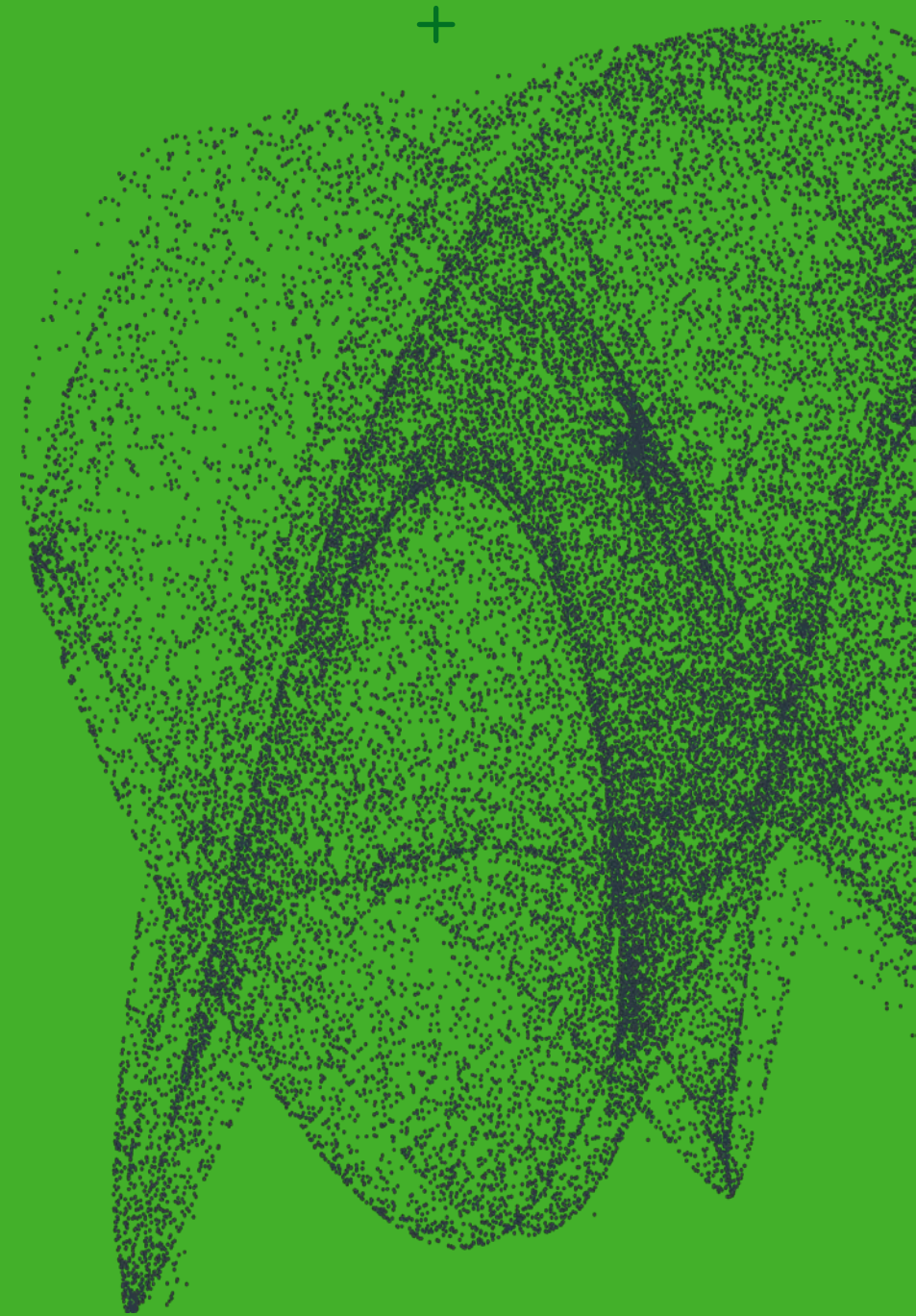


Drug Expenditure Dynamics 1995-2020

Understanding Medicine Spending in Context
Country Detail Appendix:

Brazil

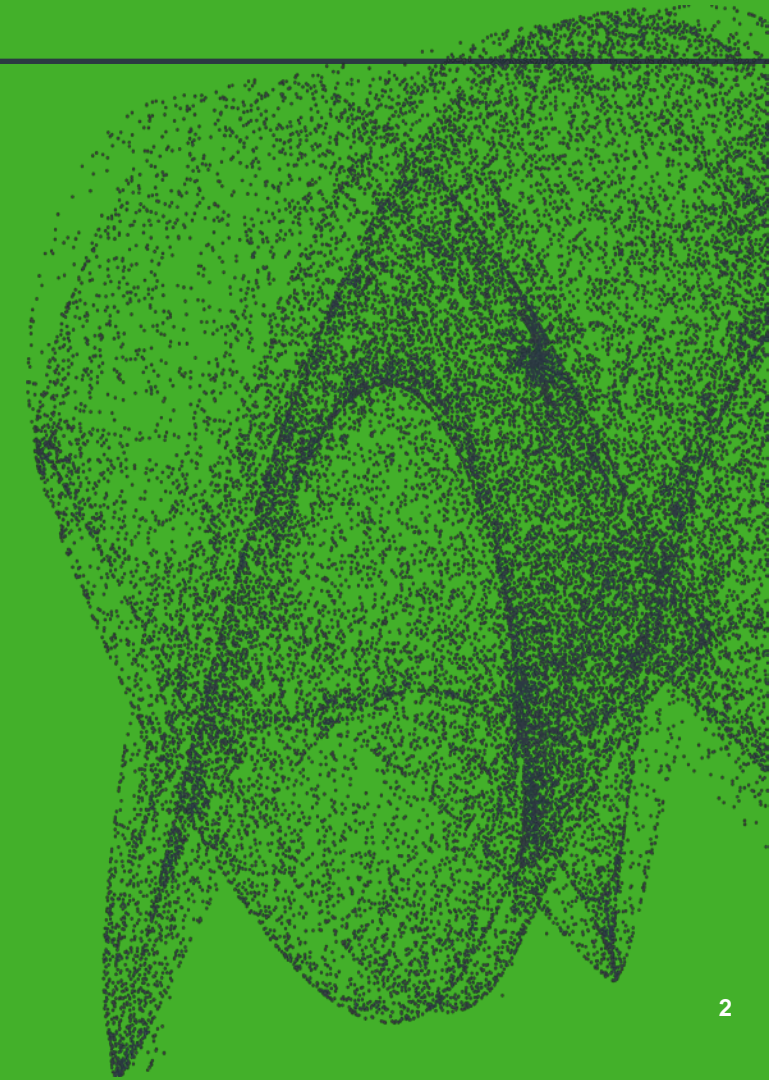


Introduction

- This document is intended as an accompanying appendix to the report Understanding the Dynamics of Drug Expenditure 1995-2020.
- The report includes analyses of 11 major countries and provides cross-country and aggregate analyses of these markets.
- This document includes specific country analyses mirroring the main report and intended to illustrate the same dynamics in each country that are shown across countries.
- In some cases, there are important differences from cross-country trends, and those are illustrated and highlighted.
- The key findings in relation to each country are summarized and each page represents a specific analysis of interest.
- This document is not an exhaustive analysis or summary of the country, and the primary purpose is to provide the long-history analyses which are unique to this report.
- The exhibits in this report are sometimes complex or include multiple graphics per page. This document ends with several annotated examples of the layout of important exhibits to enable the reader to better understand how to read and understand them.



Brazil



Key findings

- Brazil healthcare spend has been declining on a GDP normalized basis, which is an artefact of rapid economic growth.
- Drug spending has remained on a strong, upward trajectory as access has improved, and now represents 13% of overall healthcare spending in 2018.
- The composition of expenditure trend has shifted toward the generic segment since 2010, occupying more than 50% share both in terms of overall spending and utilization in recent time periods.
- An almost flat trend has been observed in most therapy classes across the 25-year period, with the top 10 classes contributing 56% of total drug spending.
- While examining only protected brands, therapy classes such as oncology, diabetes, immunology, vaccines, and antithrombotics together contribute 70% in 2020, up from 11% 15 years ago.
- Primary care drug classes such as hypertension, anti-ulcerants and anti-bacterials are predominantly driven by generics in recent time periods, due to patent expiries.
- Other classes (i.e., immunology, oncology, HIV, diabetes) had continuous introduction of new innovative drugs which were either added to regimens or supersede previous standards of care, driving ongoing increases in spending.
- Note: Brazil has no coverage for non-retail prior to 2005 and hence a very low share from protected brands between 1996-2000 and 2000-2005.

With improved access to drugs in Brazil, drugs spending as a share of overall healthcare spending is up from 6% in 2001 to 13% in 2018

Drug and Healthcare Spending 1995-2018

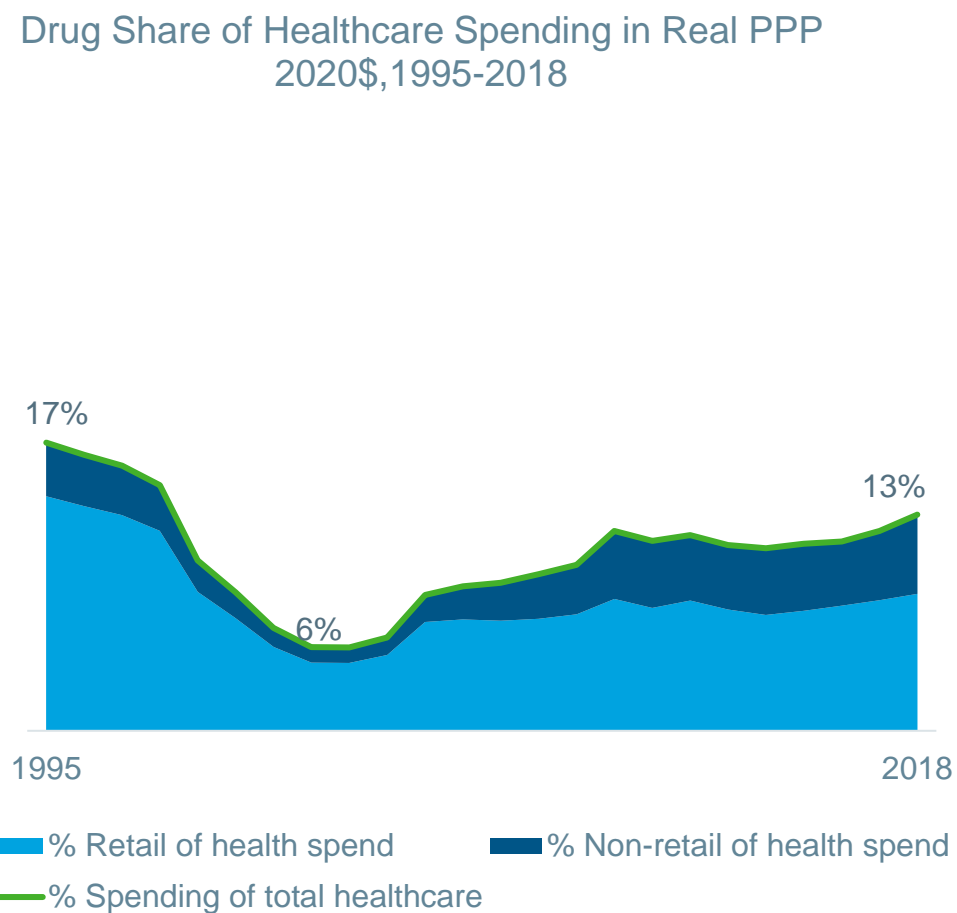
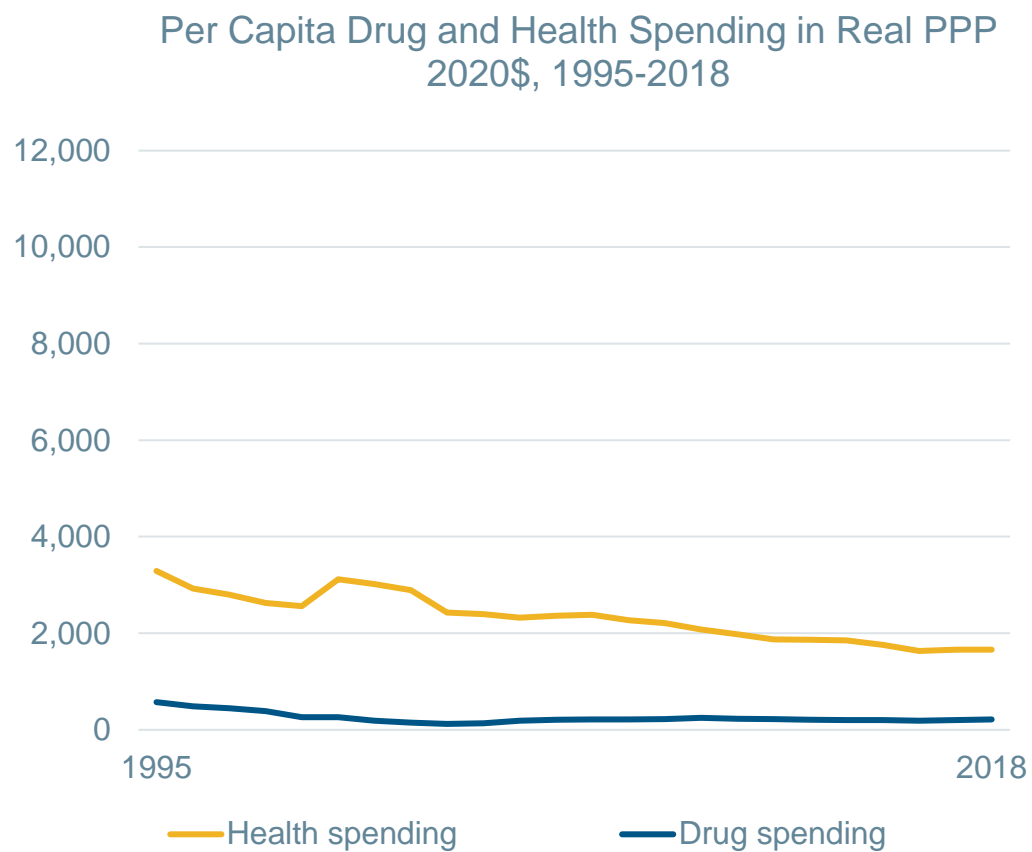
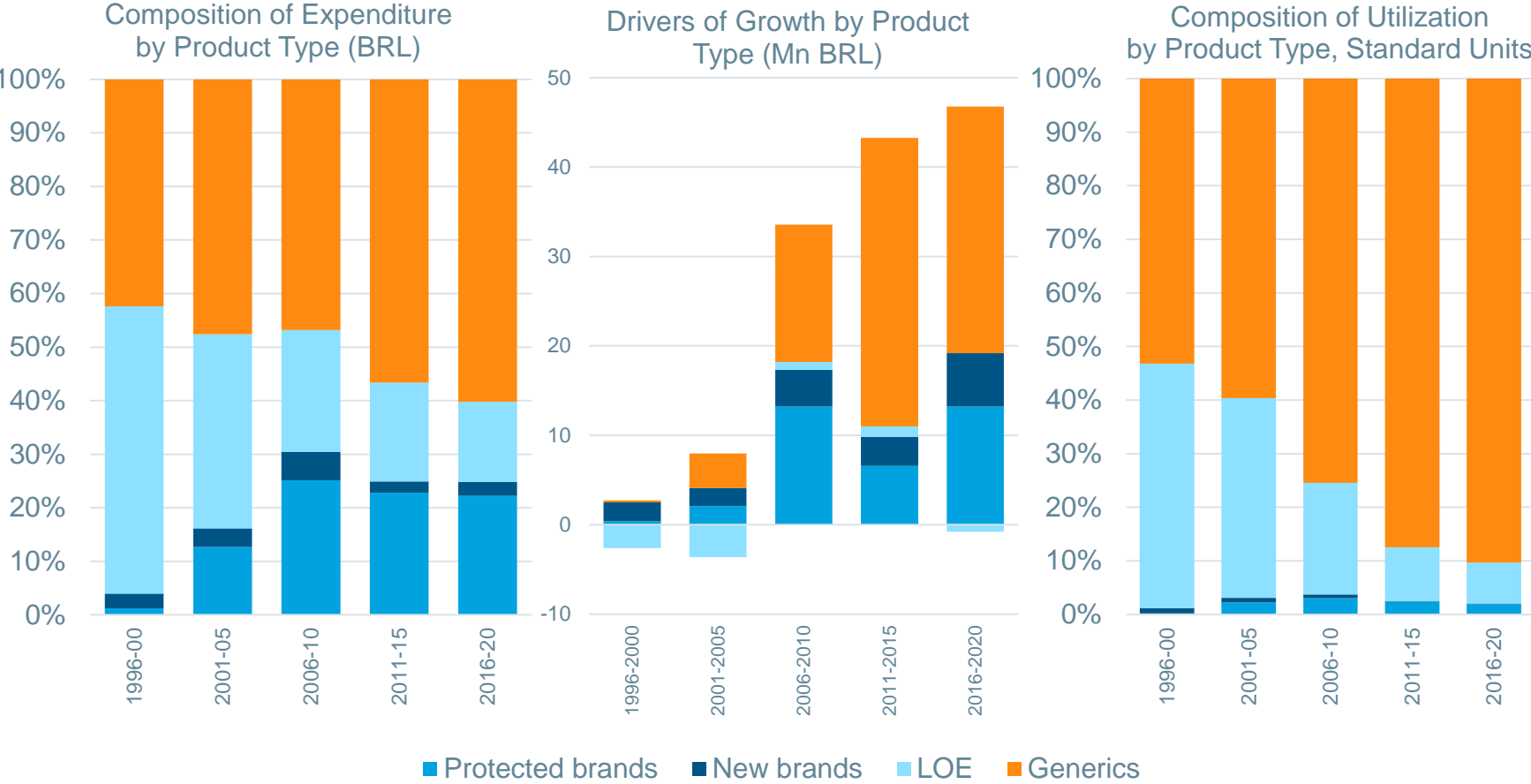


