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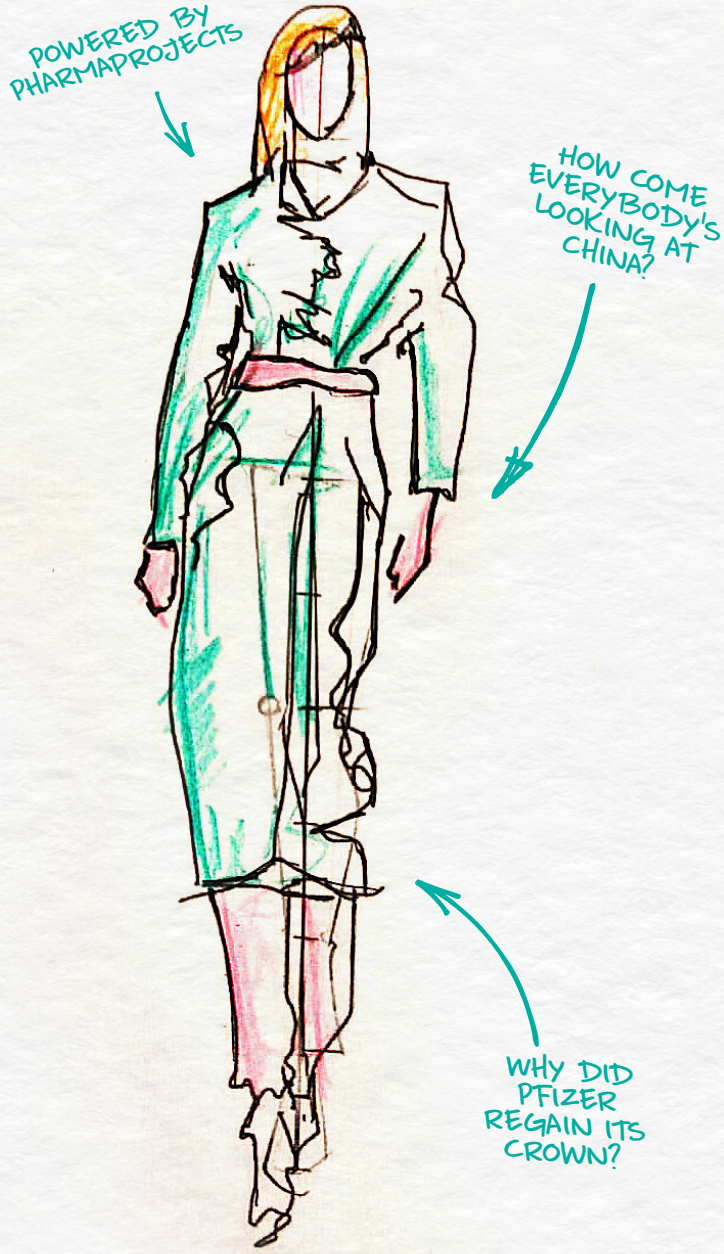
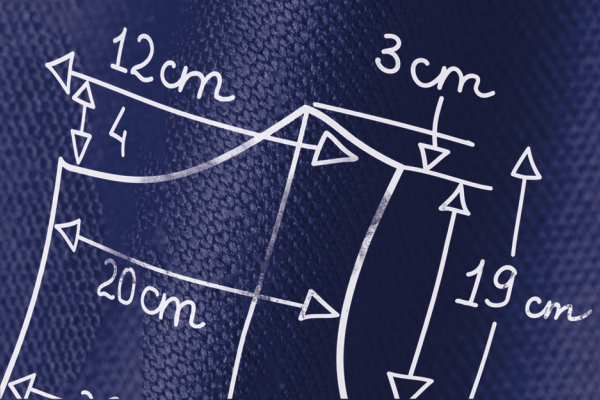


WHITE PAPER

PHARMA R&D 2025

Find out what's in and out of fashion in drug development with our analysis of this year's key pipeline trends.

Contents



Welcome to Pharmaprojects' 2025 review of trends in pharmaceutical R&D

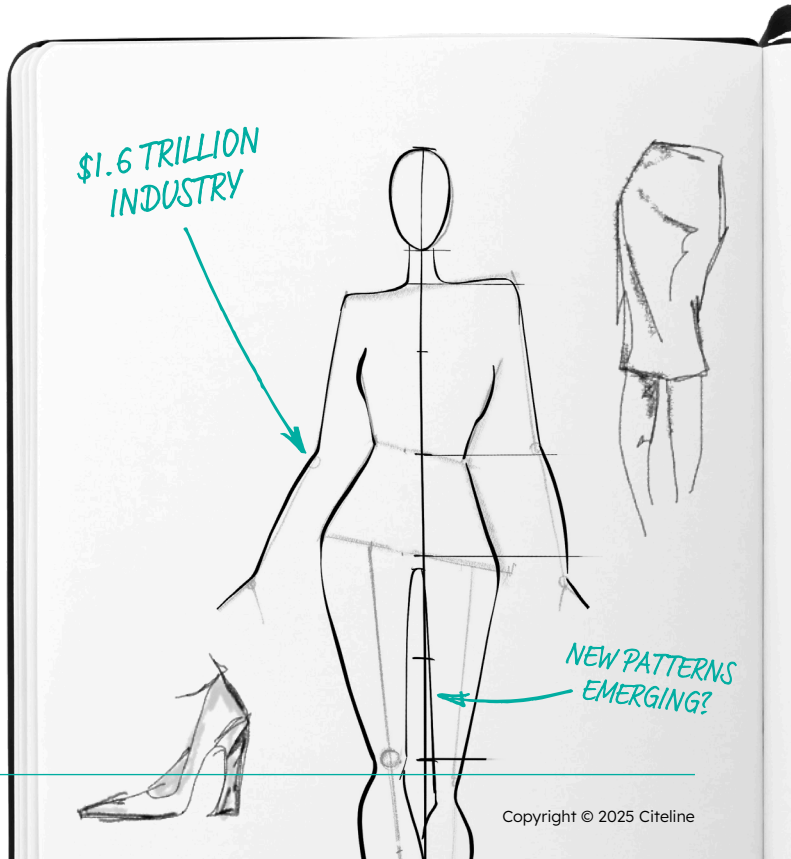
Welcome to Pharmaprojects' 2025 review of trends in pharmaceutical R&D. For over 30 years now, I've been taking an annual look at the evolution of pharma R&D, and in this article, I'll investigate how fashions are changing in the industry at the start of 2025. We'll assess industry trends by examining the pipeline by company, therapeutic area, disease, target, and drug type, using data primarily from Pharmaprojects, part of the Citeline suite of products, which has been tracking global drug development since 1980. This report will be followed up by our annual supplement reviewing the New Active Substance (NAS) launches for the year just passed. But here, we'll roll up our sleeves to examine how pharma R&D is changing, look at what's becoming a la mode and what's now decidedly last season, and try to determine where the industry is dressed for the occasion and where it's looking like vintage trying to be vogue. Hopefully, it will help you to see what's in and out of fashion in the world of drug development.

Regular readers of this report (which has been running since 1993, so is presented here in its 33rd edition) will know that in recent years, I've threaded a different theme through each edition, to highlight points, to draw analogies, and to add a little character into what could otherwise be a rather lengthy narrative through a parade of statistics, charts, and tables — drabber than a bunch of dusty hand-me-downs at the back of a charity shop. Themes selected so far have included astronomy, movies, the natural world, music, food and drink, science fiction, travel, literature and last year, weather. This year, as those of you who are on trend may have guessed, I've hung my rather jaunty hat on the topic of fashion and clothing. As with healthcare, like it or not, it's something that affects us all, and where things come in and out of style, being either all the rage or a passing fancy.

Clothing seems to have become integral to the human race somewhere around 100,000 years ago. Interestingly, modern-day molecular biology techniques have been used to get the best scientific dating of the end of nakedness.

A 2010 study in the journal *Molecular Biology and Evolution* used genetic analyses to determine when clothing lice diverged from their head louse ancestors, to date the emergence of clothing at somewhere between 83,000–170,000 years ago. This suggests that *Homo sapiens* as a species was probably still in its birthday suit for around half of its existence, with experts divided as to whether the invention of clothing facilitated our move into cooler climes, or whether migration necessitated the addition of something to cover the body. The oldest archaeological evidence of the existence of clothing dates from around 11,000 years ago in the form of figurines depicting fabric clothing. Of course, in one sense, the development of clothing has always been intrinsically linked to human health in that in keeping one warm and comfortable, one was less likely to fall prey to disease.

It is likely that, even in the days of bearskins, clothing became intrinsically linked with social status, with those leading the tribe likely to be sporting the most luxurious pelts. Certainly, by Roman times, garments and rank were interconnected, with only senators permitted to wear clothes dyed with Tyrian purple. Thus, like the production of medicinal potions, the fashion industry can be said to be several thousand years old.



As with pharmaceuticals, it is mostly the rich who have had access to the latest developments — think those Restoration ruffs, the dandies of the Regency period, or the stylish haute couture associated with Hollywood's golden age — sadly a situation that still persists. The fashion industry as we would recognize it today probably emerged about a hundred years ago, with the likes of Coco Chanel and Elsa Schiaparelli achieving worldwide fame in the period immediately following the First World War, an age forever associated with the flapper dress, at a similar time to when many of the giants of pharma we know today were also being established.

Lest we forget, the purpose of this report is to analyze trends in pharma R&D, but trends are something the fashion world is similarly obsessed with. Indeed, the word "trendy" has evolved to mean something very fashionable or up to date. As longtime readers of these reports will know, in pharma, trends emerge and change relatively slowly, which is why Pharmaprojects' 45 years' worth of data is such a valuable resource. Despite the fashion industry's reputation for fickleness, in truth, outside of the high fashion houses that actually only represent a microscopically small part of broader clothes manufacturing, trends similarly only emerge over reasonably long periods; think how we associate certain clothing styles with decades, rather than individual seasons (miniskirts and hot pants in the '60s, ra-ra skirts and shoulder pads in the '80s, etc.). The one big difference is that trends in pharma are (largely) dictated by cold hard science; no one really knows where changes in fashion trends emerge from and who is deciding whether hemlines are going up or down this year. Drugs are about substance over style.

But it's not true that changes in fashion come about solely on whim. Here, as with pharma, developments in technology play a massive part. The first synthetic fibers, developed from the 1930s onwards, gave us new fabrics such as nylon and polyester, which were often not only cheaper than natural materials, but had new properties. Chemistry also brought us new colors and shades to enhance the original dyes made from sources in nature. Thus, clothes can be manufactured today that would simply not have been possible to produce 50 years ago, just as with drugs, where the speed of technological innovation continues to quicken.

In a sense, diseases come in and out of fashion, too. As we'll see later in the report, cancer has been in the en vogue therapeutic area for the industry a while, while shifts in cultural concerns allied to therapeutic breakthroughs can lead the industry to put on its Sunday best to rush into hitherto unexplored markets (think the current fancy for obesity drugs). In other cases, the world itself can throw a curveball, creating a brand-new market out of thin air, as it did with the COVID-19 pandemic in 2020. Fortunately, in this situation, the response from the industry was nothing short of spectacular, and, as a result, is helping COVID to go out of fashion faster than flared trousers.

Another area in which pharma and the apparel industry have similarities is that they are both massive multi-billion-dollar industries. Recent estimates put the latter at $1.79 trillion, representing 1.6% of the world's GDP. Against that, the value of the haute couture, or "high" fashion industry, is calculated to be worth a paltry $12 billion. Analysts place the global healthcare market at around $8 trillion, of which the pharmaceutical industry accounts for $1.6 trillion. And herein lies another unfortunate parallel between the fashion and pharma industries — inequality. The former is certainly more greatly affected by elitism; few anywhere can afford a Gucci dress, though arguably, not many would want to. But everyone wants access to life-saving drugs and, sadly, even in 2025, it is mostly only the rich countries that can afford them — and even then they are not always available to the general populace. Innovation is highly prized — and highly priced — in both industries, but anyone with a genetic disease wants access to the latest million-dollar gene therapy, whereas most of us can live without Lady Gaga's meat-based dress from 2010.

Come with us now then, as we begin to measure up the 2025 pharma industry. Is it tightening its belt, or letting it all hang out? Who within drug R&D is looking razor sharp, and who is looking like a sack of old potatoes? What's in and what's out, what's hot and what's not? We have all the stats and trends here prêt-à-porter. Join us on the pharma catwalk as the show begins. After all, drugs maketh pharma, just as "clothes maketh the man."

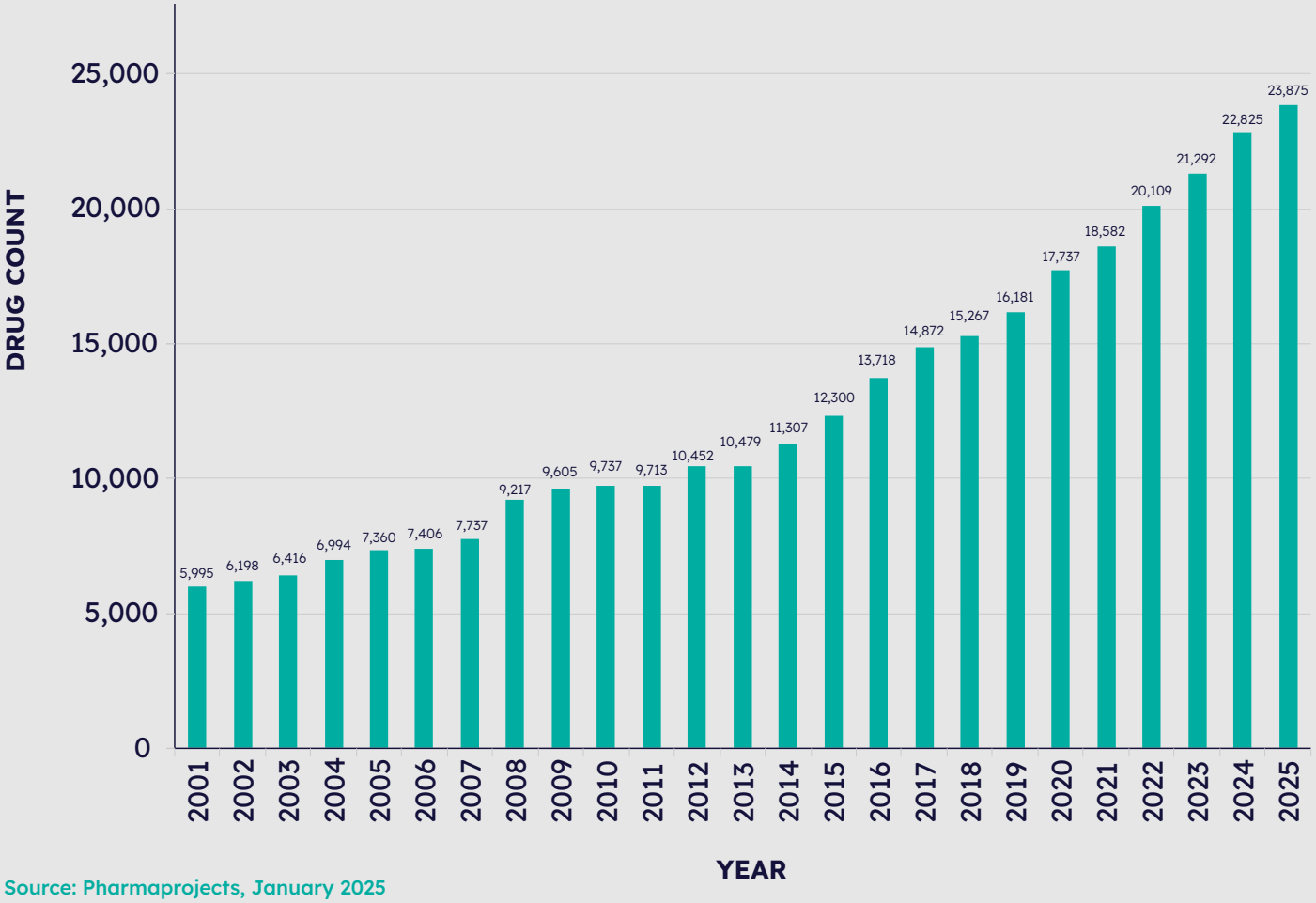
Introduction – Total Pipeline Size

Pharma has more material than ever before

As a foreword to this year's catalog of trends, let's define the world in which our analyses will take place, by looking at the total number of drugs currently in the R&D pipeline. All the analyses in this report focus on this set of drugs, so it's worth starting off with a definition of what we exactly mean by the term "pipeline." Here, we are counting all drugs disclosed as being in development by pharmaceutical companies, from those at the preclinical stage, through the various stages of clinical testing and regulatory approval, and up to and including launch. Launched drugs are still counted, but only if they are still in development for additional indications or markets. Drugs whose development has been terminated, or is complete, are not included. All data were collected on Jan. 2–3, 2025.

Will pharma need extra space in its closet in 2025, or is the wardrobe looking a little bare? Figure 1 faces fashion forward to give you the headline figure for the total size of the R&D pipeline this year. As you can see, we might need to let our waistbands out as the number of drugs in development has swollen once again, this year hitting 23,875. This represents a 4.60% increase over 2024's figure, which suggests the rate of expansion has slowed from the 7.20% seen last year. It is also the lowest rate of increase this decade, coming in just below 2021's 4.76%.

Figure 1: Total R&D pipeline size by year, 2001–25



Source: Pharmaprojects, January 2025

There are some internal factors that might have had an effect on this year's overall figure, which it would be remiss not to mention. In 2024, we launched a major technology project to completely re-engineer our editorial and data collection systems, enabling us to update our data faster and bring new features forward for our clients. As with every huge tech project of this kind, this caused some temporary disruption to our normal editorial practices. This may have resulted in somewhat fewer drugs being added to the database in 2024 than we might have normally expected. During 2024, 4,546 drugs were still entered into Pharmaprojects for the first time, which is indeed a little down on the 5,428 added during 2023 and 5,082 in 2022. This might have suppressed the overall pipeline number a little; however, for the same reason, we were also not quite so zealous as usual at moving drugs out of the active pipeline into the No Development Reported status. Our best guess is that these two issues largely canceled each other out, so the figures are probably largely unaffected to any great degree. In any case, it is still better to be transparent about this. Any effect will in any case be systematic, so will not affect comparative trend data.

Yet 4,546 is still a pretty hefty bolt of brand-new drug candidates in a single year, so where has the effort to find new molecules been concentrated? The House of Oncology rules the roost here, providing 38.8% of all newly identified R&D drugs, a little up on the 38.0% figure from 2023, and definitely wearing an XL size. Neurologicals came in second, with 13.8%, also up from the 12.7% chunk they took the previous year. Interestingly, exactly one in five drugs entering the pipeline during 2024 were targeted against one or more rare diseases — a topic we will return to later.

The pattern of the fabric of new drug additions continues to evolve. The company that added the most drugs to its pipeline over the course of the year was Novartis, with 37, deposing 2023's chart-topper Pfizer, which only added 32 that year. But fashions in pharma have been looking more eastward for some time, and the company adding the second-most drugs to its pipeline was once again Jiangsu Hengrui Pharmaceuticals from China, discovering 36 new candidates, more than the previous year's 30. China is also continuing to close the gap on the US as the country where development of most newly identified drugs was reported. 1,495 was the 2024 number, down from 1,627 in 2023, but with the US's tally falling from 1,856 to 1,683, the gap is now less than 200.

The pharma/fashion analogy further extends into contrasting items in development versus those successfully making money. While the pipeline for developing new garments has a considerably shorter timeline than drugs in terms of developing new products and bringing them to market, the shelf life for those products that do make it can be similarly brief; in pharma's case due to patent expiries, and in fashion's due to consumers' insatiable desire to always move on to something new. But as in all industries, it's not really the volume of products in the pipeline that matters the most, but more the numbers of those which are out there and making money. Thus, we roll out our annual caveat that an ever-bigger pharma pipeline size might not always be an intrinsically good thing if the industry can't continue to produce the goods. We are still finalizing our exhaustive list of New Active Substances that made it onto the market for the first time during 2024, but the year has a lot to live up to, with 2023 delivering 91, the second-highest total ever. Early signs are that 2024's count might be similarly impressive, but you will have to check out our forthcoming NAS Supplement to this report to get the full picture — that should be coming in March/April. We can at least kick off this year's Pharma R&D Report being fairly confident that this year's headline pipeline size figure is not an example of the Emperor's New Clothes.

Following the Pattern: The 2025 Pipeline by Phase of Development

Can the industry cut its clinical coat according to its cloth?

Everything you wear, just like any drug you take, has gone through a development process. For clothing, there is generally a design phase, often something as simple as a sketch on a piece of paper to start with, which is perhaps akin to drawing out your proposed molecular structure. These days, however, computers will inevitably play a role in design of both clothes and drugs. You then get your starting materials together to make your prototype. This is followed by a testing period during which clothes are tried on or drugs are administered during clinical trials, then adjustments are made, and they are deemed to be a success (or otherwise), before they are finally taken to market and mass manufactured.

While this process in the fashion industry may take just a matter of months, in pharma, it can take over a decade and cost billions. And of course, success for a drug is not just a matter of taste and a good fit — it has to be therapeutically beneficial and have an acceptable risk/benefit profile. Proving this is no mean feat, hence the scale and length of the clinical trials process. In this section of the report, we'll look at the numbers of drugs at the various stages of the R&D process and try to determine whether the industry is pushing the right number of candidates through each phase, and thus cutting its coat according to its cloth.

