CONTRACTOR PROJECT REPORT

Comparing Insulin Prices in the United States to Other Countries: Updated Results 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. insulin prices in comparison to prices in other Organisation for Economic Co-operation and Development (OECD) countries. Key takeaways are summarized below.

- In 2022, U.S. prices for insulin products were nearly ten times as high as prices in 33 OECD comparison countries. Average gross prices in the U.S. were more than 10 times prices in France and the United Kingdom; nearly nine times prices in Italy; more than eight times prices in Japan; about seven times prices in Germany; and more than six times prices in Canada.
- Insulin products are among the most heavily rebated prescription drugs—though this does not reduce insulin costs for the uninsured or for enrollees with high deductibles, who may pay full list prices. After adjusting for rebates for insulin in the U.S., but not for estimated rebates in other countries (for which data are generally unavailable), the U.S. pays $2.33 for every dollar paid for insulin in other countries.

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

Andrew W. Mulcahy, Daniel Schwam, and Nate Edenfield, "Comparing Insulin Prices in the U.S. to Other Countries," September 23, 2020, https://aspe.hhs.gov/reports/comparing-insulin-prices-us-other-countries.

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Research Report

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Comparing Insulin Prices in the United States to Other Countries

Updated Results Using 2022 Data

For more information on this publication, visit **www.rand.org/t/RRA788-2**.

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About This Report

Manufacturers' list prices for insulin have increased dramatically since the early 2010s in the United States. In this report, we present results from a comparison of U.S. and international prices for insulins using a price index approach. We describe the shares of volume and sales for all insulins and different categories of insulin in the United States and 33 comparison Organisation for Economic Co-operation and Development countries. For the market basket of insulins sold in both the United States and comparison countries, we report ratios of U.S. insulin gross prices (that is, prices prior to the application of rebates paid by drug companies to buyers) to those in other countries. This report updates a prior RAND Corporation report: Andrew W. Mulcahy, Daniel Schwam, and Nathaniel Edenfield, *Comparing Insulin Prices in the United States to Other Countries: Results from a Price Index Analysis*, RAND Corporation, RR-A788-1, 2020. In the current report, we use more-recent data and include new supplementary analyses, editorial changes, and updates to reflect the evolving insulin market landscape.

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. HHSP233201500038I and carried out within the Payment, Cost, and Coverage Program in RAND Health Care.

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Summary

Manufacturers' gross prices for insulin have increased dramatically since the early 2010s in the United States. At the same time, recent studies found flat or even decreasing U.S. trends for manufacturer net insulin prices—that is, prices reflecting off-invoice discounts paid from drug companies to insurers, their pharmacy benefit managers, and others in exchange for favorable placement on formularies.

In this report, we present results from comparisons of U.S. and international prices for insulins using a price index approach. We aim to

- describe the mix of insulin products used in the United States and other Organisation for Economic Co-operation and Development (OECD) countries
- estimate the direction and magnitude of gross and net insulin price differences between the United States and other countries
- identify trends in these price comparisons over time.

We used 2017–2022 IQVIA MIDAS data describing the national insulin markets in terms of volume and sales by product separately for the United States and 33 comparison OECD countries. We present separate comparisons using manufacturer gross prices, which may be more relevant to U.S. patients without drug coverage or otherwise paying out of pocket for insulin, and estimated manufacturer net prices after applying rebates paid by manufacturers.

Using our main price index approach, we found that U.S. manufacturer gross prices per 100 international units (IUs) of insulin were on average 971 percent (or 9.71 times) of those in OECD comparison countries combined. After estimating gross-to-net discounts for insulins, U.S. net prices remained 233 percent (or 2.33 times) of those in comparison countries combined. Related to these main results, we found the following:

- In terms of comparisons to specific countries, U.S. manufacturer gross prices ranged from 457 percent of those in Mexico to 3,799 percent of those in Turkey.
- Although the ratio of U.S. to other-country gross prices varied depending on the comparison country and insulin category, U.S. prices were always higher—often five to ten times higher—than those in other countries.
- Comparisons of U.S. insulin prices to prices in other countries were fairly constant from 2017 through 2022.

Our price comparisons were limited to insulin products sold in the United States and in comparison countries. We found generally broad overlap in the insulins used in the United States and other countries. All insulin active ingredients sold in the United States were also sold in other countries. We found nine insulin products (defined in terms of unique combinations of insulin active ingredient, dosage form, and dosage strength) sold only in the United States and 53 insulin products sold only in non-U.S. OECD comparison countries, compared with 30 insulin

products sold in both the United States and comparison countries. Despite the many insulin products sold only in or outside the United States, 98 percent of U.S. spending on insulins was on products available in other countries, while 88 percent of other-country spending was on products also available in the United States.

This suggests that the United States may use a more expensive mix of insulin products. The United States was unusual among comparison countries in permitting distribution of several types of insulin over the counter, which is likely driven by access concerns. We found modest and decreasing use of over-the-counter insulin in the United States. We also found the average vial or other "standard unit" of insulin in the United States had a higher dosage strength in terms of IUs compared with other countries.

It is important to note that manufacturer gross prices, for which we found much larger relative differences between U.S. and other-country prices, are the basis for prices throughout the U.S. prescription drug supply chain, including prices paid at pharmacies. As a result, patients without drug coverage, as well as patients with drug coverage paying in a deductible phase or patients responsible for coinsurance based on a percentage of total cost rather than a fixed copay, are responsible for either all or a share of payments to pharmacies that are anchored initially on manufacturer invoice prices.

Medicare enrollees' financial exposure to U.S. insulin gross prices and out-of-pocket spending for insulin and for all drugs are changing dramatically: Inflation Reduction Act (IRA) provisions limiting insulin cost-sharing and requiring rebates for drug price increases beyond inflation are already in effect, and total out-of-pocket spending in Medicare Part D will be capped beginning in 2024 (Pub. L. 117-169, 2022). These policies do not apply to those with coverage outside Medicare, but Congress is considering proposals to extend the IRA's $35 cap to individuals with employer or individual market coverage (Kennedy, 2023; Collins, 2023). Recent announcements from all three U.S. insulin manufacturers regarding reductions in gross prices nearer to current net prices are a more encompassing change that will have broader implications for all patients (Eli Lilly and Company, 2023; Novo Nordisk, 2023; Sanofi, 2023). Other changes in how insulin is sold—for example, the increased availability of biosimilar insulins and the recent emergence of bifurcated marketing approaches in which the same insulin is simultaneously sold by its manufacturer under a brand name (where rebates apply) and as an unbranded product (where rebates do not apply)—may also have important longer-term implications for U.S. insulin prices, how they compare with prices in other countries, and consumer out-of-pocket spending on insulin.

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Chapter 1. Background and Analysis

Introduction and Overview

Manufacturer *gross* prices (similar to *list* prices) for insulin have increased dramatically since the early 2010s in the United States.[1] For example, in an analysis of the Centers for Medicare & Medicaid Services' National Average Drug Acquisition Cost data, Cefalu et al. (2018) found that the average U.S. wholesale acquisition price for rapid-acting, long-acting, and short-acting insulin increased by 15–17 percent per year from 2012 to 2016. In another study, Hernandez et al. (2020) estimated that manufacturer gross prices increased annually by an average of 13 percent from 2007 to 2018. These gross price increases were far above general inflation over the same periods.[2]

At the same time, recent studies found markedly different price trends for U.S. *net* manufacturer prices for insulins—that is, prices reflecting off-invoice discounts paid from drug companies to insurers, their pharmacy benefit managers (PBMs), and others in exchange for favorable placement on formularies. The magnitude of these rebates and other discounts grew at the same rate or a higher rate in recent years, leading to little growth, or even declines, in net prices for insulins. One study estimated that rebates as a share of sales at gross prices for four main insulin brands grew from 38 percent in 2012 to 82 percent in 2019, or an annual average increase of 17 percent (Dickson et al., 2023).

The growing separation between manufacturer gross and net prices for insulins—which some refer to as a *bubble* or *wedge*—likely has several causes. The U.S. insulin market is relatively competitive compared with markets for other biologic drugs, with three main manufacturers offering generally similar arrays of insulin products.[3] This more-robust competition is likely driven by the long history of insulin's use as a prescription drug (Lee and Yoon, 2021); the relative scientific and chemical simplicity of insulin compared with other, typically much larger and more-complex biologics; and the size of the market from a large and growing population

[1] List prices—for example, wholesale acquisition costs—are freely set in the United States by drug companies. Actual transactional prices—that is, the prices paid to drug companies by distributors, hospitals, pharmacies, and other buyers that determine manufacturers' gross revenue—are often anchored on list prices but are generally lower than list prices and are not always known. When intermediaries, such as distributors, buy drugs from drug companies, they often add a modest markup on their initial purchase price that is passed through the supply chain (see Mulcahy and Kareddy, 2021).

[2] The Consumer Price Index for All Urban Consumers, without seasonal adjustment, increased by an annual average of 1.1 percent from 2012 to 2016 and by 1.9 percent from 2007 to 2018. See U.S. Bureau of Labor Statistics, undated.

[3] The three main manufacturers are Eli Lilly and Company, Novo Nordisk, and Sanofi. These manufacturers are also the major players in non-U.S. Organisation for Economic Co-operation and Development (OECD) countries.

with diabetes. Competitive pressures have further increased recently with the launch of new versions of older insulin active ingredients. These include biosimilar insulins, which are insulins determined by the U.S. Food and Drug Administration (FDA) to be highly similar to already-marketed insulins through a shorter and less expensive regulatory approval pathway.[4] Some biosimilar insulins are designated by the FDA as *interchangeable biosimilar insulins*, meaning that they can be substituted by a pharmacist for their already-marketed insulin *reference biologic*. Other recently introduced insulins are new branded or unbranded versions of older insulins approved via the FDA's full regulatory approval process.

This growing competition likely pushes net prices lower, as insulin producers offer relatively larger discounts in exchange for favorable formulary placement and fewer restrictions on use (such as utilization management and cost-sharing). In the other direction, PBMs' interest in maximizing documented savings for clients may place upward pressure on U.S. insulin gross prices. In other words, increasing both gross prices and rebates by the same magnitudes allows PBMs to claim greater savings while, ignoring demand responses, the manufacturer earns the exact same net price per unit.

The impact of these countervailing price trends on patients is ambiguous and multifaceted. Increasing list prices may lead to greater exposure to cost-sharing in cases in which patients must pay the gross price at the point of dispensing in full (e.g., in the deductible phase of coverage) or in part (e.g., through coinsurance). For example, Cefalu et al. (2018) found that average out-of-pocket costs between 2006 and 2013 for insulin-using Medicare Part D enrollees increased by 10 percent per year. In 2019, the average out-of-pocket cost per insulin fill for people who were uninsured was $123, more than double the national average of $58 per fill (Sayed et al., 2023).[5]

Several developments in the U.S. insulin market and broader prescription drug price policy landscape have the potential to fundamentally change these historical dynamics. First, all three major U.S. insulin producers announced major list price decreases for at least some of their insulin products, to the point that list prices will now be essentially the same as net prices (Eli Lilly and Company, 2023; Novo Nordisk, 2023; Sanofi, 2023). This change will likely not substantively affect insulin producers' net revenue, but it will "pop" the gross-to-net bubble for the insulin products subject to the price changes. Second, the Inflation Reduction Act (IRA) introduced new limits on drug pricing primarily in the Medicare program, including rebates paid to the government for drugs with gross prices rising faster than inflation and, for certain older,

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[4] The FDA's biosimilar regulatory approval pathway was authorized by the Biologics Price Competition and Innovation Act, which passed as part of the Affordable Care Act of 2010 (Pub. L. 111-148, 2010). The first interchangeable insulin biosimilar, insulin glargine-yfgn (brand name Semglee), was approved in 2021 (FDA, 2021).

[5] There are several reasons why the per-fill payment for uninsured patients from Sayed et al. (2023) is relatively modest. Type 2 diabetics often fill prescriptions for multiple insulins of different types simultaneously, which increases the total out-of-pocket spending for a patient per month. Separately, uninsured patients may use a different, less expensive mix of insulins—for example, relatively more human rather than analog insulin—compared with those with coverage. Finally, uninsured patients may be more likely to use retail pharmacy discount programs, such as GoodRx, which may reduce the cash price for insulin substantially.

single-source drugs, such as some insulins, direct negotiation of drug prices (Pub. L. 117-169, 2022). The IRA also introduced a $35 cap on insulin cost-sharing and an overall $2,000 cap on out-of-pocket spending within Medicare Part D. Several legislative proposals aim to expand this cap to other sources of coverage.[6] Third, treatment regimens for Type 2 diabetes continue to evolve, with increasing use of brand-name injected and oral antihyperglycemics, including glucagon-like peptide 1 (GLP-1) agonists and sodium-glucose cotransporter-2 inhibitors (SGLT2i) (Heyward et al., 2021). These non-insulin drugs can be either complements or substitutes to treatment with insulin. Changes in utilization of these non-insulin drugs and newer and more-differentiated insulin analogs may have important implications for prices of established insulin products.

There will likely be intense interest in understanding the impact of these recent policy and competitive changes in the U.S. insulin market on prices, patients, and payers. One yardstick for assessing changes in U.S. prices over time is pricing for the same products in other high-income countries. As we discussed in our prior research in this area (Mulcahy, Whaley, et al., 2021), international drug price comparisons can identify whether U.S. trends align with or diverge from those in other countries and provide a benchmark or range of prices from countries using data-driven, value-based approaches to regulate drug prices. To this end, the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation (ASPE) asked the RAND Corporation to update a prior comparison of U.S. and other-country prices for insulins, including for all insulins combined and for different categories of insulins, using more-recent data. While the time period covered in this update ends prior to many of the most-recent developments in U.S. insulin markets, the findings may provide a useful baseline assessment on U.S. versus other-country insulin prices for use in later policy evaluation and analysis.

Scope of the Report

Some analyses and results described in this report were first published in Mulcahy, Schwam, and Edenfield (2020) using older data (from 2018). Both the earlier report and this updated report focus on comparisons of insulin utilization, spending, and prices between the United States and nearly all other OECD countries. Both reports include the following three general sets of results:

- descriptive statistics comparing the United States and other OECD countries in terms of the mix of insulins used by volume and sales
- descriptive statistics describing the average gross price for insulin overall and by insulin category

[6] Two bipartisan bills to cap the out-of-pocket cost of insulin have been introduced in the Senate in 2023: the Affordable Insulin Now Act of 2023 and the Improving Needed Safeguards for Users of Lifesaving Insulin Now (INSULIN) Act of 2023.

- findings from price index–based comparisons holding mix constant between the United States and comparison countries.

In addition to making editorial changes and adding descriptions of recent policy developments, in this updated report, we take the following steps:

- **Use IQVIA MIDAS prescription drug market data through 2022.**[7] The updated report also includes new supplemental analyses on trends in insulin price comparisons.
- **Include initial comparisons of per capita insulin utilization and spending.** We included these analyses to help contextualize the extent to which the United States is an outlier in terms of spending.
- **Analyze prices per 100 international units (IUs) of insulin—the standardized unit for measuring insulin dosage strength—for the main analyses.** The earlier report analyzed prices in terms of standard units (SUs)—a standardized volume measure developed by IQVIA, the organization that produced the IQVIA MIDAS data extract used for this analysis. For most insulin products, an SU is a vial. While both the volume (in milliliters) and dosage strength (in terms of IUs of insulin per milliliter) of a vial varies across insulin, there are relatively few combinations of volume and dosage strength in products sold in the United States and other countries (e.g., 3 ml and 100 IU/ml). If the United States and other countries use a different mix of insulin products, then price ratios calculated using prices per 100 IUs of insulin may differ from those calculated using prices per SU. We compare findings using both price measurement approaches in the new supplemental analyses.
- **Use an updated estimate of U.S. gross-to-net discounts for insulins.** The earlier report approximated U.S. manufacturer net prices for insulins assuming a 50 percent reduction off U.S. manufacturer gross (that is, invoice) prices. Since our initial analysis, several studies have reported relatively larger rebates—for example, an estimated 76 percent invoice-to-manufacturer reduction for all insulins in Mulcahy, Schwam, et al. (2021) and an 81.4 percent reduction for four insulins in Dickson et al. (2023). We updated our price comparisons between the United States and other countries at estimated U.S. manufacturer net prices using a 76 percent rather than a 50 percent reduction.

