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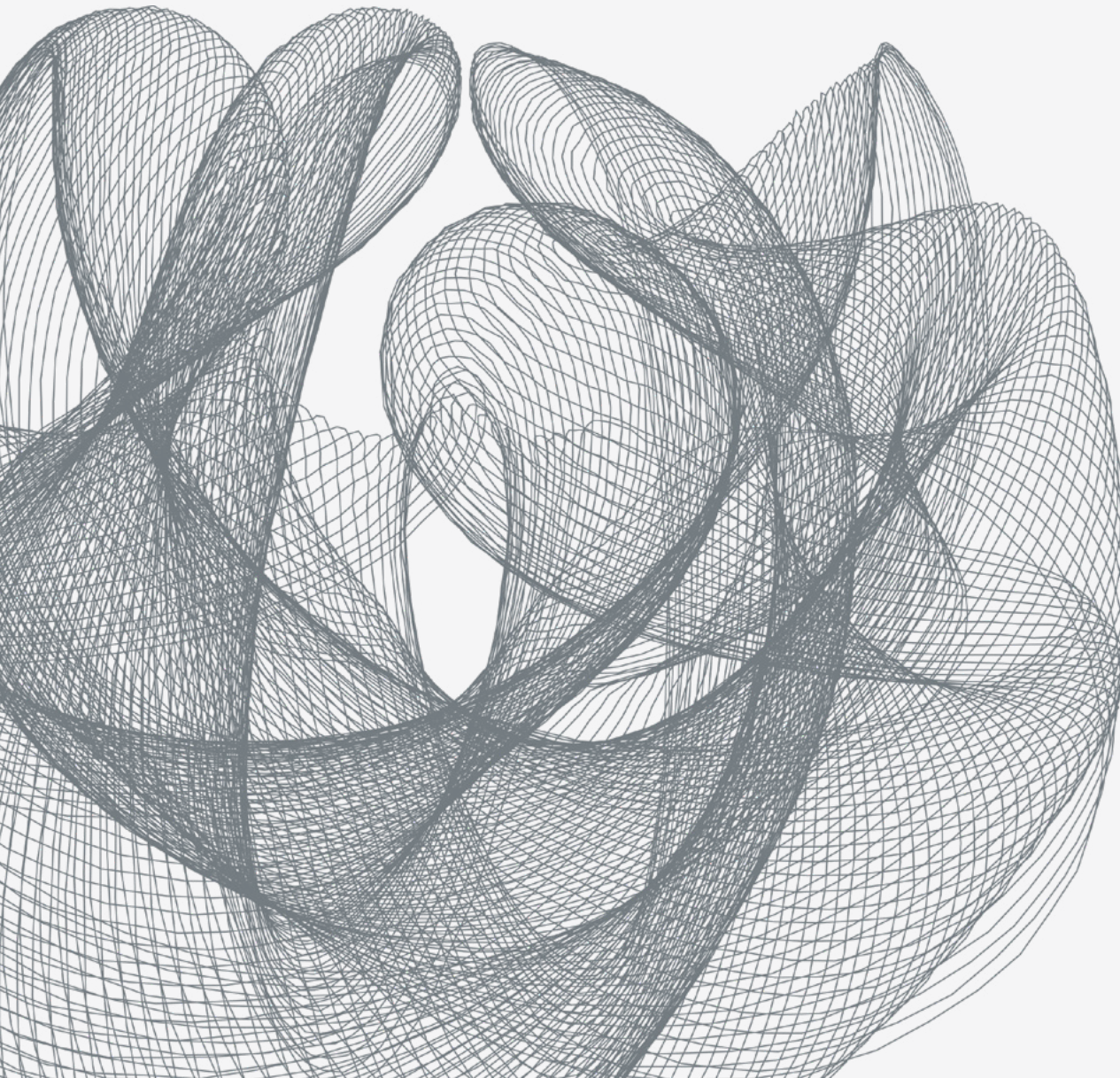
The Global Use of Medicines 2022

OUTLOOK TO 2026

Introduction

The outlook for global spending on medicines has become clearer as the uncertainties of the last two years in a global pandemic have gradually given way to more predictable challenges and opportunities for healthcare systems and policymakers across developed and emerging economies. Healthcare has shown itself to be remarkably resilient during COVID-19, but challenges remain — and evidence-based decision-making is more important than ever.

The largest driver of medicine spending through the next five years is expected to be global COVID-19 vaccinations, which are unprecedented both because of the number of people being inoculated and the speed with which it is expected to be achieved and then repeated with frequent booster shots.

But even leaving aside the pandemic, global spending on medicines continues to be driven by innovation and offset by losses of exclusivity and the lower costs of generics and biosimilars.

In this report, we quantify the impact of these dynamics and examine the spending and usage of medicines in 2021 and the outlook to 2026, globally and for specific therapy areas and countries. We intend this report to provide a foundation for meaningful discussion about the value, cost and role of medicines over the next five years in the context of overall healthcare spending.

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MURRAY AITKEN
Executive Director
IQVIA Institute for Human Data Science

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Overview

The COVID-19 pandemic has been the most impactful global public health crisis in decades, and yet it has illustrated the resilience of global health systems as they have readily adapted to peaks in demand. Managing the virus and mitigating disruptions are key elements of the outlook to 2026, especially in how that will affect non-COVID healthcare and use of medicines.

Trends in medicine use and spending have been impacted by the immediate effects of COVID-19, with a seven-year cumulative reduction in spending of $175 billion through 2026 compared to the pre-pandemic outlook. Spending on COVID-19 vaccines and novel therapeutics are expected to generate more than $300 billion in spending over the same period, and the outlook is a cumulative $133 billion higher than projected prior to the pandemic.

In developed countries, the adoption of new treatments, offset by patent lifecycles and competition from generics and biosimilars, are expected to continue as the main factors influencing medicine spending and growth. In pharmerging countries, dramatic increases in healthcare access were the largest drivers of change in the use of medicines historically, but the trend is slowing and will result in volume declines across many markets. Increasingly, and led by China, pharmerging countries are enabling access to newer medicines developed by multi-national companies, often earlier and with access to more of their populations than in the past. These trends are accompanied by efforts to contain spending, which are expected to slow China's growth to 2.5–5.5% CAGR through 2026 but will still generate the largest absolute growth of pharmerging countries.

The global medicine market — using invoice price levels — is expected to grow at 3–6% CAGR through 2026, reaching about $1.8 trillion in total market size in 2026, including spending on COVID-19 vaccines. The total cumulative spending on COVID-19 vaccines through 2026 is projected to be $251 billion, largely focused on the initial wave of vaccinations expected to be mostly completed in 2022 in developed countries and in 2023 in lower income geographies. Booster shots are now expected to be required annually or even more often as the durability of immunity and the continued emergence of viral variants raise the importance of not only vaccination, but recent vaccination. The adoption of initial vaccinations and of boosters is expected to be reduced through notable hesitancy by patients across geographies, even as lower income countries have struggled to acquire vaccines initially.

Growth in global medicine spending will be slowed by losses of exclusivity, resulting in brand losses of $188 billion, mostly offset by spending on newly launched products. The U.S. market, on a net price basis, is forecast to grow 0–3% CAGR over the next five years, down from 3.5% CAGR during the past five years. Japan, the third largest global market, will have flat to declining medicine spending and will shift to annual price cuts from the previous biennial policy. Spending in Europe is expected to increase by a total of $51 billion over the next five years, with a focus on greater adoption of generics and biosimilars to enable funding of new brands.

The total cumulative spending on COVID-19 vaccines through 2026 is projected to be $251 billion, largely focused on the initial wave of vaccinations expected to be mostly completed in 2022 in developed countries and in 2023 in lower income geographies.

New brand spending in developed markets through 2026 is projected to add $196 billion in spending, not including the impact of COVID-19 vaccines and novel therapeutics, driven by an historically high number of new drugs. There are expected to be 290-315 new active substances (NAS) launched by 2026, averaging 54–63 per year, similar to the level of the past five years. The impact of exclusivity losses will increase to $188 billion over the next five years mostly due to the availability of biosimilars, and the cumulative savings from biosimilars during that time will reach an estimated $215 billion. Five years from now, medicine spending will include nearly 60% from specialty medicines in developed markets and 45% from specialty medicines in global markets, with the remainder predominately older and traditional therapies that will become progressively lower cost over time.

The two leading global therapy areas — oncology and immunology — are forecast to grow 9–12% and 6–9% CAGR through 2026, lifted by significant increases in new treatments and medicine use and offset by losses of exclusivity, including biosimilars. Oncology is projected to add 100 new treatments over five years, contributing nearly $120 billion in new spending and bringing the total market to more than $300 billion in 2026.

Diabetes spending growth remains in low single-digits in most developed markets and is declining on a net basis in the U.S. due to the impact of highly competitive sub-categories and the emergence of biosimilars. Notably, off-invoice discounts and rebates are projected to reach 73% of invoice sales in the U.S. by 2026, far higher than other therapy areas or than is expected in other countries.

Immunology spending growth is projected to slow to 6–9% through 2026, from 17% during the past five years as biosimilar impact increases, even as volume growth continues at 12% annually. Immunology is expected to grow by 39% in aggregate over five years to 2026, adding $50 billion in spending to reach $178 billion globally. New products in psoriasis, atopic dermatitis, and severe asthma have driven spending growth in recent years and are expected to continue, while biosimilar impact will slow growth in the forecast years from 2023 to 2026.

The outlook for next-generation biotherapeutics includes both clinical and commercial uncertainty for the range of cell-, gene- and RNA-based therapies. In addition to the 30 such therapies launched globally to-date, an additional 55–65 are expected to be launched by 2026, with a dozen new per year on average, up from the average of three per year in the past five years. While there is considerable R&D activity related to these mechanisms of action, significant uncertainty remains about the pace of clinical trials and regulatory reviews as well as the reimbursement levels agreed to by payers.

New therapies in rare neurological disorders, Alzheimer's, and migraine are expected to drive spending growth in neurology. In the last five years, a new wave of rare disease neurological treatments, including dozens with orphan designations, have been approved, and others with larger populations, such as migraine, depression, and anxiety, have also seen a range of new treatments.

The historic lack of disease-modifying treatments in Alzheimer's and Parkinson's may begin to be addressed with new approvals, including adacanumab (Aduhelm), which launched in 2021. Recent scientific advances in genomics, biomarkers, diagnostics, and imaging techniques and/or regenerative medicine, combined with the emergence of disruptive digital technologies, are also changing the fundamentals of innovation in mental health disorders.

Impact of COVID-19 on the use of medicines

- Medicine use in pharmerging countries varied greatly since the start of the pandemic but has been more stable in developed countries.

- Medicine use was disrupted in some therapies in 2020 with varied timing and impact across countries but has been returning to more stable patterns since then.

- Billions of people are expected to be inoculated and receive booster shots for COVID-19, with significant variations across geographies anticipated to narrow over time.

- Global spending on COVID-19 vaccines is modeled to be $251Bn through 2026, though cost and volume estimates vary.

- Global spending, including COVID-19 vaccines and therapeutics, is expected to exceed the pre-pandemic outlook by $133Bn to 2026.

- The global market growth will return to pre-pandemic growth rates despite year-to-year fluctuations.

- Millions of people will have long-term complications of COVID-19 infection, though estimates vary considerably.

The COVID-19 pandemic has transitioned to a new phase with widespread use of vaccines and improved therapeutics, but the periodic emergence of viral variants and incomplete vaccine rollouts leaves significant uncertainty in the years ahead.
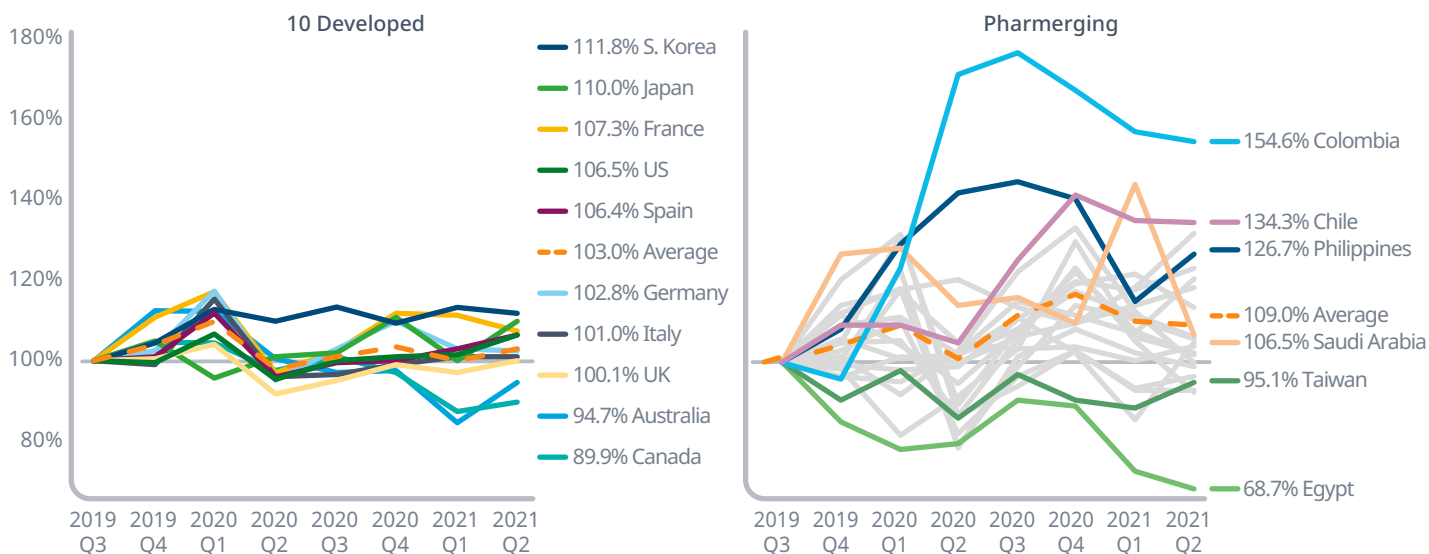
Medicine use in pharmerging countries varied greatly since the start of the pandemic but has been more stable in developed countries

Exhibit 1: Trends in Defined Daily Doses (DDD) in 10 developed and pharmerging markets indexed to Q3 2019 values
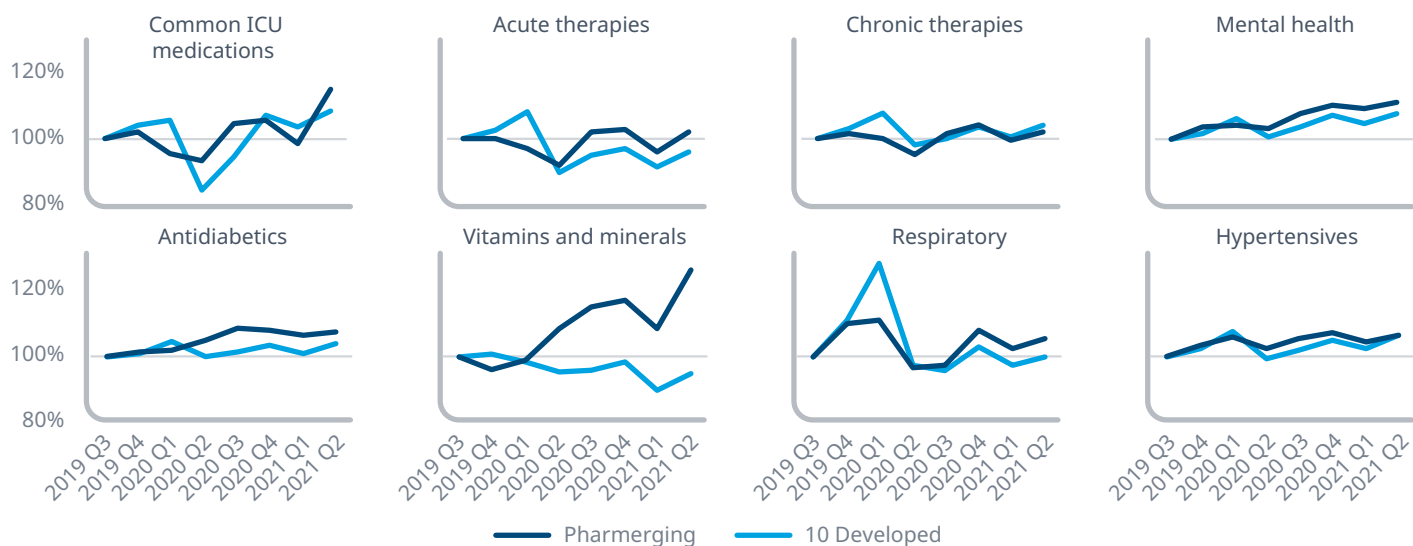

Source: IQVIA MIDAS, Sep 2021

- The impact of the pandemic on medicine use has been highly varied, including both surges in usage of chronic medicines, referred to as stockpiling, and then returning to a more normal trend, with the average for developed markets at baseline volumes by the end of 2020.

- Countries with the least impact from the pandemic, largely due to early and effective containment, including Australia and Canada, have then seen drops in volume in more recent periods.

- Pharmerging markets have had a much more varied pandemic experience, with significant variations in volume through Q3 2020 but generally returning to higher than pre-pandemic levels for the nine months since then.

- Exceptions have been countries such as Egypt, which has a largely out-of-pocket payment model and has seen overall volumes down over 30%.

- As the pandemic has continued, developed markets have demonstrated resilience to various logistical disruptions, offering financial assistance to the public, and shifting healthcare interactions to remote or virtual settings.

- Lower income countries in the pharmerging group of countries have recovered to an average of 109% of pre-pandemic volume, higher than the average 103% in the 10 developed countries.

Notes: Defined daily doses (DDD) are based on WHO definitions where each medicine is assigned a volume of medicine per day (see definitions & methodology). All charted values are indexed to Q3 2019 values, such that the Q3 2019 value is set equal to 100%. The 10 developed countries are the 10 largest high-income countries (U.S., Japan, Germany, France, Italy, Spain, UK, Canada, Australia, South Korea). Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts.

Medicine use was disrupted in some therapies in 2020, with varied timing and impact across countries

Exhibit 2: Trends in medicine use in 10 developed and pharmerging markets, Standard Units indexed to Q3 2019 values

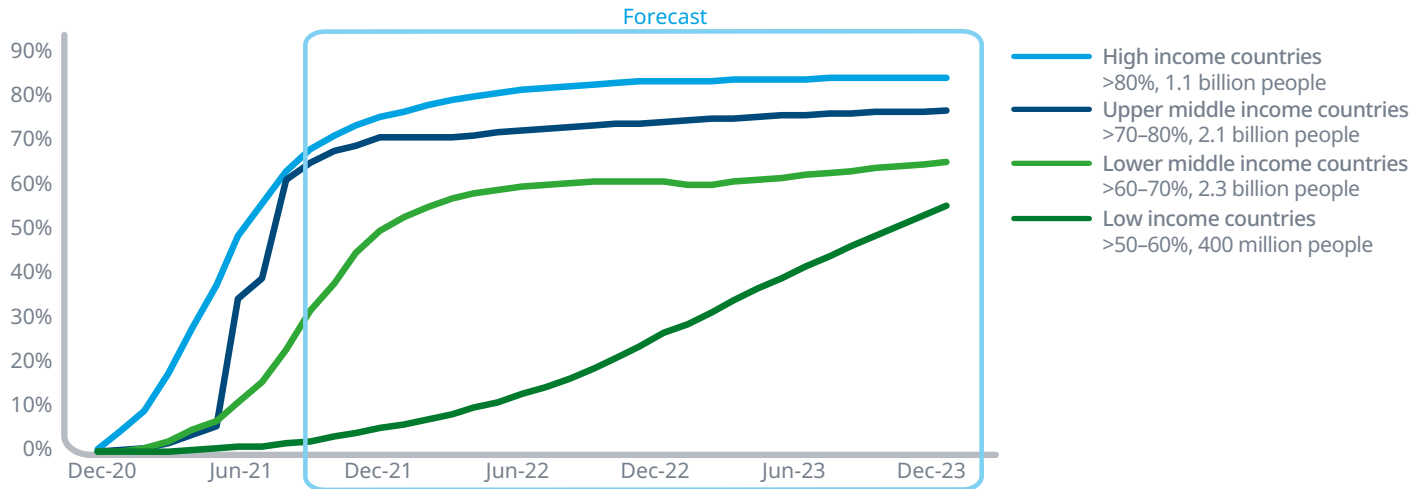Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021

- Early in the pandemic, with few treatments appearing to offer benefits for patients, there was an increased use of rescue inhalers, normally for asthma in patients in ICUs, driving a significant shift in usage in the respiratory market overall and then falling as hospitalization rates fell.

- Notably, hypertension treatments appear to be trending below expected volumes after the initial surge in developed markets, raising the potential that patients with untreated disease may have worse outcomes in the long term.

- Mental health therapies have seen a gradual rise in usage, though more modest than some had expected, potentially due to barriers to beginning new treatments for mental health disorders, including social stigma.

- Pharmerging markets have seen generally less disruption to these therapies, as many countries were later impacted by COVID-19 and experienced less of the early wave of uncertainty-driven behavior changes.

- Higher use of vitamins and minerals in pharmerging markets is, as a result of reports in the media in some of those countries, generally not supported with clinical evidence that certain treatments would either be beneficial or protective relative to COVID-19.

Notes: Indexed values are based on standard units. Common ICU medications are those indicated by the American Society of Health-System Pharmacists: Atracurium Besilate, Cisatracurium Besilate, Dexamethasone, Dexmedetomidine, Epinephrine, Etomidate, Fentanyl, Hydromorphone, Ketamine, Midazolam, Norepinephrine, Phenylephrine, Propofol, Rocuronium Bromide, Vasopressin, and Vecuronium Bromide. Chronic and acute definitions are based on therapy classes predominantly used for maintenance therapy or not. Vitamins and minerals includes OTC when captured.

Variability in the vaccination rate for COVID-19 is anticipated to narrow over time, with billions expected to be inoculated

Exhibit 3: Percentage of total population fully vaccinated for COVID-19 by month
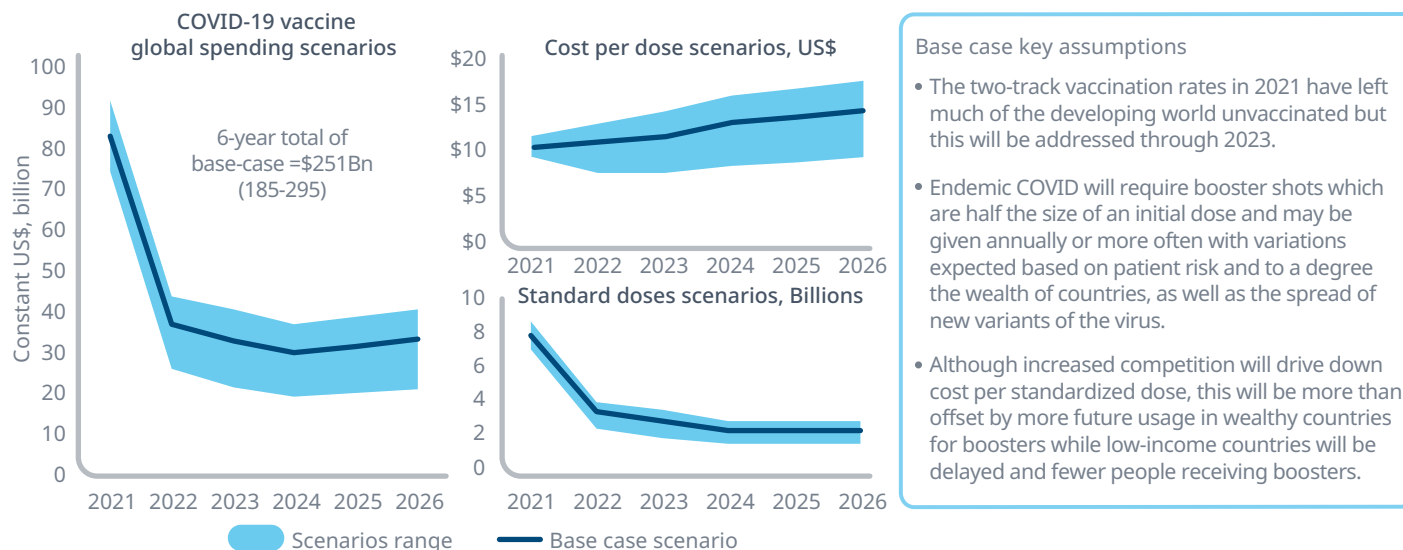

Source: IQVIA Institute, Nov 2021; Vaccination trends to date from Ourworldindata.org Accessed Nov 12, 2021

- Countries vary considerably in their rates of COVID-19 vaccination, with low-income countries averaging fewer than 10% vaccinated as of this analysis.

- The WHO has identified these disparities as reflecting a two-track pandemic and, if left unaddressed, will be a source of potential future viral variants, extending the pandemic further.

- Based on the average vaccination rates of the three highest countries in each income category, it is projected that most countries will achieve 70% vaccination rates at some point during 2022, though likely slower than current WHO goals.

- Low and lower-middle income countries are expected to continue to fall behind higher income countries until achieving higher rates near the end of 2023, when more than 6 billion people globally will have received a COVID-19 vaccine.

- These estimates are extremely volatile, with the most important variable being the actions and intentions of countries in rolling out vaccines.

- It remains possible and even likely that relaunched vaccine drives will result in significant acceleration in these rates across a wide range of low and lower-middle income countries, especially in light of periodic surges from newly emerging viral variants.

Notes: Estimates of vaccination rates based on reported vaccination data through November 12th, 2021. Countries within the four World Bank income bands have been projected to achieve a maximum vaccination rate by the end of 2023. The high income and upper-middle income countries average over 60% and will have a slowing rate of new vaccinations until they reach the projected peak. The lower-middle income and low income countries currently have much lower vaccination rates and widely diverging trends in the most recent months. The differences across countries are expected to narrow by the end of 2023 as global initiatives to encourage vaccination partly achieve their goals. The vaccinated population are relevant to the estimations of the population eligible for booster shots at a point in time used in overall volume projections.

Global spending on COVID-19 vaccines is modeled to be $251Bn through 2026, though cost and volume estimates vary

Exhibit 4: COVID-19 vaccination evolution as percentage of population

COVID-19 vaccine global spending scenarios

6-year total of base-case =$251Bn (185-295)

Constant US$, billion

Cost per dose scenarios, US$

Standard doses scenarios, Billions

Base case key assumptions

• The two-track vaccination rates in 2021 have left much of the developing world unvaccinated but this will be addressed through 2023.

• Endemic COVID will require booster shots which are half the size of an initial dose and may be given annually or more often with variations expected based on patient risk and to a degree the wealth of countries, as well as the spread of new variants of the virus.