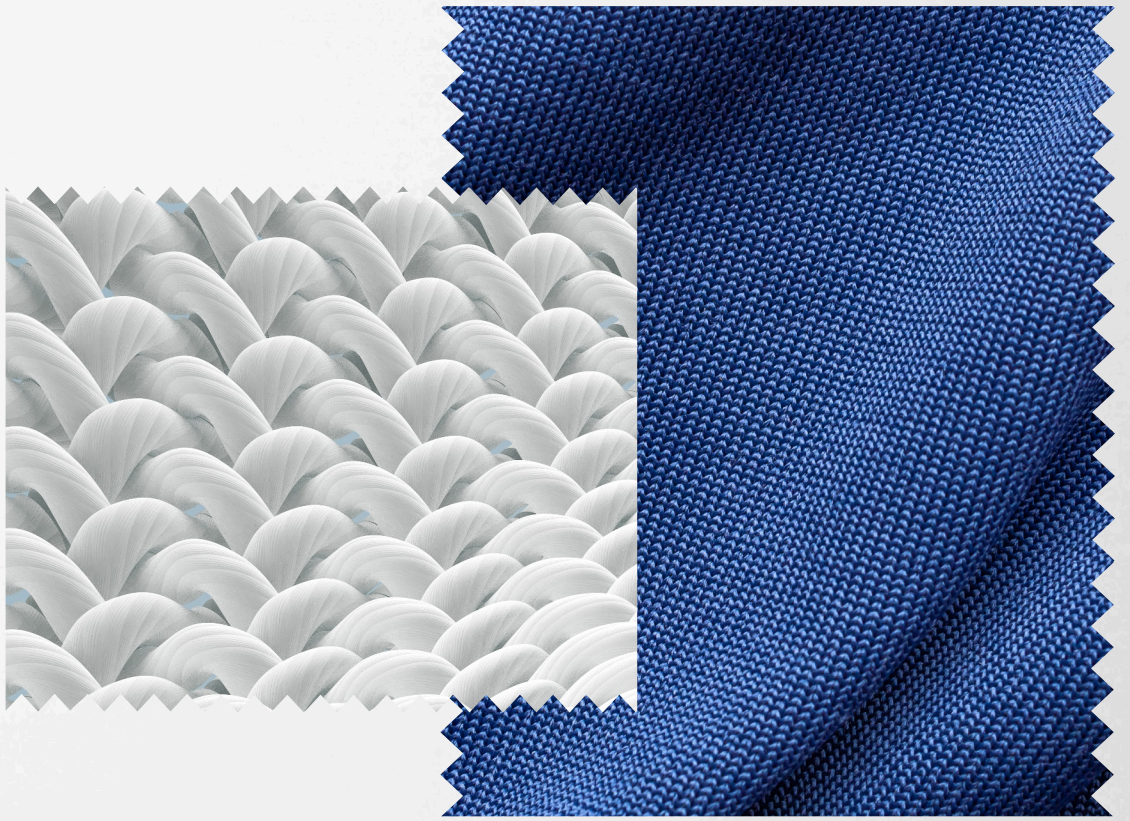
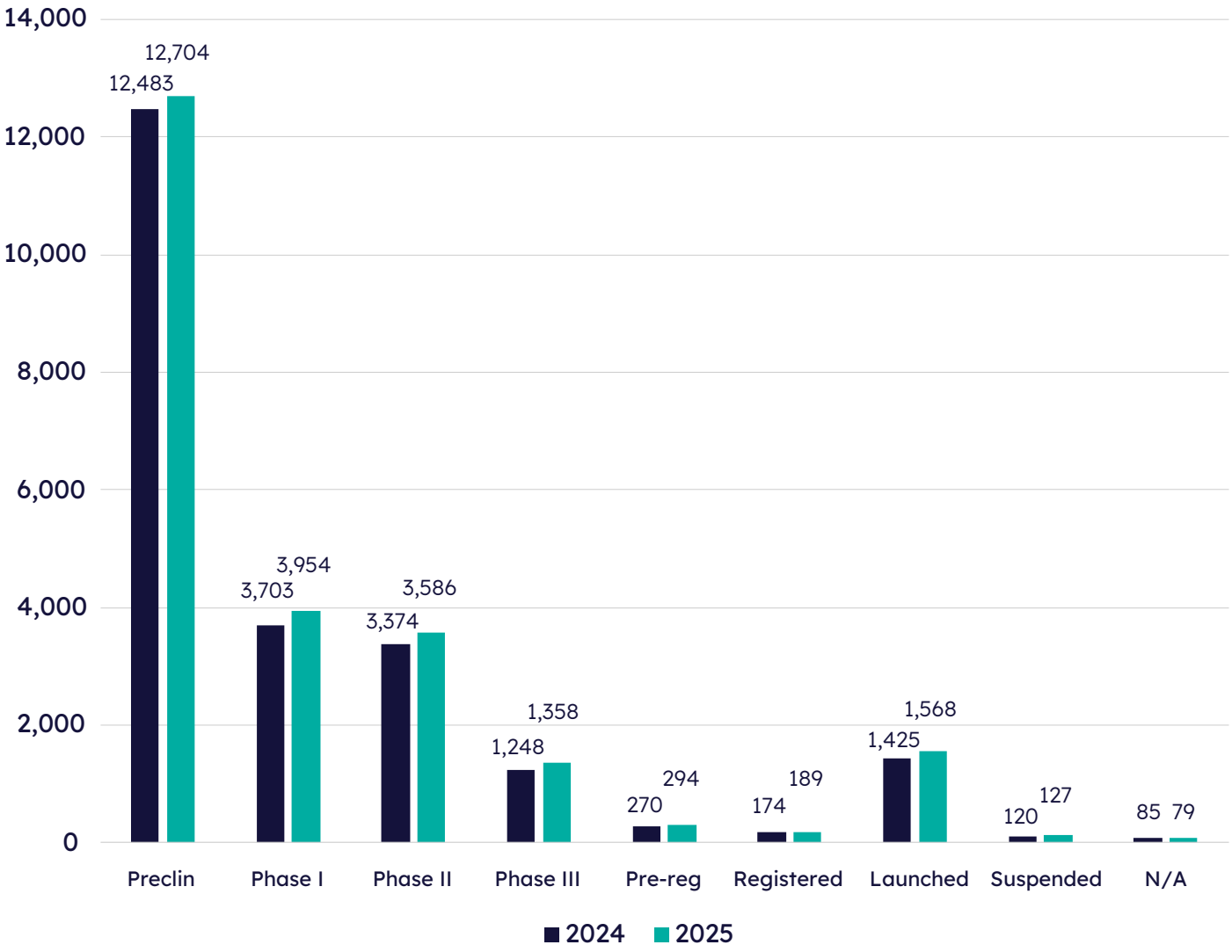


Figure 2 breaks down the 2025 pipeline by its drugs' current global statuses. Global status is the most advanced stage of development a drug has reached in any country, for any disease, and by any company, so each drug is counted only once here. You can see that this year, while the increase in the overall pipeline size is distributed across all phases of development, the percentage increases vary considerably by phase. The number of preclinical drugs this year only rises by 1.8%, compared to 5.5% last year, with equivalent rates of expansion for drugs at the clinical phases being as follows: Phase I, +6.8% (+13.5% last year); Phase II +6.3% (+7.8%); and Phase III +8.8% (+1.6%). Note that while the numbers in Phase I being higher than those in Phase II may at first seem counterintuitive, this is a function of this data being a snapshot in time. The fact that there are roughly the same numbers of drugs in Phase II as there are in Phase I in no way means that virtually all drugs undergoing Phase I then progress serenely to Phase II. There is considerable attrition between the two phases, but as Phase II development generally takes much longer, drugs pile up at the Phase II stage, so that, at any one time, there are more drugs in Phase I than there are in Phase II.

Figure 2: Pipeline by development phase, 2025 vs. 2024

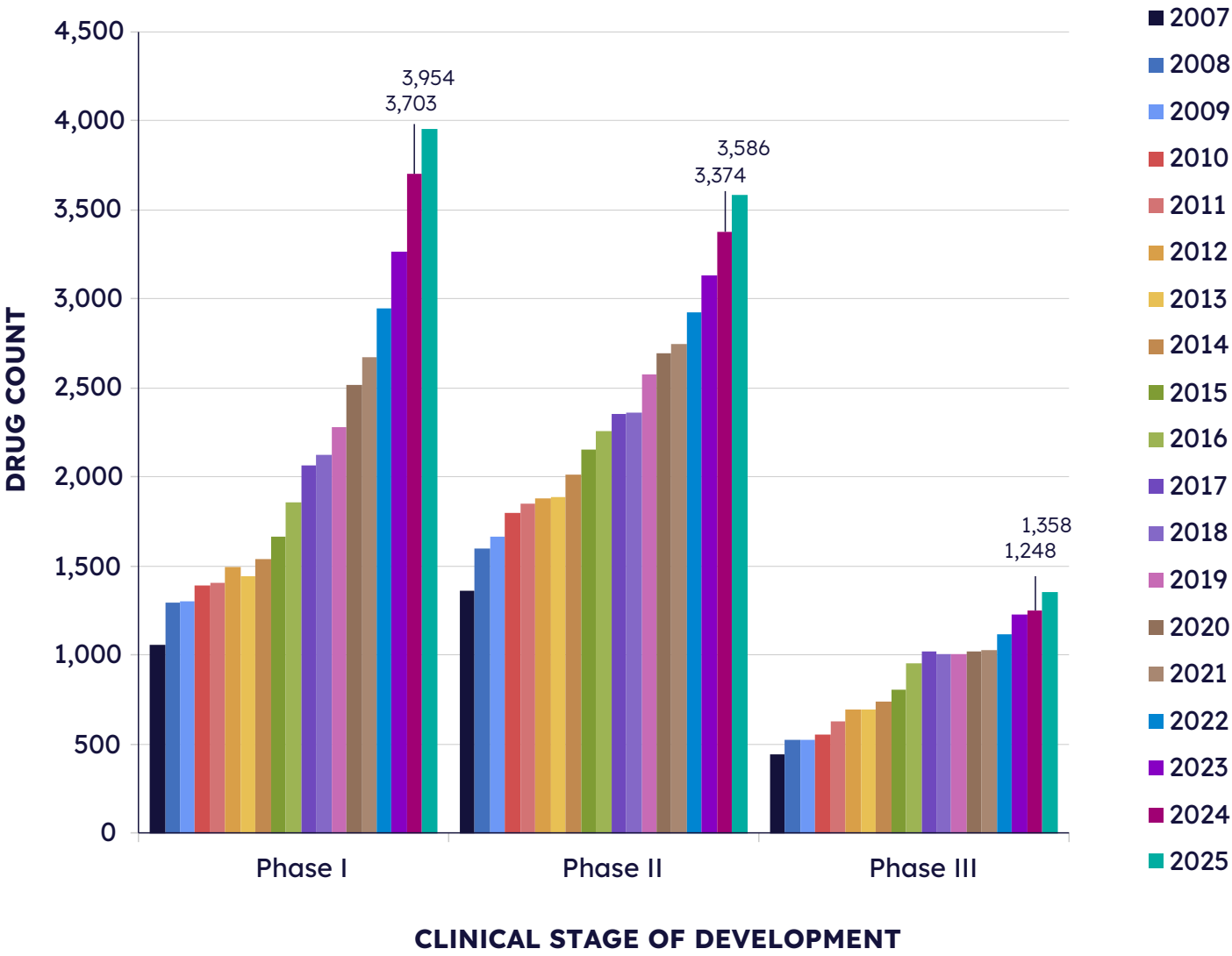


[N/A = not applicable and is applied to companion diagnostics prelaunch]

Source: Pharmaprojects, January 2025

Lurking in these statistics is cause for good cheer this year. As Figure 3, which examines clinical phase drug numbers going back almost two decades, emphasizes, you can see here that while numbers of drugs in the Phase I or Phase II stages of development have generally always headed upwards, this hasn't always been the case at the crucial — and most expensive — Phase III stage. Proving efficacy, therapeutic advance, safety and marketability at Phase III is the big hurdle drugs need to overcome to be able to put their cases to regulatory authority for approval, so it's vital that more drugs make it as far as this stage and don't fail at Phase II. Progress here has not been smooth as silk. But after flatlining throughout the 2017–2021 period, and experiencing another stumble last year, we can see positive news this year, with the total on the rise again, and up by a significant 110 candidates.

Figure 3: Clinical phase trends, 2007–25



Source: Pharmaprojects, January 2025

If more drugs making it through to Phase III will continue to feed the burst of new drugs hitting the market we've been seeing this decade, this is clearly a good thing. But developing drugs will always be a high stakes/high returns affair, with outcomes often as impenetrable as Anna Wintour behind her sunglasses. Everyone will be banking on this year's collection being a hit.

Top Companies:

Vintage names look solid, while boutique firms flourish

Many pharma companies are as much household names as the big fashion houses are. The public is probably as likely to recognize the names Pfizer, GSK, and Johnson & Johnson as it is Ralph Lauren, Gucci and Armani. But, in reality, name recognition does not translate into ownership, with few of us in possession of items from the haute couture ranges of these designers. Perhaps it's better to equate the high-end stuff to smaller boutique pharma companies working on niche products and technologies. By that token, our big pharma companies are probably more akin to the less glamorous mass marketers of apparel, such as Walmart, H&M and China's HLA. These big box names might be more prosaic, but like their couture counterparts, they need to innovate, too. Let's see how the pharma industry's major and minor players stack up in 2025.

Let's start by looking at pharma's mega corps, the top 25 pharma companies by pipeline size, listed in Table 1. A quick note on the data in this analysis, which has undergone a slight change this year. This time, we are additionally counting in the companies' pipelines drugs under development by any of their active subsidiaries. This has inflated the figures somewhat, especially for the biggest companies, which tend to have the most subsidiaries, but it probably gives a more accurate picture of the leading firms' relative pipeline sizes. Thus, the trend figure in the right-hand column reflects the actual change since last year, irrespective of how much the numbers appear to have jumped. Remember, the overall pipeline size only rose by around 4%, and most of the companies featured in this table have pipeline expansion rates centered on this mean.

In terms of this year's rankings, take your hat off to Pfizer, which regains its position at the head of the catwalk, an accolade it briefly surrendered to Roche last year.

Table 1: Top 25 pharma companies by size of pipeline

POSITION 2025 (2024)	COMPANY	NO. OF DRUGS IN PIPELINE 2025 (2024)	NO. OF ORIGINATED DRUGS 2025 (2024)	TREND
1 (2)	Pfizer	271 (205)	166	↑
2 (1)	Roche	261 (218)	139	↑
3 (6)	Novartis	254 (154)	149	↑
4 (3)	AstraZeneca	241 (166)	153	↑
5 (10)	Sanofi	233 (142)	124	↑↑
6 (5)	Bristol Myers Squibb	227 (158)	126	↑
7 (4)	Eli Lilly	224 (159)	124	↑
8 (9)	Merck & Co.	216 (145)	108	↑
9 (7)	Johnson & Johnson	200 (150)	110	↑
10 (11)	GSK	194 (138)	95	↑↑
11 (13)	AbbVie	190 (111)	76	↑↑
12 (12)	Takeda	187 (130)	73	↑
13 (8)	Jiangsu Hengrui Pharmaceuticals	173 (147)	163	↑
14 (14)	Boehringer Ingelheim	133 (111)	90	↔
15 (15)	Sino Biopharmaceutical	125 (103)	104	↔
16 (19)	Otsuka Holdings	114 (85)	60	↑
17 (18)	Gilead Sciences	106 (86)	62	↔
18 (16)	Bayer	104 (91)	67	↑
19 (24)	CSPC Pharmaceutical	102 (73)	84	↑
20 (21)	Amgen	100 (79)	61	↑
21 (22)	Astellas Pharma	100 (78)	52	↑
22 (23)	Novo Nordisk	97 (76)	70	↔
23 (27)	Daiichi Sankyo	88 (59)	45	↑
24 (20)	Eisai	86 (81)	48	↔
25 (28)	BeOne Medicines	77 (-)	39	↑

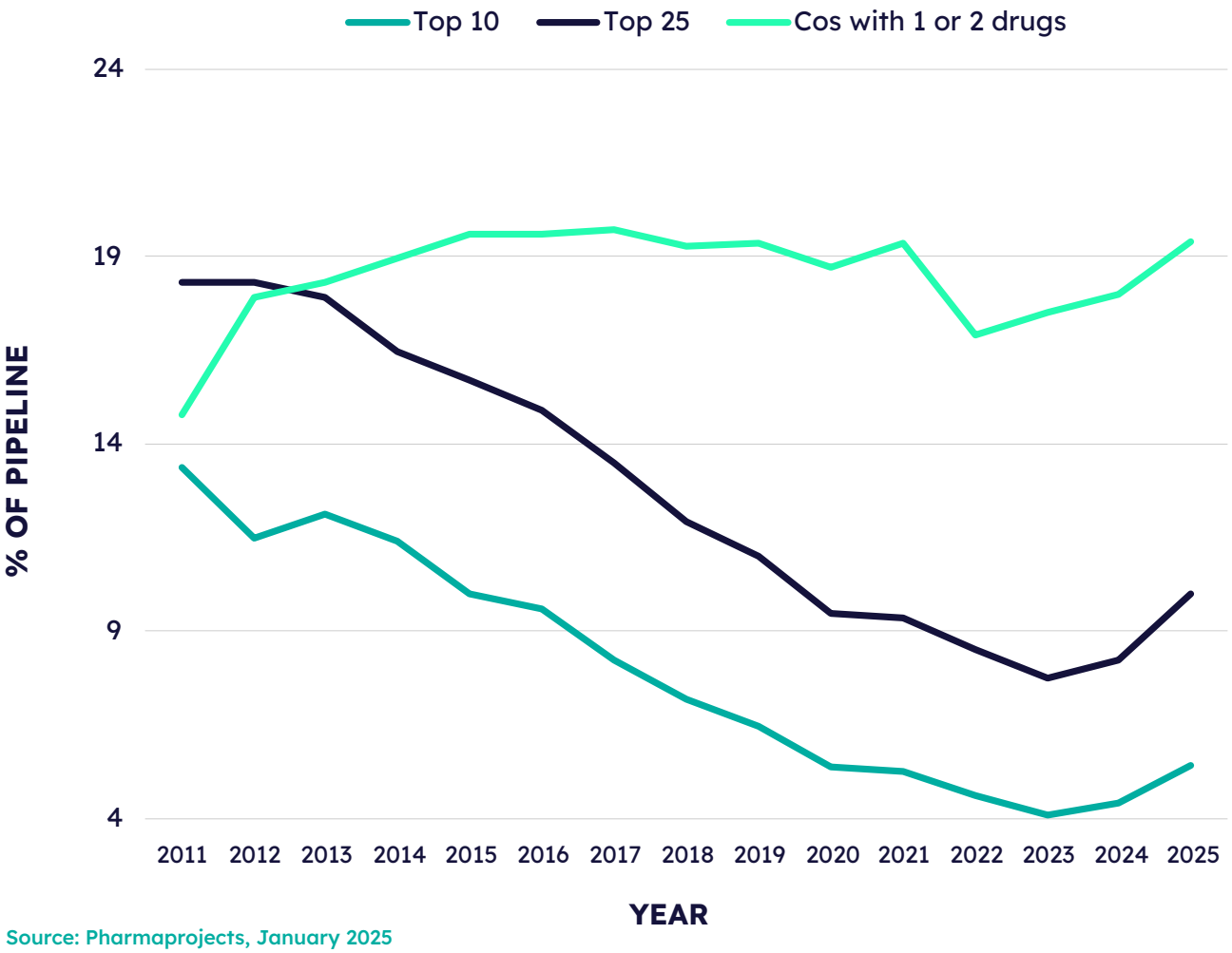
Source: Pharmaprojects, January 2025

Roche's rival, Novartis, closes the gap on it considerably, rising to number 3. The biggest mover within the top 10 is Sanofi, which surges up to number 5. After spectacularly becoming the first Chinese company to enter the upper echelons last year, Jiangsu Hengrui Pharmaceuticals this year dips out of the top 10 to number 13. It does keep its position as the top company with the highest percentage of self-originated products, though.

Away from the top 10, Chinese influence has increased, with CSPC Pharmaceutical climbing the charts, and a new entrant, BeOne Medicines, formerly Beigene, coming in at number 25. There is also considerable Japanese presence in the 11–25 section, with Takeda, Otsuka Holdings, Astellas Pharma, Daiichi Sankyo, and Eisai all putting on their glad rags to make an appearance.

I referred earlier to those exclusive boutique companies with small pipelines, which are either like their swanky equivalents in the fashion industry, or might be small because they are just starting up. Just like all those bedroom designers who show up on TV fashion talent shows such as the UK's "Project Catwalk" ("Project Runway" in the US) or "The Great British Sewing Bee," there is a huge number of cottage industry pharma firms contributing to the overall size of the pipeline. The 2025 data shows that there are now 997 companies with just two drugs in their portfolio, up from 931 last year, and no fewer than 2,638 firms with just a single molecule hanging in their closets, up from 2,249 last year.

Figure 4: Share of pipeline contributed by top 10 companies, top 25 companies, and companies with just 1 or 2 drugs, 2011–25



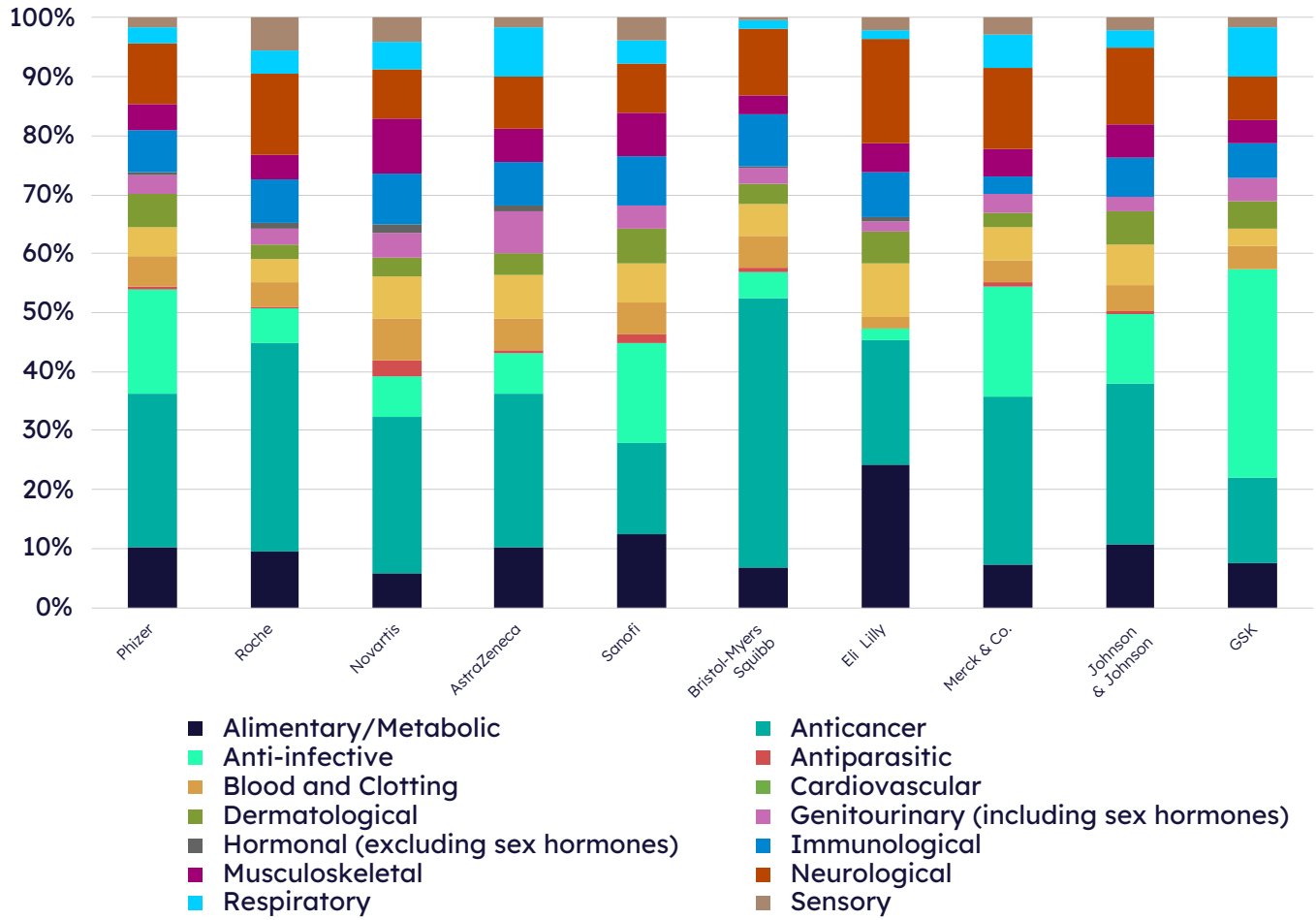
Source: Pharmaprojects, January 2025

As Figure 4 demonstrates, these micro companies make up more of the pharma ecosystem than ever, comprising 19.4% of drugs in development.