In Chapter 2, we describe our underlying methodology, and, in Chapter 3, we describe the details related to each of these changes. In Chapter 4, we conclude by putting our main findings in context. The appendix presents reference information and supplemental results.

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

Chapter 2. Data and Methods

Source Data

ASPE provided us with a list of insulin active ingredients categorized on two dimensions (see Table A.1 for details).[8] The first dimension—which we call an insulin *type*—concerns whether the insulin active ingredient is human, analog, or animal. Analogs of human insulin, such as insulin lispro and insulin detemir, differ from human insulin in terms of uptake and duration of effect and can offer additional health benefits to patients. The second dimension—which we call insulin *timing*—concerns which of the following timing characteristics accurately describes the insulin's active ingredient:

- rapid acting
- rapid–intermediate acting
- short acting
- short–intermediate acting
- intermediate acting
- long acting.

The onset, peak, and duration times of insulins in these timing categories vary. Some patients with diabetes follow a regimen of multiple insulins from different timing categories; for example, a patient may use a bolus rapid-acting insulin around meals and a basal (background) long-acting insulin. In this analysis, we treat insulin type and insulin timing separately. In other words, a single timing category can comprise both human and analog insulins, and a single type category can comprise insulins in different timing categories.

In our analysis, we used sales and volume data from IQVIA's MIDAS database.[9] The data we examined cover 2017 through 2022 and span 34 OECD countries, including the United States.[10] IQVIA MIDAS sales and volume estimates are projected from IQVIA's audits of standardized list prices and manufacturer, wholesaler, and other invoices; the estimates do not

[8] There were no new insulin active ingredients sold in the United States from 2018 through 2022. As a result, mapping provided by ASPE for our earlier report did not need to be updated.

[9] For more information, see IQVIA, undated. The run date for the extract we received from ASPE was March 7, 2023.

[10] The other 33 countries are Australia, Austria, Belgium, Canada, Chile, Columbia, the Czech Republic (Czechia), Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea (South), Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and the United Kingdom. ASPE did not supply IQVIA MIDAS data for three OECD members: Denmark, Iceland, and Israel.

The earlier RAND report covered one fewer country (i.e., the United States and 32 comparison countries) (Mulcahy, Schwam, and Edenfield, 2020). Colombia joined the OECD in May 2018 and is included in the report update for all years, including 2017 and 2018, when it was not yet an OECD member.

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.

Our IQVIA MIDAS extract used two key national-level variables for individual drug products: (1) total quarterly manufacturer sales at gross prices in U.S. dollars,[11] converted at quarterly exchange rates, and (2) manufacturer volume measured in terms of the SUs, which, as noted, is a count of vials for nearly all insulin products.

Our analysis is limited to nearly all insulins sold in the United States. We matched the active ingredients on the ASPE-provided list to IQVIA MIDAS active ingredients (*moleculelists*) using a mix of string matching and manual crosswalking to resolve spelling differences (see Table A.1).[12] We excluded animal insulin products—as identified on the ASPE-provided list—from our analysis because they accounted for an extremely small share (less than one-hundredth of a percent) of both total sales and volume across all countries and because they were not sold in the United States from 2017 through 2022. We also excluded inhaled insulins (identified using dosage form as described in IQVIA MIDAS) because IQVIA MIDAS data measure volume for these products differently from how they measure injected insulins. We did not include products in which insulin is administered in combination with a non-insulin drug (e.g., insulin degludec and liraglutide). We included both prescription and nonprescription (i.e., over the counter) drugs, as certain insulins are available over the counter in some countries (including the United States).

U.S. Manufacturer Net Sales Estimate

The manufacturer sales estimates in the IQVIA MIDAS data do not reflect rebates or other discounts that might have been applied after drugs left the factory; we expect that, in many countries (and particularly in the United States), manufacturer net sales are much lower than manufacturer gross sales. The difference between net and manufacturer sales (and, therefore, prices) is likely large. A recent study found U.S. manufacturer net prices across all brand-name drugs (including non-insulin drugs) were 37.2 percent lower than gross prices (IQVIA Institute for Human Data Science, 2023). The average discount between transactional and net prices for insulins is even greater because of the highly competitive insulin market, in which there are several broadly substitutable products for most patients. Fuglesten Biniek and Johnson (2019) applied a 50 percent discount from manufacturer to net prices specifically for insulins, but this factor was an assumption used to describe an illustrative example of results at hypothetical net

[11] *Manufacturer gross sales* refers to the sale price paid to manufacturers by wholesalers, distributors, or other buyers. 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.

[12] 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 insulin degludec). Some drugs have multiple active ingredients (such as insulin degludec and liraglutide). We defined the active ingredient for combination drugs with multiple active ingredients as the full list of active ingredients.

prices. Mulcahy, Schwam, et al. (2021) estimated a U.S. ratio of manufacturer invoice prices (from IQVIA MIDAS data) to manufacturer net prices of 76 percent for insulins. Dickson et al. (2023) found an 81.4 percent reduction for four insulin products. To estimate net sales and prices, we created a second sales measure for 2022 data by reducing the IQVIA MIDAS gross sales amounts for the United States by 76 percent.[13] We did not construct estimates of gross-to-net discounts for prior years because of the lack of annual insulin-specific discounts developed using consistent methods.

Although gross-to-net discounts may also occur in other countries, we could not identify data or estimates from the literature to support adjustments in other countries. As a result, the magnitude of differences between U.S. *net* and other-country *gross* prices likely understates the actual difference between *net* prices in both the United States and other countries.

Dosage Strength Adjustment

The earlier RAND analysis used SUs to quantify country-level insulin volume (Mulcahy, Schwam, and Edenfield, 2020). IQVIA's SUs are a way to quantify drug volume over different forms of drugs—for example, oral solid, oral liquid, and injected and other parenteral (that is, non-oral) formulations. Nearly all insulin products are sold in vials, autoinjectors, pens, or other delivery devices, each of which counts as a single SU. As a result, using SUs to measure insulin volume may obfuscate important differences related to the volume or strength of the insulin packaged in a single SU. Furthermore, the term *unit* is often associated with IUs of insulin, which is a measure of insulin active ingredient, leading to potential confusion between SUs and IUs.

Given this context, we created a second IU-based volume measure for each IQVIA MIDAS record by adjusting the reported count of SUs by the package volume (in milliliters) and dosage strength (in IUs per milliliter) per SU. More specifically, we first multiplied the count of SUs, which reflects a count of vials, pens, autoinjectors, or other product-level counting unit, by the volume per SU. For example, we multiplied the count of SUs for a 3 ml vial product by 3 (i.e., 3 ml per 1 SU) to arrive at a package volume sum in milliliters. We then multiplied the package volume sum in milliliters by dosage strength in terms of 100 IUs/ml. For example, for a product with a dosage strength of 300 IUs/ml, we multiplied the package volume sum in milliliters by 3 (i.e., 300 IUs/ml divided by 100 IUs/ml). We retain both IU- and SU-based volume measures throughout our analysis. While our main results are in terms of prices per 100 IUs, we assess how these results change when using prices per SU in the appendix.

[13] We used Mulcahy, Whaley, et al. (2021) rather than Dickson et al. (2023) because the former covers all insulins and uses the same data source as the current analysis.

Aggregation to the Presentation Level

The IQVIA MIDAS extracts we initially received from ASPE were provided at a very granular level and included different records for individual manufacturers and pack sizes. We used the fields *nfc123* (new form code [NFC]) and *intstrength* (international dosage strength) to aggregate quarterly manufacturer gross sales, estimated manufacturer net sales, volume in terms of 100 IUs, and volume in terms of SUs at the level of country, active ingredient, form, and strength, which we refer to as the *country presentation level*. We calculated prices using sales and volume aggregated at this level for most analyses. We also calculated U.S. volume weights for use in price index calculations using data aggregated at this level. For some robustness checks, we further aggregate to the active ingredient level.

Insulin Categories

After we mapped the insulin active ingredients from the ASPE list to our IQVIA MIDAS extract, we assigned each MIDAS insulin active ingredient to either a human or analog insulin type category and one of the six insulin timing categories defined earlier. While some of our analyses focus on all insulins combined, others differentiate between insulins in the specific categories listed above. For some analyses, we divide IQVIA MIDAS data for each insulin active ingredient into prescription versus nonprescription products using the *intrxstatus* variable taken directly from IQVIA MIDAS.

Calculating Per Capita Utilization and Sales

We used annual country-level historical population data (for 2017 through 2021) and projections (for 2022) from the OECD (undated). We calculated per capita utilization and sales by dividing totals for these measures by population.

Price Index Methodology

In our main 2022 price index results, we compared manufacturer gross and net prices in the United States with those of each comparison country, holding an insulin *market basket*—the mix of drugs sold in the United States—constant at U.S. volume shares by presentation. Separately, we compared prices in the United States relative to a volume-weighted price calculated across all 33 non-U.S. OECD countries combined. We compared prices first for a market basket covering all insulins and then for market baskets containing only those insulins in specific type and timing categories.

Although many insulin products are sold in both the United States and comparison countries, the overlap is not perfect, leading to potentially uneven generalizability across comparisons. Each comparison uses data only from those presentations with sales in both the United States and

the comparison country. For example, the comparison of prices in the United States and the United Kingdom uses data only from those presentations of insulin that were sold in both countries. For comparisons of U.S. prices with those in all non-U.S. OECD countries combined, we used presentations sold in both the United States and at least one non-U.S. OECD country. This approach yields more bilateral matches between the United States and other countries but with less certainty that prices are being compared for exactly the same products in terms of form, strength, and other characteristics. We also compare prices calculated at a higher, active-ingredient level. Although the overlap in insulins sold in the United States and other countries increases dramatically at the active-ingredient level, mismatches in specific dosage forms and strengths within active ingredients become more common.

For analyses focusing on trends from 2017 through 2022, we allowed U.S. volume shares to change over time, leading to the potential for changes in product mix to drive some or most of the observed changes in prices.

We did not adjust price indexes by per capita gross domestic product purchasing power parity for differential inflation between the United States and other countries or for other differences across markets.

Presenting Results

For both descriptive and price index results, we report both broader findings comparing the United States with other OECD countries combined and narrower results comparing the United States with individual OECD countries. The charts in the main body of the report include specific comparisons for the United States versus

- larger OECD economies in the Group of Seven (G7), which, excluding the United States, consists of Canada, France, Italy, Germany, Japan, and the United Kingdom
- Australia because of its inclusion as a reference-pricing comparison country in the proposed H.R. 3 drug price provisions (U.S. House of Representatives, 2021)
- Mexico because of its geographic proximity to the United States (Canada is already included via the G7).

The tables in the appendix present results comparing the United States with each of the 33 OECD comparison countries individually.

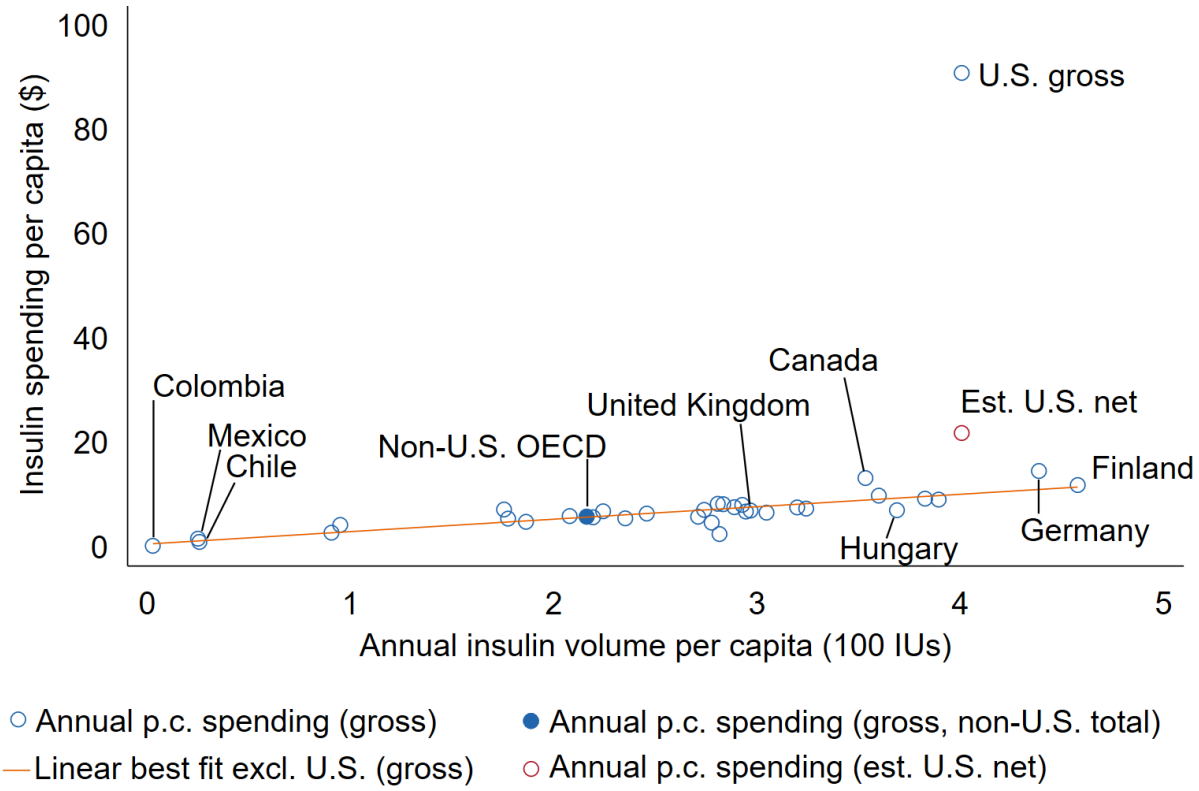
When detailing findings from price index comparisons, we report ratios (as a percentage) of U.S. prices to comparison country prices or to prices in all non-U.S. OECD countries combined. Price indexes greater than 100 indicate that U.S. prices are higher than those in the comparison country; indexes less than 100 indicate that U.S. prices are lower than those in the comparison country.

Chapter 3. Results

Broad Volume and Sales Comparisons Across Countries

Across the six-year study period (2017 through 2022), the United States had the highest per capita spending and among the highest per capita utilization among the 34 study countries (Figure 3.1). Relative to the other OECD countries in our analysis, the United States was a clear outlier in terms of per capita spending at gross prices—$90.65 compared with just $5.64 in comparison countries combined. Per capita spending at gross prices was $4.05 in Japan, $6.94 in France, $7.41 in the United Kingdom, and $14.39 in Germany. After we applied a gross-to-net discount and re-estimated spending per capita ($21.67), the United States was more in line with other countries but still had the highest per capita spending amount of any OECD country in the analysis.

