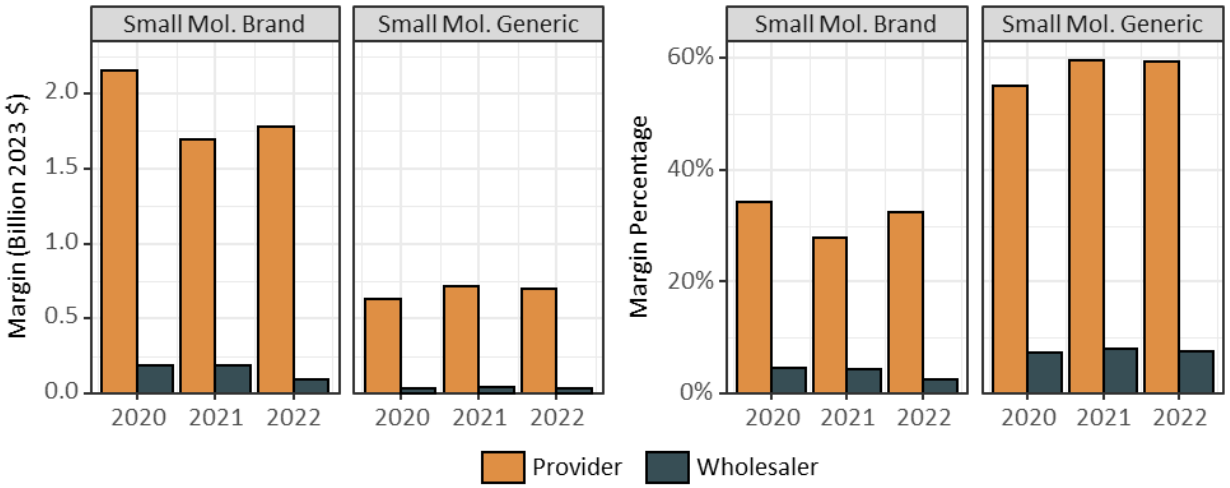
From 2020 to 2022, all supply chain entities earned more money (in 2023 dollars) on small molecule brands than small molecule generics (see Figure 5). Manufacturers retained 60.5 percent to 66.6 percent of payer and beneficiaries' net spending on small molecule brands, but only 34.2 percent to 39.0 percent on small molecule generics. Providers earned a higher share of net spending on small molecule generics (57.0 percent to 61.8 percent) than on small molecule brands (29.2 percent to 35.5 percent). They also had higher margin percentages on generic small molecule drugs (see Figure 6). Wholesalers earned 1.8 percent to 3.2 percent of net spending on small molecule brands, and 3.1 percent to 3.3 percent on small molecule generics, but had slightly higher margin percentages on small molecule generics (7.3 percent to 8.1 percent) than small molecule brands (2.6 percent to 4.5 percent). Because GPO fees are based on the sales price, which is generally higher for brand drugs, GPOs earned a slightly larger share of net spending on small molecule brands (0.9 percent to 1.0 percent) than small molecule generics (0.7 percent).

Figure 5. Distribution to Supply Chain of Payer-Beneficiary Net Spending on Brand and Generic Small Molecule Drugs



Note: Some data columns for GPOs may be too small to see at this scale.

Figure 6. Providers and Wholesalers' Margins on Brand and Generic Small Molecule Drugs

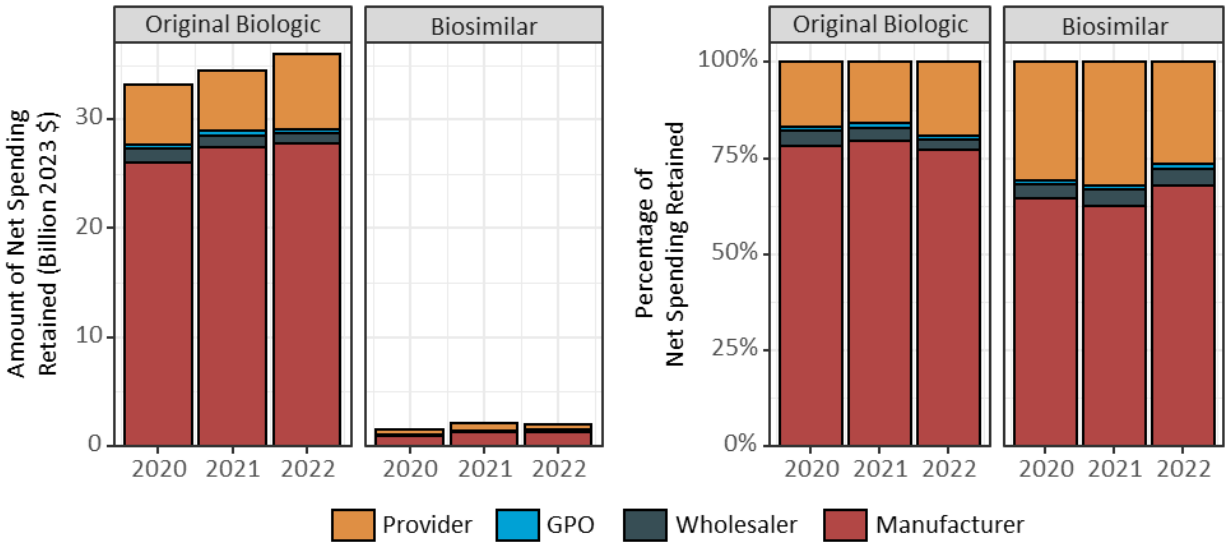


Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

4.3.2 Biological Products

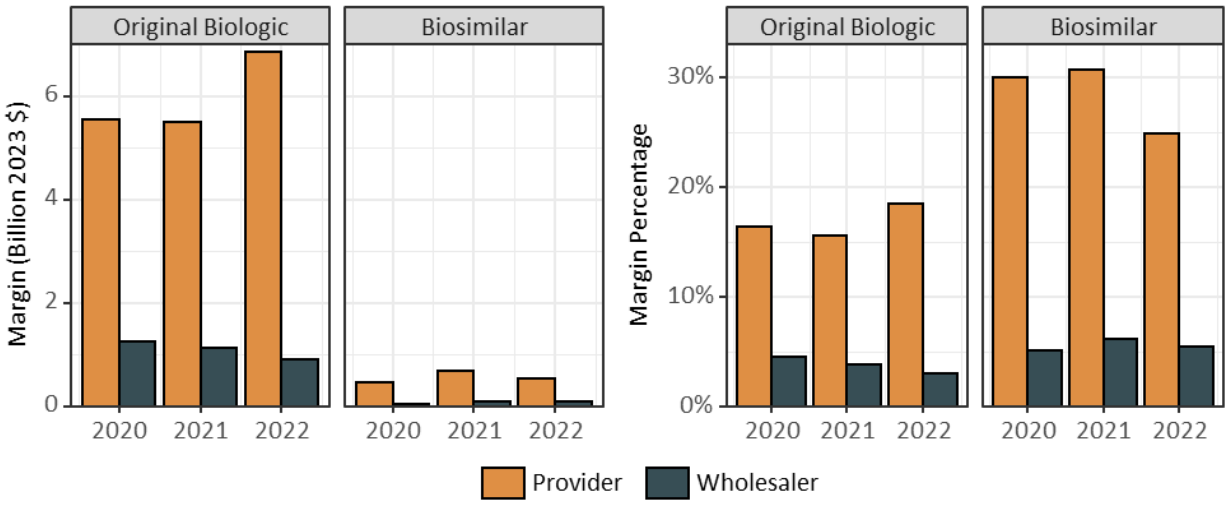
All entities retained substantially more, in total dollars, from original biologics than from biosimilars (see Figure 7), largely because there are far more original biologics on the market than biosimilars. Of the net spending on original biologics, manufacturers earned 77.3 percent to 79.6 percent, wholesalers earned 2.5 percent to 3.8 percent, providers earned 16.0 percent to 19.1 percent, and GPOs earned 1.2 percent. Of the net spending on biosimilars, manufacturers earned 62.4 percent to 68.0 percent, wholesalers earned 3.6 percent to 4.4 percent, providers earned 26.5 percent to 32.1 percent, and GPOs earned 1.0 percent to 1.1 percent. As a fraction of their net sales prices, both wholesalers and providers earned higher margin percentages on biosimilars than original biologics. Wholesalers' margin percentage on original biologics decreased from 2020 to 2022 (see Figure 8).

Figure 7. Distribution to Supply Chain of Payer-Beneficiary Net Spending on Original Biologics and Biosimilars



Note: Some data columns for GPOs may be too small to see at this scale.

Figure 8. Providers and Wholesalers' Margins on Original Biologics and Biosimilars



Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

4.4 Noncompetitive vs. Competitive Drugs or Products

4.4.1 Small Molecule Drugs

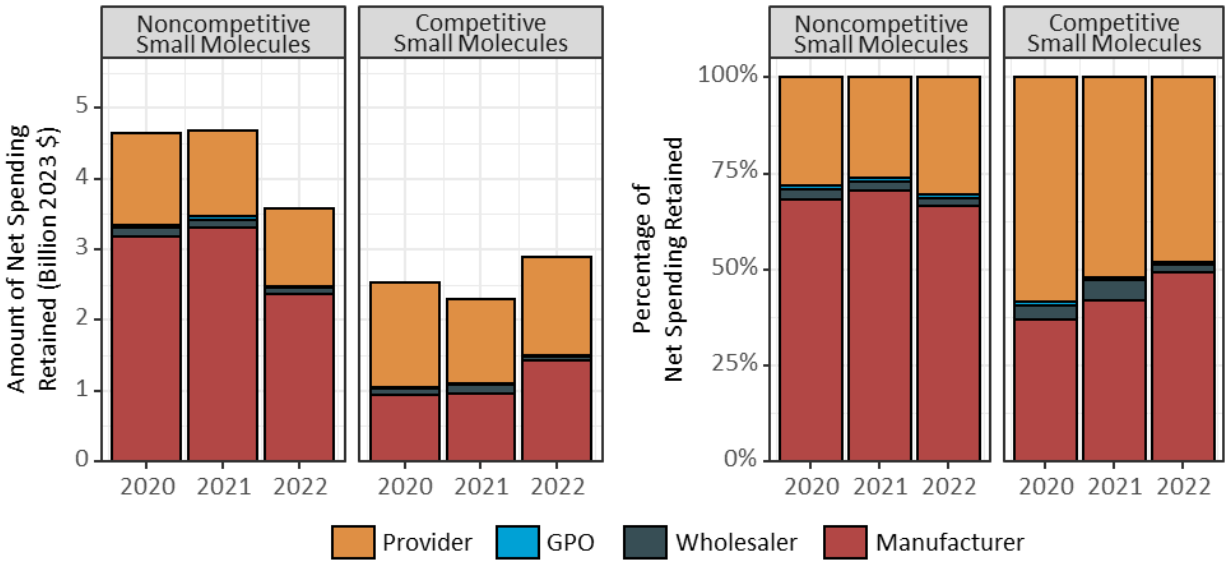
Among small molecules, total net spending was roughly twice as high on noncompetitive drugs as on competitive drugs (see Figure 9).[38] Across the three years of the study period, manufacturers' annual share of net spending was 66.4 percent to 70.6 percent for noncompetitive small molecule drugs but only 36.9 percent to 49.1 percent for competitive small molecule drugs—though the latter rose steadily from 2020 to 2022. Providers' annual share of net spending across the three years ranged from 48.1 percent to 58.6 percent for competitive small molecule drugs, compared to just 26.2 percent to 30.5 percent for noncompetitive small molecule drugs. Wholesalers' annual share of net spending ranged from 2.1 percent to 2.7 percent for noncompetitive small molecule drugs and 2.0 percent to 5.1 percent for competitive small molecule drugs. GPOs' annual share of net spending was 0.7 percent to 0.8 percent for competitive small molecule drugs and 1.0 percent for noncompetitive small molecule drug spending. Providers and wholesalers both earned substantially higher margin percentages on competitive drugs than on noncompetitive drugs (see Figure 10).

When expressed in dollars per package[39], the share of net spending on noncompetitive drugs was much higher than for competitive small molecules for all entities, and across both brands and generics (see Figure 11). Manufacturers, which retain the largest share per package across all small molecule drug types, retained $12 to $26 per package on competitive small molecule generics compared to $82 to $210 per package on noncompetitive small molecule generics (six to eight times as much). For small molecule brands, they retained $288 to $546 per package on competitive drugs and between $801 and $899 per package on noncompetitive drugs. Wholesalers retained four to nine times as much per package on noncompetitive small molecule brand drugs compared to competitive small molecule brands, and two to nine times as much on noncompetitive small molecule generics compared to competitive small molecule generics. For providers, the dollar amount retained per package was one to three times as much on small molecule brands, and three to seven times as much on small molecule generics. GPOs retained one to four times as much on small molecule brands and five to nine times as much on small molecule generics.

[38] For small molecules, we defined single-source drugs (as listed by CMS) as noncompetitive and multi-source drugs as competitive.