Meanwhile, the share contributed by the industry behemoths, the top 10 and the top 25 companies, has shown an uptick, although this is most likely due to our aforementioned change in calculation method.

We return to pharma's fashionistas for our next analysis, looking at the therapeutic area split of the pipelines across the top 10 companies. Previous analyses had contradicted the received wisdom that even big pharma firms were choosing to specialize, but the 2025 data seem to show increasing differentiation from the pattern we've observed before of companies having their fingers in every pie, the largest of which is always cancer. This time around, three of the top 10 have a different therapeutic area as their preeminent area of interest, with Sanofi and GSK preferring anti-infectives, and Eli Lilly focusing on alimentary/metabolic drugs. Notably, GSK is exhibiting a very strong preference now, with 90 anti-infectives compared to 37 anticancers. Contrast that with the most onco-centric company, Bristol Myers Squibb, for which the comparable numbers are 14 and 144, respectively (63.4% of BMS's drugs have a cancer indication). The makeup of these companies' pipelines has thus diverged considerably. Five of the top 10 firms still tick every therapeutic area box, however, and those with gaps are only ignoring the smallest therapeutic areas, hormonal and antiparasitic. In a world where changing trends only emerge slowly, this is one metric to keep a close eye on.

Figure 5: Disease focus areas of the top 10 pharma companies



Source: Pharmaprojects, January 2025

Many of the big names in fashion run mass-market clothes production alongside their more bespoke, exclusive, high-fashion items. Think Calvin Klein — while many of us might own some relatively cheap CK-branded underwear, few of us own the items displayed at his catwalk shows that command megabucks. Similarly, while big pharma has one eye on mass-market drugs with huge utility across large patient populations (think Ozempic), it also has interests in the low-patient number but high-price area of rare diseases. Here, the amount that can be charged for a drug can be astronomical, with a number of curative gene therapies being sold for over $1 million per patient. Hence the increasing move into rare disease R&D in recent years.

Table 2 shows the 20 companies that have the most drugs in development against rare diseases. Novartis comes out on top here, with 52% of drugs in its pipeline under development for at least one rare disease, and ties with Amgen as being the top 20 company with the highest percentage of rare disease activity. At the other end of the scale, Eli Lilly has the lowest proportion, with only just over a quarter of its drugs falling into this category. Even Chinese firm Jiangsu Hengrui is getting in the act, and has overtaken Lilly's percentage this year. Rare diseases are often high-risk, but offer high returns if they are successful.

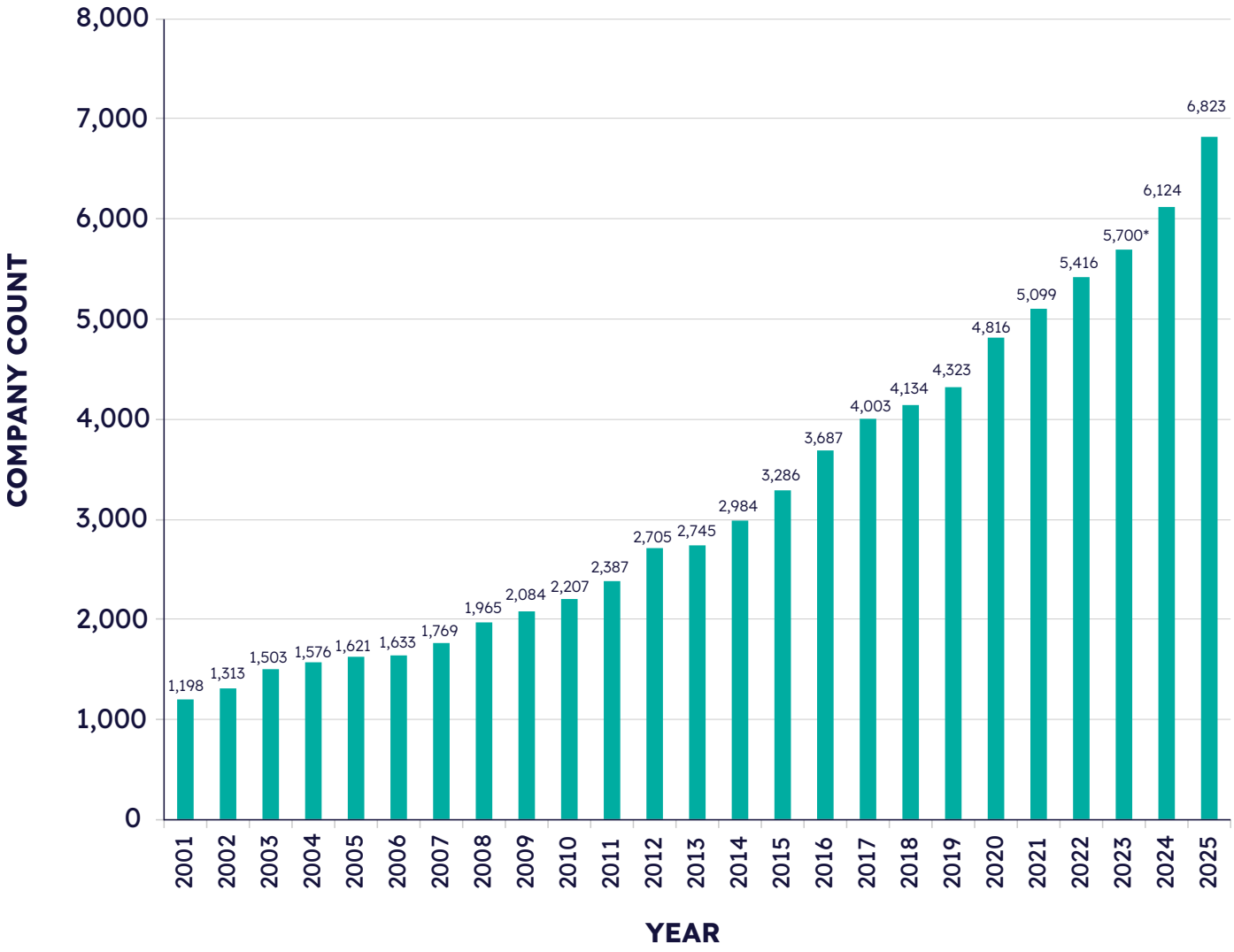
Table 2: Top 20 pharma companies with a rare disease focus

2025	COMPANY	NUMBER OF DRUGS FOR RARE DISEASES	% OF PIPELINE
1	Novartis	132	52.0
2	Bristol Myers Squibb	115	50.7
3	Pfizer	110	40.6
4	AstraZeneca	98	40.7
5	Roche	97	37.2
6	Sanofi	94	40.3
7	Takeda	87	46.5
8	Johnson & Johnson	75	37.5
9	AbbVie	70	36.8
10	GSK	68	35.1
11	Merck & Co.	68	31.5
12	Eli Lilly	59	26.3
13	Amgen	52	52.0
14	Sino Biopharmaceutical	50	40.0
15	Jiangsu Hengrui Pharmaceuticals	49	28.3
16	Eisai	41	47.7
17	Astellas Pharma	39	39.0
18	BeOne Medicines	39	50.6
19	CSPC Pharmaceutical	39	38.2
20	Regeneron	39	51.3

Source: Pharmaprojects, January 2025

What about the total number of companies with active pharma R&D pipelines? Perhaps surprisingly, this number has risen at a faster rate than the overall number of drugs, and this year stands at 6,823, an increase of 11.4%, up from the 7.4% seen last year. It's not entirely counterintuitive that the number of companies is rising at a faster rate than the number of drugs, especially if you consider that most newly added companies will be start-ups with maybe only one or two drugs, and we've already seen that there's been an uptick in such companies. It's also worth noting that, as fewer drugs were moved to the inactive No Development Reported status last year, fewer companies became inactive too, contributing to the higher number of active companies this year. Either way, it's worth noting that we always see considerable churn on an annual basis, with hundreds of companies being added and hundreds dropping off the R&D runway, in what is a very dynamic industry.

Figure 6: Total number of companies with active pipelines, 2001–25

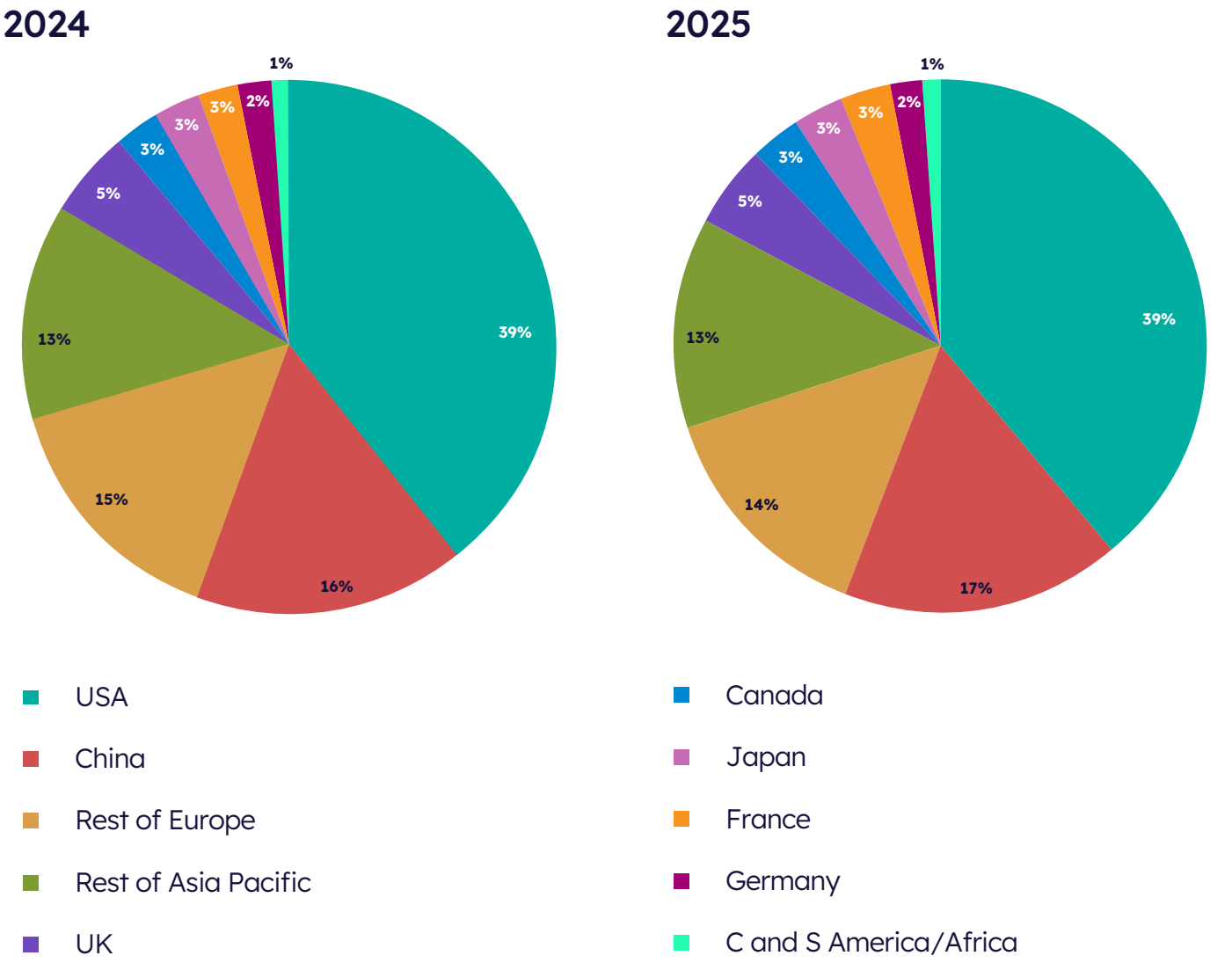


***Estimated figure**
Source: Pharmaprojects, January 2025

The pharmaceutical industry, like the clothing industry, is a truly international endeavor, and with increasing globalization, that is now truer than ever. Much has been made of how the mass manufacturing of garments moved away from its traditional origins such as Lancashire in the UK and North Carolina in the US to Asia and other developing countries whose manufacturing costs far undercut those of Western countries. The same has happened to some extent in pharma, although in recent years concerns about quality in some areas have hemmed this in somewhat. But in pharma, something really extraordinary has been occurring, with China's innovative drug R&D discovery effort coming from virtually nowhere to become a major world force in just a few short years.

Twenty years ago, the Chinese industry was focused on generics manufacturing and traditional Chinese remedies, with next to no companies working on novel drugs. Fast forward to 2025, and my, how things have changed, as we can see in Figure 7, which shows the distribution of where companies developing new drugs are headquartered.

Figure 7: Distribution of R&D companies by HQ country/region, 2024 and 2025



Source: Pharmaprojects, January 2025

The pie charts show that China gained further ground over the course of the year, with 17% of all global pharma R&D firms being based there, up from 16% last year. The country is still some way behind the US, which holds firm with 39%, but it is well ahead of any other single country, its 1,181 firms far out in front of third-place South Korea, which hosts 413 companies, keeping the UK at fourth.

Similar trends — and the same top four — can be seen if we look at the geographical breakdown of the pharma industry in a different way. Table 3 examines where R&D is actually occurring, so each drug is counted once for each country that it is in development in. By this measure, the US takes a bigger slice of R&D activity, with 48.0% of all drugs having some development activity there, but this is a further decline from the 49.1% recorded in January 2024.

Meanwhile, the proportion of drugs under development in China is up from 26.7% to 29.5%, as more Western firms realize the importance of getting their drugs approved in the Chinese market. Again, South Korea comes in third, keeping the UK at fourth after overtaking it last year. Note that the table only lists countries where 5% or more of drugs are in development. In total, our database reports active R&D in 162 different countries, a figure unchanged this year.

Table 3: Where is R&D actually occurring?

DRUG COUNTRY	NUMBER OF DRUGS	% OF PIPELINE
USA	11,455	48.0
China	7,032	29.5
South Korea	3,386	14.2
UK	3,214	13.5
Australia	2,615	11.0
Germany	2,545	10.7
France	2,485	10.4
Canada	2,446	10.2
Spain	2,381	10.0
Japan	2,160	9.0
Italy	1,925	8.1
Netherlands	1,893	7.9
Belgium	1,887	7.9
Poland	1,834	7.7
Denmark	1,624	6.8
Sweden	1,611	6.7
Switzerland	1,578	6.6
Hungary	1,447	6.1
Czech Republic	1,446	6.1
Austria	1,416	5.9
Taiwan, China	1,381	5.8
Bulgaria	1,293	5.4
Finland	1,252	5.2
Portugal	1,246	5.2
Romania	1,236	5.2
Greece	1,229	5.1
Ireland	1,215	5.1
Israel	1,214	5.1
Norway	1,185	5.0

Source: Pharmaprojects, January 2025

2025 trends in pharma's players confirm what we have been seeing for a number of years. The industry is relatively stable, with the established houses of drug development maintaining a firm grip, while the number of upstart drug designers continues to burgeon. Meanwhile, the industry is increasingly looking eastwards.

Therapies and Diseases:

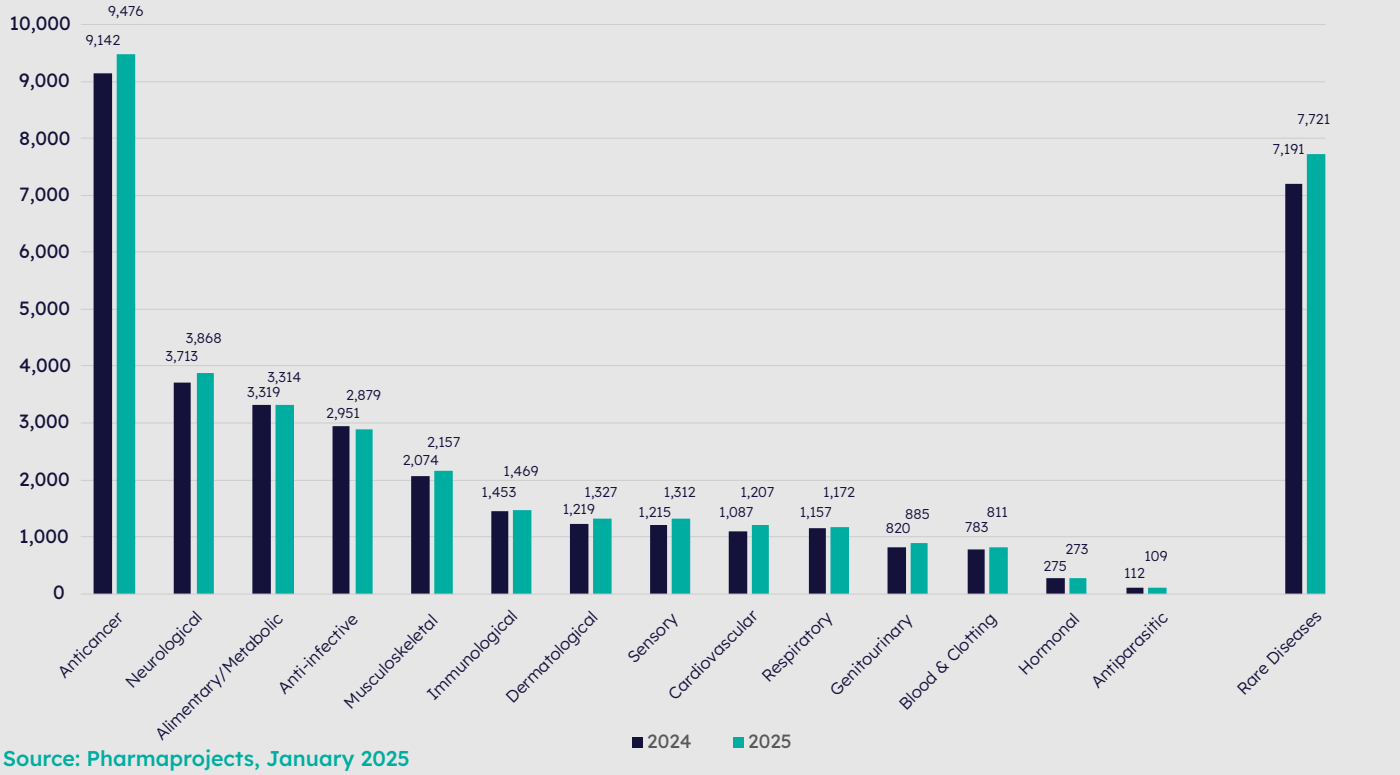
Cancer still **en vogue**, but have we reached peak oncology?

What's in and what's out in the diseases that drugs aim to treat is a complex mixture of science, sociology and cold hard cash. Technological improvements and scientific advances lead what is possible in drug discovery, but they are only one piece of the pattern. Pressures from society to focus on what is perceived as an unmet need or a huge social issue definitely color proceedings, and adding to this heady brew is the need for pharmaceutical companies to make money. Just as to complete your fashionable look, all parts of your outfit must match or coordinate, everything comes together to define trends in drug development.

In this section, we'll focus on trends in R&D in broad therapeutic areas, before zeroing in on individual diseases. There are 14 major therapeutic areas in our classification system, based on the EPhMRA classification system, which itself is closely aligned with the well-known ATC code taxonomy. Over the years we have added both to the broad therapeutic areas and to the individual 200+ therapeutic categories to more closely reflect modern drug development. Last year, however, some categories were moved to our new Drug Type ontology, of which, more later.

Figure 8 demonstrates just how dominant cancer has become as the preeminent therapeutic area of our time, driven by that perfect ensemble combination of scientific advances, a devastating group of diseases and the opportunity to create real money-spinners. The number of drugs with anticancer activity this year has reached 9,476, an increase of 3.7% to hit a new height, if with a slightly below-average rate of increase. Neurologicals in second place posted an increase closer to the mean at 4.2%, but third-placed alimentary/metabolics slipped back slightly, perhaps autocorrecting after a huge leap from 2023 to 2024. The picture is even worse for anti-infectives, which actually saw shrinkage akin to a cotton shirt put in the hot wash, with a pipeline size declining by 2.4%. The COVID-induced bounce for this therapeutic area is most definitely over.

Figure 8: R&D pipeline by therapeutic area, 2024 and 2025

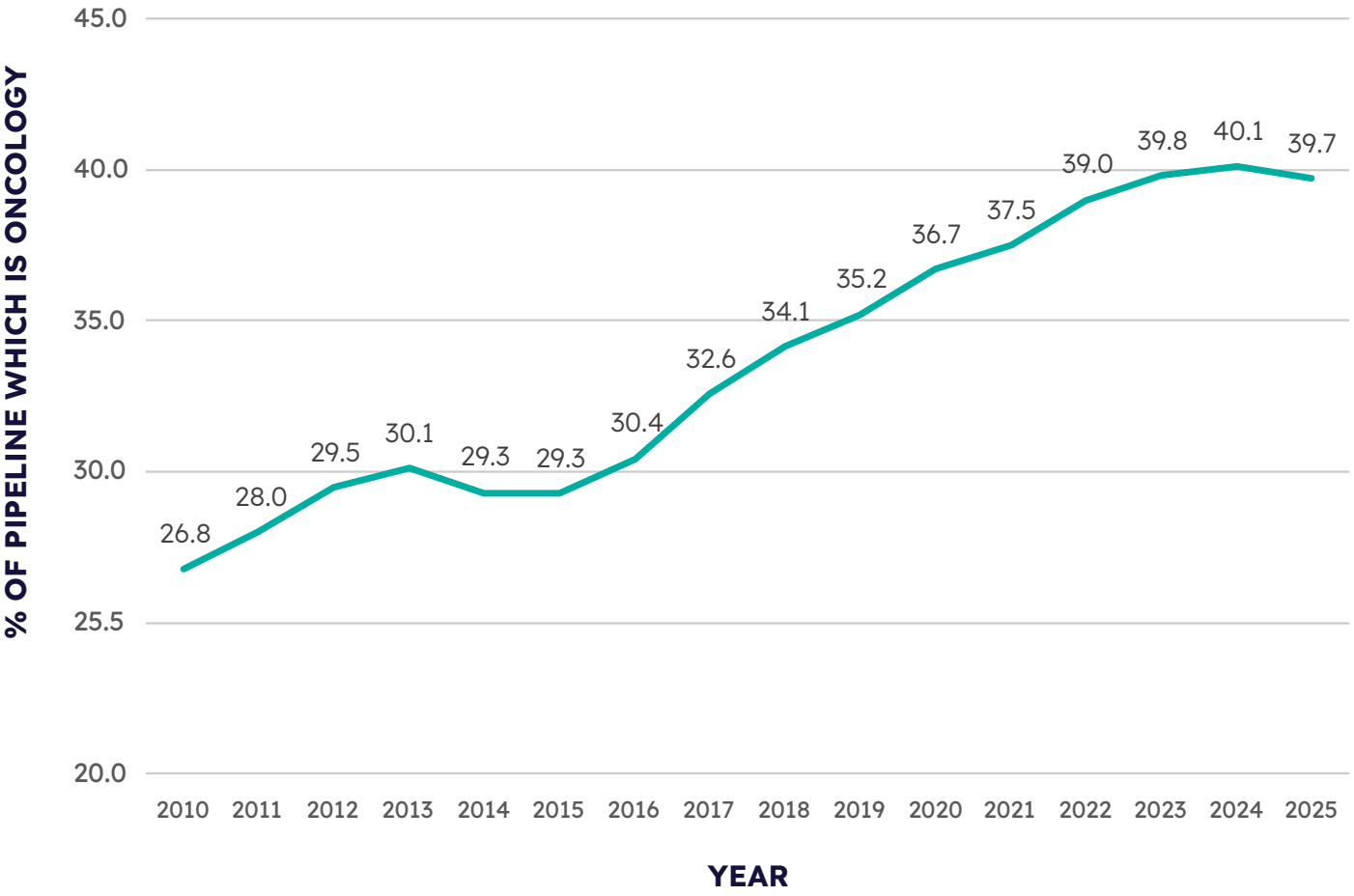


Source: Pharmaprojects, January 2025

Interestingly, however, this year sees a slight dip in the proportion of the overall pipeline oncology has grabbed. Figure 9 shows that as of January 2025, 39.7% of all drugs are being developed for an oncological indication, representing a small drop from last year's 40.1%. Have we hit an inflection point here?