Chart Note: Methodology described in main report *Drug Expenditure Dynamics 1995-2020: Understanding Medicine Spending in Context*
Source: IQVIA Institute for Human Data Science, Sep 2021

Brazil is a heavily genericized market as most medicines are paid out-of-pocket or via government programs

Brazil Drug Spending and Utilization 1995-2020

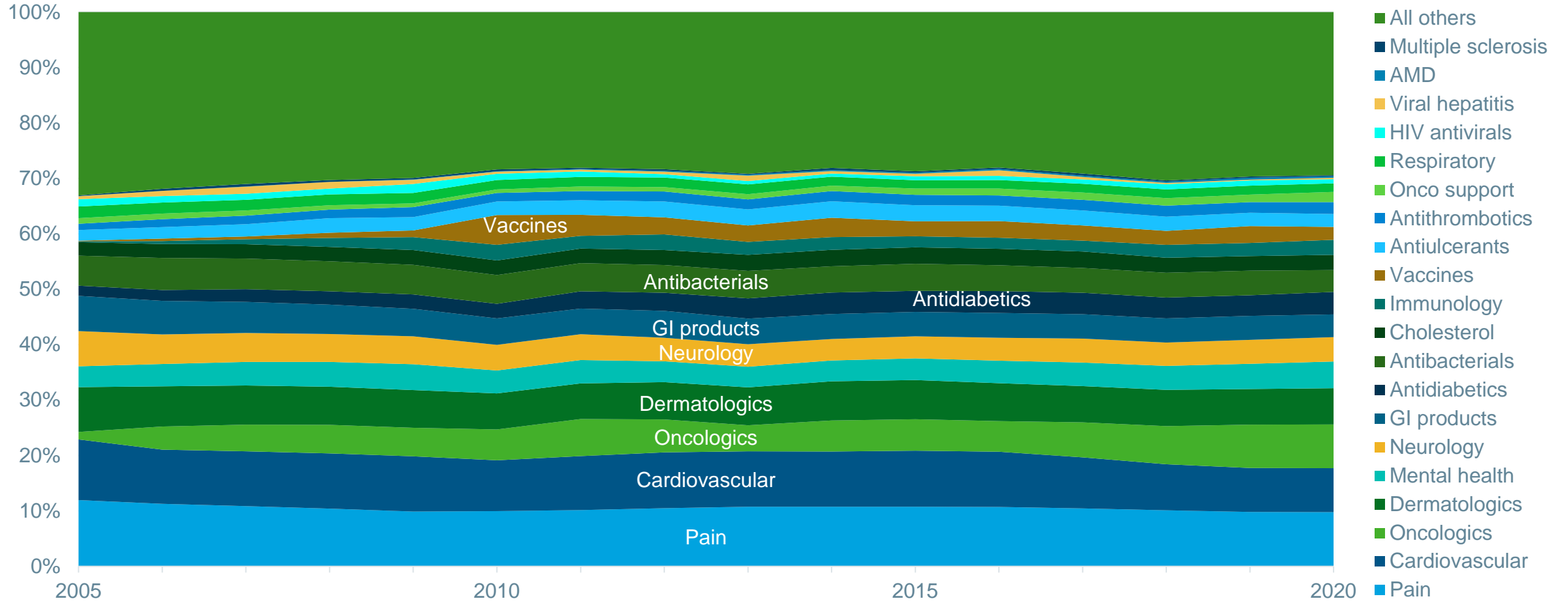


- Generics account for more than 50% of sales and spending growth in the last 10 years, and more than 90% of volume
- Protected branded drugs have had stronger spending and growth in the last 15 years as IP protections have improved
- Note: drug spending for Brazil is taken from IQVIA MIDAS (retail and non-retail) and has no coverage for non-retail prior to 2005

Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Stable trend observed in most classes across 25-year period; top 10 share contributes to almost 60% of total spending

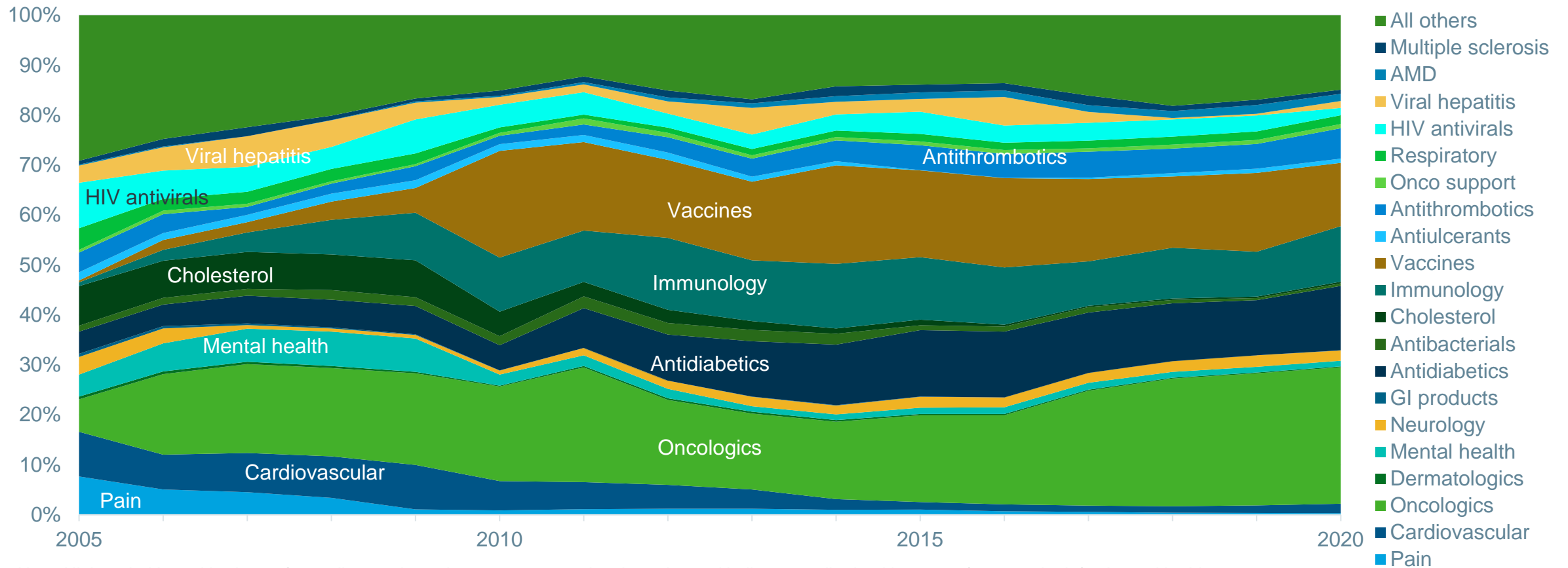
Brazil Composition of Drug Real Local Currency Spending by Drug Class, 2005-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Oncology, diabetes, vaccines, immunology & antithrombotics together contributed 70% in 2020, up from 11% 15 years ago

Brazil Composition of Protected Brands Real Local Currency Spending by Drug Class 2005-2020

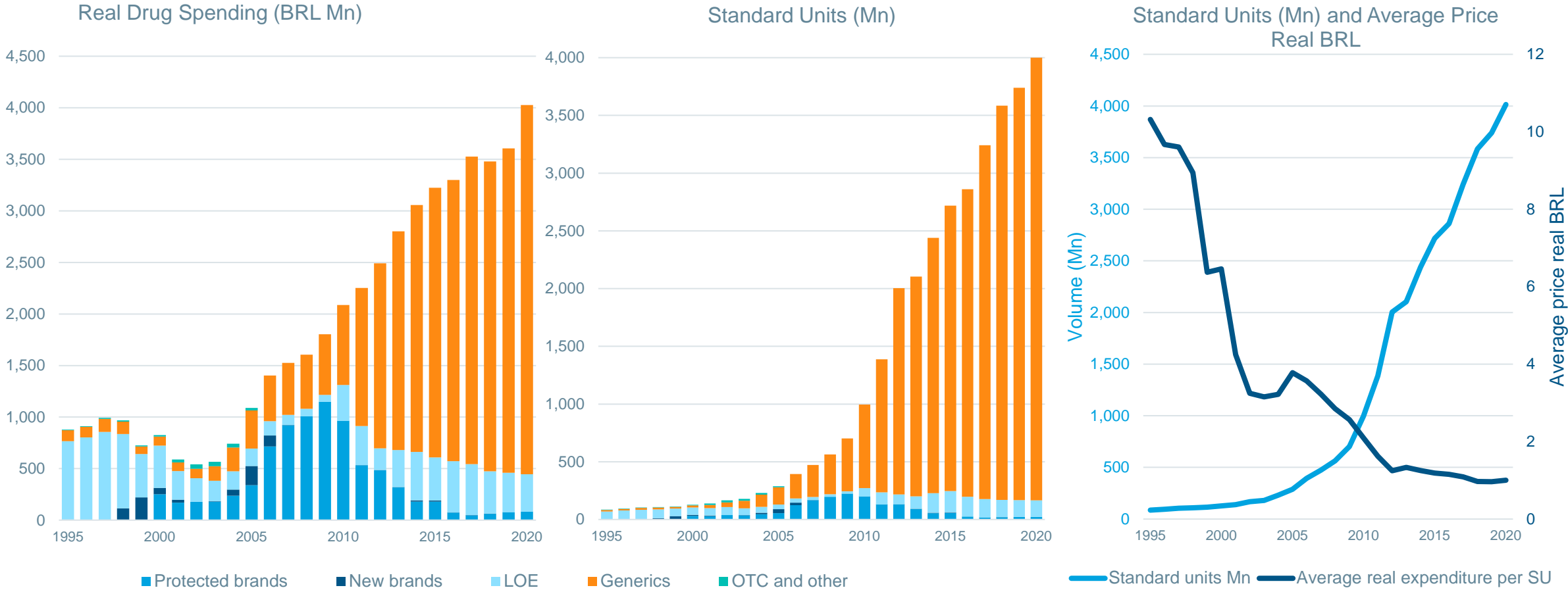


Note: Higher viral hepatitis share of spending predates the newest generation therapies and indicates earlier health system focus on the infections with older therapies.

Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Majority of cholesterol spending and volume due to generic drugs, especially after loss of exclusivity of major products

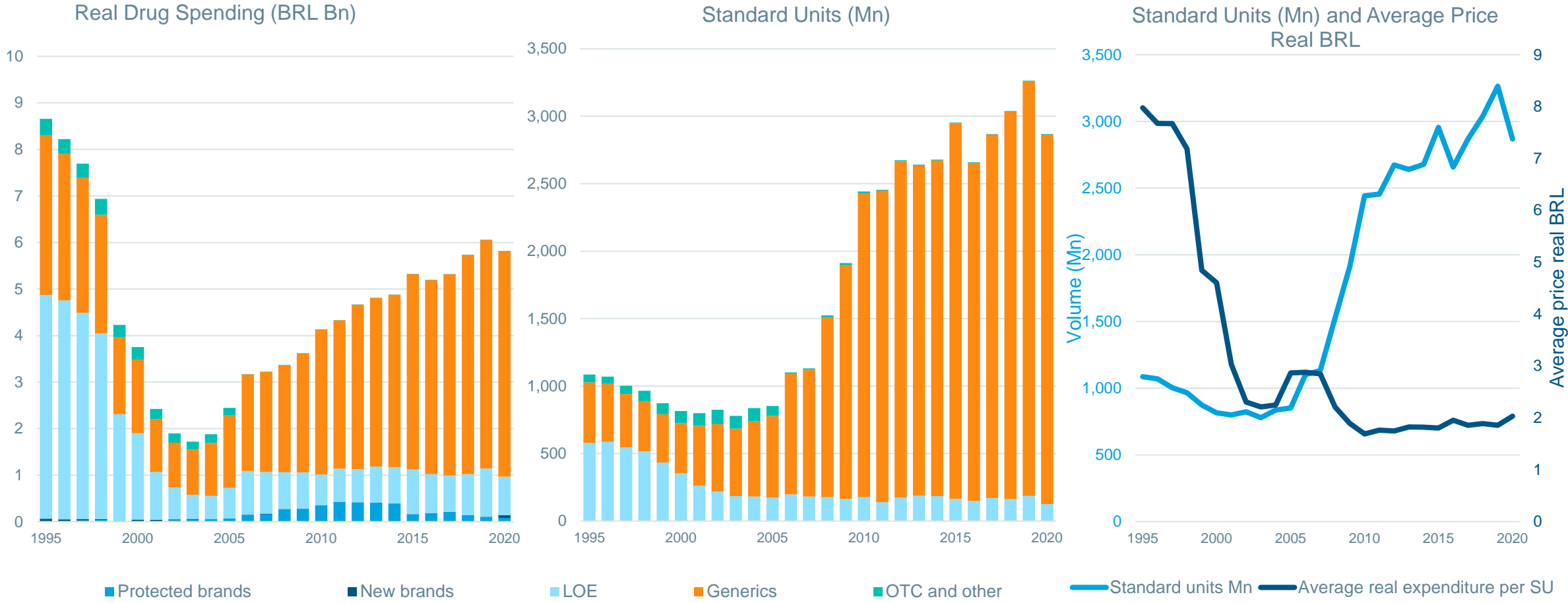
Brazil Cholesterol Volumes, Average Prices and Spending by Product Type 1995-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

While anti-bacterial spending declined 33%, volume increased by more than 164%, reflecting a significant shift to generics

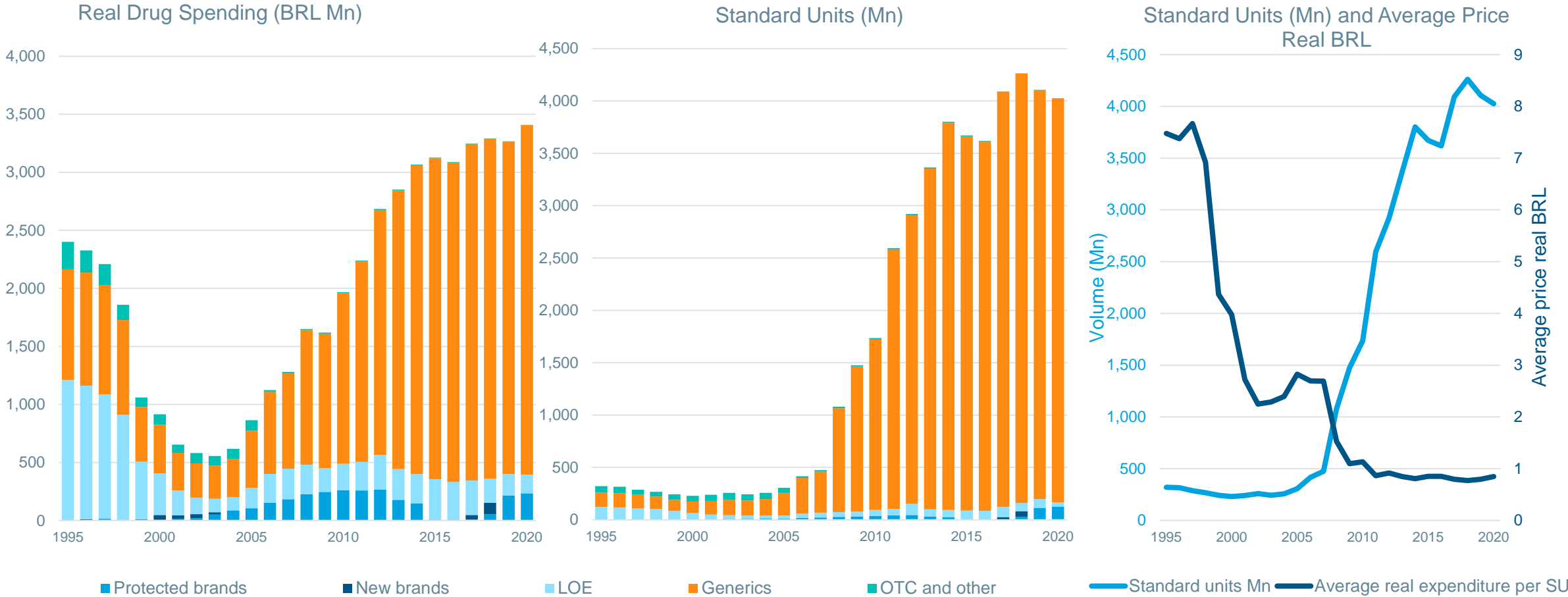
Brazil Antibacterial Volumes, Average Prices and Spending by Product Type 1995-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Anti-ulcerant generic use has increased since 2005, with 96% of volume being generics and 3% protected or new brands in 2020

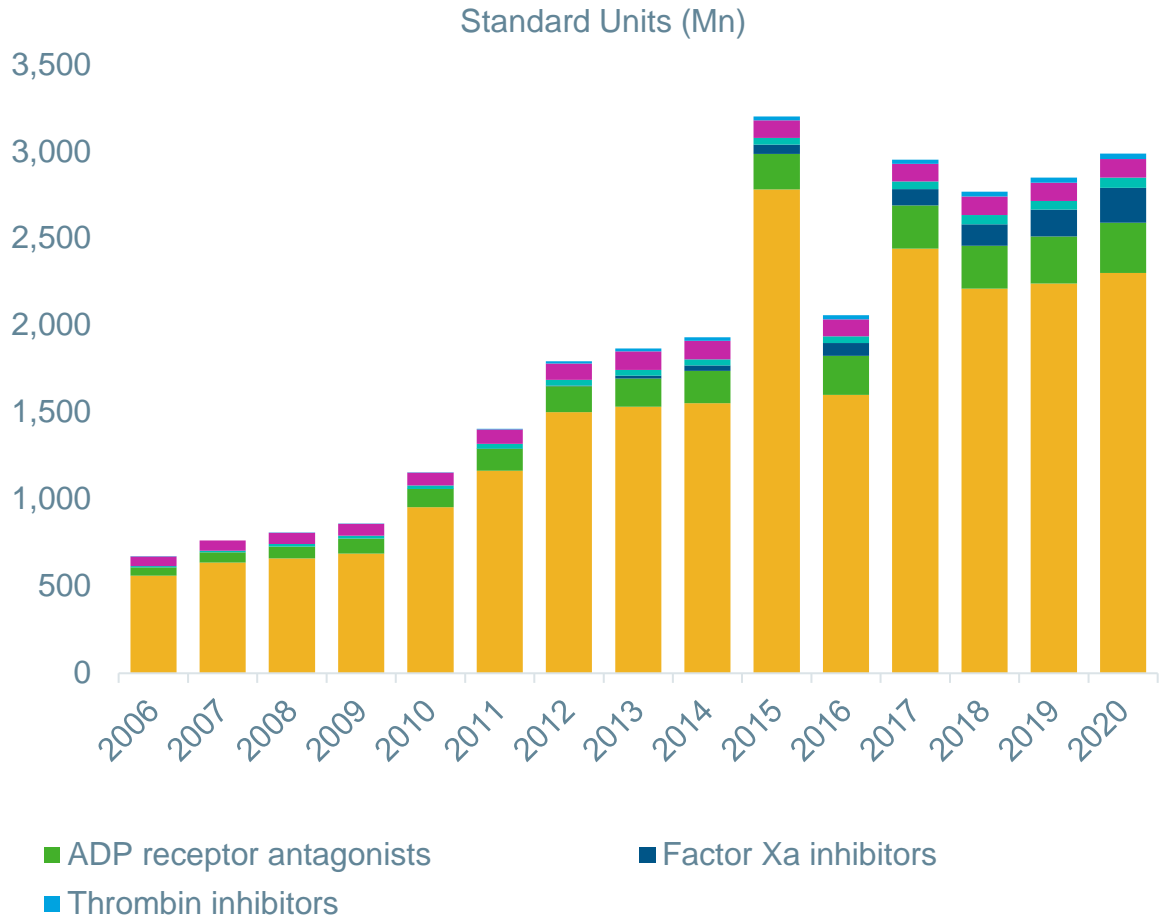
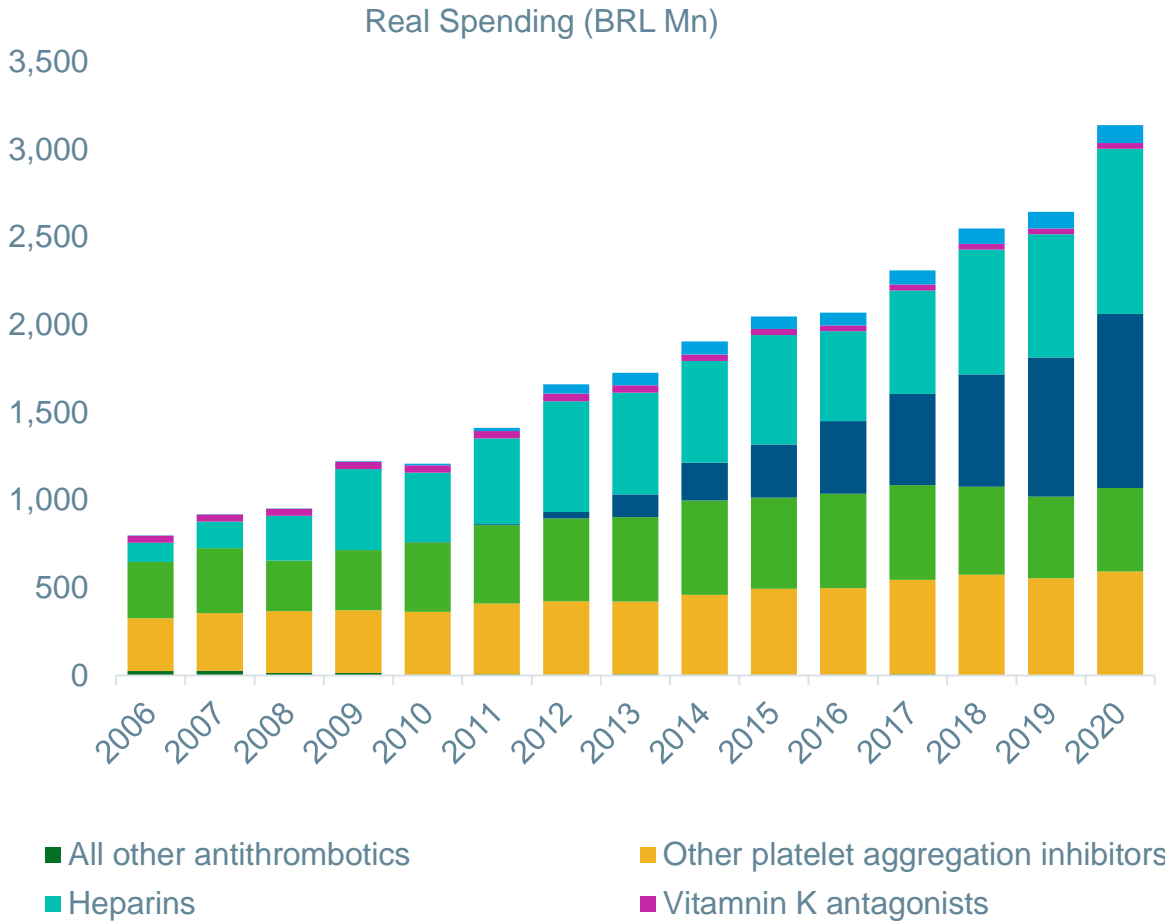
Brazil Anti-Ulcerants Volumes, Average Prices and Spending by Product Type 1995-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Antithrombotic steady increase in spending as Factor Xa inhibitors enter the market in 2012