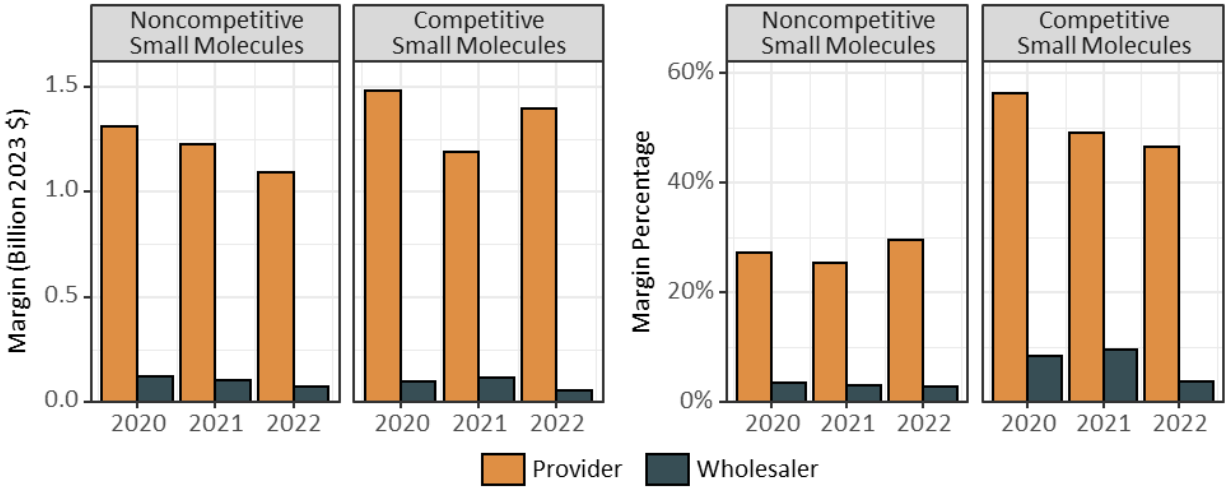
[39] See explanation of "per package" conversion at the end of section 3.3.1. Analysis of net spending per package is unweighted (i.e., does not scale up to the study population) and is limited to those drugs in the sample with known package sizes.

Figure 9. Distribution to Supply Chain of Payer-Beneficiary Net Spending on Small Molecule Drugs, Competitive vs. Noncompetitive Markets



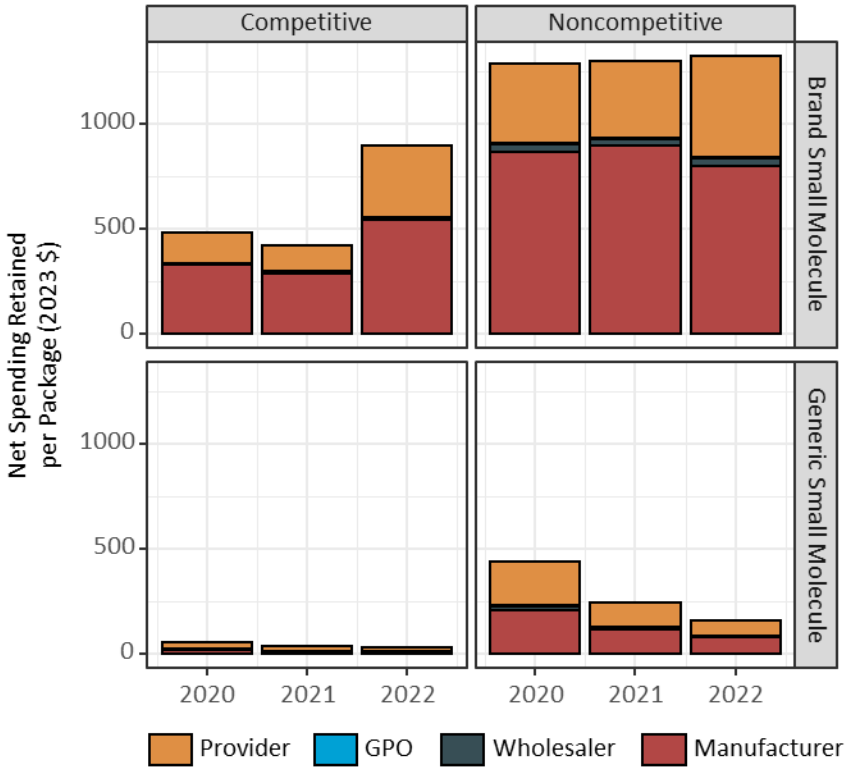
Note: Some data columns for GPOs may be too small to see at this scale.

Figure 10. Providers and Wholesalers' Margins on Small Molecule Drugs, Competitive vs. Noncompetitive Markets



Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

Figure 11. Distribution to Supply Chain of Payer-Beneficiary Net Spending per Package on Brand and Generic Small Molecule Drugs, Competitive vs. Noncompetitive Markets



Note: Some data columns for GPOs may be too small to see at this scale. The y-axis shows the unweighted sum of retained net expenditures divided by the total number of packages sold, for drugs in the sample with known package size.

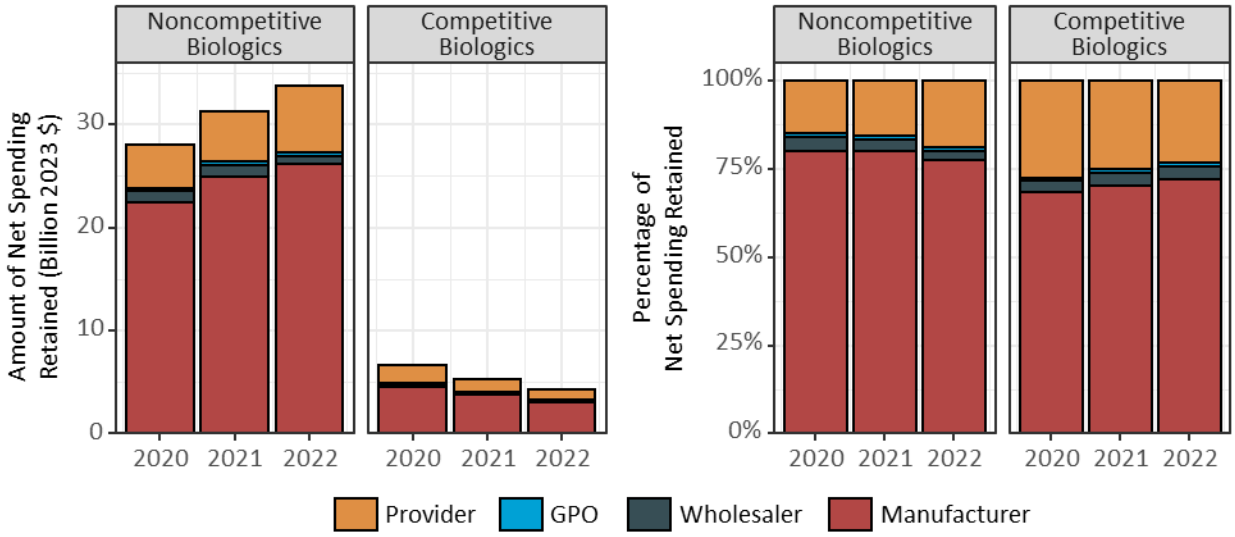
4.4.2 Biological Products

From 2020 to 2022, net spending on competitive biologics decreased despite growth in the number of competitive biologics and a rising number of those markets—a sign of declining prices. Net spending on noncompetitive biologics increased (see Figure 12).[40] Over the full study period, noncompetitive biologics accounted for 85.1 percent of all net spending on biologics. As a fraction of net spending, manufacturers retained 77.4 percent to 80.0 percent of net spending on noncompetitive biologics and 68.2 percent to 72.0 percent of net spending on competitive biologics. Wholesalers retained 2.5 percent to 3.9 percent on noncompetitive biologics and roughly the same (3.3 percent to 3.6 percent) on competitive biologics. Providers also retained approximately half again as much of net spending on competitive biologics (23.3 percent to 27.5 percent) as noncompetitive biologics (14.9 percent to 19.0 percent). GPOs retained the same share of net spending on noncompetitive biologics (1.2 percent) as competitive biologics (1.0 percent to 1.2 percent). As with small molecules, both providers and wholesalers earned higher margin percentages on competitive biologics (see Figure 13).

[40] We defined competitive biologics to include reference products and all of their marketed biosimilars.

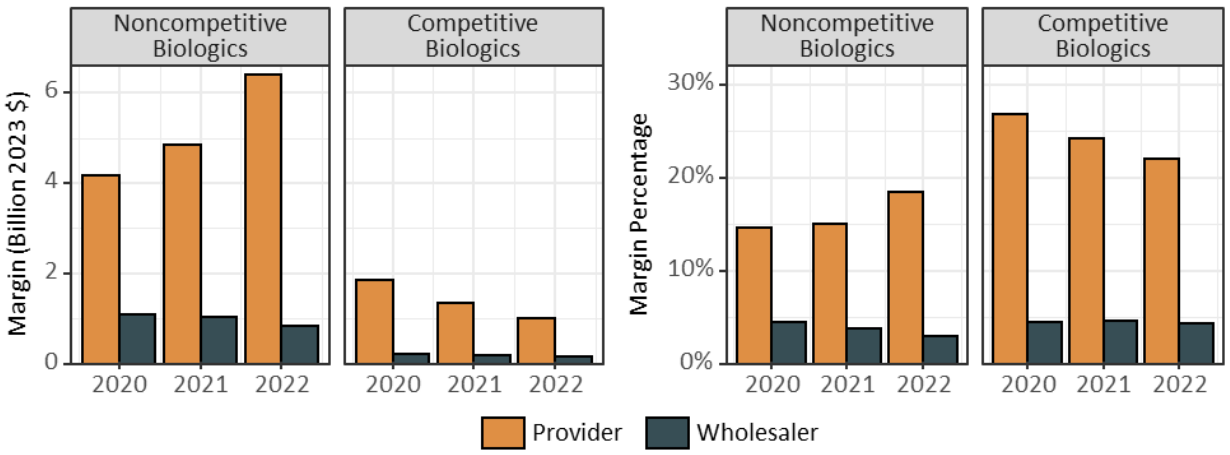
Unlike small molecules, net spending retained per package was higher for all entities on competitive original biologics compared to noncompetitive original biologics (see Figure 14). Many biosimilars are oncology drugs, which have higher spending per package than any other therapeutic area. Additionally, biosimilars are more likely to enter larger biologics markets. For these reasons, competitive biologic markets are not directly comparable to noncompetitive biologics markets, since the former contain higher-value products. All supply chain entities made roughly one to four times more on competitive original biologics than noncompetitive original biologics, when measured in dollars per package.

Figure 12. Distribution to Supply Chain of Payer-Beneficiary Net Spending on Biologics, Competitive vs. Noncompetitive Markets



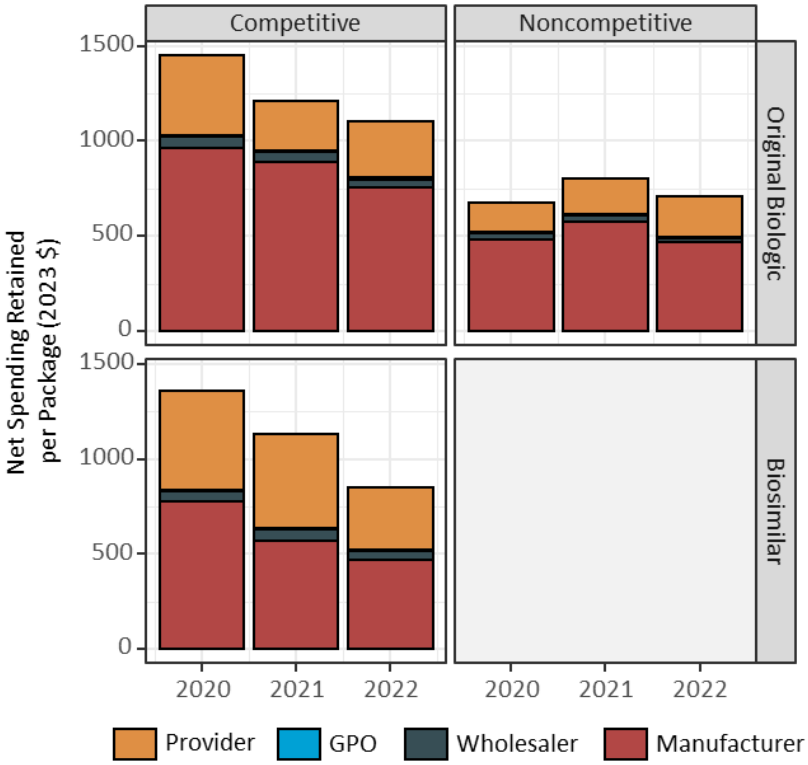
Note: Some data columns for GPOs may be too small to see at this scale.

Figure 13. Providers and Wholesalers' Margins on Biologics, Competitive vs. Noncompetitive Markets



Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

Figure 14. Distribution to Supply Chain of Payer-Beneficiary Net Spending per Package on Original Biologics and Biosimilars, Competitive vs. Noncompetitive Markets



Note: Some data columns for GPOs may be too small to see at this scale. The y-axis shows the unweighted sum of retained net expenditures divided by the total number of packages sold, for drugs in the sample with known package size. The panel for noncompetitive biosimilars is blank because all biosimilars are in competitive biologic markets.