• Although increased competition will drive down cost per standardized dose, this will be more than offset by more future usage in wealthy countries for boosters while low-income countries will be delayed and fewer people receiving boosters.
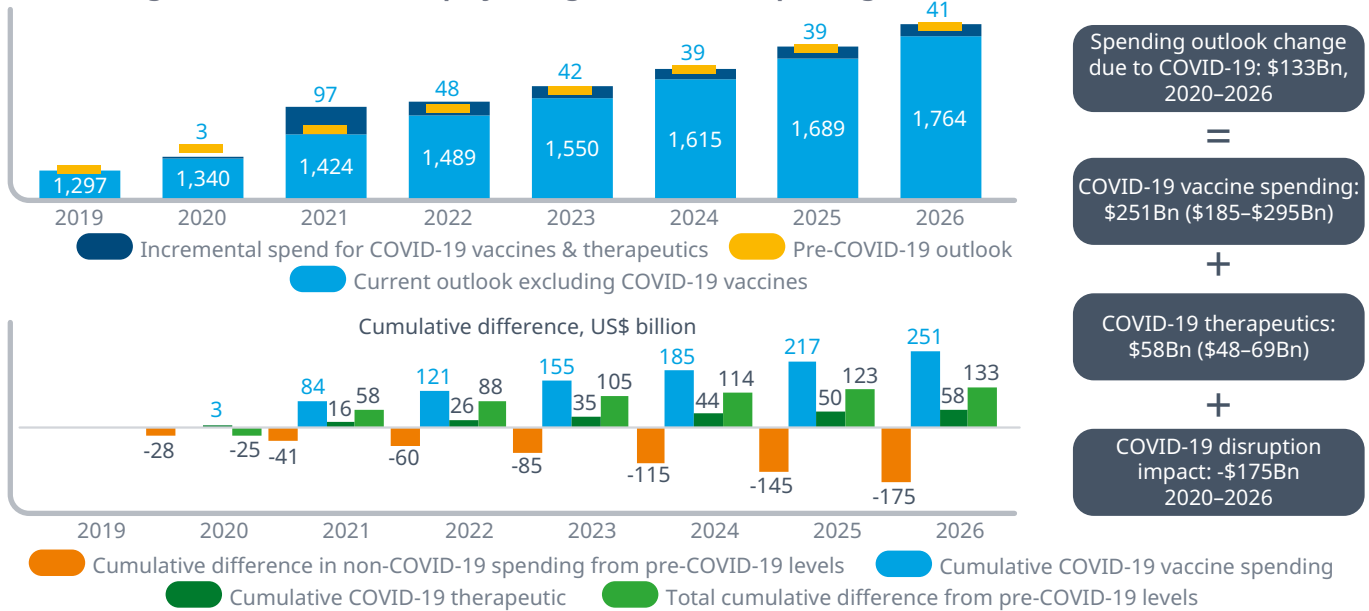
    Scenarios range   —— Base case scenario

Source: IQVIA Institute, Mar 2021; Pricing information from public disclosures as of Mar 25, 2021; Vaccination trends to date from Ourworldindata.org

• Global COVID-19 spending is expected to exceed $80 billion in in 2021 and $251 billion in total over six years to 2026, higher than earlier projections of $157 billion through 2025.

• Previous modeling phased the initial vaccination wave more slowly through 2022 and included booster shots every other year. The revised assumptions include expected faster achievement of initial vaccination rates in higher income countries, but slower in lower income countries and more frequent boosters for more of the forecast years.

• Cost per dose assumptions in the current model reflect a slight upward trend in cost per standardized dose in later years as boosters are the predominant usage and skew to higher income countries with higher prices.

• In this model, vaccinations to-date, global planned manufacturing capacity, and contracts have been considered to create a base case estimate for the number of people who will be vaccinated in an initial wave and then receive booster shots later.

• The number of doses consumed per patient is expected to change as the mix of usage shifts between the first wave of vaccinations, which are a mix of one-dose, two-dose administrations and pediatric formulations, which are 1/3rd the volume, and booster doses, which are half the volume of a standard dose.

• In future years, with such high percentages of initial vaccination, less research focus will be placed on new, more convenient one-shot vaccines, and more will be focused on periodic formulation updates to address new or resistant viral variants.

Notes: Scenario modeling was conducted by the IQVIA institute based on public information as of November 12th, 2021. Estimates of future vaccination trends include input from the public statements of responsible agencies and manufacturers, as well as modeling by the IQVIA Institute. Estimates of cost per patient are based on assumptions of the number and mix of doses of available vaccines, the published prices, and IQVIA Institute estimates of the prevailing prices that will exist across geographies through 2026. As costs are based on public statements, they may overstate the true costs after negotiated discounts. Doses are based on the standardized size of an initial dose, with booster shots assumed to be half-size.

Global spending, including COVID-19 vaccines and therapeutics, to exceed pre-pandemic outlook by $133Bn to 2026

Exhibit 5: Changes in the historical and projected global medicine spending model due to COVID-19, 2019–2026, US$Bn

Spending outlook change due to COVID-19: $133Bn, 2020–2026

=

COVID-19 vaccine spending: $251Bn ($185–$295Bn)

+

COVID-19 therapeutics: $58Bn ($48–69Bn)

+

COVID-19 disruption impact: -$175Bn 2020–2026

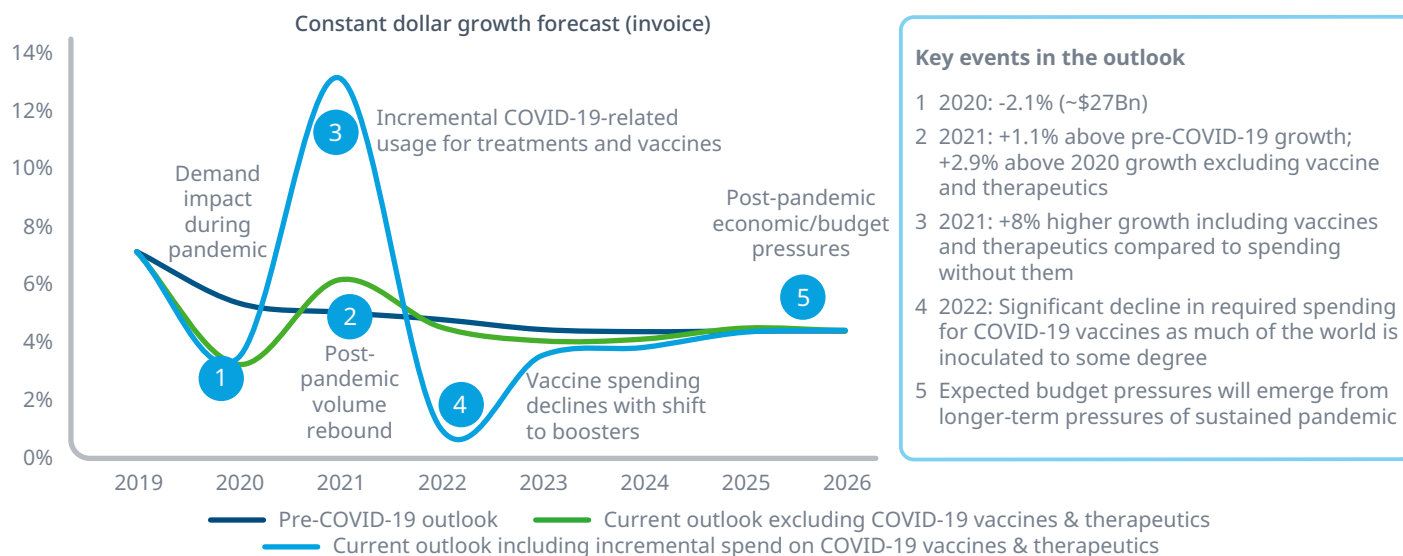Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- The outlook for global medicine spending has shifted considerably in the years 2020 to 2022, but afterwards is expected to be similar to the pre-COVID outlook, excluding the spending for COVID-19 vaccines.

- As a result of lower spending in the near-term, spending is expected to be $175 billion lower over seven years to 2026 than it would have been without the pandemic, excluding the incremental spending on vaccines and therapeutics for COVID-19.

- The most important drivers of lower spending will be those, often asymptomatic conditions which have had patient engagement disrupted and fail to make up the backlog of previously expected usage and spending.

- The phased rollout of vaccines and booster shots in the base case estimate will result in $250 billion in incremental spending globally, resulting in a net

impact on spending of $133 billion, or about 3% of the cumulative global spend during that period.

- A rapid first wave of vaccinations, reaching 70% of the world by the end of 2022, was possible with current manufacturing capacity, but is ultimately expected about a year later near the end of 2023.

- The slower progress in vaccinations and the resulting possibility of recurrent outbreaks with new viral variants are expected to drive sustained disruptions and result in lower than pre-pandemic spending on other non-COVID medicines through the forecast.

- The impact to non-COVID spending and vaccine and therapeutic spending are all greater than modeled in the prior forecast, which embedded a more optimistic and earlier end to the pandemic.

Notes: Estimates of pre-pandemic outlook are based on US$ at variable exchange rates under the same ex-rate assumptions as the current non-COVID outlook. Neither outlook were modeled including COVID-19 vaccines and the estimates of vaccine spending are entirely incremental spending. Vaccine costs reflect medicine costs only and do not include costs from provider administration or government contributions to manufacturing or distribution costs. COVID-19 therapeutics are novel therapeutics including antivirals and antibody treatments new to the market but excluding existing medicines 'repurposed' for COVID-19. No confidential or proprietary information is included in these estimates.

Global market growth will return to pre-pandemic projections by 2025 despite year-to-year fluctuations

Exhibit 6: Comparison of current outlook to pre-COVID outlook

Constant dollar growth forecast (invoice)

Demand impact during pandemic

Incremental COVID-19-related usage for treatments and vaccines

Post-pandemic economic/budget pressures

Post-pandemic volume rebound

Vaccine spending declines with shift to boosters

Key events in the outlook

1 2020: -2.1% (~$27Bn)
2 2021: +1.1% above pre-COVID-19 growth; +2.9% above 2020 growth excluding vaccine and therapeutics
3 2021: +8% higher growth including vaccines and therapeutics compared to spending without them
4 2022: Significant decline in required spending for COVID-19 vaccines as much of the world is inoculated to some degree
5 Expected budget pressures will emerge from longer-term pressures of sustained pandemic

Pre-COVID-19 outlook — Current outlook excluding COVID-19 vaccines & therapeutics — Current outlook including incremental spend on COVID-19 vaccines & therapeutics

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- While the short-term impact from COVID-19 in 2020 and 2021 has been significant, the long-term impact on growth trends is more muted.

- Including estimates of higher spending growth from COVID-19 vaccines and lower spending from existing treatments due to disruptions from the pandemic, the five-year CAGR to 2025 is expected to be 4.6%, compared to 4.5% if the pandemic had not taken place.

- Perhaps the largest uncertainty in the next five years will be the potential impact of economic factors on countries' budgeting and whether there will be shifts in policies regarding healthcare and medicine spending.

- It is expected that the pricing and value of medicines will be under increased scrutiny during this period, but this was an event that was already underway in most developed markets and an increasingly key issue in the U.S. market.

- While the pandemic has dominated much of the past year, the wider trends on the use of medicines continue to evolve relatively unchanged, which offers some hope to the millions living in lower income markets, with their improved health situation largely a result of increased access to medicines.

Notes: Pre-COVID outlook based on IQVIA Market Prognosis, Sept. 2019 edition. Current outlook based on IQVIA Market Prognosis Sept. 2021 edition. Incremental COVID vaccine and therapeutic scenario based on current outlook combined with incremental spending for vaccines and novel COVID-19 therapeutics.

There's more uncertainty about demand and use of medicines than has been the case historically

Exhibit 7: Summary of expected impacts of the COVID-19 pandemic on patients and therapeutics

Population level mental health
- Depression / anxiety, stress disorders
- Substance abuse / dependency

Disrupted or delayed diagnoses of conditions
- Interruption of typical healthcare seeking behaviors due to quarantines / shutdowns could have lasting effects or result in more severe disease when diagnosed, especially cancer

Greater rates of chronic disease
- Obesity, type-2 diabetes, heart disease rates increase due to sustained reductions in activity
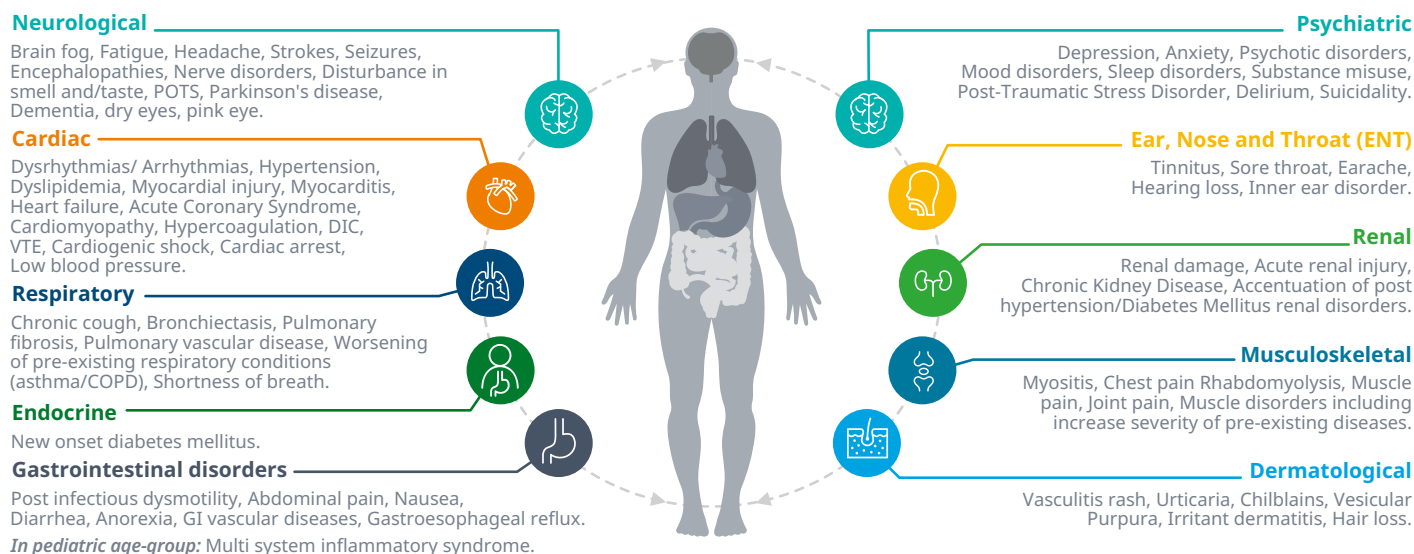
Impact on infectious diseases
- Seasonal flu season largely absent in 2020, could result in more virulent strains in future seasons, especially if vaccination rates drop
- Excessive hand sanitizer use could result in antimicrobial resistance or alcohol resistant microbes
- Increased interest in better treating/preventing other pathogens with pandemic potential such as: Influenza A (H7N9), RNA viruses (paramyxoviruses, pneumoviruses, and picornaviruses, pathogens that utilize Anopheles and Aedes mosquitoes
- Vaccine hesitancy spreads to others and results in outbreaks of previously controlled viruses such as measles, mumps, rubella

Source: IQVIA Institute for Human Data Science, Mar 2021

- The ongoing COVID-19 pandemic is reported to have increased levels of depression, anxiety and stress in the population at large as well as creating challenges for those with substance abuse disorders or drug dependency, which are often stigmatized.

- While quarantines and shutdowns have become less common across many geographies, many patients have remained less engaged with healthcare, likely resulting in continuing numbers of disrupted or delayed diagnoses and treatments — especially for those with asymptomatic conditions.

- For many asymptomatic and lifestyle-influenced conditions such as obesity, diabetes, and heart disease, the ongoing disruptions to what was normal life before the pandemic are expected to result in greater rates of these chronic diseases, especially as people are more sedentary for sustained periods of time.

- The pandemic is also impacting other infectious diseases by limiting patients' exposure due to pandemic precautions, which has resulted in far below normal seasonal flu and other respiratory viruses in 2020 and 2021.

- Those viruses may come back more strongly in future years as fewer people have recent immunity, and this will put significant pressure to ensure appropriate vaccination levels.

- Innovation for COVID-19 vaccines, particularly mRNA, is encouraging research into other pathogens, while at the same time, vaccine hesitancy for COVID-19 may result in an expansion of these attitudes to other vaccines, generating risk in previously well-controlled infections such as measles, mumps, and rubella, among others.

Research has been able to identify sustained complications of COVID-19 infection across almost all organ systems

Exhibit 8: Longer-term complications of COVID-19 infection on patients

Neurological
Brain fog, Fatigue, Headache, Strokes, Seizures, Encephalopathies, Nerve disorders, Disturbance in smell and/taste, POTS, Parkinson's disease, Dementia, dry eyes, pink eye.

Cardiac
Dysrhythmias/ Arrhythmias, Hypertension, Dyslipidemia, Myocardial injury, Myocarditis, Heart failure, Acute Coronary Syndrome, Cardiomyopathy, Hypercoagulation, DIC, VTE, Cardiogenic shock, Cardiac arrest, Low blood pressure.

Respiratory
Chronic cough, Bronchiectasis, Pulmonary fibrosis, Pulmonary vascular disease, Worsening of pre-existing respiratory conditions (asthma/COPD), Shortness of breath.

Endocrine
New onset diabetes mellitus.

Gastrointestinal disorders
Post infectious dysmotility, Abdominal pain, Nausea, Diarrhea, Anorexia, GI vascular diseases, Gastroesophageal reflux.
In pediatric age-group: Multi system inflammatory syndrome.

Psychiatric
Depression, Anxiety, Psychotic disorders, Mood disorders, Sleep disorders, Substance misuse, Post-Traumatic Stress Disorder, Delirium, Suicidality.

Ear, Nose and Throat (ENT)
Tinnitus, Sore throat, Earache, Hearing loss, Inner ear disorder.

Renal
Renal damage, Acute renal injury, Chronic Kidney Disease, Accentuation of post hypertension/Diabetes Mellitus renal disorders.

Musculoskeletal
Myositis, Chest pain Rhabdomyolysis, Muscle pain, Joint pain, Muscle disorders including increase severity of pre-existing diseases.

Dermatological
Vasculitis rash, Urticaria, Chilblains, Vesicular Purpura, Irritant dermatitis, Hair loss.

Source: IQVIA Institute: Assessing the Global Burden of Post-COVID-19 Conditions, Dec 2021

- COVID-19 infection results not only in debilitating symptoms and sometimes death, but for an important percentage of patients, long-term complications.

- Post-COVID-19 conditions are now understood as a multi-organ disorder or syndrome that consists of a constellation of different conditions, which are acute or chronic or both, and vary in terms of severity.

- Estimates of how many people may be affected have varied considerably as multiple organizations have developed widely varying criteria for assessing the presence of post-acute sequelae of COVID-19 (PASC).

- This results in estimates from 10-30% of COVID-19 patients having PASC, but also makes varying estimates not comparable to each other.

- In addition to the variety of organ systems potentially affected, in children the appearance of multi-system inflammatory syndrome (MIS-C) is one of the more challenging complications to manage as many pediatric COVID-19 cases have been mild and the emergence of MIS-C can occur in patients who were never identified as COVID positive.

- For mild or asymptomatic COVID-19 cases, a complication could be thought to be the result of some other pre-existing condition, unless a COVID antibody test were used to verify a previously unknown infection.

- Research is ongoing to improve understanding of the prevalence of PASC, as well as to develop specific therapies to address these symptoms where existing medicines are ineffective or have suboptimal outcomes, and while the pandemic continues, the ultimate size of this population remains uncertain but growing.

Millions of people will have long-term complications of COVID-19 infection, with the U.S. and India having the two largest totals

Exhibit 9: Post-COVID conditions worldwide

Rest of the world: 38.9 Mn
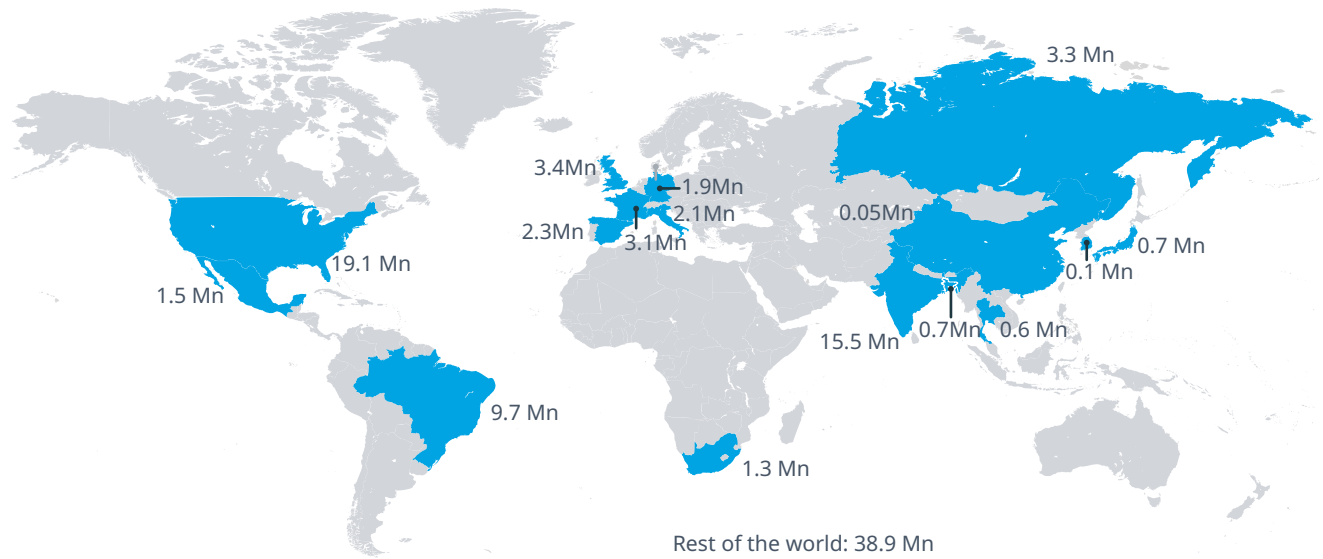
Source: IQVIA Institute: Assessing the Global Burden of Post-COVID-19 Conditions, Dec 2021

- While experts differ on the exact definition of PASC, it remains important to estimate the potential numbers of people affected.

- To estimate the impact on this group of patients, a model collating pre-COVID incidence for the conditions (those most-commonly reported in the literature in relation to PASC) were compared to literature and medical claims data in the most recent 3-6 months.

- The incremental incidence rates for these conditions were then applied to the reported COVID-19 survivors by geography, resulting in widely varying results in terms of PASC patients per survivor.

- The U.S. and India lead the world in terms of overall numbers of PASC patients, with 19.1 million and 15.5 million respectively, and while both countries have had significant numbers of COVID-19 survivors, the estimates are subject to underestimation if cases were unreported.

Historic drivers and outlook for the use of medicines

- Overall volume is projected to grow 1.5% in days of therapy through 2026, driven by pharmerging growth of 2.0% CAGR, while low-income countries are expected to grow at just 0.6% CAGR.

- Per capita use of medicines varies by income, with use in developed countries nearly double the global medicine use and use in lower income countries continuing to decline.

- Many therapy areas have seen high growth in medicine usage in pharmerging and lower income countries over the past decade, while growth varied in developed countries.

- Pharmerging and lower income countries' spending and usage of medicines is focused more on older traditional therapies, while developed countries spending is growing in newer specialty therapies despite continued high use in older therapies.

- Over two-thirds of essential medicines are available in low-income countries, with 95% of essential medicine volumes being drugs launched in the last century, and newer essential drugs accounting for only 3% of spending.

Medicine use grew by 42% over the past decade, driven by increased access to medicines in pharmerging countries, but is projected to slow through 2026. Meanwhile the lowest income countries continue to see declines in access to medicines, potentially putting health improvements at risk.

The use of medicines particularly in pharmerging markets grew in 2020 despite the pandemic but will normalize beginning in 2021

Exhibit 10: Historical and projected use of medicine by segment, 2011–2026, Defined Daily Doses (DDD) in Billions
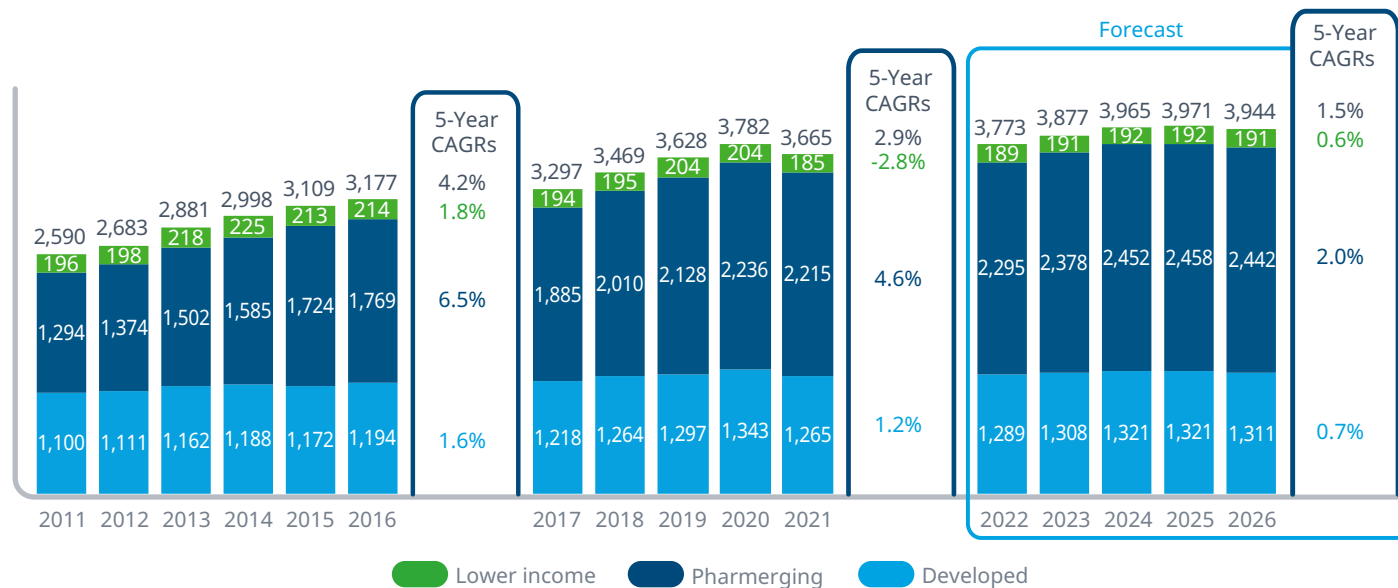
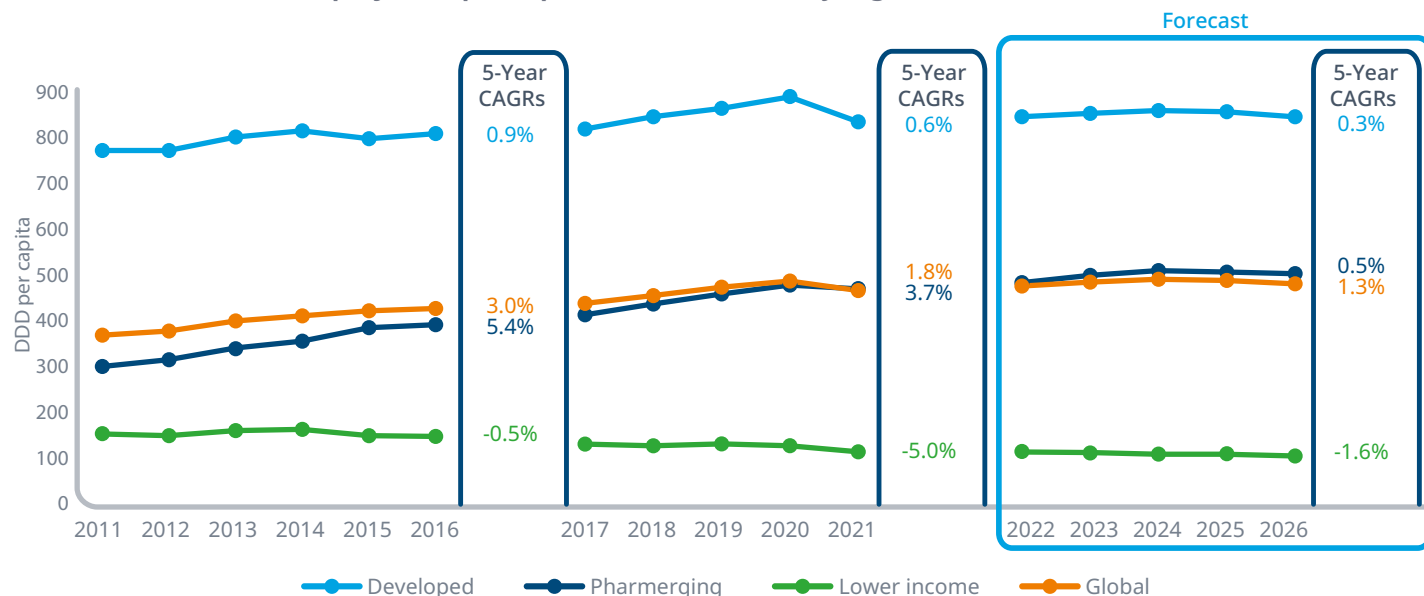Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- The global use of medicines — based on modeling medicine volumes shipped according to defined daily dose assumptions — has been growing for the past decade, driven by pharmerging markets. However, this growth is expected to slow across all markets over the next five years.