Figure 3.1. Per Capita Insulin Spending Versus Per Capita Insulin Volume Among 34 OECD Countries, 2017 Through 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: The linear best-fit line predicts gross spending per capita as a function of volume per capita and is estimated excluding the United States, as it is an outlier. Est. = estimated; excl. = excluding; p.c. = per capita.

We found a positive and statistically significant relationship between per capita annual volume and spending, which, as expected, suggests spending increases with utilization. In a model estimated without the United States (which was a clear outlier), each increase in 100 IUs in insulin volume was associated with $2.39 in annual per capita spending ($p < 0.001$, with the model explaining 59 percent of the variation in spending). We found very low utilization and spending (e.g., <100 IUs per capita annually and <$1 in gross spending annually) in some countries (e.g., Mexico, Colombia, and Chile), suggesting either incomplete information in the IQVIA MIDAS data or limited access to insulin through formal markets in these countries. As a result, the per capita statistics above may be biased downward for some comparison countries.[14]

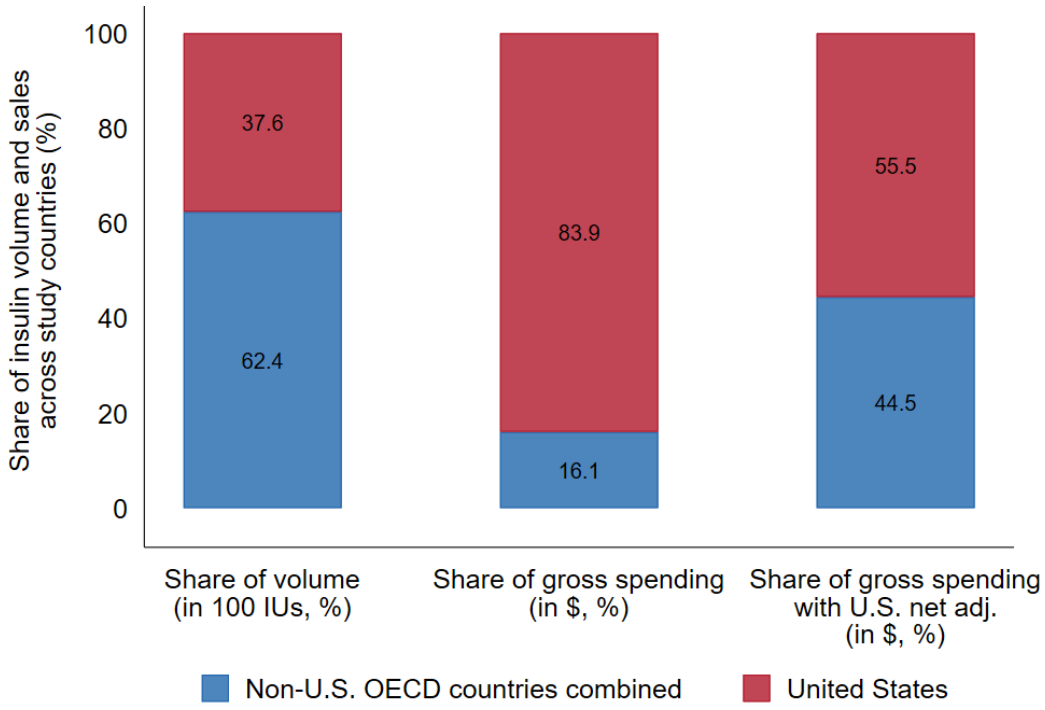
If we examine the sales and volume only in the IQVIA MIDAS data, the United States accounted for 37.6 percent of insulin volume measured in IUs (Figure 3.2) and 31.3 percent of insulin volume measured in SUs (not pictured). The United States accounted for a far larger share of spending—83.9 percent—at gross prices. The U.S. share of spending declined to 55.5 percent after we applied the gross-to-net price adjustment but remained disproportionately high relative to the U.S. share of volume.

Our finding that the United States accounted for a larger share of volume in terms of IUs versus SUs suggests a possible difference in the mix of insulin products used in the United States and other countries. More-frequent, high-dosage insulin products (e.g., 300 IU/ml versus 100 IU/ml or multi-injection vials) in the United States could explain part of this difference.

Figure 3.3 compares the average ratio of 100 IUs per SU across countries. The United States' 100 IUs per SU ratio was roughly one-quarter to one-third higher than the ratio in other countries, except for Mexico (which had a higher ratio than the United States). Although our use of IUs as a measure of volume for our main analysis addresses dosage strength differences, it does not control for other differences in product mix, such as delivery device, convenience factors, and packaging. The price index results described below more directly control for these differences for the subset of insulins sold in both the United States and comparison countries.

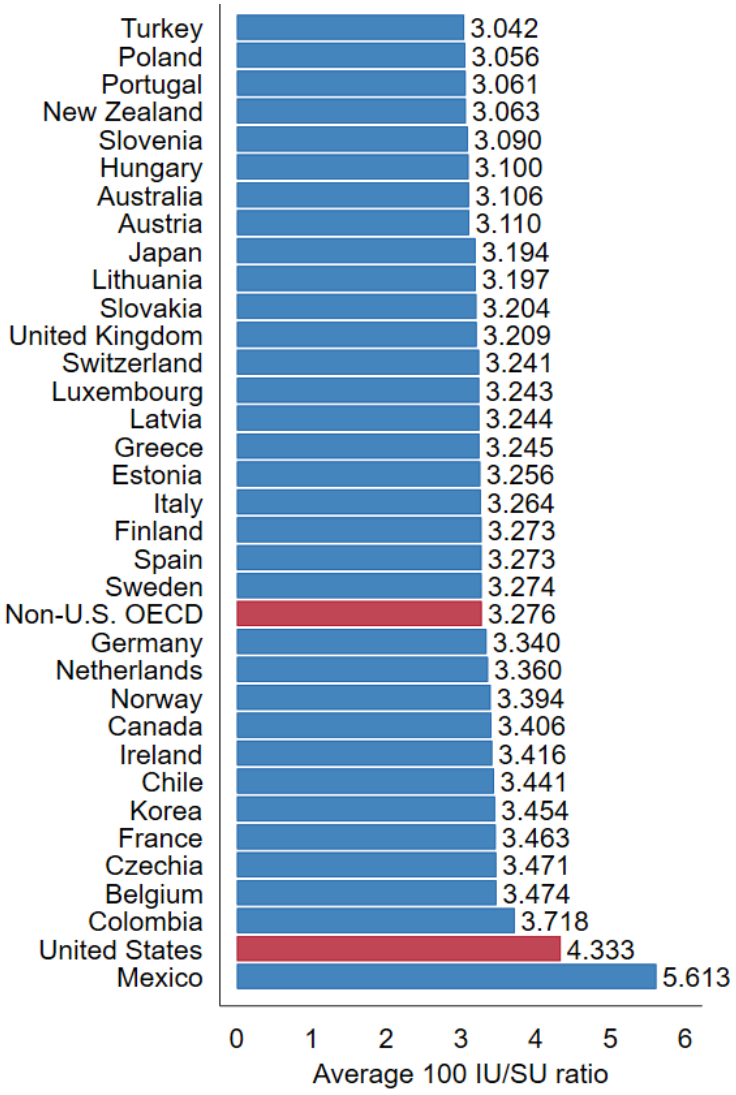
[14] The positive, statistically significant slope persists if these three countries are excluded along with the United States.

Figure 3.2. Shares of Insulin Spending and Volume Among 34 OECD Countries, 2017 Through 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Shares were calculated across the 34 OECD countries included in the extract. We applied a gross-to-net reduction only for the United States in the rightmost bar. This reduction decreased the overall denominator when calculating shares, which, in turn, increased the shares of spending at gross prices for other countries. Adj. = adjustment.

Figure 3.3. Average Ratio of 100 IUs of Insulin per SU Among 34 OECD Countries, 2017 Through 2022



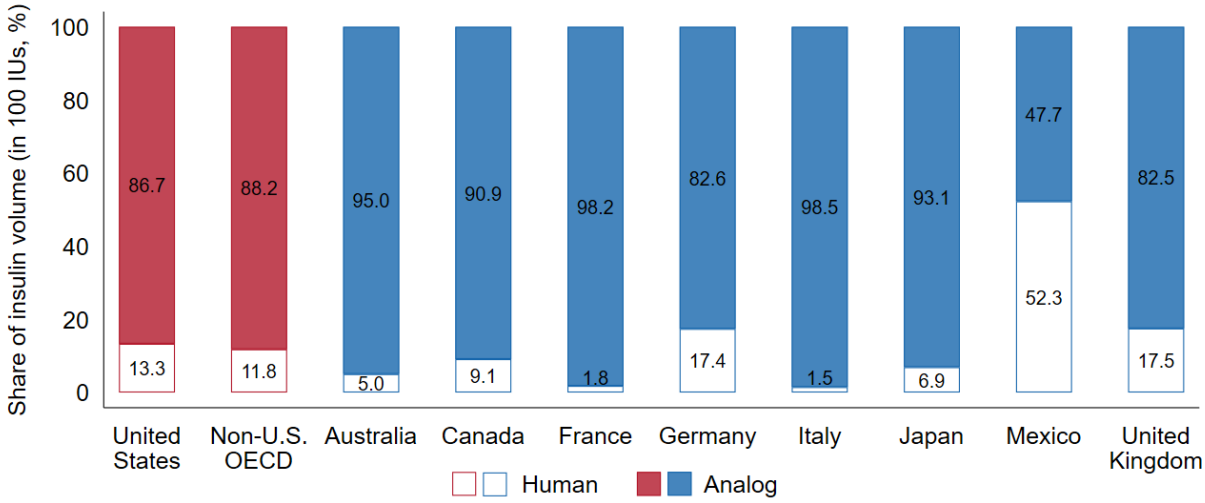
SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: The red bars highlight results for the United States and non-U.S. OECD countries combined.

Differences in Volume and Sales by Insulin Characteristics

Analog insulins accounted for 87 percent of U.S. volume measured in IUs (Figure 3.4) and 93 percent of U.S. sales at gross prices in 2022 (Figure 3.5). In most higher-income countries, analog insulins accounted for more than 80 percent—and, in some cases, nearly 100 percent—of volume and sales. Some lower-income comparison countries, such as Mexico, Hungary, and Poland, had lower shares of volume and sales for analog insulins and higher shares of volume and sales for human insulins. (See Table A.2 for full volume share results and Table A.3 for full

sales share results; Table A.4 presents volume share results with volume measured in SUs rather than IUs.)

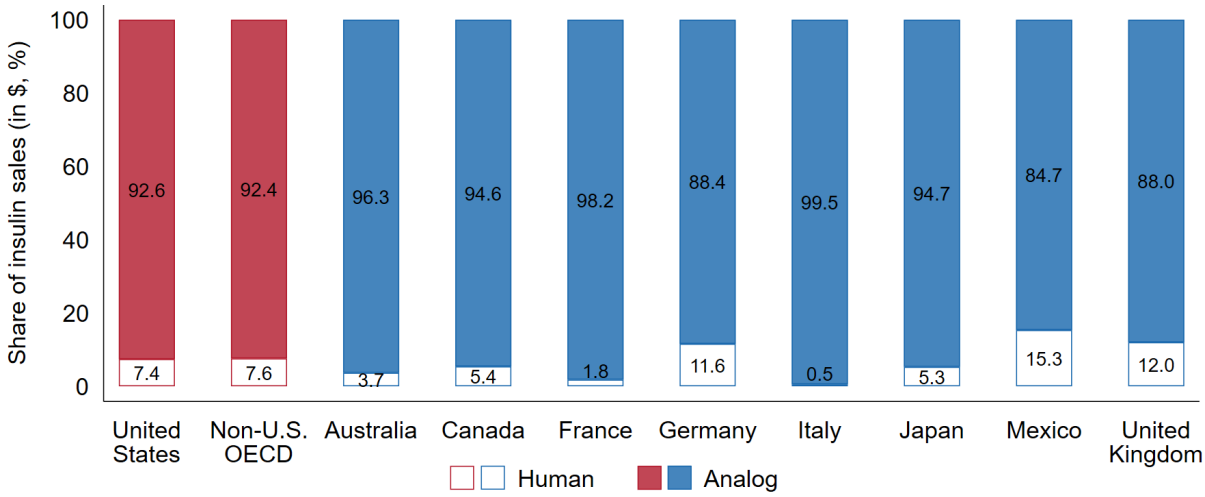
Figure 3.4. Insulin Volume Shares, by Insulin Type, Select Comparisons, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Non-U.S. OECD refers to all 33 non-U.S. OECD comparison countries combined. Red shading indicates the United States and non-U.S. OECD country results. Results from select individual countries are in blue. See Table A.2 for full country-level results. Figures 3.4 and 3.5 show the same shares calculated using either gross or net spending because the U.S. gross-to-net adjustment is a constant factor applied to all insulins and because we did not estimate net prices for other countries.

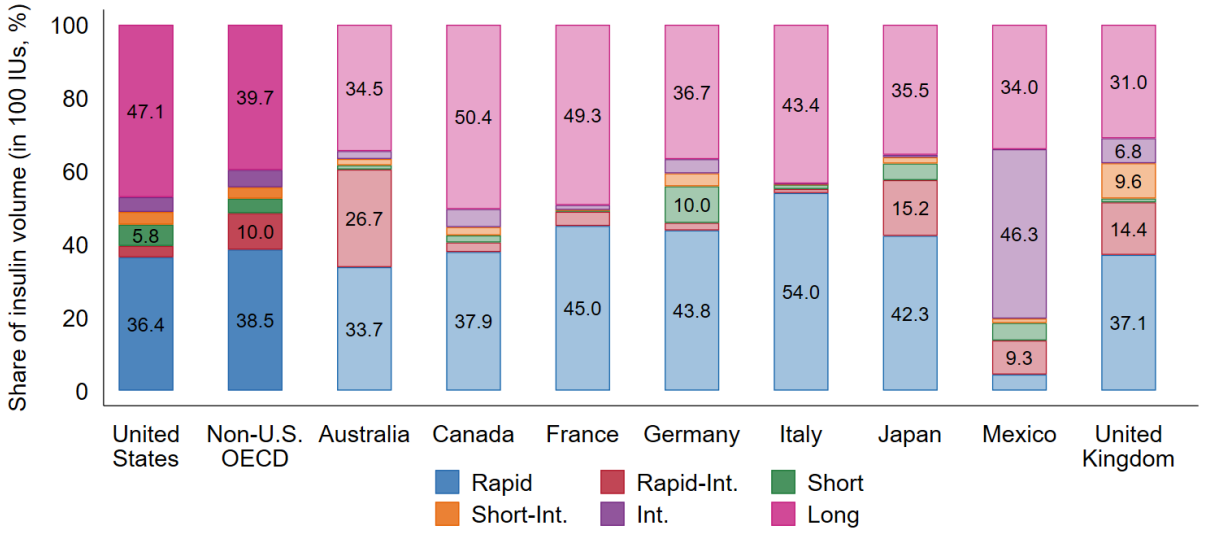
Long-acting insulins represented a higher share of volume in the United States than in several comparison countries, such as Germany and the United Kingdom, but about the same share in others, including Canada and France (Figure 3.6). The United States was in the middle of individual comparison countries and similar to non-U.S. OECD countries combined in terms of the share of sales for long-acting insulins (Figure 3.7). Combined, rapid–intermediate-acting, short-acting, short–intermediate-acting, and intermediate-acting insulins accounted for about the same share or a smaller share of both volume and sales in the United States than they did in many comparison countries in Figures 3.6 and 3.7. However, some individual comparison countries had markedly different distributions of volume and sales than others. Australia, for example, had an uncommonly larger share of rapid–intermediate-acting insulin volume and sales compared with other countries, and Germany had a relatively larger share of rapid-acting insulins compared with other countries. (See Tables A.2 and A.3 for full results.)