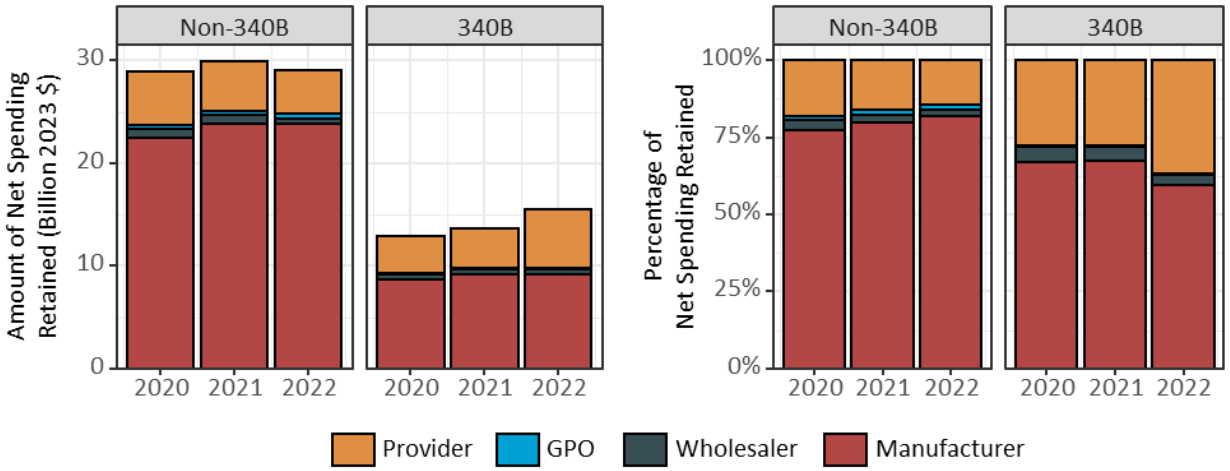
4.5 340B Discount Status

We also considered net spending on drug units that received 340B discounts, compared to drug units that did not receive 340B discounts.[41] While net spending on non-340B-discounted drugs was relatively constant, net spending on 340B-discounted drugs rose by 19.9 percent from 2020 ($12.9 billion) to 2022 ($15.5 billion). In 2022, 340B-discounted units accounted for 34.8 percent of net spending on all drugs. Almost all of this growth in 340B net spending was captured by providers, for which 340B-discounted drugs generated more profit (see Figure 15). Compared to non-340B-discounted drugs, providers' margin percentages on 340B-discounted drugs were higher by 59.2 percent, 80.5 percent, and 165.9 percent in 2020, 2021, and 2022, respectively (see Figure 16). As expected, manufacturers earned lower shares

[41] Unlike most other comparisons in the Results section, 340B discount status is not uniquely associated with specific drug products. A single drug product would have some 340B-discounted sales and some non-340B-discounted sales if administered at both 340B facilities and non-340B facilities. Our methods accounted for this by estimating separate prices and volumes of drug sold for units administered to Medicare Part B beneficiaries at 340B facilities versus at non-340B facilities. As stated previously, drugs administered to Medicaid beneficiaries do not receive 340B discounts.

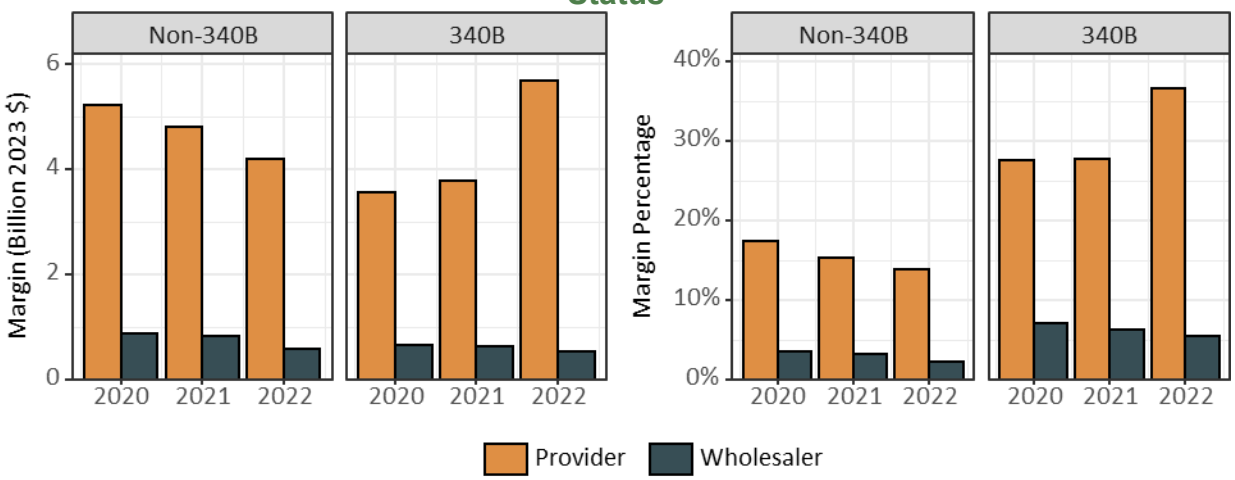
of net spending on 340B-discounted drugs (59.6 percent to 67.3 percent) than on non-340B-discounted drugs (77.5 percent to 81.9 percent). Wholesalers earned higher shares of net spending on 340B-discounted drugs (3.4 percent to 5.1 percent) than non-340B-discounted drugs (2.0 percent to 3.0 percent). This was not unexpected, as we assumed that wholesalers earned the same dollar margin regardless of 340B discount status, and 340B-discounted drugs have lower prices. GPOs earned larger shares of non-340B drug net spending (1.5 percent to 1.6 percent) than 340B drug spending (0.3 percent), as many 340B covered entities are prohibited from participating in GPOs. Providers earned 27.7 percent to 36.7 percent of net spending on 340B-discounted drugs, compared to 14.5 percent to 18.0 percent of net spending on non-340B-discounted drugs.

Figure 15. Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs, by 340B Discount Status



Note: Some data columns for GPOs may be too small to see at this scale.

Figure 16. Providers and Wholesalers' Margins on All Drugs, by 340B Discount Status



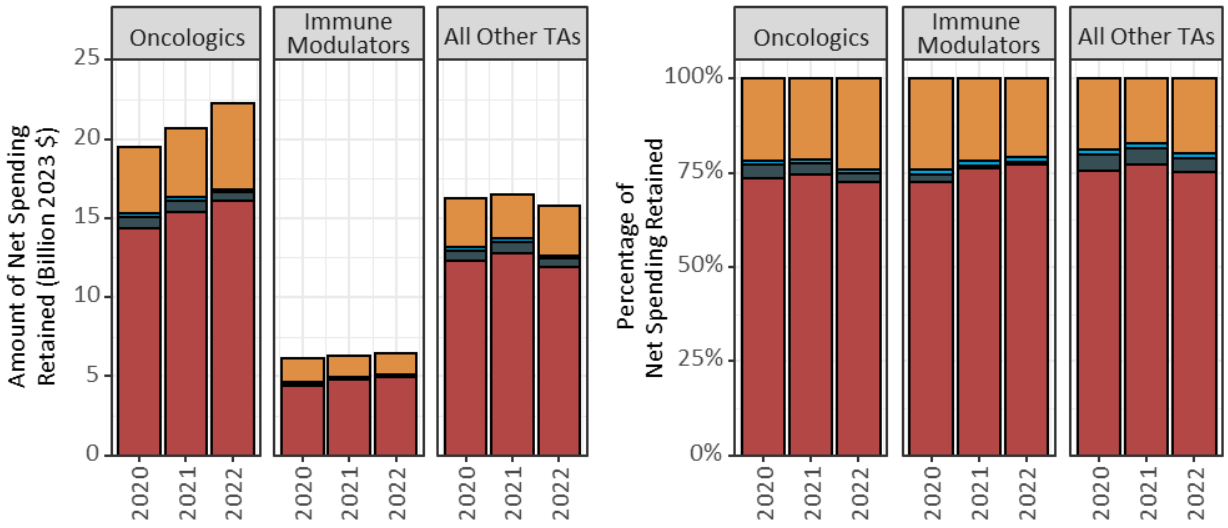
Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

4.6 Therapeutic Areas

On average, approximately $20.8 billion was spent on oncology drugs per year, which is nearly half (48.1 percent) of total net spending. Each year, oncology drug spending was three to four times as much as net spending on immune modulators, the next highest-spend therapeutic area. As Figure 17 shows, oncology drugs generated ranges of $14.4 billion to $16.1 billion per year for manufacturers (72.4 percent to 74.4 percent of net spending); $529 million to $699 million for wholesalers (2.3 percent to 3.6 percent); $4.2 billion to $5.4 billion for providers (21.3 percent to 24.2 percent); and $194 million to $218 million for GPOs (1.0 percent).

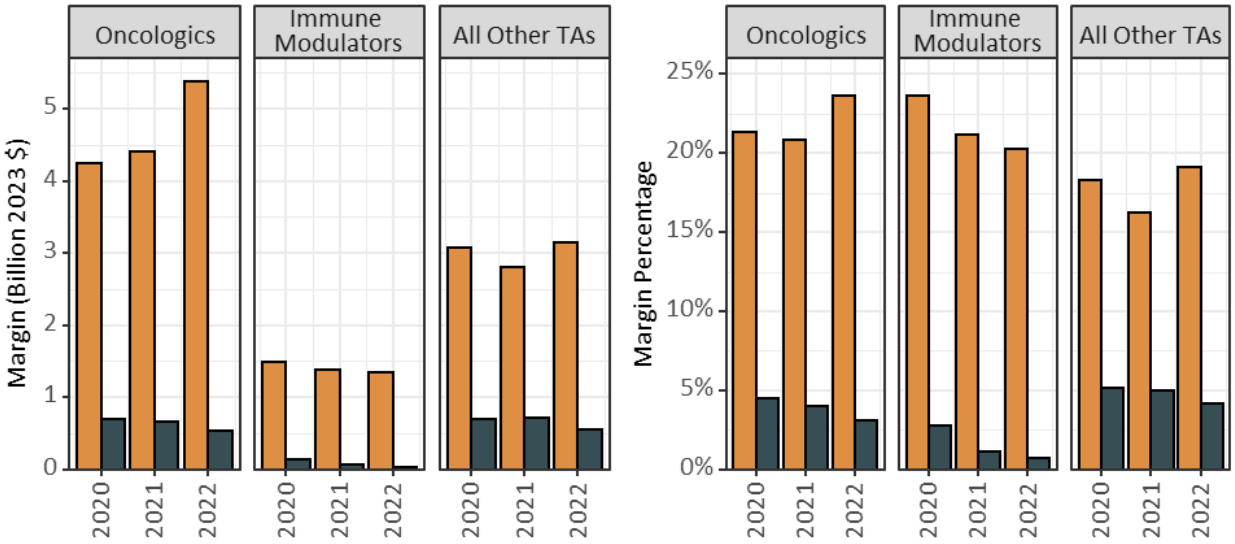
Total net spending on oncology drugs rose by 13.8 percent from 2020 to 2022. Each supply chain entity except wholesalers retained more from oncology drugs in 2022 than in 2020—with providers retaining 26.9 percent more in total dollars, manufacturers and GPOs retaining 11.9 percent and 12.3 percent more, respectively, and wholesalers earning 24.4 percent less. Wholesalers earned almost the exact same margin percentages from oncology as from other therapeutic areas, but providers gained slightly higher margin percentages from oncology drugs (see Figure 18).

Figure 17. Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs, by Therapeutic Area



Note: Some data columns for GPOs may be too small to see at this scale.