- Despite the pandemic, the use of medicines grew in pharmerging and developed markets in 2020, however usage is projected to fall 3% globally in 2021, returning to pre-pandemic levels, as some of the usage was related to temporary shifts in demand referred to as 'stockpiling'.

- Lower-income countries have dramatically lower access to medicine. Access has been declining for the past five years and is expected to remain steady over the next five years, potentially counteracting other policy initiatives to improve health in those countries.

- It is important to interpret these trends with caution, as chronic diseases drive many days of therapy in developed and pharmerging markets, and treatments for them are often much less common in lower income countries.

Notes: Chart represents IQVIA Institute estimates of global defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Developed includes all countries classified by The World Bank as High Income or Upper Middle Income based on gross national income, excluding those in pharmerging. Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts. Lower income includes countries classified as Lower Middle Income or Low Income by the The World Bank based on gross national income, excluding those in pharmerging. Most lower income countries are unaudited, however, and medicine use estimates are based on aggregate amounts of spending with no granular analysis possible.

Per capita medicine use in developed countries is nearly double pharmerging use and seven times that of lower income countries

Exhibit 11: Historical and projected per capita use of medicine by segment, 2011–2026


Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021; The World Bank, Sep 2021

- When medicine use is adjusted for population, global medicine use is projected to remain flat over the next five years, indicating growth in medicine use will follow population growth.

- After peaking in 2020, medicine use per capita declined in 2021 across all regions due to the increased use of a variety of medicines during the pandemic.

- Developed countries per capita medicine usage is nearly double that of pharmerging countries and seven times that of lower income countries.

- Medicine use in lower income countries has declined significantly per person in the past five years and is projected to continue to decline through 2026, but at a lower rate, limiting access to medicines for those living in these countries.

Notes: Chart represents IQVIA Institute estimates of global defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Developed includes all countries classified by The World Bank as High Income or Upper Middle Income based on gross national income. Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts. Lower income includes countries classified as Lower Middle Income or Low Income by the The World Bank based on gross national income.

Per capita use of medicines varies by GDP with use in developed countries typically higher than in pharmerging countries

Exhibit 12: Defined Daily Doses (DDD) Per Capita compared to Per Capita Gross Domestic Product PPP$
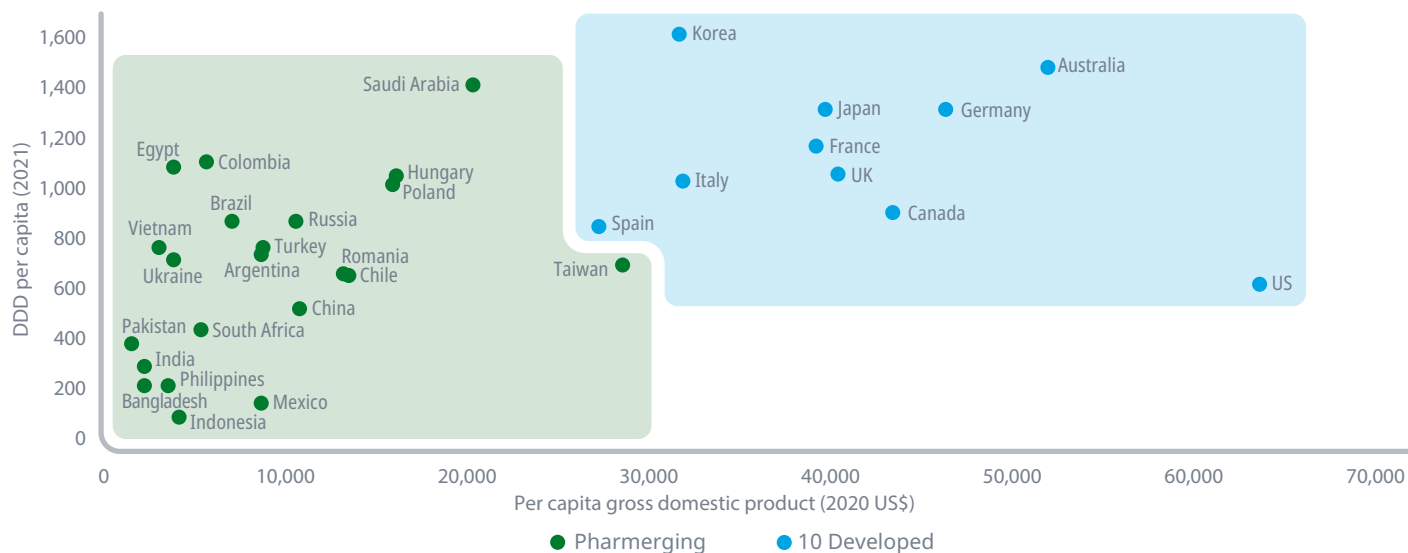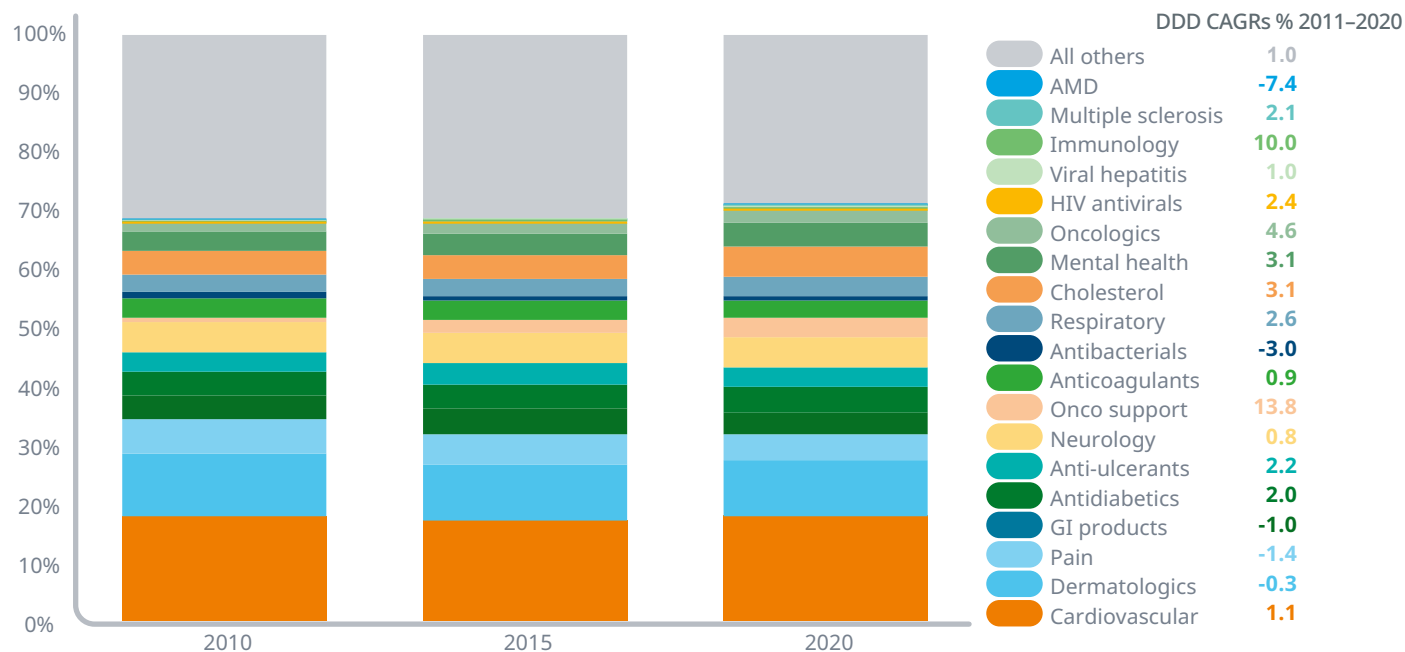

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021; The World Bank, Sep 2021; International Monetary Fund, Oct 2021

- The use of medicines varies considerably within both developed and pharmerging countries but includes some correlation to gross domestic product per capita, with higher medicine use in developed countries.

- The correlation with the economy is weaker in developed markets because of the predominance of socialized medicine systems, whereas in pharmerging countries it is more common for patients to carry a larger share of the cost burden.

- As countries vary in the cost burden patients directly bear, there is some correlation in the way patients use medicine.

- The U.S. has the lowest per capita DDD volumes of developed markets, which may be the result of high patient out-of-pocket cost exposure.

- Other factors include the disease burden patients face and the aspects of the health system they can readily access to begin using medicines for a specific disease.

- National environmental factors may also impact medicine use, for example higher-than-average use of vitamin supplements in Egypt and high use of respiratory products in Korea.

Notes: Chart represents IQVIA Institute estimates of AUDITED COUNTRIES ONLY defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts. The 10 developed countries includes developed countries with largest pharmaceutical spending.

The distribution of medicine usage across therapy areas in developed countries has remained stable over the past decade

**Exhibit 13: Defined Daily Doses (DDD) Per Capita compared to Per Capita Gross Domestic Product PPP$**

	DDD CAGRs % 2011–2020
All others	1.0
AMD	-7.4
Multiple sclerosis	2.1
Immunology	10.0
Viral hepatitis	1.0
HIV antivirals	2.4
Oncologics	4.6
Mental health	3.1
Cholesterol	3.1
Respiratory	2.6
Antibacterials	-3.0
Anticoagulants	0.9
Onco support	13.8
Neurology	0.8
Anti-ulcerants	2.2
Antidiabetics	2.0
GI products	-1.0
Pain	-1.4
Dermatologics	-0.3
Cardiovascular	1.1

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021

- In developed markets, the use of medicines has remained consistent over the past decade, with the majority of medicine use continuing to be in older, traditional therapies such as those for cardiovascular disease, dermatological conditions, and pain.

- Almost all of the major therapy areas have seen growth in medicine use in the last decade in developed markets, with exceptions of slight declines in dermatologics, pain, and GI products, and a more substantial decline in age-related macular degeneration products, which accounts for only a small share of medicine usage.

- Newer specialty therapies in oncology are driving growth of 13.8% CAGR in onco-supportive drugs and 4.6% CAGR in oncology in recent years.

Notes: Chart represents IQVIA Institute estimates of developed markets defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Analysis based on ten developed countries with largest pharmaceutical spending.

Use of medicines and spending in developed markets varied across therapy areas

Exhibit 14: 10 Developed markets Defined Daily Doses (DDD) growth compared to spending growth for select therapy areas, 2011-2020
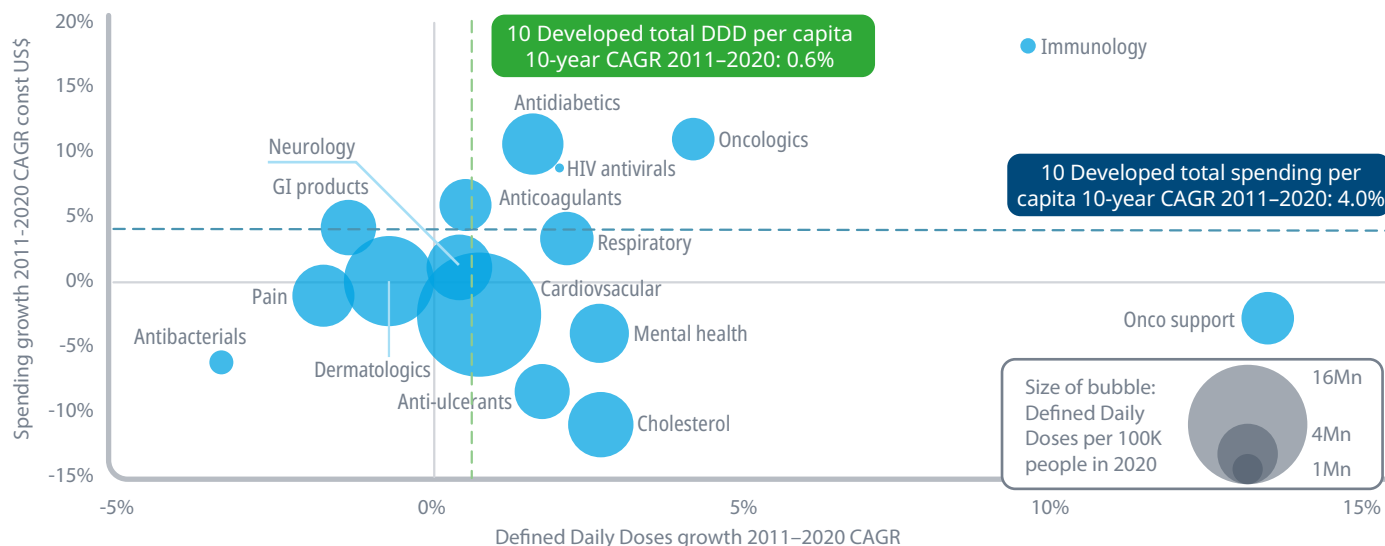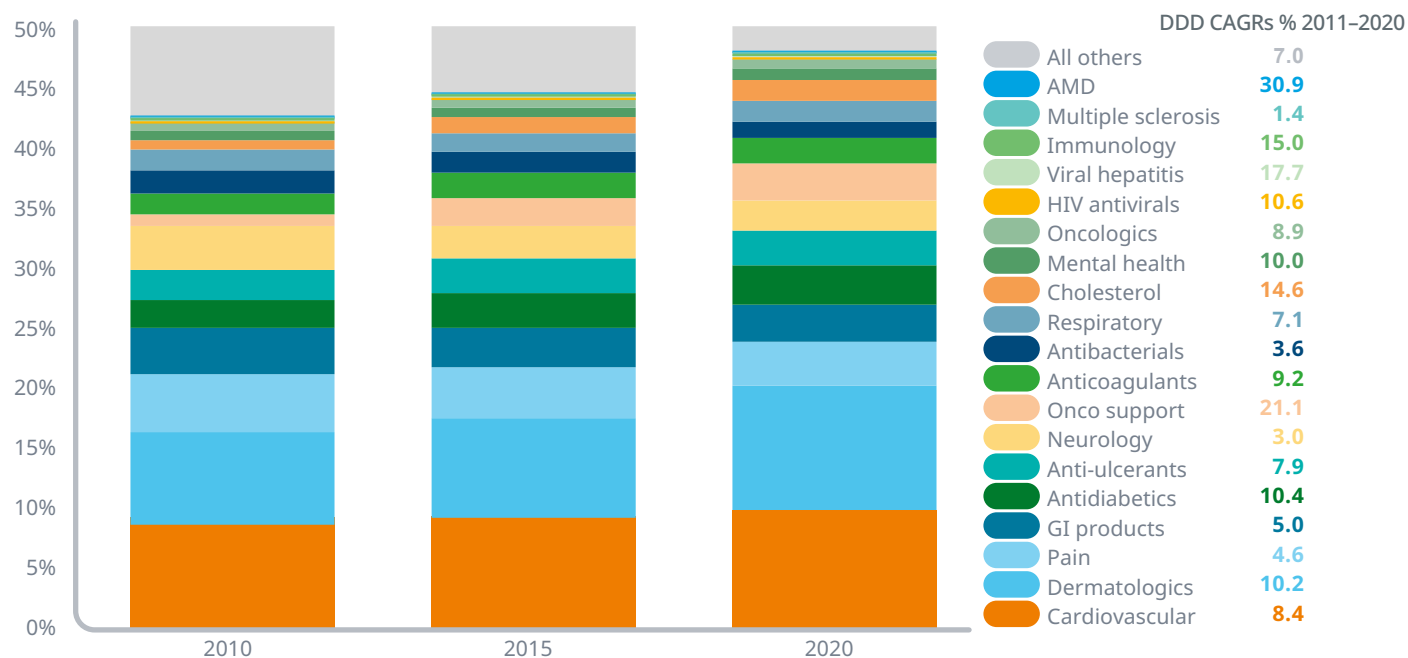

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021; The World Bank, Sep 2021

- When adjusted for population, growth in medicine use and spending over the last decade varies across therapy areas in developed markets, with some seeing growth in both use and spending and many others with use still growing, but slowing, spending growth as costs decline after patent expiries.

- While older therapies in cardiovascular disease and cholesterol are driving medicine use in developed countries, newer therapies in immunology and oncology are driving spending despite limited use on a per capita basis.

- Per person spending on cholesterol medicines and anti-ulcerants has declined significantly, -11.0% CAGR and -8.4% CAGR respectively, despite increased use in developed markets of 2.7% CAGR and 1.7% CAGR due to the availability of generics.

Notes: Chart represents IQVIA Institute estimates of developed markets defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Analysis based on ten developed countries with largest pharmaceutical spending.

Many therapy areas have seen high growth in medicine usage in pharmerging countries over the past decade

Exhibit 15: Share of Defined Daily Doses (DDD) by therapy area in pharmerging countries, 2010, 2015, and 2020

	DDD CAGRs % 2011–2020
All others	7.0
AMD	**30.9**
Multiple sclerosis	1.4
Immunology	**15.0**
Viral hepatitis	17.7
HIV antivirals	**10.6**
Oncologics	8.9
Mental health	**10.0**
Cholesterol	14.6
Respiratory	7.1
Antibacterials	**3.6**
Anticoagulants	9.2
Onco support	21.1
Neurology	**3.0**
Anti-ulcerants	7.9
Antidiabetics	**10.4**
GI products	5.0
Pain	4.6
Dermatologics	10.2
Cardiovascular	**8.4**

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021

- Medicine use in pharmerging markets has grown in all major therapy areas over the past decade, with major therapy areas accounting for 48% of all medicine use in 2020 compared to 42% in 2010.

- Older therapies in cardiovascular disease and dermatologics account for 20% of current medicine use, with share of usage in dermatologics growing 34% over the last 10 years.

- Neurology drugs have seen lower growth in usage than other therapy areas, and the share of medicine use for neurology has declined 32% since 2010.

Notes: Chart represents IQVIA Institute estimates of pharmerging countries defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts.

Use of medicines and spending in pharmerging markets increased in all major therapy areas over the last decade

Exhibit 16: Pharmerging markets Defined Daily Doses (DDD) growth compared to spending growth for select therapy areas, 2011-2020
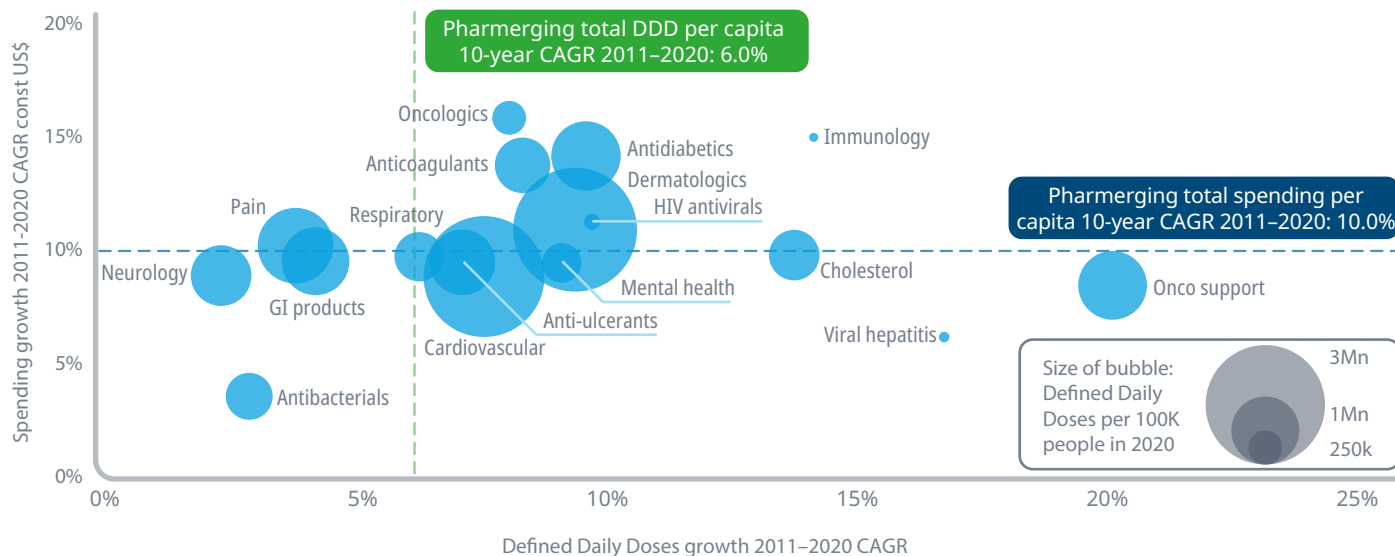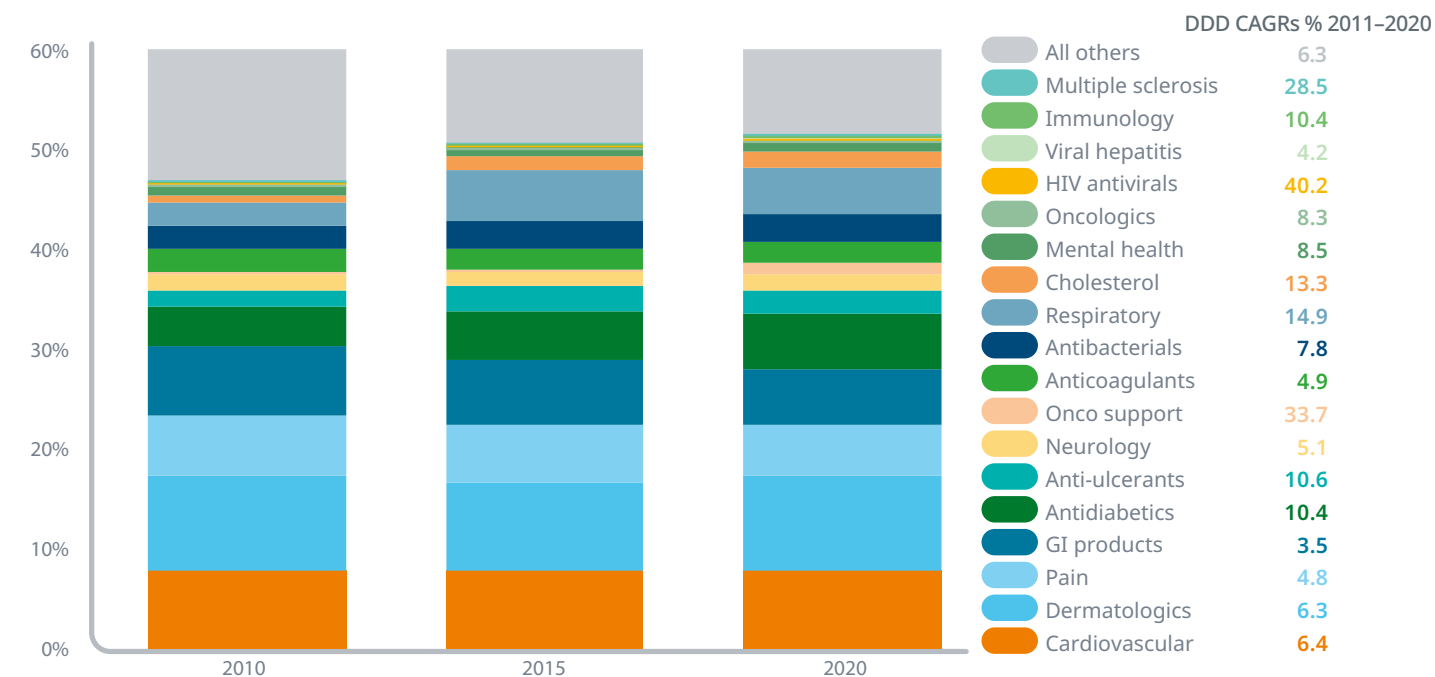

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021; The World Bank, Sep 2021

- Pharmerging markets have seen growth in medicine use and spending since 2010 with greater access to medicines in these countries.

- Growth in medicine use and spending are not always correlated as some drugs, such as those in oncology, have average growth in usage but much higher growth in spending primarily due to the high cost of these drugs.

- Similar to developed countries, the use of onco-supportive drugs per capita has grown significantly in pharmerging countries – at 19.9% on average per year.

- In contrast to developed countries, spending on anti-ulcerants and cholesterol medicines is growing in pharmerging markets on average by 8.9% and 9.8% annually, respectively.

Notes: Chart represents IQVIA Institute estimates of pharmerging countries defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts.

Most therapy areas have seen high growth in medicine usage in lower income countries over the past decade

Exhibit 17: Share of Defined Daily Doses (DDD) by therapy area in lower income countries, 2010, 2015, and 2020
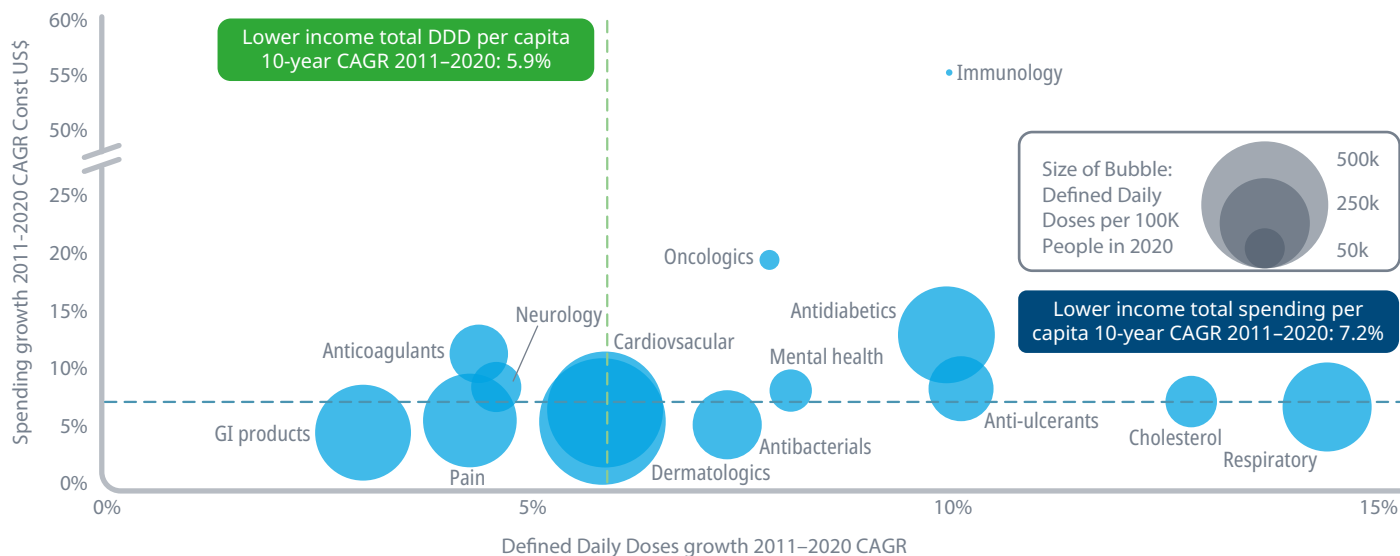
DDD CAGRs % 2011–2020

Therapy area	CAGR
All others	6.3
Multiple sclerosis	28.5
Immunology	10.4
Viral hepatitis	4.2
HIV antivirals	40.2
Oncologics	8.3
Mental health	8.5
Cholesterol	13.3
Respiratory	14.9
Antibacterials	7.8
Anticoagulants	4.9
Onco support	33.7
Neurology	5.1
Anti-ulcerants	10.6
Antidiabetics	10.4
GI products	3.5
Pain	4.8
Dermatologics	6.3
Cardiovascular	6.4

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021

- Defined daily doses by therapy area were only looked at for audited countries, providing limited insight into medicine use in lower income countries, since most lower income countries are unaudited.