Figure 3.5. Insulin Sales Shares, by Insulin Type, Select Comparisons, 2022



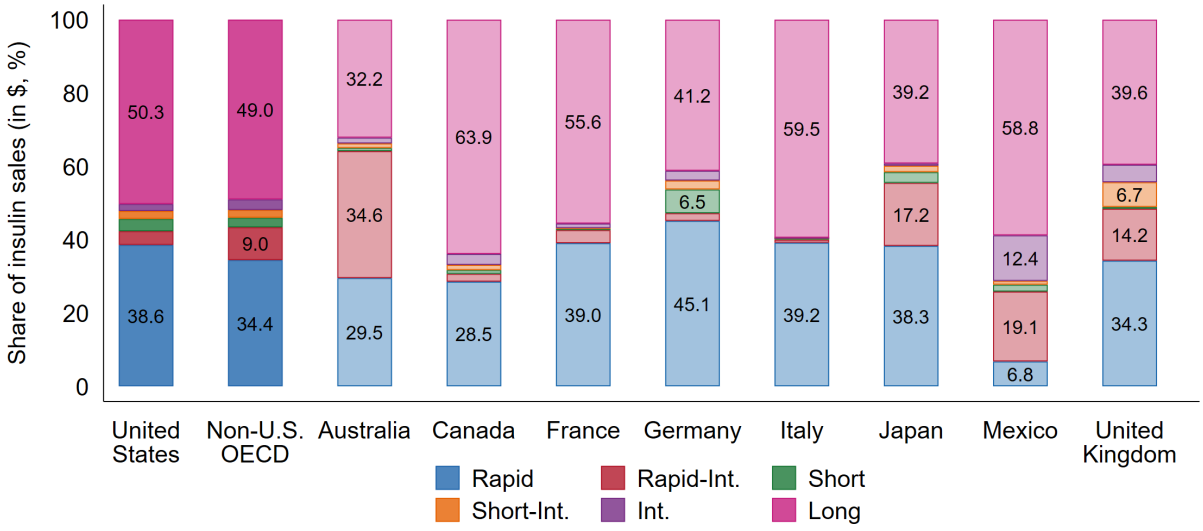
SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Sales calculated in U.S. dollars. Non-U.S. OECD refers to all 33 non-U.S. OECD comparison countries combined. Red shading indicates the United States and non-U.S. OECD country results. Results from select individual countries are in blue. See Table A.3 for full country-level results. Figures 3.4 and 3.5 show the same shares calculated using either gross or net spending because the U.S. gross-to-net adjustment is a constant factor applied to all insulins and because we did not estimate net prices for other countries.

Figure 3.6. Insulin Volume Shares, by Insulin Timing Category, Select Comparisons, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Non-U.S. OECD refers to all 33 non-U.S. OECD comparison countries combined. See Table A.2 for full results. The leftmost two bars (darker shading) emphasize results for the United States and non-U.S. OECD countries combined. Figures 3.6 and 3.7 shows the same shares calculated using either gross or net spending because the U.S. gross-to-net adjustment is a constant factor applied to all insulins and because we did not estimate net prices for other countries. Int. = intermediate.

Figure 3.7. Insulin Sales Shares, by Insulin Timing Category, Select Comparisons, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Non-U.S. OECD refers to all 33 non-U.S. OECD comparison countries combined. See Table A.3 for full results. The leftmost two bars (darker shading) emphasize results for the United States and non-U.S. OECD countries combined. Figures 3.6 and 3.7 shows the same shares calculated using either gross or net spending because the U.S. gross-to-net adjustment is a constant factor applied to all insulins and because we did not estimate net prices for other countries. Int. = intermediate.

The breakdown of insulin volume across timing categories was fairly consistent over time in the United States and in other countries (Table 3.1). Long-acting insulin accounted for 47.1 percent of U.S. insulin volume in both 2017 and 2022; in non-U.S. OECD countries, the same share increased from 35.2 percent in 2017 to 39.7 percent in 2022. U.S. volume shares for short-intermediate and intermediate insulin, both of which are available only over the counter in the United States—were modest in magnitude and, like the same shares in non-U.S. OECD countries, decreased over time. The directions and magnitudes of changes for other timing categories were also correlated.

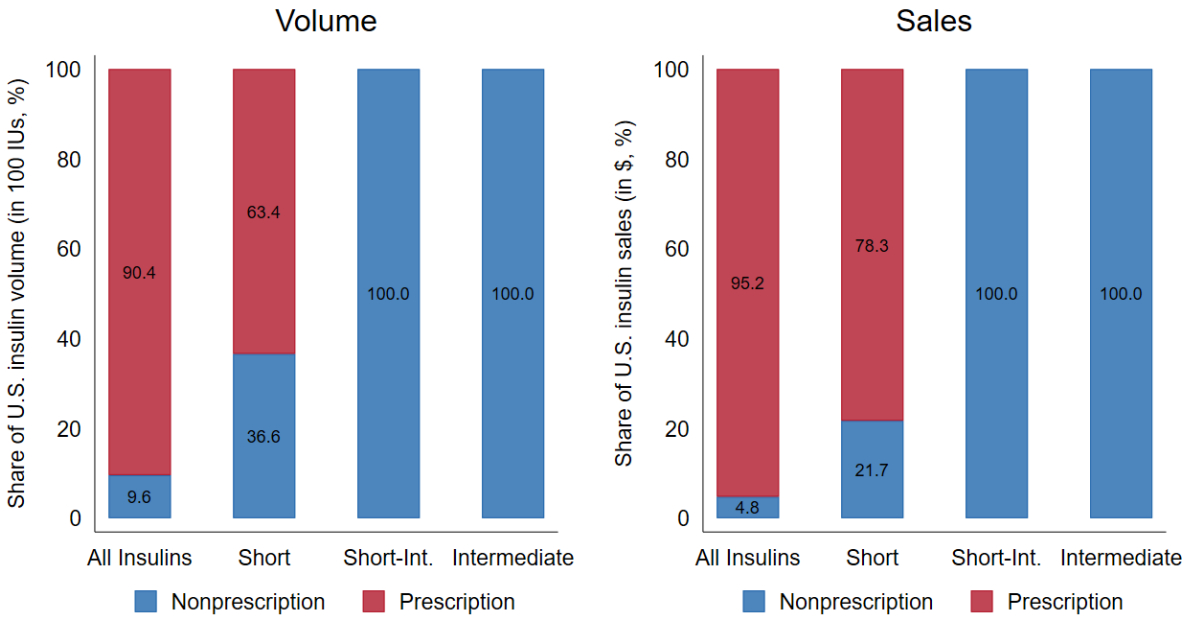
Table 3.1. Insulin Volume Shares by Timing Category, 2017 Versus 2022

Insulin Timing Category	United States		Non-U.S. OECD Countries	
	2017	2022	2017	2022
Rapid	32.0%	36.4%	34.1%	38.5%
Rapid intermediate	4.9%	3.1%	13.2%	10.0%
Short	6.5%	5.8%	5.9%	4.0%
Short intermediate	4.5%	3.5%	5.1%	3.1%
Intermediate	5.0%	4.0%	6.4%	4.7%
Long	47.1%	47.1%	35.2%	39.7%

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Non-U.S. OECD refers to all 33 non-U.S. OECD comparison countries combined.

We found that nonprescription insulins—which may serve as a way for U.S. patients without prescription drug coverage to access insulin at a lower cost—were meaningfully sold only in the United States during the study period.[15] Figure 3.8 compares U.S. insulin volume and sales that were nonprescription (both overall and by category). Nonprescription insulin accounted for only 9.6 percent of total U.S. insulin volume and 4.8 percent of total U.S. insulin sales. However, the entirety of short–intermediate-acting and intermediate-acting insulin was nonprescription in the United States.

Figure 3.8. U.S. Prescription Versus Nonprescription Insulin Volume and Sales Shares, by Timing Category, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: Int. = intermediate.

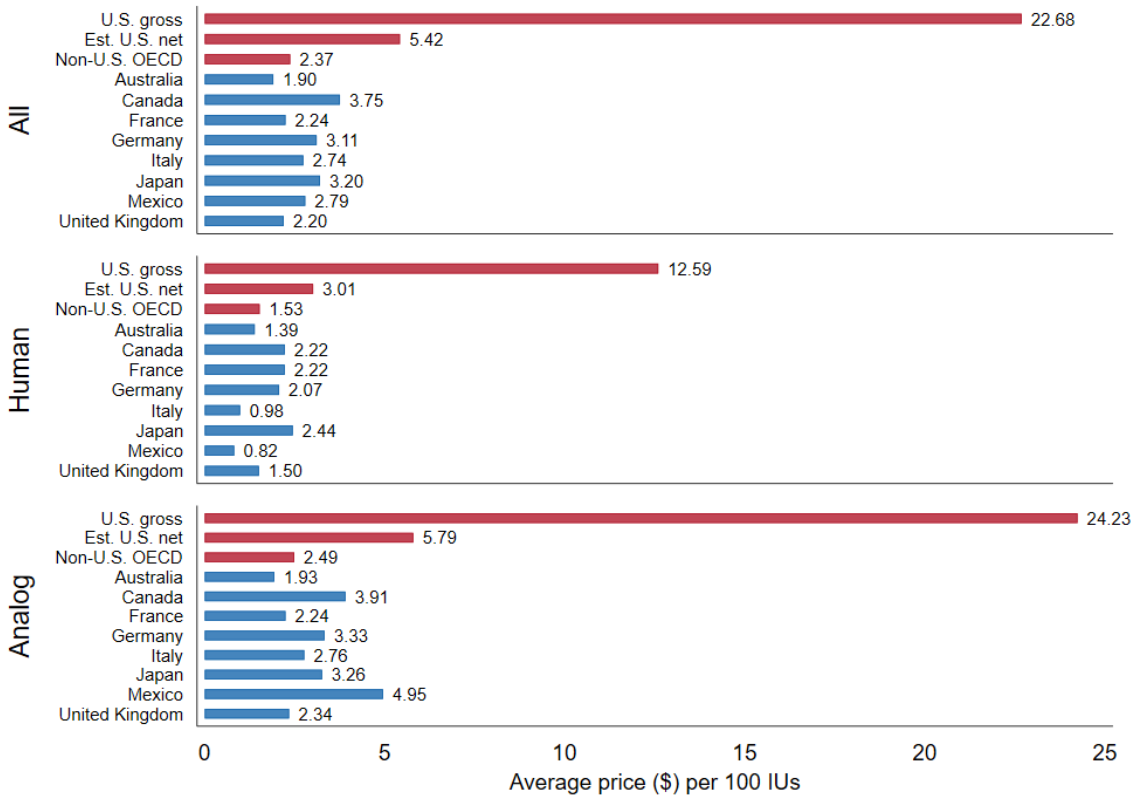
Average Prices

Compared with other countries, and in each insulin category, the United States had dramatically higher gross prices. The average U.S. manufacturer price per 100 IUs across all insulins was $22.68, compared with $3.75 in Canada, $2.20 in the United Kingdom, $2.79 in Mexico, and $2.37 across all non-U.S. OECD countries combined (Figure 3.9). Average prices

[15] Nonprescription short-acting insulin is also sold in Ireland. However, total spending for nonprescription short-acting insulin in Ireland was approximately $26,000 in 2022, and only 1 percent of total insulin volume in Ireland is nonprescription.

in the United States and most comparison countries were higher for analog insulins than for human insulins, which could in part be due to many human insulins being sold over the counter in the United States. After applying an estimated gross-to-net discount, U.S. net prices were much lower, at an average of $5.42 per 100 IUs overall. Estimated U.S. net prices remained higher for analog versus human insulins and were roughly twice the average price in non-U.S. comparison countries combined overall and separately for analog and human insulins. (See Table A.5 for full results by country.)

Figure 3.9. Average Gross Price per 100 IUs, by Insulin Type, Select Comparisons, 2022

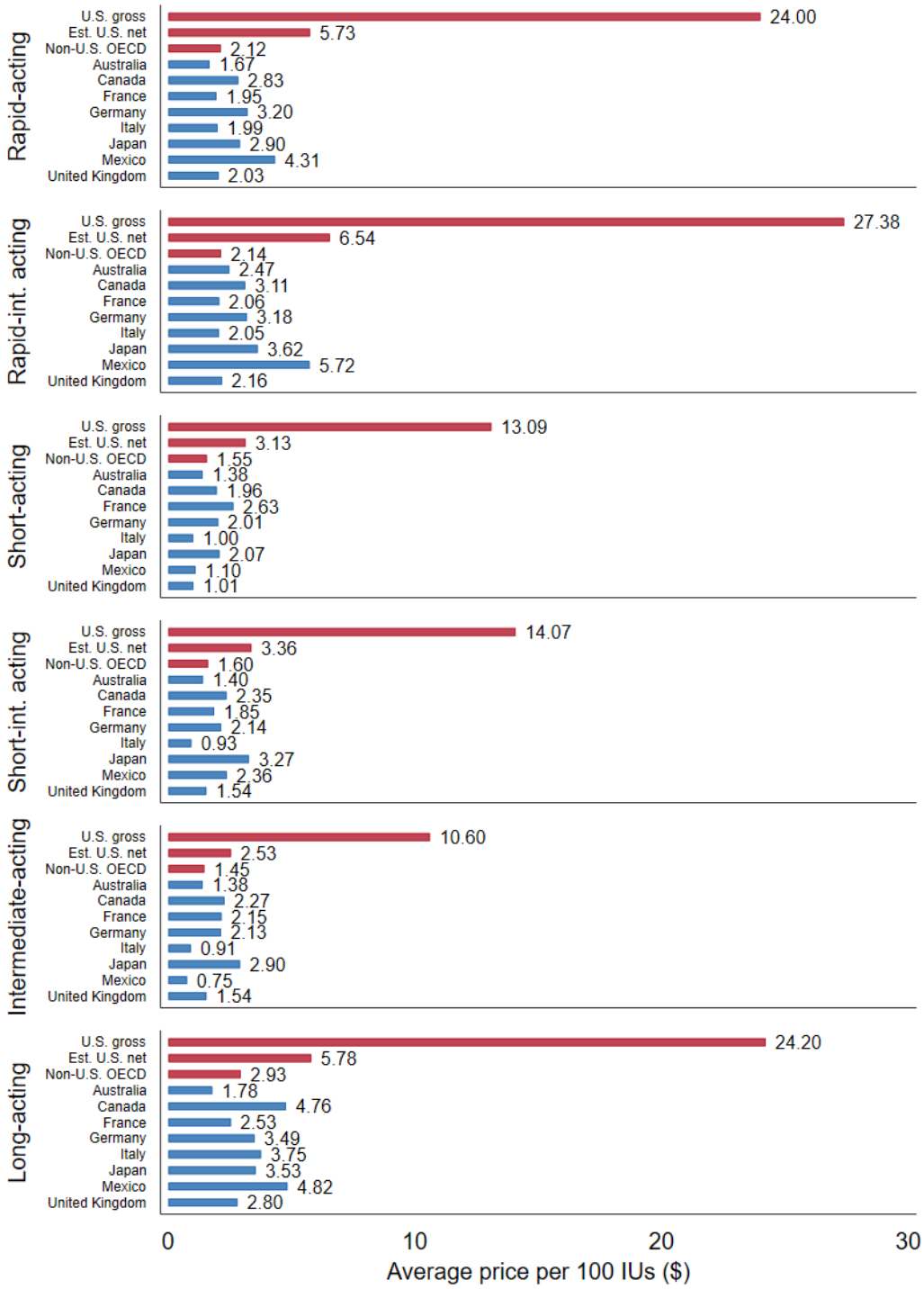


SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: See Table A.5 for full results. Red bars emphasize results for the United States and non-U.S. OECD countries combined. Est. = estimated.

