CONTRACTOR PROJECT REPORT

International Prescription Drug Price Comparisons: Estimates Using 2022 Data

Assistant Secretary for Planning and Evaluation (ASPE)
U.S. Department of Health & Human Services

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This research was funded by the U.S. Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation under Contract Number HHSP233201500038I and carried out within the Payment, Cost, and Coverage Program in RAND Health Care.

Please visit https://aspe.hhs.gov/prescription-drugs for more information about ASPE research on prescription drugs.

ASPE Executive Summary

The Office of the Assistant Secretary for Planning and Evaluation (ASPE) contracted with RAND Health Care to analyze IQVIA MIDAS data on U.S. prescription drug prices in comparison to drug prices in other Organisation for Economic Co-operation and Development (OECD) countries. Key takeaways are summarized below.

- In 2022, U.S. prices across **all drugs** (brands and generics) were nearly three times as high as prices in 33 OECD comparison countries. For every dollar paid in other countries for drugs, consumers in the U.S. pay $2.78. The gap is widening over time as U.S. drug prices grow faster than drug prices in other countries and the mix of drugs changes.
- U.S. prices for **brand drugs** were 422 percent of prices in the comparison countries, or at least 322 percent if we adjust for estimated rebates in the U.S., but not for estimated rebates in other countries (for which data are generally unavailable).
- In contrast, U.S. prices for **unbranded generics** were lower than prices in comparison countries. For every dollar the other countries on average pay for these drugs, in the U.S., consumers pay 67 cents. Unbranded generics made up 90 percent of U.S. prescription volume, compared with 41 percent of volume in the other countries.

This study updates a prior ASPE study based on data for 2018:

Andrew W. Mulcahy, Christopher Whaley, Mahlet G. Tebeka, Daniel Schwam, Nathaniel Edenfield, and Alejandro U. Becerra-Ornelas, "International Prescription Drug Price Comparisons: Current Empirical Estimates and Comparisons with Previous Studies," July 1, 2022, https://aspe.hhs.gov/reports/international-prescription-drug-price-comparisons.

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Research Report

ANDREW W. MULCAHY, DANIEL SCHWAM, SUSAN L. LOVEJOY

International Prescription Drug Price Comparisons

Estimates Using 2022 Data

For more information on this publication, visit **www.rand.org/t/RRA788-3**.

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About This Report

This report compares prices for prescription drugs in the United States with those in other high-income countries using a price index approach. The analysis uses 2022 data and updates a previous report using 2018 data: Andrew W. Mulcahy, Christopher M. Whaley, Mahlet Gizaw, Daniel Schwam, Nathaniel Edenfield, and Alejandro Uriel Becerra-Ornelas, *International Prescription Drug Price Comparisons: Current Empirical Estimates and Comparisons with Previous Studies*, RAND Corporation, RR-2956-ASPEC, 2021b.

The current report, like the prior version, compares prices for different categories of drug products, including brand-name originator drugs, unbranded generic drugs, biologics, and nonbiologic drugs. This report adds new analyses on biosimilar price comparisons and on changes in price comparison findings over time.

This research was funded by the U.S. Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation under Contract No. HHSP23320095649WC-TO38, and the update was funded under Contract No. HHSP233201500038I and carried out within the Payment, Cost, and Coverage Program in RAND Health Care.

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RAND Health Care Communications
1776 Main Street
P.O. Box 2138
Santa Monica, CA 90407-2138
(310) 393-0411, ext. 7775
RAND_Health-Care@rand.org

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Ornelas were coauthors on the earlier report. We thank Christine Eibner and Erin Taylor of RAND and Patricia Danzon of the University of Pennsylvania for their suggestions and comments as peer reviewers of the initial report (Mulcahy et al., 2021b), and we thank Annetta Zhou, Christine Buttorff, and Erin Taylor of RAND for their review of new material in this report.

Summary

Understanding the extent to which prescription drug prices are higher in the United States than in other countries—after accounting for differences in the volume and mix of drugs—is useful when developing and targeting policies to address both growth in drug spending and the financial impact of prescription drugs on consumers.

A prior RAND analysis compared 2018 manufacturer gross drug prices in the United States with those in 32 Organisation for Economic Co-operation and Development (OECD) countries using a price index approach.[1] The earlier analysis reported results for all drugs combined, for specific categories of drugs, and under different methodological approaches. This report updates the main results from this earlier report using more recent data through 2022.[2] It also includes new analyses focusing on price comparisons for biosimilars and changes in price comparison results over time.

In brief, when analyzing data for all prescription drugs available in the United States and comparison countries, we found that U.S. manufacturer gross prices for drugs in 2022 were 278 percent of prices in the 33 OECD comparison countries combined. Put another way, prices in other countries were 36 percent—or a little more than one-third—of those in the United States.

These results stem from the combination of starkly different price comparison findings for brand-name versus generic drugs: U.S. prices for brand-name originator drugs were 422 percent of prices in comparison countries, while U.S. unbranded generics, which we found account for 90 percent of U.S. prescription volume, were on average cheaper at 67 percent of prices in comparison countries, where on average only 41 percent of prescription volume is for unbranded generics. U.S. prices for brand-name drugs remained 308 percent of prices in other countries even after adjustments to account for rebates paid by drug companies to U.S. payers and their pharmacy benefit managers.

These high-level findings from the current report are consistent with results from the prior analysis using 2018 data.[3] Overall, the gap between U.S. and other countries' prices widened slightly between the two analyses because of faster growth in U.S. prices, a change in U.S. drug

[1] Andrew W. Mulcahy, Christopher M. Whaley, Mahlet Gizaw, Daniel Schwam, Nathaniel Edenfield, and Alejandro Uriel Becerra-Ornelas, *International Prescription Drug Price Comparisons: Current Empirical Estimates and Comparisons with Previous Studies*, RAND Corporation, RR-2956-ASPEC, 2021b.

[2] The prior analysis compared U.S. prices with those in 32 OECD countries. Colombia joined the OECD in April 2020, after the prior analysis was completed. Our main results in this updated report include Colombia. Costa Rica became an OECD member in May 2021 but is not included in this updated analysis because IQVIA's MIDAS data do not include Costa Rica as a separate market.

[3] Mulcahy et al., 2021b.

mix, a change in the overlap of drugs sold in both the United States and other countries, or a combination of factors.

Study Approach

We used 2022 IQVIA MIDAS data to calculate price indexes comparing prescription drug prices in the United States with those in 33 OECD comparison countries.[4] For our main results, we used presentation-level data (that is, data with separate records for each combination of active ingredient, formulation, and dosage strength) for all prescription drugs in the IQVIA MIDAS dataset.[5] We then compared prices between the United States and individual OECD comparison countries bilaterally, using as many presentations overlapping between the United States and the other markets.[6] Separately, we compared U.S. prices with those in all other countries in our data aggregated together as a summary measure. We used U.S. volume weights (that is, the share of total volume accounted for by each presentation) to calculate price indexes because of our interest in price differences from a U.S. policy perspective.

IQVIA MIDAS sales and volume estimates are projected from IQVIA's audits of standardized list prices and manufacturer, wholesaler, and other invoices; they do not reflect net prices realized by the manufacturers. These data are designed to support country-level trend and pattern analyses, but they remain estimates. The MIDAS data used in this analysis were obtained under license from IQVIA. Our MIDAS extract was prepared on May 19, 2023. The main body of the report presents results in bar charts comparing U.S. prices with those in G7 (to focus the comparison on larger OECD economies), excluding the United States—plus Mexico due to its geographic proximity to the United States and its close economic connections with the United States under the United States–Mexico–Canada Agreement) (results for other countries are available in Appendix B). We separately report a comparison of U.S. prices with prices in the 33 comparison countries combined. Price indexes greater than 100 indicate that U.S. prices are higher than those in the comparison country; indexes less than 100 indicate that U.S. prices are lower than those in the comparison country.

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[4] MIDAS is a registered trademark of IQVIA. This report does not reproduce any IQVIA MIDAS data directly.

[5] To avoid outlier presentations from exerting undue influence on our overall results, we excluded a small number of observations with (1) very low volume or sales or a given country and presentation, or (2) extreme ratios of U.S. prices to other-country prices.

[6] The share of volume and sales contributing to each analysis varied widely but was generally considerably less than 100 percent. For example, for the United States–Canada comparison, 72 and 63 percent of Canadian and U.S. volume and 84 and 71 percent of Canadian and U.S. sales, respectively, contributed to our analysis. Among the Group of Seven (G7) countries, Japan had the smallest overlap with the United States, with only 17 and 30 percent of Japanese and U.S. volume and 48 and 46 percent of Japanese and U.S. sales, respectively, contributing to our analyses. The overlap in drugs sold in the United States and Japan was much higher at the active ingredient level (rather than the presentation level) at nearly 60 percent of volume and 80 percent of sales. This finding motivated robustness checks (as described in the main body of the report) wherein we calculated prices at the active ingredient rather than the presentation level.

Gross Price Comparison Results

In 2022, U.S. prices across all drugs were 278 percent of prices in the 33 OECD comparison countries.[7] Prices in the United States were higher than those in each individual comparison country (see Figure S.1 for comparisons of U.S. prices with those in the G7 countries and Mexico). For example, U.S. prices were 229 percent of prices in Canada (or, alternatively, Canadian prices were 44 percent of U.S. prices). Across all 33 comparison countries, U.S. prices ranged from 172 percent of prices in Mexico to 1,028 percent of prices in Turkey (see Appendix B for comparisons with individual countries).

The gap between U.S. prices and prices in other countries was larger for brand-name originator drugs. U.S. prices were 422 percent of prices of non-U.S. countries for these drugs. However, prices for unbranded generic drugs were generally lower in the United States than in other countries. U.S. prices were 67 percent of prices of non-U.S. countries for unbranded generics. We found that U.S. prices were higher than most comparison countries when combining data for all non-originator drugs, including unbranded generics and brand-name non-originator drugs.[8]

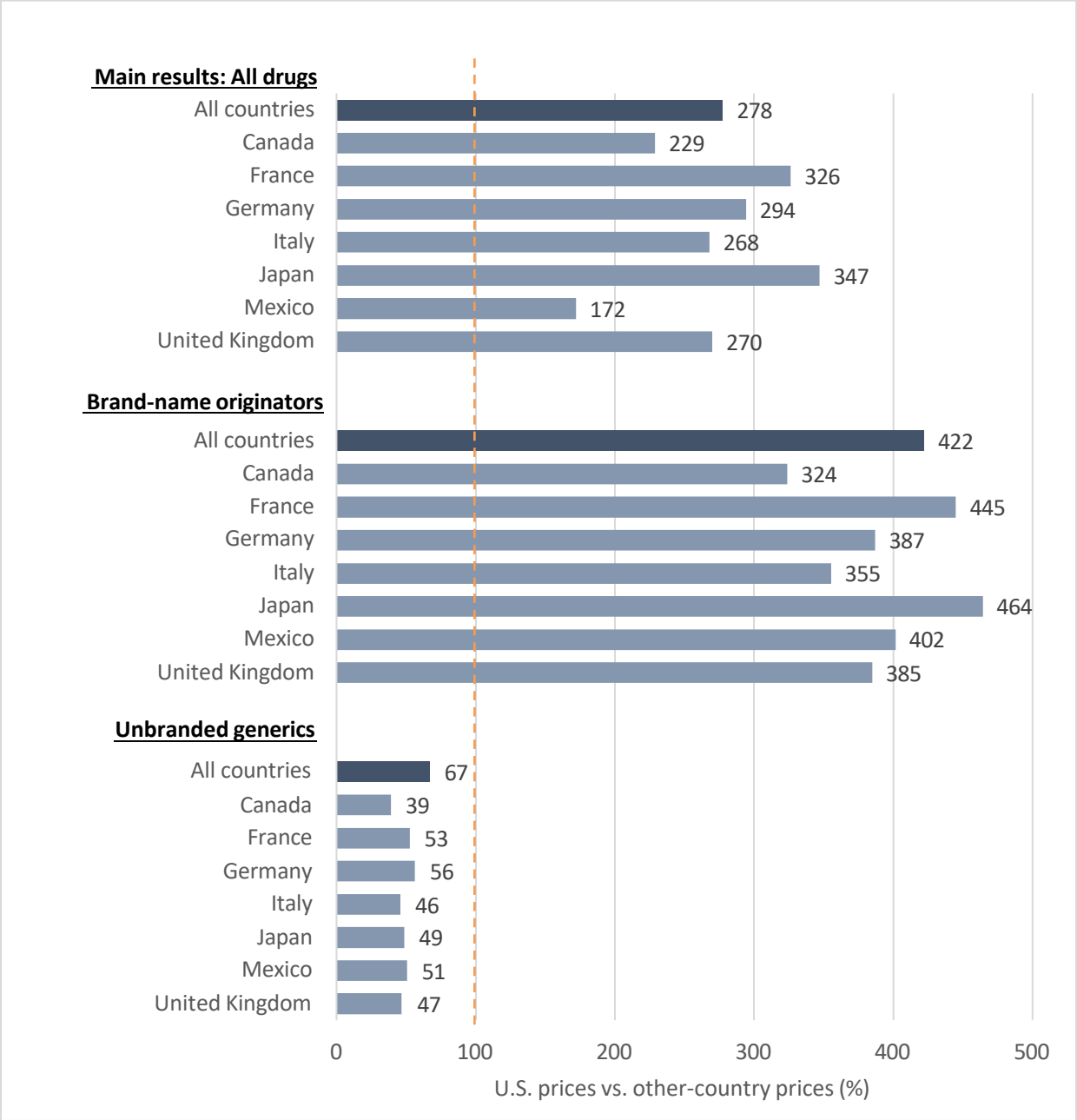
France and Japan generally have the lowest prices among the comparison countries for all drugs and for brand-name originator, biologics, and nonbiologic drugs separately. Canada, Germany, and the United Kingdom tend to have higher prices across each subset of drugs.

Our main findings—that U.S. gross prices are higher than those in comparison countries for all drugs and for brand-name originator drugs but lower for unbranded generic drugs—held through several additional sensitivity analyses related to how price indexes were calculated.

[7] The number of drug presentations included in each bilateral analysis varied given the overlap between U.S. and comparison country data. The analysis comparing U.S. prices with prices in all comparison countries combined used data from 4,690 presentations and 1,646 active ingredients.

[8] Prices in the United States were exactly 100 percent of prices in all other countries combined when unbranded generics and brand-name non-originator drugs were combined. While drugs labeled in IQVIA MIDAS as "unbranded non-originator" drugs are primarily unbranded generics, drugs designated as brand-name non-originators are more diverse and include (1) multisource branded generics (generic drugs marketed under a brand name, which is common in some countries outside the United States but very rare in the United States) and (2) brand-name drugs approved in the United States via the 505(b)(2) regulatory approval pathway (such as EpiPen). Drugs in the second category are often non-originator drugs, but they might be priced and marketed as brand-name originator drugs.

Figure S.1. U.S. Manufacturer Gross Prescription Drug Prices as a Percentage of Prices in Selected Other Countries, All Drugs, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, "MIDAS," webpage, undated (run date May 19, 2023).
NOTE: *All countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Biologics were excluded from unbranded generics. Only some presentations sold in each country contribute to bilateral comparisons. *Brand-name originators* and *Unbranded generics* reflect IQVIA's assignment of drug products in individual countries.

Addressing U.S. Gross-to-Net Discounts

One important limitation of our analysis is that we use manufacturer prices for the purposes of comparison, because net prices (that is, the prices realized by manufacturers after negotiated and other discounts are applied) are not released by the pharmaceutical companies. The magnitude of the difference between manufacturer gross and net prices is difficult to quantify across all drugs. Net prices reflect confidential rebates negotiated between manufacturers and plan sponsors (often through their pharmacy benefit managers) that vary depending on market conditions and negotiating leverage. Net prices also reflect Medicaid best price and rebate program provisions, discounts from the 340B prescription drug discount program that may or may not be applied as drugs are sold by manufacturers, and discounts from other sources. In cases in which net prices can be reliably estimated, the magnitude of gross-to-net reductions varies substantially across therapeutic classes.[9]

To assess how our results might change if net price information were available, we conducted a final set of sensitivity analyses in which we adjusted U.S. prices downward based on published estimates of the relative differences between manufacturer gross and net prices. The resulting U.S. prices remained substantially higher than prices in other countries—but with a smaller difference than in our main results. When adjusting prices for U.S. brand-name drugs dispensed through the retail channel downward by 37.2 percent,[10] U.S. prices for brand-name drugs were 308 percent of prices in other countries (versus 422 percent in our main results).

Because of a lack of available estimates, we did not adjust prices in other countries downward to reflect increasingly common discounts on manufacturer prices.[11] U.S. prices would appear relatively higher—that is, more in line with our main results—if we were able to also adjust for rebates and other discounts applied to manufacturer prices in other countries.

Building on prior findings, this update provides further evidence that gross manufacturer drug prices are higher in the United States than in comparison countries. Although we apply a single, market-wide adjustment to approximate rebates and other discounts applied to U.S. brand-name prices, we recognize gross-to-net margins vary substantially across drugs and therapeutic classes and that our estimates of U.S. net prices therefore incorporate substantial measurement error. We also recognize that resulting price indexes will understate differences between prices in the United States and other countries because they adjust only U.S. prices

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[9] Andrew W. Mulcahy, Daniel Schwam, Preethi Rao, Stephanie Rennane, and Kanaka Shetty, "Estimated Savings from International Reference Pricing for Prescription Drugs," *JAMA*, Vol. 326, No. 17, 2021a.