Figure 18. Providers and Wholesalers' Margins on All Drugs, by Therapeutic Area

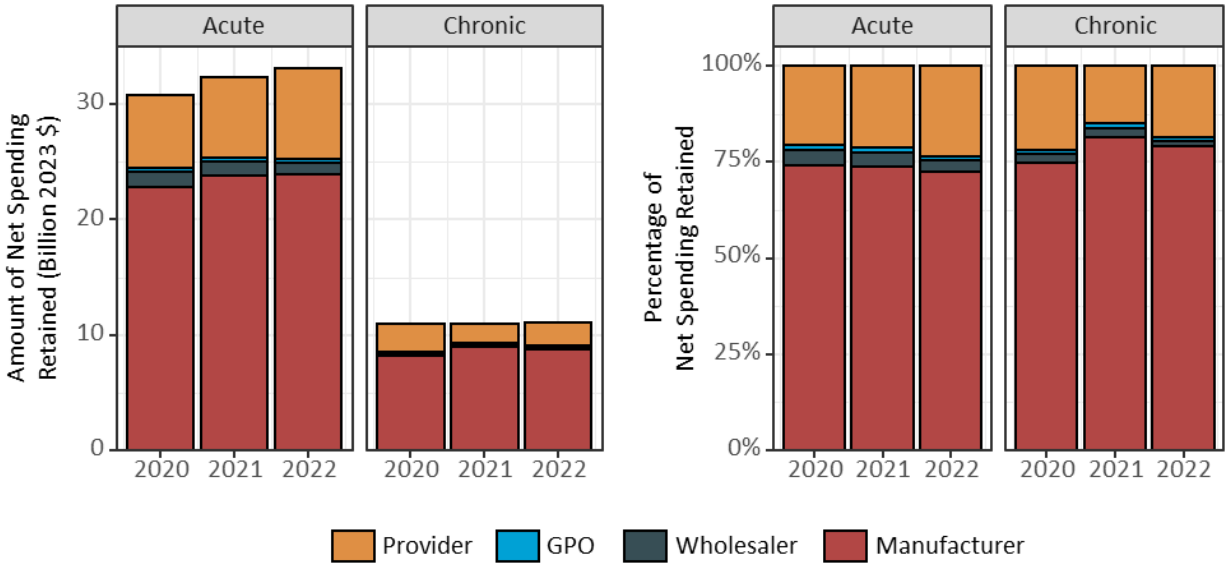


Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

4.7 Acute and Chronic Conditions

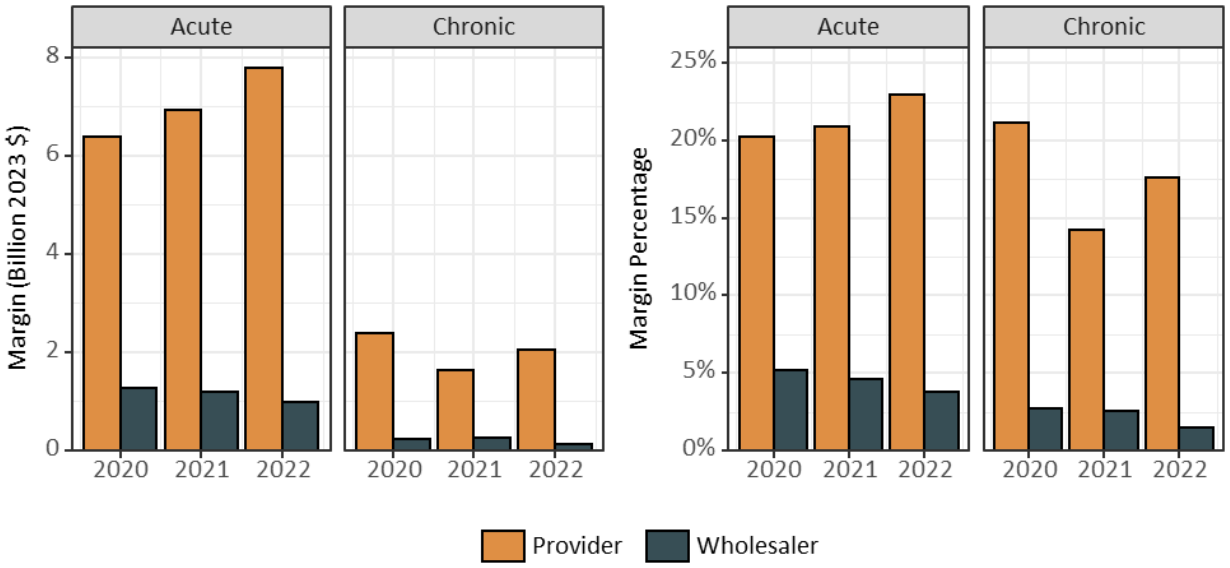
Acute conditions, which include most forms of cancer, made up roughly three-quarters of net spending (74.5 percent across all years). Each supply chain entity generally retained about the same share of net spending on acute condition drugs as they did on chronic condition drugs, as Figure 19 shows. Wholesalers and providers, though, had slightly higher margin percentages on drugs treating acute conditions, which also generated more margin dollars (see Figure 20).

Figure 19. Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs, by Acute vs. Chronic Condition



Note: Some data columns for GPOs may be too small to see at this scale.

Figure 20. Providers and Wholesalers' Margins on All Drugs, by Acute vs. Chronic Condition



Note: Manufacturer margins are not estimated because they do not generally pay an acquisition cost for the finished drug product, and we did not quantify their raw ingredient costs. GPO margins are not estimated because they generally do not pay or get paid for the full cost of the drug.

4.8 Empirical Confidence Intervals

Table 3 presents the Monte Carlo uncertainty analysis results. Each point estimate in Table 3 is the average from the 10,000 bootstrap samples, and the values in parentheses are 95 percent confidence intervals. The point estimates from the Monte Carlo simulation are generally similar to the main estimates presented above (see also Table B-2 and Table B-3), indicating that the simulation had low bootstrapping bias. For estimates involving payer and beneficiary net spending, however, the bootstrapped means are consistently less than main estimates presented above (generally by no more than 16 percent of the original estimate). This occurred because, when resampling the original dataset, there was a tendency for strata with fewer observations to be omitted entirely. Consequently, these missing strata were not represented in the weighted estimates of total net spending by the payer and beneficiary, causing a slight systematic reduction in the amount of net spending captured by each supply chain entity. The mean estimates for percentage of net spending retained and margin percentage, however, were highly similar in the Monte Carlo analysis to the point estimates from the main analysis and appear to give unbiased estimates of the confidence intervals.

The confidence intervals are relatively narrow. For estimates involving net spending, the 95 percent confidence intervals are all less than ±$6.3 billion in width or ±23.8 percent of the bootstrap mean. For estimates of the percentage of payer and beneficiary spending retained, the 95 percent confidence intervals are all less than ±4.4 percentage points, or 31.8 percent of the bootstrap mean. For estimates of margin percentages, the 95 percent confidence intervals are all less than 3.9 percentage points or 33.6 percent of the bootstrap mean.

Table 3. Monte Carlo Results: Mean Annual Net Spending Distributed to Supply Chain Participants and Margins on All Drugs, 2020–2022

Year	Entity	Mean Net Spending Retained (95% CI) (Billions, 2023 $)	Percentage of All Net Spending Retained (95% CI)	Margin Percentage [a] (95% CI)
2020	Manufacturer	$26.63 ($23.06 – $28.79)	74.71% (72.23% – 76.62%)	Not estimated
2020	Wholesaler	$1.38 ($1.24 – $1.51)	3.88% (3.45% – 4.54%)	4.76% (4.24% – 5.60%)
2020	GPO	$0.40 ($0.34 – $0.44)	1.13% (1.06% – 1.20%)	Not estimated
2020	Provider	$7.22 ($6.35 – $7.99)	20.28% (18.35% – 22.44%)	19.70% (17.84% – 21.76%)
2021	Manufacturer	$27.77 ($23.95 – $30.09)	75.70% (73.49% – 77.11%)	Not estimated
2021	Wholesaler	$1.29 ($1.14 – $1.42)	3.53% (3.06% – 4.18%)	4.27% (3.73% – 5.07%)
2021	GPO	$0.43 ($0.36 – $0.46)	1.16% (1.09% – 1.23%)	Not estimated
2021	Provider	$7.19 ($6.38 – $7.97)	19.61% (18.14% – 21.63%)	18.94% (17.50% – 20.87%)
2022	Manufacturer	$27.93 ($24.03 – $30.28)	73.91% (71.43% – 75.47%)	Not estimated
2022	Wholesaler	$1.04 ($0.93 – $1.14)	2.77% (2.42% – 3.31%)	3.45% (3.01% – 4.17%)
2022	GPO	$0.42 ($0.36 – $0.46)	1.12% (1.05% – 1.21%)	Not estimated
2022	Provider	$8.38 ($7.40 – $9.12)	22.19% (20.60% – 24.36%)	21.41% (19.87% – 23.44%)

Note: Point estimate is the mean across the 10,000 bootstrap samples. Values in parentheses are empirical 95 percent confidence intervals (CIs). For estimates of the amount of net spending retained, the bootstrapped means are consistently below the point estimates from the main results (see Table B-2 and Table B-3).
[a] The total dollar margin is equal to the amount of net spending retained (billion 2023 $).

5 DISCUSSION

Across all drugs, net spending by payers and beneficiaries increased by 6.2 percent from 2020 to 2022, but the growth was not disproportionately captured by any one supply chain entity. Instead, we observed a relatively consistent distribution of overall net spending to the supply chain entities from 2020 to 2022. This contrasts with retail drugs, where some research has found that rising list prices are accompanied by constant or decreasing manufacturer net prices (Hernandez, et al., 2020). Hernandez et al. note that net prices of retail drugs were stable between 2015 and 2018 despite list prices continuing to rise (2020). This suggests that rising prices of retail drugs may be driven primarily by rising margins of intermediaries rather than those of manufacturers. We did not observe such an effect for the provider-administered outpatient drug setting in our study. On the contrary, the distribution of net spending across the supply chain entities was relatively stable for providers and decreased slightly for wholesalers.

Manufacturers retained approximately three-quarters of overall net drug spending, and this percentage was relatively constant from 2020 to 2022. The fact that manufacturers retain the vast majority of net spending is partly because we have not separated the net spending disbursed to finished drug manufacturers from that disbursed to raw ingredient manufacturers. Nonetheless, the high share of retained spending that manufacturers capture demonstrates their strong market position to act as price setters, which is partly attributable to the fact that noncompetitive biologics dominate provider-administered outpatient drug markets, accounting for over 80 percent of net spending. In our sample, 91.4 percent of biologics were original biologics, and on these drugs, manufacturers retained almost fourth-fifths of all net spending from 2020 to 2022. In comparison, only 19.6 percent of small molecules in our sample were brand drugs. Original biologics were also much less likely than small molecule brand drugs to face competition in the market. Only 14.9 percent of net spending on biologics was in competitive markets, compared to 37.4 percent for small molecules.

One major difference from the retail drug market is that pharmacy benefit managers (PBMs) are not generally involved in managing benefits for the provider-administered drugs that we studied. In the retail drug market, PBMs create formularies (among other tasks), which dictate beneficiary copays and thus greatly influence the specific drug a patient chooses. The PBM market is highly concentrated, with three PBMs processing roughly 80 percent of all claims in 2023 (Fein, 2024). This gives PBMs broad power to negotiate lower prices from other supply chain members, including manufacturers, since formulary exclusion by just one of the big three PBMs can severely reduce a product's utilization and sales, as was seen with the initial rollout of Humira biosimilars (Mehr, 2024). PBMs often achieve price reductions by negotiating rebates that manufacturers agree to pay when their drug is used by beneficiaries. PBMs then share these rebates with the payer in part or in whole.

The absence of PBMs from physician-administered drug reimbursements may have two effects. First, other intermediaries appear to capture earnings that would have gone to PBMs—including healthcare providers, which are able to pool their purchasing power through GPOs. At the same time, however, the reliance on GPOs to achieve cost savings imposes a limit on

providers' ability to act as price setters, particularly compared to PBMs, which are far more consolidated than healthcare providers. For example, in an outpatient setting, each provider (e.g., including hospital outpatient pharmacies) may create its own formulary, increasing the opportunities for manufacturers to compete for favorable placement on different providers' formularies without the same risk of large-scale exclusion that exists in retail drug markets. We found that there was consistency from 2020 to 2022 in the distribution of net spending to supply chain members, which suggests that there was a degree of stability in the dynamics between supply chain members. While spending per beneficiary has increased more rapidly in Part B than in Part D (Nguyen, et al., 2023), our findings suggest that this is not the result of any single supply chain member gaining a foothold that might allow them to extract higher margins.

In markets where biosimilars have entered, the increased competition reduced net spending over the study period. Biosimilars offer lower-priced alternatives, which tend to be 15 to 35 percent less expensive than their reference products (Feng, et al., 2024).[42] Increased market competition leads to lower prices of the reference product, which in some cases are still declining three years after biosimilar entry (Office of Inspector General HHS, 2024). During our study period, competitive biologic markets generally grew in terms of quantity sold, patient access, the number of biosimilar competitors, and the number of competitive biologic markets. A total of 13 new biosimilars launched between 2020 and 2022, doubling the number of biosimilar products marketed in the United States (Cardinal Health, 2024).[43] We found that total net spending on biosimilars rose by 34.0 percent during the study period. Despite this increase in biosimilar spending and use, the net effect of their market entry was a 36.4 percent *decrease* in net spending on all competitive biologics, including reference products and their biosimilars. This suggests that the total growth in biosimilar spending was more than offset by the savings on reference products as their prices dropped in response to the competition. The 36.4 percent spending decline we observed over the three-year study period is very similar to the average 36-month price reduction following biosimilar market entry, which has ranged from about 13 percent to 42 percent and averages about 31 percent when using the IQVIA NSP invoice price metric (Pritchett, 2023) (estimated from Pritchett's Exhibit 17). While this supports the notion that biosimilars are effective at lowering net spending, they are not yet being fully exploited. The Office of Inspector General (OIG) at the U.S. Department of Health and Human Services (HHS) found that, in 2021, "Part B and enrollee spending on [reference] biologics could have decreased by $179 million, or 4 percent, if more affordable biosimilars had been used as frequently as the most-used biosimilars" (Office of Inspector General HHS, 2024b).

Manufacturers have more market power to set prices of noncompetitive drugs or products for which they are the exclusive supplier, and we found that they retained a larger proportion of payer and beneficiary spending on those drugs. In contrast, our analysis suggests

[42] The reference product is the original biological product licensed under section 351(a), against which a proposed biosimilar product is evaluated.

[43] Specifically, this includes Semglee, Avsola, Byooviz, Cimerli, Ruxience, Riabni, Trazimera, Herzuma, Ontruzant, Zirabev, Alymsys, Nyvepria, and Releuko. During 2023 and 2024, FDA approved 23 additional biosimilars, bringing the total to 63 approved biosimilars representing 18 original biologic reference products. Not all of these biosimilars have entered their markets due to ongoing patent litigation or settlement agreements.

that providers—and wholesalers to a lesser extent—had more market power to act as price setters on competitive drugs or products, which earned them higher margin percentages. On competitive small molecule drugs, providers' margin percentages were almost double what they were on noncompetitive small molecules. Between providers and wholesalers (the two intermediaries whose margins we quantified), providers tended to have higher margin percentages. Providers even retained over half of payer and beneficiaries' net spending on generic small molecule drugs and over half on competitive small molecule drugs. The large gap between wholesalers and providers may be partly due to 340B discounts that providers receive, but even on non-340B-discounted units, providers had roughly five times the margin percentages of wholesalers, on average.