Nearly two out of every five drugs is an enormous proportion, bursting at the seams, and surely oncology couldn't continue to command an ever-increasing share forever? This is one metric it will be very interesting to keep an eye on in the coming years.

Figure 9: Proportion of pipeline in development for cancer, 2010–25



Source: Pharmaprojects, January 2025

Table 4 breaks this data down into the individual therapeutic categories by which we classify drugs. Immunological anticancers continue to top this table, but here the growth rate has slowed to a measly 2.1%. However, the general anticancer category in the runner-up position did post a more respectable 5.7% increase. You'll see a lot of upward movement in positions in this table, so it's worth reiterating that some of this is because all the biotechnology-based categories, such as those for gene therapies and cell therapies, have been removed from this taxonomy to take up residence in our new drug type classification, which we'll be taking an in-depth look at later. This removed five of last year's top 25 from consideration, allowing other categories to shuffle higher.

Table 4: Top therapeutic categories

POSITION 2025 (2024)	THERAPY	NUMBER OF ACTIVE COMPOUNDS 2025 (2024)	TREND
1 (1)	Anticancer, immunological	4,960 (4,860)	↔
2 (2)	Anticancer, other	4,159 (3,935)	↑
3 (6)	Prophylactic vaccine, anti-infective	1,153 (1,115)	↔
4 (5)	Neurological	1,149 (1,125)	↔
5 (7)	Ophthalmological, other	1,131 (1,054)	↑
6 (9)	Immunosuppressant	972 (899)	↑
7 (8)	Antiviral, other	853 (935)	↓
8 (11)	Antidiabetic	818 (772)	↔
9 (12)	Musculoskeletal	817 (767)	↑
10 (13)	Anti-inflammatory	770 (747)	↔
11 (14)	GI inflammatory/bowel disorders	755 (740)	↔
12 (15)	Cognition enhancer	737 (702)	↔
13 (18)	Cardiovascular	717(645)	↑
14 (19)	Neuroprotective	676 (632)	↑
15 (21)	Dermatological	659 (589)	↑
16 (17)	Respiratory	652 (654)	↔
17 (20)	Hepatoprotective	622 (618)	↔
18 (22)	Urological	620 (578)	↑
19 (23)	Antiparkinsonian	618 (570)	↑
20 (25)	Analgesic, other	547 (547)	↔
21 (43)	Anti-obesity	450 (331)	↑↑
22 (31)	Metabolic and enzyme disorders	448 (468)	↔
23 (39)	Symptomatic antidiabetic	419 (391)	↔
24 (35)	Antiarthritic, other	407 (414)	↔
25 (36)	Therapeutic vaccine, anti-infective	400 (414)	↔

Source: Pharmaprojects, January 2025

There is, however, one genuinely startling trend that deserves a callout. Anti-obesity drugs surge into the top 25 with a remarkable 36.0% increase. It's not difficult to discern why: the staggering success of glucagon-like peptide-1 (GLP-1) receptor agonists such as Novo Nordisk's Ozempic/Wegovy (semaglutide) and Eli Lilly's Mounjaro (tirzepatide) is clearly fueling a boom in anti-obesity drug development. It's here that health and fashion blur their boundaries again.

Table 5: Top 25 diseases/indications

POSITION 2025 (2024)	THERAPY	NUMBER OF ACTIVE COMPOUNDS 2025 (2024)	TREND
1 (1)	Cancer, breast	1,129 (1,031)	↑
2 (2)	Cancer, lung, non-small cell	1,111 (1,010)	↑
3 (3)	Cancer, colorectal	882 (825)	↑
4 (4)	Cancer, pancreatic	804 (740)	↑
5 (5)	Cancer, ovarian	654 (625)	↔
6 (8)	Cancer, prostate	609 (576)	↔
7 (9)	Alzheimer's disease	606 (563)	↑
8 (6)	Cancer, brain	586 (580)	↔
9 (10)	Cancer, liver	541 (501)	↑
10 (11)	Diabetes, type 2	537 (498)	↑
11 (12)	Cancer, leukemia, acute myelogenous	530 (497)	↑
12 (14)	Cancer, gastrointestinal, stomach	508 (473)	↑
13 (13)	Cancer, melanoma	499 (496)	↔
14 (7)	Infection, coronavirus, novel coronavirus	491 (580)	↓
15 (16)	Parkinson's disease	486 (457)	↔
16 (18)	Cancer, head and neck	480 (432)	↑
17 (15)	Cancer, myeloma	462 (459)	↔
18 (17)	Arthritis, rheumatoid	450 (449)	↔
19 (23)	Obesity	430 (300)	↑↑
20 (20)	Cancer, lymphoma, non-Hodgkin's	421 (419)	↔
21 (21)	Non-alcoholic steatohepatitis	391 (383)	↔
22 (19)	Infection, coronavirus, novel coronavirus prophylaxis	388 (425)	↓
23 (22)	Psoriasis	360 (348)	↔
24 (24)	Cancer, renal	318 (299)	↔
25 (28)	Colitis, ulcerative	307 (271)	↑

Source: Pharmaprojects, January 2025

While obesity is undoubtedly a huge medical problem, raising morbidity risks in everything from stroke to cancer, it cannot have escaped pharmaceutical companies' notice that these drugs have sprouted up a whole new secondary market in private prescriptions for those who simply want to lose a bit of weight to look better. They may not have a clinical need to take these drugs, but my goodness, they have a need to be able to fit into that little black cocktail dress.

Thus far, taking these drugs seems to have few drawbacks, although they are still relatively new, and only time will tell whether taking them for protracted periods simply to look hotter is a good idea.

This trend is also reflected in the next of our analyses, where we present the top 25 individual diseases that are the focus of pharma R&D this year. In Table 5, obesity may only move up four places, but again, the percentage increase in the number of drugs in its pipeline is most definitely XXL, coming in at 43.3%. At the top of the listing, breast cancer remains the disease against which more drugs are in development than any other, followed by non-small cell lung cancer and colorectal cancer. Pancreatic, ovarian, and prostate cancer then complete a clean sweep for oncology in the top six, which has eight of the top 10 spots. Note that only specific diseases are listed in this table; non-specific indications such as "Cancer, unspecified" have been removed from this analysis.

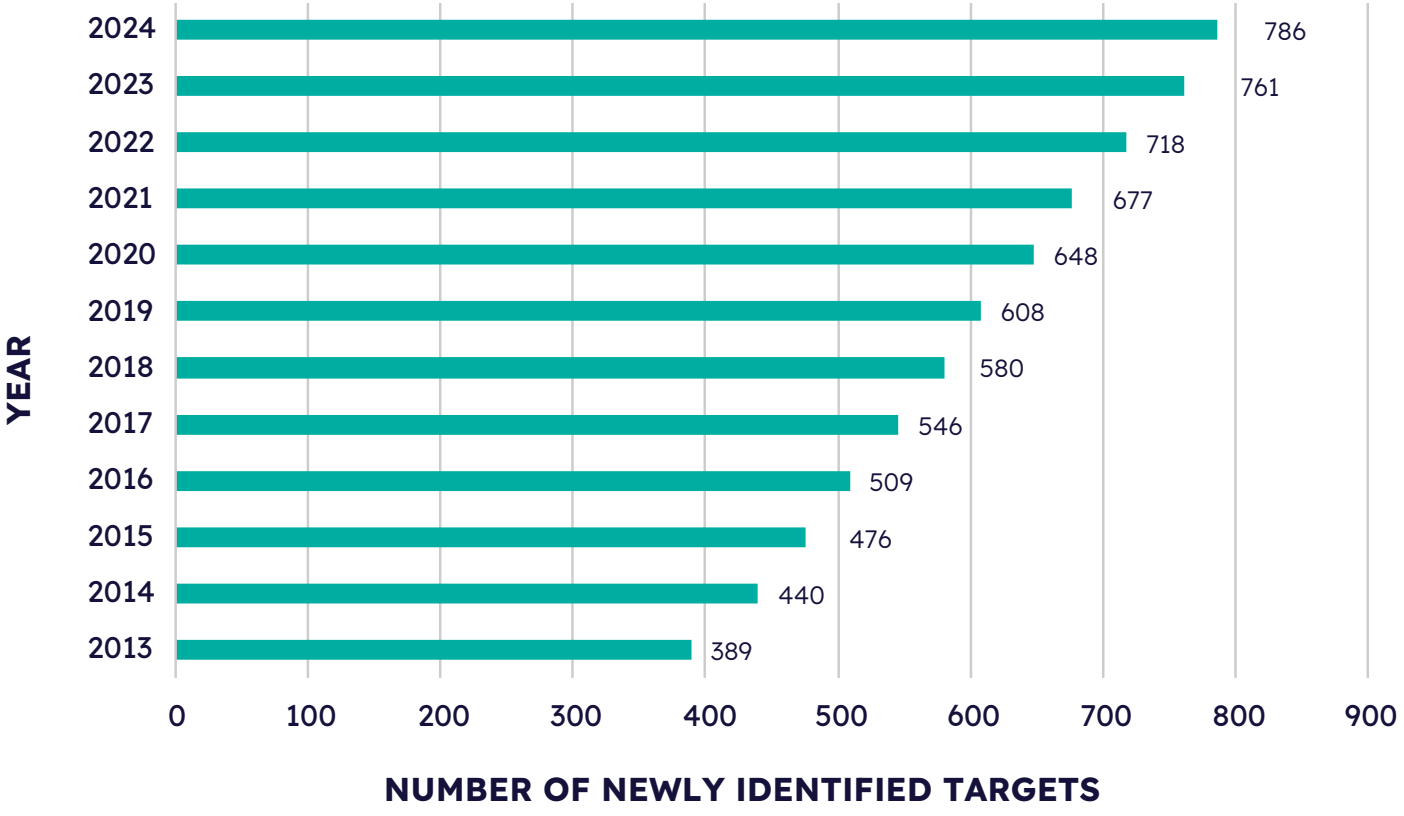
Another disease proving the old adage that nothing succeeds like success is Alzheimer's disease, which expanded its pipeline size by 7.6% this year on the back of the success of BioArctic Neuroscience/Biogen/Eisai's beta amyloid protein antagonist Leqembi (lecanemab-irmb), which launched in late 2023. It may not be the wonder jab that sufferers of this debilitating illness crave, delivering just a modest slowing in the rate of cognitive decline rather than disease reversal, but at least this drug is being successfully marketed.

Its predecessor, Aduhelm (aducanumab), which was approved in controversial circumstances, was withdrawn, ostensibly because few were prepared to fund a drug they didn't believe in. While the amyloid hypothesis for Alzheimer's remains far from proven, Leqembi's success does seem to be driving further resource into this disease, even if a cure remains as elusive as bagging a Birkin bag.

Out of the top 10 this year, but still commanding a perhaps surprising amount of attention, are drugs against the virus that causes COVID-19. The virus certainly hasn't gone entirely out of fashion, but with the global population now almost universally exposed and/or vaccinated, it has thankfully become far less of a public health concern.

Most of the top 25 diseases are unfortunately still commonplace, and thus have large markets, contributing to their popularity as targets for drug development. But, as we saw in Figure 8, there is also huge interest in the bespoke tailoring end of R&D, rare diseases. Like the exclusive catwalk creations of the top designers, drugs for such diseases can command enormous fees. In Pharmaprojects, a rare disease is defined as one with a prevalence of 1 in 2,000 people in the EU, or affecting fewer than 200,000 people in the US (equivalent to around 1 in 1,600 people). Drugs in development against rare diseases this year hit 7,721, up 7.4%, and accounting for 32.3% of the pipeline — almost a third, and up from 31.5% last year. Meanwhile, the number of different rare diseases being targeted by pharma also continues to grow, as Figure 10 illustrates.

Figure 10: Number of rare diseases being targeted by pharma

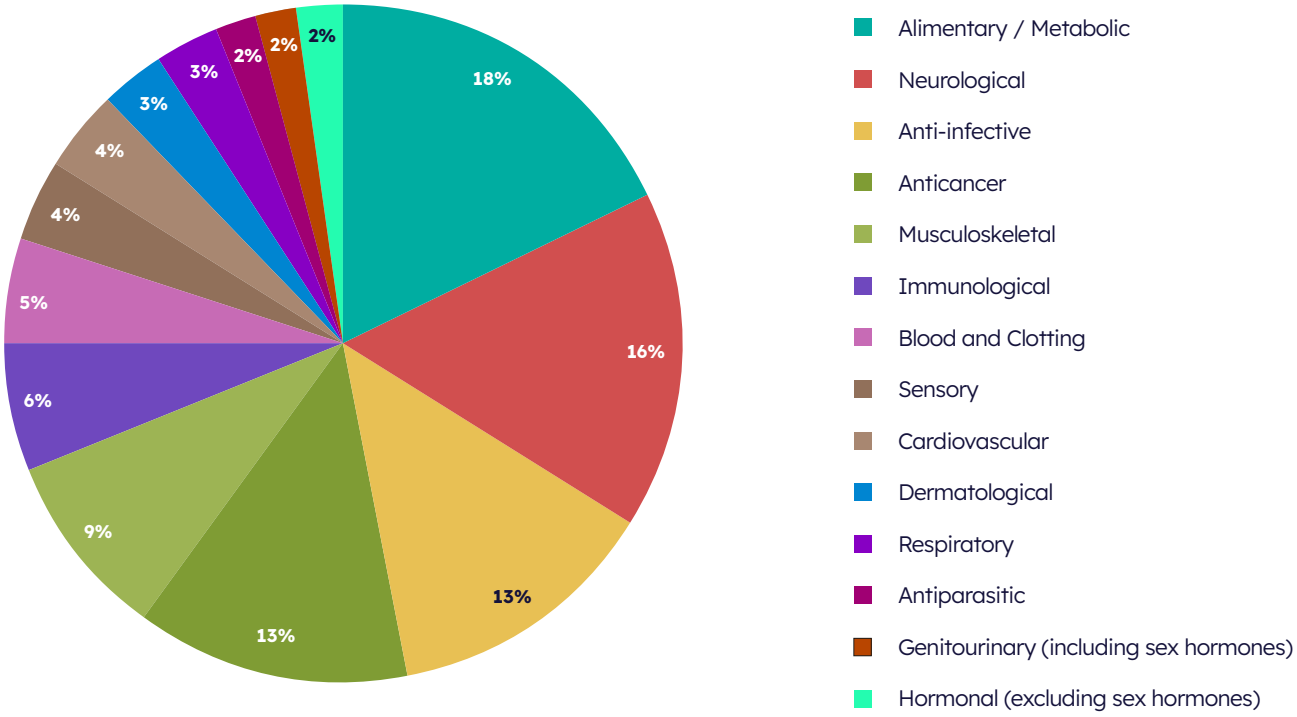


Source: Pharmaprojects, January 2025

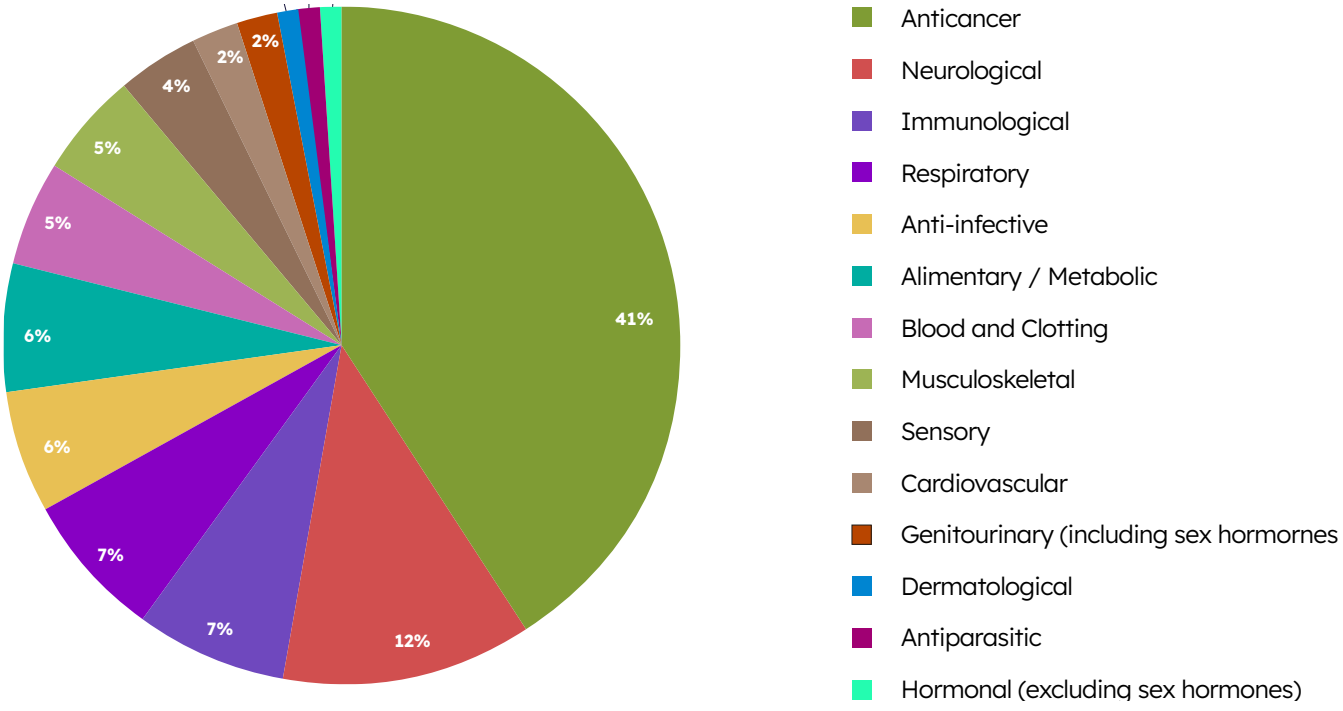
The largest proportion of these diseases falls into the alimentary/metabolic therapeutic area — unsurprising, since many rare inherited genetic conditions cause metabolic disorders. Cancers are only joint-third in terms of the numbers of rare diseases being targeted. However, when we look at the number of drugs being developed, drugs against cancers constitute 41% of the rare disease pipeline, by far the biggest share. Alimentary/metabolic slips into sixth place by this measure.

Figure 11: Rare diseases by therapeutic area, by number of diseases and number of drugs

Split for rare diseases by therapeutic area



Split of drugs for rare diseases by therapeutic area



Source: Pharmaprojects, January 2025

A further illustration of the rise of rare disease drug R&D can be taken from a look at the number of clinical trial starts in studies targeting rare diseases over the years. This again hit a new record last year, with 2,577 trials commencing, but the real news here is that this figure has more than doubled since the start of the 2010s.

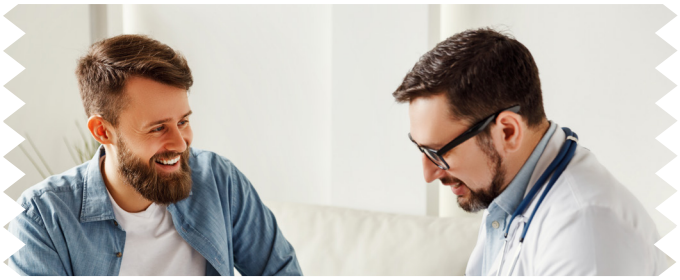
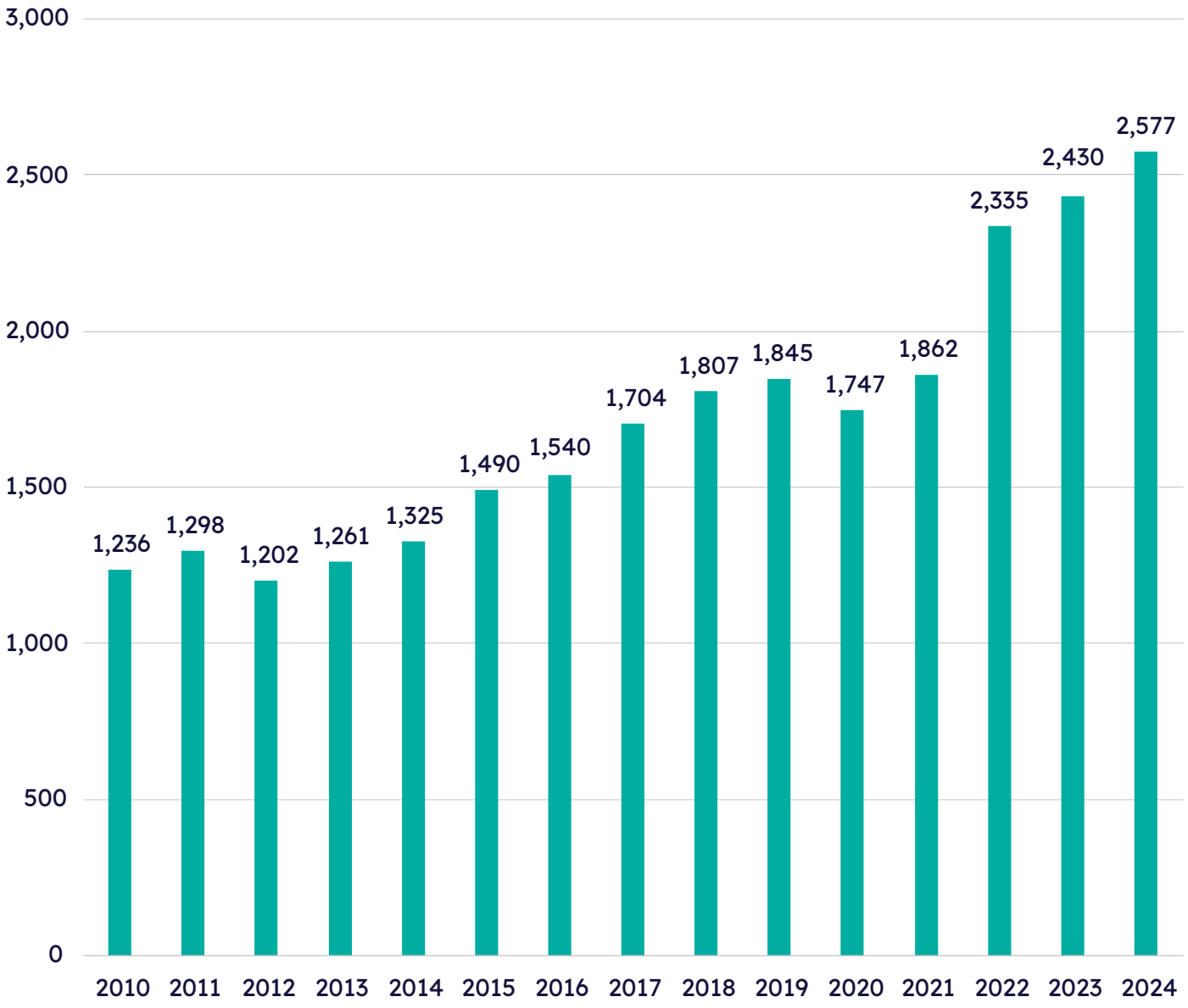


Figure 12: Industry-sponsored rare disease trials by start date, 2010–present



Source: Trialtrove, January 2025

Rare disease drug R&D has other incentives to encourage companies to develop drugs where market size is not large. Orphan drug status can be obtained in several different markets, offering benefits such as the seven years of market exclusivity offered in the US version, and many territories offer different styles of expedited reviews, such as fast-track or priority review in the US, Sakigake status in Japan and PRIME designation in the EU.