[10] We calculated the 37.2 percent as one minus the 2022 ratio of net to invoice prices measured across protected brand drugs from IQVIA Institute for Human Data Science, *The Use of Medicines in the U.S. 2023: Usage and Spending Trends and Outlook to 2027*, May 2, 2023b.

[11] Ulf Persson and Bengt Jönsson, "The End of the International Reference Pricing System?" *Applied Health Economics and Health Policy*, Vol. 14, No. 1, 2016.

downward even though rebates and similar discounts are increasingly common in other countries.

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Chapter 1. Introduction and Background

U.S. health plans and patients paid an estimated $603 billion for prescription drugs in 2022.[12] Even after adjusting for general inflation, U.S. retail prescription drug spending increased by 91 percent from 2000 to 2020,[13] and spending is expected to further increase by 5 percent year-on-year through 2030.[14] These spending levels and trends reflect net spending on drugs—that is, spending after adjusting for rebates and other discounts paid to health plans and their pharmacy benefit managers (PBMs). Without considering these important reductions, gross spending by health plans and patients is growing even more rapidly, driven in part by increasing list prices for drugs.[15]

Previous research demonstrates that spending on prescription drugs is higher in the United States than in other countries on a per capita basis but accounts for a similar share of total health care spending.[16] Utilization rates, the mix of dispensed drugs, and prices all contribute to higher U.S. spending on drugs.[17] The relationships among utilization rates, mix, and price are complex. However, when holding utilization rates and the mix of drugs constant, higher prices translate directly to higher spending on drugs—which, in turn, contributes to higher health insurance premiums and higher out-of-pocket spending by patients on health care more broadly.

The robust policy discussion surrounding U.S. prescription drug prices focuses on whether prices in the United States are too high or appropriate relative to the benefits that they offer to patients. Broad, systematic comparisons of U.S. drug prices to those in other high-income countries are useful for informing this discussion. International drug price comparisons also have the potential to serve as a more direct input in future U.S. drug price policy. For example, recent but now abandoned policy proposals and initiatives include international reference pricing for certain Medicare Part B drugs and using international prices for drugs as a ceiling for negotiated

[12] IQVIA Institute for Human Data Science, *The Use of Medicines in the U.S. 2023: Usage and Spending Trends and Outlook to 2027*, May 2, 2023b.

[13] U.S. Centers for Medicare & Medicaid Services (CMS), "National Health Expenditure Data," webpage, undated-b.

[14] John A. Poisal, Andrea M. Sisko, Gigi A. Cuckler, Sheila D. Smith, Sean P. Keehan, Jacqueline A. Fiore, Andrew J. Madison, and Kathryn E. Rennie, "National Health Expenditure Projections, 2021–30: Growth to Moderate as COVID-19 Impacts Wane," *Health Affairs*, Vol. 41, No. 4, 2022.

[15] Bosworth, Arielle, Steven Sheingold, Kenneth Finegold, Nancy De Lew, and Benjamin D. Sommers, "Price Increases for Prescription Drugs, 2016–2022," Office of the Assistant Secretary for Planning and Evaluation, 2022.

[16] Dana O. Sarnak, David Squires, and Shawn Bishop, "Paying for Prescription Drugs Around the World: Why Is the U.S. an Outlier?" Commonwealth Fund, October 5, 2017.

[17] Comparisons of prescription drug spending involve volume and mix in addition to price. Some studies attempt to decompose differences in spending along these dimensions. See, for example, Sarnak, Squires, and Bishop, 2017.

U.S. prices.[18] Other current and future policy proposals may rely on prices in other countries as a benchmark for determining fair U.S. drug prices.[19]

Report Updates

A prior RAND Corporation report systematically compared U.S. with other countries' drug prices using 2018 data.[20] Like the earlier report, this update presents descriptive comparisons of drug prices between the United States and other high-income Organisation for Economic Co-operation and Development (OECD) countries using price indexes as a basis for comparison. Our updated analyses use data from 2022. Although the main analyses in the report focus on gross prices received by manufacturers, we estimate price comparisons with adjustments to reflect important gross-to-net discounts for brand-name drugs in the United States.

In addition to results from a similar array of subgroup analyses and robustness checks that were included in the earlier report, this update presents the following findings from new analyses, including price comparisons for subsets of drugs with the potential to lower drug prices and spending in the United States: biosimilars and their reference biologics (which are previously approved biologics that biosimilar applicants reference to support their biosimilar application). This update also introduces an analysis of trends in price comparison results from 2017 to 2022.

Measuring Prescription Drug Prices

There are many measurable prices in prescription drug markets, with some easier than others to measure and analyze across all drug products. Figure 1.1 is a stylized comparison of the relationships between the magnitudes of key prescription drug prices for retail-dispensed, brand-name drugs. The relevant prices are in two broad categories: manufacturer prices and prices paid by health plans and their PBMs.

The largest of the three key manufacturer prices is a manufacturer-determined catalog or *list* price called wholesale acquisition cost (WAC). Despite its name, WAC is not the actual transactional price between drug companies and purchasers of drugs, such as distributors and large health care delivery systems. The actual transactional price is the *gross* or *invoice* price reflecting the amount paid, including on-invoice discounts, to the manufacturer by distributors or other buyers.

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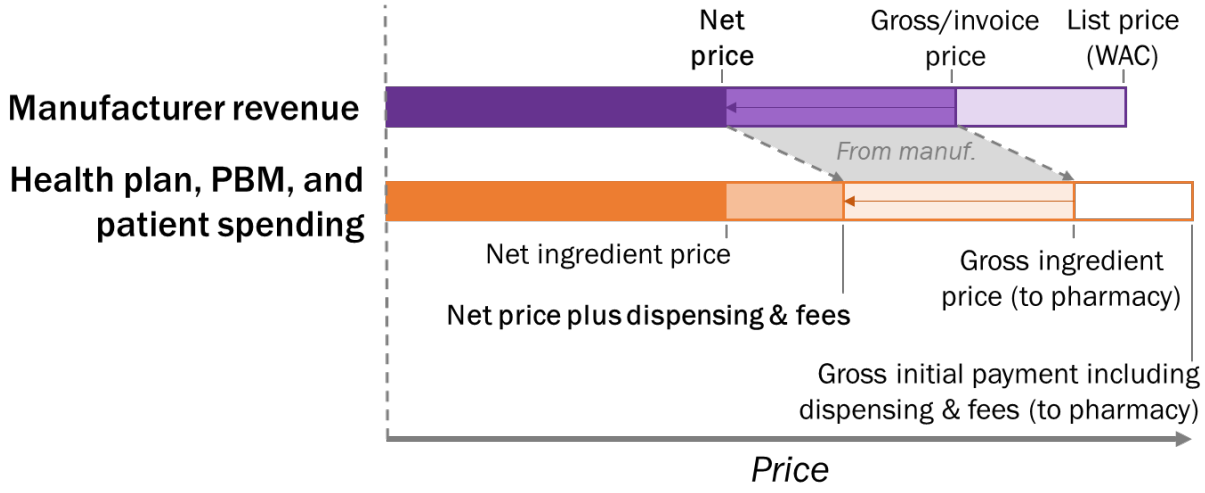
[18] CMS, "Most Favored Nation Model," webpage, undated-a; H.R. 3, Elijah E. Cummings Lower Drug Costs Now Act, April 22, 2021.

[19] One current proposal would cap U.S. prices at the median price across five high-income OECD countries. See S. 909, Prescription Drug Price Relief Act of 2021, March 23, 2021.

[20] Andrew W. Mulcahy, Christopher M. Whaley, Mahlet Gizaw, Daniel Schwam, Nathaniel Edenfield, and Alejandro Uriel Becerra-Ornelas, *International Prescription Drug Price Comparisons: Current Empirical Estimates and Comparisons with Previous Studies*, RAND Corporation, RR-2956-ASPEC, 2021b.

Manufacturer *net* prices reflect the set of complex business arrangements that have evolved over time among plan sponsors, PBMs, and drug companies. U.S. health insurers often work with a PBM to develop prescription drug formularies and benefit designs and to negotiate rebates with drug manufacturers. PBMs negotiate lower prices from manufacturers by offering larger shares of volume—driven by such tools as tiered formularies and exclusive contracts—with preferred drugs tied to lower cost-sharing for patients and fewer authorization steps for prescribing. PBMs realize these lower negotiated prices by collecting rebates from drug manufacturers. Manufacturers' net prices account for these off-invoice rebates paid after the fact.

Figure 1.1. General Drug Price Relationships for Brand-Name Drugs and Commercial PBMs or Payers



Among prices paid by health plans, patients, and their PBMs, the initial outlay to pharmacies—reflecting the price of the drug product with markups through the supply chain, dispensing fees, and potentially other amounts—is the largest. These prices appear in prescription drug claims data and are often used in analyses of drug spending.

The net price ultimately paid by the health plans and PBMs differs from the initial gross payment to pharmacies on several dimensions. First, the net price reflects rebates paid by manufacturers. These rebates determine the net manufacturer price described above and the amount paid by the health plan or PBM for the drug product itself. However, the final net price paid by health plans and PBMs is greater than the manufacturer's net revenue because of dispensing fees and other amounts paid by the health plan or PBM. Both of these net prices paid by health plans or PBMs are generally not known by policymakers and researchers because rebates from manufacturers are considered trade secrets.

Furthermore, the relationships between net prices to health plans and to PBMs are difficult to disentangle. Although PBMs are able to negotiate lower prices, the extent to which they pass the lower prices on to health plans is not well understood. All or a portion of the rebates might be

passed on to consumers through lower premiums—a process that is also opaque. Even if negotiated rebates are completely passed on to health plans, fee-based amounts paid to PBMs must also be considered. If a large portion of the rebates and other discounts is passed on to payers, then PBMs could offer value by reducing prescription drug spending, even if they retain a share of the discounts. One 2017 study suggests that PBMs retain 7 percent of U.S. spending on prescription drugs from the plan sponsor and patient perspective.[21]

Net prices—both to manufacturers and to health plans and PBMs—are likely the most relevant prices to ongoing policy discussions in the United States. Estimates of the magnitude of gross-to-net discounts hinge on two factors: (1) whether the focus is on the net price to manufacturers, PBMs, or health plans (2) and how exactly the discount is measured. One 2018 study estimated rebates of 23 percent from the plan sponsor perspective.[22] Another recent study suggests that U.S. manufacturer net prices—including rebates and other discounts—are 37 percent below invoice prices and 52 percent below WAC.[23] However, the same study finds net prices to payers are 41 percent higher than manufacturer net prices, reflecting markups and margins throughout the supply chain, including the margin retained by PBMs.[24]

In other countries, the functions performed by PBMs in the United States are typically performed by government or quasi-governmental entities, often in conjunction with direct and indirect price controls on drugs. Discounts that would not be reflected in manufacturer sales and prices are increasingly important in other countries.[25] For example, German sickness funds (similar to U.S. insurers) receive statutory rebates that are not reflected in manufacturer sales. In the United Kingdom, off-invoice discounts paid to the National Health Service and formulary-based rebates are not reflected in manufacturer sales.

Although drug prices after rebates and all discounts are particularly relevant to U.S. policymakers and payers, data on prices measured in this way have historically not been available to researchers. Researchers increasingly use estimates of net prices from third-party vendors and from U.S. Securities and Exchange Commission filings from publicly traded drug companies to approximate U.S. manufacturer net prices.

Our analysis uses IQVIA MIDAS licensed data, which offer data on volume and spending at manufacturer list or invoice prices (depending on the country) for nearly all OECD countries and

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[21] Neeraj Sood, Tiffany Shih, Karen Van Nuys, and Dana Goldman, "Flow of Money Through the Pharmaceutical Distribution System," Leonard D. Schaeffer Center for Health Policy & Economics, June 6, 2017.

[22] Charles Roehrig, *The Impact of Prescription Drug Rebates on Health Plans and Consumers*, Altarum Institute, April 2018.

[23] IQVIA Institute for Human Data Science, *The Global Use of Medicines 2023: Outlook to 2027*, January 18, 2023a, p. 65.

[24] The IQVIA report estimates 2022 net manufacturer revenue of $429 billion versus 2022 payer net payments of $603 billion, or 41 percent higher. IQVIA Institute for Human Data Science, 2023a, pp. 27, 29.

[25] Ulf Persson and Bengt Jönsson, "The End of the International Reference Pricing System?" *Applied Health Economics and Health Policy*, Vol. 14, No. 1, 2016.

drugs.[26] For single-source brand-name drugs, these prices are likely between manufacturer net prices and WAC. In Chapter 2, we present results from some price comparisons, applying aggregate U.S. gross-to-net adjustment factors to approximate how U.S. net prices would compare with those in other countries. However, the resulting price comparisons understate differences between prices in the United States and other countries because they adjust only U.S. prices downward, even though rebates and similar discounts are increasingly common in other countries. We return to these gross-versus-net–price issues as a limitation of our price index approach in Chapter 4.

The Motivation for Price Indexes

Calculating the average price for drugs in one country by dividing total drug sales and volume yields a result that reflects both prices and the mix of drugs used. Prescription drug utilization can vary from country to country on many dimensions, such as the following:

- mix of *active ingredients* (specific molecules or combinations of molecules)
- mix of *presentations* (prices and quantities calculated narrowly for each combination of an active ingredient, formulation, and strength)
- mix of manufacturers for each active ingredient and presentation
- mix of brand-name originator, brand-name non-originator, unbranded generic, and over-the-counter drugs
- mix of drugs that reach patients through retail outlets, health care facilities, and other channels.

Without addressing differences in mix, a comparison of average prices in two countries may say as much about differences in the mix (or *market basket*) of drugs in those countries as it does about prices directly. For example, if the mix of drugs in the United States contains a greater number of expensive brand-name originator drugs than the mix in a comparison country, the resulting difference in average price could be the result of this difference in mix; a difference in price; or, most likely, both.

Price indexes are a tool used to compare differences in prices over time or across markets (such as countries). The rationale behind price indexes is that a comparison of prices is most meaningful when it focuses on prices alone without the risk of interference from differences in the mix of products. Price indexes accomplish this by holding a market basket of goods constant while allowing prices to vary across markets. The best-known price index—the Consumer Price Index (CPI)—is calculated by the U.S. Department of Labor's Bureau of Labor Statistics and compares prices for a broad market basket of consumer goods over time. The approach that serves as the foundation for the CPI can be used to compare prices for market baskets of prescription drugs between countries.

[26] IQVIA MIDAS includes (subtracts) customary discounts that appear on invoices, so these prices will be below manufacturer gross, which we do not know directly.

The prior RAND report described the many methodological decisions needed to calculate and compare price indexes for prescription drugs—for example, whether to use a U.S., other-country, or blended market basket (or *volume weights*); the breadth of products included; and whether to adjust prices to account for differences in purchasing power parity.[27]

Prior Research

In Mulcahy et al., 2021b, the authors found that 2018 U.S. prices across all drugs were 256 percent of prices in other OECD countries. U.S. prices for brand-name originator drugs were relatively higher at 344 percent of prices in other countries, while prices for unbranded generics were generally cheaper in the United States versus other countries. Findings from a broad set of subgroup analyses and robustness checks yielded results similar to those presented in this report. In general, as we discuss in Chapter 4, the gap between U.S. and other countries' prices is slightly larger in the results presented here compared with those in Mulcahy et al., 2021b.

Several prior studies used similar data and price index approaches to systematically compare U.S. and other countries' drug prices.[28] These studies consistently found higher U.S. prices for drugs, especially for brand-name drugs.[29] However, each of these studies used data that are now over a decade old.

A small number of more-recent studies directly compares U.S. to other countries' drug prices—for example, Mattingly et al., 2021, and Kang et al., 2021.[30] These studies cover a relatively small number of drugs (20 brand and 20 generic drugs in Mattingly et al., 2021, and 79 top drugs by spending in Kang et al., 2021) and use prices from a relatively small set of countries (ten OECD countries in Mattingly et al., 2021, and Canada, Japan, and the United Kingdom in

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[27] Mulcahy et al., 2021b.

[28] The studies described in this section are each broad, systematic comparisons of U.S. to other-country drug prices. Other studies present price comparisons for much smaller sets of drugs (e.g., the top seven drugs by sales in the United States) and sometimes for individual drugs. Comparing prices for specific drugs or narrow sets of drugs might not yield results that are representative of broader price differences because each specific drug represents a small share of total utilization and spending. See Mulcahy et al., 2021b, for more information on these narrower studies.

[29] See Patricia M. Danzon and Michael F. Furukawa, "Prices and Availability of Biopharmaceuticals: An International Comparison," *Health Affairs*, Vol. 25, No. 5, 2006; Patricia M. Danzon and Michael F. Furukawa, "International Prices and Availability of Pharmaceuticals in 2005," *Health Affairs*, Vol. 27, No. 1, 2008; Panos Kanavos and Sotiris Vandoros, "Determinants of Branded Prescription Medicine Prices in OECD Countries," *Health Economics, Policy and Law*, Vol. 6, No. 3, 2011; and Panos Kanavos, Alessandra Ferrario, Sotiris Vandoros, and Gerard F. Anderson, "Higher US Branded Drug Prices and Spending Compared to Other Countries May Stem Partly from Quick Uptake of New Drugs," *Health Affairs*, Vol. 32, No. 4, 2013. See also Mulcahy et al., 2021b, for a detailed comparison of the methods and results from these studies.