- Medicine use has grown since 2010, but overall usage declined since 2015 in lower income countries.

- The distribution of medicine use across therapy areas in lower income countries is similar to that of pharmerging countries, with respiratory medicine use being an exception.

- Respiratory products account for 4.8% of medicine use in lower income countries compared to 1.6% in pharmerging countries, with much higher growth at 14.9% CAGR in lower income countries.

- Therapy areas with the highest growth in medicine use in lower income countries, such as onco-supportive medicines and HIV antivirals, represent minimal shares of overall medicine usage.

Notes: Chart represents IQVIA Institute estimates of AUDITED COUNTRIES ONLY defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Lower income countries shown here only include the five lower middle income countries audited by IQVIA: Algeria, French W. Africa, Morocco, Sri Lanka, and Tunisia.

Use of medicines and spending in lower income markets remains low but increased in all major therapy areas over the last decade

Exhibit 18: Lower income markets Defined Daily Doses (DDD) growth compared to spending growth for select therapy areas, 2011-2020
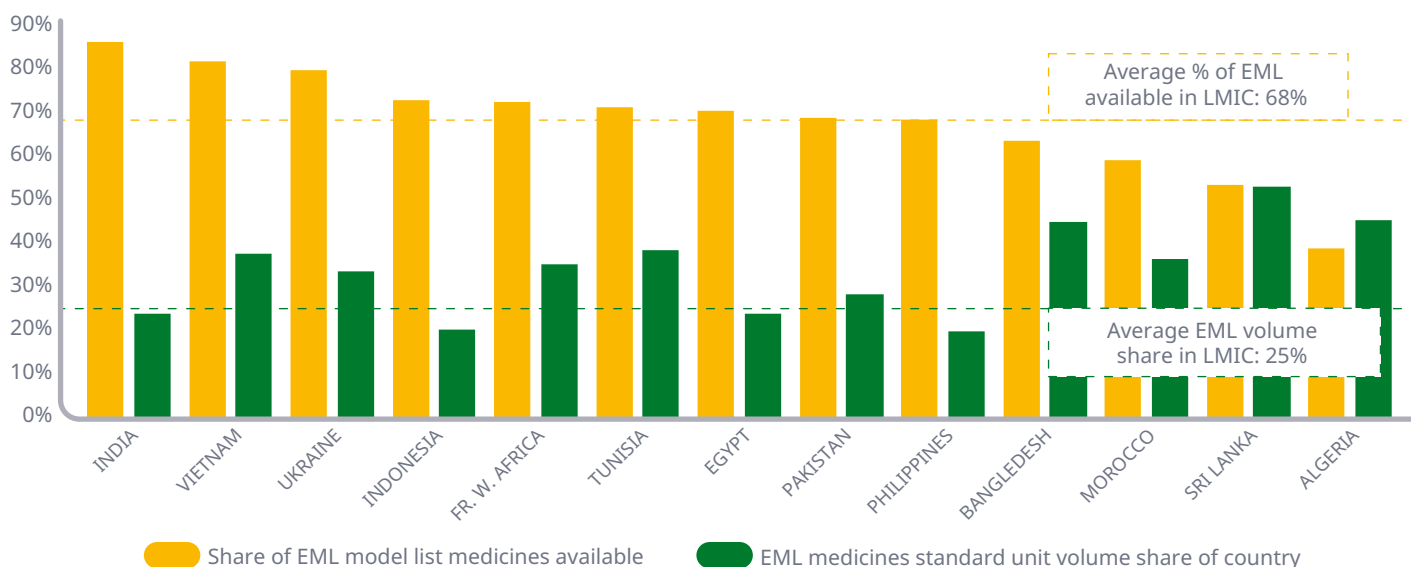
Spending growth 2011-2020 CAGR Const US$

- Lower income total DDD per capita 10-year CAGR 2011–2020: 5.9%
- • Immunology
- Oncologics
- Size of Bubble: Defined Daily Doses per 100K People in 2020: 500k / 250k / 50k
- Neurology
- Anticoagulants
- Cardiovsacular
- Antidiabetics
- Mental health
- Lower income total spending per capita 10-year CAGR 2011–2020: 7.2%
- GI products
- Pain
- Dermatologics
- Antibacterials
- Anti-ulcerants
- Cholesterol
- Respiratory

Defined Daily Doses growth 2011–2020 CAGR

Source: IQVIA MIDAS, Sep 2021; IQVIA Institute, Nov 2021; The World Bank, Sep 2021

- Although medicine use and spending has increased across major therapy areas in lower income countries, levels are still significantly below those of developed and pharmerging markets.

- Medicine use and spending in newer therapies, such as those in oncology and immunology, is growing but is still minimal due to the high cost of many of these therapies.

- Growth in use of respiratory products, cholesterol drugs, and anti-ulcerants in lower income countries outpaces the growth in spending for these drugs due to the availability of low-cost products.

Notes: Chart represents IQVIA Institute estimates of AUDITED COUNTRIES ONLY defined daily doses (DDD). These estimates are based on IQVIA audited data and application of WHO-DDD factors in IQVIA MIDAS as well as additional DDD calculation assumptions developed by the IQVIA Institute (see Methodology). Lower income countries shown here only include the five lower middle-income countries audited by IQVIA: Algeria, French W. Africa, Morocco, Sri Lanka, and Tunisia.

Over two-thirds of essential medicines are available in low income countries and account for 25% of medicine volume used

Exhibit 19: Essential medicine availability and use in low and lower-middle income countries
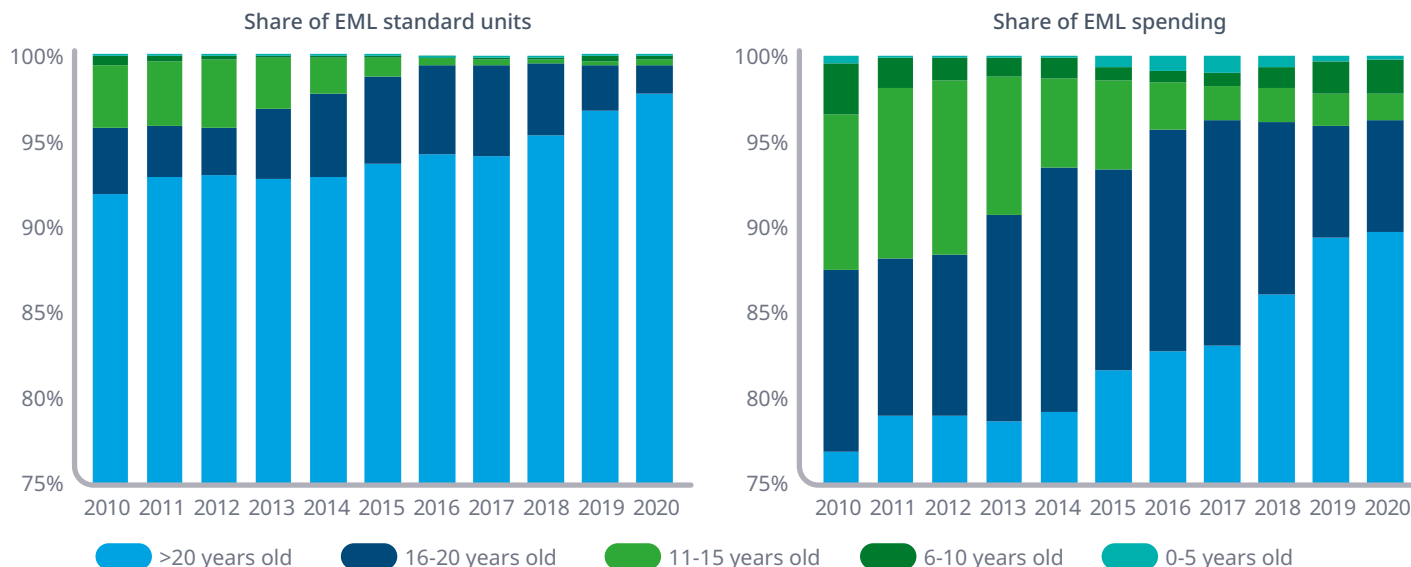

Average % of EML available in LMIC: 68%

Average EML volume share in LMIC: 25%

Countries (left to right): INDIA, VIETNAM, UKRAINE, INDONESIA, FR. W. AFRICA, TUNISIA, EGYPT, PAKISTAN, PHILIPPINES, BANGLEDESH, MOROCCO, SRI LANKA, ALGERIA

■ Share of EML model list medicines available　■ EML medicines standard unit volume share of country

Source: IQVIA MIDAS, Jun 2021; WHO 2021 Essential Medicines Model list, Jun 2021

- There are 469 medicine items on the WHO model list which were present in the audited data analyzed, 447 of which were available in any one of the 13 low and lower-middle income countries shown.

- On average, these countries have 68% of the essential medicines available, which reflects robust access to treatment options across a wide range of diseases.

- Volume share for essential medicines appears to be inversely reflecting robustness of country health systems, with higher share suggesting that fewer other medicines are used, whereas lower shares indicate a well-functioning health system that can do more than the essential.

- Using the current (2021 edition) EML model list and comparing volume trends over 10 years, most countries in this group have changed EML share of standard units by less than 5% since 2010.

- Significant progress in advancing health in these countries may require more concerted efforts over time.

Notes: Essential Medicines analyzed are based on the 2021 revision of the WHO model essential medicines list. Countries customize the model list to their specific needs, which are not analyzed here. The WHO EML model list includes over 500 medicine recommendations, sometimes suggesting that any similar medicine in the same therapy area is appropriate. This analysis considers availability of any similar medicine when assessing availability.

Over 95% of essential medicine volumes are drugs launched in the last century; newer essential drugs are 3% of spending

Exhibit 20: Essential medicine use and spending in low and lower-middle income countries by molecule first global launch cohort

Share of EML standard units

Share of EML spending

Legend: >20 years old | 16-20 years old | 11-15 years old | 6-10 years old | 0-5 years old

Source: IQVIA MIDAS, Jun 2021; WHO 2021 Essential Medicines Model list, Jun 2021

- Historically, essential medicines have been older medicines, often available as generic drugs, often taking more than 20 years to become widely used in lower income countries.

- While ongoing revisions of recommended essential medicines have begun to include newer medicines, sometimes adding cancer drugs to the list within five or ten years after global launch, these medicines represent a small share of usage and spending in these countries.

- Use of these drugs increases only after countries have adopted and implemented model list recommendations and negotiated access to the medicines, suggesting that there will be an increase in newer product usage over the next five years following the 2021 EML revision.

- The new essential drug model list includes several new cancer drugs with significant efficacy benefits as well as insulin analogues (which have biosimilars available) and SGTL2 diabetes therapies, which could bring significant benefits to patients if adopted.

Notes: Essential Medicines analyzed are based on the 2021 revision of the WHO model essential medicines list. Medicines considered essential have been assessed for the first global launch and grouped into cohorts based on the amount of time after global launch has elapsed in the relevant year.

Spending and growth by regions and key countries

- The global medicine market – using invoice price levels – is expected to grow at 3-6% CAGR through 2026, reaching about $1.8 trillion in total market size.

- The COVID-19 impact in 10 developed markets varies, but a return to steady low single digit growth is projected after 2021.

- The U.S. market, on a net price basis, is forecast to grow 0-3% CAGR over the next five years, down from 3.5% CAGR for the past five years.

- Japan medicine spending is forecast to decline slightly through 2026, despite robust brand growth due to a shift annual price cuts and a shift to generics.

- Spending in Europe is expected to increase by $51 billion through 2026, with a focus on generics and biosimilars.

- Spending growth in China is expected to slow, with positives driven by greater uptake and use of new original medicines and offset by pressures on off-patent and generic pricing.

- Other pharmerging markets are expected to grow strongly but from a smaller base.

Growth in developed economies continues at relatively steady rates with new products offset by patent expiries; pharmerging countries' access-expansion driven growth is being augmented in some markets, with greater use of newer original branded products.

The global medicine market — using invoice price levels — is expected to grow at 3–6% CAGR through 2026 to about $1.8Tn

Exhibit 21: Global medicine market size and growth 2011–2026, const US$Bn
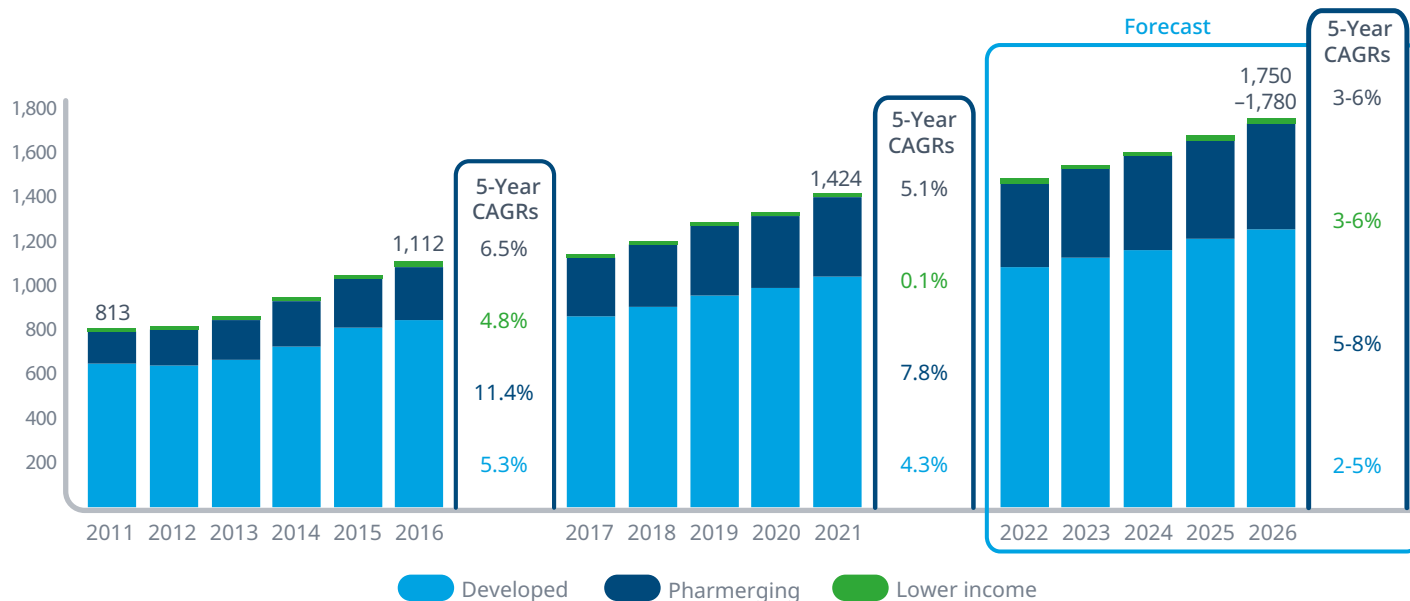
Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Global medicine spending — the amount spent purchasing medicines from manufacturers before off-invoice discounts and rebates — is expected to reach $1.8 trillion by 2026, increasing at a rate of 3–6% per year.

- This outlook is excluding the separate impact of spending on COVID-19 vaccines modeled separately (see exhibits 3-6).

- Developed countries — those with upper middle or high incomes — are expected to grow from 2–5% through 2026, similar by comparison to the past five years.

- The past five years had similar growth globally but had slower contribution from pharmerging and lower income countries than earlier in the decade.

- The differing impact of the COVID-19 pandemic across countries is expected to impact growth through 2022 before returning to historic patterns as rates of vaccination rise to reduce the risk of further social disruptions.

Notes: Does not include estimates for COVID-19 vaccines. Developed includes all countries classified by The World Bank as High Income or Upper Middle Income based on gross national income. Pharmerging includes countries with per capita GDP <$30,000 in 2020 and forecasted 5-year aggregate pharma sales growth >$1bn (absolute or rounded) in at least two forecasts. Lower income includes countries classified as Lower Middle Income or Low Income by the The World Bank based on gross national income. 5-year CAGRs in 2026 are forecasted to be within 1.5% of calculated value.

The COVID-19 impact in 10 developed markets varies but a return to low single digit growth is projected after 2021

Exhibit 22: Spending growth in ten developed countries, total market, const US$ 2019–2026
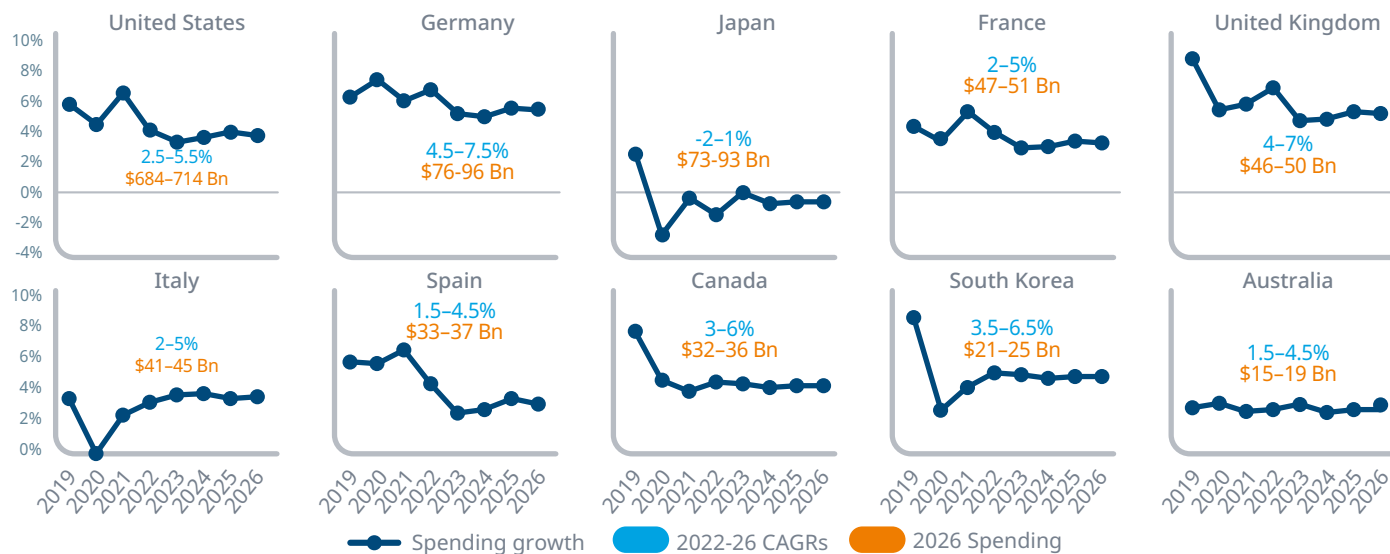
Source: IQVIA MIDAS, Jun 2021; WHO 2021 Essential Medicines Model list, Jun 2021

- Most developed markets returned to a pre-pandemic growth trend during 2021 and are expected to maintain consistent trends through 2026.

- U.S. spending growth will slow to 2.5-5.5% on an invoice basis as price growth for brands remains historically low and expiries, especially biologics, offset some of the growth from new products.

- Japan's sharp decline in 2020 was a result of the April 2020 biennial price cut coinciding with disruptions from the pandemic, followed by lingering pandemic impacts and an off-cycle price cut in 2021, and then continuing slower growth partly due to expected shifts to annual price cuts.

- Italy, the most impacted country early in the pandemic and the first to experience additional waves, has had some of the greatest impacts from the pandemic and is expected to take longer to return to normal trends

- In Spain, growth in 2023 and beyond is expected to be impacted by national plans to promote the use of generics and biosimilars.

- In the UK, growth is expected to normalize in low single digits from 2023 as the country adapts to a post-Brexit environment.

Notes: 2019 is included to show the impacts of the pandemic on spending growth.

The U.S. market, on a net price basis, is forecast to grow 0–3% CAGR over the next 5 years, down from 3.5% for the past 5 years

Exhibit 23: U.S. Medicine spending and growth at invoice-level and estimated net 2011–2026
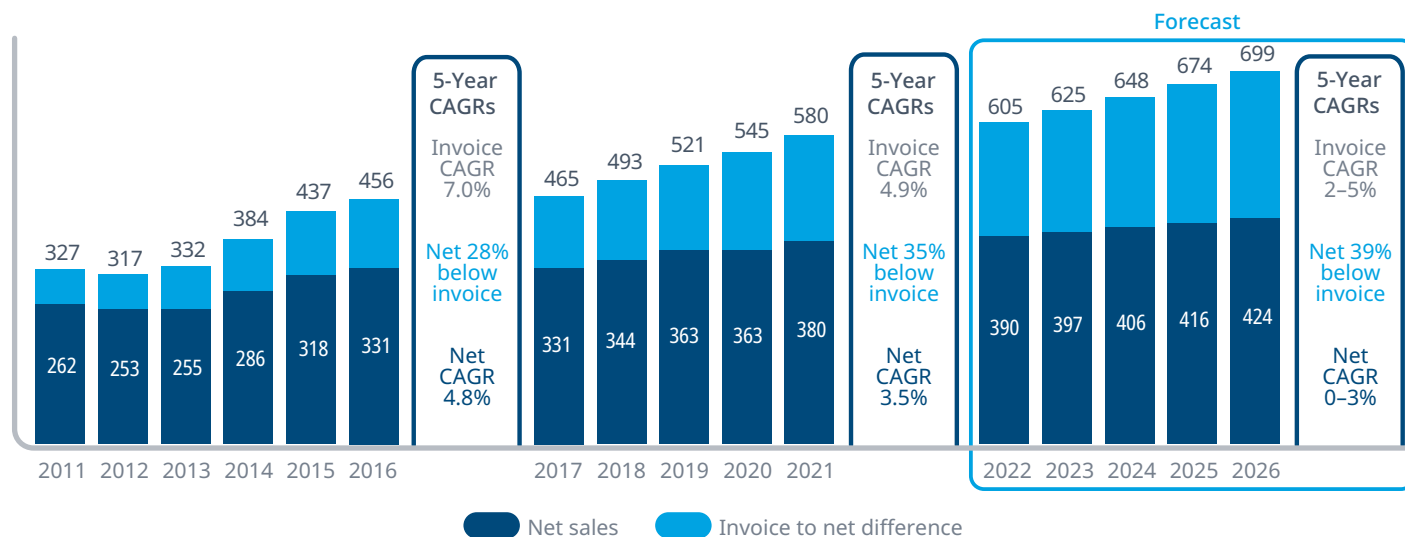
Source: IQVIA Institute, Nov 2021

- Spending at net levels in the U.S. is projected to grow at 0–3% as rising off-invoice discounts and rebates are expected to slow spending growth over time.

- The fragmented payer environment in the U.S. includes a range of stakeholders who receive off-invoice discounts and rebates, including statutory discounts and rebates for the government, negotiated rebates by pharmacy benefit managers and insurers as well as discounts negotiated by purchasers, and coupons used by patients.

- In total, these off-invoice discounts and rebates result in spending that is estimated at 35% lower than invoice level in 2021 and projected to be 39% lower than invoice level in 2026.

- New legislation affecting insurance cost-sharing and price negotiation are expected to contribute significantly to these trends but with phased impacts later in the forecast period.

- In addition to discounts and rebates, ongoing market dynamics around the use of medicines, the adoption of newer treatments, the impact of patent expiries, and new generic or biosimilar competition will all contribute to historically slow market growth in the U.S. for the next five years.

Notes: Estimates of net manufacturer sales are based on analysis by the IQVIA institute from public sources combined with IQVIA's audited invoice-level data (see methodology).

Spending in the U.S. is expected to increase by $119Bn through 2026 driven by new and existing brands

Exhibit 24: Spending and growth drivers in U.S. 2016–2026 const US$Bn
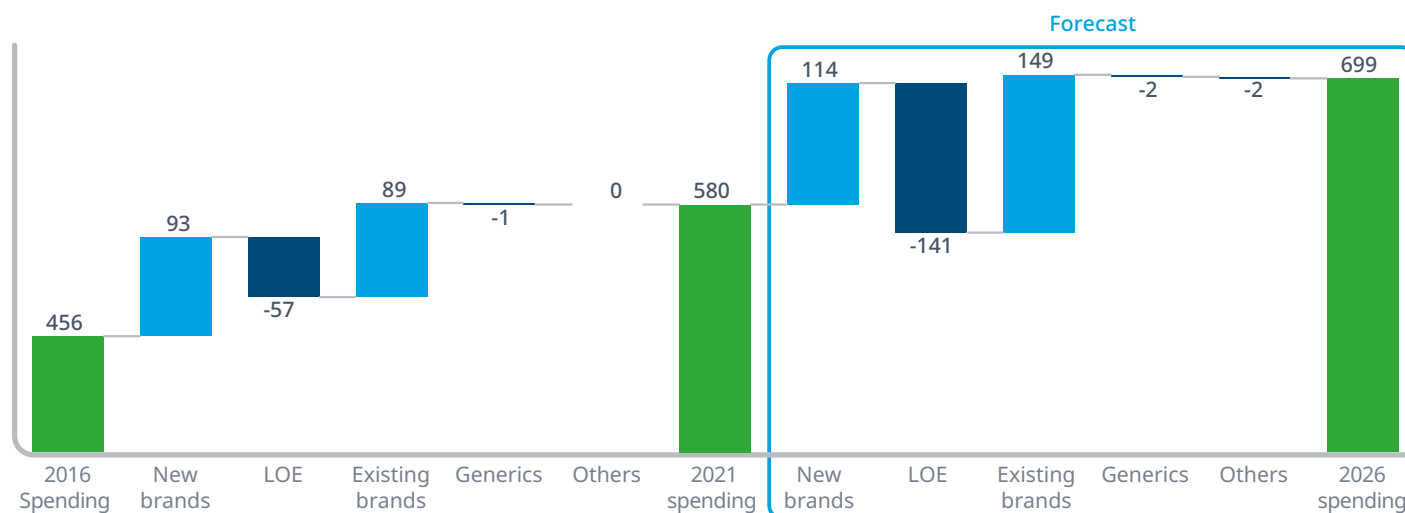
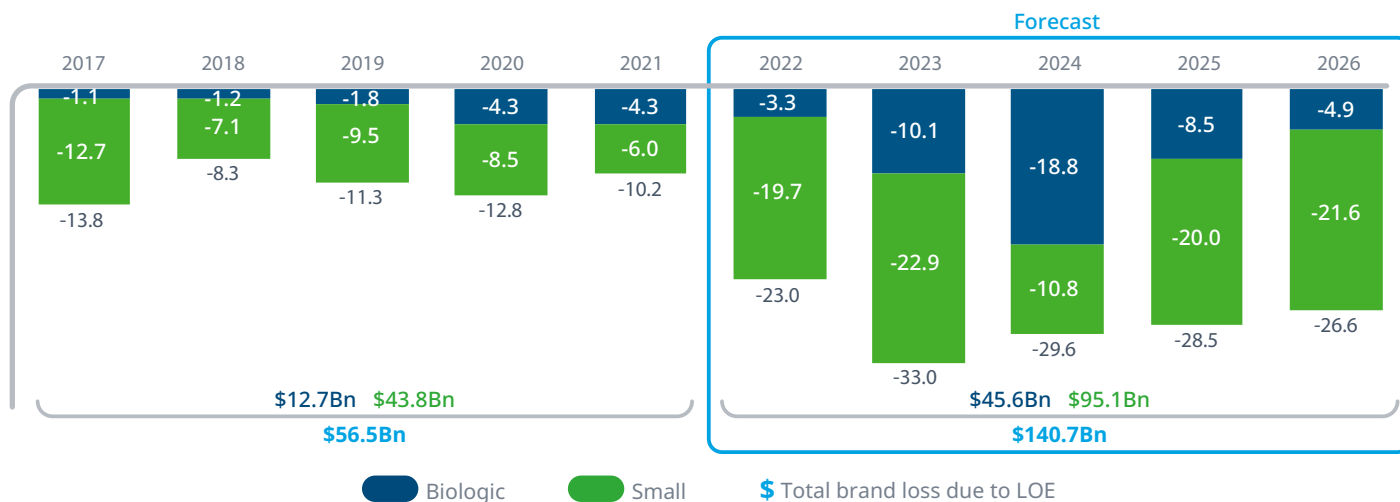Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Spending on medicines in the U.S. at invoice prices is expected to increase by $119 billion through 2026, very similar to the $124 billion increase over the past five years.