Providers' margins are affected by the 340B program, and they retained about twice as much of net spending on 340B-discounted drugs than on non-340B-discounted drugs. In particular, we estimate that providers retained 27.7 percent to 36.7 percent on 340B-discounted drugs, compared to 14.5 percent to 18.0 percent on non-340B-discounted drugs. In another study of provider margins, Robinson et al. (2024) found that hospitals eligible for 340B discounts retained 64.3 percent of private insurers' drug spending, compared to 44.8 percent by hospitals not eligible for 340B discounts and 19.1 percent by independent physician practices (2024). These estimates are substantially higher than our own, but their analysis was limited to claims covered by non-federal payers (employment-based or individually purchased insurance) while we only considered Medicaid and Medicare claims. They also used a much smaller sample of 57 drugs, many of which were being "targeted for cost-reduction strategies by a large national insurer." Another major difference is that Robinson et al. estimated provider acquisition costs using the average sales price published by CMS, while assuming 340B-eligible hospitals receive a 35 percent discount on acquisition costs. In contrast, our acquisition costs are estimated using IQVIA NSP data, which is based on actual invoices to providers.

Provider margins on 340B-discounted drugs also grew substantially in 2022 when a 2018 CMS rule regarding 340B reimbursement rates was revoked. In 2020 and 2021, providers' margin percentages were 10.3 to 12.5 percentage points higher on 340B-discounted drugs than on non-340B-discounted drugs. This corresponded to 59.5 percent to 81.1 percent higher margin percentages. In 2022, the gap between providers' margins on 340B-discounted drugs versus non-340B-discounted drugs rose to 22.9 percentage points—a 166.3 percent difference. This coincided with a change in CMS's 340B reimbursement rates. From Quarter 1 (Q1) of 2018 through Q3 of 2022, a rule was in effect that reduced providers' reimbursements on 340B-discounted units from ASP plus 6 percent to ASP minus 22.5 percent (Centers for Medicare & Medicaid Services, 2023). In Q4 of 2022, the 340B drug reimbursement rate was changed back to ASP plus 6 percent, after the rule implementing these rate changes was deemed invalid.

Notably, even before the CMS rule was revoked, we still found that providers earned substantially higher margin percentages on 340B drug sales than on non-340B drug sales. From 2020 to 2021, there was a 5.5 percent growth in 340B drug spending, which outpaced growth in non-340B drug spending (3.3 percent). This may be due to expansion of the 340B program. For example, from 2000 to 2020, there was a roughly six-fold increase in the number of 340B

covered sites. From 2020 to 2021, the number of covered sites rose by roughly 3.7 percent (Mulligan, 2021) (estimated from Mulligan's Figure 3).

It should be noted that discounted acquisition costs of drugs are intended to create opportunities for 340B facilities to offer additional services to at-risk patients. The rapid expansion of the 340B drug program has led to greater scrutiny in recent years, and some efforts have been made to compare outcomes at 340B facilities to non-340B facilities. While this type of analysis is beyond the scope of our study, a scoping review by Knox et al. (2023) found "mixed evidence … on how covered entities used their 340B revenue, with some studies suggesting use to expand health care services for low-income populations and others to acquire physician practices and open sites in higher-income neighborhoods."

Regarding therapeutic areas, about half of net spending was on oncology drugs, which tend to be more expensive than drugs in other therapeutic areas. From 2020 to 2022, oncology drugs made up 46.6 percent to 50.0 percent of total annual spending.[44] Total net spending on oncology drugs increased steadily over the study period, rising from $19.5 billion in 2020 to $22.2 billion in 2022—an increase of $2.7 billion or 13.8 percent. Of this spending increase, $1.1 billion or 42.2 percent was captured by providers, which is twice their average share of net spending on oncology drugs from 2020 to 2022.

The fact that oncology spending growth (13.8 percent) outpaced overall spending growth (6.2 percent) may be due, in part, to the COVID-19 pandemic. During the pandemic, some non-essential or elective procedures and office visits were canceled or rescheduled to reduce exposure and reduce the burden on healthcare facilities. Compared to other therapeutic areas, however, oncology treatments are less likely to be delayed given the severity of the disease. From 2008 to 2021, Part B drug spending rose by 9.2 percent annually in traditional Medicare, on average (Nguyen, et al., 2023), which is 3.0 percentage points higher than what we observed from 2020 through 2022, during the COVID-19 pandemic.

Our study has several limitations. The primary limitations relate to the lack of available data on drug pricing. We did not observe wholesaler net acquisition costs and instead estimated these from the VA FSS data, which required assuming that (a) VA FSS prices are representative of payments to wholesalers, and (b) the VA FSS prices depend only on the WAC, the NSP invoice price, the drug's brand-generic status, and the calendar year. Another limitation is that, because our analysis is focused on drug-level payment flows, we do not account for per-member fees. For this reason, we have not included profits to insurance companies, Managed Care Organizations (MCOs), or Medicare Administrative Contractors (MACs). With respect to prices, we did not have data on reimbursement rates in Medicaid or Medicare Part B physician settings. We assumed these reimbursement rates to providers were

[44] Our study was not designed to estimate the number of packages sold in the full study population, as spending data was only available at the 9-digit NDC level and not the 11-digit NDC level for some drugs. However, based on unweighted estimates of sampled drugs with known package information (which cover 99.8 percent of spending in the sample), oncology drugs comprised 15.5 percent to 21.2 percent of packages sold to Medicare beneficiaries but 59.0 percent to 63.5 percent of net spending from 2020 to 2022.

the same as for Medicare Part B outpatient settings. Similarly, we did not account for Medicare Advantage spending, which is a growing share of the Medicare market and reached over 50 percent of Medicare enrollment in 2023 (Freed, et al., 2024).

Our estimates of provider margins rely, in part, on the estimated 340B discounts. However, we did not have data for 340B-discounted prices or manufacturers' AMPs, from which they are calculated. Our method of estimating these used IQVIA NSP data, which differs from the AMP and does not contain all rebates.[45] We also did not account for the inflation-based component of the 340B or Medicaid unit rebate amount (URA) because, in most cases, we did not have price estimates going back to the drug's market entry date. However, as validation, our average 340B discount can be compared with other published estimates. For each drug in our sample, we calculated the 340B-to-WAC discount and found the average of these to be 51.9 percent. In comparison, Blalock estimated that "340B prices were, on average, 59 percent lower than list prices in 2020" (Blalock, 2022). A recent IQVIA report estimated that "the average 340B discount [was] approximately 55%" as of 2023 (Martin & Karne, 2024). While our average 340B discount is relatively similar to these reported figures, the discount is larger when expressed as the total weighted sales in 340B dollars divided by the total weighted sales in WAC dollars. Using this metric, the total 340B discount according to our data is 69.5 percent—higher than the other two estimates.

As another limitation, we treated the supply chain as a closed system, which does not account for the fact that, under the buy-and-bill system, some drugs expire before they are used, which generates losses for providers that we did not quantify. Accounting for these losses would tend to reduce providers' margins slightly. We also assumed that all units were sold through a wholesaler, which is not true in every case, as some providers purchase certain drugs directly from manufacturers. This simplification may have led to a small overestimate in the amount of net spending retained by wholesalers and a slight underestimate in manufacturers' retained share of net spending. We made a similar assumption about GPOs and attributed an administrative fee on every drug administered by a nonprohibited 340B facility or non-340B facility. This likely overestimated the amount of net spending that GPOs retain, since not all eligible facilities participate in GPO contracts. On the other hand, we did not account for all fees that GPOs earn; for example, some GPOs charge a membership fee to participating providers, though these are not applied on a per-drug basis. We also did not account for all manufacturer price concessions, including copay assistance programs (to the extent that they are used with provider-administered drugs). Because manufacturers provide these additional discounts, their retained share of net spending may be lower than we estimated.

While our sample was large, it was a convenience sample nonetheless. Certain drugs were excluded out of necessity, and some HCPCS codes had no data and were excluded from our study population altogether. If these out-of-sample drugs differ systematically from the in-

[45] Similarly, the IQVIA NSP invoice price would only reflect the GPO-negotiated discount if the wholesaler invoiced the provider at the discounted price. The GPO-negotiated price may not be listed on the invoice in cases where, for example, the manufacturer of the drug participates in the GPO but the wholesaler does not.

sample drugs, then this would limit the extent to which our findings can be extrapolated beyond the sample. This limitation was mitigated, however, by our large sample.

Our findings are focused on net spending and margins, but as an area of future research, it would be valuable to compare trends in spending to trends in utilization and price. In our study, we were unable to assess the extent to which increased spending (and margin dollars) are due to growing patient populations as opposed to rising drug prices. Additionally, we only considered spending on Medicare Part B and Medicaid beneficiaries, and price transparency has historically been higher in these public programs. With the implementation of the Transparency in Coverage rule, reimbursement rates by commercial providers have become publicly available (Centers for Medicare & Medicaid Services, 2020). These data are relatively new and highly useful for estimating margins on drugs administered to commercial plan beneficiaries. It would be worthwhile to assess how margins vary between public and private payer spending. Finally, our findings suggest that the 340B program generates substantially higher margins to providers. It would be interesting to evaluate the extent to which increased margins correlate with additional services at 340B facilities offer or improved health outcomes.

6 CONCLUSION

This study combines prices from each level of the supply chain, tracking the flows and payments of individual drugs as they are acquired, sold, or negotiated by manufacturers, wholesalers, GPOs, providers, and payers. Using these drug-level price estimates, which account for 340B discounts, we estimated the share of net spending that each supply chain entity retains. By comparing the net acquisition cost to the net sales price, we also calculated the margins earned by wholesalers and providers. We found that spending on provider-administered outpatient drugs in Medicare Part B and Medicaid is dominated by original biologics, small molecule brands, and drugs or products with no competition in the market. Consequently, manufacturers—which have more negotiating power than other supply chain entities when they are the exclusive suppliers of a market—retained almost three-quarters of total drug spending. While manufacturers earned more on drugs that do not face competition, providers and wholesalers earned higher margin percentages on drugs that do face competition. Providers' margin percentages were also significantly higher for 340B-discounted drugs than for non-340B-discounted drugs—more than double in 2022. From 2020 to 2022, payer and beneficiary net spending on physician-administered drugs increased, but the relative distribution of these payments to the various supply chain entities did not change substantially. To the extent that increased spending is due to rising list prices, no single supply chain entity benefited more than the others from the growth in drug prices.

Despite the high spending on drugs and biological products with no competition, our results suggest that biosimilars have been very effective, when available, at generating savings for Medicare and Medicaid. Between 2020 and 2022, net spending in competitive biologic markets declined even as the number of biosimilars marketed in the United States doubled. The downward pressure on the reference product's price was great enough to reduce overall net spending in these markets by about 36 percent from 2020 to 2022.

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APPENDIX A: DETAILED METHODOLOGY

A.1 Identifying the Target Population

The target population of drug spending included all Medicare Part B and Medicaid spending on individually billed drugs administered by healthcare professionals in outpatient settings or physician offices in 2020, 2021, and 2022. We restricted inclusion to Medicaid drugs with the same HCPCS codes reimbursed by Medicare and listed in the CMS Part B Crosswalk files (Centers for Medicare & Medicaid Services, 2020-2022). Spending by commercial healthcare plans was excluded from the study, as was Medicare Advantage spending.

To identify the total spending, we used the 100 percent Medicare FFS claims data (Carrier and Outpatient Hospital files) from 2020 to 2022.[46] The FFS outpatient files contain claims for services provided in hospital outpatient departments. We excluded (a) claims with no Medicare payments; (b) claims where the drug was bundled with a service (i.e., we only included Outpatient Prospective Payment System status indicators of A, F, G, K, L or S); and (c) claims for Investigational Devices billed under Revenue Center code 0624. The FFS Carrier file contains claims for services provided in independent physician offices; in this file, we excluded claims with no Medicare or beneficiary payments. In both files, we only analyzed HCPCS codes listed in the CMS Part B HCPCS-NDC Crosswalks (Centers for Medicare & Medicaid Services, 2020-2022).

We also used the 100 percent Medicaid claims data to quantify spending on and use of in-scope drugs administered to Medicaid beneficiaries. We included only claims with HCPCS codes listed in the CMS Part B HCPCS-NDC Crosswalk file. For the drug sample, we further restricted inclusion to valid 11-digit NDCs where the labeler and package codes matched to CMS's list of drugs that participate in the MDRP (Medicaid.gov, 2020-2022). We excluded (a) claims with missing or zero Medicaid payments; (b) MCO capitated payments, service tracking claims, and supplemental lump sum payments (i.e., we only included FFS claims and MCO encounters with claim types 1, 3, A, c, U, or W); and (c) payments where the Type of Service (TOS) code indicated services that were not delivered in an outpatient or physician office setting.

A.2 Identifying the Sample and Study Population

We selected the sample of drugs based on data availability. Some drugs were not included in the sample because their information was suppressed (e.g., due to aggregating fewer than 11 claims). Additionally, we only included spending on drugs that appeared in IQVIA NSP, which was necessary to estimate provider acquisition costs.

While the final sample represented the majority of spending in the full target population, there were some cases where the sample did not contain any drug-level data for an entire stratum (i.e., unique combination of year, payer, provider type, 340B discount status, and

[46] These files were accessible through a CMS Innovator Data Use Agreement (DUA #54757) with Dobson | DaVanzo.

HCPCS). Because the unsampled strata could differ systematically from the sampled strata, we identified a study population that was narrower than the full target population, which excluded the unsampled strata.