[30] T. Joseph Mattingly II, Dominique Seo, Adam M. Ostrovsky, David J. Vanness, and Rena M. Conti, "60 Years After Kefauver: Household Income Required to Buy Prescription Drugs in the United States and Abroad," *Research in Social Administrative Pharmacy*, Vol. 17, No. 8, 2021; So-Yeon Kang, Michael J. DiStefano, Mariana P. Socal, and Gerard F. Anderson, "Using External Reference Pricing in Medicare Part D to Reduce Drug Price Differentials with Other Countries, *Health Affairs*, Vol. 38, No. 5, 2019.

Kang et al., 2021). These studies both find that U.S. prices are higher than those in other countries. One recent study compared U.S. to other-country prices for top brand-name drugs by spending at net prices after adjusting for rebates and other discounts offered by manufacturers in the United States.[31] This study found that U.S. net prices remained roughly twice as high as manufacturer prices in other countries overall and across therapeutic classes.

Report Overview

Chapter 2 describes the methodological decisions and steps underlying our main analysis, separate analyses for several subsets of drugs, and robustness checks in which we varied methodological decisions. We present the findings from our analysis in Chapter 3. Chapter 4 concludes with a discussion on the usefulness, limitations, and future directions for price index–based systematic international comparisons of drug prices.

[31] Mulcahy et al., 2021a.

Chapter 2. Price Index–Based Drug Price Comparisons Using 2022 Data

In this chapter, we describe the data and methods for our comparisons of drug prices between the United States and OECD countries, present results from our main approach, and compare results with those from various sensitivity analyses using different sets of drugs or approaches.

Data

We used 2022 IQVIA MIDAS data for the United States and the following 33 countries:[32]

Australia	Estonia	Italy	New Zealand	Spain
Austria	Finland	Japan	Norway	Sweden
Belgium	France	Latvia	Poland	Switzerland
Canada	Germany	Lithuania	Portugal	Turkey
Chile	Greece	Luxembourg	Slovakia	United Kingdom
Colombia	Hungary	Mexico	Slovenia	
Czechia	Ireland	Netherlands	South Korea	

Our IQVIA MIDAS data extract listed sales for specific drugs in terms of quarterly 2022 *manufacturer amounts paid* in U.S. dollars, converted at quarterly exchange rates, and quarterly volume measured in *standard units*.[33] Each row in the IQVIA MIDAS extract is defined by a combination of country; manufacturer; sector (retail or hospital); active ingredient;[34] formulation

[32] Sales and volume data for calendar year 2022 (run date May 19, 2023) from IQVIA, "MIDAS," webpage, undated. Data were not available for three OECD countries: Denmark, Iceland, and Israel. Colombia joined the OECD in April 2020 and was not included in the prior analysis (Mulcahy et al., 2021b). Costa Rica became an OECD member in May 2021 but was not included in this updated analysis because IQVIA's MIDAS data does not include Costa Rica as a separate market. While we refer to *Czechia* in this report rather than the *Czech Republic* as in the previous report; this change affects table labeling only.

[33] *Manufacturer amounts paid* refers to the sale price paid to manufacturers by wholesalers or distributors as reflected on invoices. These prices might reflect bulk and other discounts paid at this point in the distribution chain. These prices do not include retail markups or rebates paid from manufacturers to insurers. Note that IQVIA MIDAS data do include other prices, including estimated retail prices, although our extract did not include these prices. Instead, IQVIA provided a set of adjustment factors that can be applied to manufacturer prices as a way to convert them to retail prices. A *standard unit* is a tablet or capsule for oral solid drug formulations; 5 mL for oral liquid formulations; and a count of vials, syringes, autoinjectors, other counting unit for injected and infused formulations, and other prespecified counting units for each other formulation.

[34] The active ingredient of a drug is the molecule that has a biologic impact or effect. Most drugs have a single active ingredient (such as simvastatin). Some drugs have multiple active ingredients (such as ezetimibe and simvastatin). We defined the active ingredient for combination drugs with multiple active ingredients as the full list of active ingredients.

and route of administration; strength; over-the-counter indicators; and indicators for whether the drug was a brand-name originator drug, a brand-name non-originator drug, or an unbranded generic drug. Each record at this level lists volume and sales for the four quarters of 2022 in the data used for our main results; analyses looking at trends over time use quarterly data from 2017 to 2022.

IQVIA MIDAS sales and volume estimates are projected from IQVIA's audits of standardized list prices and manufacturer, wholesaler, and other invoices; they do not reflect net prices realized by the manufacturers. These data are designed to support country-level trend and pattern analyses, but they remain estimates. The MIDAS data used in this analysis were obtained under license from IQVIA. Our MIDAS extract was prepared on May 19, 2023.

We excluded data for specific products flagged in the IQVIA MIDAS data as "over-the-counter" in a given country.[35] Over-the-counter drugs were out of scope for our analyses and have markedly different prices across countries. We also excluded records that did not have positive volume or sales. We aggregated the remaining records that shared the same country and presentation (that is, the same active ingredient, formulation and route of administration, and dosage strength) into a single country-presentation-level record by summing sales and volume.[36] We aggregated by presentation rather than by active ingredient to address concerns that differences in the mix of presentations relating to active ingredients could be driving differences in price. We calculated U.S. and other countries' unit prices by dividing presentation-level sales by presentation-level volume.

As in the prior RAND report, we excluded 32 country-presentation records with incorrect sales and/or volume data.[37] We also excluded 49 blood factor active ingredients from our analysis because of inconsistencies across country and channel markets in how volume was measured for these drugs in IQVIA MIDAS.[38]

Overview of Drug Markets Using IQVIA MIDAS Data

Table 2.1 compares 2022 prescription drug market size for all OECD countries with data available for analysis in an extract from the IQVIA MIDAS dataset (run date May 19, 2023). We

[35] For drugs sold over the counter in one country and by prescription in another, or sold both over the counter and by prescription in the same country, we excluded all over-the-counter products and included data from prescription products.

[36] As an example, one of the resulting rows of data from this step is U.S. sales and volume in 2018 for atorvastatin 10 mg film-coated tablets. There was a separate row for this same presentation in each country and separate rows for different presentations (such as 20 mg film-coated tablets) in each country.

[37] We excluded pertuzumab presentations in Italy, aclidinium bromide presentations in Canada, ranibizumab presentations in Germany, and gadobenic acid presentations in Hungary. These specific drugs were confirmed by IQVIA to have volume measured inconsistently across countries. Although the underlying issues may have been resolved at the time of our analysis, we excluded these records out of an abundance of caution.

[38] Blood factors accounted for 0.1 percent of volume and 0.6 percent of sales across all countries.

calculated total sales of $988.9 billion and total volume of 1,099.1 billion standard units across OECD countries in our data. The United States accounted for 62.4 percent of sales but only 23.8 percent of volume. The ratio of sales-to-volume weight is much higher in the United States than in any other country; without addressing issues around the mix of drugs, this is an initial sign that U.S. prices are much higher than those in other countries. Japan, by comparison, accounted for 6.6 percent of sales and 20.0 percent of volume.[39]

There are also important differences in the mix of drugs among countries, such as the relative contributions of brand and generic drugs to sales and volume totals. Table 2.2 presents the share of drug sales and volume from brand-name originator drugs, brand-name non-originator drugs, and unbranded drugs for each country. Brand-name originator drugs are those marketed by the original developer of the drug (that is, the originator manufacturer). Brand-name non-originator drugs are uncommon in the United States and are typically competing "branded generic" versions of off-patent drugs marketed under brand names.[40] Most generic drugs in the United States are unbranded generics. Unbranded generics accounted for greater shares of U.S. volume in 2022 than in the earlier analysis using 2018 data (90 percent in 2022 versus 84 percent in 2018).[41]

[39] The OECD countries in the analysis include eight of the ten countries globally with the most spending on prescription drugs in 2018 (the exceptions are China and Brazil). IQVIA Institute for Human Data Science, *The Global Use of Medicine in 2019 and Outlook to 2023*, January 29, 2019.

[40] IQVIA categorizes some brand-name drugs approved in the United States via the 505(b)(2) regulatory approval pathway, such as EpiPen, as brand-name non-originators. Biosimilars are categorized in IQVIA MIDAS as brand-name originator, brand-name non-originator, or unbranded depending on the product and country. Authorized generics, which are usually generic drugs manufactured and marketed under a license from the originator company, are usually listed in the unbranded generic category rather than the brand-name non-originator category.

[41] Mulcahy et al., 2021b.

Table 2.1. Prescription Drug Market Shares by Sales and Volume, 2022

Country	Sales (billions, U.S. $)	Volume (billions, standard units)	Share of Sales (%)	Share of Volume (%)
All countries	**988.9**	**1,099.1**	**100.0**	**100.0**
United States	**617.2**	**261.6**	**62.4**	**23.8**
All countries excluding the United States	**371.7**	**837.6**	**37.6**	**76.2**
Japan	64.9	219.8	6.6	20.0
Germany	46.5	63.9	4.7	5.8
France	37.5	51.1	3.8	4.6
Italy	33.0	44.3	3.3	4.0
United Kingdom	31.6	66.8	3.2	6.1
Spain	27.4	48.6	2.8	4.4
Canada	26.6	30.6	2.7	2.8
Korea	15.3	54.9	1.5	5.0
Australia	10.9	15.6	1.1	1.4
Belgium	7.3	8.8	0.7	0.8
Mexico	7.3	16.3	0.7	1.5
Poland	7.2	29.7	0.7	2.7
Turkey	6.7	73.0	0.7	6.6
Switzerland	6.5	5.8	0.7	0.5
Austria	5.7	6.5	0.6	0.6
Sweden	4.7	9.1	0.5	0.8
Portugal	4.3	11.1	0.4	1.0
Czechia	3.7	8.9	0.4	0.8
Netherlands	3.6	13.5	0.4	1.2
Norway	3.2	4.7	0.3	0.4
Greece	3.0	10.3	0.3	0.9
Finland	2.7	5.4	0.3	0.5
Ireland	2.6	4.5	0.3	0.4
Hungary	2.4	7.8	0.2	0.7
Slovakia	1.5	4.4	0.2	0.4
Chile	1.4	5.4	0.1	0.5
New Zealand	1.2	5.0	0.1	0.5
Colombia	0.9	6.1	0.1	0.6
Slovenia	0.8	1.6	0.1	0.1
Lithuania	0.7	1.8	0.1	0.2
Latvia	0.3	1.1	0.0	0.1
Estonia	0.3	0.8	0.0	0.1
Luxembourg	0.2	0.4	0.0	0.0

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: The numbers in each column might not sum to totals because of rounding.

Table 2.2. Within-Country Shares of Brand-Name Originator, Brand-Name Non-Originator, and Unbranded Generic Drugs, by Percentage

Country	Share of Sales: Brand-Name Originator	Share of Sales: Brand-Name Non-Originator	Share of Sales: Unbranded Generic	Share of Volume: Brand-Name Originator	Share of Volume: Brand-Name Non-Originator	Share of Volume: Unbranded Generic
All countries	**82**	**8**	**10**	**23**	**24**	**53**
United States	**87**	**5**	**8**	**7**	**2**	**90**
All countries excluding the United States	**74**	**13**	**13**	**29**	**31**	**41**
Australia	83	8	8	34	31	35
Austria	78	11	12	43	29	28
Belgium	84	7	9	48	15	38
Canada	77	5	19	19	11	69
Chile	31	60	9	10	41	49
Colombia	20	49	31	7	42	51
Czechia	73	19	8	31	50	18
Estonia	74	17	9	42	35	23
Finland	76	14	10	31	37	33
France	76	8	16	27	18	55
Germany	77	9	14	19	16	65
Greece	68	28	4	49	46	6
Hungary	74	17	9	38	43	20
Ireland	81	9	10	40	32	28
Italy	78	11	11	44	29	27
Japan	75	10	15	29	20	51
Korea	52	43	5	26	67	7
Latvia	65	25	11	28	42	29
Lithuania	75	17	8	40	35	25
Luxembourg	89	7	3	66	21	13
Mexico	41	50	9	15	43	42
Netherlands	61	10	29	17	11	72
New Zealand	77	15	8	23	52	26
Norway	74	12	15	37	22	41
Poland	62	32	5	24	67	9
Portugal	72	14	14	35	26	39
Slovakia	68	24	8	28	54	18
Slovenia	80	16	4	45	51	4
Spain	79	8	13	40	18	42
Sweden	76	12	12	21	27	52
Switzerland	77	8	15	39	29	33
Turkey	49	50	1	30	69	1
United Kingdom	75	8	17	22	14	64

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: The numbers in each row might not sum to totals because of rounding.

In the United States, brand-name originator drugs account for 87 percent of sales but only 7 percent of volume. Brand-name originator drugs account for a larger share of volume in

countries other than the United States (29 percent) but a smaller share of sales (74 percent). The United States has the highest share of volume for unbranded generic drugs (90 percent), and these drugs account for 8 percent of sales compared with 41 percent of volume and 13 percent of sales in the OECD comparison countries. Brand-name non-originator drugs account for larger shares of both volume (31 percent) and sales (13 percent) in the other OECD countries than in the United States, where they are only 2 percent of volume and 5 percent of sales.

Main Price Index Method

Because of our interest in price differences from a U.S. policy perspective, we used U.S. volume weights (that is, the share of total U.S. volume accounted for by each presentation) to calculate price indexes. For each bilateral comparison, we calculated a U.S. volume-weighted price equal to the sum of the products of the U.S. volume weights and U.S. prices. Similarly, we calculated an other-country volume-weighted price equal to the sum of the products of the U.S. volume weights and other countries' prices.

We used all available IQVIA MIDAS data after applying the exclusions described above (for example, for blood products) and after further excluding country presentation records with fewer than 1,000 standard units in volume or less than $1,000 in sales in both the United States and the individual comparison country.[42] See Appendix A for more information on these exclusions.

Our reported price indexes are the ratio of the U.S. volume-weighted price to the other countries' volume-weighted price scaled by 100. We did not adjust price indexes by per capita gross domestic product or purchasing power parity or for other differences across markets. To compare U.S. prices with those in other countries broadly, we calculated a separate "all non-U.S. countries" price index using prices calculated by aggregating sales and volume across all non-U.S. countries in our data. The price indexes were calculated as described earlier.

Additional Analyses

Subgroup and Sensitivity Analyses

Replicating our main approach using subgroups of presentations by type, we conducted the following additional analyses:

- We compared prices separately for all brand-name originator drugs and for unbranded generic drugs.[43] The latter analysis focuses on drugs typically thought of as generic drugs in the United States. Prior studies found that the United States had relatively low prices

[42] We excluded presentations with fewer than 1,000 standard units in volume or less than $1,000 in sales because these records tended to have outlier prices.

[43] We excluded a small number of presentations categorized as "unbranded biologics" in MIDAS when we calculated unbranded generic price indices. These presentations tended to be older biologics and not biosimilars (which are usually marketed under a brand name).

for generics and relatively high prices for brand-name originator drugs.[44] We also compared prices for brand-name non-originator and unbranded generic drugs combined (that is, combining unbranded generics and brand-name non-originator drugs).
- We compared prices for nonbiologic drugs and biologics and, among biologics, for reference biologics and biosimilars separately because manufacturer prices might be different across countries for these categories of drugs.

We also changed the following individual steps in our main method as a series of sensitivity analyses:

- We aggregated sales and volume to the active ingredient level rather than the presentation level to test whether the mix of drugs within each active ingredient is driving price differences.
- We calculated price indexes using volume weights from comparison countries rather than from the United States. Relatedly, we calculated price indexes using a blended, geometric mean of U.S. and other countries' volume weights (known as a Fisher index).
- We used retail instead of manufacturer prices to test whether higher wholesale and retail markups in other countries narrow price differences between them and the United States.
- We applied more restrictive (excluding more records) and less restrictive (excluding fewer records) price ratio exclusion criteria.

Finally, we explored how our price comparison results changed over time from 2017 through 2022. We did this in two ways: first, allowing the market basket of drugs used to compare prices to vary year to year and, second, holding the market basket constant at 2018 levels for a set of drugs sold consistently in the United States and each comparison country. Other than the addition of historical data, we used the same methods for the price comparison as in the main analysis.

Addressing U.S. Gross-to-Net Discounts

We used four approaches to adjust U.S. manufacturer gross prices to reflect rebates and other discounts leading to lower manufacturer net prices. The first approach reduced U.S. prices for *all drugs* (that is, across brand-name originator, brand-name generic, and unbranded generic drugs) by 37.7 percent—a factor calculated from IQVIA Institute, which reports ratios of manufacturer gross to net prices across all drugs[45]—then compared prices across all drugs. For each of the second through fourth approaches, we reduced U.S. retail-dispensed brand-name prices by 37.2 percent—a similar factor calculated from the same source but specifically for brand-name

[44] Danzon and Furukawa, 2008.

[45] IQVIA Institute for Human Data Science, 2023b. This IQVIA report noted invoice and manufacturer net prices as a share of WAC prices separately for all drugs and for protected brand drugs that we considered a close analog to brand-name originators. We used these estimates to calculate proportional reductions from invoice prices to net prices (as one minus the ratio of net to invoice prices). The resulting reductions to U.S. ex-manufacturer prices were 37.7 percent for all drugs and 37.2 percent for retail-dispensed brand-name originator drugs.

originator drugs.[46] The second through fourth approaches differ in the scope of drugs included in the subsequent price comparison, which were

- across **all drugs**
- across **all brand-name originator drugs**
- across **all retail brand-name originator drugs**.