- The largest driver of growth will be increased usage of existing protected branded products, which are expected to add $149 billion in spending over five years, much higher than the $89 billion increase from 2016 to 2021 for products more than two years after their launch up until their loss of exclusivity (LOE).

- The contribution from new brands is expected to increase to $114 billion over five years as more than 250 new active substances (NAS) are expected to launch in the period.

- The impact of losses of exclusivity is expected to increase dramatically to $141 billion, from $57 billion in the prior five years, as both small molecule and biologic product exposure to LOE has increased substantially.

- Generics, including biosimilars, have had an only modest impact on growth as price deflation has largely offset growth from the related patent expiry events.

- Overall medicine spending at invoice prices is |expected to reach nearly $700 billion by 2026, even as off-invoice discounts and rebates are expected to reach 39% and net spending increases by only $44 billion over five years.

Notes: New brands growth contribution defined as the growth during periods when products had been marketed for less than two years. Growth from products defined as new in each year of the five-year period are aggregated together. Existing brands are those which are no longer new and not yet off-patent. Off-patent brands have faced Loss of Exclusivity (LOE). Generics includes non-original branded products or 'branded generics' as well as biosimilars. Other includes OTC/other products.

The impact of exclusivity losses will increase to $140.7Bn over 5 years including significant biosimilars in 2023 and 2024

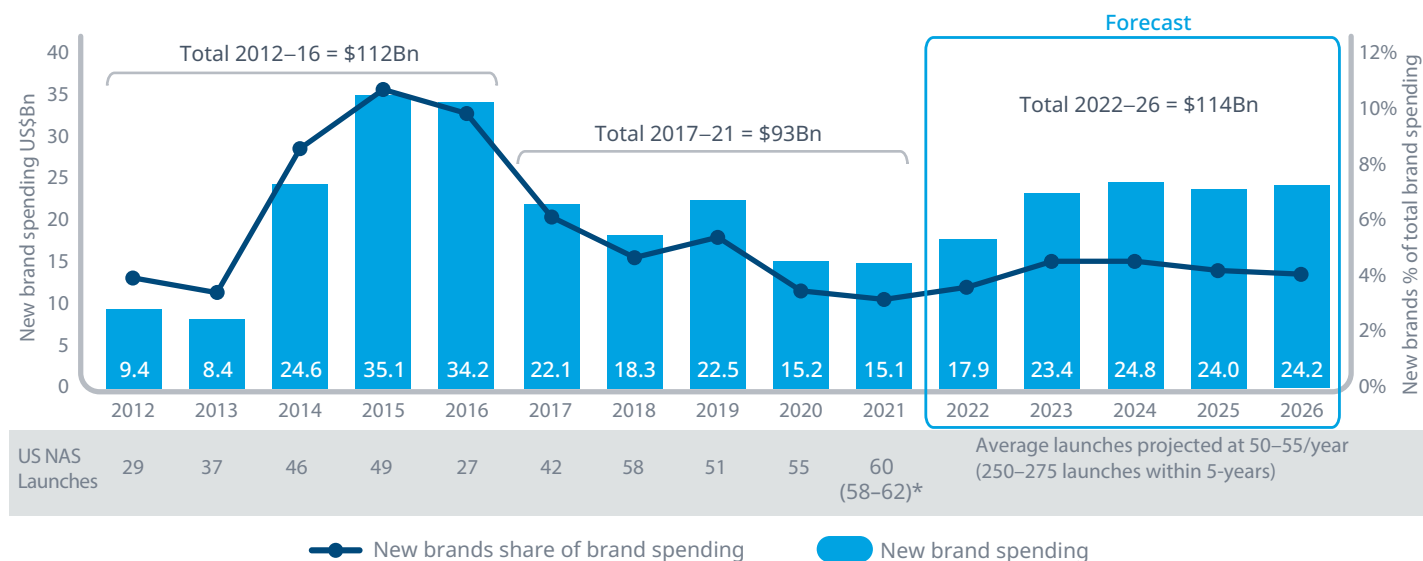**Exhibit 25: U.S. Impact of brand losses of exclusivity 2017–2026, US$Bn**

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Losses of exclusivity in the U.S. are expected to be nearly $140 billion through 2026, with significant impact on spending for both small molecules and biologics.

- Small molecule expiries are expected to reduce brand spending by $95 billion through 2026, more than double the impact of the last five years, including the impact of high-profile products in the anticoagulants therapy area, including rivaroxaban (Xarelto).

- Biologics are expected to result in $46 billion in lower brand spending over five years as biosimilar market dynamics mature and major products face competition, including ranibizumab (Lucentis) in 2022, adalimumab (Humira) in 2023, and Ustekinumab (Stelara) in 2024.

- The impact of biosimilars has been increasing since the introduction of oncology biosimilars in 2019 for bevacizumab (Avastin), rituximab (Rituxan) and trastuzumab (Herceptin), which achieved significant volume shares of the relevant molecules and suggest the emergence of new market dynamics in the future.

- The approval of interchangeable biosimilars for insulins in the second half of 2021 and for adalimumab pending launch in 2023 suggests more dramatic volume uptake is possible, contributing to the nearly $19 billion impact of biologics overall in 2024.

Notes: Does not reflect offsetting spending increases from generic or biosimilar competitors. Losses in future periods are modeled based on expected pre-expiry growth for the brand and subsequent post-expiry loss of sales for the brands. The rates of loss are based on historic averages in each country and inclusive of adjustments for products with expiries in progress from historic periods where losses extend into the forecast periods. Historic period analyses are based on audited data. Expected loss of exclusivity dates are highly variable and can change due to outcomes of litigation, granting of new patents or changes in the expectation of launch of biosimilars. Information is current as of September 2021.

New brand spending in the U.S. is projected to be higher than the last 5 years, but a smaller share of spending

Exhibit 26: U.S. New brand spending

Total 2012–16 = $112Bn

Total 2017–21 = $93Bn

Forecast

Total 2022–26 = $114Bn

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
New brand spending	9.4	8.4	24.6	35.1	34.2	22.1	18.3	22.5	15.2	15.1	17.9	23.4	24.8	24.0	24.2
US NAS Launches	29	37	46	49	27	42	58	51	55	60 (58–62)*					

Average launches projected at 50–55/year (250–275 launches within 5-years)

— New brands share of brand spending   ⬤ New brand spending

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Over the next five years, more than 250 new active substances (NAS) are expected to launch in the U.S. and new products in aggregate are expected to contribute $114 billion in spending.

- Four of the last five years have had more than 50 NAS launches, and the next five years are expected to average at least 50 per year, with an aggregate total of more than $22 billion in new brand spending per year.

- New launches in the next five years are expected to include 100 new cancer drugs globally, with most of those available in the U.S. at launch.

- Other clusters of innovative drugs include as many as 60 next-generation biotherapeutics, which include cell and gene therapies and RNA therapeutics, and which partly overlap with oncology treatments.

Notes: New brands spending defined as products marketed for less than two years in each year. Number of New Active Substances (NAS) per year reflect launches rather than approvals as there can be a lag between approval and launch. *NAS launches in 2021 Estimated based on YTD Sep 2021.

Spending in Europe is expected to increase by $51Bn through 2026 driven by new brands

**Exhibit 27: Spending and growth drivers in France, Germany, Italy, Spain, and UK 2016–2026 const US$Bn**
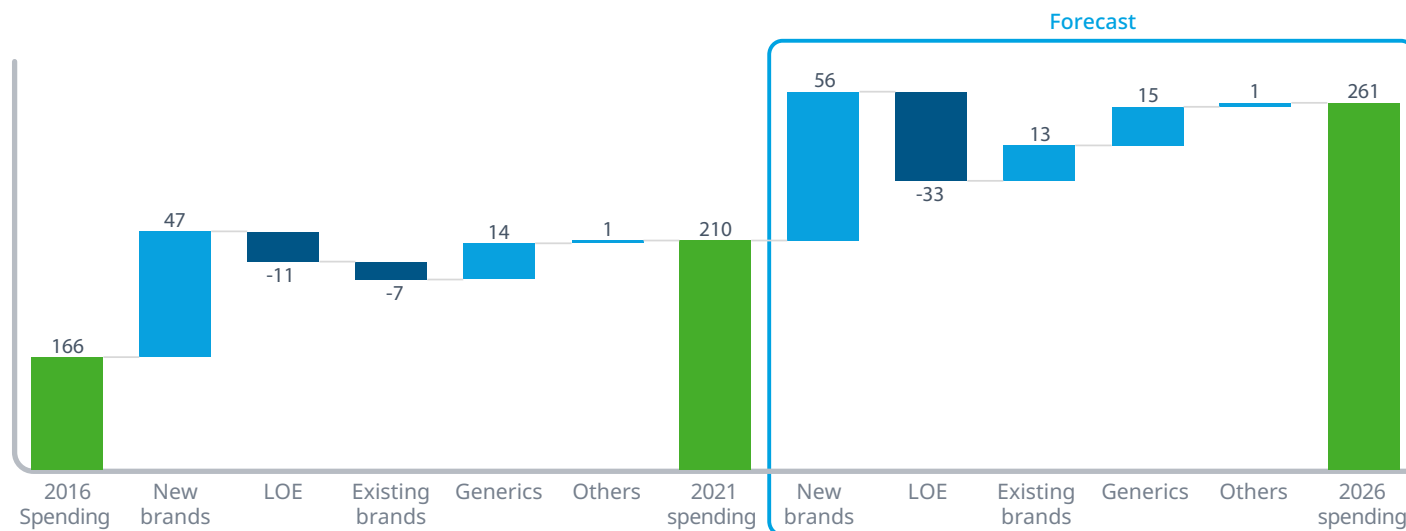
Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Medicine spending in the top five European markets is expected to increase by $51 billion over the next five years, up from $44 billion in the past five years but with large shifts in the drivers of growth.

- New brands were the largest driver of growth from 2016 to 2021 and are expected to continue in the next five years but will be hampered by lingering effects of the pandemic on marketing operations and reimbursement decisions.

- Generics, including biosimilars, are expected to add $15 billion in growth over the next five years, about the same as in the past five years despite a larger impact of losses of exclusivity as volume gains will be offset by price deflation.

- Innovation has been expected to be significantly strong in the next five years, but adoption of newer medicines will be slowed by the disruptions to industry's promotional activity from the pandemic and greater scrutiny of the value of new medicines in the form of health technology assessments.

- It is still possible that new brand growth will be lower while older established brands may grow more after they have demonstrated value in the market and negotiated market access, and these dynamics represent an area of significant uncertainty.

- Payer actions will be shaped by the pace of economic and COVID-19 recovery and may be more impactful later in the forecast.

Notes: Spending in US$ with constant Q2 2021 exchange rates. New brands growth contribution defined as the growth during periods when products had been marketed for less than two years. Growth from products defined as new in each year of the five year period are aggregated together. Existing brands are those which are no longer new and not yet off-patent. Off-patent brands have faced Loss of Exclusivity (LOE). Generics includes non-original branded products or 'branded generics' as well as biosimilars. Other includes OTC/other products.

The impact of exclusivity losses will reach $33 billion over 5 years, with more than half due to the availability of biosimilars

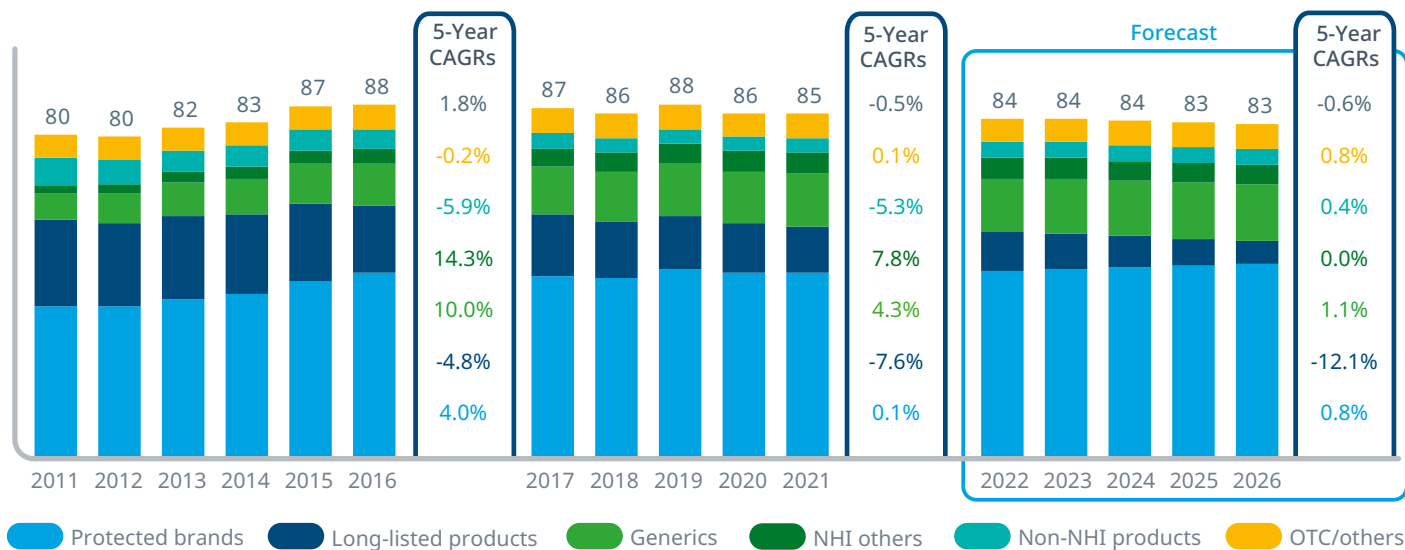**Exhibit 28: EU4+UK impact of brand losses of exclusivity 2017–2026, US$Bn**
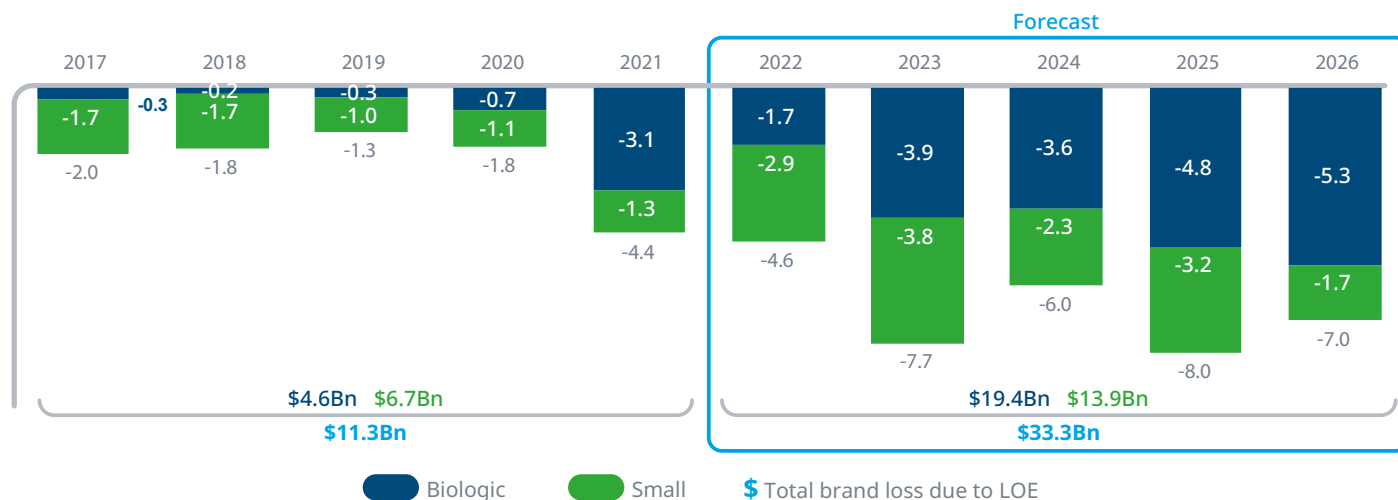
Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- The impact of losses of exclusivity (LOE) in the five largest European markets (Germany, France, Italy, Spain and the UK), are expected to triple over the next five years and more than half of the impact is expected to be biologics, with $19.4 billion of the $33.3 billion total impact.

- The major impact is seen in 2023 and 2024 with patent expiry of ranibizumab (Lucentis) in 2022 and ustekinumab (Stelara) in 2024.

- Europe's biosimilar market is largest in the world, with the first biosimilar launched in 2006. The biologic molecules facing biosimilar competition increased from 2013 to 2018 in European union, with the EMA

approvals increasing in 2017 and 2018. The approval of biosimilars is based on solid and robust legal pathway introduced in 2004 and since then has led to the highest number of biosimilar approvals in the world.

- Loss of exclusivity impact is modeled as brand losses within the first two years following the LOE and as such, some of the slower impact of biosimilars may be understated in past years.

- Small molecule LOE is expected to double in terms of impact on brands in the next five years even as they have been a smaller share of overall impact.

Notes: Does not reflect offsetting spending increases from generic or biosimilar competitors. Losses in future periods are modeled based on expected pre-expiry growth for the brand and subsequent post-expiry loss of sales for the brands. The rates of loss are based on historic averages in each country and inclusive of adjustments for products with expiries in progress from historic periods where losses extend into the forecast periods. Historic period analyses are based on audited data. Expected loss of exclusivity dates are highly variable and can change due to outcomes of litigation, granting of new patents or changes in the expectation of launch of biosimilars. Information is current as of September 2021.

Japan medicine spending is forecast to decline slightly through 2026 as stronger innovation is offset by shift to annual price cuts

Exhibit 29: Japan medicine spending by product type 2011–2026, const US$ Billions

	5-Year CAGRs		5-Year CAGRs		5-Year CAGRs
	1.8%		-0.5%		-0.6%
	-0.2%		0.1%		0.8%
	-5.9%		-5.3%		0.4%
	14.3%		7.8%		0.0%
	10.0%		4.3%		1.1%
	-4.8%		-7.6%		-12.1%
	4.0%		0.1%		0.8%

Legend: Protected brands · Long-listed products · Generics · NHI others · Non-NHI products · OTC/others

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Japan, Sep 2021; IQVIA Institute, Nov 2021

- Spending growth in Japan is expected to maintain a consistent -2 to 1% growth rate over the next five years as COVID-19 recovery continues and long-term trends affecting long-listed brands continue.

- While 2020 had the impact of being a price-cut year on top of the pandemic, the more muted rebound in 2021 included an off-cycle price-cut as well as the lingering effects of the pandemic on the market.

- The largest impact expected in the forecast period is the -12% CAGR growth for long-listed products, which are expected to continue to face above average price cuts and to increase to annual frequency, though the policy has not been announced.

- Over the past decade, protected brands share of spending has risen from 47% to 54%, reversing a long historical trend where share would decline over time.

- Long-listed products have declined from 27% of spending in 2011 to 13% in 2021 and are expected to drop to 7% by 2026.

- Generic share of spending is also expected to rise, supported by policies that have been largely effective over this entire 15-year period, encouraging doctors to substitute available generics with a combination of incentives and penalties.

Notes: Medicine spending at ex-manufacturer level, segmented according to Japan-specific product types which differ from segmentations used elsewhere in this report. Price revisions historically have taken effect in April, every other year.

The pandemic's impact on the pharmerging markets varies considerably but a return to steady growth is projected after 2021

Exhibit 30: Spending growth in select pharmerging countries 2019–2026, total market, const US$
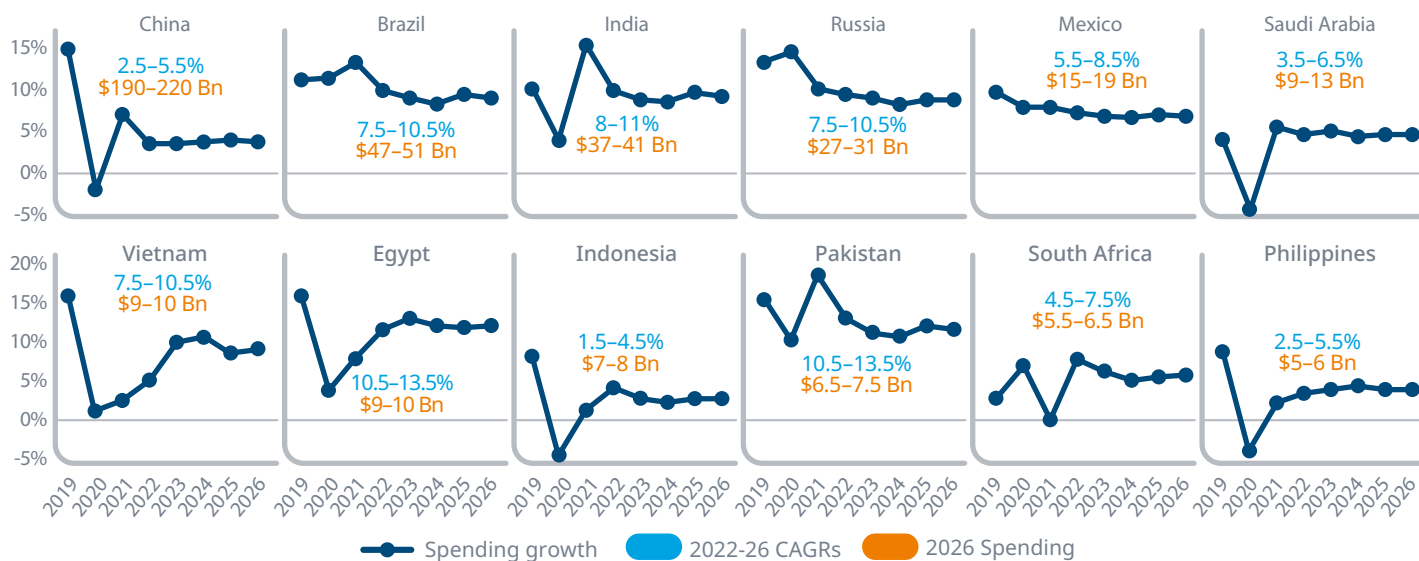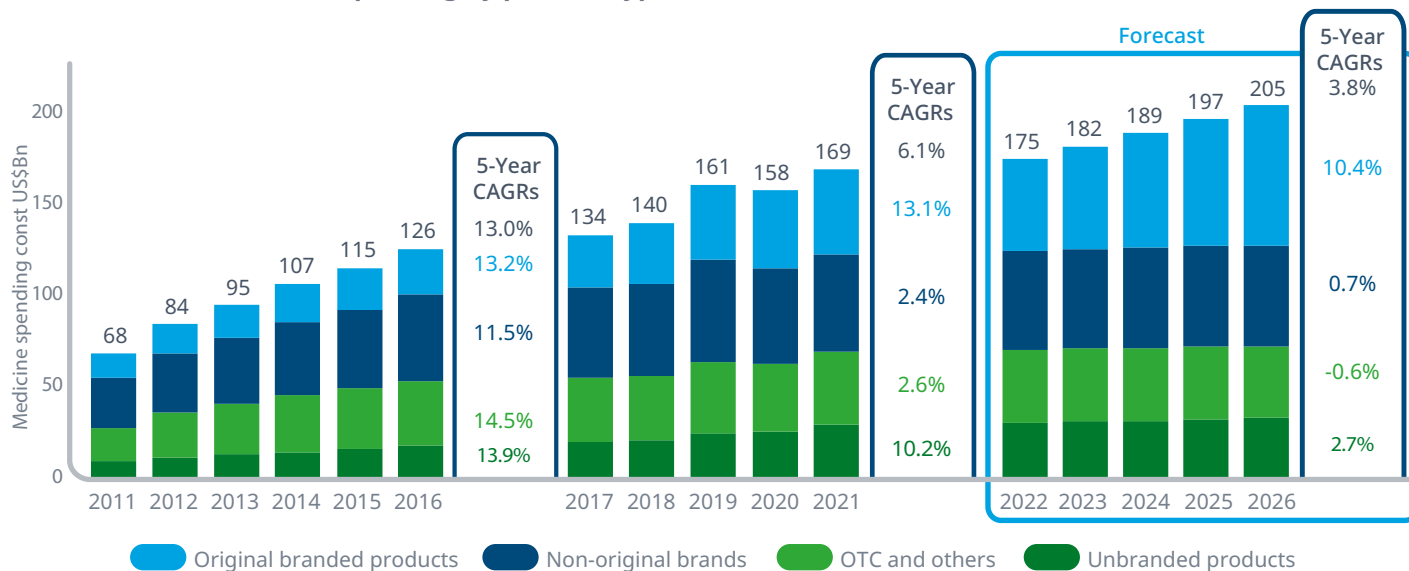

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- The impact of the pandemic on medicine spending growth has been significant in some pharmerging countries including China, where growth dropped from 8% to -3% in a single year before the rebound in 2021.

- China's growth remains the largest driver of this group of countries and is being driven by a shift in the types of products being used, with spending being driven by new medicines to a greater degree.

- Brazil, India and Russia are the next three largest pharmerging markets and all are expected to grow by more than 7.5% CAGR through 2026.

- Saudi Arabia, Philippines and Indonesia had significant impacts on spending in 2020 from the pandemic but have rebounded in 2021, with compound annual growth projected through 2026 to continue steadily in low- to mid-single digits.

Notes: 2019 is included to show the impacts of the pandemic on spending growth.