Specifically, the unsampled strata included HCPCS codes classified as miscellaneous (J7308-J7402, Q100-Q2028) or other (C8957-C9488) (American Academy of Professional Coders, n.d.). These miscellaneous drugs made up 43 percent (n=87) of the HCPCS codes with no sample data. In addition, 12 percent were vaccines (n=24 HCPCS codes), 9 percent were chemotherapy drugs (n=18), 8 percent were radiopharmaceuticals (n=17), 8 percent were clotting factors (n=16), 5 percent were stem cell therapies (n=10), and 4 percent were immunoglobulins (n=5). In general, these unsampled strata contained few claims and made up a very small fraction of total spending in the full target population. After excluding these unsampled strata, the study population covered 88 percent and 94 percent of the full target population of Medicare and Medicaid spending, respectively.

A.3 Outlier Analysis and Exclusions

When aggregating utilization (i.e., quantity sold), spending, and prices from the Medicare claims data, we excluded claims with outlying sales prices, because the outliers may be typographical errors or may result from expressing the quantity of drug in the wrong unit. For the outlier analysis, we followed the same general procedure as CMS describes (Centers for Medicare & Medicaid Services, 2020-2022).[47] While outlier claims were excluded when calculating NDC-level prices or spending for the sample, we included these outlier claims' spending in the target and study populations since the reimbursement amount generally does not contain errors.

In addition to excluding specific claims with outlying prices, we also performed a separate outlier analysis on the final sample. We compared each drug's net sales price to its net acquisition cost, at each available stage of the supply chain. We excluded extreme observations where the sales price was over 100 times the acquisition cost, or where the acquisition cost was over 100 times the sales price. Errors of this magnitude likely indicate errors in unit conversions and were rare.[48] We similarly excluded cases where we identified inconsistencies or possible errors in the package information or HCPCS dosage in the CMS crosswalks.[49]

A.4 Estimating Wholesaler Acquisition Costs from VA FSS Data

We estimated net wholesaler acquisition costs using VA FSS pricing data, which lists discounted prices on generic and brand drugs under various types of contracts, including Big

[47] Specifically, we grouped outliers by year, HCPCS code, and provider type (either outpatient setting or physician office) and calculated lower and upper bounds of the provider sales price per HCPCS dosage unit as (25^{th} percentile) – 1.5×(interquartile range) and (75^{th} percentile) + 1.5×(interquartile range), respectively. Claims with a provider sales price per HCPCS dosage unit outside of these bounds were excluded from the drug claims sample.

[48] This exclusion reduced the sample by only $1.6 billion, or 3.8 percent.

[49] Drugs with multiple dosage units reported for a single HCPCS in a given year, or multiple billing units per package reported for a single NDC-11 in a given year, were excluded from the sample.

Four price agreements, FSS price agreements, and national contract (NC) price agreements (U.S. Department of Veterans Affairs, Office of Procurement, Acquisition and Logistics, 2023). FSS prices are based on actual discounts given to direct purchasers, making them appropriate for estimating wholesalers' actual net acquisition costs. NC contracts are also useful because they often reflect additional discounts that can be achieved in exchange for preferred placement on the VA's national formulary (3 Axis Advisors, 2023). In the case of brand drugs, these additional discounts likely do not go to wholesalers, but rather to PBMs. For generic drugs, however, these additional discounts likely are accessible to wholesalers, at least in part, because wholesalers act as price setters in generic drug markets (Seeley, 2022) and can use the increased competition among generic manufacturers to negotiate lower prices. We therefore used the FSS and NC prices to estimate the net wholesaler acquisition cost of generic drugs, and we used only the FSS prices to estimate wholesalers' net acquisition cost of brand drugs. We did not use Big Four prices because these stipulate additional statutory discounts, which may not reflect the actual negotiation processes between wholesalers and manufacturers.

We merged VA FSS pricing files for 2020, 2021, and 2022 with IQVIA NSP pricing data by 11-digit NDC and year and filtered to in-scope outpatient drugs that appear in either the CMS Medicare Part B HCPCS-NDC Crosswalk files (Centers for Medicare & Medicaid Services, 2020-2022) or the CMS MDRP drug list (Medicaid.gov, 2020-2022).[50] For each in-scope, 11-digit NDC with data in both sources in a given year, we calculated (a) the weighted-average NSP price per extended unit in that year and (b) the simple average VA FSS price per extended unit across selected contract types in that year's pricing file. We then computed the ratio of the average NSP price to the average VA FSS price. This comparison of the NSP price with the VA FSS price was made because every drug in our sample had an available NSP price. Additionally, we expect the NSP price and the VA FSS price to be correlated because the former estimates the wholesaler's sales price (before the GPO fee), and the latter estimates the wholesaler's net acquisition cost. The VA FSS-to-NSP price ratio therefore represents the wholesaler's markup on the drug. Because of extreme outliers, we removed observations in the top and bottom five percent of the FSS-to-NSP price ratios. On average, this removed cases where the two prices differed by roughly a factor of 10. We removed these extreme outliers because the large discrepancy may be a result of the two datasets referring to different package sizes or not expressing the original prices on a per-package basis.

Many of the drugs in our final sample were not in the matched VA FSS-NSP dataset. We therefore developed a linear model to predict the average markup between the VA FSS price and the NSP price, so that we could calculate expected wholesaler net acquisition costs for all drugs in our sample. To develop the model, we conducted a stepwise model selection procedure that iteratively added and dropped terms and selected the best-fitting model with the lowest Akaike Information Criterion (AIC). To identify the optimal model, we performed this stepwise procedure with three different starting models, shown below. We compared the selected models across the three stepwise procedures and chose the one with the best fit (i.e.,

[50] To access historical versions of the VA FSS pricing file, we used the Internet Archive (Internet Archive, 2024). For each year in the study period, only one archive of the VA FSS pricing file was available, which we used as representative of the prices for the full year.

lowest AIC). The price terms (p_{NSP}, p_{FSS}, and p_{WAC}) all refer to prices per extended unit. We included the NSP price and the WAC price as predictors because discounts and drug prices are correlated, at least in the case of manufacturer net prices (Sood, et al., 2020). t is a numeric variable for the calendar year. I_{generic} is an indicator variable that takes the value of one (1) if the drug is a brand and zero (0) if the drug is a generic. We included all interaction terms with the generic drug indicator variable because price discounts are expected to differ for brands versus generics.

$$\log\left(\frac{\text{NSP}}{\text{FSS}}\right) = (\beta_0 + \beta_1 t + \beta_2 p_{\text{NSP}} + \beta_3 p_{\text{WAC}}) + I_{\text{generic}}(\beta_4 + \beta_5 t + \beta_6 p_{\text{NSP}} + \beta_7 p_{\text{WAC}}) \quad \text{(A-1)}$$

$$\log\left(\frac{\text{NSP}}{\text{FSS}}\right) = (\beta_0 + \beta_1 t + \beta_2 \log p_{\text{NSP}} + \beta_3 \log p_{\text{WAC}}) + I_{\text{generic}}(\beta_4 + \beta_5 t + \beta_6 \log p_{\text{NSP}} + \beta_7 \log p_{\text{WAC}}) \quad \text{(A-2)}$$

$$\log\left(\frac{\text{NSP}}{\text{FSS}}\right) = \left(\beta_0 + \beta_1 t + \beta_2 \log\left(\frac{p_{\text{NSP}}}{p_{\text{WAC}}}\right)\right) + I_{\text{generic}}\left(\beta_3 + \beta_4 t + \beta_5 \log\left(\frac{p_{\text{NSP}}}{p_{\text{WAC}}}\right)\right) \quad \text{(A-3)}$$

The final model we selected is shown below in equation A-4. Table A-1 shows the model coefficients, standard errors, and p values.

$$\log\left(\frac{\text{NSP}}{\text{FSS}}\right) = \beta_0 + \beta_1 t + (\beta_2 \log p_{\text{NSP}} + \beta_3 \log p_{\text{WAC}}) + I_{\text{generic}}(\beta_4 + \beta_5 \log p_{\text{NSP}} + \beta_6 \log p_{\text{WAC}}) \quad \text{(A-4)}$$

Table A-1. Selected Model for Predicting the NSP-to-FSS Price Discount

Variable	Coefficient	Point Estimate	Standard Error	p Value
Intercept	β_0	25.4736	11.3790	0.0252
t	β_1	-0.0124	0.0056	0.0272
$\log p_{\text{NSP}}$	β_2	0.0185	0.0172	0.2840
$\log p_{\text{WAC}}$	β_3	-0.0597	0.0177	0.0008
I_{generic}	β_4	-0.0856	0.0170	<0.0001
$I_{\text{generic}} \cdot \log p_{\text{NSP}}$	β_5	0.1535	0.0238	<0.0001
$I_{\text{generic}} \cdot \log p_{\text{WAC}}$	β_6	-0.1268	0.0238	<0.0001

Using the model of equation A-4, we calculated the expected VA FSS-to-NSP ratio (i.e., the reciprocal of the model output) for each 11-digit NDC in our merged VA FSS-NSP sample. To avoid overfitting or poor fits due to extrapolation when applying the model to new drugs, we binned the predicted VA FSS-to-NSP ratios into four groups based on quartiles and computed the mean ratio for each drug group. These drug groups and mean predicted ratios are shown in Table A-2. We performed this binning procedure separately for brands and generics.

Table A-2. Drug Groups for Predicting VA FSS-to-NSP Price Ratio

Brand Status	Range of Predicted VA FSS-to-NSP Price Ratio	Mean VA FSS-to-NSP Price Ratio	Number of 11-digit NDCs in Sample
Brand	Less than 0.768	0.718	387
Brand	0.768 to 0.846	0.807	393
Brand	0.846 to 0.937	0.892	418
Brand	Greater than 0.937	0.997	387
Generic	Less than 0.812	0.784	372
Generic	0.812 to 0.860	0.835	465
Generic	0.860 to 0.919	0.887	458
Generic	Greater than 0.919	0.991	398

For each 11-digit NDC in our drug sample, we used the fitted model of equation A-4 to calculate the expected VA FSS-to-NSP ratio and then assigned the mean ratio of Table A-2 based on the drug's price group. Multiplying this ratio by the NSP price yielded the estimate of the wholesaler's net acquisition cost on non-340B-discounted drugs. As with other price metrics, to collapse from 11-digit NDC to 9-digit NDC, we divided total dollar sales, expressed in terms of the wholesaler's net acquisition cost, by the total extended units sold across all package sizes in the year.

APPENDIX B: SUPPLEMENTAL TABLES

Table B-1. Sample Characteristics, by Year

Year	Drug Group	Spending in Sample (Billion 2023 $)	Number of Drugs	Number of HCPCS Codes
2020	All drugs	$11.61	1,528	427
2021		$13.07	1,629	468
2022		$14.04	1,685	466
2020	Small molecules, generic	$0.17	994	189
2021		$0.19	1,047	196
2022		$0.23	1,120	198
2020	Small molecules, brand	$1.70	284	165
2021		$1.85	301	182
2022		$1.81	272	164
2020	Biosimilars	$0.38	22	13
2021		$0.69	26	15
2022		$0.74	29	17
2020	Original biologics	$9.36	228	131
2021		$10.35	255	143
2022		$11.26	264	155
2020	Competitive small molecules (multi-source)	$0.34	1,096	201
2021		$0.39	1,139	214
2022		$0.76	1,197	212
2020	Noncompetitive small molecules (single source)	$1.53	181	116
2021		$1.65	209	129
2022		$1.28	195	118
2020	Competitive biologics	$1.58	27	17
2021		$1.41	31	19
2022		$1.23	34	21
2020	Noncompetitive biologics	$8.16	223	127
2021		$9.62	250	139
2022		$10.76	259	151
2020	340B drug sales	$7.95	1,437	422
2021		$8.88	1,532	462
2022		$9.60	1,599	462
2020	Non-340B drug sales	$3.67	930	341
2021		$4.20	946	363
2022		$4.43	969	378
2020	Oncology	$6.82	377	110
2021		$8.01	406	125
2022		$8.85	407	123
2020	Other therapeutic areas	$4.79	1,151	318
2021		$5.06	1,223	344
2022		$5.19	1,278	344

Year	Drug Group	Spending in Sample (Billion 2023 $)	Number of Drugs	Number of HCPCS Codes
2020	Acute conditions	$8.72	1,195	325
2021		$10.00	1,262	357
2022		$10.78	1,287	353
2020	Chronic conditions	$2.86	327	105
2021		$3.03	361	112
2022		$3.19	392	115

Note: Six drugs had an unclassified condition type (neither acute nor chronic).