Gross-to-Net Discounts Outside the United States

Although rebates and other discounts that are not reflected in manufacturer and retail sales and prices are increasingly common in other countries, our sensitivity analysis focused on adjusting U.S. prices only, recognizing that the resulting prices will understate the gap between U.S. prices and other countries' prices.

Presenting Results

Bar charts illustrate the ratio of the U.S. price index to the comparison country (or all comparison countries combined) price index (that is, other countries' prices equal 100; a result of 250 means U.S. prices are 2.5 times those in other countries). Most bar charts present results for six OECD countries with relatively large economies—Canada, France, Germany, Italy, Japan, and the United Kingdom (the Group of Seven [G7] countries, excluding the United States)—and for Mexico because of its geographic proximity to the United States and its close economic connections with the United States under the United States–Mexico–Canada Agreement. We also present results for the 33 OECD comparison countries combined. Results for all analyses, including price indexes for other countries and from sensitivity analyses not presented as figures, are in Appendix B.

[46] IQVIA MIDAS distinguishes between retail and hospital distribution channels for most countries, with additional distribution channels for the United States. We did not adjust U.S. prices for drugs dispensed through the U.S. hospital or clinic channels because discounts for these purchases, which often involve group purchasing organizations, are less likely to involve off-invoice rebates and other discounts (see Andrew W. Mulcahy and Vishnupriya Kareddy, *Prescription Drug Supply Chains: An Overview of Stakeholders and Relationships*, RAND Corporation, RR-A328-1, 2021).

Chapter 3. Results

Our main results present 2022 price differentials for pairwise comparisons of the United States with a set of other countries (or 33 OECD comparison countries combined) using presentation-level prices, U.S. volume weights, and all presentations that are sold in both the United States and the comparison market.

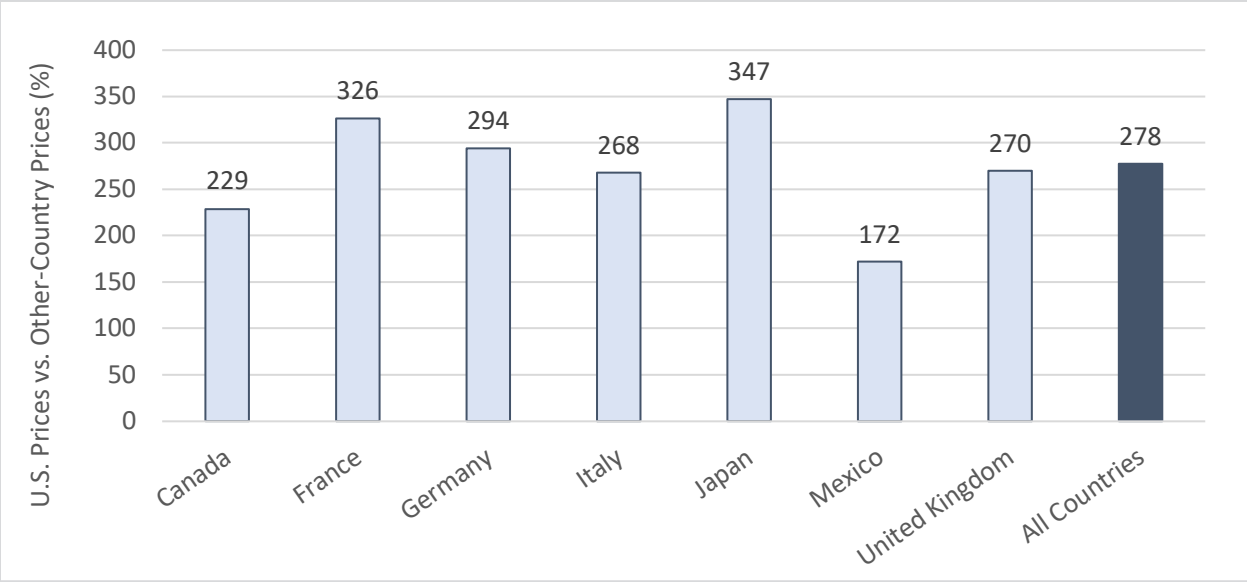
Prices in the United States were higher than prices in each of the 33 comparison countries individually and all comparison countries combined (see Figure 3.1 for comparisons of U.S. prices with those in Mexico and the G7 countries; see Appendix B for comparisons with other individual OECD countries). Each result illustrated in Figure 3.1 shows U.S. prices relative to those in a comparison country fixed at 100 percent. For example, the 229 percent result for Canada means that U.S. prices were 229 percent of those in Canada. The same result can be alternatively framed as U.S. prices being 2.29 times those in Canada, or as Canadian prices being 44 percent (100 percent over 229 percent) of U.S. prices.

U.S. prices were 278 percent of prices in the 33 OECD comparison countries combined. Among comparisons with individual G7 countries, U.S. prices ranged from 229 percent of prices in Canada to 347 percent of prices in France.

Across all 33 individual comparison countries, U.S. prices ranged from 172 percent of prices in Mexico to 1,028 percent of prices in Turkey. Both Mexico and Canada had prices relatively closer to those in the United States compared with those in other countries. This may be partially explained by geographic proximity, more shared generic formulations between the United States and these countries compared with the United States and other countries, and cross-border flow of prescription drugs.

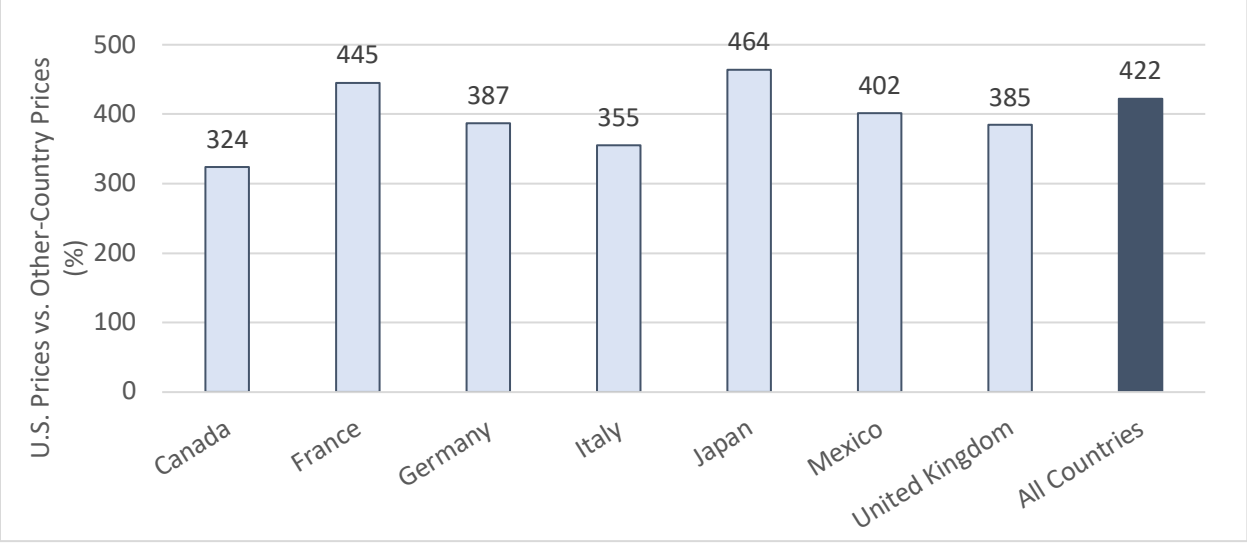
Figure 3.2 illustrates price comparisons for brand-name originator drugs. U.S. manufacturer gross prices were 422 percent of prices in other countries. As in Figure 3.1, Canada had prices that were closest to those in the United States among the countries for which Figure 3.2 shows results individually. In the opposite direction, France and Japan had the relatively lowest prices for brand-name originator drugs.

Figure 3.1. U.S. Prescription Drug Prices as a Percentage of Prices in Selected Other Countries, All Drugs, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

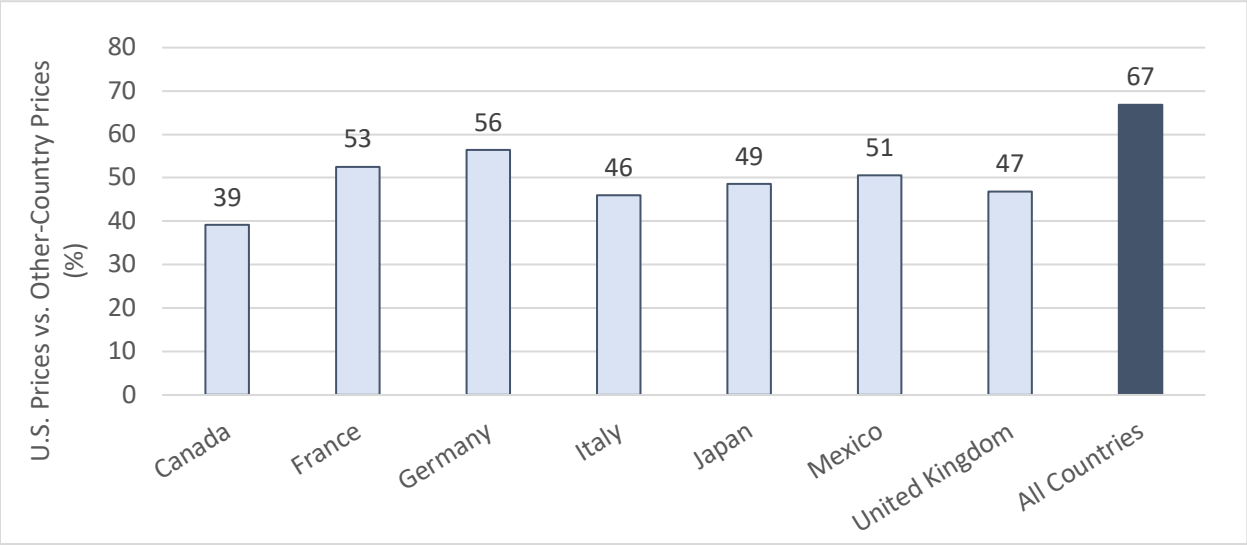
Figure 3.2. U.S. Brand-Name Originator Drug Prices as a Percentage of Other Countries' Prices, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

Figure 3.3 illustrates compared prices for unbranded generic drugs. Overall, U.S. unbranded generic drug prices were 67 percent of prices in other countries, and most individual comparison countries have higher prices for unbranded generics than the United States does.[47] Unbranded generic prices in the United States were 39 percent of those in Canada and 56 percent of those in Germany. Combining brand-name non-originator drugs and unbranded generic drugs does substantively affect results, with many countries showing lower prices than the United States and U.S. prices on average exactly 100 percent of prices in other countries combined (see Table B.1). This reversal could be the result of some drugs categorized by IQVIA as brand-name non-originator drugs having high U.S. prices.

Figure 3.3. U.S. Unbranded Generic Drug Prices as a Percentage of Other Countries' Prices, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Biologics are excluded. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

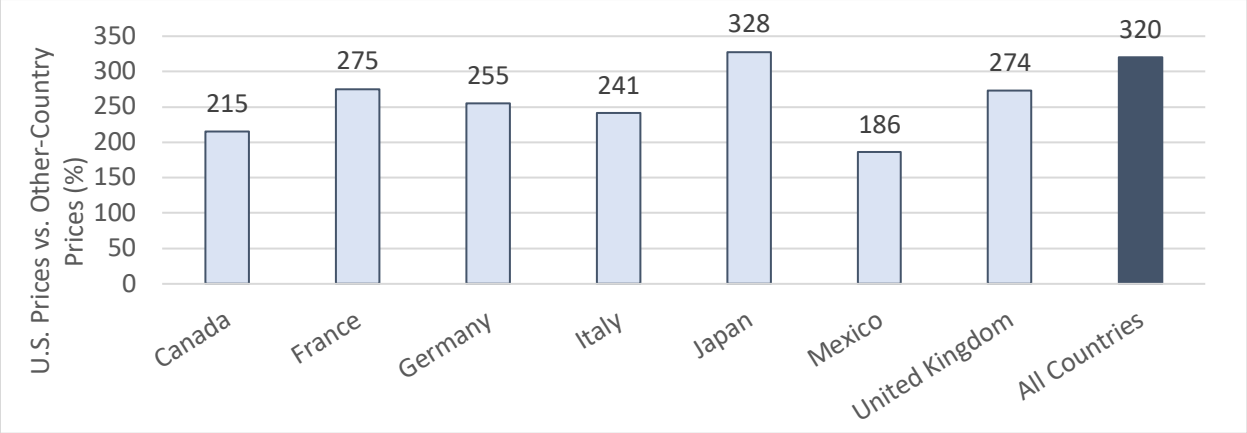
Results at the Active Ingredient Level

A presentation (that is, active ingredient, dosage form, and strength)-level market basket and price comparison uses only data for which there is a specific match between products sold in the United States and a comparison country. Figure 3.4 presents results from the robustness test comparing prices calculated at the broader active ingredient level instead of at the presentation level. The differences between U.S. and other countries' prices are typically larger at the active ingredient level than at the presentation level. U.S. prices were 320 percent of prices in other countries combined when price indexes were calculated using active ingredient–level data; they

[47] These results do not change substantively when unbranded biologics are included with other unbranded generic drugs.

were 278 percent of other countries' prices when using presentation-level data. This suggests the United States uses a more expensive mix of specific presentations and products within an active ingredient.

Figure 3.4. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, Active Ingredient Level, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some active ingredients sold in each country contribute to bilateral comparisons.

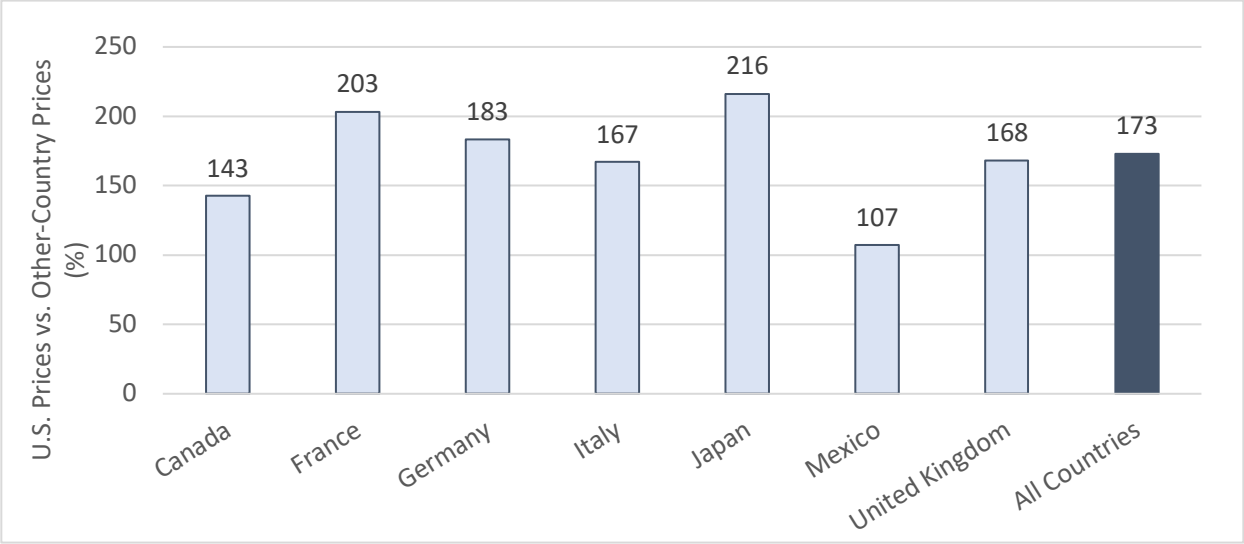
Results with Net Price Adjustments

We reduced U.S. prices based on estimates of the relative difference between U.S. manufacturer gross and net prices because of rebates and other discounts.[48] We used two alternative approaches to apply U.S. manufacturer net price adjustments. First, a constant 37.7 percent reduction across all U.S. prices yielded U.S. prices that were 173 percent of prices in other countries (Figure 3.5). Second, a 37.2 percent reduction to retail-dispensed, brand-name U.S. drug prices yielded U.S. prices that were

- 213 percent of prices in other countries when comparing across all drugs
- 308 percent of prices in other countries when comparing prices just for brand-name originator drugs
- 381 percent of prices in other countries when comparing prices for only retail-dispensed, brand-name drugs (Figure 3.6).

[48] IQVIA Institute for Human Data Science, 2023b. This IQVIA report noted invoice and manufacturer net prices as a share of WAC prices separately for all drugs and for protected brand drugs that we considered a close analog to brand-name originators. We used these estimates to calculate proportional reductions from invoice prices to net prices (as one minus the ratio of net to invoice prices). The resulting reductions to U.S. ex-manufacturer prices were 37.7 percent for all drugs and 37.2 percent for retail-dispensed brand-name originator drugs.