Brazil Antithrombotics Spending and Volumes by Drug Type, 2006-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Hypertension spending and use has continued to rise in last 10 years, indicating addition of newer mechanisms to treatment regimens

Brazil Hypertension Spending and Volume by Mechanism, 1995-2020

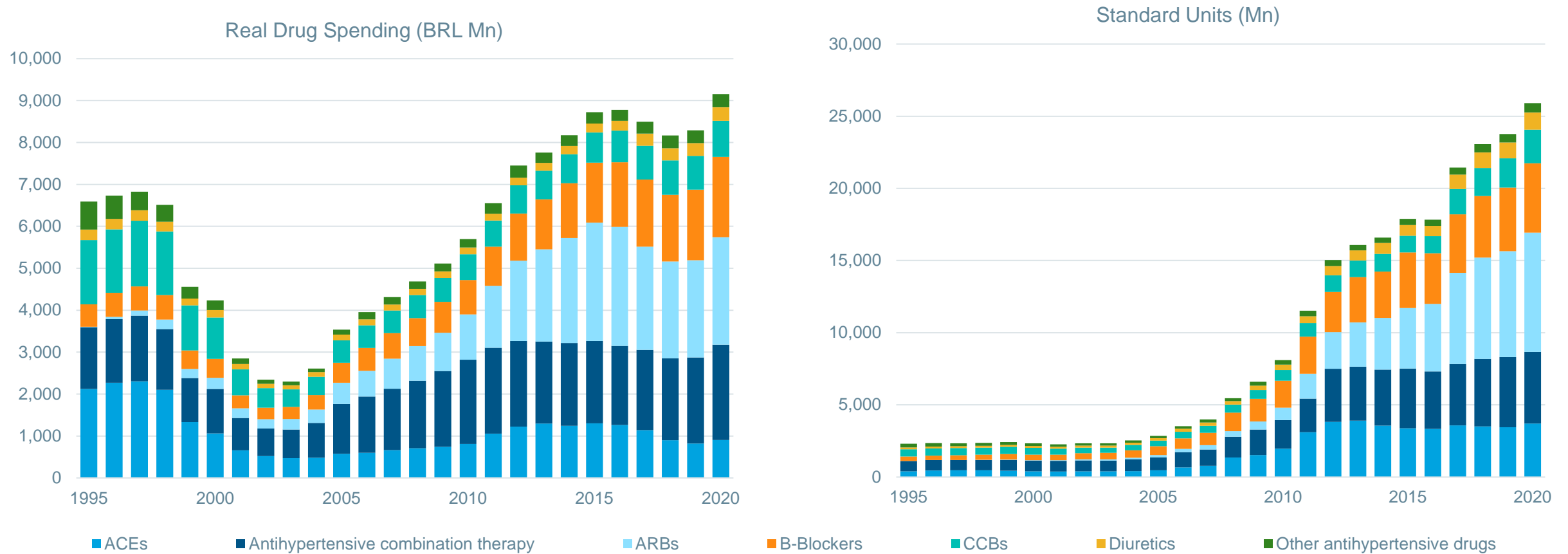
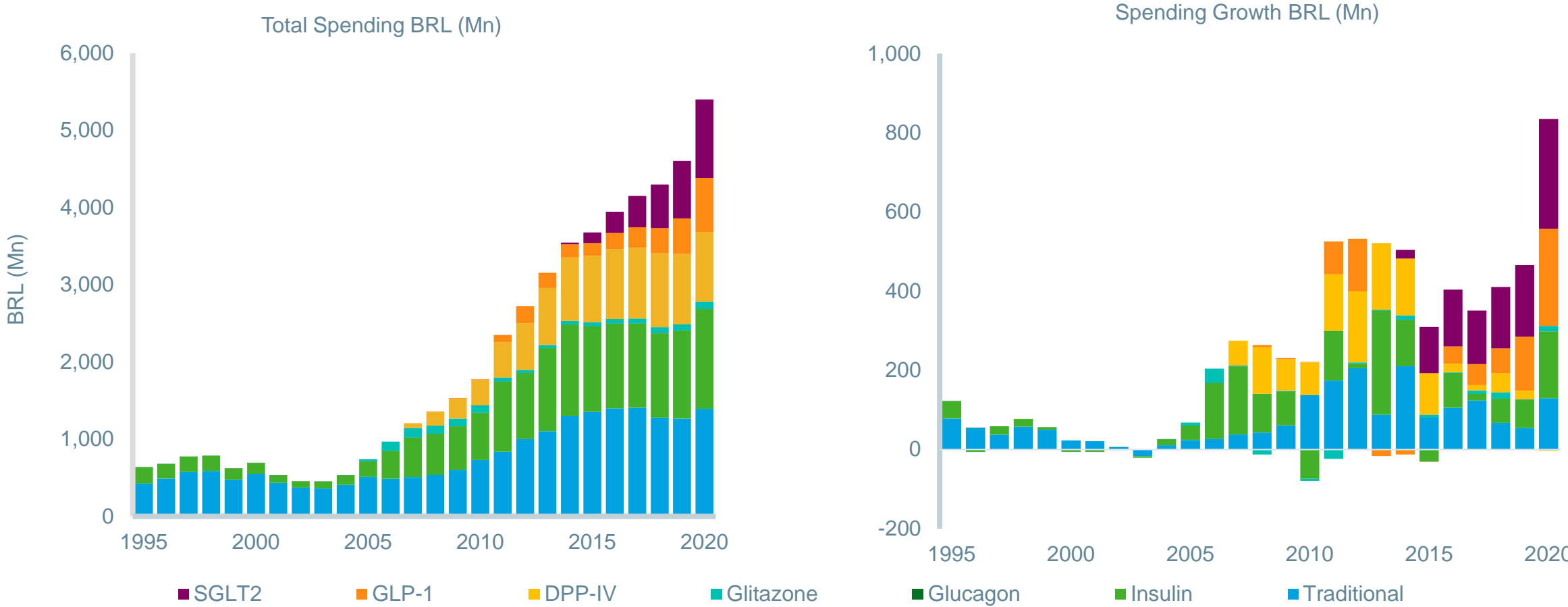


Chart notes: ARBs: Angiotensin II receptor antagonists, CCBs: Calcium channel blockers; ACEs: Angiotensin-converting enzyme.

Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Adoption of diabetes innovation drives most spending growth, with more stable spending in traditional therapies and insulins

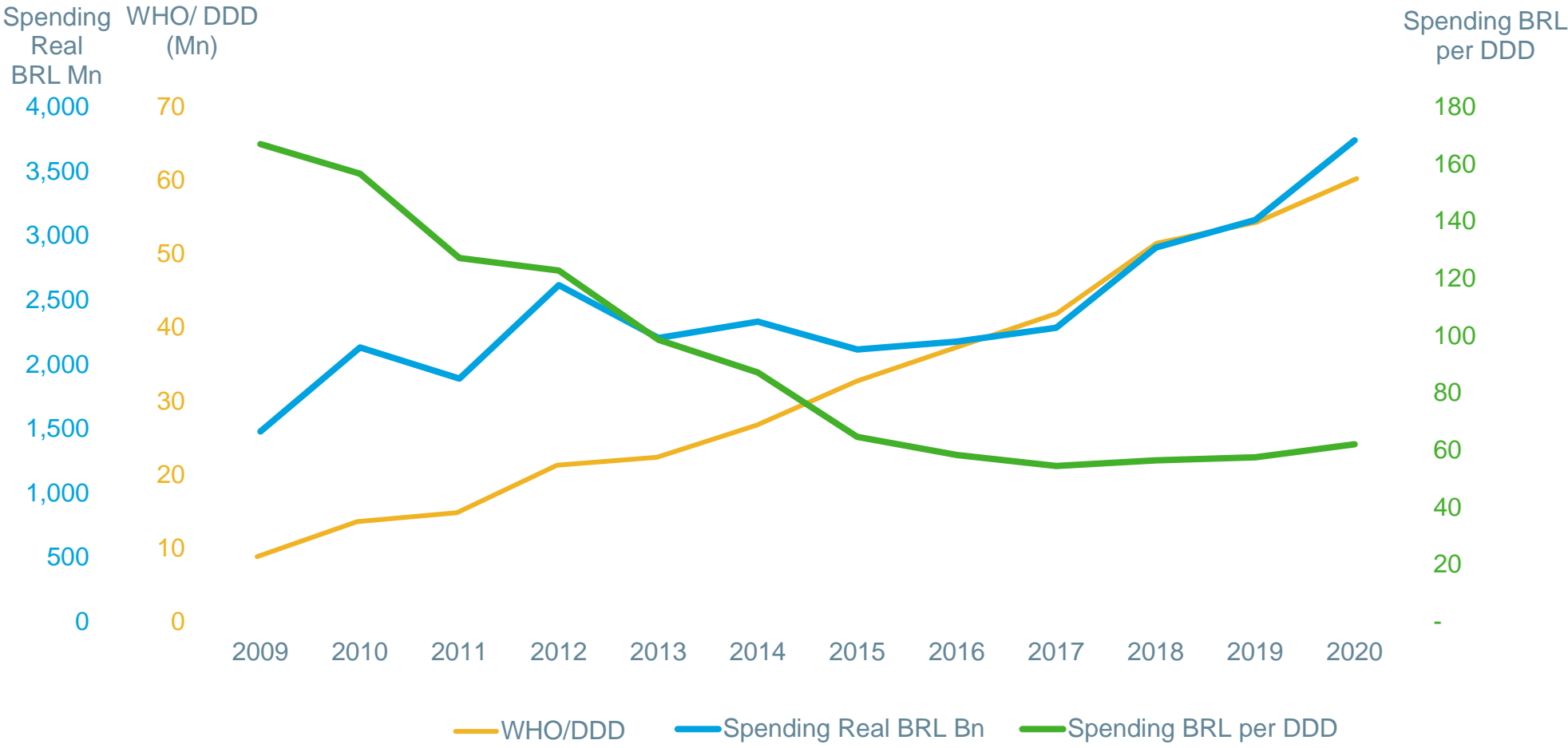
Brazil Diabetes Real Spending and Growth BRL (Mn) by Drug Type, 1995-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Auto-immune cost per day of therapy declined from R\$167 in 2009 to R\$62 in 2020 while usage increased almost seven-fold

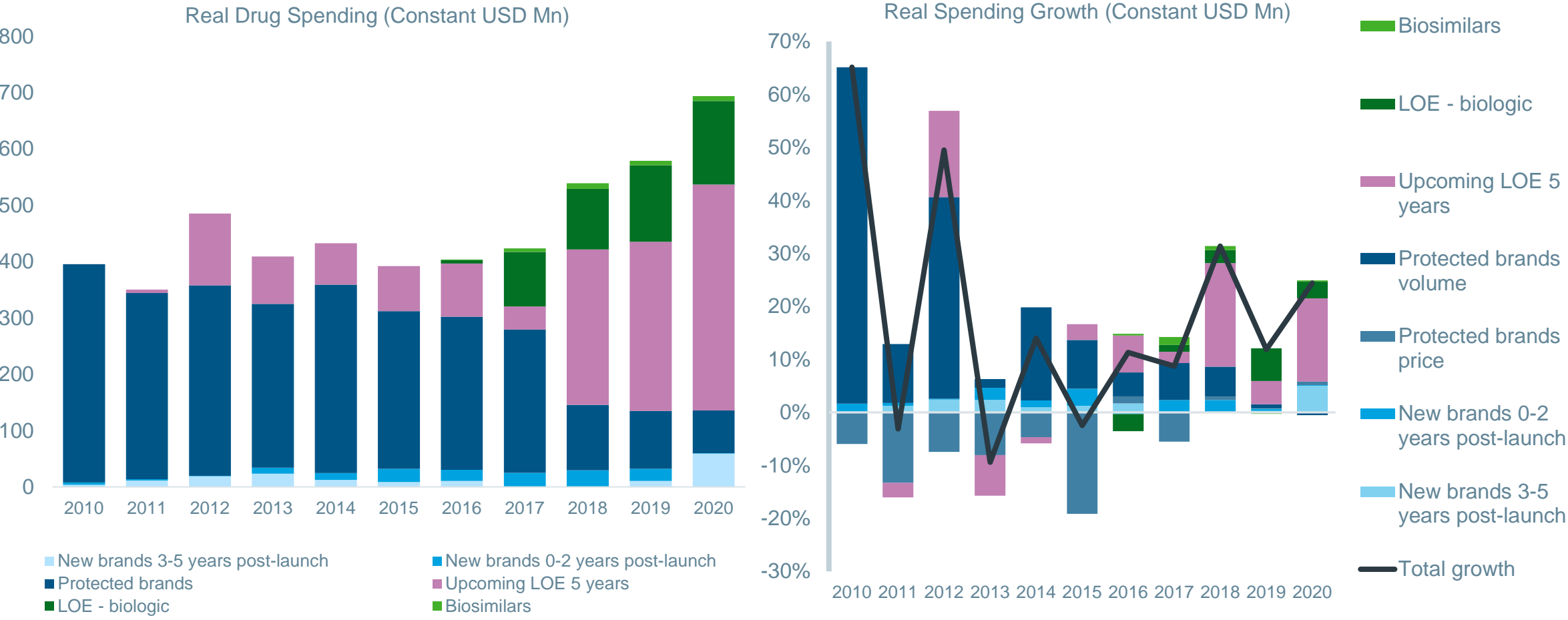
Brazil Auto-immune Biologic Spending, DDD and Cost, 2009-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Auto-immune protected brand spending declines, with more than 60% of spending from drugs that will face biosimilars by 2025