Spending growth in China is expected to accelerate post-COVID, driven almost entirely by new original medicines

Exhibit 31: China medicine spending by product type 2011–2026

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute Nov 2021

- Medicine spending in China has risen from $68 billion in 2011 to $169 billion in 2021, dipping to $158 billion in 2020 due to COVID on a constant U.S.$ basis.

- Over the past five years, spending growth was driven by original branded products, most often from multinational companies, which grew at an average of 13.1% per year to reach 28% of spending in 2021, up from 20% five years earlier.

- Over the next five years, the government policies to update the national reimbursement drug list (NRDL) annually is contributing to a greater share of new original medicines being reimbursed, resulting in higher levels of spending, though these are generally subject to lower negotiated net prices.

- Over the next five years, original brands will grow by more than 10% per year, while other types of products will grow at less than 3%, contributing to the overall growth rate slowing to 2–5%.

- By 2026, China is projected to exceed $205 billion, an increase of more than $35 billion in the next five years.

Notes: Original brands are those marketed by their originator (or licensed partner) and includes vaccine products by all manufacturers.
Analysis does not include COVID-19 vaccines.

Pricing and reimbursement reforms in China are bringing new medicines to the market sooner while managing costs

Exhibit 32: Numbers and timing of reimbursement listing of international drug launches in China

Number of new western drugs added to the NRDL in NRDL updates

- 2009: 226
- 2017: 164 (31 Negotiation route, 133 Traditional route)
- 2018: 17
- 2019: 121 (74 Negotiation route, 47 Traditional route)
- 2020: 119 (96 Negotiation route, 23 Traditional route)

Negotiation route Traditional route

Median time (years) between approval and NRDL inclusion

Longer…

- Before 2017: 4.6
- 2017 Negotiation (31 western drugs): 1.6 (-3.0)
- 2018 Negotiation (17 oncology drugs): 1.9 (-2.7)
- 2019 Negotiation (52 western drugs): (-2.8)
- 2020 Negotiation (96 western drugs): 1.8

Source: IQVIA analysis, Jun 2021

- Annual national reimbursement drug list (NRDL) updates, including a price negotiation component, are resulting in earlier launches of international drugs since 2017.

- Previously NDRL inclusion was limited to established, often off-patent drugs and was updated approximately every five years, but since 2017, the list is updated annually and includes a path to reimbursement where manufacturers can negotiate prices with the government.

- As companies can now proactively seek NRDL via negotiation, reimbursement can be achieved faster, and companies are launching earlier in China (after global launch), resulting in new drugs reaching patients sooner.

- These dynamics are expected to be the key driver of higher medicine spending growth through the forecast period before the application of price negotiations.

- In parallel, the government has introduced volume-based procurement policies with tenders for off-patent and generic drugs to control the spend in off-patent categories.

- These volume-based procurement policies have affected an increasing number of high-volume medicines starting in 2018 and have resulted in prices 50% lower initially but reaching 70% lower prices in the most recent series of tenders in 2020.

- Earlier rounds impacted multi-national companies to a greater degree, while more recent rounds have affected local companies more, with future rounds expected to expand into medical devices and off-patent biologics.

Notes: NRDL updates were less frequent prior to 2017.

Almost all countries are expected to have a lower growth rate through 2026 than in the past 5 years

Exhibit 33: Global invoice spending and growth in selected countries

	2021 SPENDING US$BN	2017–2021 CAGR	2026 SPENDING US$BN	2022–2026 CAGR
Global	**1,423.5**	**5.1%**	**$1,750–1,780**	**3–6%**
Developed	1,050.4	4.3%	$1,240–1,270	2–5%
10 Developed	935.2	4.3%	$1,100–1,130	2–5%
United States	580.4	4.9%	$685–715	2.5–5.5%
Japan	85.4	-0.5%	$73–93	-2–1%
EU4+UK	209.7	4.8%	$245–275	3–6%
Germany	64.6	6.2%	$76–96	4.5–7.5%
France	42.0	3.0%	$48–52	2–5%
United Kingdom	36.6	5.9%	$46–50	4–7%
Italy	36.5	3.0%	$41–45	2–5%
Spain	29.8	5.4%	$32–36	1.5–4.5%
Canada	27.4	5.2%	$32–36	3–6%
South Korea	17.9	6.0%	$21–25	3.5–6.5%
Australia	14.4	0.6%	$15–19	1.5–4.5%
Other Developed	115.2	4.7%	$132–152	3–6%
Pharmerging	354.2	7.8%	$470–500	5–8%
China	169.4	6.1%	$190–220	2.5–5.5%
Brazil	31.6	11.7%	$47–51	7.5–10.5%
India	25.2	11.1%	$37–41	8–11%
Russia	18.8	11.4%	$27–31	7.5–10.5%
Other Pharmerging	109.2	8.3%	$151–171	6.5–9.5%
Lower Income Countries	19.0	0.1%	$21–25	2.5–5.5%

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Spending across major pharmerging markets is expected to grow 5-8% CAGR through 2026, with China slowing to 2.5-5.5% offsetting higher growth in other large markets – Brazil, India and Russia – and smaller pharmerging markets, which are growing at a rate of 6.5-9.5% over the same period.

- In the next five years, global spending will increase by nearly $350 billion, lifting spending to nearly $1.8 trillion in 2026, with most of the increase from developed countries, despite their lower rates of growth.

Notes: Spending in US$Bn, CAGR = Compound Annual Growth Rate using Constant US$ with Q2 2021 exchange rates.
Pharmerging, Developed and Lower Income Countries are defined based on a mix of national income and pharmaceutical market dynamics, see definitions

Faster growing pharmerging markets are generally improving in their global rankings while developed markets rank lower

Exhibit 34: Global top 20 countries ranking and invoice spending relative to the United States

RANK	2016	% OF U.S. INVOICE SPENDING	RANK	2021	% OF U.S. INVOICE SPENDING	RANK	2026	% OF U.S. INVOICE SPENDING
1	United States	100.0%	1	United States	100.0%	1	United States	100.0%
2 ▲1	China	27.6%	2	China	29.2%	2	China	29.3%
3 ▼1	Japan	19.2%	3	Japan	14.7%	3 ▲1	Germany	12.3%
4	Germany	10.5%	4	Germany	11.1%	4 ▼1	Japan	11.9%
5	France	7.9%	5	France	7.2%	5	France	7.1%
6	Italy	6.9%	6 ▲1	United Kingdom	6.3%	6 ▲2	Brazil	7.0%
7	United Kingdom	6.0%	7 ▼1	Italy	6.3%	7 ▼1	United Kingdom	6.8%
8	Spain	5.0%	8 ▲2	Brazil	5.5%	8 ▼1	Italy	6.2%
9	Canada	4.7%	9 ▼1	Spain	5.1%	9 ▲2	India	5.6%
10 ▲2	Brazil	4.0%	10 ▼1	Canada	4.7%	10 ▼1	Spain	5.0%
11 ▲2	India	3.3%	11	India	4.3%	11 ▼1	Canada	4.8%
12 ▼1	Australia	3.1%	12 ▲2	Russia	3.2%	12	Russia	4.1%
13 ▼3	South Korea	2.9%	13	South Korea	3.1%	13	South Korea	3.3%
14 ▲1	Russia	2.4%	14 ▼2	Australia	2.5%	14 ▲1	Mexico	2.5%
15 ▼1	Mexico	1.9%	15	Mexico	2.1%	15 ▲4	Turkey	2.4%
16 ▲1	Argentina	1.6%	16 ▲1	Poland	1.6%	16 ▼2	Australia	2.4%
17 ▼1	Poland	1.6%	17 ▲1	Saudi Arabia	1.5%	17 ▲3	Argentina	1.8%
18 ▲3	Saudi Arabia	1.5%	18 ▲3	Belgium	1.5%	18 ▼2	Poland	1.6%
19	Switzerland	1.3%	19 ▲19	Turkey	1.4%	19 ▼2	Saudi Arabia	1.6%
20 ▼3	Netherlands	1.3%	20 ▼4	Argentina	1.3%	20 ▼2	Belgium	1.5%

Source: IQVIA Market Prognosis, Sep 2021   ▼▲   Change in ranking over prior 5 years

- Over the past 10 years, the relative spending of countries has shifted; generally, pharmerging countries have risen while slower-growing, developed markets have dropped.

- Germany will pass Japan to become the third largest market globally in 2026, while all other improvements in ranking will be pharmerging markets, which are generally growing faster than developed markets.

Notes: Rankings using constant US$ with Q2 2020 exchange rates, except Argentina, using US$ due to hyperinflation. Country spending percentage of the level in the U.S. using the same currency as rankings.

Spending and growth drivers by product type

- Strong growth in pharmerging markets and new brands in developed markets will lift global spending through 2026.

- New brand spending in developed markets is projected to be similar to the last five years but represent a smaller share of spending.

- Global new active substances (NAS) launches are projected at an average of 54-63 per year, totaling 290-315 for five years through 2026. The last five years averaged 63 per year, including the unprecedented 79 per year in both 2020 and 2021.

- The impact of exclusivity losses will increase to $188 billion over the next five years, with a large increase in the impact of biosimilars.

- Global savings from biosimilars will exceed $215 billion in cumulative spending through 2026 — below estimates without new biosimilars.

- Specialty medicines will represent 45% of global spending in 2026 and almost 60% of total spending in developed markets.

Pharmerging markets will grow through continued access expansion and wider use of more novel medicines in those countries, while in developed markets, new medicines that are increasingly specialty, niche and rare-disease-focused will drive growth and be offset by maturing biosimilar market dynamics and declining costs in older medicines.

Strong growth in pharmerging markets and new brands in developed markets will lift global spending through 2026

Exhibit 35: Spending and growth drivers 2016–2026 const US$Bn
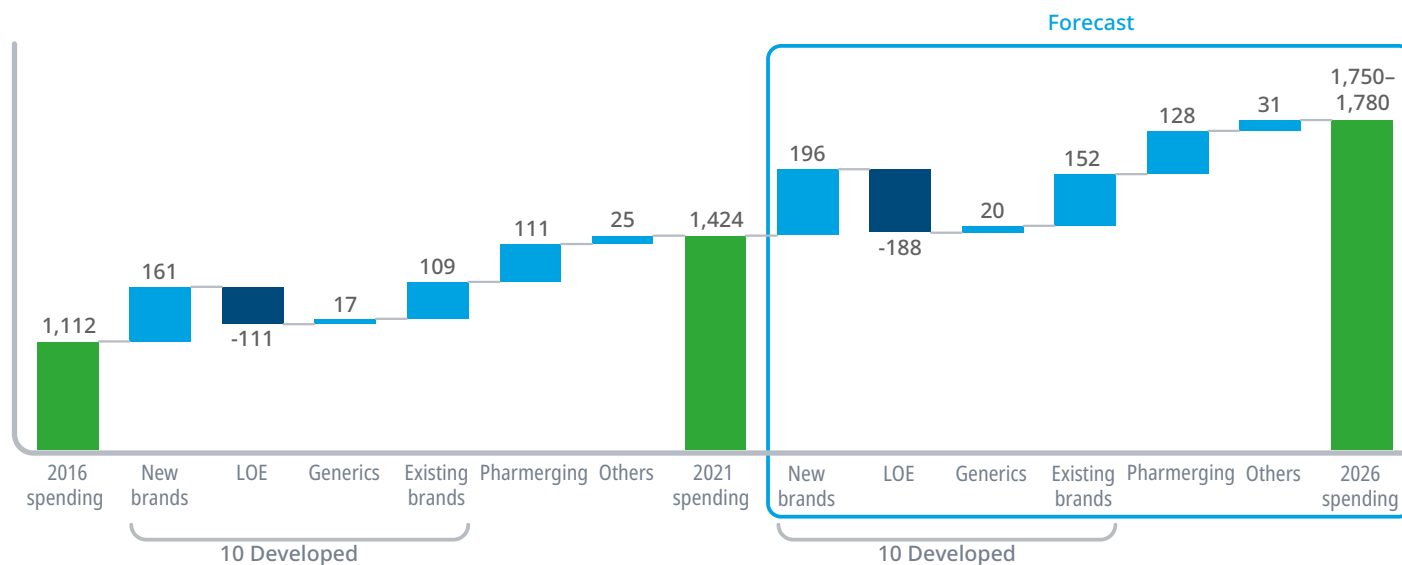
Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Global medicine spending continues to increase, with most driven by new medicines, increasing $196 billion over the next five years compared to $161 billion over the past five.

- Losses of exclusivity are expected to be significantly higher through 2026 at $188 billion compared to the $111 billion in the past five years, contributing to overall slowing growth.

- Generic spending growth contribution is typically muted as volume increases are offset by price deflation, but the influx and maturation of biosimilars, particularly in the U.S., is expected to result in slightly higher absolute growth.

- Pharmerging growth is expected to increase through 2026 and driving an increase of $128 billion, contributing over one-third of global spending growth in the five-year period.

Notes: New brands growth contribution defined as the growth during periods when products had been marketed for less than two years. Growth from products defined as new in each year of the five year period are aggregated together. Existing brands are those which are no longer new and not yet off-patent. Off-patent brands have faced Loss of Exclusivity (LOE). Generics includes non-original branded products or 'branded generics' as well as biosimilars. Pharmerging shows the absolute growth of this group of countries (see definitions for details). Other includes growth from all other lower income countries, Other includes OTC/other products and the growth from other developed and other lower income countries.

New brand spending in developed markets is projected to be similar to the last 5 years but a smaller share of spending

Exhibit 36: Ten developed countries new brand spending

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
New brand spending	16.9	15.2	34.1	54.7	56.6	38.1	35.1	36.0	25.5	26.0	31.0	40.5	42.0	41.0	41.7
Global NAS Launches	36	42	56	46	39	48	59	51	79	79 (77–81)*					

Total 2012–16 = $177Bn   Total 2017–21 = $161Bn   Total 2022–26 = $196Bn

Forecast

Average launches projected at 54–63/year (290–315 launches within 5 years)

— New brands share of brand spending   ▇ New brand spending
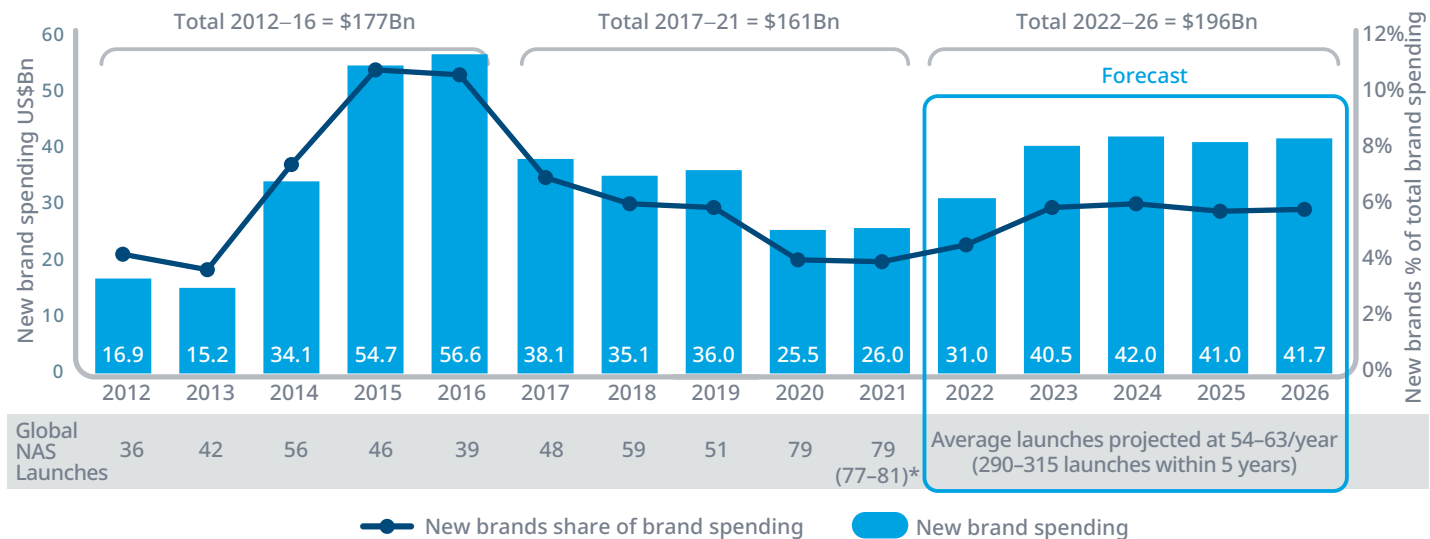
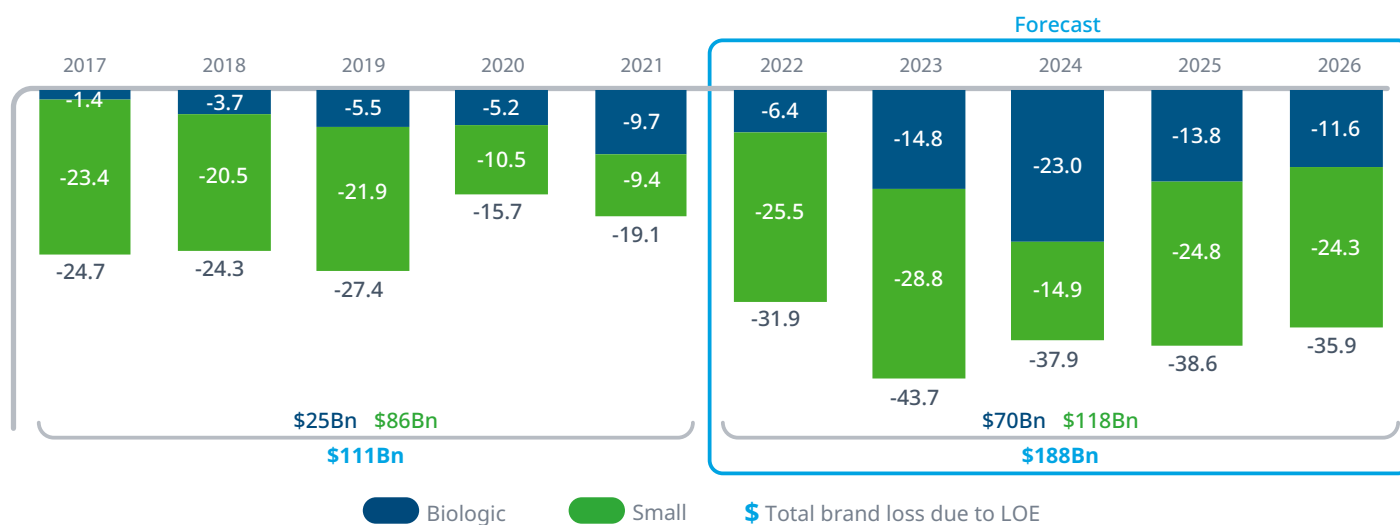Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Medicine spending on new branded products is the largest driver of increased spending growth globally and is expected to add $196 billion to spending over the next five years, up from $161 billion in the last five years.

- Annual average spending for new brands is expected to increase compared to the last five years as the outlook includes fewer of the low years from the COVID-19 pandemic.

- Over the next five years, an average of 54-63 new active substances (NAS) are expected to launch globally per year, totaling 290-315 over five years.

- In the past five years, there were an average of 63 NAS launches per year, including the past two years with unprecedented 79 NAS launches each and totaling 316 over five years.

- The past five and next five years represent a historic increase over 2012-2016, when it was 219.

- The continuing increases in the numbers of actively researched compounds is expected to contribute a rising number of new medicines, albeit a group of products becoming more specialty, niche and related to rare diseases.

- The combination of payer concerns about spending trends in the post-COVID environment and the types of products launching will result in trends to lower spending per launch generally with some outlier products with much higher spending.

Notes: Developed markets include: U.S., Japan, Germany, France, Italy, UK, Spain, Canada, S. Korea, Australia. New brands defined as those launched less than two years previously, measured separately in each country and can reflect launches of the same products at different times. Number of New Active Substances (NAS) per year reflect launches rather than approvals as there can be a lag between approval and launch. *NAS launches in 2021 Estimated based on YTD Sep 2021.

The impact of exclusivity losses will increase to $188Bn overthe next 5 years with a large increase in the impact of biosimilars

Exhibit 37: Developed markets impact of brand losses of exclusivity 2017–2026, US$Bn

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Biologic	-1.4	-3.7	-5.5	-5.2	-9.7	-6.4	-14.8	-23.0	-13.8	-11.6
Small	-23.4	-20.5	-21.9	-10.5	-9.4	-25.5	-28.8	-14.9	-24.8	-24.3
Total brand loss due to LOE	-24.7	-24.3	-27.4	-15.7	-19.1	-31.9	-43.7	-37.9	-38.6	-35.9

2017–2021: $25Bn $86Bn — $111Bn

Forecast 2022–2026: $70Bn $118Bn — $188Bn

● Biologic ● Small $ Total brand loss due to LOE

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- The ongoing flow of innovation and the savings as those medicines face competition and become cheaper a decade or more after their launch has continued to reward innovators and generate savings.

- In the last five years, losses of exclusivity resulted in $111 billion in lower brand spending as relatively few of the largest-selling products faced LOE, in contrast to the next five years, which are expected to generate $188 billion in lower brand spending including biosimilars.

- With the loss of exclusivity for some of the major products, led by adalimumab (Humira), ustekinumab (Stelara), and rivaroxaban (Xarelto), the lower brand spending offset by spending on associated generics and biosimilars will generate significant savings to healthcare systems and patients in the next five years

- In the next five years to 2026, biologics are expected to lose exclusivity and result in $70 billion lower brand spending, compared to an impact of $25 billion in the past five years.

- Small molecules by contrast lost $86 billion in the past five years and are projected to lose $118 billion through 2026.

Notes: Does not reflect offsetting spending increases from generic or biosimilar competitors. Losses in future periods are modeled based on expected pre-expiry growth for the brand and subsequent post-expiry loss of sales for the brands. The rates of loss are based on historic averages in each country and inclusive of adjustments for products with expiries in progress from historic periods where losses extend into the forecast periods. Historic period analyses are based on audited data. Expected loss of exclusivity dates are highly variable and can change due to outcomes of litigation, granting of new patents or changes in the expectation of launch of biosimilars. Information is current as of September 2021.

Global biotech spending to exceed $620Bn by 2026, with growth slowing to 9-12% from biosimilar savings

Exhibit 38: Global biotech spending and growth
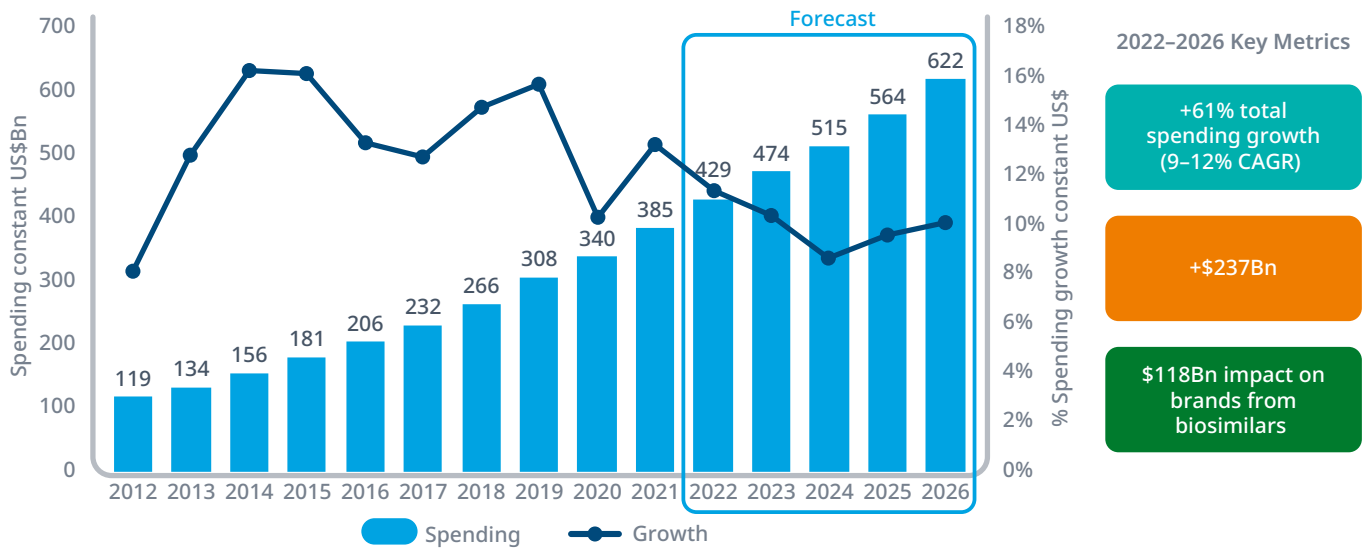
Source: IQVIA Institute, Nov 2021

- Global spending on biotech drugs – those created through recombinant DNA technology – are expected to reach $620 billion by 2026, over 1/3rd of global medicine spending.

- Spending growth is expected to slow significantly in the next five years from the impact of key biosimilars, especially in developed markets, but will remain robust through the continued flow of new medicines.

- Biotech drugs will see a 61% aggregate increase over five years with a 9-12% CAGR through 2026, adding $237 billion over the period globally.

- And this growth will occur despite brand losses of $118 billion due to biosimilars in the five years to 2026.

Global savings from biosimilars will have a significant impact on country medicine spending through 2026

Exhibit 39: Global savings from biosimilars 2021–2026
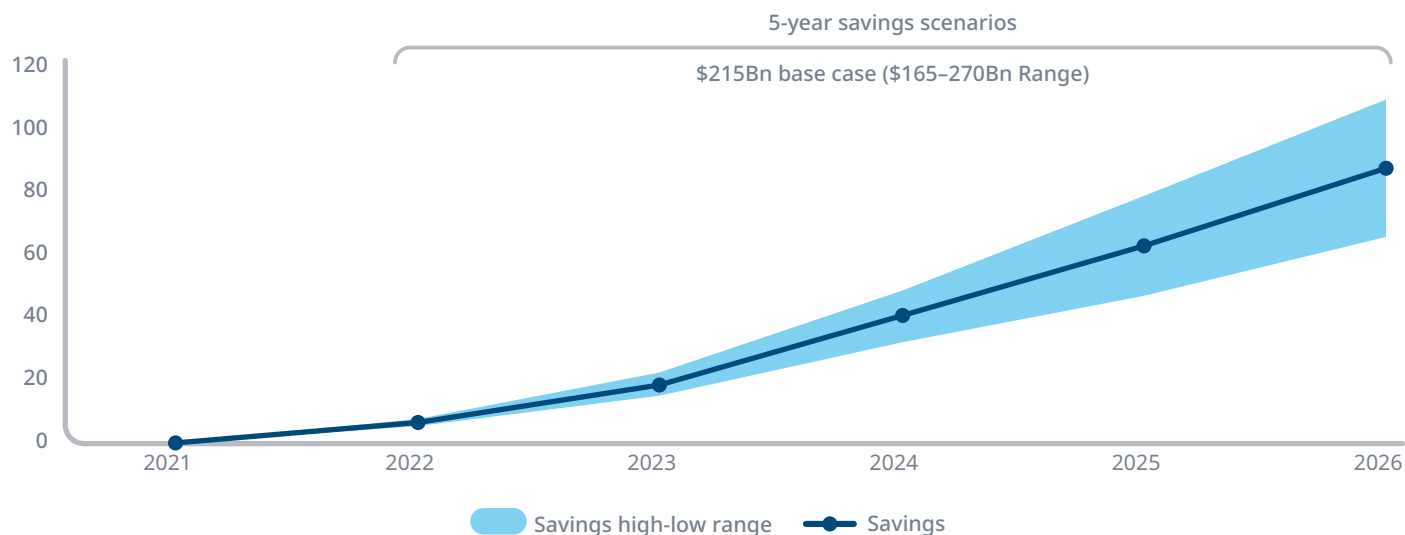
Source: IQVIA Market Prognosis, Sep 2020; IQVIA Institute Mar 2021

- Incremental savings from biosimilars are expected to be a cumulative $215 billion globally from 2021 to 2026.