Figure 3.5. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, U.S. Net Price Adjustment Applied to All Drugs, 2022

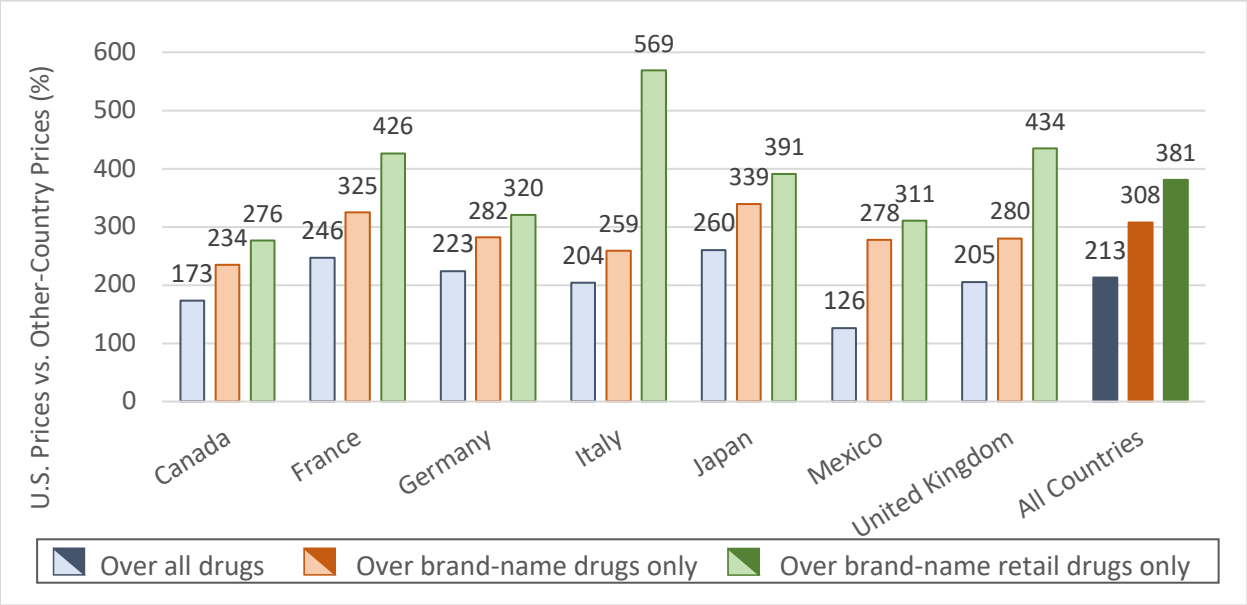


SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: For the purposes of this comparison, we reduced U.S. prices for all drugs by 37.7 percent. We calculated the 37.7 percent reduction using data presented in IQVIA Institute for Human Data Science, 2023b. *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

The relative magnitudes of these results line up with our findings without the U.S. net price adjustment: Without adjustment, U.S. prices were 278 percent of prices in other countries across all drugs and 422 percent of prices in other countries for brand-name originator drugs. As we noted, the results from these sensitivity analyses understate differences between prices in the United States and other countries because we have not applied similar adjustments to prices in other countries to reflect rebates and other discounts on manufacturer prices, such as statutory rebates to German sickness funds or "patient access scheme" payments from manufacturers to the National Health Service in the United Kingdom.[49]

[49] Persson and Jönsson, 2016.

Figure 3.6. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, U.S. Net Price Adjustment Applied to Retail-Dispensed, Brand-Name Drugs, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: For the purposes of this comparison, we reduced U.S. prices for retail-dispensed, brand-name drugs by 37.2 percent. We calculated the 37.2 percent reduction using data presented in IQVIA Institute for Human Data Science, 2023b. *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

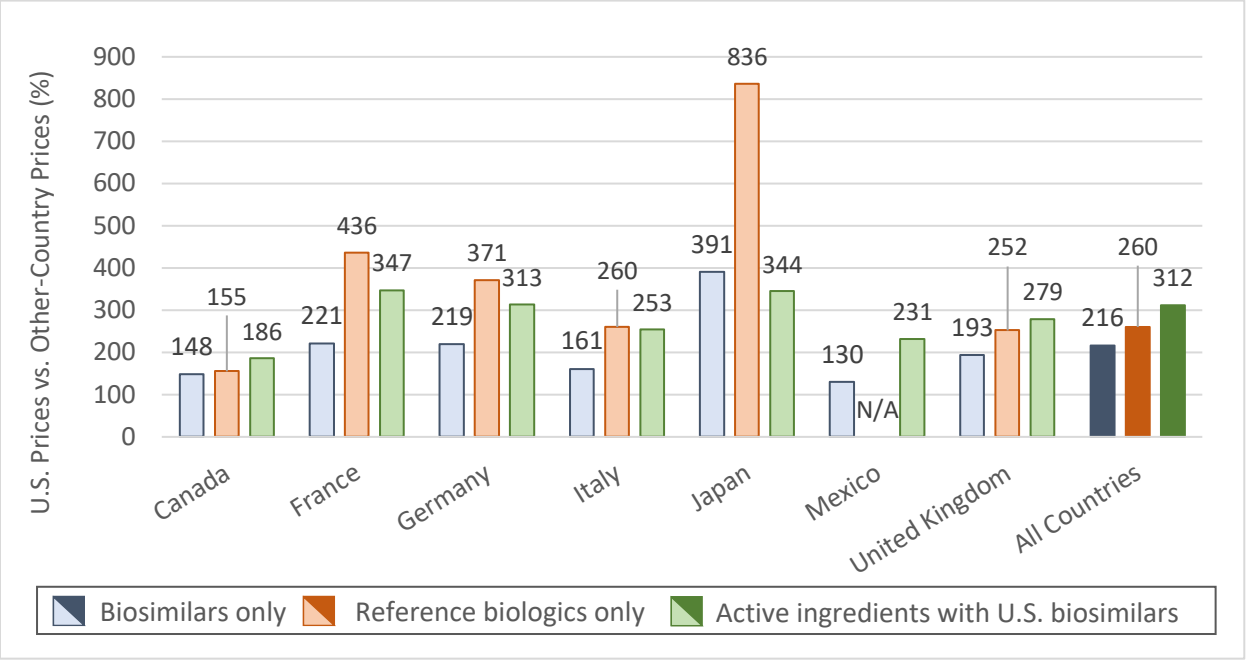
Results for Biosimilars and Reference Biologics

U.S. prices for biosimilar products were generally closer to those in other countries compared with all brand-name drugs and with reference biologics (Figure 3.7).[50] Across all countries, U.S. biosimilar and reference biologic prices were 216 and 260 percent, respectively, of prices in other countries. When comparing prices across all active ingredients facing biosimilar competition in the United States as of the end of 2022 (that is, pooling across biosimilars, reference biologics, and any other versions), U.S. prices were 312 percent of prices in comparison countries combined. Comparisons of U.S. prices for biosimilars and reference biologics to those in other individual countries varied, with U.S. prices still higher but relatively closer to those in in Canada and Mexico.[51]

[50] We found no overlap in the specific reference biologic products sold in the United States and Mexico.

[51] Much higher U.S. reference biologic prices versus those in Japan are driven by a 16x price difference for teriparatide reference biologics. Although this is an outlier price, it may reflect the actual price for this drug in Japan, stemming from price regulation.

Figure 3.7. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, Biosimilar and Reference Biologic Categories, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons. We found no overlap in the specific reference biologic products sold in the United States and Mexico; N/A = not applicable.

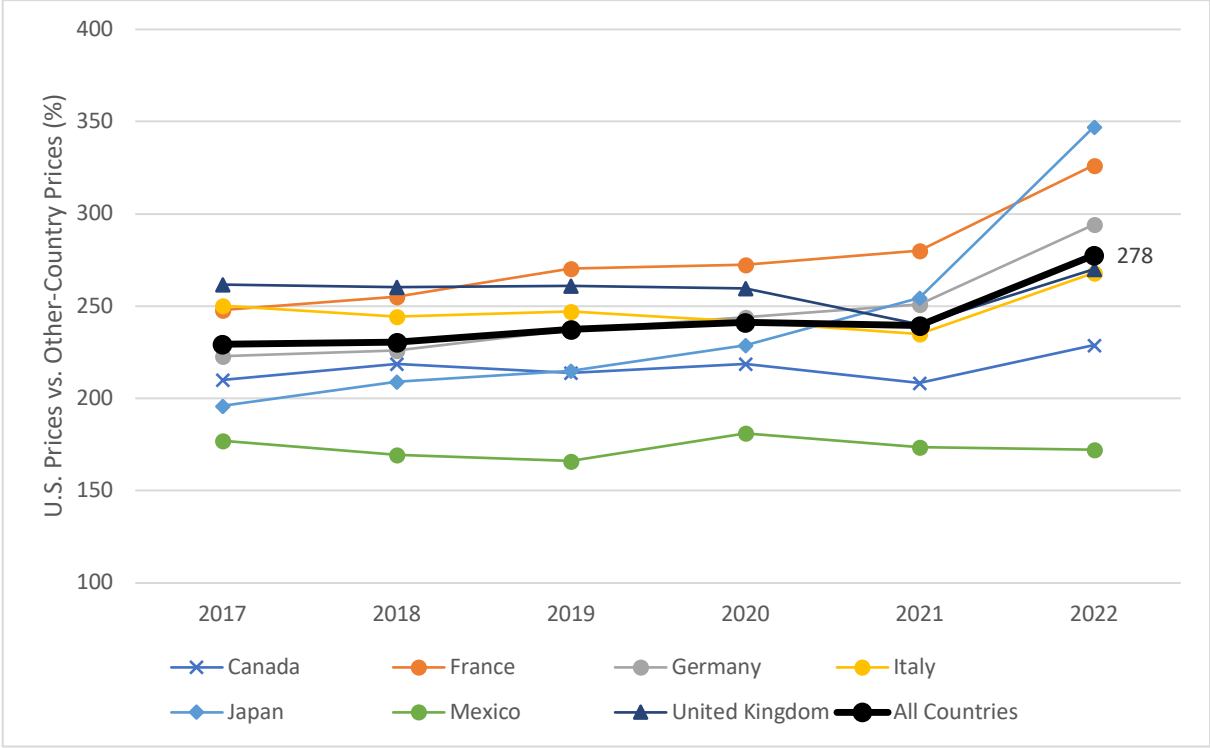
Trends in Results over Time

Figure 3.8 illustrates changes in the ratio of U.S. to other countries' prices from 2017 through 2022 for prices in comparison countries combined (thick black trend line) and for prices in individual G7 countries and Mexico. Although trends from 2017 through 2021 were relatively stable, U.S. prices were proportionally higher (or other countries' prices were proportionally lower, or both) in 2022. This may be due to the introduction of new brand-name drugs in the United States slightly before launching in some other countries, thereby changing the mix of drugs contributing to some bilateral comparisons (for example, with Japan and France where the 2021 to 2022 increases were greatest). Looking at 2021 prices, U.S. prices were 240 percent of prices in other countries, compared with 278 percent in 2022.

Changing the cohorts of matching drugs contributing to the price comparison for each comparison country and year effectively undoes the constant market basket integral to price index calculations. We also calculated changes in our price comparison results over time using a fixed market basket of drugs sold in the United States and other countries in each year from 2018 through 2022 (Figure 3.9). Trends, including the relative increase in U.S. prices from 2021 to 2022, looked relatively similar when restricting to this stable market basket. Given that Figure

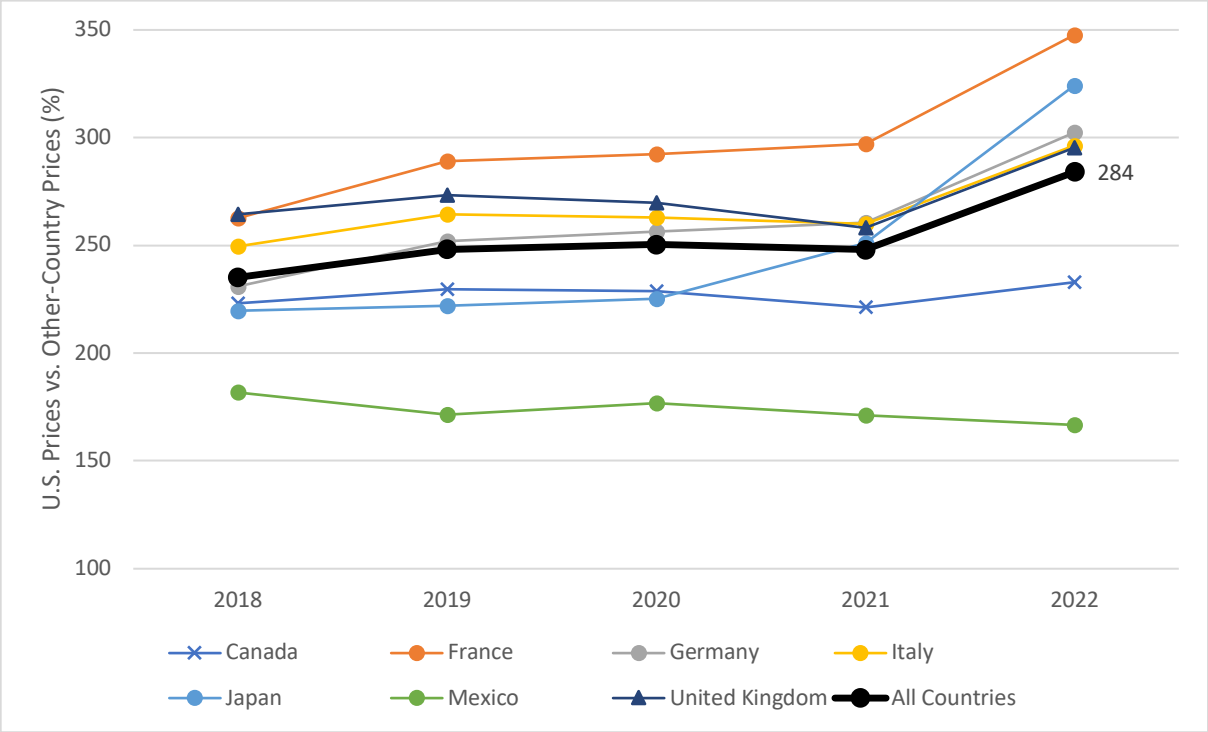
3.9 presents results using a time-invariant market basket of drugs, this increase appears to be at least partially driven by factors other than new drugs and warrants further investigation.

Figure 3.8. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, 2017–2022



SOURCE: Authors' analysis of 2017–2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons in each country year.

Figure 3.9. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, 2018–2022, Fixed Market Basket

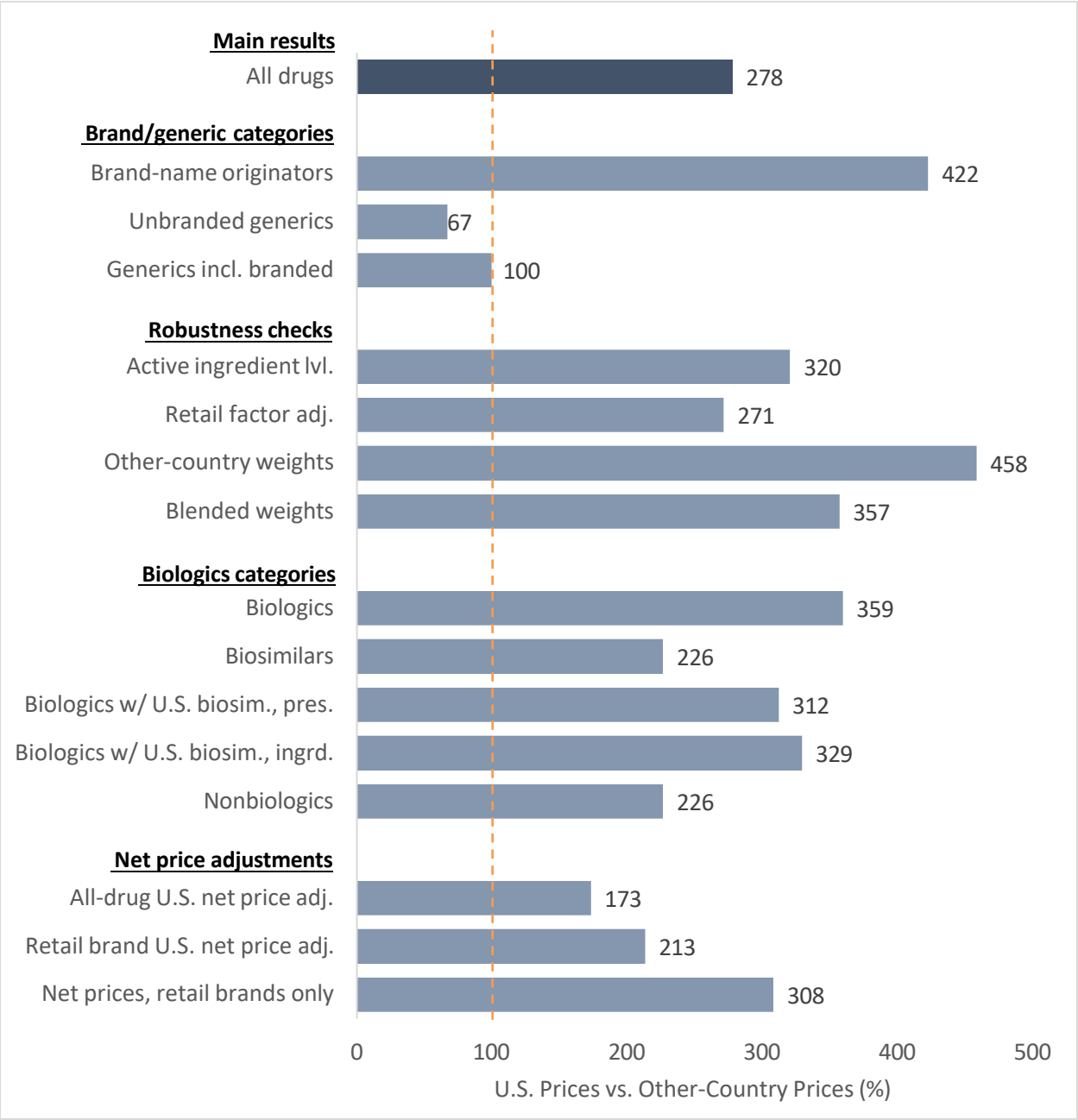


SOURCE: Authors' analysis of 2018–2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. The same set of presentations contributes to the analysis in each year (by design).