As Figure 3.10 shows, average gross U.S. prices were highest for rapid–intermediate-acting insulins (at $27.38 per 100 IUs, versus $2.14 in non-U.S. OECD countries). U.S. prices were similarly high for rapid-acting and long-acting insulins and were lower (but still several times higher than those in other countries) for short-acting, short-intermediate acting, and intermediate-acting insulins, again likely because, in part, insulins in these categories are available over the counter. U.S. prices were again much lower after applying an estimated gross-to-net discount. Estimated U.S. net prices remained higher than those in other non-U.S. OECD countries combined, ranging from 75 percent higher for intermediate-acting insulins (which, again, are

available over the counter in the United States) to about three times prices in other countries combined for rapid–intermediate-acting insulins. Estimated U.S. net prices were below specific comparison country prices in some cases. (See Table A.5 for full results by country.) For example, intermediate-acting insulin prices in Japan were roughly 15 percent higher than estimated U.S. net prices. However, comparisons of estimated U.S. net prices to gross prices in other countries for narrow subsets of insulin products—for example, an individual insulin timing category—should be interpreted with caution. Our approach to estimate U.S. net prices may under- or overestimate reductions for specific insulin timing categories, and we did not have data available to estimate net versus gross prices in other countries.

Figure 3.10. Average Gross Price per 100 IUs, by Insulin Timing Category, Select Comparisons, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: See Table A.5 for full results. Red bars emphasize results for the United States and non-U.S. OECD countries combined. Est. = estimated.

Overlap in Insulins Sold in the United States and Other Countries

We found considerable overlap in the specific insulin products sold in the United States and comparison countries. Ninety-six percent of U.S. insulin sales were for presentations sold in at least one comparison country, and 97 percent of sales in the OECD comparison countries combined were for presentations also sold in the United States. In terms of volume, 88 percent of IUs in both the United States and OECD comparison countries were also sold in the other markets. Shares of volume and sales from insulin products sold in both the United States and individual comparison countries varied but were generally high, particularly among larger OECD comparison countries. (See Table A.7 for full results.)

Although most insulin volume and sales were for products sold in the United States and comparison countries, we found some specific insulin products sold only in the United States or only in other countries. At the active-ingredient level, all insulin active ingredients sold in the United States were also sold in other countries, whereas two insulin active ingredients—insulin lispro protamine and a combination of insulin aspart and insulin degludec—were not sold in the United States but were sold in other countries. Combined, these two insulins not available in the United States accounted for 2.7 percent of sales and 2.2 percent of volume measured in IUs in other OECD countries combined.

There was less overlap in terms of the specific presentations sold in the United States and other countries. Notably, between one-third and one-half of insulin *presentations* (that is, specific dosage forms and strengths of a given insulin active ingredient) in Canada and Germany did not align with presentations available in the United States as recorded in the IQVIA MIDAS data. Overall, in 2022, we found 30 insulin presentations sold in both the United States and other countries, nine insulin presentations sold only in the United States, and 53 insulin presentations sold only in OECD comparison countries.

Because the overlap in sales and volume between the United States and individual comparison countries was generally high, these mismatching insulin products sold in one market but not the other must collectively account for relatively small shares of utilization and spending compared with overlapping products.

In several cases, the lack of overlap in specific insulin products potentially stems from narrow delivery device and formulation distinctions in IQVIA MIDAS data. For example, insulins coded as having an NFC of GRA (parenteral retard or long-acting cartridges)—which include insulin glargine, insulin detemir, and insulin human isophane in Canada and Germany—were not available in the United States. In the United States, these same insulins are available only as prefilled pens (coded under an NFC of GRF). These granular details in terms of formulation and delivery devices could be driven by regulatory, marketing, and other differences between markets and may or may not have practical implications for patients in terms of safety and effectiveness. While our active-ingredient–level price index comparisons below increase the

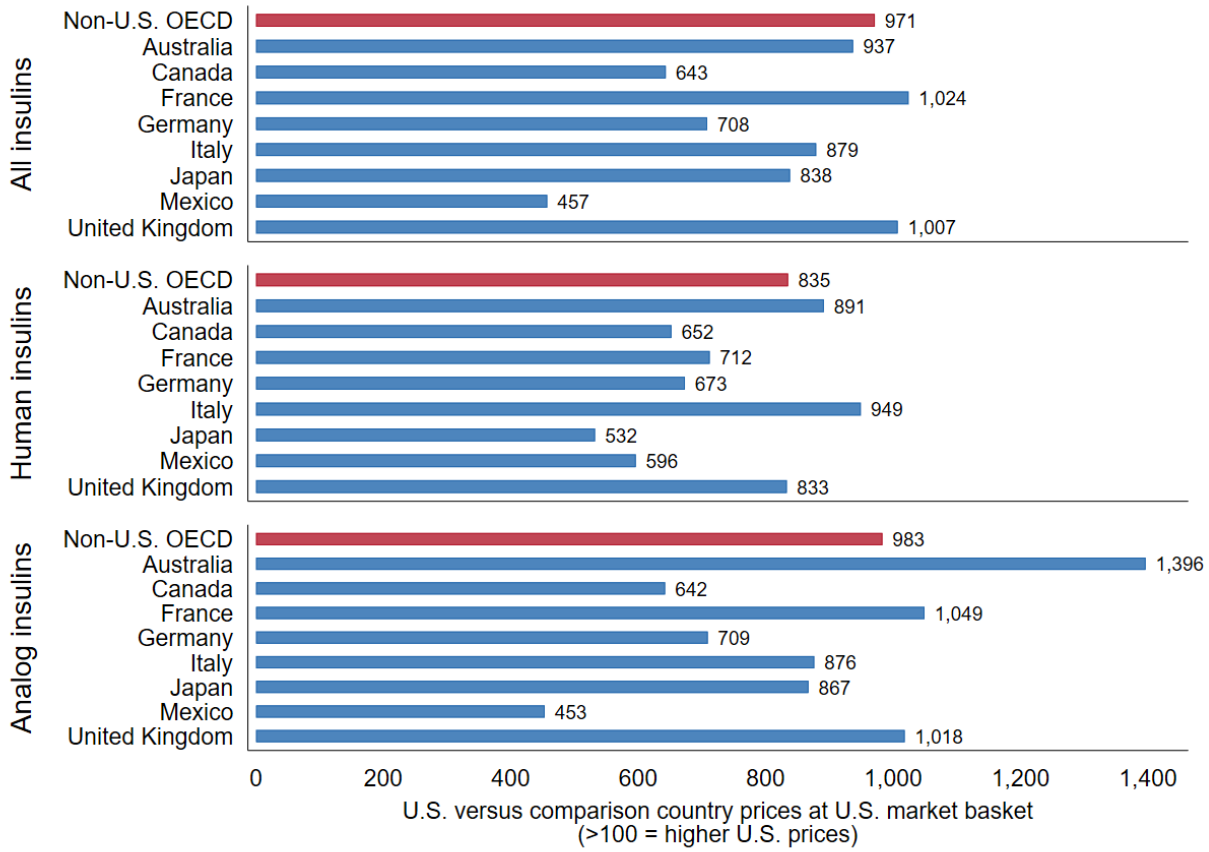
overlap in products dramatically, using broader prices per active ingredient increases the concern that differences in prices may reflect differences in product mix.

Price Index Comparisons Using Gross Prices

Using our price index results, we compared gross prices per 100 IUs in the United States with those in each comparison country, holding the market basket constant at U.S. volume shares by presentation. As we noted earlier, these comparisons are necessarily limited to those presentations that are sold both in the United States and in each comparison country. Each bar in the bar charts in this section shows the ratio of price indexes in the United States (numerator) versus the indicated comparison country (denominator) as a percentage. Ratios greater than 100 indicate that U.S. gross prices are higher than those in the comparison country; ratios less than 100 indicate that U.S. gross prices are lower than those in the comparison country.

U.S. gross prices per 100 IU for all insulin types combined ranged from 457 to 1,024 percent (in other words, 4.6 to 10.0 times) of those in the select countries shown in Figure 3.11, and they were 971 percent (in other words, 9.7 times) of those in all non-U.S. OECD countries combined. As the full results presented in Table A.8 show, across all 33 non-U.S. OECD countries, for all insulin types combined, U.S. prices were closest to those in Mexico and Chile (with U.S. gross prices 457 and 460 percent of those in Mexico and Chile, respectively) and furthest from those in Turkey (with U.S. prices 3,799 percent higher than those in Turkey).

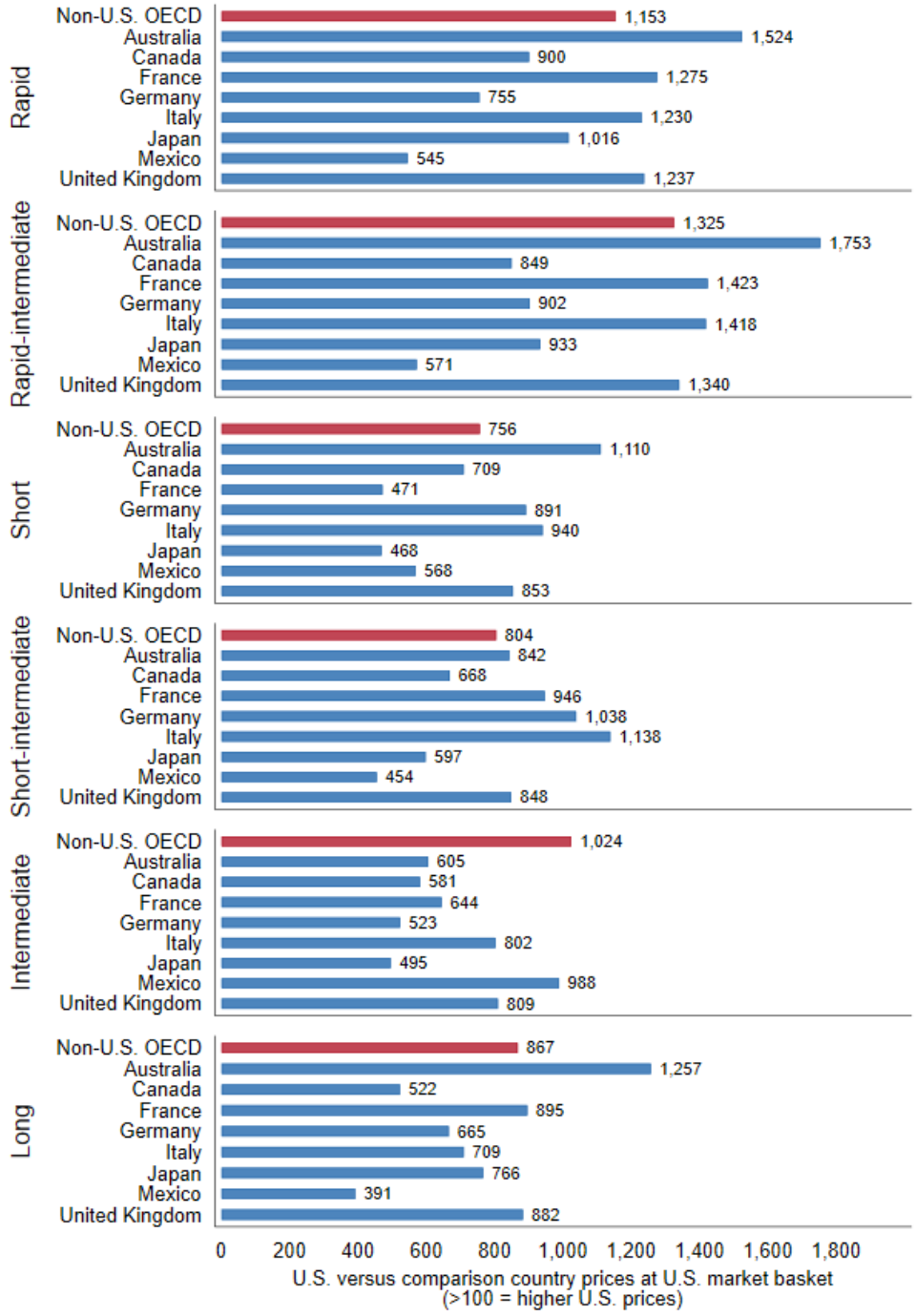
Figure 3.11. Price Index Comparison, Gross Prices per Standard Unit, by Insulin Type, Select Comparisons, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: A value of 100 means that the U.S. price was the same as the other country's price. A higher number means that the U.S. price was higher than the other country's price. The reported magnitudes are differences in percentages between U.S. and other countries' prices (e.g., a value of 500 means that U.S. prices were 500 percent of prices in the comparison country). See Table A.8 for full results.

U.S. gross prices were dramatically higher than those in comparison countries across different timing categories of insulins, with the largest difference between U.S. and other-country prices for rapid- and rapid–intermediate-acting insulins (Figure 3.12). In general, U.S. prices for short-acting, intermediate-acting, and long-acting insulins were closer to, but still much higher than, prices in other countries, which may reflect the United States' availability of less-expensive over-the-counter insulins in these categories.