Brazil Autoimmune Biologic Invoice Spending and Growth Drivers, 2010-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Vaccine spending increased for adoption of the meningitis vaccine, accounting for 31% of overall spending in 2020

Brazil Vaccine Spending and Volumes by Drug Type, 2010-2020

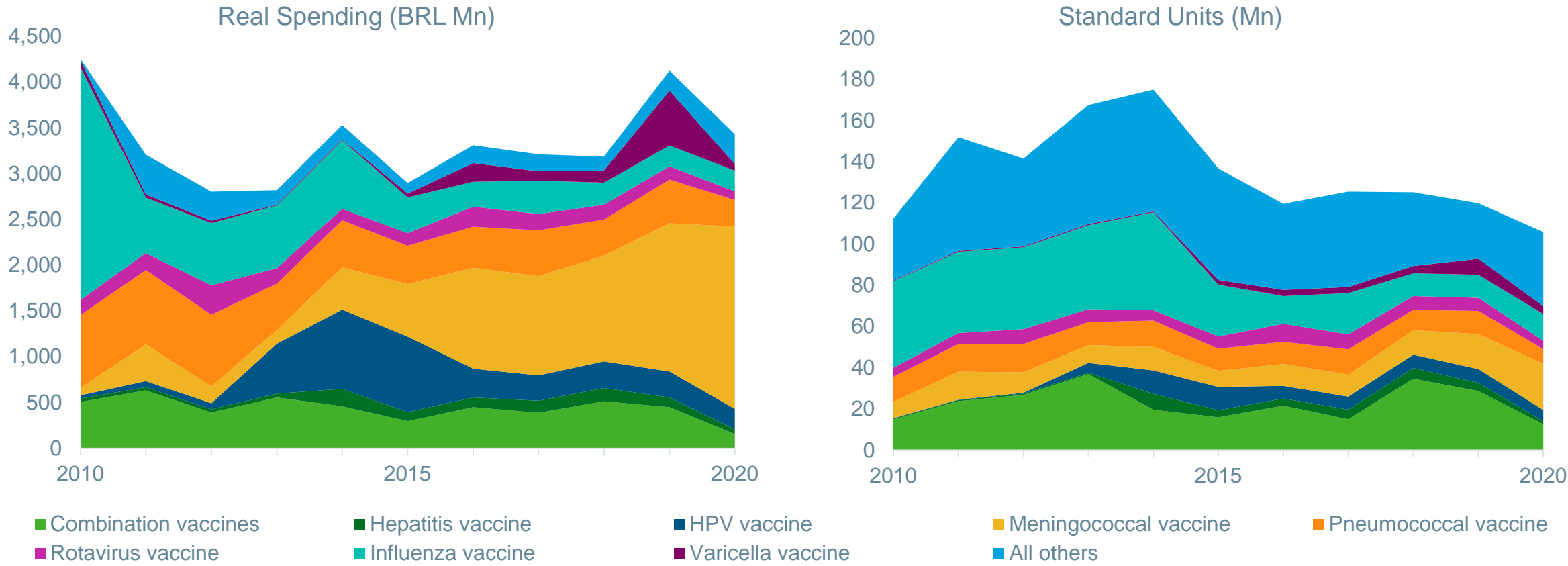
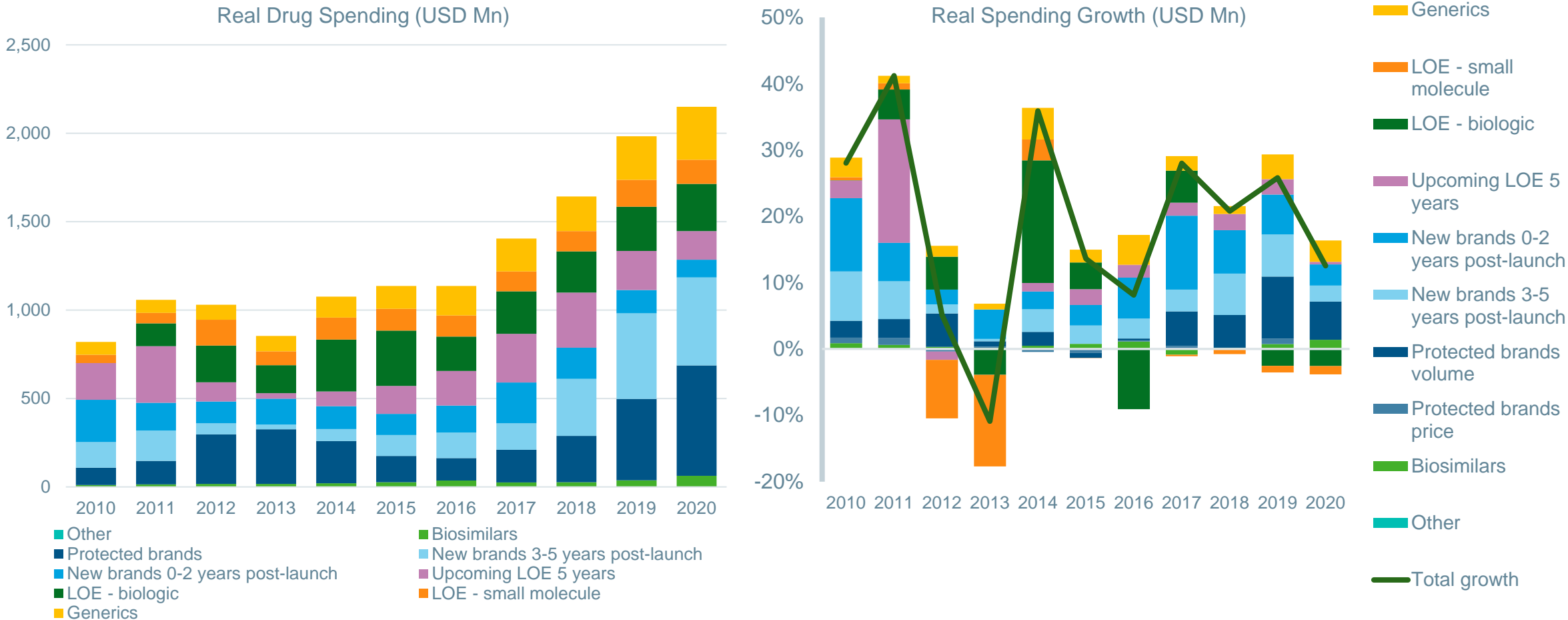


Chart notes: Combination vaccines represent combined vaccines (with measles, mumps, tetanus or other); HPV vaccine for human papillomavirus; Meningococcal vaccine for meningitis; Pneumococcal vaccine for pneumonia; Rotavirus vaccine for rotavirus; Influenza vaccine for the flu; Varicella vaccine for shingles; and All others for cholera, tetanus, typhoid and other viral/bacterial vaccines

Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Brazil had oncology biosimilars before other countries due to weaker IP protection, innovation the big driver

Brazil Oncology Invoice Spending and Spending Growth Drivers, 2010-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Oncology HER-2 MABs contributed ~20% to the oncology spending in the last 5 years, followed by new mechanisms like PD/PDL1 inh.

Brazil Oncology Real Local Currency Spending by Mechanism, 2010-2020

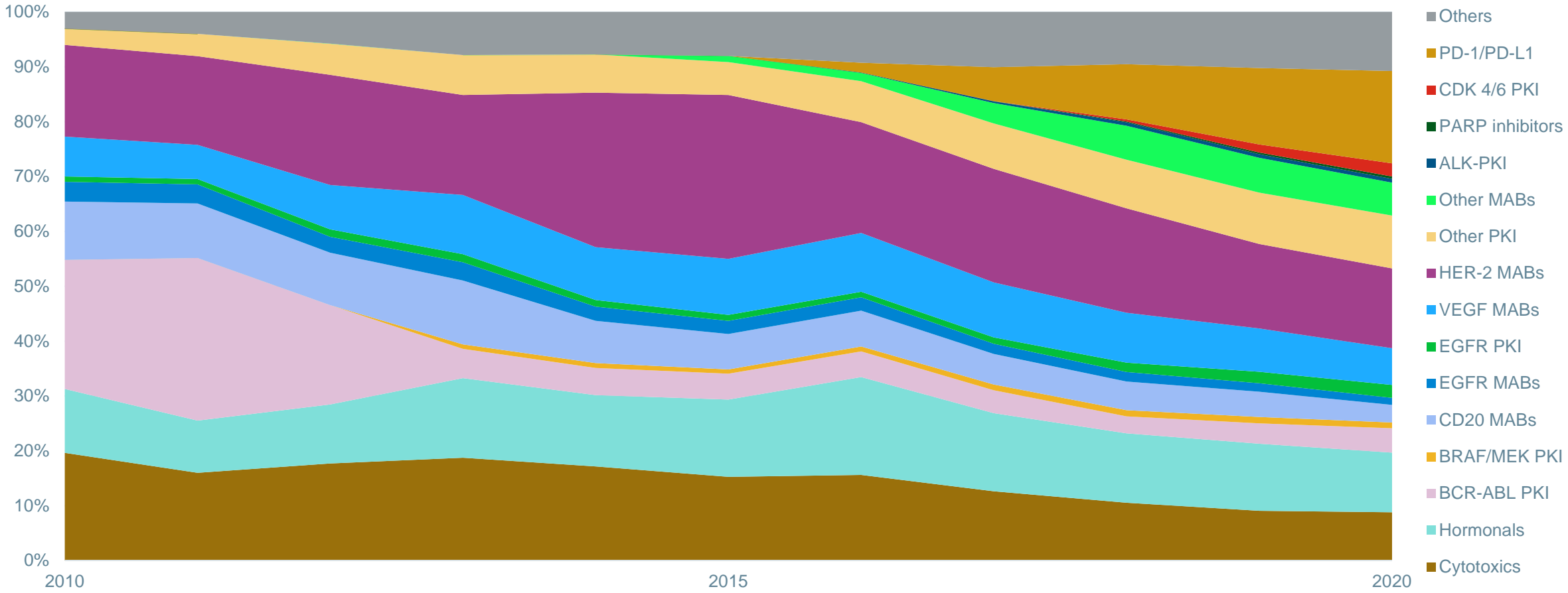


Chart notes: Cytotoxics include antimetabolites, taxane, alkylating agents, camptothecin, platinum, lidomide, podophyllotoxin, vinca alkaloid and other antineoplastics, aromatase inhibitors; Hormonals include cytostatic anti-androgens, gonadotropins, gonadotropin releasing hormones, progestogens, estrogens, anti-estrogens; others include all other neoplastics.
 Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Wider use of HIV NRTI and protease inhibitors occupied more than 70% share in spending as well as volume in last decade