Table B-2. Data for Figure 3: Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs

Year	Drug Group	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	All Drugs	Manufacturer	$31.09	74.24%
2020	All Drugs	Wholesaler	$1.53	3.65%
2020	All Drugs	Provider	$8.79	21.00%
2020	All Drugs	GPO	$0.46	1.11%
2021	All Drugs	Manufacturer	$33.00	75.79%
2021	All Drugs	Wholesaler	$1.44	3.30%
2021	All Drugs	Provider	$8.60	19.76%
2021	All Drugs	GPO	$0.50	1.15%
2022	All Drugs	Manufacturer	$32.98	74.15%
2022	All Drugs	Wholesaler	$1.12	2.52%
2022	All Drugs	Provider	$9.88	22.22%
2022	All Drugs	GPO	$0.49	1.11%

Table B-3. Data for Figure 4: Providers and Wholesalers' Margins on All Drug

Year	Drug Group	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	All Drugs	Wholesaler	$1.53	4.53%
2020	All Drugs	Provider	$8.79	20.46%
2021	All Drugs	Wholesaler	$1.44	4.01%
2021	All Drugs	Provider	$8.60	19.13%
2022	All Drugs	Wholesaler	$1.12	3.15%
2022	All Drugs	Provider	$9.88	21.52%

Table B-4. Data for Figure 5: Distribution to Supply Chain of Payer-Beneficiary Net Spending on Brand and Generic Small Molecule Drugs

Year	Brand-Generic Status	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	Small Molecule Brand	Manufacturer	$3.67	60.53%
2020	Small Molecule Brand	Wholesaler	$0.18	3.03%
2020	Small Molecule Brand	Provider	$2.16	35.54%
2020	Small Molecule Brand	GPO	$0.06	0.91%
2020	Small Molecule Generic	Manufacturer	$0.43	38.98%
2020	Small Molecule Generic	Wholesaler	$0.04	3.33%
2020	Small Molecule Generic	Provider	$0.63	56.98%
2020	Small Molecule Generic	GPO	$0.01	0.70%
2021	Small Molecule Brand	Manufacturer	$3.87	66.57%
2021	Small Molecule Brand	Wholesaler	$0.18	3.16%
2021	Small Molecule Brand	Provider	$1.70	29.24%
2021	Small Molecule Brand	GPO	$0.06	1.02%
2021	Small Molecule Generic	Manufacturer	$0.40	34.24%
2021	Small Molecule Generic	Wholesaler	$0.04	3.33%
2021	Small Molecule Generic	Provider	$0.72	61.77%
2021	Small Molecule Generic	GPO	$0.01	0.66%
2022	Small Molecule Brand	Manufacturer	$3.40	63.78%
2022	Small Molecule Brand	Wholesaler	$0.10	1.80%
2022	Small Molecule Brand	Provider	$1.78	33.49%
2022	Small Molecule Brand	GPO	$0.05	0.93%
2022	Small Molecule Generic	Manufacturer	$0.40	34.98%
2022	Small Molecule Generic	Wholesaler	$0.04	3.13%
2022	Small Molecule Generic	Provider	$0.70	61.23%
2022	Small Molecule Generic	GPO	$0.01	0.66%

Table B-5. Data for Figure 6: Providers and Wholesalers' Margins on Brand and Generic Small Molecule Drugs

Year	Brand-Generic Status	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	Small Molecule Brand	Wholesaler	$0.18	4.51%
2020	Small Molecule Brand	Provider	$2.16	34.31%
2020	Small Molecule Generic	Wholesaler	$0.04	7.25%
2020	Small Molecule Generic	Provider	$0.63	54.97%
2021	Small Molecule Brand	Wholesaler	$0.18	4.25%
2021	Small Molecule Brand	Provider	$1.70	27.92%
2021	Small Molecule Generic	Wholesaler	$0.04	8.09%
2021	Small Molecule Generic	Provider	$0.72	59.63%
2022	Small Molecule Brand	Wholesaler	$0.10	2.60%
2022	Small Molecule Brand	Provider	$1.78	32.30%
2022	Small Molecule Generic	Wholesaler	$0.04	7.58%
2022	Small Molecule Generic	Provider	$0.70	59.36%

Table B-6. Data for Figure 7: Distribution to Supply Chain of Payer-Beneficiary Net Spending on Original Biologics and Biosimilars

Year	Type of Biologic	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	Biosimilar	Manufacturer	$0.95	64.63%
2020	Biosimilar	Wholesaler	$0.05	3.60%
2020	Biosimilar	Provider	$0.45	30.79%
2020	Biosimilar	GPO	$0.01	0.97%
2020	Original Biologic	Manufacturer	$26.03	78.35%
2020	Original Biologic	Wholesaler	$1.25	3.77%
2020	Original Biologic	Provider	$5.55	16.71%
2020	Original Biologic	GPO	$0.39	1.17%
2021	Biosimilar	Manufacturer	$1.33	62.45%
2021	Biosimilar	Wholesaler	$0.09	4.40%
2021	Biosimilar	Provider	$0.68	32.14%
2021	Biosimilar	GPO	$0.02	1.02%
2021	Original Biologic	Manufacturer	$27.41	79.57%
2021	Original Biologic	Wholesaler	$1.12	3.26%
2021	Original Biologic	Provider	$5.51	15.98%
2021	Original Biologic	GPO	$0.41	1.19%
2022	Biosimilar	Manufacturer	$1.37	67.99%
2022	Biosimilar	Wholesaler	$0.09	4.33%
2022	Biosimilar	Provider	$0.53	26.53%
2022	Biosimilar	GPO	$0.02	1.14%
2022	Original Biologic	Manufacturer	$27.82	77.28%
2022	Original Biologic	Wholesaler	$0.90	2.50%
2022	Original Biologic	Provider	$6.86	19.07%
2022	Original Biologic	GPO	$0.41	1.15%

Table B-7. Data for Figure 8: Providers and Wholesalers' Margins on Original Biologics and Biosimilars

Year	Type of Biologic	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	Biosimilar	Wholesaler	$0.05	5.07%
2020	Biosimilar	Provider	$0.45	29.95%
2020	Original Biologic	Wholesaler	$1.25	4.46%
2020	Original Biologic	Provider	$5.55	16.32%
2021	Biosimilar	Wholesaler	$0.09	6.16%
2021	Biosimilar	Provider	$0.68	30.71%
2021	Original Biologic	Wholesaler	$1.12	3.80%
2021	Original Biologic	Provider	$5.51	15.53%
2022	Biosimilar	Wholesaler	$0.09	5.48%
2022	Biosimilar	Provider	$0.53	24.86%
2022	Original Biologic	Wholesaler	$0.90	3.02%
2022	Original Biologic	Provider	$6.86	18.51%

Table B-8. Data for Figure 9: Distribution to Supply Chain of Payer-Beneficiary Net Spending on Small Molecule Drugs, Competitive vs. Noncompetitive Markets

Year	Competition Status	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	Noncompetitive Small Molecule	Manufacturer	$3.17	68.23%
2020	Noncompetitive Small Molecule	Wholesaler	$0.12	2.66%
2020	Noncompetitive Small Molecule	Provider	$1.31	28.12%
2020	Noncompetitive Small Molecule	GPO	$0.05	0.98%
2020	Competitive Small Molecule	Manufacturer	$0.93	36.90%
2020	Competitive Small Molecule	Wholesaler	$0.10	3.83%
2020	Competitive Small Molecule	Provider	$1.48	58.58%
2020	Competitive Small Molecule	GPO	$0.02	0.68%
2021	Noncompetitive Small Molecule	Manufacturer	$3.31	70.55%
2021	Noncompetitive Small Molecule	Wholesaler	$0.11	2.25%
2021	Noncompetitive Small Molecule	Provider	$1.23	26.17%
2021	Noncompetitive Small Molecule	GPO	$0.05	1.03%
2021	Competitive Small Molecule	Manufacturer	$0.96	41.97%
2021	Competitive Small Molecule	Wholesaler	$0.12	5.12%
2021	Competitive Small Molecule	Provider	$1.19	52.09%
2021	Competitive Small Molecule	GPO	$0.02	0.83%
2022	Noncompetitive Small Molecule	Manufacturer	$2.37	66.43%
2022	Noncompetitive Small Molecule	Wholesaler	$0.07	2.07%
2022	Noncompetitive Small Molecule	Provider	$1.09	30.53%
2022	Noncompetitive Small Molecule	GPO	$0.03	0.98%
2022	Competitive Small Molecule	Manufacturer	$1.42	49.14%
2022	Competitive Small Molecule	Wholesaler	$0.06	1.99%
2022	Competitive Small Molecule	Provider	$1.39	48.10%
2022	Competitive Small Molecule	GPO	$0.02	0.77%

Table B-9. Data for Figure 10: Providers and Wholesalers' Margins on Small Molecule Drugs, Competitive vs. Noncompetitive Markets

Year	Competition Status	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	Noncompetitive Small Molecule	Wholesaler	$0.12	3.60%
2020	Noncompetitive Small Molecule	Provider	$1.31	27.26%
2020	Competitive Small Molecule	Wholesaler	$0.10	8.49%
2020	Competitive Small Molecule	Provider	$1.48	56.12%
2021	Noncompetitive Small Molecule	Wholesaler	$0.11	2.94%
2021	Noncompetitive Small Molecule	Provider	$1.23	25.24%
2021	Competitive Small Molecule	Wholesaler	$0.12	9.58%
2021	Competitive Small Molecule	Provider	$1.19	48.98%
2022	Noncompetitive Small Molecule	Wholesaler	$0.07	2.87%
2022	Noncompetitive Small Molecule	Provider	$1.09	29.47%
2022	Competitive Small Molecule	Wholesaler	$0.06	3.64%
2022	Competitive Small Molecule	Provider	$1.39	46.43%

Table B-10. Data for Figure 11: Distribution to Supply Chain of Payer-Beneficiary Net Spending per Package on Brand and Generic Small Molecule Drugs, Competitive vs. Noncompetitive Markets

Year	Competition Status	Drug Type	Entity	Net Spending Retained per Package (2023 $)
2020	Competitive	Brand Small Molecule	Manufacturer	$327.76
2020	Competitive	Brand Small Molecule	Wholesaler	$6.14
2020	Competitive	Brand Small Molecule	Provider	$142.75
2020	Competitive	Brand Small Molecule	GPO	$2.68
2020	Competitive	Generic Small Molecule	Manufacturer	$25.65
2020	Competitive	Generic Small Molecule	Wholesaler	$2.00
2020	Competitive	Generic Small Molecule	Provider	$30.49
2020	Competitive	Generic Small Molecule	GPO	$0.33
2020	Noncompetitive	Brand Small Molecule	Manufacturer	$865.15
2020	Noncompetitive	Brand Small Molecule	Wholesaler	$37.02
2020	Noncompetitive	Brand Small Molecule	Provider	$379.59
2020	Noncompetitive	Brand Small Molecule	GPO	$7.60
2020	Noncompetitive	Generic Small Molecule	Manufacturer	$210.13
2020	Noncompetitive	Generic Small Molecule	Wholesaler	$17.97
2020	Noncompetitive	Generic Small Molecule	Provider	$212.10
2020	Noncompetitive	Generic Small Molecule	GPO	$2.89
2021	Competitive	Brand Small Molecule	Manufacturer	$288.13
2021	Competitive	Brand Small Molecule	Wholesaler	$6.84
2021	Competitive	Brand Small Molecule	Provider	$124.07
2021	Competitive	Brand Small Molecule	GPO	$2.46
2021	Competitive	Generic Small Molecule	Manufacturer	$14.43
2021	Competitive	Generic Small Molecule	Wholesaler	$1.34
2021	Competitive	Generic Small Molecule	Provider	$22.62
2021	Competitive	Generic Small Molecule	GPO	$0.23
2021	Noncompetitive	Brand Small Molecule	Manufacturer	$899.12
2021	Noncompetitive	Brand Small Molecule	Wholesaler	$27.75
2021	Noncompetitive	Brand Small Molecule	Provider	$366.59
2021	Noncompetitive	Brand Small Molecule	GPO	$7.79
2021	Noncompetitive	Generic Small Molecule	Manufacturer	$118.37
2021	Noncompetitive	Generic Small Molecule	Wholesaler	$10.28
2021	Noncompetitive	Generic Small Molecule	Provider	$112.82
2021	Noncompetitive	Generic Small Molecule	GPO	$1.57
2022	Competitive	Brand Small Molecule	Manufacturer	$546.22
2022	Competitive	Brand Small Molecule	Wholesaler	$3.62
2022	Competitive	Brand Small Molecule	Provider	$341.48
2022	Competitive	Brand Small Molecule	GPO	$4.29
2022	Competitive	Generic Small Molecule	Manufacturer	$12.09
2022	Competitive	Generic Small Molecule	Wholesaler	$0.91

Year	Competition Status	Drug Type	Entity	Net Spending Retained per Package (2023 $)
2022	Competitive	Generic Small Molecule	Provider	$21.40
2022	Competitive	Generic Small Molecule	GPO	$0.18
2022	Noncompetitive	Brand Small Molecule	Manufacturer	$801.97
2022	Noncompetitive	Brand Small Molecule	Wholesaler	$30.98
2022	Noncompetitive	Brand Small Molecule	Provider	$483.99
2022	Noncompetitive	Brand Small Molecule	GPO	$7.28
2022	Noncompetitive	Generic Small Molecule	Manufacturer	$82.74
2022	Noncompetitive	Generic Small Molecule	Wholesaler	$2.68
2022	Noncompetitive	Generic Small Molecule	Provider	$74.03
2022	Noncompetitive	Generic Small Molecule	GPO	$1.04

Table B-11. Data for Figure 12: Distribution to Supply Chain of Payer-Beneficiary Net Spending on Biologics, Competitive vs. Noncompetitive Markets