Figure 3.12. Price Index Comparison, Gross Prices by Insulin Timing Category, Select Comparisons, 2022

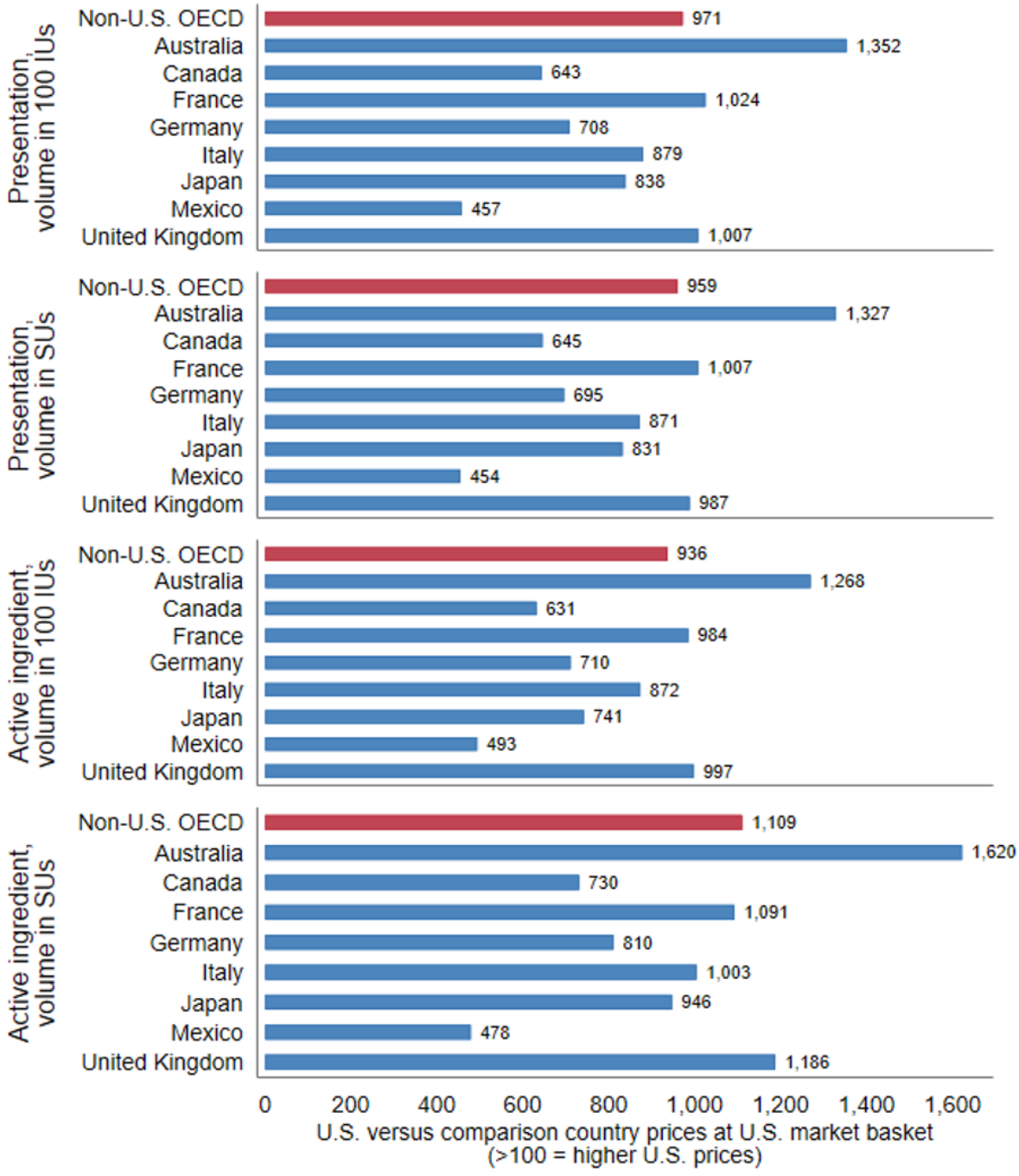


SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: A value of 100 means that the U.S. price was the same as the other country's price. A higher number means that the U.S. price was higher than the other country's price. The reported magnitudes are differences in percentages between U.S. and other countries' prices (e.g., a value of 500 means that U.S. prices were 500 percent of prices in the comparison country). See Table A.8 for full results.

We compared our main price index result using prices calculated per SU rather than per 100 IUs (see Table A.9 for full results by country). Prices per SU may be less sensitive to differences in insulin product volume and dosage strength. U.S. prices in terms of SUs were 959 percent of those in other countries, about the same as our findings when calculating prices per 100 IUs (at a corresponding 971 percent).

To assess whether the lack of complete overlap in insulin presentations could be driving our results, we also compared price indexes using prices and volumes aggregated at the IQVIA MIDAS moleculelist level rather than presentation level to achieve more-granular combinations of active ingredient, form, and dosage strength. We found that U.S. prices were roughly 1,000 percent of those in other countries when price indexes were calculated at the active-ingredient level rather than presentation level (Figure 3.13 comparison across all panels; see Table A.10 for full results by country). When switching to both the active ingredient aggregation level and measuring volume in terms of SUs rather than IUs, U.S. prices were roughly 1,100 percent of those in other countries. This suggests that other countries use a less expensive mix of insulins and have lower prices for each presentation separately.

Figure 3.13. Gross Price Index Result Comparison, Presentation Level Versus Molecule Level, 2022

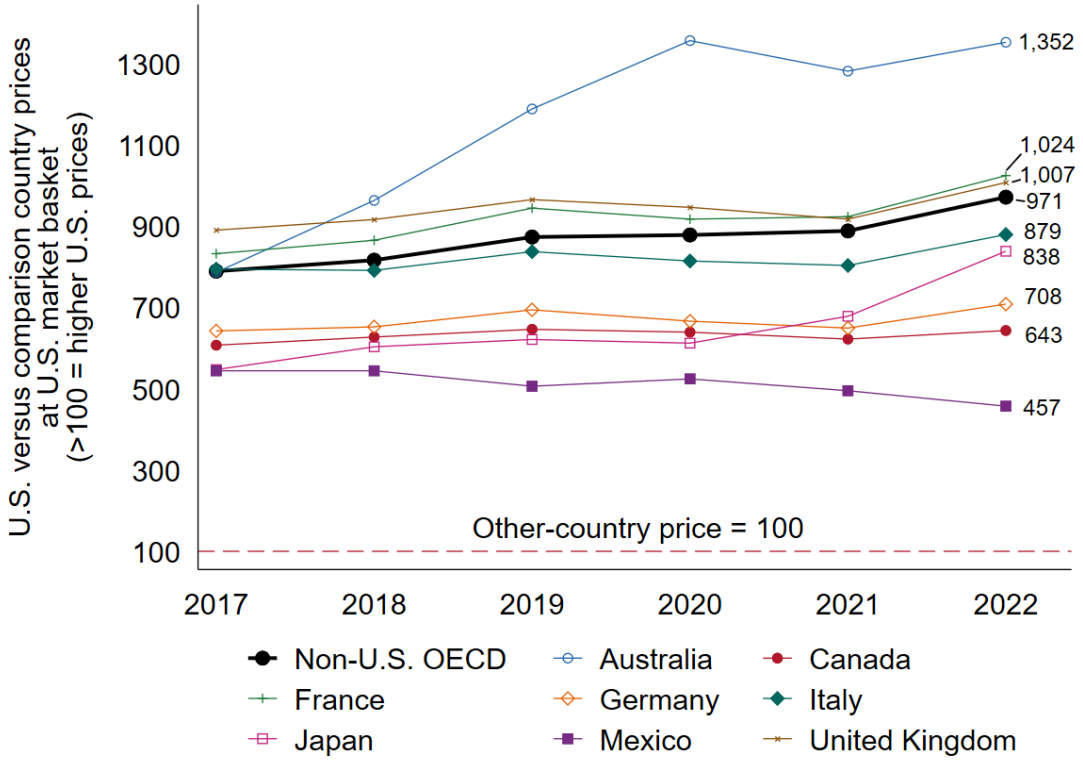


SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: A value of 100 means that the U.S. price was the same as the other country's price. A higher number means that the U.S. price was higher than the other country's price. The reported magnitudes are differences in percentages between U.S. and other countries' prices (e.g., a value of 500 means that U.S. prices were 500 percent of prices in the comparison country).

Gross Price Index Comparison Trends over Time

Figure 3.14 illustrates trends in our main price index result from 2017 through 2022. This comparison over time uses gross prices calculated per 100 IUs of insulin and data aggregated at the presentation level. U.S. gross insulin prices overall were 789 percent of those in other countries in 2017, compared with 971 percent in 2022. U.S. gross prices increased over time compared with each of the individual G7 countries and Australia. The increase was largest relative to Australia: U.S. prices were roughly eight times those in Australia in 2017 compared with nearly 14 times in 2022. Given more-modest increases in G7 countries, price decreases in Australia could be driving this trend rather than price increases in the United States. Changes in the mix of drugs matching between the United States and each comparison country is likely another driver of the trends in Figure 3.14. We did not restrict the trend analysis to a stable panel of products matching between the United States and each comparison country. Of the comparison country results plotted in Figure 3.14, only Mexico had insulin prices that became more rather than less similar to those in the United States over time.

Figure 3.14. Price Index Main Result Trends, 2017 Through 2022

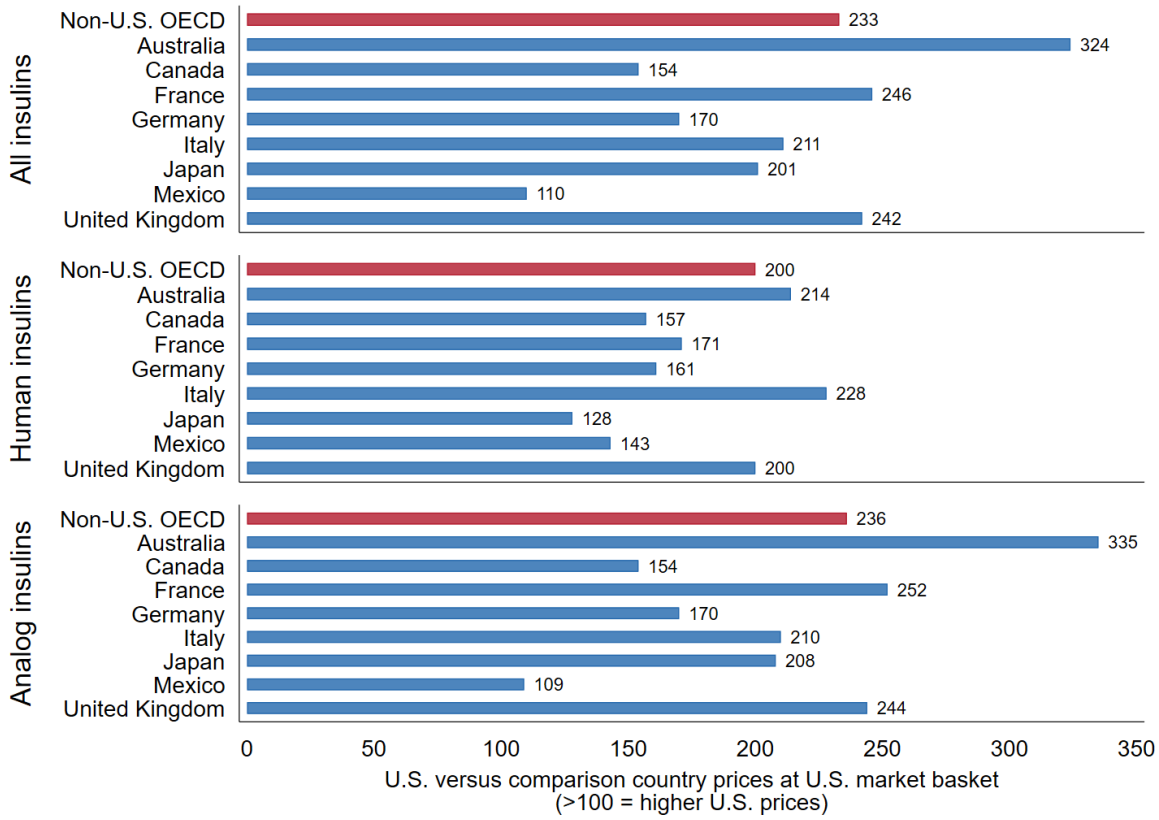


SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: A value of 100 means that the U.S. price was the same as the other country's price. A higher number means that the U.S. price was higher than the other country's price. The reported magnitudes are differences in percentages between U.S. and other-country prices (e.g., a value of 500 means that U.S. prices were 500 percent of prices in the comparison country).

Price Index Comparisons with a U.S. Net Price Adjustment

We adjusted 2022 U.S. gross insulin prices downward by 76 percent to account for manufacturer invoice-to-net discounts (Mulcahy, Schwam, et al., 2021). We found that U.S. prices remained above, but much closer to, those in other countries compared with our other results, both overall and for human and analog insulins separately (Figure 3.15). U.S. prices for all insulins were 233 percent of those in other countries combined (compared with 971 percent when comparing gross prices). We discuss the implications of these findings in the next chapter. As noted, we did not adjust prices in other countries downward to lower net prices because of a lack of data. Although evidence in this area is scarce, countries purchasing insulin via tendering arrangements may have initial, transactional purchase prices recorded in IQVIA MIDAS data while later discounts and rebates are not reflected. The results in Figure 3.15 may therefore understate differences between U.S. and other countries' prices. For example, if U.S. net prices were initially 200 percent of those in another country, but that country achieved a 20 percent off-invoice discount through tendering, U.S. net prices would actually be 250 percent, not 200 percent, of those in the other country.

Figure 3.15. Price Index Result Comparison, U.S. Manufacturer Net Price Adjustment, All Insulins, 2022



SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: A value of 100 means that the U.S. price was the same as the other country's price. A higher number means that the U.S. price was higher than the other country's price. The reported magnitudes are differences in percentages between U.S. and other countries' prices (e.g., a value of 500 means that U.S. prices were 500 percent of prices in the comparison country). U.S. net prices were estimated by applying a gross-to-net discount of 76 percent.

Chapter 4. Summary of Findings

Manufacturer gross prices for insulins in the United States were considerably higher than those in other countries for all insulins combined and for different types of insulin. When comparing prices for a U.S. market basket of insulins, we found that U.S. manufacturer gross prices ranged from 457 percent of those in Mexico (that is, U.S. gross prices were 4.57 times those in Mexico) to 3,799 percent (or roughly 38 times) of those in Turkey. We found U.S. prices were 971 percent (or nearly ten times) those in all non-U.S. OECD countries combined. Although the ratio of U.S. to other-country gross prices varied depending on the comparison country and insulin category, U.S. prices were always higher, and often five to ten times higher, than those in other countries. After applying a U.S. gross-to-net discount, overall U.S. prices were 233 percent of (or roughly two times) those in other countries combined.

The overlap between the presentations of insulin sold in the United States and in comparison countries was generally high. However, there were differences in market shares across categories of insulin, and there was more overlap with the United States in the types of insulin used for some individual comparison countries than for others. Given our presentation-level price index main approach, our results likely highlight differences in prices rather than differences in the mix of insulins sold in the United States versus other countries. We found that our price comparison results were very similar regardless of whether prices were calculated per 100 IUs of insulin (which controls for differences in terms of volume and dosage strength) or per SU. U.S. gross prices were slightly higher in relative terms when we used active ingredient–level data rather than presentation-level data, suggesting that the United States had higher prices at the presentation level and offered a more expensive mix of insulin presentations.

There are, however, some compositional differences worth noting. The United States was unusual among comparison countries in permitting distribution of several types of insulin over the counter, which is likely driven by access concerns. Some patients without prescription drug coverage, with coverage but with high cost-sharing, or without access to prescribers can face barriers to filling insulin prescriptions (Tribble, 2015). Despite the availability of some insulins over the counter in the United States, U.S. gross prices were much higher than those in comparison countries, even in categories in which U.S. distribution is entirely over the counter.

We estimated prices using data from all 34 OECD countries in our IQVIA MIDAS extract, including countries with markets and economic circumstances that are extremely different from those of the United States, without adjusting for observable differences across countries. An alternative approach could focus on a smaller subset of countries that are more similar to the United States in terms of per capita gross domestic product, population, demographics, or other factors. Analyses could also adjust for these factors to the extent they can be observed.

One key limitation of this study is that most of our analyses used manufacturer gross prices, not manufacturer net prices after rebates and other discounts are applied.[16] Given the generally competitive insulin market, rebates in the United States are substantial (Mulcahy, Schwam, et al., 2021; Dickson et al., 2023). After applying a 76 percent manufacturer gross-to-net reduction, U.S. prices were roughly twice as high as those in other countries (compared with nearly ten times as high without the discount). We caution that these results likely underestimate the magnitude of the price differential because we were unable to estimate similar gross-to-net discounts in other countries. If manufacturer net prices in at least some non-U.S. OECD countries are lower than their manufacturer gross prices, the ratio of U.S. to other-country prices would be higher. In addition, because of data limitations, we applied a single U.S. gross-to-net reduction across all insulins. Actual product-specific gross-to-net discounts likely vary along product characteristics (for example, prescription versus over the counter and timing category). As a result, our estimated ratios of U.S. to other countries' prices for specific insulin categories likely reflect measurement error.