Brazil HIV Spending and Volume by Mechanism, 2005-2020

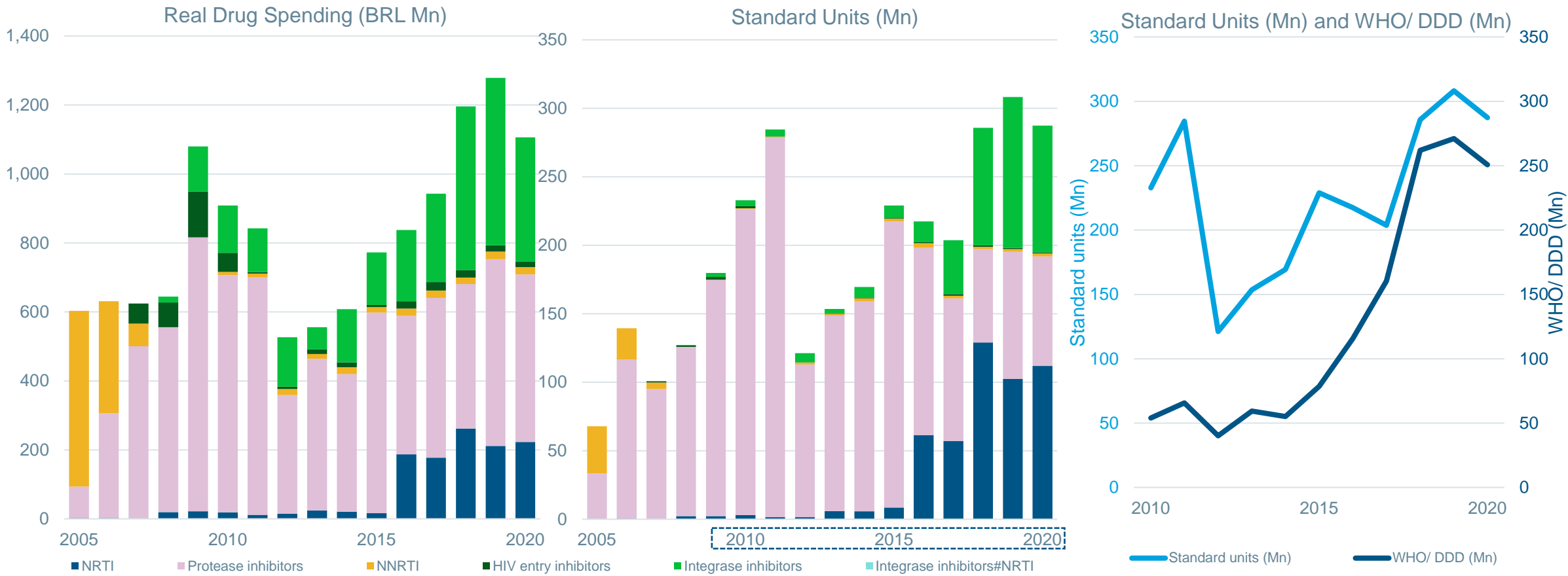
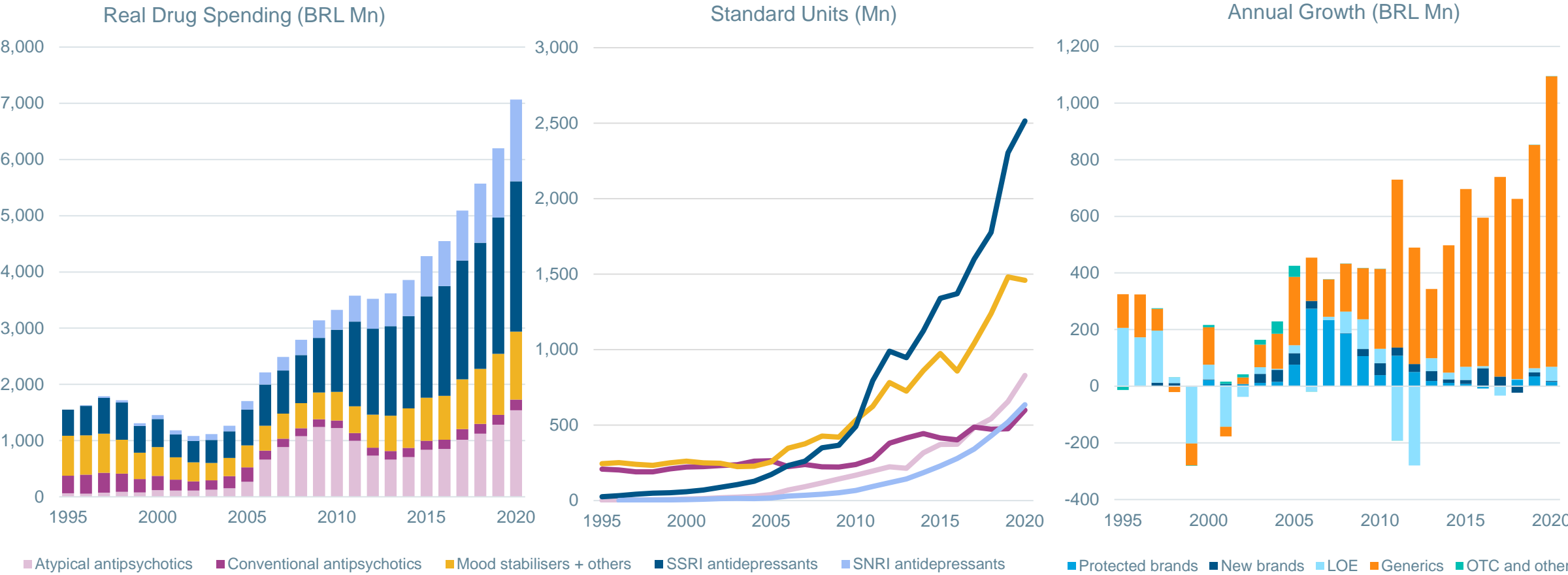


Chart notes: NRTI - Nucleos(t)ide reverse transcriptase inhibitor; NNRTI - Non- nucleoside reverse transcriptase inhibitor; CYP3A inhibitors - cytochrome P450 3A CYP3A inhibitors; # is used to define the combinations of mechanisms used in respective categories.

Source: IQVIA MIDAS; IQVIA Institute, Dec 2020

Over the last decade, mental health spending has been driven by generics

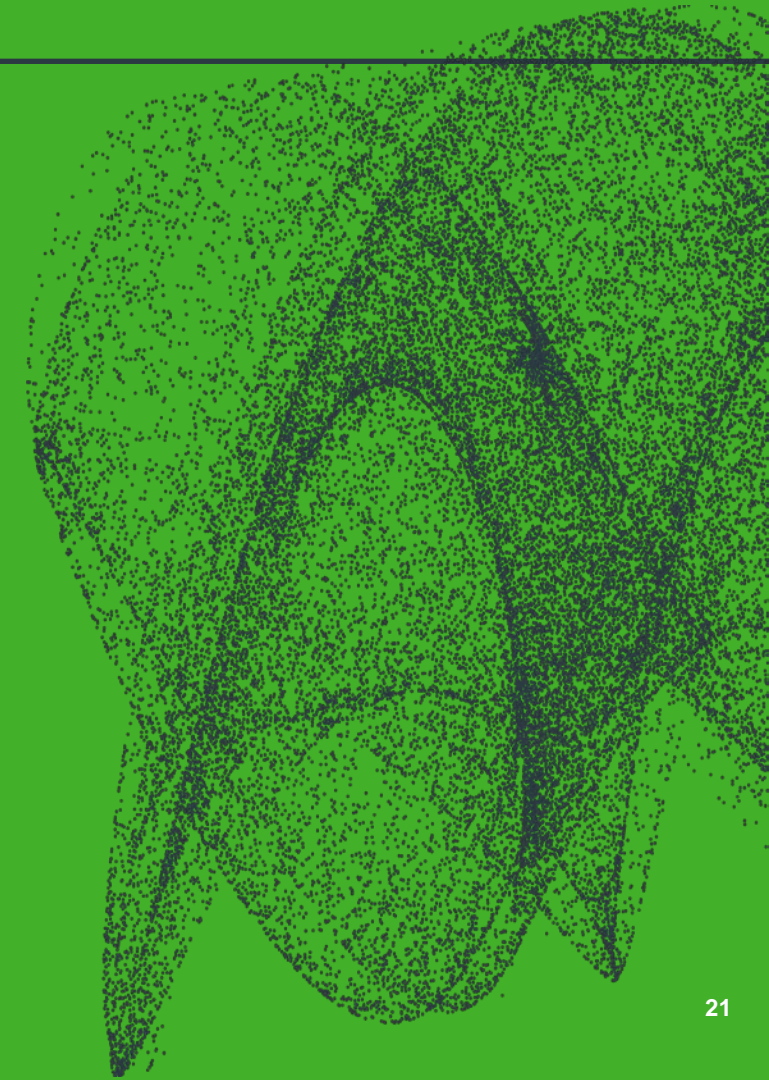
Brazil Mental Health Spending by Mechanism and Annual Growth by Product type 1995-2020



Source: IQVIA MIDAS; IQVIA Institute, Dec 2020



Illustration and explanation of data and chart layouts



Drug and Healthcare Spending Analyses

Key elements to note for interpreting charts

Drug and Healthcare Spending 1995-2018

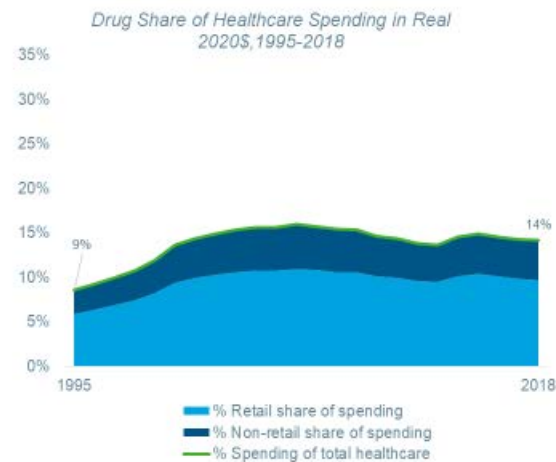
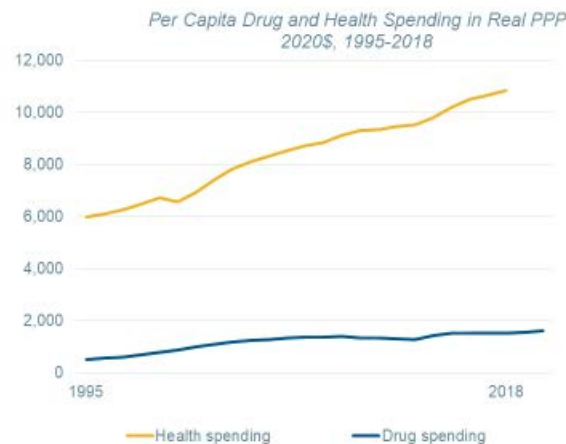


Chart Note: Methodology described in main report *Drug Expenditure Dynamics 1995-2020: Understanding Medicine Spending in Context*
Source: IQVIA Institute for Human Data Science, Sep 2021

Drug Expenditure Dynamics 1995-2020: Understanding Medicine Spending in Context U.S. Detail Appendix

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- Drug and healthcare spend have been adjusted for economic growth ('real' GDP growth has been removed), population growth, and for cost of living differences (Purchasing Power Parity – PPP).
- Drug spending as a percentage of healthcare spending uses estimates of total drug spending in all channels (retail and hospital) and after discounts and rebates.
- The hospital drug spend adds 1-11 percentage points, depending on the country, to the retail drug share of healthcare that is most often reported by governments (OECD).
- The right-most chart illustrates how much of overall drug spending is attributable to non-retail spending, which is significant and varies over time.

Drug spending is segmented by type of product, changing over time for some products to enable more complex analyses

Illustrating the Drug Type Segmentation Used in the Report

Drug Expenditure Segmented by Type of Drug

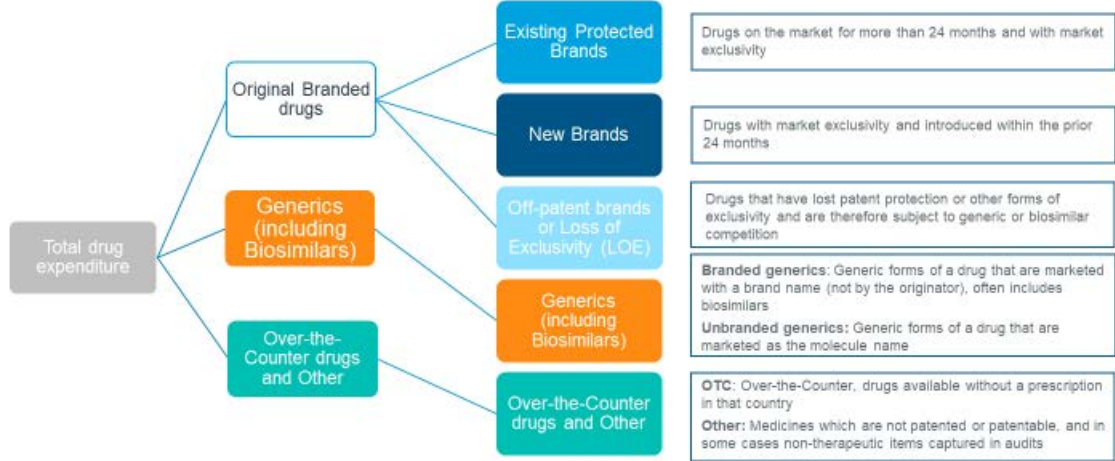


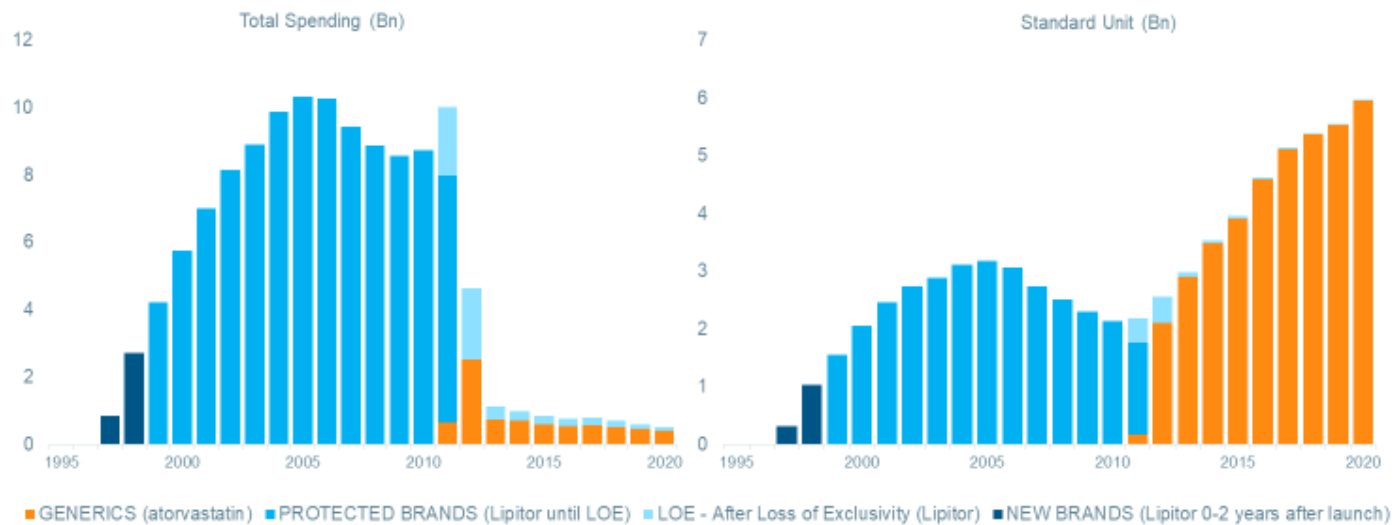
Chart notes: Protected brands include original protected brands, upcoming LOE and vaccines. New brands include original new brands; LOE include drugs that lost patent protection. Generics include non-original branded products as well as drugs that are marketed using the molecule name. OTC and other include non-prescription bound products and not patentable products. Due to the methods of combining multiple archived databases, products which are no longer marketed but had spending or volume in 2005 or earlier are included in the 'other' segment as specific segmentation was not possible.