Year	Competition Status	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	Competitive Biologics	Manufacturer	$4.57	68.22%
2020	Competitive Biologics	Wholesaler	$0.22	3.31%
2020	Competitive Biologics	Provider	$1.84	27.48%
2020	Competitive Biologics	GPO	$0.07	0.98%
2020	Noncompetitive Biologics	Manufacturer	$22.42	80.05%
2020	Noncompetitive Biologics	Wholesaler	$1.09	3.88%
2020	Noncompetitive Biologics	Provider	$4.17	14.87%
2020	Noncompetitive Biologics	GPO	$0.34	1.20%
2021	Competitive Biologics	Manufacturer	$3.75	70.20%
2021	Competitive Biologics	Wholesaler	$0.19	3.55%
2021	Competitive Biologics	Provider	$1.34	25.19%
2021	Competitive Biologics	GPO	$0.06	1.06%
2021	Noncompetitive Biologics	Manufacturer	$24.99	80.01%
2021	Noncompetitive Biologics	Wholesaler	$1.03	3.28%
2021	Noncompetitive Biologics	Provider	$4.84	15.51%
2021	Noncompetitive Biologics	GPO	$0.38	1.20%
2022	Competitive Biologics	Manufacturer	$3.07	72.04%
2022	Competitive Biologics	Wholesaler	$0.15	3.53%
2022	Competitive Biologics	Provider	$0.99	23.28%
2022	Competitive Biologics	GPO	$0.05	1.15%
2022	Noncompetitive Biologics	Manufacturer	$26.11	77.38%
2022	Noncompetitive Biologics	Wholesaler	$0.84	2.48%
2022	Noncompetitive Biologics	Provider	$6.41	18.98%
2022	Noncompetitive Biologics	GPO	$0.39	1.15%

Table B-12. Data for Figure 13: Providers and Wholesalers' Margins on Biologics, Competitive vs. Noncompetitive Markets

Year	Competition Status	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	Competitive Biologics	Wholesaler	$0.22	4.46%
2020	Competitive Biologics	Provider	$1.84	26.73%
2020	Noncompetitive Biologics	Wholesaler	$1.09	4.49%
2020	Noncompetitive Biologics	Provider	$4.17	14.53%
2021	Competitive Biologics	Wholesaler	$0.19	4.57%
2021	Competitive Biologics	Provider	$1.34	24.23%
2021	Noncompetitive Biologics	Wholesaler	$1.03	3.81%
2021	Noncompetitive Biologics	Provider	$4.84	15.07%
2022	Competitive Biologics	Wholesaler	$0.15	4.34%
2022	Competitive Biologics	Provider	$0.99	22.01%
2022	Noncompetitive Biologics	Wholesaler	$0.84	3.00%
2022	Noncompetitive Biologics	Provider	$6.41	18.45%

Table B-13. Data for Figure 14: Distribution to Supply Chain of Payer-Beneficiary Net Spending per Package on Original Biologics and Biosimilars, Competitive vs. Noncompetitive Markets

Year	Competition Status	Type of Biologic	Entity	Net Spending Retained per Package (2023 $)
2020	Competitive	Original Biologic	Manufacturer	$961.99
2020	Competitive	Original Biologic	Wholesaler	$62.21
2020	Competitive	Original Biologic	Provider	$418.92
2020	Competitive	Original Biologic	GPO	$8.64
2020	Competitive	Biosimilar	Manufacturer	$775.42
2020	Competitive	Biosimilar	Wholesaler	$55.59
2020	Competitive	Biosimilar	Provider	$519.62
2020	Competitive	Biosimilar	GPO	$7.46
2020	Noncompetitive	Original Biologic	Manufacturer	$482.03
2020	Noncompetitive	Original Biologic	Wholesaler	$32.88
2020	Noncompetitive	Original Biologic	Provider	$155.65
2020	Noncompetitive	Original Biologic	GPO	$4.26
2021	Competitive	Original Biologic	Manufacturer	$892.30
2021	Competitive	Original Biologic	Wholesaler	$51.01
2021	Competitive	Original Biologic	Provider	$258.15
2021	Competitive	Original Biologic	GPO	$8.16
2021	Competitive	Biosimilar	Manufacturer	$568.14
2021	Competitive	Biosimilar	Wholesaler	$64.36
2021	Competitive	Biosimilar	Provider	$493.05
2021	Competitive	Biosimilar	GPO	$6.70
2021	Noncompetitive	Original Biologic	Manufacturer	$575.63
2021	Noncompetitive	Original Biologic	Wholesaler	$33.97
2021	Noncompetitive	Original Biologic	Provider	$185.83
2021	Noncompetitive	Original Biologic	GPO	$5.26
2022	Competitive	Original Biologic	Manufacturer	$757.70
2022	Competitive	Original Biologic	Wholesaler	$40.50
2022	Competitive	Original Biologic	Provider	$296.85
2022	Competitive	Original Biologic	GPO	$8.08
2022	Competitive	Biosimilar	Manufacturer	$468.73
2022	Competitive	Biosimilar	Wholesaler	$50.42
2022	Competitive	Biosimilar	Provider	$324.00
2022	Competitive	Biosimilar	GPO	$5.61
2022	Noncompetitive	Original Biologic	Manufacturer	$469.63
2022	Noncompetitive	Original Biologic	Wholesaler	$21.31
2022	Noncompetitive	Original Biologic	Provider	$212.16
2022	Noncompetitive	Original Biologic	GPO	$4.28

Table B-14. Data for Figure 15: Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs, by 340B Discount Status

Year	Discount Status	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	340B	Manufacturer	$8.63	66.94%
2020	340B	Wholesaler	$0.65	5.08%
2020	340B	Provider	$3.57	27.69%
2020	340B	GPO	$0.04	0.29%
2020	Non-340B	Manufacturer	$22.46	77.49%
2020	Non-340B	Wholesaler	$0.87	3.01%
2020	Non-340B	Provider	$5.22	18.02%
2020	Non-340B	GPO	$0.43	1.47%
2021	340B	Manufacturer	$9.16	67.31%
2021	340B	Wholesaler	$0.62	4.54%
2021	340B	Provider	$3.78	27.83%
2021	340B	GPO	$0.04	0.32%
2021	Non-340B	Manufacturer	$23.85	79.64%
2021	Non-340B	Wholesaler	$0.82	2.74%
2021	Non-340B	Provider	$4.82	16.10%
2021	Non-340B	GPO	$0.46	1.52%
2022	340B	Manufacturer	$9.22	59.57%
2022	340B	Wholesaler	$0.53	3.43%
2022	340B	Provider	$5.68	36.72%
2022	340B	GPO	$0.04	0.28%
2022	Non-340B	Manufacturer	$23.77	81.93%
2022	Non-340B	Wholesaler	$0.59	2.03%
2022	Non-340B	Provider	$4.20	14.48%
2022	Non-340B	GPO	$0.45	1.55%

Table B-15. Data for Figure 16: Providers and Wholesalers' Margins on All Drugs, by 340B Discount Status

Year	Discount Status	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	340B	Wholesaler	$0.65	7.05%
2020	340B	Provider	$3.57	27.69%
2020	Non-340B	Wholesaler	$0.87	3.57%
2020	Non-340B	Provider	$5.22	17.36%
2021	340B	Wholesaler	$0.62	6.32%
2021	340B	Provider	$3.78	27.83%
2021	Non-340B	Wholesaler	$0.82	3.14%
2021	Non-340B	Provider	$4.82	15.37%
2022	340B	Wholesaler	$0.53	5.44%
2022	340B	Provider	$5.68	36.72%
2022	Non-340B	Wholesaler	$0.59	2.28%
2022	Non-340B	Provider	$4.20	13.79%

Table B-16. Data for Figure 17: Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs, by Therapeutic Area

Year	Therapeutic Area	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	All Other Therapeutic Areas	Manufacturer	$12.27	75.56%
2020	All Other Therapeutic Areas	Wholesaler	$0.70	4.30%
2020	All Other Therapeutic Areas	Provider	$3.07	18.90%
2020	All Other Therapeutic Areas	GPO	$0.20	1.25%
2020	Immune Modulators	Manufacturer	$4.44	72.54%
2020	Immune Modulators	Wholesaler	$0.13	2.13%
2020	Immune Modulators	Provider	$1.48	24.20%
2020	Immune Modulators	GPO	$0.07	1.12%
2020	Oncologics	Manufacturer	$14.38	73.68%
2020	Oncologics	Wholesaler	$0.70	3.58%
2020	Oncologics	Provider	$4.24	21.74%
2020	Oncologics	GPO	$0.19	1.00%
2021	All Other Therapeutic Areas	Manufacturer	$12.76	77.35%
2021	All Other Therapeutic Areas	Wholesaler	$0.71	4.31%
2021	All Other Therapeutic Areas	Provider	$2.81	17.03%
2021	All Other Therapeutic Areas	GPO	$0.22	1.31%
2021	Immune Modulators	Manufacturer	$4.82	76.11%
2021	Immune Modulators	Wholesaler	$0.06	0.93%
2021	Immune Modulators	Provider	$1.38	21.78%
2021	Immune Modulators	GPO	$0.07	1.17%
2021	Oncologics	Manufacturer	$15.42	74.45%
2021	Oncologics	Wholesaler	$0.67	3.22%
2021	Oncologics	Provider	$4.42	21.32%
2021	Oncologics	GPO	$0.21	1.01%
2022	All Other Therapeutic Areas	Manufacturer	$11.90	75.34%
2022	All Other Therapeutic Areas	Wholesaler	$0.55	3.49%
2022	All Other Therapeutic Areas	Provider	$3.14	19.91%
2022	All Other Therapeutic Areas	GPO	$0.20	1.26%
2022	Immune Modulators	Manufacturer	$4.99	77.23%
2022	Immune Modulators	Wholesaler	$0.04	0.61%
2022	Immune Modulators	Provider	$1.35	20.96%
2022	Immune Modulators	GPO	$0.08	1.20%
2022	Oncologics	Manufacturer	$16.09	72.42%
2022	Oncologics	Wholesaler	$0.53	2.38%
2022	Oncologics	Provider	$5.38	24.22%
2022	Oncologics	GPO	$0.22	0.98%

Table B-17. Data for Figure 18: Providers and Wholesalers' Margins on All Drugs, by Therapeutic Area

Year	Therapeutic Area	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	All Other Therapeutic Areas	Wholesaler	$0.70	5.16%
2020	All Other Therapeutic Areas	Provider	$3.07	18.27%
2020	Immune Modulators	Wholesaler	$0.13	2.77%
2020	Immune Modulators	Provider	$1.48	23.62%
2020	Oncologics	Wholesaler	$0.70	4.52%
2020	Oncologics	Provider	$4.24	21.31%
2021	All Other Therapeutic Areas	Wholesaler	$0.71	4.99%
2021	All Other Therapeutic Areas	Provider	$2.81	16.26%
2021	Immune Modulators	Wholesaler	$0.06	1.17%
2021	Immune Modulators	Provider	$1.38	21.18%
2021	Oncologics	Wholesaler	$0.67	4.03%
2021	Oncologics	Provider	$4.42	20.85%
2022	All Other Therapeutic Areas	Wholesaler	$0.55	4.20%
2022	All Other Therapeutic Areas	Provider	$3.14	19.10%
2022	Immune Modulators	Wholesaler	$0.04	0.76%
2022	Immune Modulators	Provider	$1.35	20.26%
2022	Oncologics	Wholesaler	$0.53	3.08%
2022	Oncologics	Provider	$5.38	23.63%

Table B-18. Data for Figure 19: Distribution to Supply Chain of Payer-Beneficiary Net Spending on All Drugs, by Acute vs. Chronic Condition

Year	Type of Condition	Entity	Amount of Net Spending Retained (Billion 2023 $)	Percentage of Net Spending Retained
2020	Acute	Manufacturer	$22.81	74.06%
2020	Acute	Wholesaler	$1.28	4.15%
2020	Acute	Provider	$6.38	20.70%
2020	Acute	GPO	$0.34	1.09%
2020	Chronic	Manufacturer	$8.16	74.73%
2020	Chronic	Wholesaler	$0.24	2.18%
2020	Chronic	Provider	$2.40	21.93%
2020	Chronic	GPO	$0.13	1.16%
2021	Acute	Manufacturer	$23.86	73.80%
2021	Acute	Wholesaler	$1.19	3.69%
2021	Acute	Provider	$6.93	21.42%
2021	Acute	GPO	$0.35	1.09%
2021	Chronic	Manufacturer	$8.95	81.47%
2021	Chronic	Wholesaler	$0.25	2.26%
2021	Chronic	Provider	$1.64	14.96%
2021	Chronic	GPO	$0.14	1.31%
2022	Acute	Manufacturer	$23.94	72.42%
2022	Acute	Wholesaler	$0.98	2.97%
2022	Acute	Provider	$7.78	23.55%
2022	Acute	GPO	$0.35	1.06%
2022	Chronic	Manufacturer	$8.77	79.03%
2022	Chronic	Wholesaler	$0.14	1.27%
2022	Chronic	Provider	$2.05	18.44%
2022	Chronic	GPO	$0.14	1.25%

Table B-19. Data for Figure 20: Providers and Wholesalers' Margins on All Drugs, by Acute vs. Chronic Condition

Year	Type of Condition	Entity	Margin (Billion 2023 $)	Margin Percentage
2020	Acute	Wholesaler	$1.28	5.15%
2020	Acute	Provider	$6.38	20.23%
2020	Chronic	Wholesaler	$0.24	2.71%
2020	Chronic	Provider	$2.40	21.18%
2021	Acute	Wholesaler	$1.19	4.60%
2021	Acute	Provider	$6.93	20.86%
2021	Chronic	Wholesaler	$0.25	2.54%
2021	Chronic	Provider	$1.64	14.23%
2022	Acute	Wholesaler	$0.98	3.80%
2022	Acute	Provider	$7.78	22.92%
2022	Chronic	Wholesaler	$0.14	1.50%
2022	Chronic	Provider	$2.05	17.59%