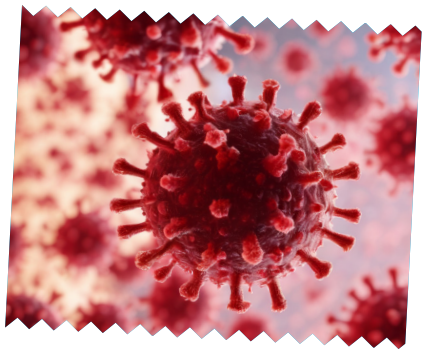
Last year saw a record number of such expedited review designations being granted, which at 443 far outshone 2023's 302.

Orphan drug designations, in contrast, posted a small decline (see Figure 13).

Also in this graph are emergency authorizations granted. This was a technique exploited to get drugs and vaccines onto the market quickly during the COVID crisis. Therefore, it's not surprising to see these fall back to a very low number again last year.

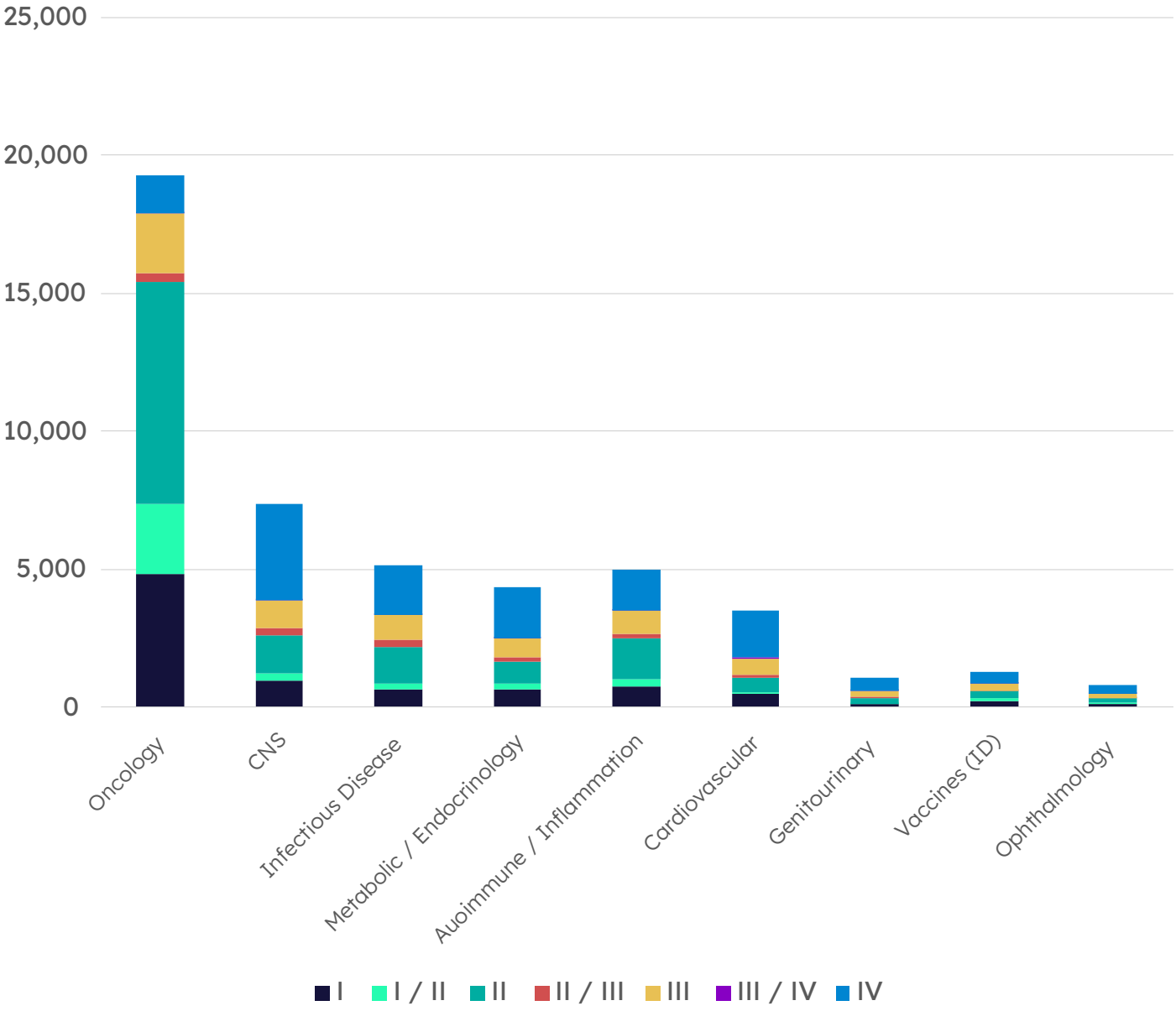
Figure 13: Numbers of drugs receiving Orphan Drug status, Expedited Review designation*, and Emergency Authorization, 2013–24**

**Data for 2013 not complete as we only began systematically recording the dates of these events mid-year.
**Emergency Authorizations only tracked from 2019.
Source: Pharmaprojects, January 2025



While the focus of this report is primarily drugs, and clinical trials will be the subject of their own round-up later in the year, before we leave the topic of the industry's therapeutic focus, let's dip into that world, as drugs and trials go together like a two-piece suit. Figure 14 reports the number of ongoing (open, closed, or temporarily closed) clinical trials reported by Pharmaprojects' sister publication, Trialtrove, at the start of 2025 (note that Trialtrove uses slightly different therapeutic areas from Pharmaprojects). In the trials world, cancer dominates even more profoundly. There were 19,261 oncology clinical trials under way at the start of 2025, a rise of 1.6%, a number which puts CNS trials, at 7,369, in a distant second. Growth was not uniform across all therapeutic areas; while CNS, metabolic/endocrinology, autoimmune/inflammation and ophthalmology all also grew, infectious disease, cardiovascular, genitourinary, and vaccines were all in decline.

Figure 14: Ongoing clinical trials, by therapeutic area



Source: Trialtrove, January 2025

Trends in therapeutic area and disease focus develop fairly slowly in pharma R&D, with rapid changes in focus being about as likely as everyone suddenly deciding to wear bell bottoms again. Fashions do come and go — it will be fascinating to see if interest in obesity treatments is just a fad or an industry game changer — but the picture across the industry is otherwise fairly stable. With drugs under development for a total of 1,530 different diseases, many of them lacking a decent treatment, there is clearly still much to do.

Regional Variations:

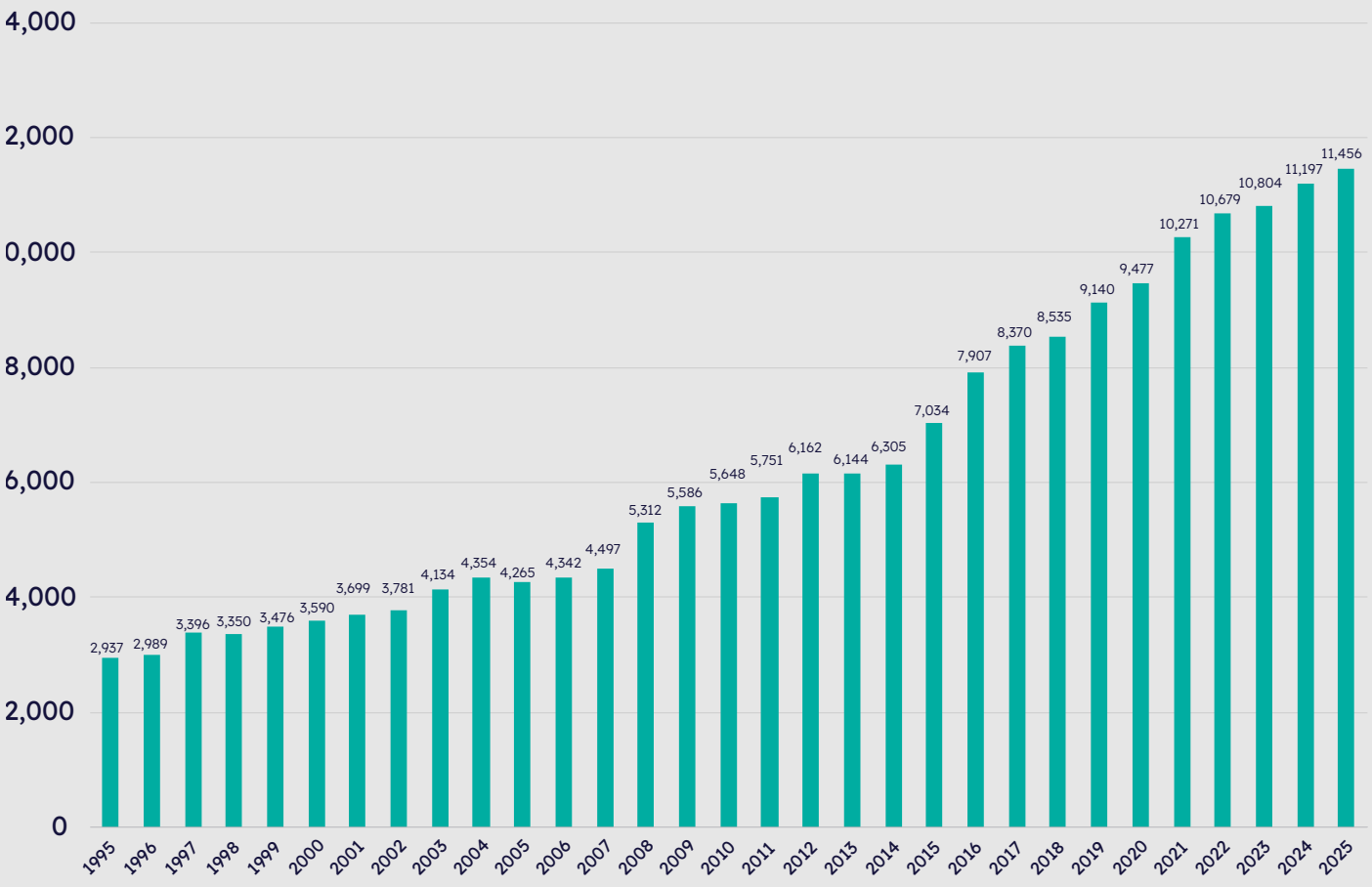
The leading players in key markets, and the varying styles of drug R&D

Despite globalization, the clothing market varies across the world, both in terms of leading suppliers and what people wear. While many multinational retailers seem omnipresent (I've yet to visit a city which doesn't have a Zara store), other names might be ubiquitous in their home markets, but unheard of elsewhere. Similarly, despite the apparent global dominance of the jeans, T-shirt and sneakers combo, style does vary across the world, with many countries still dominated by their own traditional apparel, and clothing being inevitably influenced by differences in climate (I'd wager the fur coat market in Saharan Africa is pretty small). Having reviewed global trends in total pipeline size, the leading companies and the biggest diseases, this section takes things down to the country level in 11 major markets, where we'll see where there are differences and similarities across these metrics.

USA

As we've seen, despite other countries chipping away at its dominance, the US remains by far the largest territory for pharmaceutical R&D worldwide. Nevertheless, there are some differences in trends in the US compared to the world as a whole. The total number of drugs in development in the US increased by 2.3% this year, lower than the global rate. This is a further decline from the 3.6% rise reported last year, and continues the general slowdown seen since the powerhouse years of the middle of the last decade.

Figure 15: Total US R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

As of January 2025, there were 2,803 companies developing drugs that are headquartered in the US, up from 2,609 last year. The top 10 companies are listed in Table 6, alongside the size of their pipelines. [Note: data in this chapter were pulled at a slightly later date than the data used for Table 1, hence there may be minor differences in numbers.] The biggest mover in the US-HQed top 10 this year is Bristol Myers Squibb, which moves up four places into the runner-up position.

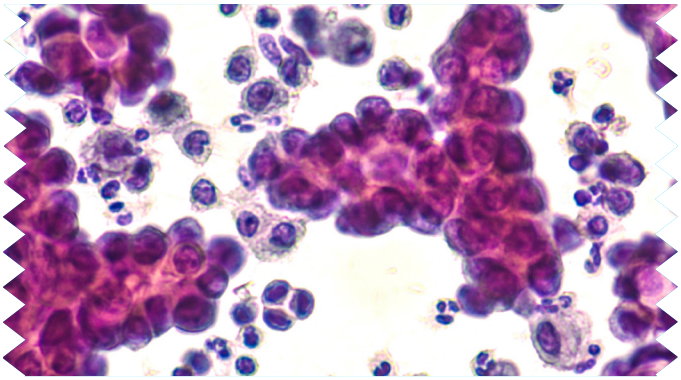


Table 6: Top 10 US-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Pfizer	271
2 (6)	Bristol Myers Squibb	227
3 (3)	Eli Lilly	224
4 (4)	Merck & Co.	216
5 (2)	Johnson & Johnson	200
6 (5)	AbbVie	190
7 (7)	Gilead Sciences	106
8 (8)	Amgen	100
9 (9)	Regeneron	76
10 (-)	Biogen	66

Source: Pharmaprojects, January 2025

Table 7: Top 10 diseases for US pipeline drugs

POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	632
2 (2)	Cancer, breast	573
3 (3)	Cancer, colorectal	433
4 (4)	Cancer, pancreatic	421
5 (5)	Cancer, ovarian	384
6 (8)	Cancer, prostate	356
7 (7)	Cancer, brain	334
8 (10)	Cancer, leukemia, acute myelogenous	325
9 (6)	Alzheimer's disease	322
10 (-)	Cancer, melanoma	306

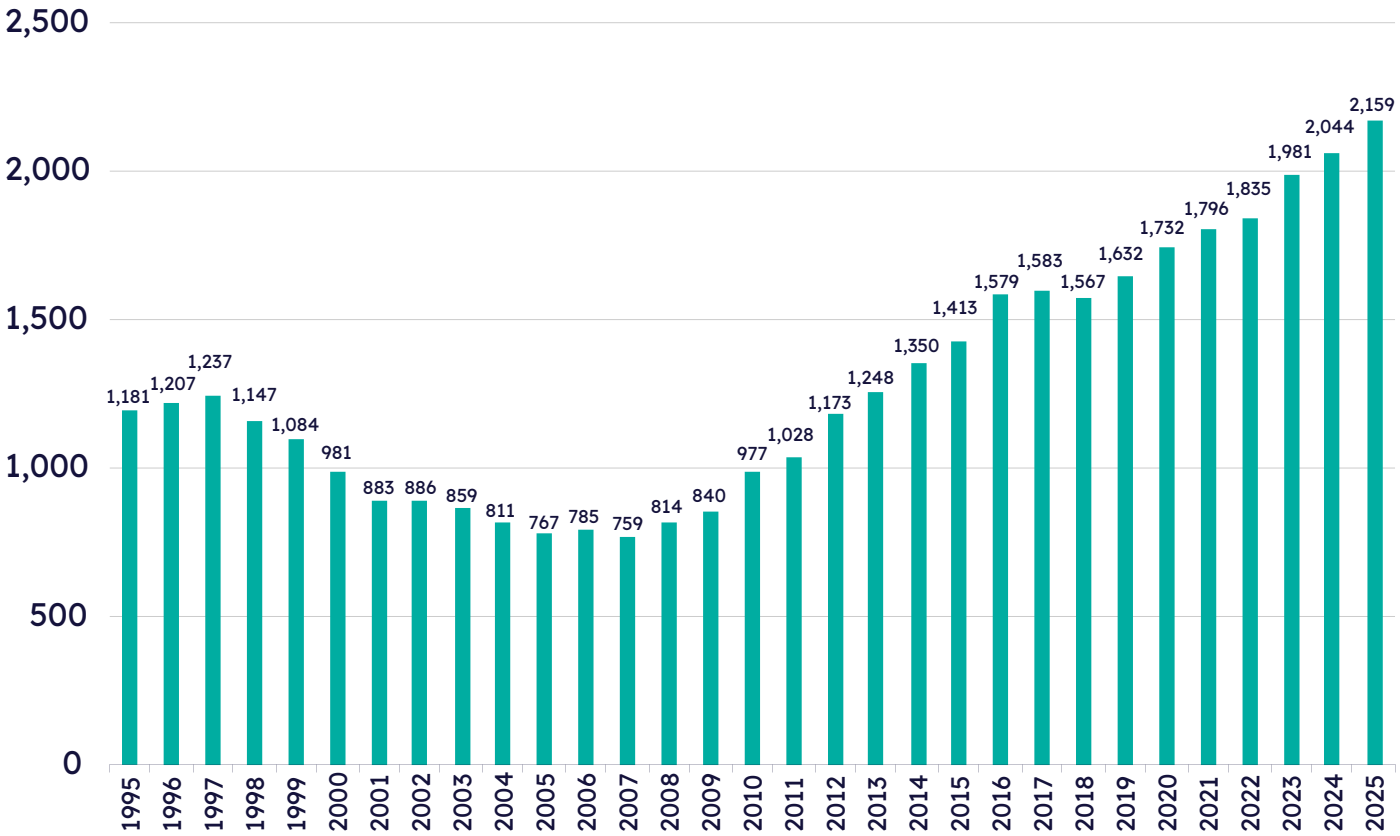
Source: Pharmaprojects, January 2025

The top 10 diseases for which drugs have US development show that, in this territory, non-small cell lung cancer comes out on top again, keeping the global leader, breast cancer, in second place. Nine of the top 10 are oncological diseases. In the US, unlike in the global list, Alzheimer's disease slips down the chart.

JAPAN

The size of the pipeline of drugs under development in Japan has grown consistently in recent years, and this year, its expansion rate of 5.6% surpassed the global rate. This picks up the pace again after the rate had decelerated in recent years (it was just 3.2% last year). The trend for Japan this decade is now clearly on the up.

Figure 16: Total Japan R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

As of January 2025, there were 205 companies developing drugs headquartered in Japan, up from 184 last year. The top 10 Japanese companies are listed in Table 8, alongside the size of their pipelines. Otsuka Holdings is this year's top model, having moved up five places to number 2. Cancer indications dominate Japan's top 10 diseases in active development, taking nine of the 10 spots this time around. Non-small cell lung cancer, which has a higher-than-average prevalence in the country, has long held top spot in this table. Elsewhere, there are new entries into the top 10 this year for both ovarian and prostate cancer. Alzheimer's does not appear in this country's top 10, perhaps surprisingly, since Japan is famous for having an aging population.