Summary of Results

Figure 3.10 shows ratios of U.S. to other countries' drug prices across a variety of subgroup analyses and robustness checks, including those described above and others that were included in Mulcahy et al. (2021b) but not separately presented above. See Appendix B for detailed findings from individual analyses not presented in the main body of the report.

Figure 3.10. Summary of Results: U.S. Prices as a Percentage of Other-Country Prices, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 4, 2023).
NOTE: *Other-Country Prices* refers to all 33 OECD comparison countries combined. Adj. = adjustment; biosim. = biosimilar; incl. = including; ingrd. = ingredient; lvl. = level; pres. = presentation.

Chapter 4. Discussion

We found that 2022 manufacturer gross prescription drug prices in the United States were substantially higher than those in other countries. The magnitude of the difference between prices in the United States and other countries was substantial. For all drugs, U.S. prices were 278 percent of prices in other countries combined. U.S. prices for brand-name originator drugs were 422 percent of prices in other countries combined. Adjusting prices for U.S. brand-name originator drugs downward to reflect off-invoice rebates and other discounts closed the gap between U.S. and other countries' prices, but U.S. brand-drug prices remained over three times as high. Across all drugs, U.S. prices were higher than those in all 33 comparison countries individually, ranging from 172 percent of prices in Mexico to 1,028 percent of prices in Turkey.

Of the subsets of drugs that we examined, only unbranded generics had lower prices in the United States than in most comparison countries, with U.S. prices on average about one-third less than those in other countries. This finding suggests that robust price competition in U.S. unbranded generic markets continues to drive savings for consumers and health care payers relative to spending on these drugs in other countries. Although we found that generics account for 90 percent of U.S. prescription volume versus roughly 10 percent for brand-name originators, the much higher dollar amounts and price ratios for brand-name originator versus unbranded generics yield an overall price index ratio of 278 percent.

Our main findings—that U.S. prices are higher than those in comparison countries for all drugs and for brand-name originator drugs but generally lower for unbranded generic drugs—held through several additional sensitivity analyses, such as an analysis with and without outlier presentations in terms of price and analysis using different volume weights.

Comparisons with Prior Work

Our findings are broadly consistent with those described in Mulcahy et al. (2021b), which presents findings aligning with those from earlier studies.[52] This updated report found U.S. manufacturer invoice prices were overall 278 percent of prices in other countries in 2022, which suggests a slightly wider gap in prices between U.S. and other countries' prices compared with the analogous 256 percent finding from the analysis of 2018 data in the earlier RAND report. However, we recommend caution when comparing results from the two reports. Relative to the 2018 data analyzed in the earlier report, the 2022 data used in the current analysis adds data from Colombia (which joined the OECD in April 2020) and includes additional presentations in

[52] In addition to Mulcahy et al., 2021b, see Danzon and Furukawa, 2006; Danzon and Furukawa, 2008; Kanavos and Vandoros, 2011; and Kanavos et al., 2013.

bilateral comparisons due to increasingly standardized IQVIA MIDAS formulation and strength categories over time.

The current and prior findings from sensitivity analyses were also broadly consistent. One notable set of sensitivity analyses involve adjustments for lower manufacturer net versus manufacturer gross prices. In the absence of comprehensive information on manufacturer net prices, we used three approaches to make this adjustment, including one applying a fixed price reduction across all drugs and the other two applying a fixed price reduction to retail-dispensed brand-name drugs only. This approach differed slightly from Mulcahy et al. (2021b), in which a reduction was applied to all brand-name originator drugs, not just those dispensed via the retail channel. We made this change because drugs dispensed through other channels—for example, physician-administered drugs—appear to be less likely to have any rebates and other discounts.

We found that U.S. prices were closer to those in other countries—at 173 and 213 percent of international prices—when applying the overall and retail-dispensed, brand-name originator drug adjustments only, provided prices were then compared across all drugs. However, when adjusting retail-dispensed, brand-name originator prices downward and then comparing prices for only brand-name drugs, U.S. prices remained 308 percent of prices in other countries. The much higher relative U.S. prices when focusing just on retail-dispensed, brand-originator drugs emphasizes the importance of unbranded generic drugs in lowering overall U.S. drug spending and average prices. The differences in these results also highlight the importance of refining methodologies to estimate manufacturer net prices and the key decision of whether to apply an invoice-to-net reduction to drugs other than retail-dispensed, brand-originator drugs (which was not discussed in the earlier report).

The Role of Methodological Decisions

The magnitudes of estimated price differentials varied with our measurement approach. For our main results, we opted to use presentation-level data because these more-granular price and volume weights allow comparisons that reflect the mix of drugs in each market. The differences between U.S. prices and prices in other countries was slightly wider when we used active ingredient–level data instead. This suggests that, on average, the U.S. mix of drugs within an active ingredient tended toward higher-priced presentations. While active ingredient–level analyses can help address potential mismatches between the specific dosage forms and strengths of the selected drugs sold in the United States versus other countries, they introduce new concerns by effectively averaging prices across presentations (nested within an active ingredient) with potentially important differences in characteristics and prices.

Relatedly, our use of bilateral comparisons in which we had data for both the United States and a respective comparison country in some cases led to small shares of all presentations sold in the U.S. and comparison countries contributing to each comparison. This leads to concerns regarding the generalizability of our findings. However, as discussed earlier, the presentations

and active ingredients available for comparison tended to account for larger shares of volume and sales compared with presentations and active ingredients that did not contribute to our analysis.

Excluding U.S. and other countries' presentations for which the other country's price was very high or low compared with the U.S. price had generally modest implications on the magnitude of results. U.S. prices relative to other countries' prices without these outlier exclusion steps were almost always within 10 percent of those from our main results. We opted to implement these outlier exclusion steps because presentations with extreme differences between U.S. and other countries' prices have the potential to exert significant leverage over volume-weighted price calculations. Although our main concern was that inconsistencies in how sales or volumes are measured across markets could lead to outliers, there is the possibility that some of the excluded presentations with very high U.S. or other countries' prices could have reflected an actual price difference, and, in this case, their exclusion would bias our results. For example, high prices in non-U.S. countries could reflect high private-pay amounts outside a public health care system and price controls.

We chose to use data from all of 2022 to calculate price indexes. Other studies noted the relatively quicker approval and uptake of newer, typically more-expensive drugs and presentations in the United States compared with other countries.[53] Our bilateral comparisons omit new drugs and presentations released in the United States in 2022 but not yet in other countries. Access to innovative treatment likely has important benefits to patients. Our study does not address the trade-offs between higher prices and earlier access to new drugs.

We opted to use U.S. volume weights because of the U.S. policy focus of the analysis. This choice had important implications for our results. Using other countries' volume weights yielded U.S. prices that were 458 percent of prices in other countries (compared with 278 percent when using U.S. volume weights). Prescribing patterns outside the United States might be skewed toward drugs with favorable prices in individual countries as a result of price controls and/or volume purchasing. As a result, it is unsurprising that other countries' volume weights result in findings of relatively higher U.S. drug prices.

General Limitations

There are important limitations that apply to all of the prior studies that we describe in this report and to our own analysis. First, although the drug prices net of rebates and all discounts are particularly relevant to policymakers and other stakeholder groups, there is no comprehensive source of net prices paid for drugs—either to manufacturers or by payers—in the United States. We expect a significant difference between manufacturer prices and prices to payers net of rebates in the United States and in other countries (such as Germany and the United Kingdom)

[53] Danzon and Furukawa, 2008.

where similar rebates and discounts are increasingly common. We used manufacturer prices because they are the best available comparable data for all countries.

The price differentials between the United States and other countries presented here and in other studies could be biased upward if actual negotiated discounts are larger than the factor applied to brand-name originator drugs as an ad hoc adjustment. We applied an estimated adjustment to U.S. prices to approximate rebates and other discounts applied to manufacturer prices as one of our sensitivity analyses. However, U.S. gross-to-net reductions vary across therapeutic classes and with the extent of competition for specific drug products,[54] and we recognize that the resulting net prices will almost certainly differ from the actual U.S. net prices for individual products.

We also recognize that resulting price indexes might understate differences between prices in the United States and other countries because they adjust only U.S. prices downward even though rebates and similar discounts are increasingly common in other countries. U.S. prices would appear relatively higher—that is, more in line with our main results—if we were able to also adjust for rebates and other discounts applied to manufacturer prices in other countries.

Second, manufacturer prices (that is, the prices paid to manufacturers net of discounts at the time of purchase), such as those available from the IQVIA MIDAS data, are calculated in some countries by applying a set of assumed adjustment factors on observed local-level prices. In other words, IQVIA obtains a list price or average invoice price at the local level and then calculates manufacturer prices where necessary by applying a set of country-specific average margin factors. These average margin country-specific factors are generated and updated by local industry experts. The IQVIA MIDAS dataset is the standard for use in industry to compare manufacturer prices.

Finally, we use standard units as reported by IQVIA in the IQVIA MIDAS data as our unit of volume. Although standard units are designed to improve comparability in volume measurement between different drugs, there are remaining concerns, particularly when the number of units used in practice differs from country to country. As an example, lower-dosage presentations are more common in some other countries (for example, Japan) than in the United States, and volume could be higher. We address this, in part, by using presentation-level (rather than active ingredient–level) data. We did not have data available to further adjust the volumes reported in IQVIA MIDAS by a defined daily dose or other conversion factor to improve comparability.

Potential Further Analyses

Future analyses should address the core limitation of our work: the lack of systematic data on U.S. and other countries' net prices from either the manufacturer or payer perspectives. Although

[54] Mulcahy et al., 2021a; Immaculada Hernandez, Alvaro San-Juan-Rodriguez, Chester B. Good, and Walid F. Gelland, "Changes in List Prices, Net Prices, and Discounts for Branded Drugs in the US, 2007-2018," *JAMA*, Vol. 323, No. 9, 2020.

there are promising avenues of research focusing on estimates of U.S. manufacturer net prices, other prices remain elusive. The Section 204 provisions introduced by the Consolidated Appropriations Act, 2021, will, for the first time, require plan sponsors to report net spending overall, for certain specific drugs, and by therapeutic class.[55] These data will be useful to the U.S. Department of Health and Human Services and other policymakers as an input into analyses on net prices to U.S. commercial payers, particularly when combined with other data available to the U.S. government, such as Medicare Part D rebates and Medicaid best price information.

Further research is also needed to measure net manufacturer prices in countries outside the United States. Off-invoice discounts through rebates, tendering, and other arrangements are increasingly common outside the United States. As a result, the magnitude of our price comparisons adjusting for lower U.S. net prices are likely too small because we did not have data available to apply similar adjustments to lower net prices in other countries. Although there are growing calls among OECD countries for transparency in drug prices, including net prices,[56] there have been few concrete steps toward net price publication or comparison among countries.

Several prior studies have noted that adjusting for differences in per capita income explains a portion of the difference in prescription drug prices across countries, particularly for drugs sold to middle- and low-income countries.[57] However, the differences in income are not large enough to explain the entire difference in prices between the United States and other OECD countries, and four OECD countries (Luxembourg, Ireland, Norway, and Switzerland) have both higher per capita gross domestic product and lower drug prices than the United States.[58] Other studies assess whether variations among countries in health care systems and regulatory characteristics explain variation in prices.[59] Because an improved understanding of the drivers of drug price differences among countries is an important input into U.S. policy discussions on drug prices, we recommend further study on this topic.

[55] Public Law 116-260, Consolidated Appropriations Act, 2021, December 27, 2020.

[56] Eliana Barrenho and Ruth Lopert, "Exploring the Consequences of Greater Price Transparency on the Dynamics of Pharmaceutical Markets," Organisation for Economic Co-operation and Development, OECD Health Working Paper No. 146, September 8, 2022.

[57] Patricia Danzon, Andrew W. Mulcahy, and Adrian K. Towse, "Pharmaceutical Pricing in Emerging Markets: Effects of Income, Competition, and Procurement," *Health Economics*, Vol. 24, No. 2, 2015.

[58] OECD, "Gross Domestic Product (GDP)," webpage, undated.

[59] For example, see Kanavos et al., 2013.

Appendix A. Price Index Methodology

We calculated bilateral price indexes for the United States versus each other country separately using all presentations that had more than 1,000 standard units in volume or $1,000 in sales in both the United States and the individual comparison country.[60] We used low volume and low sales exclusion steps to prevent outlier presentations from exerting undue influence on our overall results. Less than 0.3 percent of sales and volume across all countries were excluded because of the low volume or sales exclusion criteria (see Table A.1).

Of the presentations remaining after these initial exclusions, only those presentations sold in both the United States and comparison countries contributed to bilateral comparisons (see Table A.2). In general, between one-third and two-thirds of presentations above sales and volume thresholds from comparison countries were also above sales and volume thresholds in the United States. Japan is an outlier; only 17 percent of its presentations by volume also sold in the United States. The United States had the largest number of presentations that could contribute to analyses, in part because the United States is the largest market, which increased the likelihood that each presentation was above sales and volume thresholds. Between 10 and 30 percent of presentations above volume and sales thresholds in the United States were also above volume and sales thresholds in other countries. As an example, 6,816 and 4,729 presentation-level records were above volume and sales thresholds for the United States and the United Kingdom, respectively. Of these, only 2,267 matched in both countries.[61]

Presentations that did not contribute to the calculation of a bilateral price index tended to have lower volume and smaller sales in terms of dollars than those that did. For example, the matched presentations between the United States and United Kingdom accounted for approximately 64 percent of total volume and 78 percent of total sales in both countries combined. Using active ingredient–level data rather than presentation-level data increased match rates considerably. For example, 53.3 percent of U.S. active ingredients and 63.4 percent of UK active ingredients meeting minimum volume and sales thresholds were used for bilateral comparison between the two countries, and these active ingredients accounted for 98.0 percent of volume and 99.7 percent of sales in both countries combined.

[60] We excluded presentations with fewer than 1,000 standard units in volume or less than $1,000 in sales because these records tended to have outlier prices.

[61] This represents 31 percent of U.S. presentations and 45 percent of UK presentations meeting volume and sales thresholds.

Table A.1. Initial Pool of Presentations and First Exclusion Step

Country	Total Presentations with Sales > $0 and Volume > 0, No Other Exclusions (A)	Total Presentations with ≥ $1,000 Sales and ≥ 1,000 Volume (B)	Share of Volume (B/A) (%)	Share of Sales (B/A) (%)
United States	**7,427**	**6,816**	**>99.9**	**>99.9**
All countries excluding the United States	**31,630**	**26,990**	**>99.9**	**99.8**
Australia	3,139	2,851	>99.9	99.3
Austria	3,800	3,284	>99.9	98.2
Belgium	3,433	2,907	>99.9	99.1
Canada	3,538	3,299	>99.9	99.3
Chile	2,802	2,176	>99.9	99.2
Colombia	3,436	2,751	>99.9	99.7
Czechia	3,075	2,689	>99.9	97.2
Estonia	1,776	1,361	>99.9	98.1
Finland	2,930	2,536	>99.9	97.5
France	4,093	3,686	>99.9	99.4
Germany	5,807	5,255	>99.9	99.0
Greece	2,675	2,235	>99.9	99.8
Hungary	2,658	2,366	>99.9	97.0
Ireland	3,224	2,710	99.6	98.0
Italy	4,987	4,475	>99.9	99.5
Japan	5,781	5,604	>99.9	>99.9
Korea	4,109	3,846	>99.9	99.4
Latvia	2,415	1,705	>99.9	95.5
Lithuania	2,472	1,843	>99.9	94.5
Luxembourg	2,071	1,542	99.7	94.2
Mexico	4,308	3,520	>99.9	99.5
Netherlands	3,398	2,986	>99.9	99.6
New Zealand	2,377	1,873	98.6	97.2
Norway	3,975	3,204	>99.9	97.3
Poland	3,778	3,229	>99.9	99.2
Portugal	4,336	3,568	>99.9	97.8
Slovakia	2,639	2,272	>99.9	96.5
Slovenia	2,202	1,793	>99.9	91.1
Spain	4,584	4,150	>99.9	99.4
Sweden	3,316	2,988	>99.9	98.2
Switzerland	3,639	3,237	>99.9	99.0
Turkey	3,279	3,041	>99.9	>99.9
United Kingdom	6,405	4,729	>99.9	99.3

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).