- Analyses in this report that use product segmentations as shown here are based on IQVIA audited data. They do not reflect payer net spending due to the confidential nature of some of the discounts and rebates. Unless a page indicates a non-IQVIA source, the analysis would not be adjusted for off-invoice discounts and rebates.
- Products have been segmented both by the way they are marketed (brands, generics, biosimilars, Over-the-counter) as well as by the status of their patent or other types of protection.
- Existing Protected brands are those which are no longer 'new' and are not yet off-patent.
- New brands are defined as those products within their first 2 years in the market; however, some analytics in this report specifically identify older new brands from 3-5 years after launch.
- Loss of exclusivity is the status for branded products that are off-patent or no longer protected (but still had sales in the market) and these terms are used interchangeably in the report.
- Generics and biosimilars are treated in the same segment unless noted specifically on the chart.
- Over-the-counter status is a country-specific regulatory status and some drugs have both prescription-bound and OTC packs in the market.
- Other is a status where products either do not have typical brand or generic or protection statuses or where the product is no longer marketed and it was not possible to apply segmentation.

Illustration: product segmentation drug lifecycle dynamics

Example of Drug Type Segmentation using a single medicine

Exhibit x: Illustration of U.S. branded and generic segmentation, Lipitor and Atorvastatin generics

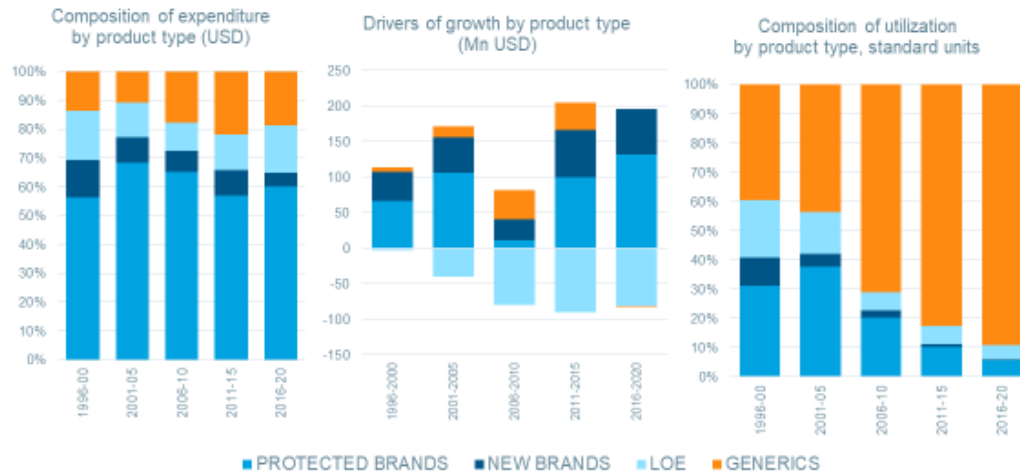


- In this example, the drug 'atorvastatin' begins life as a New Brand when Lipitor launched.
- The segmentation changes after 24 months to 'Protected Brand'. Analyses are based on quarterly time periods and a product may be considered new in 3 calendar years depending on the timing of launch in a country.
- At the point of patent expiry, the brand Lipitor becomes LOE, and new competing Generics enter the market.
- The left chart shows 'spending,' which is reflected in the currency noted on each chart. In the report the currencies are most often normalized to real 2020\$ with constant US\$ exchange rates, but in the country appendix local currencies are used.
- The right chart shows values in standard units. Standard units vary by form and are generally not recommended to report in this aggregated way. However most drugs in the therapy areas were similar enough to enable this analysis.

Illustration of data and charts in this report

Country level overview of product types

Drug Spending and Utilization 1995-2020



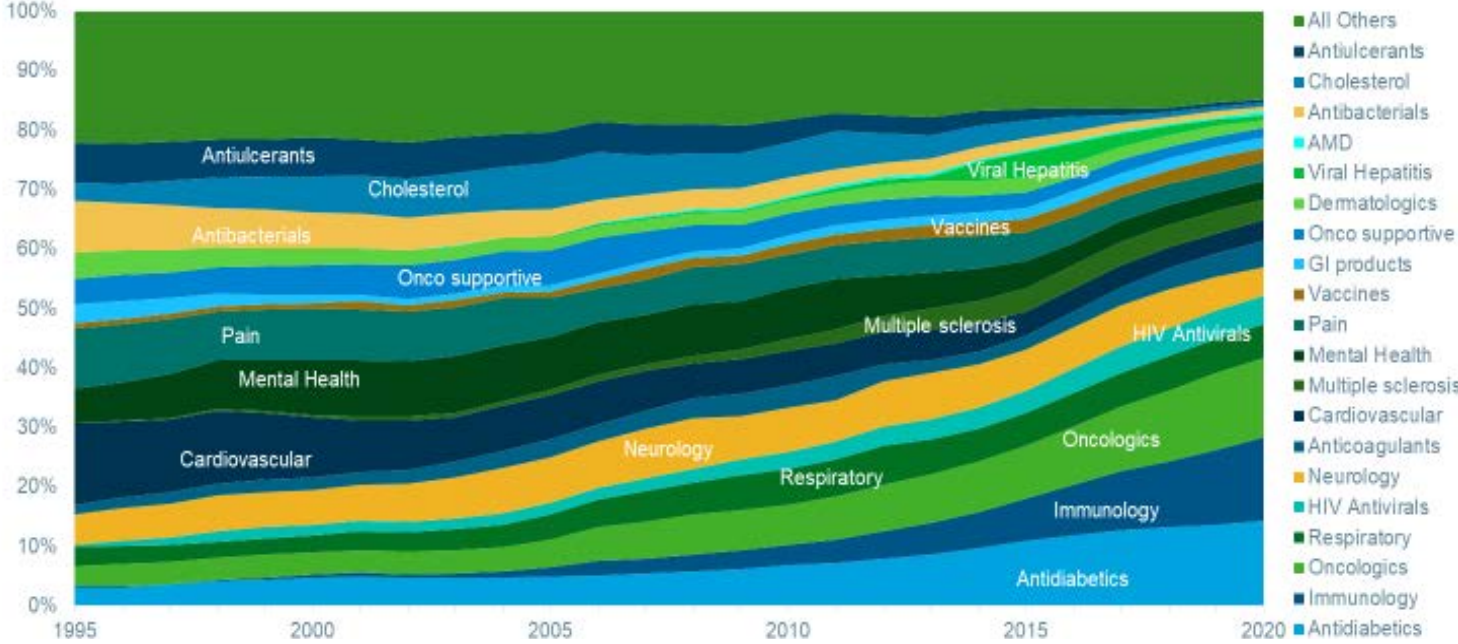
- Protected brands including new products average less than 70% of spending consistently
- Generic share of combined generic and LOE segments increasing steadily over time
- Generic share of volume increasing as generations of products shift to off-patent
- Most growth is driven by protected brands including new products, and offset by losses of exclusivity

- This analysis includes three views of drug spending, growth and volume in standard units, each present in the cross-country comparison section of the report and repeated in the beginning of each country section of the appendix.
- Spending is IQVIA audited sales and does not reflect off-invoice discounts and rebates.
- The drivers of growth chart is represented in absolute values of the currency noted.
- Products each have a segment status in each time period, and growth is a representation of the current group of products and their growth compared to prior periods. The product status in the prior period is not considered.
- Growth on an annual basis has been added together into 5-year groupings.
- Standard units are highly dissimilar by formulation and not recommended.

Illustration of data and charts in this report

Total drug spending over time on 100% scale by top 20 Therapy areas

US Composition of Drug Real Local Currency Spending by Drug Class, 1995-2020

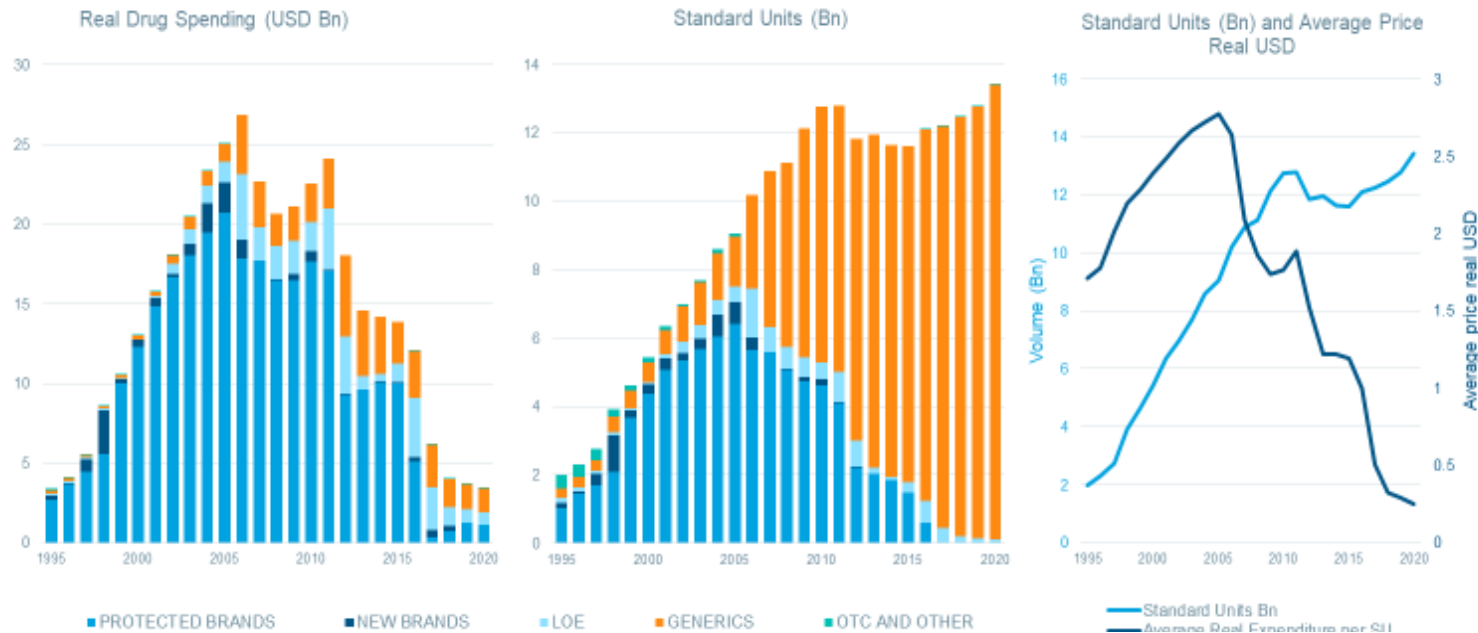


- Total IQVIA audited spending over 25 years has been collated and grouped by therapy areas.
- The therapy areas are defined by IQVIA with details of the definitions in the main report methodology section.
- The therapy areas called out by name are the classes that were ranked in the top 20 the most often across the eleven countries studied across the 25 years. This can mean that some classes which have declined in sales outside the top 20 in the most recent period are still shown.