Table 8: Top 10 Japan-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Takeda	187
2 (7)	Otsuka Holdings	114
3 (2)	Astellas Pharma	100
4 (4)	Daiichi Sankyo	88
5 (3)	Eisai	86
6 (5)	Ono Pharmaceutical	74
7 (6)	Shionogi	60
8 (-)	Sumitomo Pharma	57
9 (-)	Kyowa Kirin	50
10 (10)	Mitsubishi Tanabe Pharma	45

Source: Pharmaprojects, January 2025

Table 9: Top 10 diseases for Japan pipeline drugs

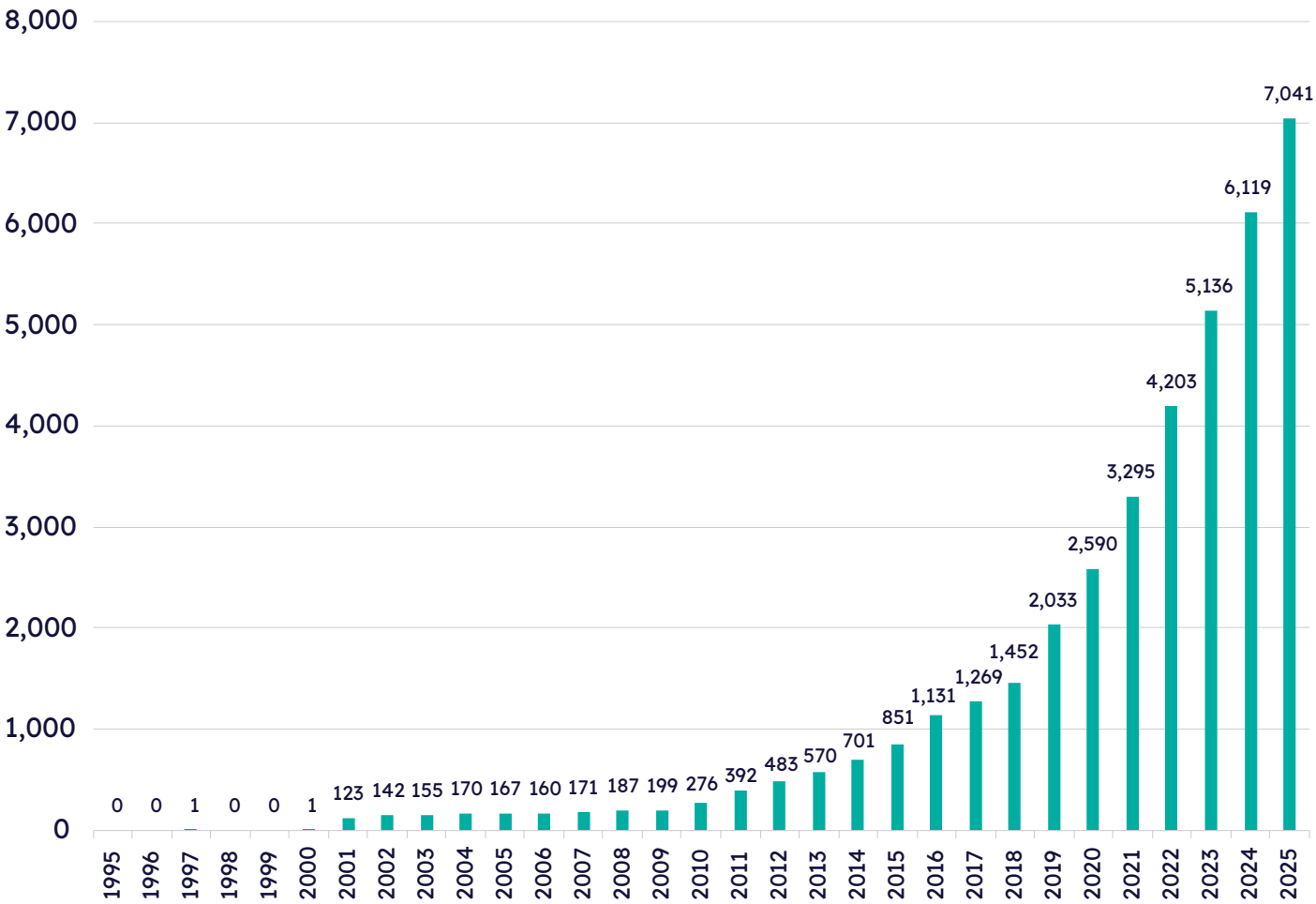
POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	152
2 (2)	Cancer, breast	98
3 (3)	Cancer, colorectal	82
4 (4)	Cancer, gastrointestinal, stomach	70
5 (7)	Cancer, pancreatic	63
6 (-)	Cancer, ovarian	59
7 (6)	Cancer, lymphoma, non-Hodgkin's	57
8 (5)	Diabetes, type 2	54
9 (10)	Cancer, myeloma	52
10 (-)	Cancer, prostate	51

Source: Pharmaprojects, January 2025

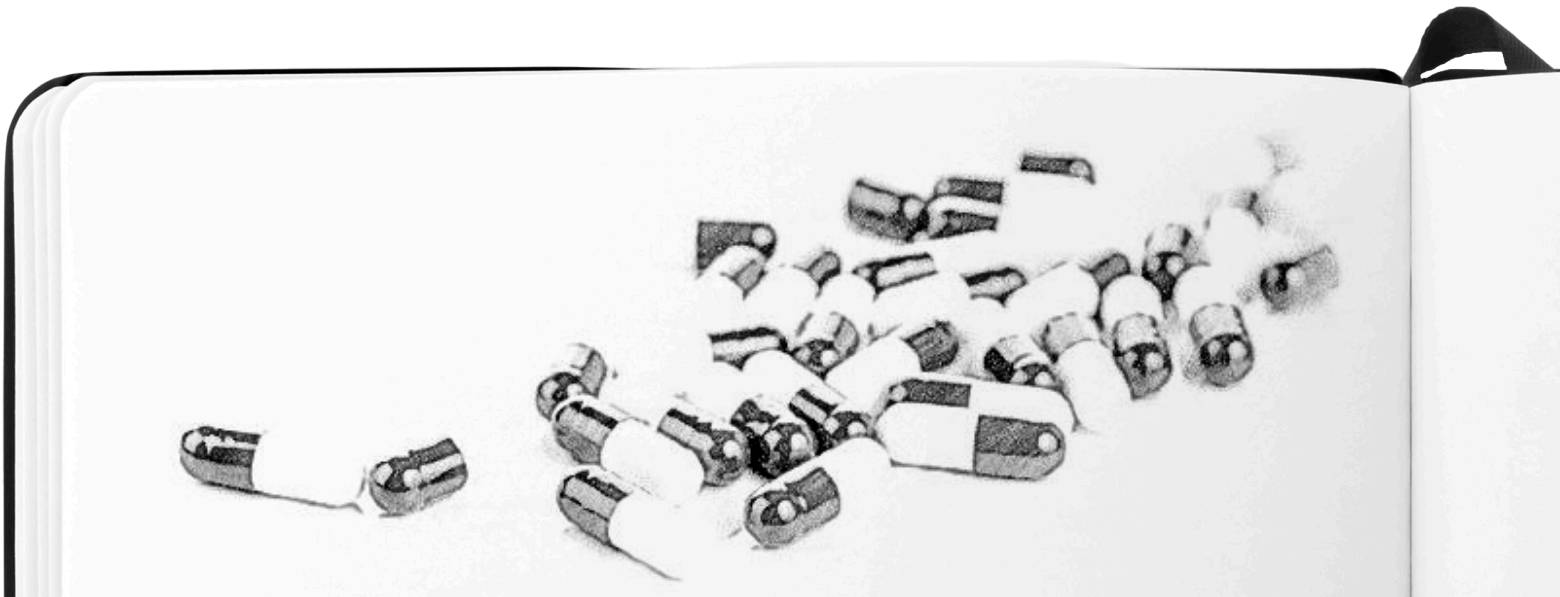
CHINA

The graph of total pipeline drugs for China is perhaps the most striking. From virtually no activity in the 1990s, the country's pharma R&D efforts have soared, to make it the second-most active market. The growth rate for its pipeline, at 15.1%, far outstrips the global mean, although it is a little down on the 2023–24 expansion rate of 19.1%. But the boom in novel drug development in China is really showing no sign of ending anytime soon.

Figure 17: Total China R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025



A total of 1,218 pharmaceutical companies are headquartered in China (including Hong Kong), which as previously noted is now a total that is second only to the US. One company entered China's top 10 this year, 3SBio. Meanwhile, the top 10 diseases were remarkably stable, and have considerable overlap with that of Japan.

Table 10: Top 10 China-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Jiangsu Hengrui Pharmaceuticals	173
2 (2)	Sino Biopharmaceutical	125
3 (4)	CSPC Pharmaceutical	102
4 (5)	BeOne Medicines	77
5 (10)	Huadong Medicine	61
6 (3)	Shanghai Fosun Pharmaceutical	59
7 (8)	Innovent Biologics	56
8 (9)	Qilu Pharmaceutical	56
9 (6)	Shanghai Junshi Biosciences	55
10 (-)	3SBio	50

Source: Pharmaprojects, January 2025

Table 11: Top 10 diseases for China pipeline drugs

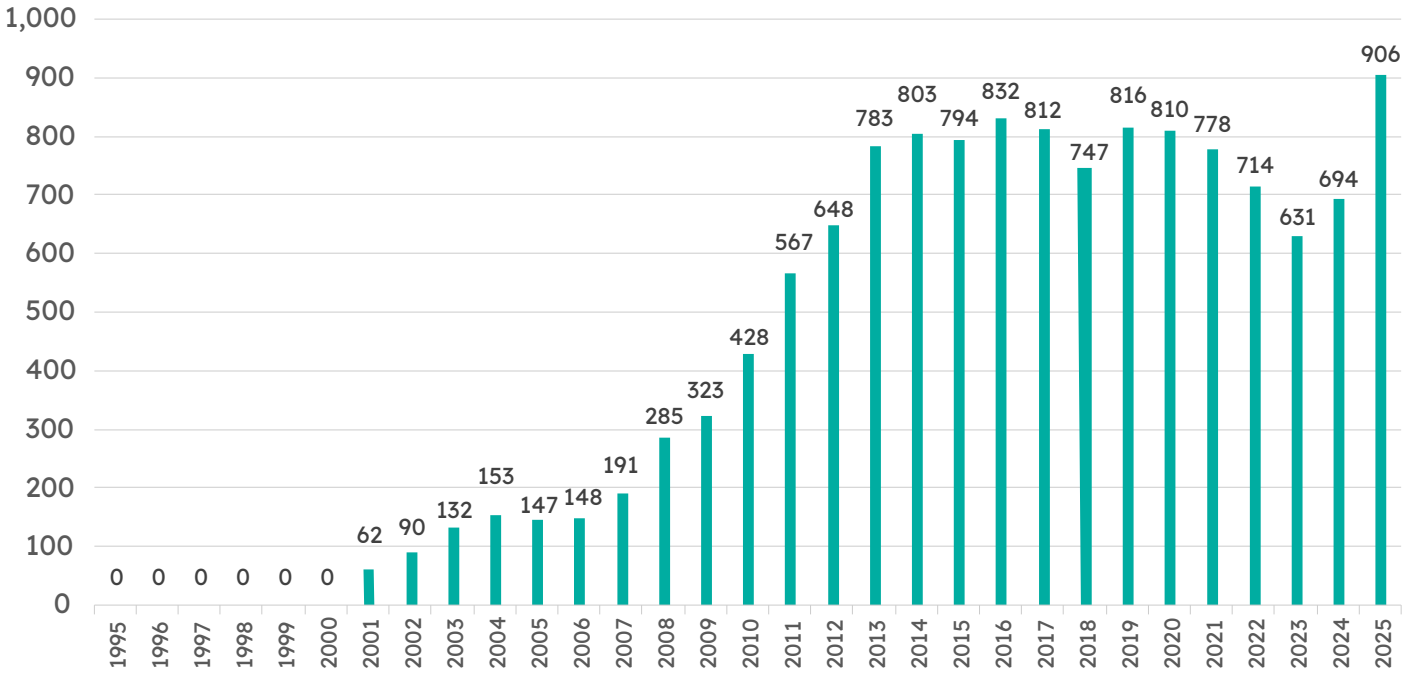
POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	447
2 (2)	Cancer, breast	371
3 (4)	Cancer, colorectal	252
4 (3)	Cancer, gastrointestinal, stomach	250
5 (5)	Cancer, liver	224
6 (6)	Diabetes, type 2	216
7 (7)	Cancer, pancreatic	203
8 (8)	Cancer, lymphoma, non-Hodgkin's	183
9 (9)	Cancer, myeloma	175
10 (10)	Cancer, leukemia, acute myelogenous	149

Source: Pharmaprojects, January 2025

INDIA

Development of novel drugs in India was similarly nonexistent in the 1990s, but since then, its takeoff has followed a more uneven path. Massive expansion in the 2007–2013 period was followed by stuttering progress, and the early 2020s actually saw numbers decline. Things are looking up this year, with 906 drugs setting a new record.

Figure 18: Total India R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

You can see that India's R&D effort, however, is dwarfed by China's, and indeed the country only has 67 companies headquartered there, only just above 5% of its larger neighbor. Like China, Indian companies were primarily focused on generics production, which is why many of the companies listed in its top 10 might be familiar from that world. It has been slower to move into novel ethical R&D, with the biggest pipeline of this type being of just 36 drugs. There is one new entry into the 2025 top 10: Glenmark Pharmaceuticals.

Table 12: Top 10 India-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Dr. Reddy's Laboratories	36
2 (2)	Lupin	34
3 (3)	Sun Pharmaceutical Industries	25
4 (4)	Serum Institute of India	20
5 (6)	Biocon	19
6 (7)	Cipla	16
7 (-)	Glenmark Pharmaceuticals	15
8 (8)	Intas Pharmaceuticals	14
9 (10)	Bharat Biotech	13
10 (9)	Suven Life Sciences	13

Source: Pharmaprojects, January 2025

Table 13: Top 10 diseases for India pipeline drugs

POSN	DISEASE	NUMBER OF DRUGS
1 (2)	Cancer, breast	68
2 (3)	Cancer, lung, non-small cell	59
3 (1)	Diabetes, type 2	56
4 (8)	Infection, coronavirus, novel coronavirus	34
5 (4)	Arthritis, rheumatoid	31
6 (5)	Cancer, colorectal	24
7 (-)	Cancer, prostate	24
8 (-)	Colitis, ulcerative	21
9 (-)	Crohn's disease	20
10 (8)	Infection, coronavirus, novel coronavirus prophylaxis	20

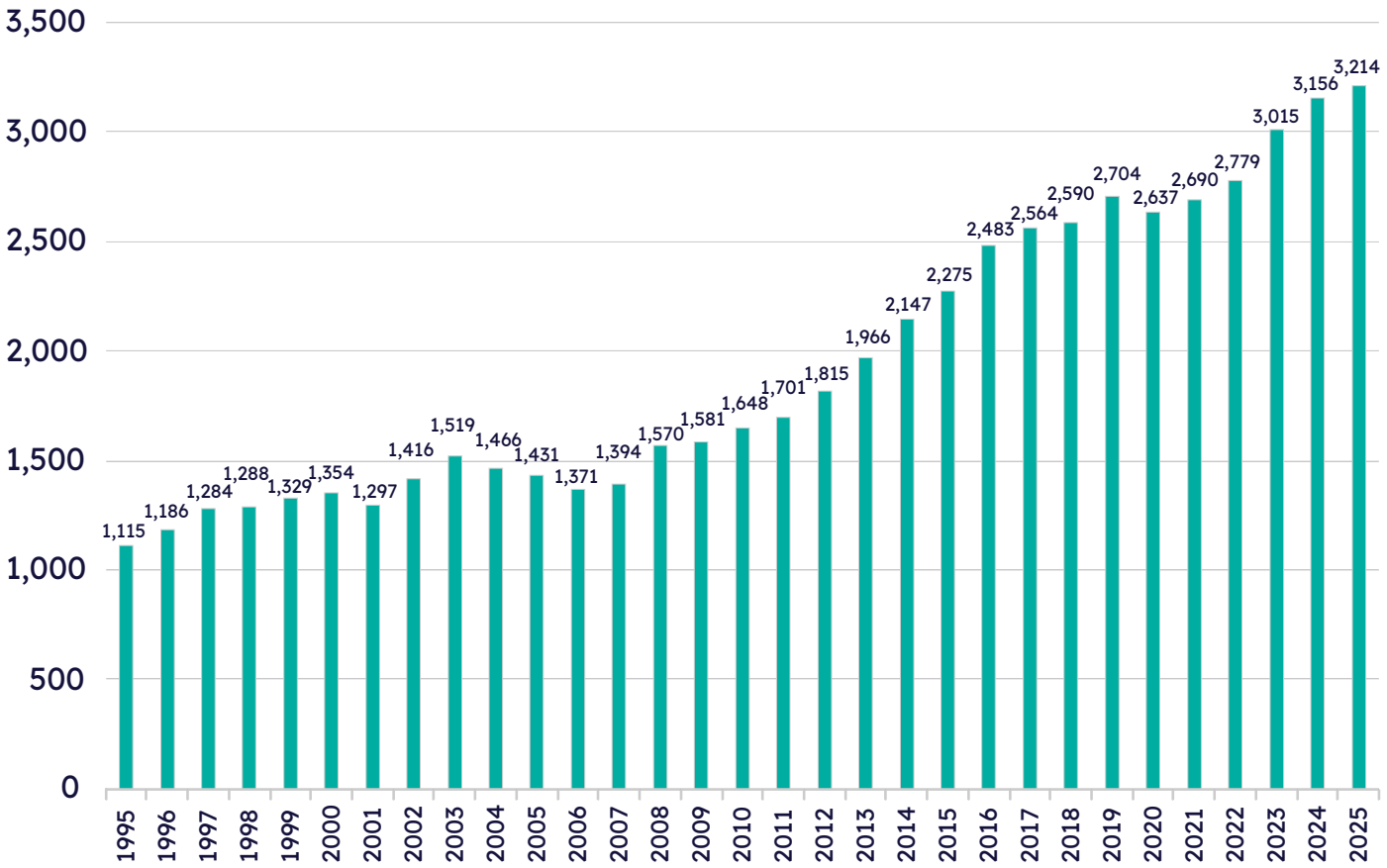
Source: Pharmaprojects, January 2025

In terms of the disease focus for India, it follows the global pattern with its top two being breast cancer followed by non-small cell lung cancer. Type 2 diabetes this year lost its position at the summit of the chart, but at third, it's still a bigger focus in India than globally, where it just scrapes into the top 10. Another way in which India bucks the global trend is that drugs against COVID-19 are actually rising. COVID vaccines also feature in the top 10, but slipped down the chart this year. Cancer is less represented than in any other major territory.

UK

Leaving Asia behind, we turn our attention to what is still the biggest European center for pharma R&D, the UK. This year saw further growth in this country's pipeline, but slowed to just 1.8%, quite a bit below the 2024 rate of 4.5%.

Figure 19: Total UK R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

The UK R&D scene is, however, completely dominated by its two big pharma companies, AstraZeneca and GSK, with pipelines around 10 times the size of those trailing behind them like a couture wedding gown train. Among these smaller companies, Oxford BioTherapeutics makes a climb up the table, whereas Cancer Research Horizons, Scancell, and Adaptimmune make debut appearances.

Table 14: Top 10 UK-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	AstraZeneca	241
2 (2)	GSK	194
3 (3)	Mundipharma International	25
4 (4)	Hikma Pharmaceuticals	24
5 (10)	Oxford BioTherapeutics	18
6 (5)	Albumedix	15
7 (-)	Cancer Research Horizons	15
8 (8)	Bicycle Therapeutics	13
9 (-)	Scancell	13
10 (-)	Adaptimmune	12

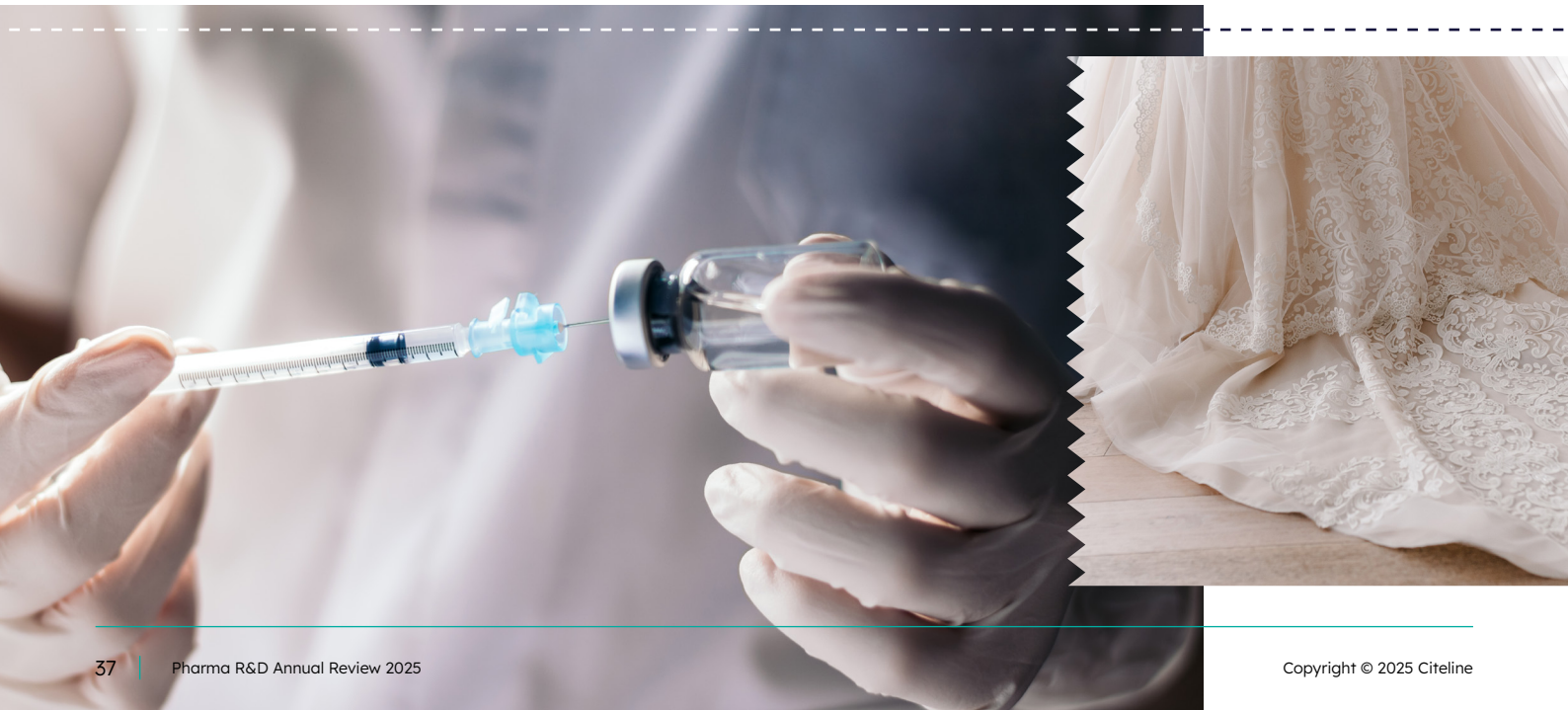
Source: Pharmaprojects, January 2025

Table 15: Top 10 diseases for UK pipeline drugs

POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	178
2 (2)	Cancer, breast	154
3 (3)	Cancer, colorectal	126
4 (4)	Cancer, prostate	99
5 (6)	Cancer, melanoma	94
6 (5)	Cancer, ovarian	88
7 (-)	Cancer, head and neck	81
8 (-)	Cancer, pancreatic	76
9 (-)	Arthritis, rheumatoid	75
10 (-)	Colitis, ulcerative	71

Source: Pharmaprojects, January 2025

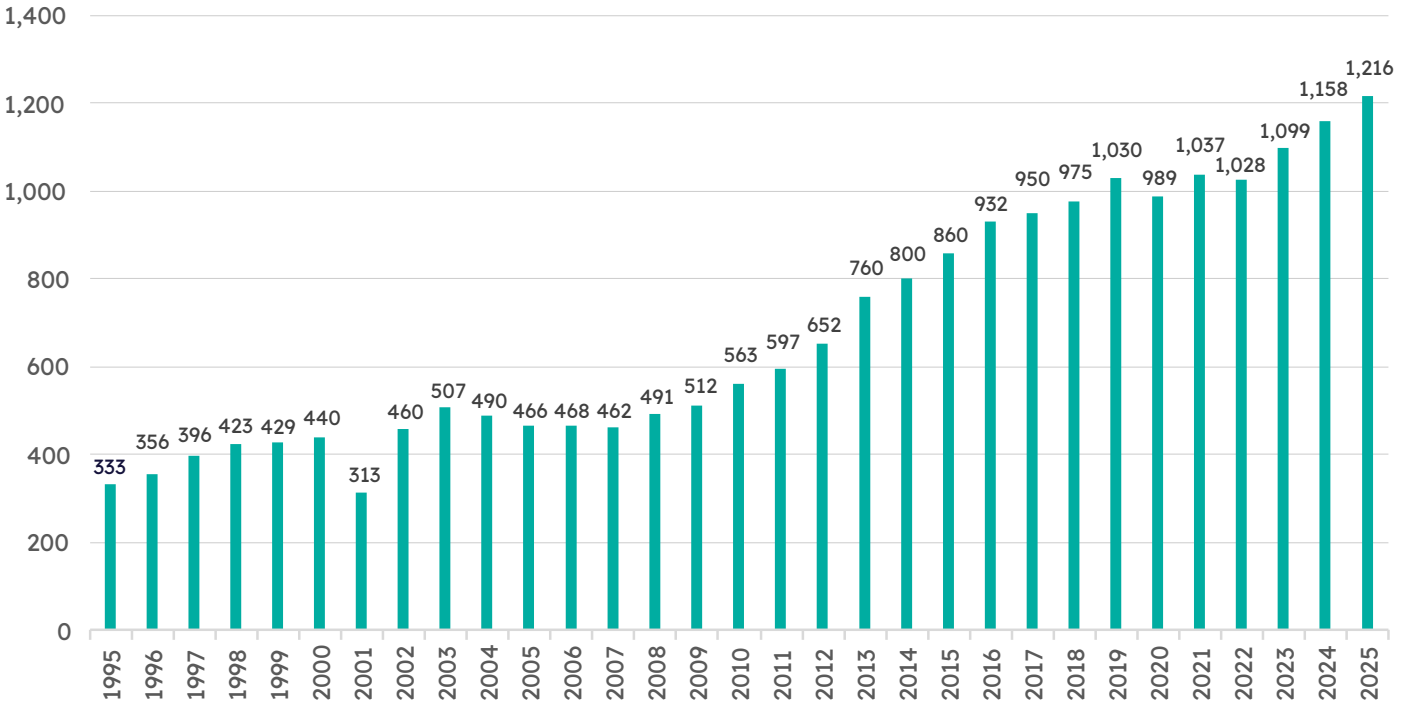
The UK also has non-small cell lung cancer beating breast cancer to the top spot, and cancer taking the top eight positions. It differs from the worldwide table by having two autoimmune diseases, rheumatoid arthritis and ulcerative colitis, in the top 10, which are at numbers 18 and 25, respectively, globally.