Table A.2. Total Presentations Potentially Contributing to Bilateral Comparisons

Country	Total Presentations with ≥ $1,000 Sales and ≥ 1,000 Volume (A)	Total Presentations Potentially Contributing to Bilateral Comparisons with the United States, Before Price Ratio Exclusion (B)	Share of Volume (B/A) (%)	Share of Sales (B/A) (%)
United States	**6,816**	**N/A**	**N/A**	**N/A**
All countries excluding the United States	**26,990**	**4,467**	**45.6**	**70.8**
Australia	2,851	1,683	70.9	75.1
Austria	3,284	1,676	54.7	78.1
Belgium	2,907	1,552	63.2	78.4
Canada	3,299	2,335	82.5	87.4
Chile	2,176	864	46.0	43.9
Colombia	2,751	889	48.7	41.8
Czechia	2,689	1,352	55.9	71.3
Estonia	1,361	754	56.0	71.7
Finland	2,536	1,453	62.7	78.0
France	3,686	1,825	57.7	76.9
Germany	5,255	2,277	65.2	79.1
Greece	2,235	1,126	56.1	67.4
Hungary	2,366	1,228	57.0	72.2
Ireland	2,710	1,541	60.3	82.6
Italy	4,475	1,894	54.9	73.5
Japan	5,604	1,295	17.4	54.2
Korea	3,846	1,553	37.2	59.6
Latvia	1,705	866	54.2	62.5
Lithuania	1,843	938	49.7	65.6
Luxembourg	1,542	864	62.1	75.3
Mexico	3,520	1,219	41.5	46.9
Netherlands	2,986	1,564	63.3	69.8
New Zealand	1,873	994	48.5	68.3
Norway	3,204	1,722	55.2	78.9
Poland	3,229	1,467	57.3	67.9
Portugal	3,568	1,666	54.6	72.6
Slovakia	2,272	1,171	51.6	67.4
Slovenia	1,793	1,046	55.7	75.5
Spain	4,150	1,973	58.1	79.3
Sweden	2,988	1,694	60.8	77.7
Switzerland	3,237	1,681	53.2	81.4
Turkey	3,041	1,337	38.3	65.9
United Kingdom	4,729	2,267	63.8	77.6

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: N/A = not applicable.

We also excluded any remaining presentations for which the ratio of prices between the United States and the comparison country was less than 0.01 or greater than 100. This step excluded a small number of presentations from each bilateral comparison and about 1 percent of sales and volume in most countries (see Table A.3). In exploratory analyses, we found that the most common scenario leading to outlier prices involved presentations with both (1) extremely low volume and relatively high sales in a non-U.S. country and (2) relatively high volume and very low prices in the United States. Some outliers could be the results of inconsistences in the measurement of sales or volume across markets. It is also possible that the high prices in non-

U.S. countries reflect high private-pay amounts outside a public health care system and price controls. We cannot definitively distinguish between these cases. The differences in prices reported in the IQVIA MIDAS data might be more relevant to policymakers in the second case. We varied the price ratio exclusion thresholds in a set of sensitivity analyses that we describe in Appendix B.

These steps resulted in a different number of presentations being analyzed for each pairwise comparison between countries. Table A.4 compares the starting number of presentations in each country with the final number of presentations used for bilateral comparisons with the United States. Table A.4 also compares the share of starting U.S. and other countries' volume and sales that contributed to bilateral comparisons. Table A.5 replicates Table A.4 at the active ingredient level rather than the presentation level. Using active ingredient–level data rather than presentation-level data results in larger shares of sales and volume contributing to each comparison. These gains come at the cost of a less-precise overlap with the specific presentations sold. Table A.6 lists the distribution of volume and sales from presentations contributing to bilateral comparisons across brand-name originator, brand-name non-originator, and unbranded categories (similar to Table 2.2). In general, the presentations contributing to bilateral comparisons accounted for smaller shares of brand-name originator and brand-name non-originator sales and volume than all presentations sold in comparison countries did.

Table A.3. Presentations Contributing to Bilateral Comparisons After Price Ratio Exclusion

Country	Total Presentations Potentially Contributing to Bilateral Comparisons with the United States, Before Price Ratio Exclusion (A)	Total Presentations Contributing to Bilateral Comparisons, After Price Ratio Exclusion[a] (B)	Share of Volume (B/A) (%)	Share of Sales (B/A) (%)
United States	**6,816**	**N/A**	**N/A**	**N/A**
All countries excluding the United States	**4,467**	**4,222**	**98.5**	**98.1**
Australia	1,683	1,640	99.2	99.6
Austria	1,676	1,637	99.6	99.3
Belgium	1,552	1,511	99.2	98.1
Canada	2,335	2,284	98.6	99.2
Chile	864	843	97.5	97.9
Colombia	889	855	94.2	97.2
Czechia	1,352	1,308	98.8	98.0
Estonia	754	737	98.4	99.3
Finland	1,453	1,418	98.6	97.0
France	1,825	1,770	98.7	97.2
Germany	2,277	2,198	99.4	98.2
Greece	1,126	1,094	99.1	98.9
Hungary	1,228	1,198	99.4	98.9
Ireland	1,541	1,510	97.8	99.1
Italy	1,894	1,820	99.2	99.1
Japan	1,295	1,257	97.1	96.8
Korea	1,553	1,500	98.5	98.5
Latvia	866	845	99.1	98.4
Lithuania	938	918	99.1	99.1
Luxembourg	864	849	98.2	96.8
Mexico	1,219	1,169	91.4	97.0
Netherlands	1,564	1,516	98.0	97.0
New Zealand	994	971	99.7	99.3
Norway	1,722	1,666	97.7	97.8
Poland	1,467	1,422	98.8	98.8
Portugal	1,666	1,606	97.4	98.7
Slovakia	1,171	1,134	98.9	98.3
Slovenia	1,046	1,025	99.3	98.2
Spain	1,973	1,907	98.1	98.4
Sweden	1,694	1,649	98.8	97.8
Switzerland	1,681	1,647	98.6	98.7
Turkey	1,337	1,293	98.8	98.5
United Kingdom	2,267	2,202	99.0	98.1

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: N/A = not applicable.
[a] This excludes presentations with price ratio less than 1 percent of U.S. price or greater than 100x U.S. price.

Table A.4. Number of Presentations Used to Calculate Price Indexes

Country	Total Presentations in the MIDAS Extract	Total Presentations Contributing to Bilateral Comparisons	Other Countries' Shares Contributing to Bilateral Comparisons (%)		United States Shares Contributing to Bilateral Comparisons (%)	
			Volume	Sales	Volume	Sales
All countries	**34,652**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
United States	**7,427**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
All countries excluding the United States	**31,630**	**4,690**	**45.6**	**70.8**	**88.3**	**90.2**
Australia	3,139	1,787	70.9	75.1	52.0	61.1
Austria	3,800	1,906	54.7	78.0	55.1	72.6
Belgium	3,433	1,750	63.2	78.3	49.2	70.1
Canada	3,538	2,465	82.5	87.3	66.6	72.8
Chile	2,802	1,139	46.0	44.2	46.8	48.4
Colombia	3,436	1,130	48.7	41.8	47.5	40.2
Czechia	3,075	1,518	55.9	71.7	52.1	65.2
Estonia	1,776	941	56.0	72.0	42.4	40.9
Finland	2,930	1,640	62.7	78.1	51.4	71.4
France	4,093	1,957	57.7	76.5	50.1	67.0
Germany	5,807	2,424	65.2	78.9	61.9	75.6
Greece	2,675	1,313	56.1	67.4	48.9	43.7
Hungary	2,658	1,397	57.0	72.6	49.4	62.9
Ireland	3,224	1,765	60.2	82.4	55.7	68.1
Italy	4,987	2,025	54.9	73.4	51.4	71.9
Japan	5,781	1,334	17.4	54.1	33.0	55.8
Korea	4,109	1,642	37.2	59.7	53.0	61.6
Latvia	2,415	1,153	54.2	62.9	46.1	52.2
Lithuania	2,472	1,228	49.7	66.6	47.5	57.1
Luxembourg	2,071	1,097	62.1	75.3	47.1	50.2
Mexico	4,308	1,451	41.5	47.1	50.5	64.0
Netherlands	3,398	1,728	63.3	69.8	58.7	47.6
New Zealand	2,377	1,218	49.1	68.3	45.3	43.6
Norway	3,975	2,022	55.1	79.1	55.9	74.4
Poland	3,778	1,669	57.3	68.0	58.7	56.4
Portugal	4,336	1,893	54.6	72.8	54.4	69.9
Slovakia	2,639	1,367	51.6	68.1	50.9	60.1
Slovenia	2,202	1,259	55.7	76.3	46.4	64.7
Spain	4,584	2,088	58.1	79.0	55.3	72.4
Sweden	3,316	1,866	60.8	77.8	55.9	73.2
Switzerland	3,639	1,856	53.2	81.3	53.0	72.2
Turkey	3,279	1,413	38.3	65.9	51.4	58.1
United Kingdom	6,405	2,564	63.8	77.5	62.7	77.8

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: N/A = not applicable.

Table A.5. Number of Active Ingredients Used to Calculate Price Indexes

Country	Total Active Ingredients with Sales > $0 and Volume > 0, No Other Exclusions (A)	Total Active Ingredients Contributing to Bilateral Comparisons, After Price Ratio Exclusion[a] (B)	Share of Volume (B/A) (%)	Share of Sales (B/A) (%)
United States	**2,180**	**2,029**	**N/A**	**N/A**
All countries excluding the United States	**31,630**	**1,646**	**75.2**	**88.2**
Australia	1,151	912	91.4	95.2
Austria	1,526	976	78.1	90.8
Belgium	1,374	915	84.3	90.8
Canada	1,268	1,056	95.6	97.2
Chile	1,141	589	82.1	78.7
Colombia	1,322	591	80.4	74.0
Czechia	1,345	878	78.2	85.0
Estonia	831	520	80.3	86.6
Finland	1,200	841	88.1	91.8
France	1,540	1,024	83.9	91.8
Germany	1,845	1,157	84.0	90.7
Greece	1,104	709	82.9	87.0
Hungary	1,220	806	80.3	86.6
Ireland	1,225	868	90.9	95.0
Italy	1,804	1,118	83.3	91.2
Japan	2,127	1,056	59.5	79.0
Korea	1,706	990	60.7	76.8
Latvia	1,188	643	73.2	76.8
Lithuania	1,200	696	73.4	79.4
Luxembourg	890	552	85.8	88.7
Mexico	1,780	800	71.7	70.7
Netherlands	1,171	834	85.2	89.7
New Zealand	1,080	734	79.8	92.5
Norway	1,570	1,021	90.2	92.0
Poland	1,492	903	83.0	87.3
Portugal	1,756	1,036	79.4	87.6
Slovakia	1,222	787	71.7	80.1
Slovenia	1,044	706	84.2	85.2
Spain	1,703	1,091	84.1	91.8
Sweden	1,244	923	91.2	91.8
Switzerland	1,348	919	86.7	93.5
Turkey	1,383	851	67.7	84.1
United Kingdom	1,832	1,163	90.0	93.7

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: N/A = not applicable.
[a] This excludes active ingredients below sales and volume thresholds and/or with ratios of less than 1 percent of U.S. price or greater than 100x U.S. price.

Table A.6. Within-Country Shares of Brand-Name Originator, Brand-Name Non-Originator, and Unbranded Generic Drugs, Presentations Contributing to Bilateral Comparisons, by Percentage

Country	Share of Sales: Brand-Name Originator	Share of Sales: Brand-Name Non-Originator	Share of Sales: Unbranded Generic	Share of Volume: Brand-Name Originator	Share of Volume: Brand-Name Non-Originator	Share of Volume: Unbranded Generic
United States	**84**	**6**	**11**	**8**	**3**	**89**
All countries excluding the United States	**79**	**7**	**14**	**31**	**19**	**50**
Australia	85	7	8	40	24	36
Austria	81	7	12	42	19	39
Belgium	85	5	10	49	10	41
Canada	78	4	18	20	11	68
Chile	45	41	13	10	21	68
Colombia	29	30	41	7	31	62
Czechia	81	10	9	37	34	29
Estonia	79	11	10	46	25	29
Finland	79	10	11	37	23	39
France	75	6	19	27	14	59
Germany	79	6	15	16	12	72
Greece	82	14	4	62	29	9
Hungary	81	9	10	39	31	30
Ireland	84	6	11	43	23	34
Italy	82	6	12	48	19	33
Japan	83	4	13	32	15	54
Korea	75	18	7	44	43	13
Latvia	75	11	14	33	24	43
Lithuania	81	9	10	41	25	33
Luxembourg	92	5	3	69	18	13
Mexico	62	22	16	19	23	57
Netherlands	65	8	27	14	6	79
New Zealand	80	11	8	26	33	41
Norway	78	10	12	37	16	47
Poland	75	18	7	31	53	16
Portugal	77	8	16	37	15	49
Slovakia	80	12	8	35	37	29
Slovenia	87	8	4	57	37	6
Spain	81	5	14	39	11	50
Sweden	79	9	12	22	19	59
Switzerland	81	5	14	43	17	40
Turkey	71	28	1	53	45	2
United Kingdom	75	6	19	22	13	65

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: Numbers might not sum to totals because of rounding.

Appendix B. Supplemental Results

Tables B.1 and B.2 list calculated price indexes for each bilateral comparison (that is, the United States versus each comparison country individually and the United States versus all comparison countries combined). The tables cover each set of results summarized in the body of the report. Table B.2 focuses on different sensitivity analyses around the extreme price outlier exclusion criteria.

Table B.1. Calculated U.S. Versus Other Countries' Price Indexes, 2022

Country	Main Results	Brand-Name Originator Drugs	Top 60 Drugs by U.S. Sales	Unbranded Generics Without Biologics	Unbranded Generics and Brand-Name Non-Originators	Biologics	Nonbiologics	Other Country Weights	Fisher Index	Active Ingredient Level	Retail Prices	U.S. Net Price Adjustment	Brand-Name Originators with Net Price Adjustment
United States	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
All countries excluding the United States	**277.59**	**422.23**	**504.32**	**66.83**	**99.59**	**359.27**	**226.29**	**458.10**	**356.60**	**320.24**	**172.94**	**277.59**	**380.81**
Australia	369.89	500.45	590.91	62.92	80.34	416.68	334.69	518.89	438.10	305.03	230.44	369.89	437.95
Austria	276.24	378.71	462.88	37.95	69.39	324.28	237.16	385.41	326.29	219.49	172.10	276.24	377.21
Belgium	320.61	414.46	477.76	49.06	89.79	355.23	288.23	363.11	341.20	282.19	199.74	320.61	434.95
Canada	228.92	324.00	374.37	39.11	58.49	272.06	195.55	318.42	269.99	214.97	142.62	228.92	276.03
Chile	259.87	748.46	716.18	76.42	40.23	530.55	205.91	439.00	337.77	267.09	161.90	259.87	499.89
Colombia	267.00	1,164.92	1,138.24	48.50	41.66	916.35	189.10	451.40	347.17	251.57	166.34	267.00	778.85
Czechia	353.72	453.29	552.98	54.38	106.33	393.79	314.16	489.54	416.13	317.49	220.37	353.72	534.56
Estonia	503.15	1,073.82	1,251.75	50.80	69.65	1,110.83	352.62	787.85	629.61	418.40	313.46	503.15	743.49
Finland	322.81	422.05	471.98	65.30	88.92	353.54	294.84	530.21	413.71	271.52	201.11	322.81	444.07
France	326.41	445.02	516.14	52.52	88.71	374.01	280.21	394.26	358.73	275.28	203.35	326.41	426.01
Germany	294.18	387.00	441.34	56.44	86.97	326.46	264.22	419.83	351.43	255.42	183.27	294.18	320.30
Greece	406.79	870.84	829.62	52.63	81.98	630.31	325.17	586.31	488.37	347.75	253.43	406.79	598.49
Hungary	388.73	513.11	551.52	64.30	112.37	417.40	363.87	521.37	450.19	360.34	242.18	388.73	500.67
Ireland	291.64	396.62	422.42	43.89	78.26	324.25	264.05	456.43	364.85	249.49	181.69	291.64	396.00
Italy	268.03	355.29	406.30	46.00	93.26	307.00	234.13	352.61	307.42	241.21	166.98	268.03	568.77
Japan	347.07	464.34	591.11	48.60	94.74	446.75	268.40	587.67	451.62	327.84	216.22	347.07	390.57
Korea	391.29	702.71	837.19	24.96	52.62	572.87	293.49	523.26	452.49	373.72	243.77	391.29	707.92
Latvia	495.01	747.29	842.14	55.44	78.31	714.55	383.58	673.32	577.32	406.18	308.39	495.01	659.51
Lithuania	426.50	624.65	666.72	62.93	106.03	518.91	354.26	615.37	512.30	369.03	265.71	426.50	605.23
Luxembourg	413.56	660.86	709.53	48.10	81.42	585.01	321.40	524.61	465.79	318.65	257.65	413.56	442.69
Mexico	172.16	401.52	425.52	50.59	45.50	325.93	122.32	244.18	205.03	186.24	107.25	172.16	311.10
Netherlands	333.17	589.15	627.21	66.11	93.67	400.25	303.53	570.50	435.97	281.58	207.57	333.17	432.88
New Zealand	288.07	371.51	394.21	84.52	121.97	299.19	279.95	503.68	380.91	278.03	179.46	288.07	378.05
Norway	248.17	417.11	441.24	42.69	57.24	330.61	196.87	476.98	344.05	218.00	154.61	248.17	408.35
Poland	403.68	525.16	649.87	79.41	118.83	481.49	343.38	540.51	467.11	420.50	251.49	403.68	603.32
Portugal	402.04	518.49	602.17	74.06	112.85	443.55	365.83	544.12	467.72	328.99	250.47	402.04	635.49

Country	Main Results	Brand-Name Originator Drugs	Top 60 Drugs by U.S. Sales	Unbranded Generics Without Biologics	Unbranded Generics and Brand-Name Non-Originators	Biologics	Nonbiologics	Other Country Weights	Fisher Index	Active Ingredient Level	Retail Prices	U.S. Net Price Adjustment	Brand-Name Originators with Net Price Adjustment
Slovakia	442.07	565.88	626.36	83.08	136.42	484.93	398.37	597.13	513.79	330.45	275.41	442.07	519.69
Slovenia	423.92	582.82	691.25	51.68	87.87	514.75	355.14	538.60	477.83	329.54	264.10	423.92	518.86
Spain	284.22	361.86	447.95	44.45	80.48	322.56	249.66	402.01	338.02	267.67	177.07	284.22	620.93
Sweden	333.19	418.15	466.45	71.48	98.81	336.89	329.19	505.86	410.55	293.90	207.58	333.19	392.85
Switzerland	218.87	339.33	376.04	19.07	38.07	282.31	172.73	317.71	263.70	195.68	136.36	218.87	293.30
Turkey	1,028.36	1,580.84	1,456.68	178.27	235.60	1,069.64	985.05	1,489.05	1,237.45	996.16	640.67	1,028.36	1,611.12
United Kingdom	270.04	384.80	438.75	46.85	79.11	326.27	226.04	392.42	325.53	273.55	168.23	270.04	434.47

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: We did not calculate a retail price comparison for the U.S. versus Colombia because we did not have a separate IQVIA manufacturer-to-retail conversion factor for Colombia.