In addition, although manufacturer net prices (in other words, the amount received by the manufacturer net of rebates and other discounts paid after the fact) may be more salient for some research and policy applications than manufacturer gross prices, they are different from net prices to payers (for example, insurers and plan sponsors), which include supply chain markups, dispensing fees, and PBM margins. Relatively little is known about the net amount paid by payers and their PBMs for specific drugs after rebates. However, the payer net price for insulins could be substantially higher than the manufacturer net price. Ongoing data collection required by Section 204 of the 2021 Consolidated Appropriations Act may shed some light on the magnitude of these margins for commercial PBMs and sources of coverage (Pub. L. 116-260, 2020).

It is important to note that manufacturer gross prices, for which we found much larger relative differences between U.S. and other-country prices, are the basis for prices throughout the U.S. prescription drug supply chain, including prices paid at pharmacies. As a result, patients without drug coverage, as well as patients with drug coverage paying in a deductible phase or patients responsible for coinsurance based on a percentage of total cost rather than a fixed copay, are responsible for either all or a share of payments to pharmacies that are anchored initially on manufacturer invoice prices.

Medicare enrollees' financial exposure to U.S. insulin gross prices and out-of-pocket spending for insulin and for all drugs is changing dramatically: IRA provisions limiting insulin cost-sharing and requiring rebates for drug price increases beyond inflation are already in effect, and total out-of-pocket spending in Medicare Part D will be capped beginning in 2024 (Pub. L. 117-169, 2022). These policies do not apply to those with coverage outside Medicare, but Congress is considering proposals to extend the IRA's $35 cap to individuals with employer or

[16] The exception is on-invoice discounts (such as discounts for prompt payment), which may be included.

individual market coverage (Kennedy, 2023; Collins, 2023). The recent announcements from all three U.S. insulin manufacturers regarding reductions in gross prices nearer to current net prices are a more encompassing change that will have broader implications for all patients (Eli Lilly and Company, 2023; Novo Nordisk, 2023; Sanofi, 2023). Other changes in how insulin is sold—for example, the increased availability of biosimilar insulins and the recent emergence of bifurcated marketing approaches in which the same insulin is simultaneously sold by its manufacturer under a brand name (where rebates apply) and as an unbranded product (where rebates do not apply)—may also have important longer-term implications for U.S. insulin prices, how they compare with prices in other countries, and consumer out-of-pocket spending on insulin.

Appendix. Supplemental Results

Tables A.1–A.10 present reference information and supplemental results.

Table A.1. Insulin Active Ingredient Mapping

ASPE-Provided Active Ingredient	IQVIA MIDAS Moleculelist Active Ingredient	Insulin Type	Human, Analog, or Animal
Insulin Aspart	INSULIN ASPART	R	Analog
Insulin Aspart Protamine & Aspart (Human)	INSULIN ASPART!INSULIN ASPART PROTAMINE (CRYSTALLINE)	RI	Analog
Insulin Degludec	INSULIN DEGLUDEC	L	Analog
Insulin Detemir	INSULIN DETEMIR	L	Analog
Insulin Glargine	INSULIN GLARGINE	L	Analog
Insulin Glulisine	INSULIN GLULISINE	R	Analog
Insulin Isophane	—[a]	I	Human
Insulin Isophane (Pork)	INSULIN PORCINE ISOPHANE	I	Animal[b]
Insulin Lispro	INSULIN LISPRO	R	Analog
Insulin Lispro Protamine & Lispro	INSULIN LISPRO!INSULIN LISPRO PROTAMINE	RI	Analog
Insulin NPH (Human) (Isophane)	INSULIN HUMAN ISOPHANE	I	Human
Insulin NPH Isophane & Reg (Human)	INSULIN HUMAN BASE!INSULIN HUMAN ISOPHANE	SI	Human
Insulin Reg (Human) Buffered	INSULIN HUMAN BASE	S	Human
Insulin Regular	—[b]	S	Animal[b]
Insulin Regular (Human)	INSULIN HUMAN BASE	S	Human
Insulin Regular (Pork)	INSULIN PORCINE BASE	S	Animal[b]
Insulin Zinc	—[b]	I	Animal[b]
Insulin Zinc (Human)	INSULIN HUMAN ZINC SUSPENSION (COMPOUND/CRYSTALLINE)	I	Human[c]
Insulin Zinc (Pork)	INSULIN PORCINE ZINC SUSPENSION (COMPOUND)	I	Animal[b]
Insulin Zinc Extended (Human)	—[c]	L	Human[c]

SOURCE: Author crosswalk of IQVIA MIDAS active ingredients to an ASPE-provided list of insulin products.
NOTE: NPH = neutral protamine Hagedorn; I = intermediate acting; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting.
[a] No IQVIA MIDAS moleculelist was identified. We excluded this insulin product from our analysis.
[b] We excluded animal insulins from our analysis. We did not find IQVIA MIDAS moleculelist matches for some animal insulins.
[c] Insulin zinc (human) and insulin zinc extended (human) are not sold in the United States; we therefore excluded them from our analysis. Furthermore, it is not clear whether human zinc extended (human) should map to the IQVIA MIDAS insulin human zinc suspension (compound/crystalline) moleculelist.

Table A.2. Percentages of Insulin Volume Shares in IUs, by Insulin Type, 34 Select OECD Countries, 2022

	Share of Volume (IUs)		Share of Volume (IUs)					
Country	**Human**	**Analog**	**R**	**RI**	**S**	**SI**	**I**	**L**
Australia	5	95	34	27	1	2	2	35
Austria	11	89	43	19	1	1	8	28
Belgium	17	83	39	10	12	1	4	35
Canada	9	91	38	3	2	2	5	50
Chile	12	88	25	2	2	0	10	61
Colombia	15	85	35	0	3	0	13	50
Czechia	10	90	39	11	8	1	1	40
Estonia	0	100	38	5	0	0	0	57
Finland	1	99	37	1	0	0	1	61
France	2	98	45	4	0	0	1	49
Germany	17	83	44	2	10	4	4	37
Greece	3	97	32	6	1	2	1	59
Hungary	42	58	28	3	22	7	13	27
Ireland	6	94	49	7	3	3	1	38
Italy	2	98	54	1	1	0	0	43
Japan	7	93	42	15	5	2	1	36
Korea, South	7	93	25	24	3	1	3	45
Latvia	10	90	45	10	0	0	10	34
Lithuania	2	98	34	31	0	0	1	33
Luxembourg	2	98	45	6	1	0	1	46
Mexico	52	48	4	9	5	1	46	34
Netherlands	5	95	44	10	0	0	4	41
New Zealand	14	86	29	16	1	5	9	40
Norway	20	80	48	2	0	0	20	29
Poland	39	61	34	14	10	17	12	13
Portugal	12	88	21	15	2	3	7	52
Slovakia	23	77	35	13	15	3	5	29
Slovenia	11	89	39	28	2	1	8	22
Spain	6	94	27	7	2	1	2	60
Sweden	15	85	44	7	0	1	14	34
Switzerland	2	98	41	7	1	0	2	50
Turkey	2	98	38	21	1	0	0	39
UK	18	82	37	14	1	10	7	31
Non-U.S. OECD	**12**	**88**	**39**	**10**	**4**	**3**	**5**	**40**
United States	**13**	**87**	**36**	**3**	**6**	**3**	**4**	**47**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: The “Human” and “Analog” columns in each row sum to 100 percent. The six timing categories in each row also sum to 100 percent. However, exact sums might not total 100 percent because of rounding. I = intermediate acting; IU = international unit; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting.

Table A.3. Percentages of Insulin Sales Shares at Gross Prices, by Insulin Type, 34 Select OECD Countries, 2022

	Share of Sales ($)		Share of Sales ($)					
Country	**Human**	**Analog**	**R**	**RI**	**S**	**SI**	**I**	**L**
Australia	4	96	30	35	1	1	2	32
Austria	9	91	38	17	1	1	7	36
Belgium	10	90	35	10	7	1	2	45
Canada	5	95	29	2	1	1	3	64
Chile	5	95	19	2	1	0	4	74
Colombia	7	93	28	0	1	0	6	64
Czechia	6	94	34	11	4	1	1	49
Estonia	0	100	32	4	0	0	0	63
Finland	1	99	23	1	0	0	1	75
France	2	98	39	4	0	0	1	56
Germany	12	88	45	2	6	2	3	41
Greece	2	98	25	5	0	1	0	68
Hungary	25	75	25	3	13	5	8	47
Ireland	4	96	42	6	1	2	1	48
Italy	1	99	39	1	0	0	0	59
Japan	5	95	38	17	3	2	1	39
Korea, South	3	97	20	28	1	1	2	49
Latvia	9	91	37	10	0	0	9	45
Lithuania	1	99	27	31	0	0	1	42
Luxembourg	1	99	31	5	1	0	0	63
Mexico	15	85	7	19	2	1	12	59
Netherlands	3	97	37	10	0	0	3	49
New Zealand	8	92	23	12	0	3	4	57
Norway	16	84	43	2	0	0	15	39
Poland	30	70	33	16	8	13	9	20
Portugal	7	93	17	13	1	2	5	62
Slovakia	15	85	32	16	10	2	3	38
Slovenia	9	91	35	27	1	1	7	29
Spain	4	96	22	6	1	1	2	68
Sweden	10	90	34	7	0	1	9	49
Switzerland	1	99	31	8	0	0	1	60
Turkey	1	99	35	25	1	0	0	39
UK	12	88	34	14	0	7	5	40
Non-U.S. OECD	**8**	**92**	**34**	**9**	**3**	**2**	**3**	**49**
U.S.	**7**	**93**	**39**	**4**	**3**	**2**	**2**	**50**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: The “Human” and “Analog” columns in each row sum to 100 percent. The six timing categories in each row also sum to 100 percent. However, exact sums might not total 100 percent because of rounding. I = intermediate acting; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting.

Table A.4. Percentages of Insulin Volume Shares in SUs, by Insulin Type, 34 Select OECD Countries, 2022

	Share of Volume (SUs)		Share of Volume (SUs)					
Country	**Human**	**Analog**	**R**	**RI**	**S**	**SI**	**I**	**L**
Australia	5	95	34	28	1	2	2	33
Austria	12	88	44	20	1	2	9	25
Belgium	15	85	43	12	9	2	4	31
Canada	10	90	38	3	2	3	5	49
Chile	7	93	29	3	1	0	6	62
Colombia	6	94	39	0	1	0	5	56
Czechia	12	88	41	14	9	1	2	33
Estonia	1	99	40	5	0	0	1	54
Finland	2	98	38	1	0	0	1	59
France	2	98	44	5	0	0	2	49
Germany	20	80	43	2	11	4	4	35
Greece	3	97	32	7	1	2	1	58
Hungary	44	56	29	3	23	8	14	24
Ireland	5	95	47	8	1	3	1	40
Italy	1	99	56	1	1	0	0	42
Japan	5	95	43	16	3	2	1	35
Korea, South	4	96	23	27	1	1	2	45
Latvia	11	89	45	12	0	0	11	33
Lithuania	2	98	35	31	0	0	1	32
Luxembourg	2	98	44	7	1	0	1	47
Mexico	33	67	7	15	3	1	29	46
Netherlands	6	94	44	11	0	0	5	39
New Zealand	14	86	29	17	0	5	9	41
Norway	24	76	46	3	0	0	24	28
Poland	40	60	34	15	10	18	13	11
Portugal	12	88	21	16	1	3	7	52
Slovakia	25	75	34	14	16	4	5	26
Slovenia	11	89	40	29	1	1	9	20
Spain	5	95	30	8	2	1	3	57
Sweden	17	83	43	8	0	1	16	32
Switzerland	2	98	42	7	0	0	2	48
Turkey	1	99	38	22	1	0	0	39
UK	18	82	35	16	1	10	7	31
Non-U.S. OECD	**12**	**88**	**39**	**11**	**4**	**3**	**4**	**38**
U.S.	**8**	**92**	**35**	**4**	**2**	**3**	**3**	**54**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: The "Human" and "Analog" columns in each row sum to 100 percent. The six timing categories in each row also sum to 100 percent. However, exact sums might not total 100 percent because of rounding. I = intermediate acting; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting; SU = standard unit.

Table A.5. Average Gross Price per 100 IUs, Overall and by Insulin Type, 34 Select OECD Countries, 2022

Country	Total	Human	Analog	R	RI	S	SI	I	L
Australia	$1.90	$1.39	$1.93	$1.67	$2.47	$1.38	$1.40	$1.38	$1.78
Austria	$2.32	$1.95	$2.37	$2.07	$2.12	$1.90	$1.96	$1.96	$2.99
Belgium	$1.94	$1.17	$2.09	$1.76	$1.99	$1.12	$1.61	$1.18	$2.50
Canada	$3.75	$2.22	$3.91	$2.83	$3.11	$1.96	$2.35	$2.27	$4.76
Chile	$5.42	$2.43	$5.81	$4.15	$4.20	$2.18	$2.25	$2.48	$6.55
Colombia	$1.66	$0.81	$1.81	$1.37	NA	$0.62	$1.40	$0.85	$2.12
Czechia	$2.27	$1.31	$2.38	$1.96	$2.34	$1.28	$1.48	$1.38	$2.80
Estonia	$2.63	$1.65	$2.64	$2.25	$2.42	$1.63	NA	$1.65	$2.91
Finland	$2.16	$1.73	$2.17	$1.36	$1.96	$1.38	NA	$1.78	$2.66
France	$2.24	$2.22	$2.24	$1.95	$2.06	$2.63	$1.85	$2.15	$2.53
Germany	$3.11	$2.07	$3.33	$3.20	$3.18	$2.01	$2.14	$2.13	$3.49
Greece	$2.36	$1.24	$2.39	$1.82	$2.05	$1.18	$1.30	$1.17	$2.74
Hungary	$1.58	$0.95	$2.03	$1.39	$1.48	$0.95	$0.96	$0.95	$2.77
Ireland	$2.47	$1.53	$2.53	$2.11	$2.28	$1.09	$1.92	$1.69	$3.13
Italy	$2.74	$0.98	$2.76	$1.99	$2.05	$1.00	$0.93	$0.91	$3.75
Japan	$3.20	$2.44	$3.26	$2.90	$3.62	$2.07	$3.27	$2.90	$3.53
Korea, South	$2.63	$1.19	$2.73	$2.14	$3.07	$0.84	$1.54	$1.40	$2.88
Latvia	$2.20	$1.85	$2.24	$1.79	$2.12	$1.22	NA	$1.86	$2.85
Lithuania	$1.99	$1.36	$2.00	$1.55	$1.98	$1.27	NA	$1.38	$2.48
Luxembourg	$2.52	$1.37	$2.55	$1.71	$1.98	$1.33	$1.62	$1.35	$3.43
Mexico	$2.79	$0.82	$4.95	$4.31	$5.72	$1.10	$2.36	$0.75	$4.82
Netherlands	$2.32	$1.62	$2.36	$1.95	$2.34	$1.85	$1.71	$1.60	$2.81
New Zealand	$2.80	$1.46	$3.02	$2.20	$2.09	$1.71	$1.80	$1.26	$4.00
Norway	$2.20	$1.70	$2.33	$1.95	$2.17	$1.95	NA	$1.69	$2.97
Poland	$1.43	$1.12	$1.63	$1.38	$1.64	$1.12	$1.12	$1.12	$2.27
Portugal	$2.39	$1.51	$2.51	$1.97	$2.03	$1.23	$1.50	$1.58	$2.88
Slovakia	$1.91	$1.18	$2.13	$1.76	$2.26	$1.21	$1.14	$1.10	$2.52
Slovenia	$1.88	$1.58	$1.92	$1.70	$1.84	$1.28	$1.31	$1.68	$2.39
Spain	$2.51	$1.53	$2.56	$2.00	$2.20	$1.32	$1.71	$1.69	$2.87
Sweden	$2.04	$1.34	$2.17	$1.60	$1.94	$1.49	$1.64	$1.32	$2.95
Switzerland	$3.85	$2.06	$3.90	$2.88	$4.63	$1.70	$2.28	$2.16	$4.65
Turkey	$0.65	$0.44	$0.65	$0.59	$0.78	$0.42	$0.53	$0.51	$0.64
UK	$2.20	$1.50	$2.34	$2.03	$2.16	$1.01	$1.54	$1.54	$2.80
Non-U.S. OECD	**$2.37**	**$1.53**	**$2.49**	**$2.12**	**$2.14**	**$1.55**	**$1.60**	**$1.45**	**$2.93**
U.S.	**$22.68**	**$12.59**	**$24.23**	**$24.00**	**$27.38**	**$13.09**	**$14.07**	**$10.60**	**$24.20**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: *NA* indicates that no volume or sales information was available in MIDAS. I = intermediate acting; IU = international unit; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting.