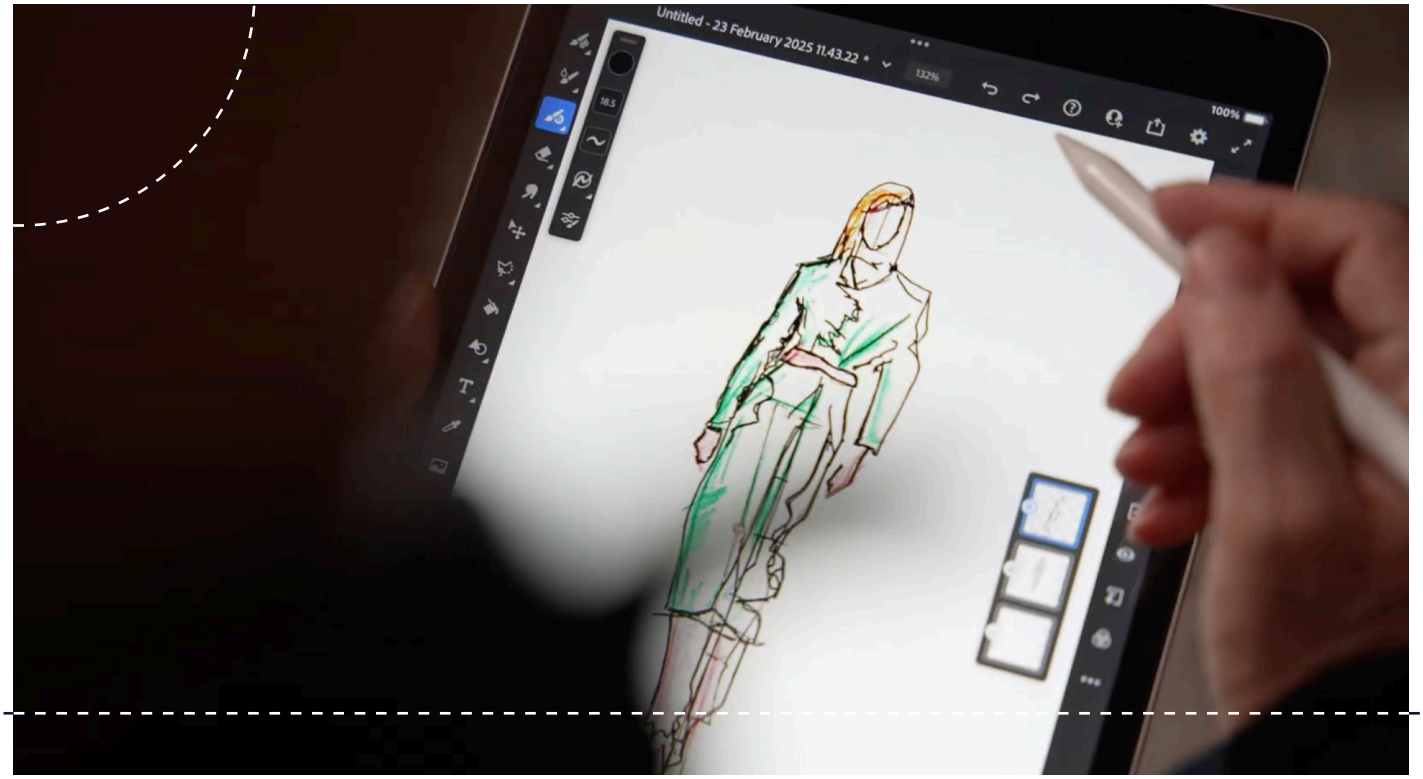
IRELAND

Neighboring Ireland, in contrast, has grown its pipeline this year by a rate slightly above the average, 5.0%. This trends fairly consistently with the 5.4% reported last year. Its overall R&D closet is a little over a third of the UK's size which, considering its population is around one-thirteenth, suggests that this EU country is punching above its weight.

Figure 20: Total Ireland R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025



Despite this fact, Ireland has relatively few homegrown pharma companies; only three companies have portfolio numbers in double figures. Jazz Pharmaceuticals, a firm focusing on cannabinoids and anticancers, is the preeminent force here, as Table 16 shows.

Table 16: Top 10 Ireland-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Jazz Pharmaceuticals	26
2 (5)	Perrigo	12
3 (3)	Mallinckrodt	10
4 (2)	Alkermes	9
5 (4)	Prothena	9
6 (-)	OmniSpirant	6
7 (6)	ONK Therapeutics	5
8 (-)	ATXA Therapeutics	4
9 (8)	GH Research	3
10 (9)	Inflection Biosciences	3

Source: Pharmaprojects, January 2025

Table 17: Top 10 diseases for Ireland pipeline drugs

POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	67
2 (2)	Cancer, breast	63
3 (3)	Arthritis, rheumatoid	43
4 (6)	Psoriasis	39
5 (5)	Arthritis, psoriatic	38
6 (8)	Colitis, ulcerative	36
7 (-)	Crohn's disease	34
8 (4)	Diabetes, type 2	34
9 (9)	Arthritis, juvenile	29
10 (7)	Cancer, colorectal	27

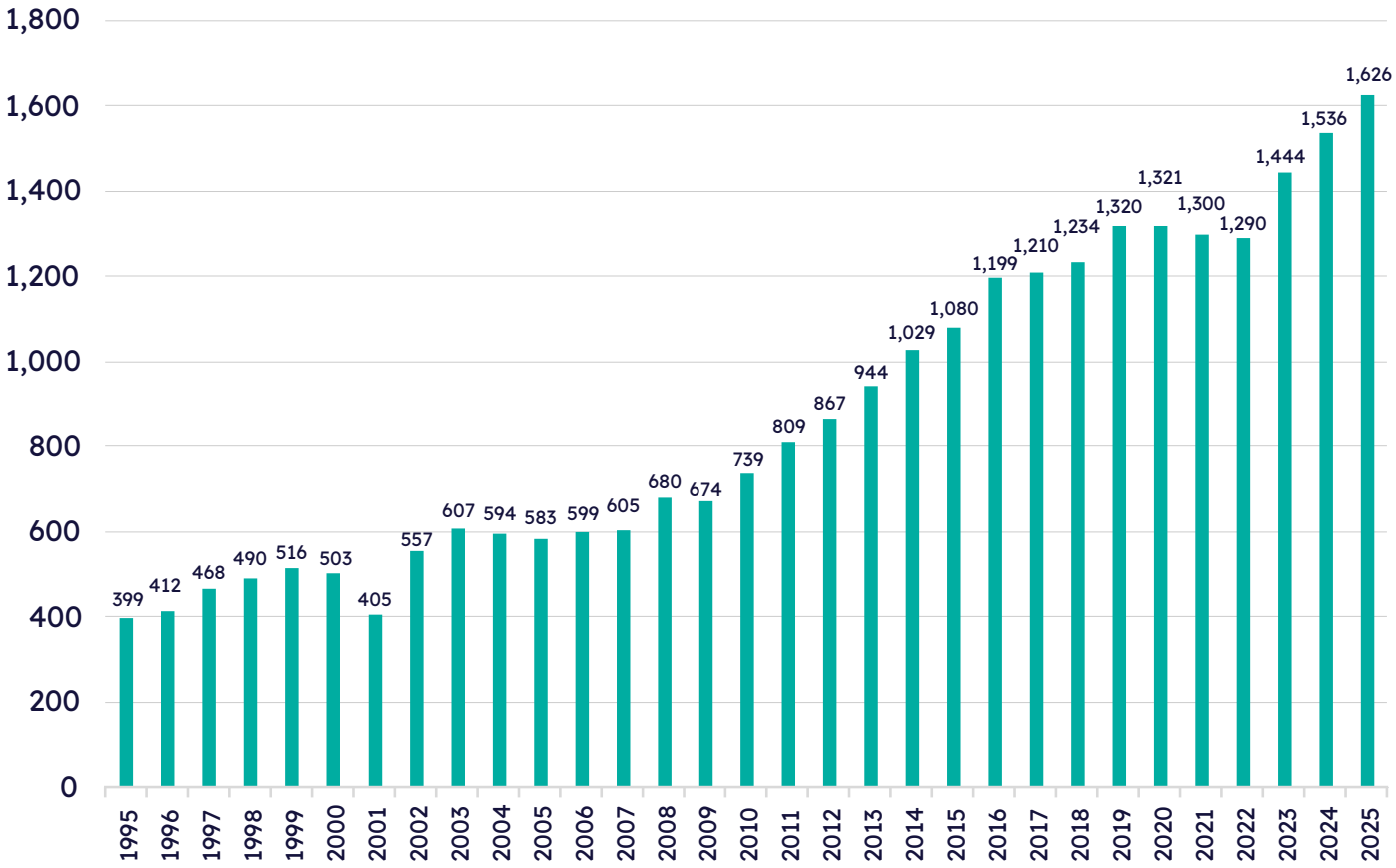
Source: Pharmaprojects, January 2025

Ireland has an even bigger leaning than the UK towards autoimmune disease drug development, with rheumatoid arthritis taking third position, and being joined in the top 10 by psoriasis, ulcerative colitis, Crohn's disease, and juvenile arthritis. With only three, it is the major market with the fewest cancer indications in its top 10.

DENMARK

Denmark has both a similar-sized population to Ireland and a similar pipeline size. It also posted an above-average pipeline growth rate and one just slightly below its 2024 level, hitting 5.9% this year versus 6.4% last.

Figure 21: Total Denmark R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

Table 18: Top 10 Denmark-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Novo Nordisk	97
2 (2)	Genmab	38
3 (3)	Lundbeck	26
4 (6)	Leo Pharma	13
5 (5)	Bavarian Nordic	12
6 (-)	Tetra Pharm Technologies	12
7 (7)	Zealand Pharma	12
8 (-)	Allarity Therapeutics	10
9 (9)	ALK-Abello	9
10 (4)	Gubra	9

Source: Pharmaprojects, January 2025

Table 19: Top 10 diseases for Denmark pipeline drugs

POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	80
2 (2)	Cancer, breast	69
3 (6)	Psoriasis	48
4 (5)	Arthritis, rheumatoid	46
5 (3)	Cancer, colorectal	46
6 (4)	Diabetes, type 2	44
7 (-)	Cancer, prostate	43
8 (10)	Crohn's disease	42
9 (8)	Cancer, myeloma	38
10 (-)	Cancer, ovarian	38

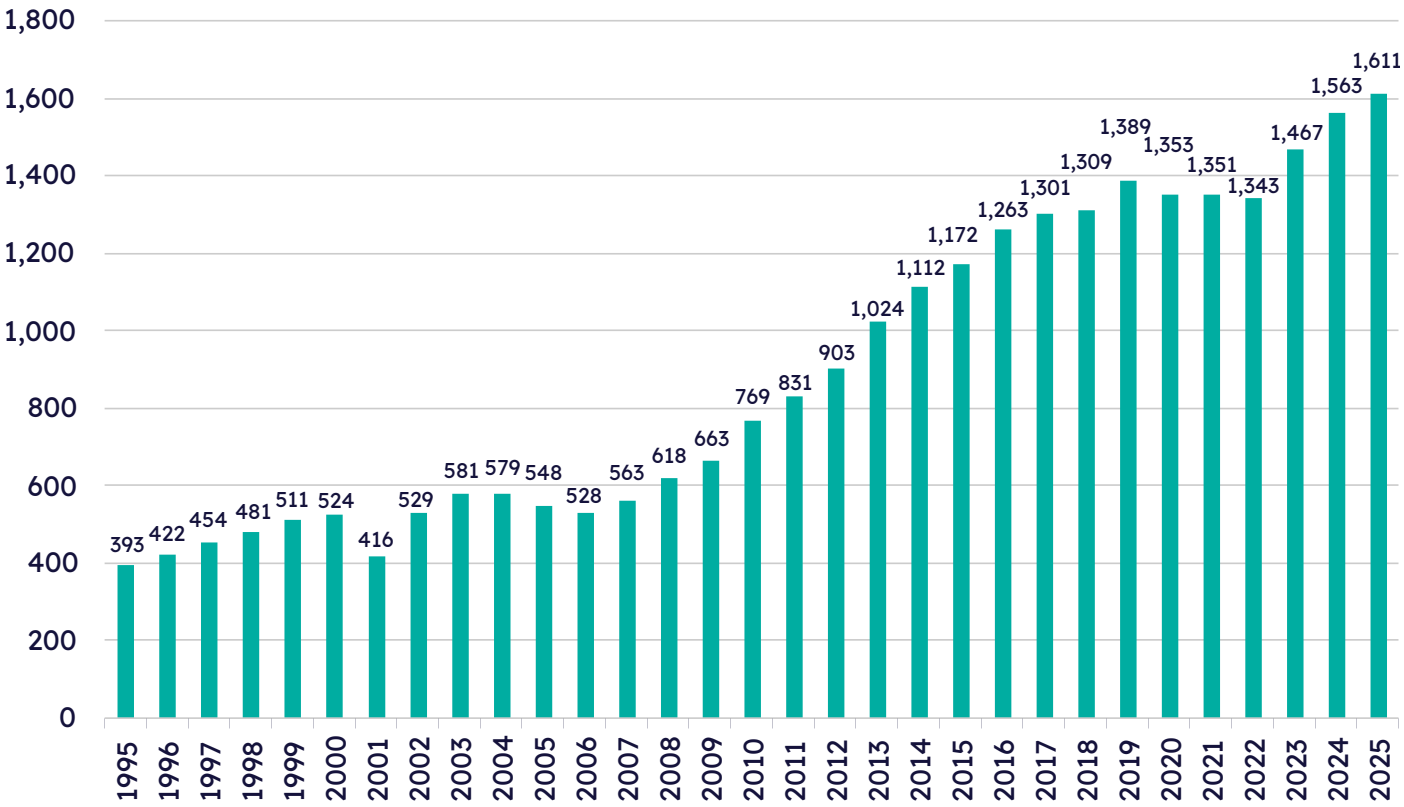
Source: Pharmaprojects, January 2025

The country has some larger pharma companies, though, with diabetes and obesity specialist Novo Nordisk by far the biggest, and both second- and third-placed Genmab and Lundbeck sitting within the top 100 companies by pipeline size worldwide. Its top disease focus is non-small cell lung cancer, one of six cancers in the country's top 10 diseases. It too has strong interest in psoriasis, rheumatoid arthritis, and Crohn's disease.

SWEDEN

Staying in the Nordic countries, Sweden has an almost identical pipeline size to Denmark, although it posted a much slower growth rate this year, at 3.1%, than last year's 6.5%. The past three years have, however, seen a return to growth after a period of stagnation seen from 2017 to 2022.

Figure 22: Total Sweden R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

In contrast to Denmark, Sweden does not have any large homegrown pharma companies, with its biggest one this year, Sobi, only having 22 drugs in its pipeline. It places type 2 diabetes even higher than its southern neighbor, though, in a top 10 that features a broadly similar disease profile.

Table 20: Top 10 Sweden-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (3)	Sobi	22
2 (4)	BioArctic Neuroscience	13
3 (6)	Alligator Bioscience	9
4 (5)	Medivir	9
5 (9)	BioInvent	8
6 (10)	Camurus	7
7 (7)	Salipro Biotech	7
8 (8)	AlzeCure Pharma	6
9 (2)	Anocca	6
10 (-)	Hamlet Biopharma	6

Source: Pharmaprojects, January 2025

Table 21: Top 10 diseases for Sweden pipeline drugs

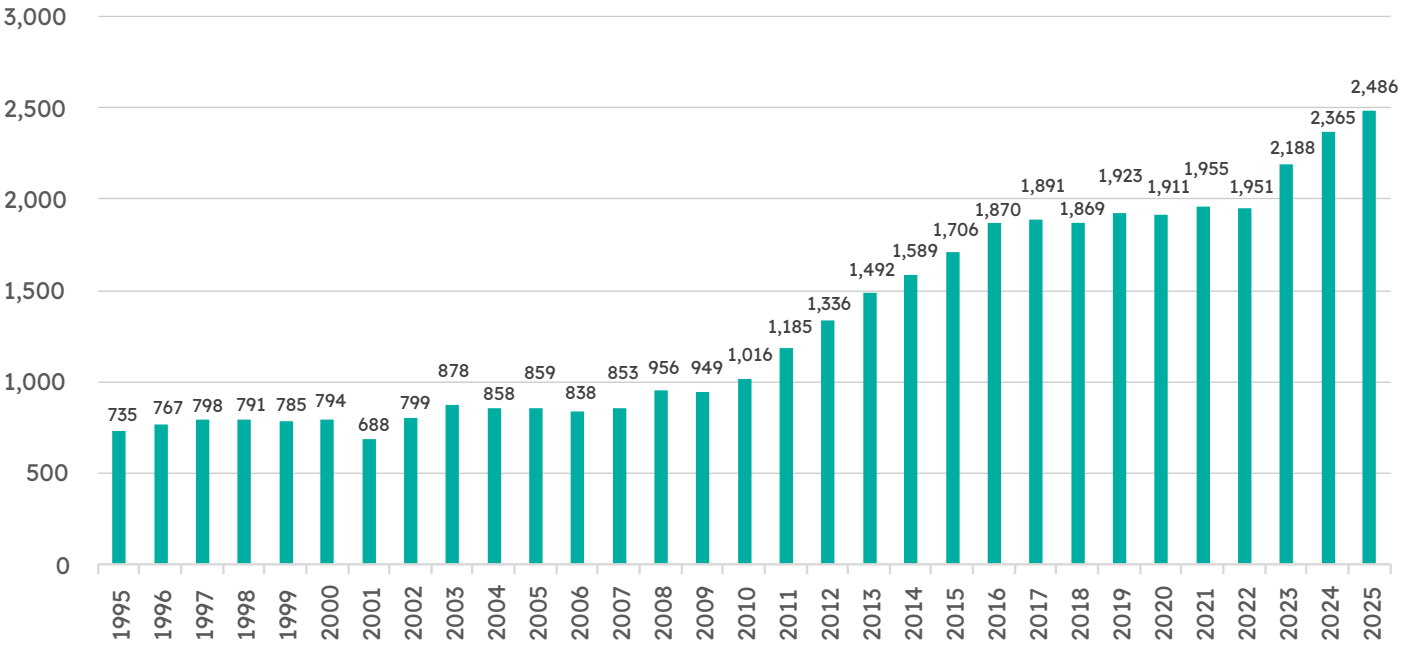
POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	78
2 (2)	Cancer, breast	62
3 (4)	Diabetes, type 2	48
4 (5)	Arthritis, rheumatoid	47
5 (3)	Cancer, colorectal	45
6 (10)	Cancer, prostate	42
7 (7)	Psoriasis	42
8 (6)	Cancer, myeloma	41
9 (8)	Arthritis, psoriatic	40
10 (-)	Crohn's disease	39

Source: Pharmaprojects, January 2025

FRANCE

France is developing around 1.5 times as many drugs as the Scandinavian countries covered above. Like Sweden, growth in pipeline size was moribund in the 2017–2022 period, but has since taken off again. It also posted a slower growth rate this year, with the pipeline expanding by 5.1%, compared to 8.1% last year.

Figure 23: France's R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

Sanofi remains France's biggest domestic pharma company — and by some distance. This year, Servier shuffles up to second, pushing Ipsen down into third. There are two entrants into France's top 10, Cellectis at number 7 and Apteeus at number 10. France's top 10 diseases are dominated by cancer indications, which take the whole of the first nine positions. Only rheumatoid arthritis breaks the oncology stronghold.