Table B.2. Calculated Price Indexes, U.S. Versus Other Countries' Drugs, Exclusion Criteria Sensitivity Analyses, 2022

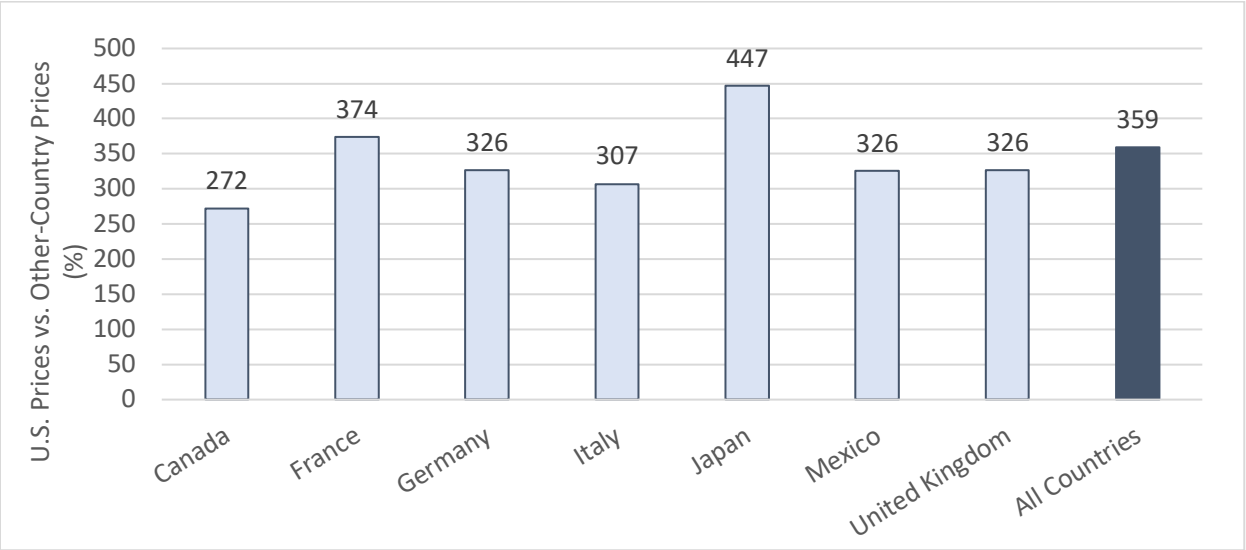
Country	Scenario 1: No Cleaning Steps	Scenario 2: Volume or Sales ($) > 1,000; No Other Exclusions	Scenario 3: Volume or Sales ($) > 1,000; 0.1%–1,000x Price Ratio Exclusion	Scenario 4: Main Results	Scenario 5: Volume or Sales ($) > 1,000; 10%–10x Price Ratio Exclusion
United States	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
All countries excluding the United States	**237.22**	**232.19**	**231.20**	**229.39**	**227.96**
Australia	291.79	277.64	275.99	275.47	255.51
Austria	228.57	224.42	224.42	223.16	207.17
Belgium	269.34	257.08	257.06	256.45	226.29
Canada	221.74	210.78	210.78	209.95	206.24
Chile	192.15	182.49	182.38	182.36	224.24
Colombia	211.06	150.40	150.40	157.14	200.11
Czechia	327.44	300.12	300.08	299.30	259.45
Estonia	470.96	351.03	351.03	348.93	259.92
Finland	264.81	240.52	240.52	237.15	221.99
France	263.38	248.82	248.82	247.91	233.23
Germany	229.98	223.84	223.82	222.91	212.83
Greece	382.86	343.19	343.19	340.95	260.23
Hungary	315.23	271.68	271.68	270.84	251.69
Ireland	283.79	248.23	248.23	247.00	234.40
Italy	257.14	250.80	250.80	250.16	236.14
Japan	224.58	196.28	196.28	195.97	224.21
Korea	327.73	298.53	298.38	297.25	257.84
Latvia	405.47	326.19	326.19	325.12	266.54
Lithuania	429.17	326.76	326.76	326.61	271.46
Luxembourg	345.60	310.52	310.52	309.26	264.30
Mexico	184.23	166.91	166.91	177.24	221.06
Netherlands	291.82	279.57	279.57	278.02	256.87
New Zealand	279.69	262.44	262.44	259.48	240.62
Norway	237.35	224.22	224.22	223.30	226.45
Poland	373.99	302.49	302.49	301.63	254.16
Portugal	324.73	307.47	307.46	305.65	279.76
Slovakia	357.99	367.12	367.12	366.45	313.16
Slovenia	332.06	303.39	303.39	303.17	260.55
Spain	266.15	256.08	256.06	254.56	227.55
Sweden	272.49	270.87	270.87	270.19	247.16
Switzerland	182.79	179.53	179.52	179.39	191.93
Turkey	760.48	704.40	703.20	699.48	336.45
United Kingdom	278.19	263.60	263.58	261.72	252.81

SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).

Biologics and Nonbiologics

Figures B.1 and B.2 illustrate compared prices for biologics and nonbiologics, respectively.[62] U.S. prices are higher than prices in all comparison countries for both biologics and nonbiologics, at 359 percent and 226 percent, respectively, of prices in all other countries combined; these higher prices are likely driven by brand-name originator drugs.

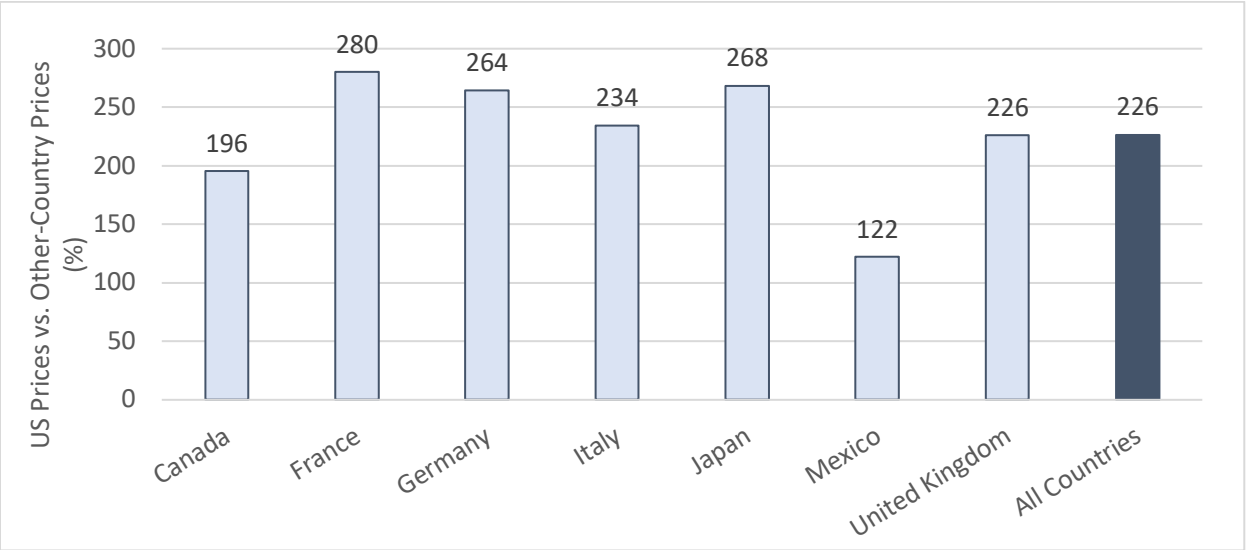
Figure B.1. U.S. Biologic Prices as a Percentage of Other Countries' Prices, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

[62] We rely on the assignment of each active ingredient to a biologic and nonbiologic category in MIDAS. Biosimilars are categorized as biologics. Small-molecule brand and generic drugs that are not biologics are categorized as nonbiologics.

Figure B.2. U.S. Nonbiologic Drug Prices as a Percentage of Other Countries' Prices, 2022

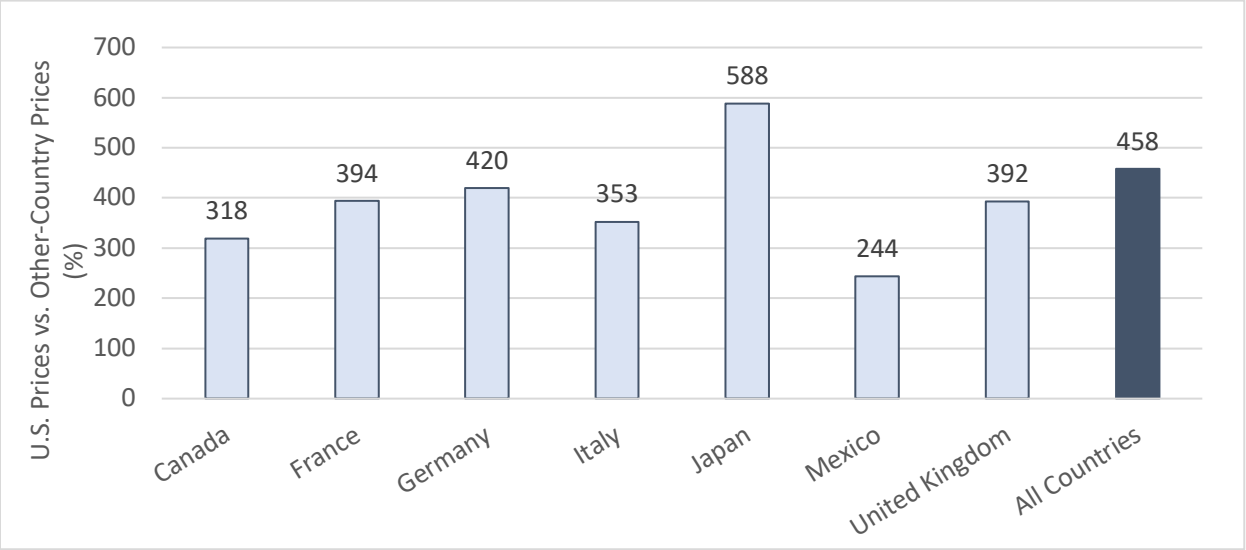


SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

Results from Robustness Checks

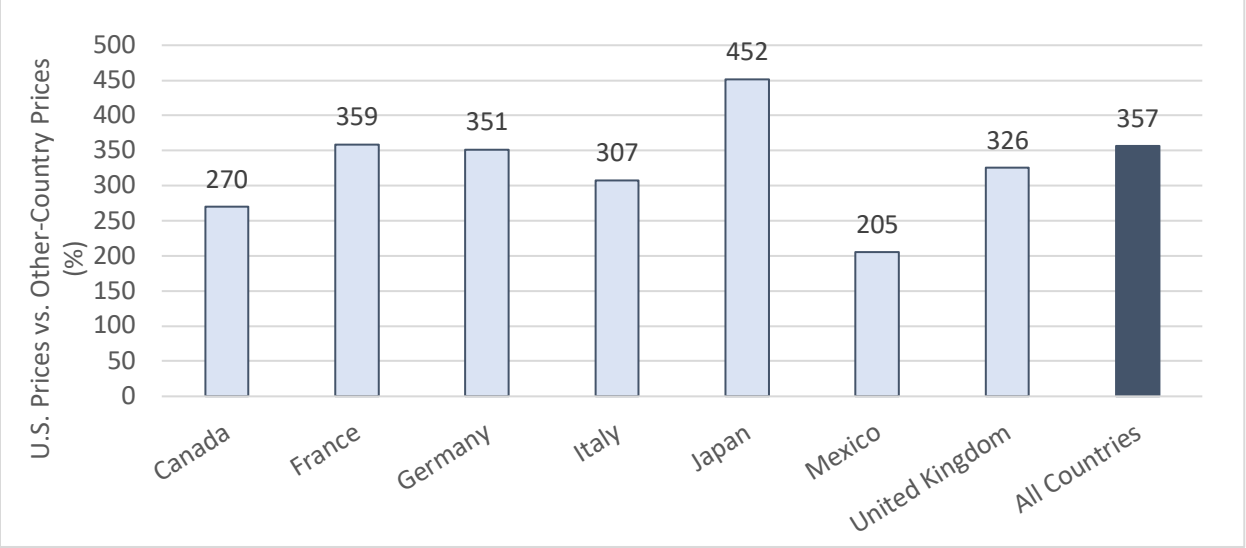
Figures B.3 and B.4 present results from a sensitivity analysis using other countries' volume weights (Figure B.3) and blended volume weights (Figure B.4) rather than U.S. volume weights. Compared with the main results, U.S. prices are even higher than other countries' prices in these sensitivity analyses. U.S. prices were 458 percent of prices in other countries when using other countries' weights and 357 percent of prices in other countries when using a blended rate (the geometric mean to calculate what is called the Fisher index), compared with 278 percent in our main results. When using other countries' weights, higher U.S. prices are expected if prescribing patterns outside the United States are skewed toward drugs with favorable prices in individual countries because of price controls and/or volume purchasing.

Figure B.3. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, Other Countries' Volume Weights, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

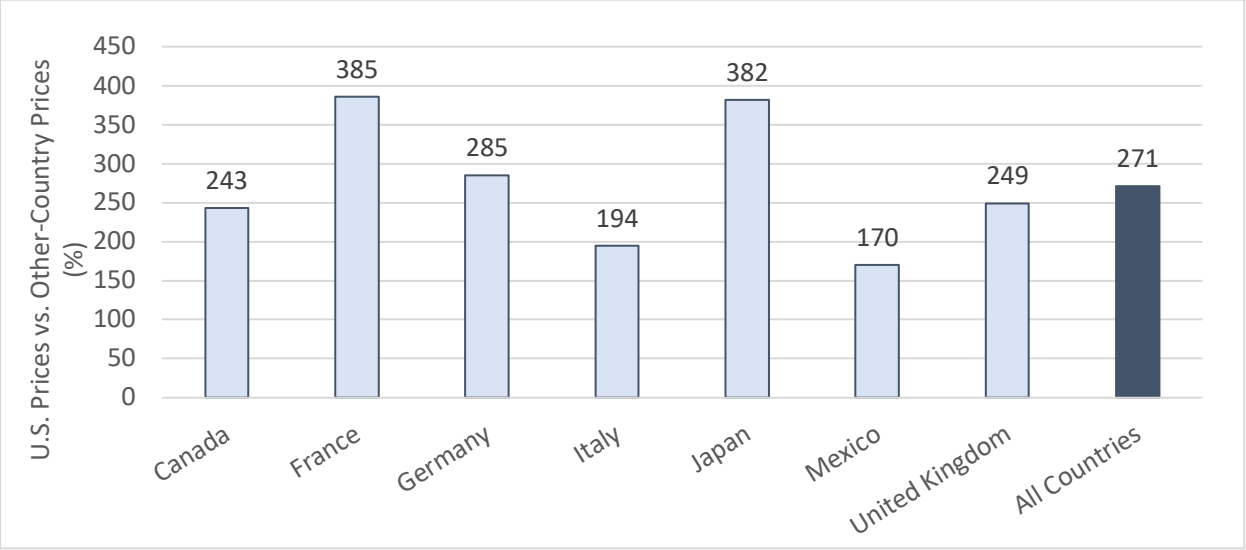
Figure B.4. U.S. Prescription Drug Prices as a Percentage of Other Countries' Prices, Blended Volume Weights (Fisher Index), 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

Figure B.5 presents price comparisons using retail prices rather than manufacturer prices. U.S. prices are still notably higher than prices in other countries (271 percent, compared with 278 percent in our main results using manufacturer prices). Other countries' prices increase when using retail prices rather than manufacturer prices in some bilateral comparisons (for example, for Germany, Italy, Mexico, and the United Kingdom), likely because of higher wholesale and retail markups in these countries.

Figure B.5. U.S. Prescription Drug Retail Prices as a Percentage of Other Countries' Prices, 2022



SOURCE: Authors' analysis of 2022 sales and volume data from IQVIA, undated (run date May 19, 2023).
NOTE: *All Countries* refers to all 33 OECD comparison countries combined. Other countries' prices are set to 100. Only some presentations sold in each country contribute to bilateral comparisons.

Abbreviations

CMS	Centers for Medicare & Medicaid Services
G7	Group of Seven (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States)
OECD	Organisation for Economic Co-operation and Development
PBM	pharmacy benefit manager
WAC	wholesale acquisition cost

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