Table A.6. Average Gross Price per SU, Overall and by Insulin Type, 34 Select OECD Countries, 2022

Country	Total	Human	Analog	R	RI	S	SI	I	L
Australia	$5.98	$4.39	$6.06	$5.19	$7.41	$4.59	$4.26	$4.39	$5.82
Austria	$7.35	$5.92	$7.54	$6.42	$6.37	$6.16	$5.90	$5.89	$10.38
Belgium	$7.11	$4.91	$7.49	$5.85	$5.98	$5.41	$4.93	$3.78	$10.36
Canada	$13.34	$7.37	$13.99	$9.92	$9.33	$7.37	$7.53	$7.30	$17.47
Chile	$18.58	$14.45	$18.88	$12.29	$12.60	$13.98	$22.50	$14.48	$22.25
Colombia	$5.95	$7.93	$5.83	$4.37	NA	$5.85	$14.00	$8.37	$6.84
Czechia	$8.51	$4.10	$9.10	$7.03	$7.03	$4.02	$4.43	$4.31	$12.49
Estonia	$8.73	$4.95	$8.75	$6.92	$7.26	$4.89	NA	$4.95	$10.27
Finland	$7.35	$5.20	$7.39	$4.47	$5.88	$4.14	NA	$5.34	$9.30
France	$8.18	$7.56	$8.19	$7.19	$6.17	$12.94	$6.38	$6.72	$9.29
Germany	$10.79	$6.35	$11.87	$11.30	$9.54	$6.30	$6.42	$6.42	$12.73
Greece	$7.83	$4.03	$7.95	$6.00	$6.15	$3.87	$4.10	$4.10	$9.24
Hungary	$4.96	$2.86	$6.63	$4.31	$4.45	$2.85	$2.89	$2.85	$9.70
Ireland	$8.57	$6.48	$8.67	$7.60	$6.84	$9.30	$5.77	$5.52	$10.33
Italy	$9.08	$6.21	$9.10	$6.31	$6.25	$5.81	$9.27	$9.04	$12.96
Japan	$10.27	$10.90	$10.24	$9.08	$10.85	$11.73	$9.91	$10.33	$11.38
Korea, South	$8.94	$6.42	$9.05	$7.60	$9.20	$8.36	$5.45	$6.03	$9.70
Latvia	$7.27	$5.56	$7.48	$5.98	$6.37	$3.67	NA	$5.59	$9.94
Lithuania	$6.33	$4.09	$6.37	$4.84	$6.23	$3.82	NA	$4.14	$8.14
Luxembourg	$8.42	$4.30	$8.51	$5.84	$5.93	$4.09	$4.88	$4.56	$11.43
Mexico	$17.19	$8.06	$21.63	$17.88	$22.41	$10.98	$21.10	$7.39	$21.92
Netherlands	$7.96	$4.88	$8.14	$6.73	$7.04	$5.59	$5.14	$4.81	$10.06
New Zealand	$8.55	$4.55	$9.22	$6.85	$6.26	$7.72	$5.55	$3.88	$12.10
Norway	$7.77	$5.09	$8.61	$7.25	$6.50	$6.02	NA	$5.08	$11.05
Poland	$4.44	$3.37	$5.15	$4.33	$4.92	$3.40	$3.37	$3.35	$7.87
Portugal	$7.37	$4.73	$7.71	$6.26	$6.09	$5.53	$4.51	$4.71	$8.78
Slovakia	$6.17	$3.53	$7.06	$5.80	$6.77	$3.64	$3.41	$3.30	$8.86
Slovenia	$5.86	$5.01	$5.97	$5.14	$5.53	$5.76	$3.94	$5.04	$8.17
Spain	$8.45	$5.54	$8.61	$6.20	$6.60	$6.28	$5.16	$5.21	$10.17
Sweden	$6.91	$4.02	$7.50	$5.52	$5.83	$4.75	$4.92	$3.96	$10.63
Switzerland	$12.57	$7.04	$12.70	$9.20	$13.90	$9.46	$6.83	$6.65	$15.57
Turkey	$1.99	$2.05	$1.99	$1.79	$2.34	$2.30	$1.58	$1.80	$1.98
UK	$7.20	$4.74	$7.75	$6.98	$6.50	$6.06	$4.68	$4.73	$9.28
Non-U.S. OECD	**$7.99**	**$5.21**	**$8.36**	**$7.07**	**$6.44**	**$5.56**	**$4.89**	**$5.17**	**$10.22**
U.S.	**$95.17**	**$91.55**	**$95.47**	**$105.72**	**$97.31**	**$131.07**	**$80.83**	**$66.09**	**$88.76**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: *NA* indicates that no volume or sales information was available in MIDAS. I = intermediate acting; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting; SU = standard unit.

Table A.7. Share of Insulin Sales and Volume Contributing to Presentation-Level Bilateral Price Index Comparisons, 2022

Country	Share of U.S. Sales ($)	Share of Other-Country Sales ($)	Share of U.S. Volume (in 100 IUs)	Share of Other-Country Volume (in 100 IUs)
Australia	80	70	82	78
Austria	80	75	77	75
Belgium	86	89	86	88
Canada	93	85	93	84
Chile	77	98	77	97
Colombia	73	99	74	99
Czechia	78	84	77	81
Estonia	72	98	64	97
Finland	85	97	79	97
France	90	98	91	98
Germany	89	88	88	87
Greece	82	98	83	97
Hungary	55	74	50	64
Ireland	89	100	87	100
Italy	79	99	80	99
Japan	87	87	88	89
Korea, South	86	82	87	87
Latvia	72	100	64	99
Lithuania	65	90	59	90
Luxembourg	74	63	71	78
Mexico	85	90	86	94
Netherlands	87	89	83	90
New Zealand	58	77	62	71
Norway	86	86	82	91
Poland	64	47	61	43
Portugal	77	90	74	86
Slovakia	73	83	69	81
Slovenia	73	94	67	94
Spain	94	98	93	97
Sweden	91	95	85	96
Switzerland	85	84	83	86
Turkey	76	91	77	94
UK	95	89	94	89
Non-U.S. OECD	**97**	**88**	**96**	88
United States	**98**	**NA**	**98**	NA

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: U.S. shares are reported only once. IU = international unit; NA = not applicable.

Table A.8. U.S. Gross Prices per 100 IUs Relative to Comparison Country Prices in Percentage Points, Overall and by Insulin Type, 34 Select OECD Countries, 2022

Country	Total	Human	Analog	R	RI	S	SI	I	L
Australia	1,352	891	1,396	1,524	1,753	605	1,110	842	1,257
Austria	975	685	984	1,105	1,445	477	NA	1,055	877
Belgium	1,125	926	1,136	1,407	1,427	817	839	1,045	948
Canada	643	652	642	900	849	709	668	581	522
Chile	460	413	461	601	711	390	NA	421	391
Colombia	1,300	974	1,310	1,782	NA	1,211	NA	860	1,109
Czechia	1,005	928	1,009	1,260	1,342	724	1,293	889	861
Estonia	979	1,280	976	1,194	1,244	NA	NA	1,280	881
Finland	1,214	1,172	1,214	1,849	1,582	NA	NA	1,172	934
France	1,024	712	1,049	1,275	1,423	471	946	644	895
Germany	708	673	709	755	902	891	1,038	523	665
Greece	1,091	891	1,099	1,382	1,427	835	1,085	768	902
Hungary	1,201	2,196	1,191	1,842	NA	1,664	NA	2,250	956
Ireland	978	873	983	1,161	1,282	704	1,153	832	858
Italy	879	949	876	1,230	1,418	940	1,138	802	709
Japan	838	532	867	1,016	933	468	597	495	766
Korea, South	1,050	1,064	1,049	1,208	1,172	884	1,242	974	938
Latvia	1,048	1,133	1,047	1,514	1,387	NA	NA	1,133	891
Lithuania	1,178	1,532	1,174	1,748	1,510	NA	NA	1,532	971
Luxembourg	1,135	NA	1,135	1,413	1,512	NA	NA	NA	921
Mexico	457	596	453	545	571	568	454	988	391
Netherlands	1,039	780	1,046	1,286	1,294	516	NA	1,325	893
New Zealand	742	589	751	1,126	1,405	460	647	645	545
Norway	1,031	1,245	1,029	1,252	1,408	NA	NA	1,245	880
Poland	1,291	851	1,320	2,228	NA	705	NA	925	1,053
Portugal	983	1,335	979	1,249	1,396	1,102	NA	1,357	831
Slovakia	1,108	1,913	1,102	1,313	1,364	1,458	NA	1,959	965
Slovenia	1,199	1,017	1,207	1,525	1,676	543	1,685	1,251	1,072
Spain	958	955	958	1,285	1,334	720	1,144	888	789
Sweden	1,029	1,519	1,026	1,542	1,518	916	NA	1,599	800
Switzerland	664	633	666	822	861	505	NA	694	573
Turkey	3,799	1,667	3,909	4,264	4,301	1,827	NA	1,574	3,556
UK	1,007	833	1,018	1,237	1,340	853	848	809	882
Non-U.S. OECD	**971**	**835**	**983**	**1,153**	**1,325**	**756**	**804**	**1,024**	**867**
U.S.	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: *NA* indicates that there were no matching presentations in MIDAS on which to compare prices.
I = intermediate acting; IU = international unit; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting.

Table A.9. U.S. Gross Prices per SU Relative to Comparison Country Prices in Percentage Points, Overall and by Insulin Type, 34 Select OECD Countries, 2022

Country	Total	Human	Analog	R	RI	S	SI	I	L
Australia	1,327	783	1,387	1,445	1,753	396	1,074	809	1,305
Austria	959	521	976	1,047	1,445	320	NA	1,055	902
Belgium	1,107	809	1,126	1,343	1,427	547	799	1,004	962
Canada	645	723	641	881	849	805	636	684	526
Chile	456	352	461	568	711	255	NA	406	400
Colombia	1,286	806	1,304	1,659	NA	792	NA	815	1,137
Czechia	982	808	993	1,187	1,342	482	1,293	857	868
Estonia	996	1,280	993	1,194	1,244	NA	NA	1,280	902
Finland	1,206	1,172	1,206	1,755	1,582	NA	NA	1,172	946
France	1,007	625	1,042	1,217	1,423	308	919	621	911
Germany	695	612	699	715	902	606	1,038	502	676
Greece	1,075	759	1,090	1,317	1,427	546	1,033	728	918
Hungary	1,210	2,196	1,201	1,842	NA	1,664	NA	2,250	967
Ireland	966	765	977	1,102	1,282	460	1,153	803	878
Italy	871	814	873	1,147	1,418	632	1,084	760	727
Japan	831	479	868	978	933	316	581	479	787
Korea, South	1,042	955	1,048	1,155	1,172	578	1,210	943	965
Latvia	1,061	1,133	1,060	1,514	1,387	NA	NA	1,133	905
Lithuania	1,196	1,532	1,192	1,748	1,434	NA	NA	1,532	994
Luxembourg	1,125	NA	1,125	1,342	1,512	NA	NA	NA	941
Mexico	454	509	453	519	571	371	432	938	402
Netherlands	1,038	1,155	1,036	1,224	1,294	996	NA	1,325	906
New Zealand	714	492	731	1,037	1,405	301	616	611	545
Norway	1,063	1,245	1,062	1,189	1,408	NA	NA	1,245	959
Poland	1,301	710	1,349	2,228	NA	469	NA	887	1,083
Portugal	979	1,335	975	1,175	1,396	1,102	NA	1,357	852
Slovakia	1,097	1,913	1,091	1,241	1,364	1,458	NA	1,959	982
Slovenia	1,209	812	1,231	1,525	1,676	355	1,685	1,251	1,103
Spain	948	848	954	1,228	1,334	471	1,112	857	801
Sweden	1,023	1,519	1,019	1,470	1,518	916	NA	1,599	809
Switzerland	657	529	662	782	861	330	NA	670	585
Turkey	3,733	1,355	3,883	4,056	4,301	1,194	NA	1,491	3,680
UK	987	754	1,004	1,173	1,340	558	819	778	889
Non-U.S. OECD	**959**	**781**	**975**	**1,095**	**1,324**	**675**	**778**	**998**	**883**
U.S.	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: *NA* indicates that there were no matching presentations in MIDAS on which to compare prices.
I = intermediate acting; L = long acting; R = rapid acting; RI = rapid–intermediate acting; S = short acting; SI = short–intermediate acting; SU = standard unit.

Table A.10. U.S. Gross Prices Relative to Comparison Country Prices in Percentage Points at the Active Ingredient Level, Overall and by Insulin Type, 34 Select OECD Countries, 2022

Country	Prices per 100 IUs	Prices per SU
Australia	1,268	1,620
Austria	908	1,118
Belgium	1,074	1,126
Canada	631	730
Chile	452	541
Colombia	1,327	1,555
Czechia	1,000	989
Estonia	938	1,086
Finland	1,135	1,313
France	984	1,091
Germany	710	810
Greece	1,038	1,241
Hungary	1,199	1,321
Ireland	934	1,078
Italy	872	1,003
Japan	741	946
Korea, South	978	1,101
Latvia	1,010	1,117
Lithuania	1,165	1,410
Luxembourg	975	1,168
Mexico	493	478
Netherlands	987	1,136
New Zealand	768	1,005
Norway	971	1,079
Poland	1,278	1,557
Portugal	973	1,268
Slovakia	1,062	1,251
Slovenia	1,163	1,439
Spain	920	1,112
Sweden	1,022	1,187
Switzerland	662	801
Turkey	3,598	4,752
UK	997	1,186
Non-U.S. OECD	**936**	**1,109**
U.S.	**100**	**100**

SOURCE: Analysis of IQVIA MIDAS data from an extract provided by ASPE (run date: June 26, 2023).
NOTE: IU = international unit; SU = standard unit.

Abbreviations

ASPE	Office of the Assistant Secretary for Planning and Evaluation
FDA	U.S. Food and Drug Administration
G7	Group of Seven (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States)
I	intermediate acting
IRA	Inflation Reduction Act
IU	international unit
L	long acting
NFC	new form code
NPH	neutral protamine Hagedorn
OECD	Organisation for Economic Co-operation and Development
PBM	pharmacy benefit manager
R	rapid acting
RI	rapid–intermediate acting
S	short acting
SI	short–intermediate acting
SU	standard unit

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