- Annual savings could exceed $100 billion in 2026 as some of the largest spending biologic molecules will face biosimilar competition during this period.

- This level of savings will also likely mean the opening of access to relevant biologic medicines to more people globally, as costs of treating patients for cancer or auto-immune disorders are reduced to affordable levels for patients or governments across all countries.

- As a result of bevacizumab biosimilar availability, the National Institute for Health and Care Excellence (NICE) has recommended wider use of the medicine

in England and Wales, expanding access to an already widely recommended cancer therapy.

- Incremental usage of biologic therapies has been observed in periods after biosimilar entry and this is expected to be particularly important in lower income countries, but the largest savings will still be focused in developed markets, which already have very high levels of usage of and spending on the originator versions of these medicines.

- Key upcoming biosimilars are expected to reach patients throughout the next five years, but particularly notable is autoimmune therapy adalimumab, currently the world's leading medicine by spending.

Notes: Savings estimated by calculating spending in a scenario where historic trends continue and compared to modeled impact of brand losses of exclusivity and biosimilar uptake. Range reflects uncertainty of the level of uptake, price deflation, and incremental volume after LOE. Modeling includes the impact in the 5-year period of savings from earlier biosimilar introductions.

Medicine spending and growth by product type varies by region

**Exhibit 40: Global medicine spending and growth by product type**

		ORIGINAL BRANDS	NON-ORIGINAL BRANDS	UNBRANDED GENERICS	OTHER	TOTAL
Spending 2021 US$	**Global**	**889.6**	**247.0**	**154.0**	**133.0**	**1,423.5**
	Developed	776.8	114.1	106.6	52.8	1,050.4
	10 Developed	708.3	88.5	96.6	41.8	935.2
	Other developed	68.5	25.6	10.0	11.0	115.2
	Pharmerging	106.2	123.7	46.2	78.1	354.2
	Lower income countries	6.6	9.2	1.2	2.0	19.0
Constant dollar CAGR 2017–2021	**Global**	5.7%	5.9%	1.9%	3.6%	5.1%
	Developed	5.1%	6.3%	-0.9%	1.1%	4.3%
	10 Developed	5.2%	6.6%	-1.4%	0.6%	4.3%
	Other developed	4.8%	5.3%	4.5%	3.2%	4.7%
	Pharmerging	10.9%	6.0%	10.9%	5.5%	7.8%
	Lower income countries	-2.0%	0.8%	2.6%	3.2%	0.1%
Spending 2026 US$	**Global**	**$1,110–1,140**	**$300–330**	**$155–175**	**$147–167**	**$1,750–1,780**
	Developed	$940–970	$136–156	$93–113	$54–58	$1,240–1,270
	10 Developed	$855–885	$104–124	$81–101	$40–44	$1,100–1,130
	Other developed	$75–95	$30–34	$10–14	$12–16	$132–152
	Pharmerging	$153–173	$150–170	$59–63	$89–109	$470–500
	Lower income countries	$7–9	$9–13	$1-2	$1–5	$21–25
Constant dollar CAGR 2022–2026	**Global**	3.5–6.5%	3.5–6.5%	0–3%	2–5%	3–6%
	Developed	2.5–5.5%	3.5–6.5%	-2–1%	-0.5–2.5%	2–5%
	10 Developed	2.5–5.5%	3.5–6.5%	-2.5–0.5%	-1.5–1.5%	2–5%
	Other developed	3–6%	3–6%	2–5%	3–6%	3–6%
	Pharmerging	7.5–10.5%	4–7%	4–7%	3.5–6.5%	5–8%
	Lower income countries	2–5%	3–6%	3.5–6.5%	3–7%	2.5–5.5%

Source: IQVIA Market Prognosis, Sep 2021; IQVIA Institute, Nov 2021

- Developed countries typically have higher shares from original branded products but vary to the degree they shift usage to generics or non-original products after patent expiry, contributing to differences in spending share for originators, including those that are off-patent.

- Pharmerging and lower income countries have much lower shares of spending from originator products with a greater focus on either generics or non-original branded products, and all products typically have lower prices.

Specialty medicines will represent about 45% of global spending in 2026 and almost 60% of total spending in developed markets

Exhibit 41: Specialty medicines share of spending

Forecast

- 10 developed
- Other developed
- Pharmerging
- Global
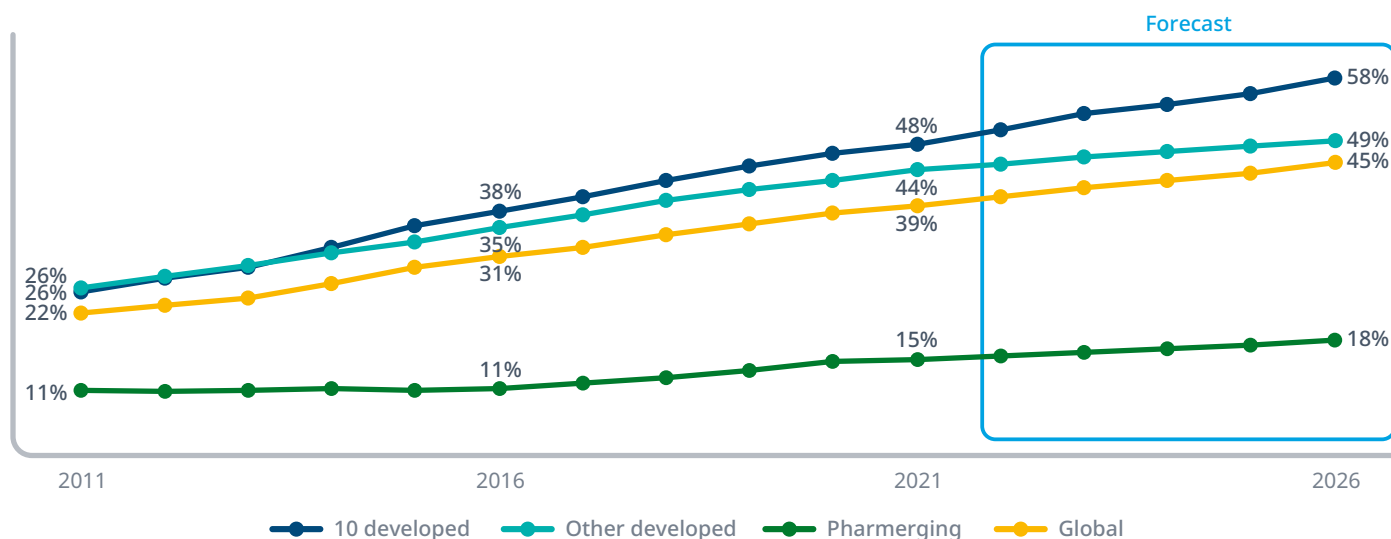
Source: IQVIA Institute, Nov 2021

- Specialty medicines have been increasing as a share of spending in higher-income countries, such as the 10 largest developed countries and other high and upper-middle income countries, where they have reached 48% and 39% respectively in 2021, up from 26% and 22% 10 years earlier.

- Pharmerging countries have fallen behind largely due to cost and had 15% of spending in 2021 on specialty medicines, rising to 18% in 2026.

- Globally, specialty medicines will be 45% of global spending by 2026, with more than half of spending on these product in major developed markets.

- Specialty medicines are those which treat chronic, complex and rare diseases, and while they have a range of characteristics — including the complexity of disease management or distribution — the most-commonly noted attribute is that they are more expensive than other more traditional medicines.

- As specialty medicine share of spending increases, it is notable that they treat only 2–3% of patients. While the unmet needs of these few patients are being addressed, by contrast other patients getting traditional therapies are seeing their costs decline.

Notes: For details on specialty medicine definition, see the methodology and definitions section.

Key therapy areas

- The two leading global therapy areas — oncology and immunology — are forecast to grow 9–12% and 6–9% CAGR, respectively, through 2026.

- Oncology is projected to add 100 new treatments over five years, contributing to an increase in spending of $119 billion to a total of more than $300 billion in 2026.

- Diabetes spending growth is slowing to low single-digits in most developed markets and declining in some, especially net of rebates.

- Treatments for autoimmune disorders are forecast to reach $178 billion globally by 2026, driven by steadily increasing numbers of treated patients and new products, and offset after 2023 due to biosimilars.

- New therapies contribute to rapid acceleration of neurology markets, including greater use of novel migraine therapies, potential treatments for rare diseases, and the potential for therapies for Alzheimer's and Parkinson's.

- The outlook for next-generation biotherapeutics includes significantly uncertain clinical and commercial prospects for cell, gene and RNA therapies, which will grow to $20 billion in spending by 2026.
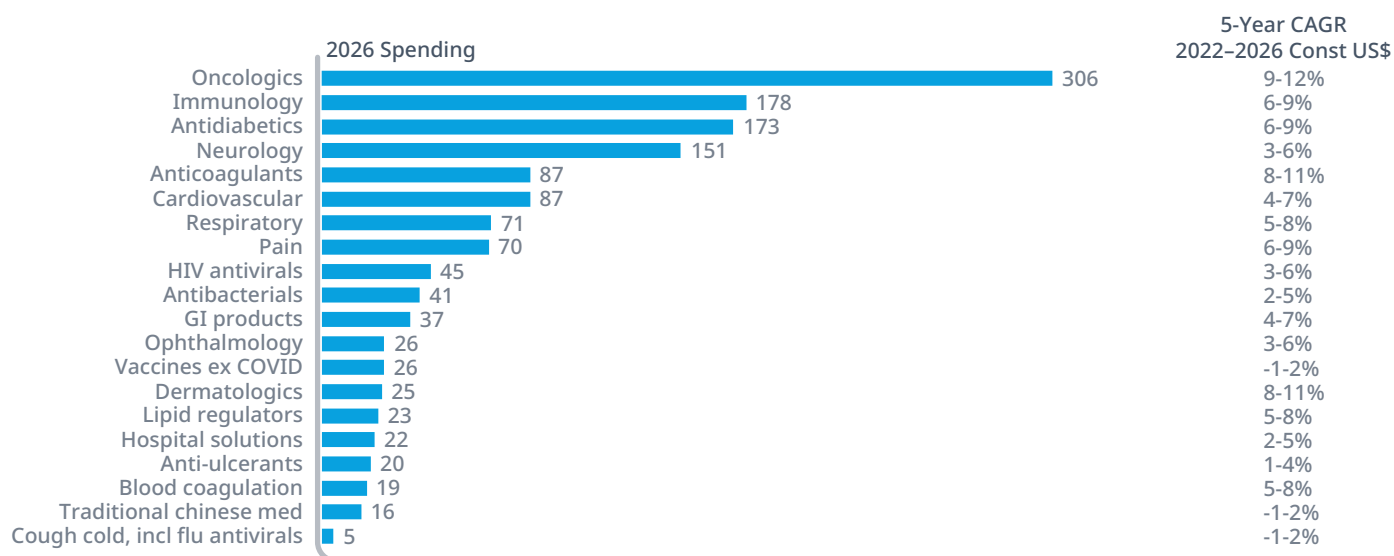
While COVID-19 has garnered the most attention in the two years, the vast majority of patients with other diseases will need to work around social disruptions to receive care. Major advances are expected to continue, especially in oncology, immunology and neurology.

Oncology and neurology lead growth while immunology slows due to biosimilars

Exhibit 42: Top 20 therapy areas in 2026 in terms of global spending with forecast 5-year CAGRs, const $US

| Therapy area	2026 Spending	5-Year CAGR 2022–2026 Const US$
Oncologics	306	9-12%
Immunology	178	6-9%
Antidiabetics	173	6-9%
Neurology	151	3-6%
Anticoagulants	87	8-11%
Cardiovascular	87	4-7%
Respiratory	71	5-8%
Pain	70	6-9%
HIV antivirals	45	3-6%
Antibacterials	41	2-5%
GI products	37	4-7%
Ophthalmology	26	3-6%
Vaccines ex COVID	26	-1-2%
Dermatologics	25	8-11%
Lipid regulators	23	5-8%
Hospital solutions	22	2-5%
Anti-ulcerants	20	1-4%
Blood coagulation	19	5-8%
Traditional chinese med	16	-1-2%
Cough cold, incl flu antivirals	5	-1-2%

Source: IQVIA Institute, Nov 2021

- The therapy areas with the highest forecast spending in 2026 are oncology, immunology, and anti-diabetics, followed by neurology.

- Oncology is expected to grow 9–12% CAGR through to 2026 as novel treatments continue to be launched for the treatment of cancer.

- Immunology is expected to grow slowly in the range of 6-9% due to the launch of biosimilars. While several biosimilars are already launched in Europe, leading to slow growth of immunology segment, the launch of adalimumab biosimilar in 2023 in the U.S. is further expected to impact growth.

- With nearly $170 billion by 2026, diabetes is expected to be the third largest therapy area globally, with growth estimated to be 6-9% over the next five years.

- Neurology is expected to be grow by 3–6% crossing, $150 billion in 2026, including strong growth from migraine and Alzheimer's therapies.

- Anti-coagulants and dermatologics are expected to be the fastest growing therapy areas, with a rate of 8–11% over the next five years.

Notes: Oncology includes therapeutic oncology only and not supportive care. Immunology includes small molecule and biologic treatments for a range of diseases as noted. Neurology includes central nervous system disorder treatments and mental health treatments but does not include pain management or anesthesia. Pain includes narcotic and non-narcotic analgesics, muscle relaxants and migraine treatments. Cardiovascular includes hypertension and other cardiovascular treatments with the exception of lipid regulators, which are shown separately.

Oncology, immunology and diabetes growth to slow over the next 5 years while innovation lifts neurology

Exhibit 43: Global historic and forecast growth for top 20 therapy areas
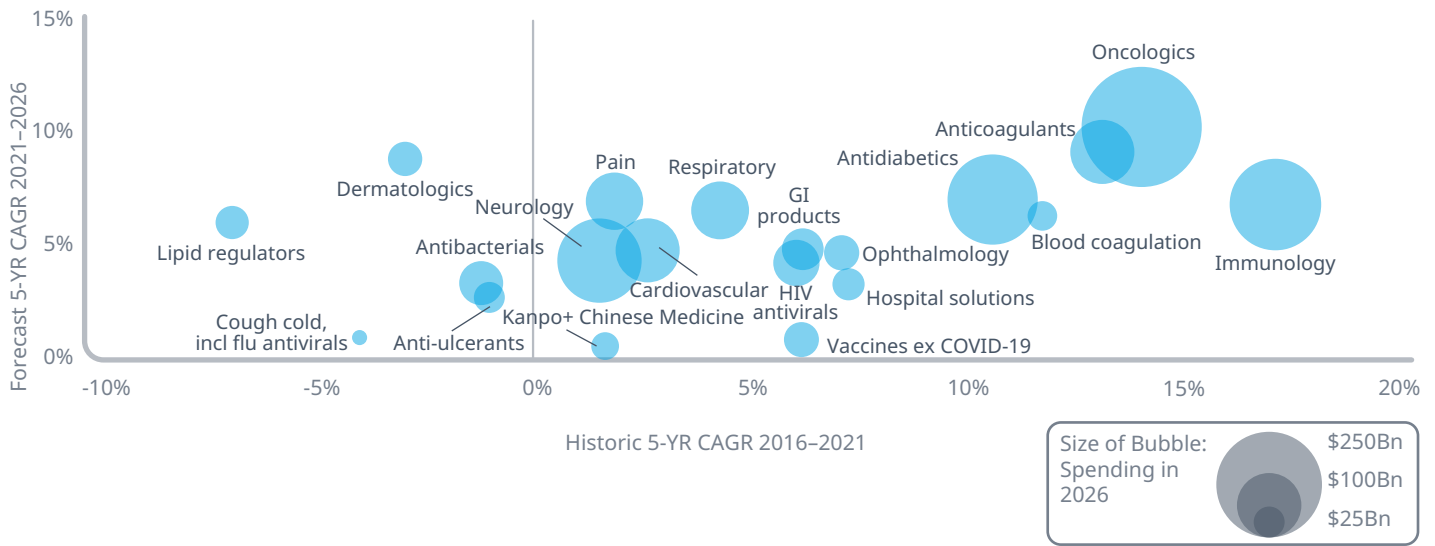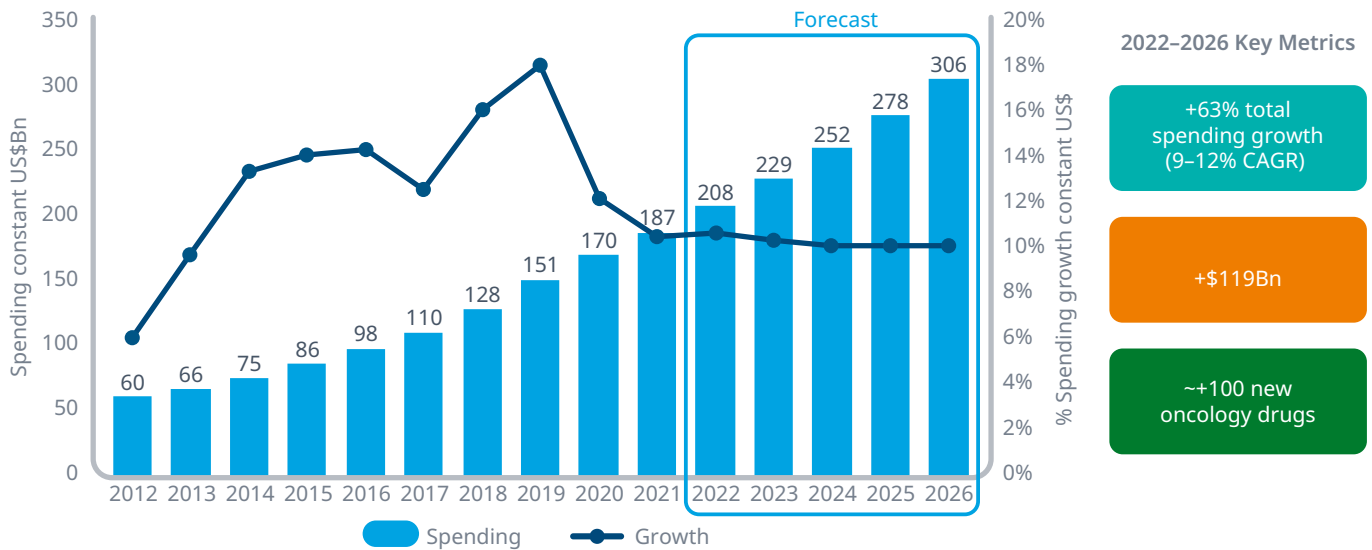

Source: IQVIA Institute, Nov 2021

- The biggest contributors to the growth in the next five years are oncologics, immunology, anti-diabetics and neurology — the growth being a result of continuous influx of innovative products and offset by exclusivity losses.

- Many therapy areas are expected to grow more slowly in the next five years than in the past five, with notable exceptions in neurology driven by rare diseases and Alzheimers. Pain, including migraine treatments, is expected to grow 6–9% through 2026.

- Lipid regulators, which have been declining steadily since leading product expiries a decade ago, are expected to return to growth, with new therapies for some patients.

Notes: Bubble Size represents forecast in 2026; COVID Vaccine and therapeutics are not included; Oncology includes therapeutic oncology only and not supportive care. Immunology includes small molecule and biologic treatments for a range of diseases as noted. Neurology includes central nervous system disorder treatments and mental health treatments but does not include pain management or anesthesia. Pain includes narcotic and non-narcotic analgesics, muscle relaxants and migraine treatments. Cardiovascular includes hypertension and other cardiovascular treatments with the exception of lipid regulators, which are shown separately.

Global oncology spending to exceed $300 billion by 2026, with growth slowing to 10% from biosimilar savings

Exhibit 44: Global oncology spending and growth

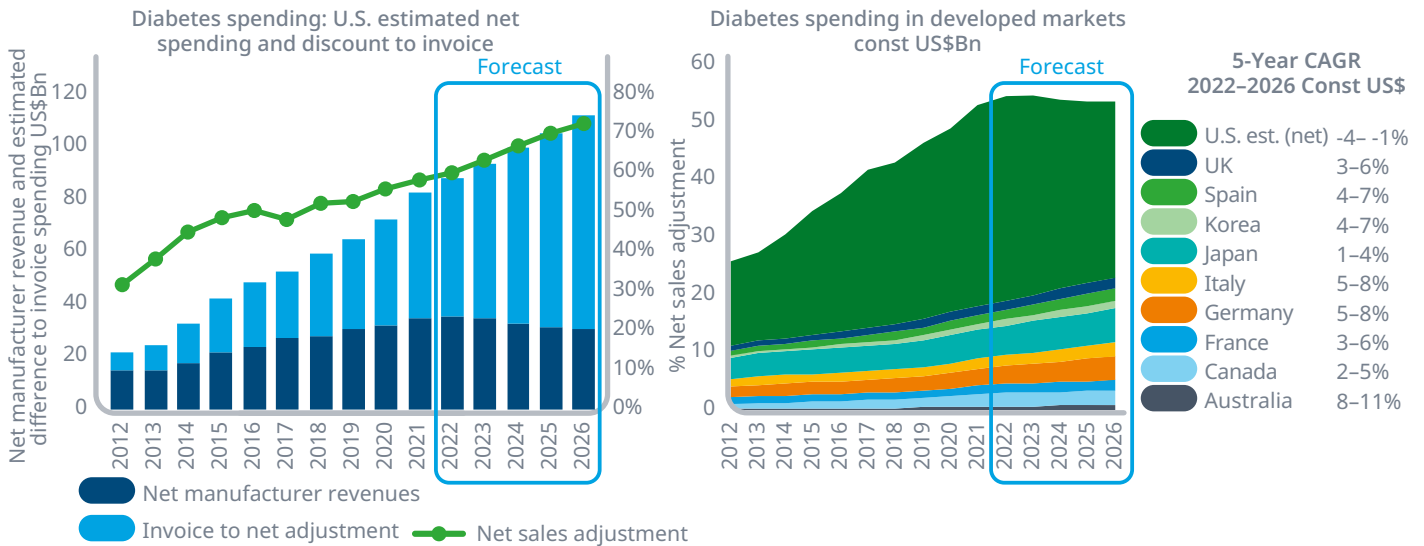Source: IQVIA Institute, Nov 2021

- Global oncology spending is expected to grow slowly at a rate of 9–12% through 2026 as new medicines are offset by losses of exclusivity.

- Oncology spending is expected to increase by 63% over the next five years, adding $119 billion in spending by 2026.

- The increase in oncology spending is expected to be driven by early diagnosis of patients, continued introduction of new drugs, and wider access to novel cancer drugs in more countries beyond the major developed countries where they often launch first.

- The current oncology pipeline is expected to add more than 100 new drugs in the next five years ,which includes innovative treatment through cell therapy,

RNA therapy, and immuno-oncology treatments – including those that are mutation-specific and thus tumor-agnostic.

- Increasing adoption of precision medicine for cancer treatment includes a range of therapies from those where treatment is determined with biomarker testing or next-generation sequencing, as well as CAR T-cell therapies which are prepared for each patient individually.

- The introduction of biosimilars for bevacizumab, trastuzumab and rituximab in in the past five years in major markets has contributed significantly to the slowing growth seen in 2020 and 2021, and a continuing flow of losses of exclusivity will be a factor offsetting innovation-driven growth through 2026.

Notes: Oncology includes therapeutics only, excluding supportive care treatments.

Diabetes spending growth remains in low single-digits in most developed markets and declining on net basis in the U.S.

Exhibit 45: Diabetes spending and growth

Diabetes spending: U.S. estimated net spending and discount to invoice

Net manufacturer revenue and estimated difference to invoice spending US$Bn

% Net sales adjustment

Forecast

- Net manufacturer revenues
- Invoice to net adjustment
- Net sales adjustment

Diabetes spending in developed markets const US$Bn

Forecast

|	5-Year CAGR 2022–2026 Const US$
U.S. est. (net)	-4– -1%
UK	3–6%
Spain	4–7%
Korea	4–7%
Japan	1–4%
Italy	5–8%
Germany	5–8%
France	3–6%
Canada	2–5%
Australia	8–11%

Source: IQVIA Institute, Nov 2021

- Diabetes spending in developed markets reflects both the consistent use of older therapies as patients' type 2 disease progresses, and the adoption of novel therapies later in the treatment pathway.

- The key element in assessing trends in diabetes is that net revenue is currently 58% lower than invoice level, with that percentage projected to reach 73% lower than invoice by 2026.

- This impact of off-invoice discounts and rebates is far higher than other therapy areas in the U.S. or than is expected in other countries.

- The estimate of U.S. net spending provides a more comparable trend to the other developed markets and embeds the significant impacts in recent years and projected to 2026 from rising discounts and rebates.

Notes: Estimates of U.S. net manufacturer revenues based on comparisons of IQVIA audits to company-reported net spending in the U.S. (see methodology). Ex-U.S. spending has not been adjusted to an estimate of net level as company net spending is not reported on a country-by-country basis and estimates can only be based on less reliable methods.