Therapy area charts with sales, volume and cost by type of drug

Example of single therapy area with multiple metrics analyzed

US Cholesterol Volumes, Average Prices and Spending by Product Type, 1995-2020

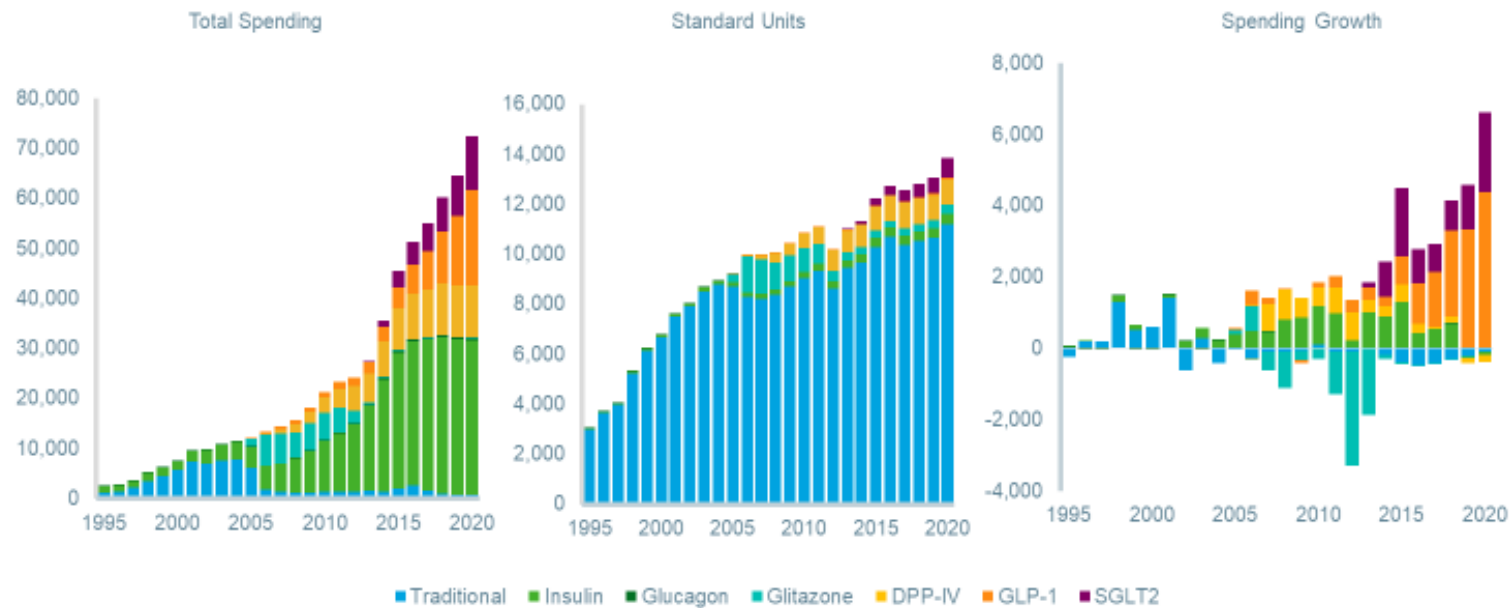


- Some analyses show three charts in this orientation, with spending, standard unit volume and finally a chart of volume and average cost per standard unit.
- Spending and cost are based on IQVIA audited data and do not reflect discounts and rebates.
- The segmentations shown in the charts are the same as described earlier.
- The average cost calculation is at the therapy area level.

Therapy areas showing subclasses by mechanism of action

Illustration of a therapy area using multiple analysis metrics

U.S. Diabetes Real Spending, Volume and Growth USD (Mn) by Drug Type, 1995-2020



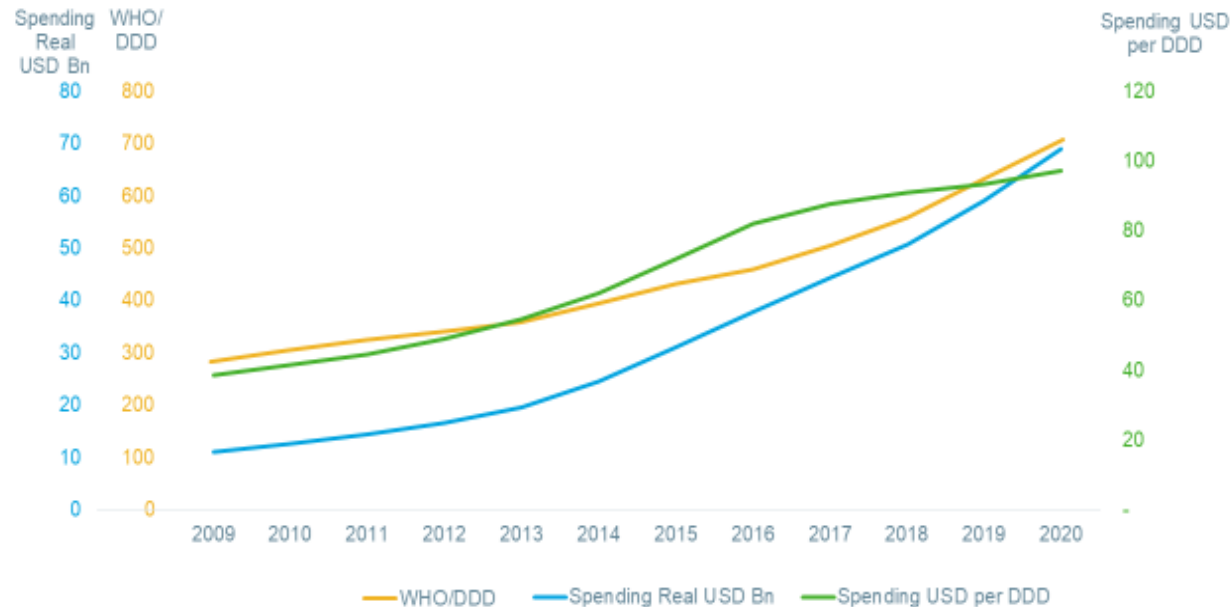
- Some therapy area charts include spending, standard units and spending growth.
- All are shown in the currency value noted.
- The colors of the chart indicate therapy sub segments, typically indicating shifts in the types of medicines used over time.

Autoimmune biologic charts

Illustration of three metrics on three axes on the same chart

Cost per day in immunology had been rising rapidly but has slowed since the first introduction of biosimilars in 2016

US Auto-immune Biologic Spending, DDD and Cost 2009-2020



Sources: IQVIA MIDAS, IQVIA Institute, December 2020

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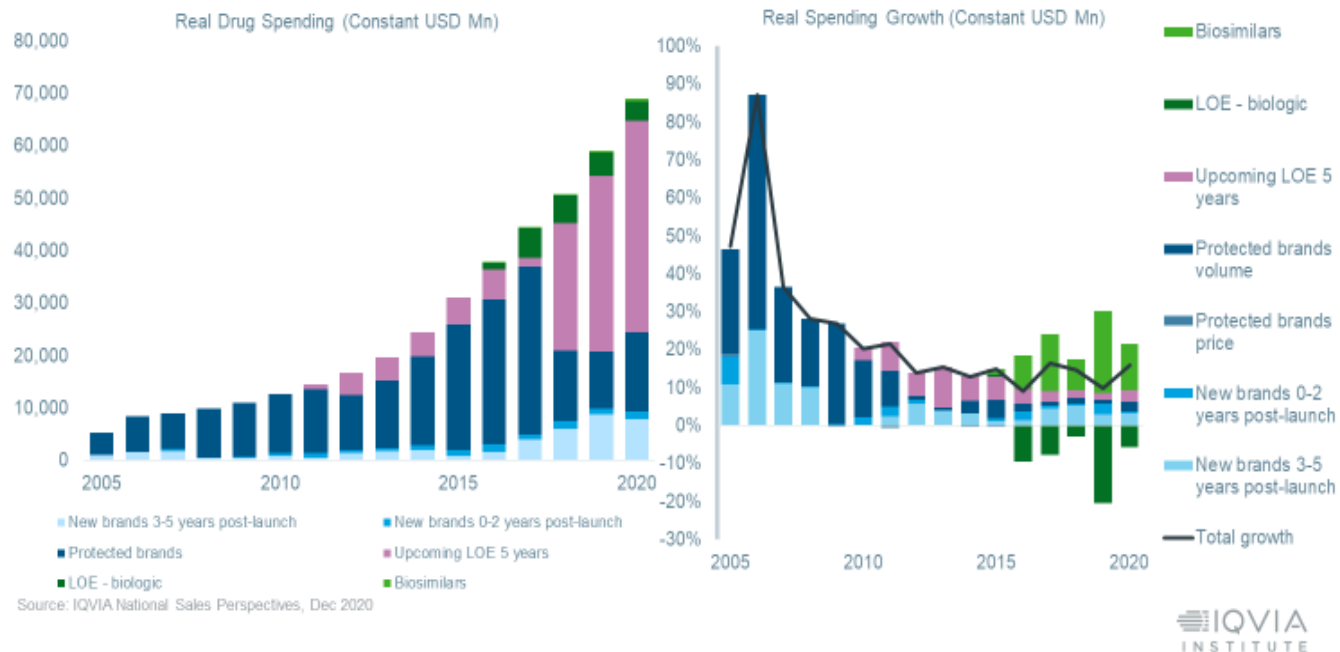
- This chart layout is used for the autoimmune biologic market.
- It has 3 axes which are color-matched to the lines
- Two axes are on the left (sales and volume in WHO Defined Daily Doses – WHODDD). The color of the lines matches the color used on the axis to show increments.
- WHODDD represent a standardized dose used for all patients and normalized for packaging and formulation differences which are common with some products in this therapy area.
- WHODDD is particularly helpful for comparisons when original and biosimilar products are packaged differently from each other.

Charts using a more granular product type view

Illustration of product type segmentation with forward-looking segment

More than half of autoimmune biologic spending is due to lose exclusivity in next 5 years

U.S. Auto-immune Biologic Invoice Spending and Growth Drivers, 2005-2020



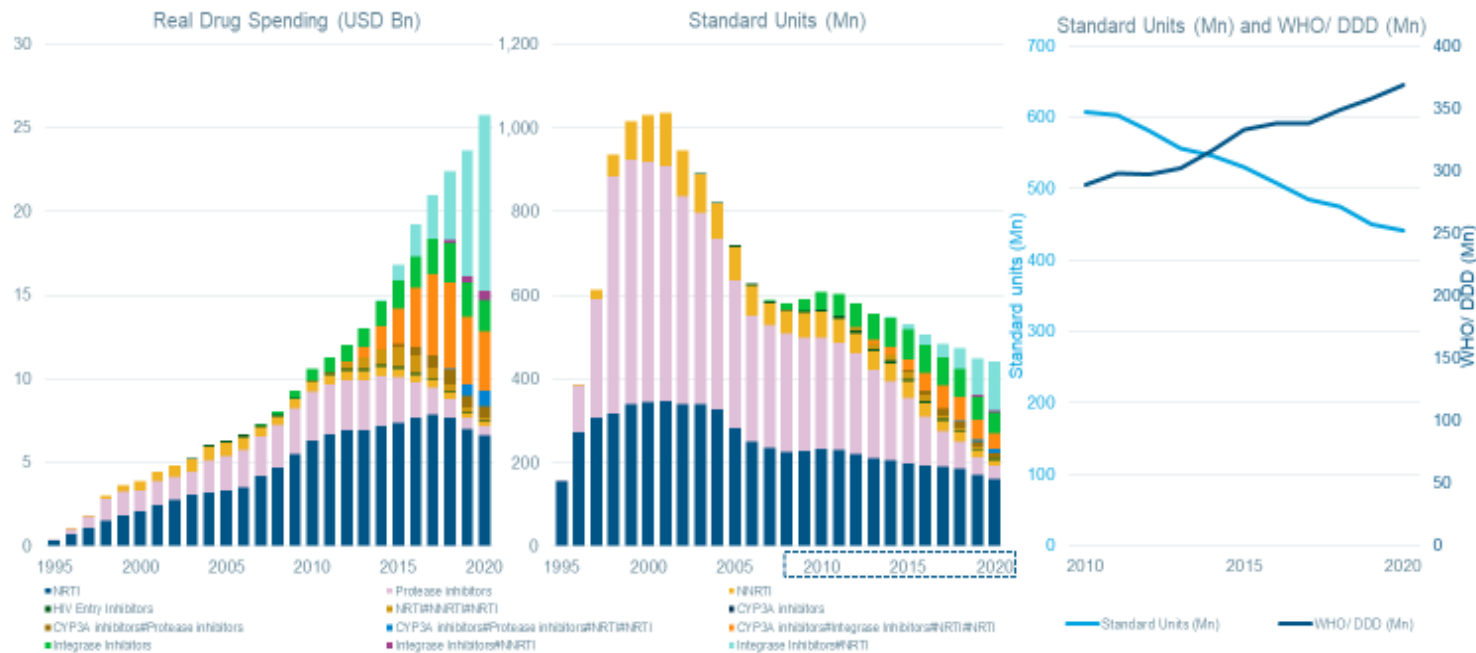
- Oncology and Autoimmune charts employ a more granular time-dependent segmentation of product type than other analyses in the report.
- Original biologics and small molecules when off-patent are identified separately as well as generics (small molecule) and biosimilars.
- The autoimmune charts are limited to biologic products and therefore exclude some small molecule products that could be relevant in some analyses such as JAK inhibitors.
- The upcoming LOE 5 years segment is composed of different products each year as their status changes, and refers to the expected entry of biosimilars in key products in future years.
- New products are shown with both 0-2 years and 3-5 year segments.
- Brands that are not 'new' and not LOE are shown as 'protected' and growth charts are split by price and volume.

HIV market charts

Illustration of products with varying mechanisms of action

New combination treatments with low dosing regimens led to reduction in volume, offset by an increase of days of therapy

US HIV Spending and Volume by Mechanism 1995-2020 and DDD, 2010-2020



Sources: IQVIA MIDAS, IQVIA Institute, December 2020
 Chart notes: NRTI - Nucleos(t)ide reverse transcriptase inhibitor; NNRTI - Non-nucleoside reverse transcriptase inhibitor; CYP3A inhibitors - cytochrome P450 3A CYP3A inhibitors; # is used to define the combinations of mechanisms used in respective categories



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- Products in this market have been grouped by mechanism of action.
- Fixed-dose combination products are grouped by the type of mechanism of each ingredient, with each mechanism separated by a '#' symbol.
- Volume is measured in standard units in the middle chart.
- In the right chart, volume is in both standard units and WHO DDD, and the shift in the trajectory of these two measures suggests a changing number of doses per day as combination products become more common.



Access the full report at www.iqvainstitute.org