Immunology spending growth to slow to 6-9% through 2026 from biosimilar impact as volume growth continues at 12% annually
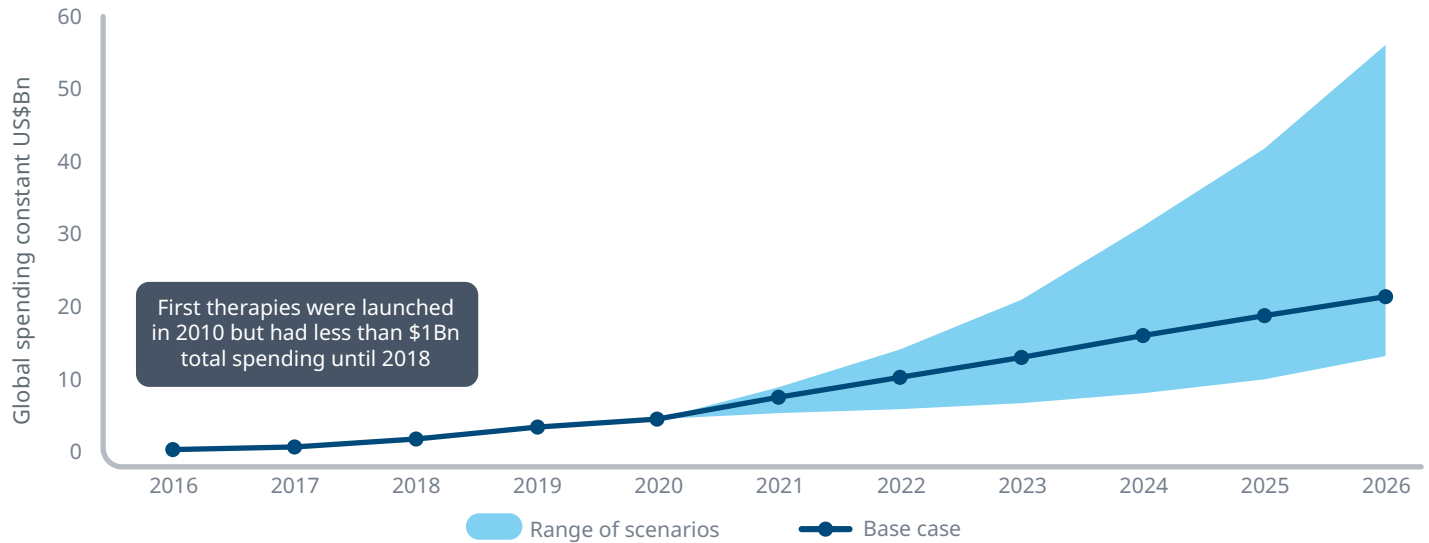
Exhibit 46: Global immunology spending and growth
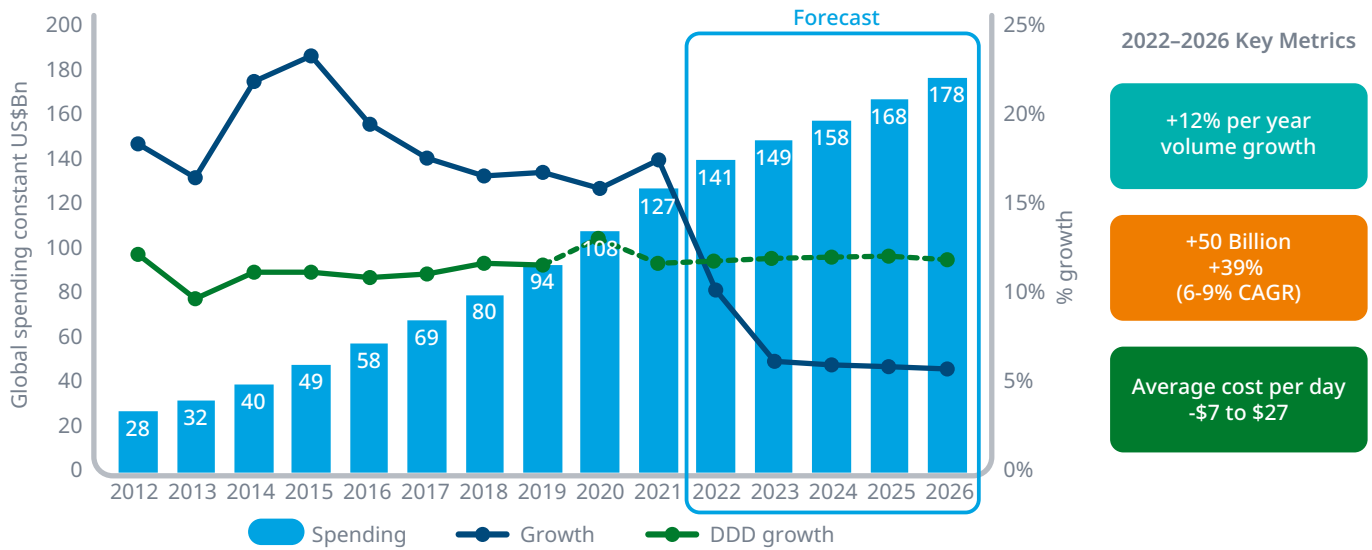
Source: IQVIA Institute, Nov 2021

- Immunology is expected to grow by 39% by 2026, adding $50 billion in spending with growth offset by the impact of biosimilars. Immunology spending is expected to grow at a rate of 6–9% CAGR through 2026 to reach $178 billion globally.

- New products in psoriasis, atopic dermatitis, and severe asthma have driven spending growth in recent years and are expected to continue, while biosimilar impact will slow growth in the forecast years from 2023 to 2026.

- In many developed markets, more than half of current immunology spending is expected to face generic or biosimilar competition due to brand losses of exclusivity in the next five years.

- During this same period, the average cost of a day of therapy is expected to decline to $27, driven by the introduction of biosimilar adalimumab (Humira) in the U.S. in 2023, and likely to decline further in the years that follow.

- Immunology treatments have consistently been driven by increasing volume, averaging 12% volume growth in standardized days of therapy, projected to continue through 2026.

Notes: Immunology includes small molecule and biologic treatments for a range of diseases including rheumatoid arthritis, crohn's disease, ulcerative colitis, lupus erythematosus, psoriasis, atopic dermatitis. Defined daily doses (DDD) are based on WHO definitions where each medicine is assigned a volume of medicine per day (see definitions & methodology). Cost per day is defined as total sales per total DDD; spending/estimated days of therapy does not reflect actual cost or patient out of pocket costs

The outlook for next-generation biotherapeutics includes significantly uncertain clinical and commercial successes

Exhibit 47: Cell, gene and RNA therapeutics

First therapies were launched in 2010 but had less than $1Bn total spending until 2018

Global spending constant US$Bn

Range of scenarios — Base case

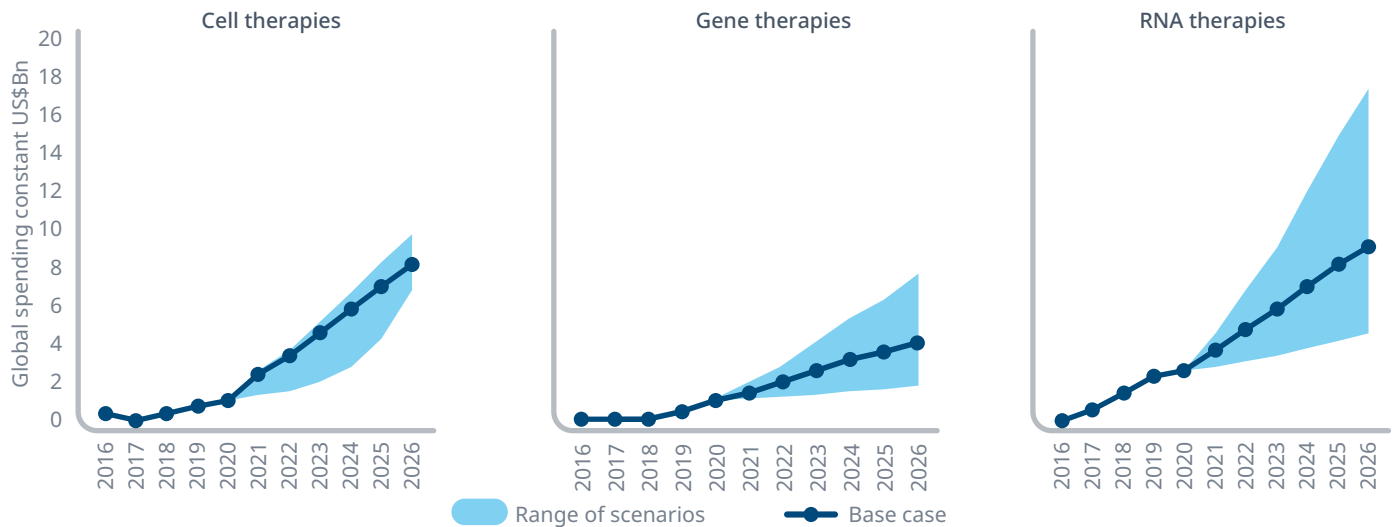Source: Company Financials; IQVIA Institute Nov 2021

- In addition to the 30 cell, gene or RNA-based therapies launched globally to-date, an additional 55–65 are expected to be launched by 2026, with a dozen new per year on average, up from the average of three per year in the past five years.

- While there is considerable R&D activity related to these mechanisms of action, there remains significant uncertainty about the emergence of safety risks and the pace of clinical trials and regulatory reviews.

- Total global spending to date has reached $5 billion and is expected to rise to $20 billion by 2026, but with the potential for both higher or lower scenarios.

- Usage of these medicines and the associated spending to-date has been relatively limited for most of the products, with a few driving larger amounts of spending, as they have been in very rare diseases.

- Many of these therapies have very high costs which, combined with uncertain numbers of patients, is generating significant attention and resistance from payers, and dampens expected spending levels in the lower end of expectations.

- Health technology assessments (HTAs) are likely to limit access and/or prices especially in Europe, while clinical complexity is likely to limit adoption of cell and gene therapies to highly specialized clinics or hospitals in developed markets.

- Even considering the large number of these products, they are not expected to be more than 20% of the estimated 300 new drugs launched in the period and are expected to be less than 10% of the spending on new drugs in the next five years in the base case.

Notes: Spending estimates based on company financials and IQVIA audited data to address potential underreporting of therapies with unique distribution methods. RNA excludes mRNA vaccines

Cell and gene therapies have differing spending outlook and large uncertainties while RNA therapies have largest potential

Exhibit 48: Cell, gene and RNA therapeutics

Source: Company Financials; IQVIA Institute Nov 2021

- While the expectations vary by type of drug within these next-generation biotherapeutics, generally the expectation is that spending will rise from the current $5 billion globally to approximately $20 billion by 2026, with more of the spending in cell and RNA therapies and slightly less for gene therapies.

- The continued flow of new therapies of all three types, combined with relatively slow uptake of approved drugs, are market characteristics that are expected to continue. These products will see market access limitations across geographies, with spending and usage mostly limited to major developed markets.

- Lower uptake, likely due to more limited reimbursement, could result in lower levels or delayed usage and spending, and result in more risk-sharing agreements, outcomes-based contracts or other negotiated price concessions.

- Alternatively, accelerated trends could result from demonstration of significant clinical benefits, evolving comfort with complex logistics for cell and gene therapies.

- The uncertainties in this area are related to the potential improved performance of already marketed therapies, the still uncertain outcomes of ongoing research, and the reactions of payers to a significant bolus of approvals in these areas.

Notes: Spending estimates based on company financials and IQVIA audited data to address potential underreporting of therapies with unique distribution methods. RNA excludes mRNA vaccines

New therapies in rare neurological disorders, Alzheimer's, and migraine are expected to drive spending growth in neurology

Exhibit 49: Leading CNS disorders global market growth dynamics
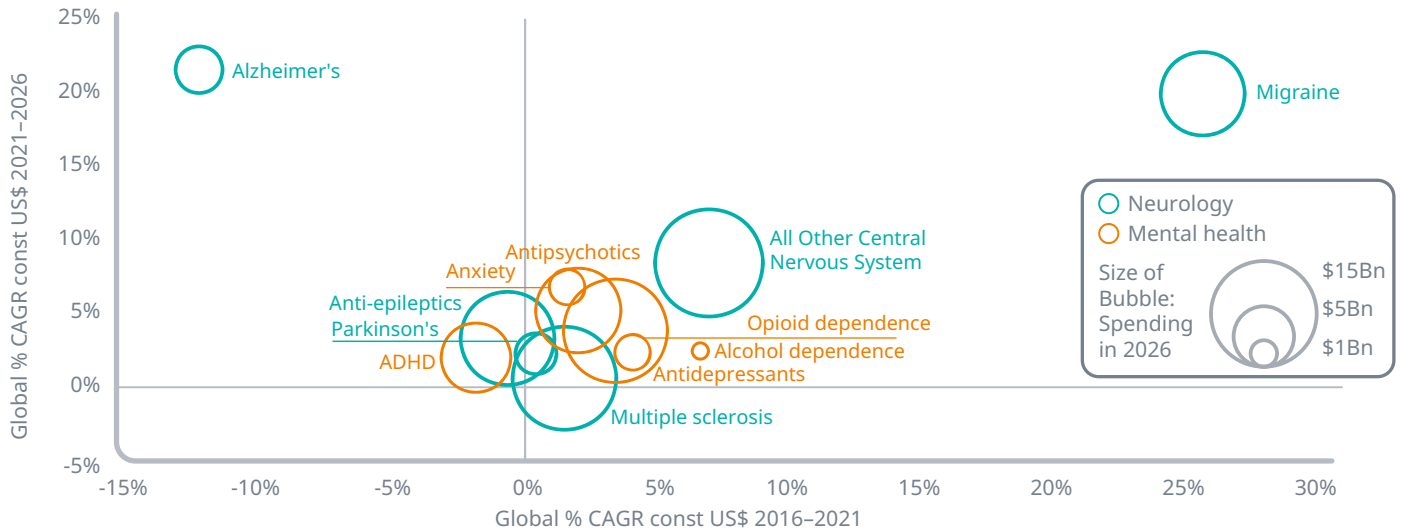
Source: IQVIA Institute, Nov 2021

- In the last five years, a new wave of rare disease neurological treatments, including dozens with orphan designations, have been approved. Other diseases with larger populations such as migraine, depression and anxiety have also seen a range of new treatments approved and launched.

- Expected spending growth in mental health areas is generally lower than in neurology treatments but both reflect levels of innovation for unmet needs across these diseases.

- New mental health treatments are generally focused on specific subsets of patients, and older established therapies continue to be used for most patients.

- Migraine treatments have seen significant shifts with the introduction of CGRP inhibitors and these are expected to continue to drive growth through the forecast period.

- The historic lack disease-modifying treatments in Alzheimer's and Parkinson's may begin to be addressed with new approvals, including adacanumab (Aduhelm), which launched in 2021.

- Recent scientific advances in genomics, biomarkers, diagnostics, and imaging techniques and/or regenerative medicine, combined with the emergence of disruptive digital technologies, are changing the fundamentals of CNS innovation.

Notes: Migraine therapies are included in this analysis while otherwise indicated as pain management in this report.

Notes on sources

THIS REPORT IS BASED ON THE IQVIA SERVICES DETAILED BELOW

MIDAS® is a unique platform for assessing worldwide healthcare markets. It integrates IQVIA's national audits into a globally consistent view of the pharmaceutical market, tracking virtually every product in hundreds of therapeutic classes, and provides estimated product volumes, trends and market share through retail and non-retail channels. MIDAS data is updated monthly and retains 12 years of history.

IQVIA™ MARKET PROGNOSIS is a comprehensive, strategic market forecasting publication that provides decision-makers with insights on the drivers and constraints of healthcare and pharmaceutical market growth. This includes political and economic developments, alongside dynamics in healthcare provision, cost containment, pricing and reimbursement, regulatory affairs, and the operating environment for pharmaceutical companies. Market Prognosis contains economic forecasts from the Economist Intelligence Unit and delivers in-depth analysis at a global, regional and country level, and analyzes dynamics at distribution channel, market segment and therapy class levels.

Definitions and methodologies ⎯⎯⎯⎯⎯⎯ + ⎯⎯

ESTIMATES OF NET MANUFACTURER REVENUE AND PRICES

IQVIA audits reflect invoice-based pricing derived from proprietary information gathered from wholesalers and company direct sales. While IQVIA invoice prices reflect supply-chain price concessions, they do not reflect the off-invoice discounts and rebates separately paid to insurers, or other price concessions paid to patients or other health system participants. Estimates of net manufacturer revenue and prices are based on a sample of companies and products where details are reported to the U.S. Securities and Exchange Commission (SEC) and where the volume of sales captured in IQVIA audits is consistent with information provided directly by manufacturers in support of IQVIA proprietary datasets. Net prices are calculated by dividing publicly-reported net sales values by volumes for the same products reported to IQVIA. Estimated brand net price growth for the total market is projected from the analysis sample to the total market. Net prices represent an estimate of the average manufacturer realized price, reflecting any reductions in net revenues due to off-invoice discounts, rebates, co-pay assistance, or other price concessions, and do not necessarily reflect the net costs paid by insurers, the federal government or patients, which all vary significantly and independently.

NEW ACTIVE SUBSTANCES (NAS):

Medicines are considered a NAS if at least one active ingredient has not been previously marketed globally.

SPECIALTY PHARMACEUTICALS:

specialty medicines as those that treat chronic, complex or rare diseases, and that have a minimum of four out of seven additional characteristics related to the distribution, care delivery and/or cost of the medicines.

Chronic diseases are long-lasting and often without direct cure, and treatments are intended to be used for more than six months.

Complex diseases have both environmental and genetic components, meaning they may be hereditary and/or exacerbated by environmental factors (e.g., obesity, diet, etc.). Complex diseases can affect multiple organ systems and may be caused or be the cause of secondary diseases (e.g., diabetes can cause renal failure such that both are considered complex diseases).

Rare diseases are defined as those with fewer than 200,000 new cases annually, equivalent to the U.S. definition of orphan diseases, but not exclusively linked to the granting of an FDA orphan drug designation.

Additional product characteristics, where a product must exhibit four of the seven to be considered specialty are:

- Costly: list price is in excess of $6,000 per year

- Initiated/maintained by a specialist

- Requiring administration by another individual or healthcare professional (i.e., not self-administered)

- Requiring special handling in the supply chain (e.g., refrigerated, frozen, chemo precautions, biohazard)

- Requiring patient payment assistance

- Distributed through non-traditional channels (e.g., specialty pharmacy)

- Medication has significant side-effects that require additional monitoring/counselling (including, but not limited to, REMS programs) and/or disease requires additional monitoring of therapy (e.g., monitoring of blood/cell counts to assess effectiveness/side effects of therapy).

Definitions and methodologies

Developed markets are defined by IQVIA based on the World Bank's income definitions and include high and upper-middle income countries, with the exception of pharmerging markets. Within the developed markets are a subset focusing on the 10 largest countries with high incomes and with pharmaceutical spending greater than $10 billion. These countries are Australia, Canada, France, Germany, Italy, Japan, South Korea, Spain, the UK, and the U.S.

Pharmerging markets are defined as countries with per capita GDP less than $30,000/year and forecasted five-year aggregate pharma sales growth greater than $1 billion (absolute or rounded) in at least two forecasts. These countries are Argentina, Bangladesh, Brazil, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Mexico, Pakistan, Philippines, Poland, Romania, Russia, Saudi Arabia, South Africa, Taiwan, Turkey, Ukraine, and Vietnam.

Lower income countries includes lower-middle and low-income countries using the World Bank's bands, with the exception of pharmerging markets.

World Bank Income Bands such as high, upper middle, lower middle, and low are based on World Bank methodologies. For current World Bank classifications, see: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

Innovation Insights is IQVIA's proprietary product classification system, categorizing products as original brands, non-original brands, unbranded, OTC, or other on the basis of a selection of product attributes.

WHO-DDD - The World Health Organization (WHO) has developed a method of normalizing medicines of varying intended doses using a defined daily dose (WHO-DDD). The WHO-DDD measure is intended to represent a standard day of therapy for a maintenance dose of a chronic therapy. The WHO-DDD measure does not reflect actual treatment decisions and is not derived from distinct patients measured with anonymized data. The WHO-DDD guidance is provided online (see https://www.whocc.no/atc_ddd_index/) but does not include factors or guidance for all drug products. Distinct numeric factors are provided in relation to milligrams or international units (IU) depending on the medicine, or in terms of number of pills per day in the case of chronic medicines such as hypertension. WHO provides guiding principles for calculating DDDs for fixed-dose combination products. The IQVIA institute has developed additional factors using the same or highly similar concepts to represent more than 75% of audited standard unit volume globally. DDDs have been estimated for other products based on the standard unit to DDD ratios per product type and therapy area in each country, where specific DDD values have been determined. In unaudited countries, IQVIA Market Prognosis collates sales values from international trade data for the pharmaceutical sector. The IQVIA Institute has used audited data in geographically adjacent countries to infer various characteristics from this international trade data, including standard unit volumes. DDD in these countries has been estimated based on standard unit to DDD ratios in adjacent countries. DDDs in unaudited countries represent 5% of global estimated DDDs.

About the authors

MURRAY AITKEN
Executive Director, IQVIA Institute
for Human Data Science

MICHAEL KLEINROCK
Research Director, IQVIA Institute
for Human Data Science

Murray Aitken is Executive Director, IQVIA Institute for Human Data Science, which provides policy setters and decisionmakers in the global health sector with objective insights into healthcare dynamics. He led the IMS Institute for Healthcare Informatics, now the IQVIA Institute, since its inception in January 2011. Murray previously was Senior Vice President, Healthcare Insight, leading IMS Health's thought leadership initiatives worldwide. Before that, he served as Senior Vice President, Corporate Strategy, from 2004 to 2007. Murray joined IMS Health in 2001 with responsibility for developing the company's consulting and services businesses. Prior to IMS Health, Murray had a 14-year career with McKinsey & Company, where he was a leader in the Pharmaceutical and Medical Products practice from 1997 to 2001. Murray writes and speaks regularly on the challenges facing the healthcare industry. He is editor of Health IQ, a publication focused on the value of information in advancing evidence-based healthcare, and also serves on the editorial advisory board of Pharmaceutical Executive. Murray holds a Master of Commerce degree from the University of Auckland in New Zealand, and received an M.B.A. degree with distinction from Harvard University.

Michael Kleinrock serves as research director for the IQVIA Institute for Human Data Science, setting the research agenda for the Institute, leading the development of reports and projects focused on the current and future role of human data science in healthcare in the United States and globally. Kleinrock leads the research development included in Institute reports published throughout the year. The research is focused on advancing the understanding of healthcare and the complex systems and markets around the world that deliver it. Throughout his tenure at IMS Health, which began in 1999, he has held roles in customer service, marketing, product management, and in 2006 joined the Market Insights team, which is now the IQVIA Institute for Human Data Science. He holds a B.A. degree in History and Political Science from the University of Essex, Colchester, UK, and an M.A. in Journalism and Radio Production from Goldsmiths College, University of London, UK.

About the Institute

The IQVIA Institute for Human Data Science contributes to the advancement of human health globally through timely research, insightful analysis and scientific expertise applied to granular non-identified patient-level data.

Fulfilling an essential need within healthcare, the Institute delivers objective, relevant insights and research that accelerate understanding and innovation critical to sound decision making and improved human outcomes. With access to IQVIA's institutional knowledge, advanced analytics, technology and unparalleled data the Institute works in tandem with a broad set of healthcare stakeholders to drive a research agenda focused on Human Data Science including government agencies, academic institutions, the life sciences industry and payers.

Research Agenda
The research agenda for the Institute centers on five areas considered vital to contributing to the advancement of human health globally:

- Improving decision-making across health systems through the effective use of advanced analytics and methodologies applied to timely, relevant data.

- Addressing opportunities to improve clinical development productivity focused on innovative treatments that advance healthcare globally.

- Optimizing the performance of health systems by focusing on patient centricity, precision medicine and better understanding disease causes, treatment consequences and measures to improve quality and cost of healthcare delivered to patients.

- Understanding the future role for biopharmaceuticals in human health, market dynamics, and implications for manufacturers, public and private payers, providers, patients, pharmacists and distributors.

- Researching the role of technology in health system products, processes and delivery systems and the business and policy systems that drive innovation.

Guiding Principles
The Institute operates from a set of guiding principles:

- Healthcare solutions of the future require fact based scientific evidence, expert analysis of information, technology, ingenuity and a focus on individuals.

- Rigorous analysis must be applied to vast amounts of timely, high quality and relevant data to provide value and move healthcare forward.

- Collaboration across all stakeholders in the public and private sectors is critical to advancing healthcare solutions.

- Insights gained from information and analysis should be made widely available to healthcare stakeholders.

- Protecting individual privacy is essential, so research will be based on the use of non-identified patient information and provider information will be aggregated.

- Information will be used responsibly to advance research, inform discourse, achieve better healthcare and improve the health of all people.
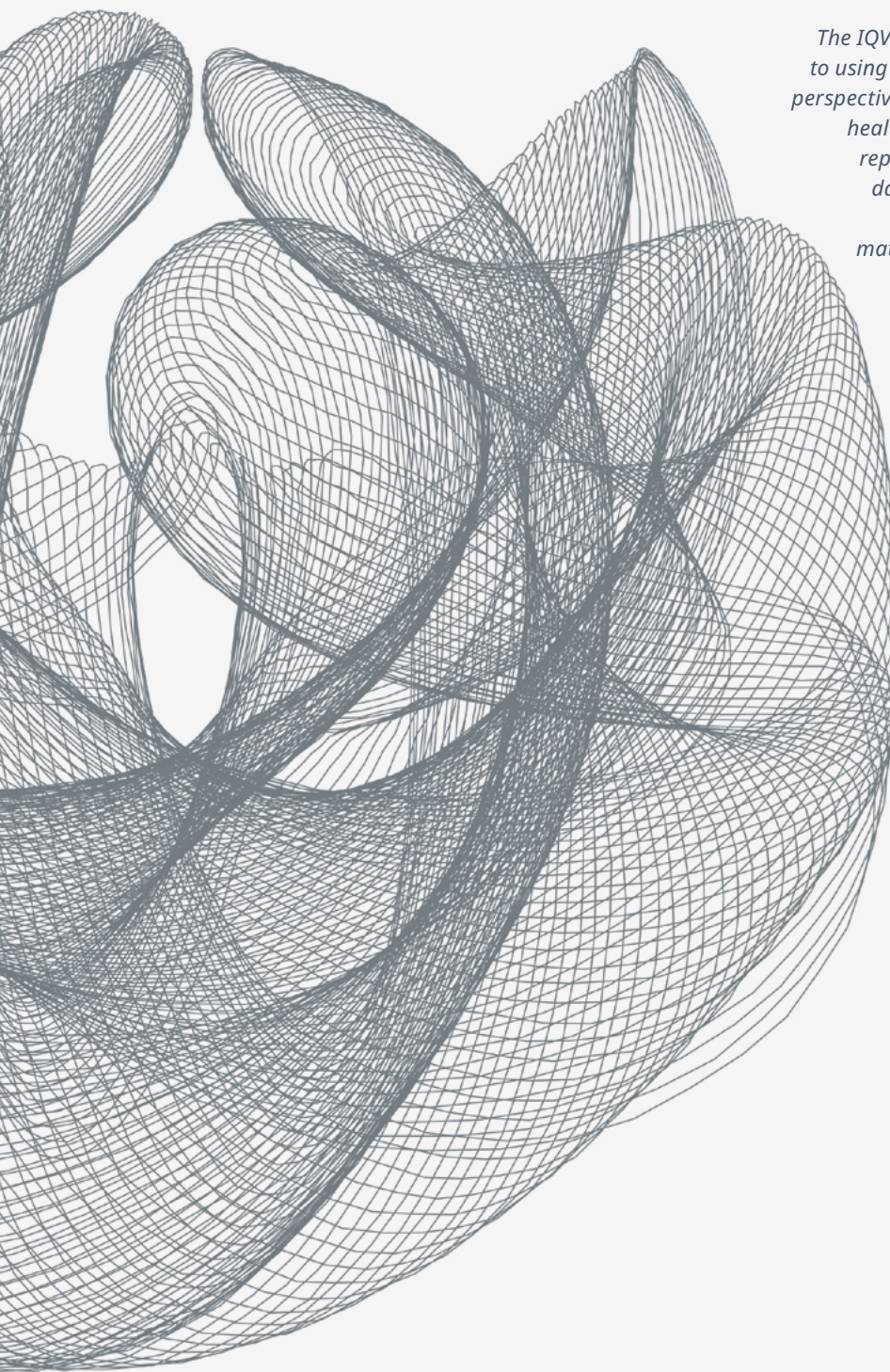
The IQVIA Institute for Human Data Science is committed to using human data science to provide timely, fact-based perspectives on the dynamics of health systems and human health around the world. The cover artwork is a visual representation of this mission. Using algorithms and data from the report itself, the final image presents a new perspective on the complexity, beauty and mathematics of human data science and the insights within the pages.

This artwork is based on the results of the global forecast model, including 219 countries worldwide, for 11 years of historic data and a five year forecast covering the years from 2011 to 2026. The art is based on medicine spending and usage by specialty and traditional product types and by brand and generic types.

CONTACT US

100 IMS Drive

Parsippany, NJ 07054

United States

info@iqviainstitute.org

iqviainstitute.org