Table 22: Top 10 France-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Sanofi	233
2 (3)	Servier	48
3 (2)	Ipsen	39
4 (4)	TheraVectys	22
5 (5)	Pierre Fabre	21
6 (7)	Innate Pharma	13
7 (-)	Cellectis	12
8 (6)	Valneva	12
9 (8)	OSE Immunotherapeutics	10
10 (-)	Apteeus	9

Source: Pharmaprojects, January 2025

Table 23: Top 10 diseases for France pipeline drugs

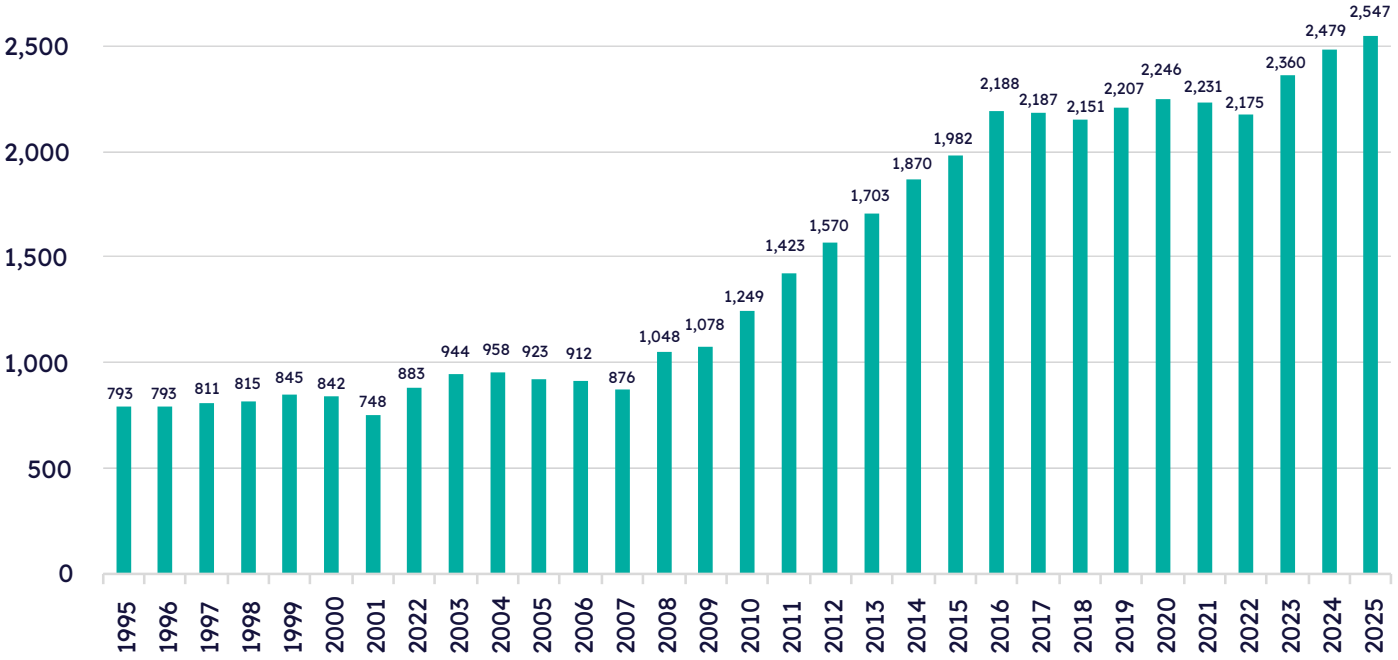
POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	187
2 (2)	Cancer, breast	149
3 (3)	Cancer, colorectal	105
4 (4)	Cancer, melanoma	87
5 (7)	Cancer, myeloma	75
6 (6)	Cancer, leukaemia, acute myelogenous	73
7 (5)	Cancer, lymphoma, non-Hodgkin's	71
8 (8)	Cancer, prostate	71
9 (-)	Cancer, ovarian	65
10 (-)	Arthritis, rheumatoid	62

Source: Pharmaprojects, January 2025

GERMANY

Germany's pipeline size graph follows a similar curve to many of the other European countries featured here, with a period of stagnation around the turn of the last decade, followed by some growth in the '20s. This year, the country's total pipeline size only rose by 2.7%. In common with many other countries, this represented a slowdown from the 2024 rate of 5.0%.

Figure 24: Germany's R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

Five Germany-headquartered companies have more than 30 drugs in their pipelines, with Boehringer Ingelheim and Bayer passing the 100 mark. Merck KGaA, a further example of one of Germany's long-standing corporations, rises to third place this year. In terms of diseases, this territory has non-small cell lung cancer way out in front of second-placed breast cancer. Both rheumatoid arthritis and melanoma make significant climbs within the top 10 this year.

Table 24: Top 10 Germany-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Boehringer Ingelheim	133
2 (2)	Bayer	104
3 (5)	Merck KGaA	65
4 (3)	BioNTech	50
5 (4)	Evotec	37
6 (6)	CureVac	16
7 (10)	Medigene	15
8 (8)	Stada	15
9 (-)	Fresenius Kabi	14
10 (7)	Grunenthal	14

Source: Pharmaprojects, January 2025

Table 25: Top 10 diseases for Germany pipeline drugs

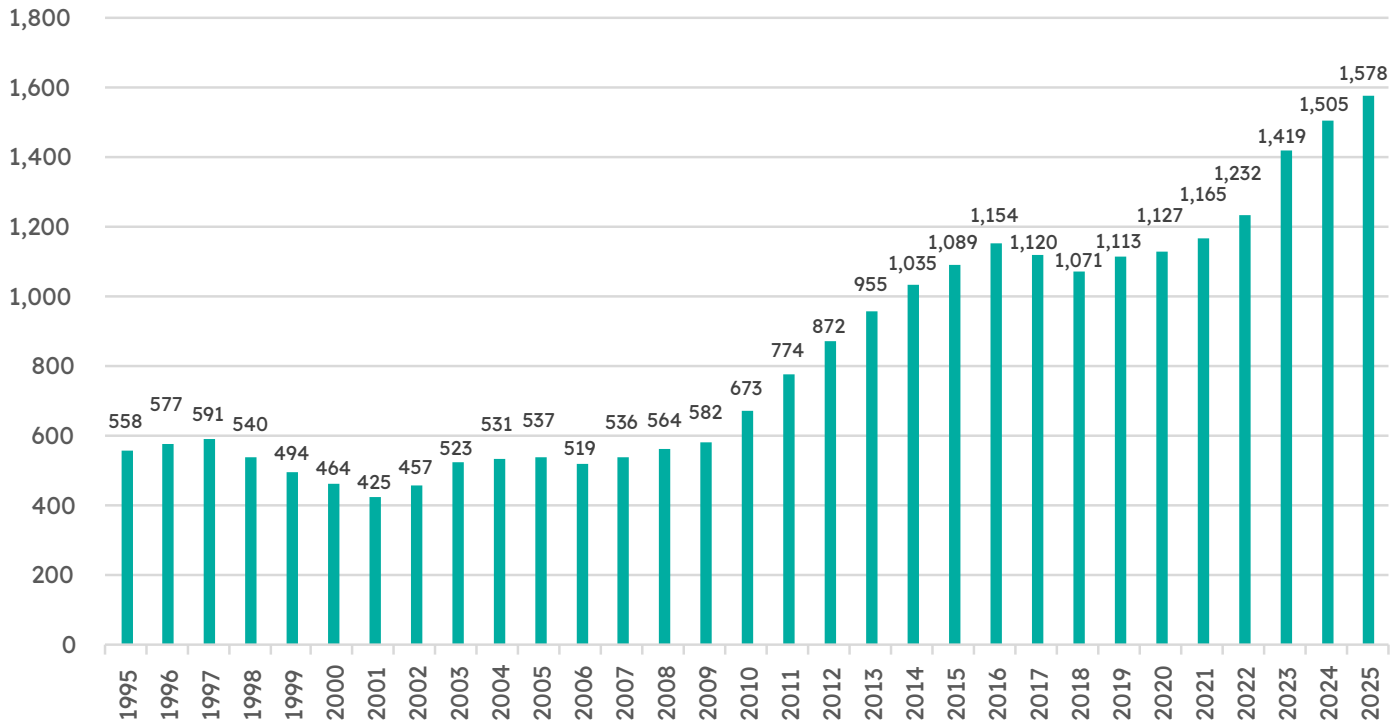
POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	165
2 (2)	Cancer, breast	111
3 (3)	Cancer, colorectal	97
4 (8)	Arthritis, rheumatoid	77
5 (4)	Diabetes, type 2	76
6 (10)	Cancer, melanoma	69
7 (5)	Psoriasis	69
8 (-)	Colitis, ulcerative	67
9 (6)	Cancer, myeloma	65
10 (7)	Cancer, leukemia, acute myelogenous	62

Source: Pharmaprojects, January 2025

SWITZERLAND

Our final station on our whistlestop tour around the pharma world is Switzerland, and our graph of the country's total pipeline size exhibits a now-familiar shape for European countries. The growth rate here for 2025 is slightly above average at 4.9%, but once again below the 2024 figure of 6.1%.

Figure 25: Switzerland's R&D pipeline size, 1995–2025



Source: Pharmaprojects, January 2025

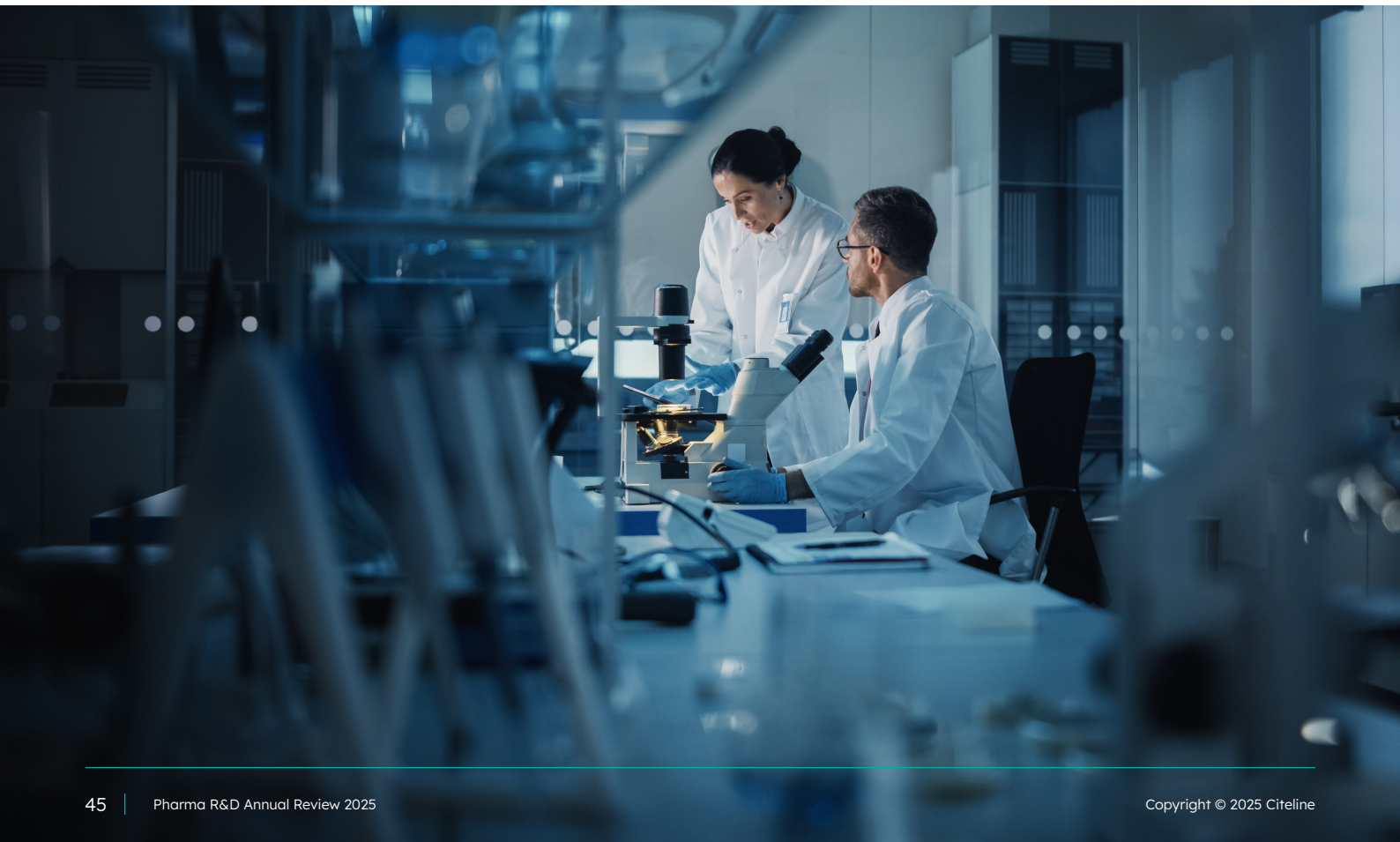


Table 26: Top 10 Switzerland-HQed companies by size of pipeline

POSN	COMPANY	NUMBER OF DRUGS
1 (1)	Roche	261
2 (2)	Novartis	254
3 (3)	Medicines for Malaria Venture	34
4 (4)	DNDi	27
5 (8)	Sandoz	22
6 (5)	CRISPR Therapeutics	21
7 (6)	Debiopharm	20
8 (-)	Ferring	19
9 (7)	AC Immune	15
10 (9)	Light Chain Bioscience	15

Source: Pharmaprojects, January 2025

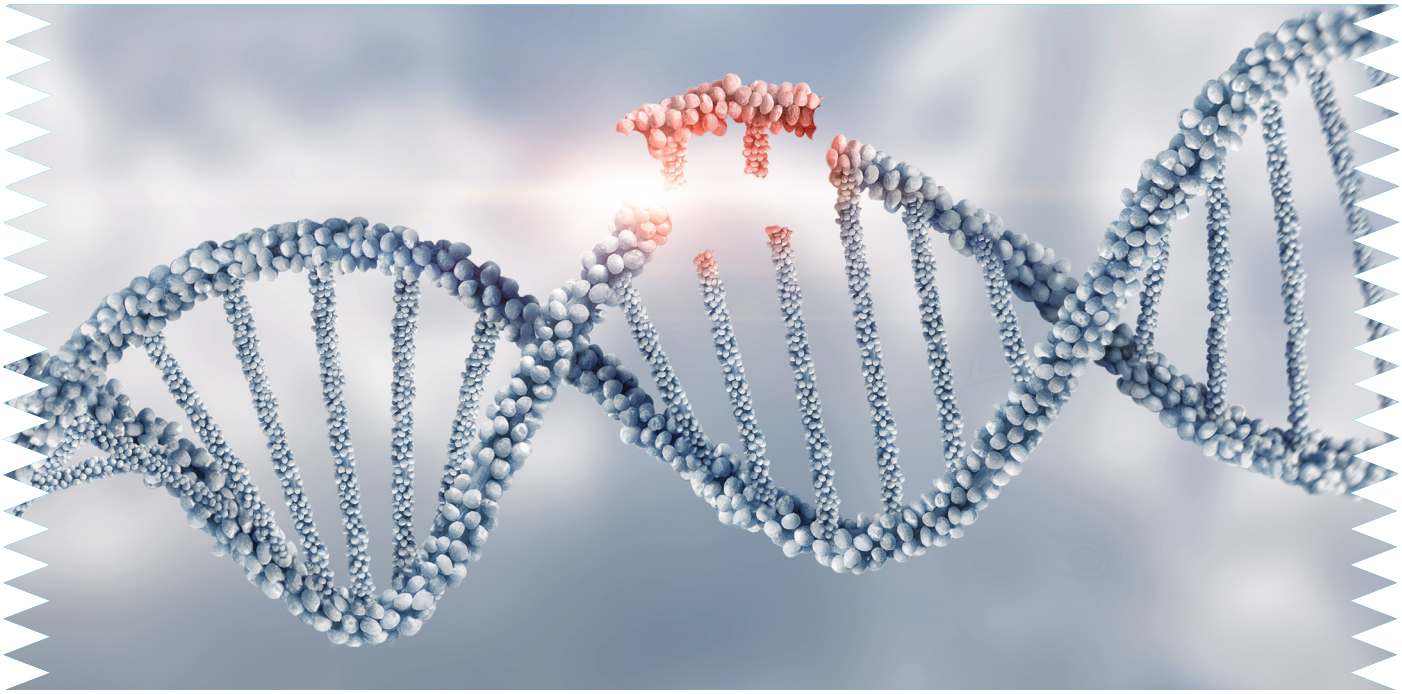
Table 27: Top 10 diseases for Switzerland pipeline drugs

POSN	DISEASE	NUMBER OF DRUGS
1 (1)	Cancer, lung, non-small cell	78
2 (2)	Cancer, breast	69
3 (3)	Cancer, colorectal	58
4 (4)	Cancer, melanoma	52
5 (5)	Cancer, brain	41
6 (-)	Cancer, pancreatic	39
7 (8)	Diabetes, type 2	38
8 (-)	Arthritis, rheumatoid	35
9 (7)	Cancer, myeloma	35
10 (-)	Cancer, ovarian	35

Source: Pharmaprojects, January 2025

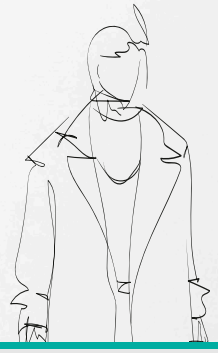
Swiss pharma R&D remains dominated by the two Basel-based giants, Roche and Novartis, both with pipelines of more than 250 drugs. Following with pipelines barely above a tenth of their size are two not-for-profit organizations, the Medicines for Malaria Venture, and Drugs for Neglected Diseases Initiative (DNDi). Rounding out the top five is Sandoz, a company primarily involved in generic drug development. The disease top five is unchanged from last year, featuring five types of cancer, while both pancreatic and ovarian cancers enter the chart, bringing the total of cancers in top 10 up to eight.

Our globetrotting, which took in as many countries in a short time as an international supermodel on tour, thus draws to a close. We've seen some subtle variations in the shape and style of the pharma R&D outfit across the world, but overall, fashions don't change that much in such a globalized industry.



Mechanisms and Targets:

Immuno-oncology continues to be the trend everyone is following



Fashion and clothing are not just about design — they are about the materials used too, as well as the properties they have and how appropriate they are to the garment's intended use. You wouldn't use the finest silk to wipe up spilled tea, not just because silk is very expensive, but also because it just doesn't absorb liquid as well as a linen dishcloth or a terry-cloth towel, but you would be equally unlikely to make a high-end cocktail dress from either of those materials. The intended need informs the strategy. Similarly, drug design must employ molecules with appropriate properties — their mechanisms and targets. Come with us now as we unpick the seams of how drugs in the 2025 pipeline are working.

Table 28 presents the top 25 mechanisms of action for drugs at the start of 2025. It's worth pointing out that the classification system developed by Pharmaprojects for mechanisms, or pharmacological activities, is hierarchical — in other words, it has a tree structure, whereby broad terms sit at the top, and more specific terms sit underneath them, and this can go down to five or six levels. This structure does have the effect of making the broader terms at the top of the hierarchy crop up most commonly. This is because, with over half of the pipeline still at the preclinical phase, where often full mechanistic information is as yet unknown or undisclosed, there tend to be a lot of drugs where only a broad mechanistic class can be ascribed. As drugs move up through development stages, these general categorizations are often replaced by those that are more precise. There are also a number of "umbrella" terms, created to permit searching across mechanisms in certain broader categories, which have generally been added to the taxonomy based on clients' searching needs.

One of these broader terms has now been topping the table for a few years now, that for immuno-oncology therapies. This year, it increased its portfolio size by 4.9% and widened the gap to the second-placed similarly broad category, immunostimulant. The trajectory of immuno-oncological drugs has been remarkable. Such agents treat cancer not by attacking tumor cells directly, but by triggering the body's own immune system to recognize the cancer as a foreign invader to be killed. What's striking is that this is still a relatively new strategy, with it being less than 20 years since the technique first started gaining traction. Further evidence of its relative immaturity can be seen in the right-hand-most column of the table, which shows the percentage of its drugs that have reached late-stage development and are launched, approved, or awaiting approval. Only 3% of immuno-oncology agents have made it this far, which means it is still a relatively unproven strategy. That being said, over one in six of all drugs in development are employing this approach — an extraordinary vote of confidence in this new way to tackle this devastating group of diseases.

And it doesn't stop there, as several subgroups of immuno-oncological agents also pitch up in the top 10. Both immune checkpoint inhibitors and stimulants feature, although numbers for the former did fall back slightly this year after 2024's gigantic jump of nearly 60%. Some T cell stimulants and natural killer cell stimulants also fall into this category, as do CD3 agonists, pivotal to cell engager-based therapies, which enter the top 10 this year. Elsewhere in the upper echelons of this table, there are notable increases for gene expression inhibitors and protein degraders at numbers 5 and 6, respectively.

Table 28: Top 25 mechanisms of action (pharmacologies)

POSITION 2025 (2024)	MECHANISM OF ACTION	NUMBER OF DRUGS 2025 (2024)	% AT PR, R OR L	TREND
1 (1)	Immuno-oncology therapy	4,125 (3,932)	3.0	↑
2 (2)	Immunostimulant	1,847 (1,812)	10.7	↔
3 (3)	T cell stimulant	1,236 (1,148)	1.7	↑
4 (4)	Immune checkpoint inhibitor	978 (986)	4.0	↔
5 (5)	Gene expression inhibitor	410 (354)	2.7	↑
6 (7)	Protein degrader	348 (292)	0.9	↑
7 (6)	Immune checkpoint stimulant	300 (303)	1.3	↔
8 (8)	Genome editing	287 (290)	0.3	↔
9 (10)	Natural killer cell stimulant	225 (223)	0.4	↔
10 (12)	CD3 agonist	209 (190)	5.3	↔
11 (17)	GLP-1 receptor agonist	208 (156)	6.7	↑↑
12 (11)	Angiogenesis inhibitor	192 (192)	28.6	↔
13 (13)	PD-1 antagonist	190 (178)	12.6	↔
14 (14)	Immunosuppressant	182 (174)	37.4	↔
15 (16)	PD-L1 antagonist	179 (165)	7.3	↔
16 (18)	Vascular endothelial growth factor receptor antagonist	177 (152)	24.3	↑
17 (15)	Microbiome modulator, live microorganisms	172 (167)	1.2	↔
18 (-)	Radioemitter, beta	167 (-)	9.0	↑
19 (19)	Ubiquitin ligase E3 stimulant	157 (125)	0	↑
20 (21)	DNA topoisomerase I inhibitor	152 (98)	5.3	↑↑
21 (20)	K-Ras inhibitor	130 (108)	3.8	↑
22 (9)	Radioemitter	128 (-)	1.6	↑
23 (25)	ErbB-2 antagonist	114 (87)	26.3	↑
24 (23)	Tubulin inhibitor	111 (89)	8.1	↑
25 (24)	DNA inhibitor	100 (87)	27.0	↑

Abbreviations used in table: PR = pre-registration; R = registered; L = launched
Source: Pharmaprojects, January 2025

Just outside the top 10, with a striking 33.3% increase in their pipeline size, are GLP-1 receptor agonists, the mechanism employed by the aforementioned new clutch of anti-obesity drugs that are creating something of a sensation. Their rapid ascent this year shows that not all trends in pharma R&D evolve slowly, and that something rather remarkable is occurring in this particular field. Elsewhere, our radiopharmaceutical category has been renamed radioemitter and takes a tumble purely because three new subcategories have been created for it, delineating whether the radioemitter emits alpha, beta or gamma radiation. The new subcategory for beta emitters actually makes the top 25 all by itself. This improvement to classification of agents of this kind was undertaken as part of our development of a new ontology for immunoconjugate payloads, which we will examine in more detail in the section of this report on drug types, which follows shortly.

A more precise way to examine how drugs are stitched together is to look at the precise proteins they are targeting, which is what we do in Table 29. You'll see a lot of similar trends reflected here. The CD3 protein, referred to previously, retains its position at the top of the table, but two targets from the non-immuno-oncology side of cancer take the next two positions, with significant rises for both the epidermal growth factor (EGF) receptor at number 2, and the Her2 receptor at number 3. Once again, the big story is in obesity, with the GLP-1 receptor becoming the fourth most popular target in all of drug R&D, with a gut-busting 32.0% increase in drugs hitting this target. Elsewhere in the top 10, there is more evidence of the ubiquity of immuno-oncology, with a rise up the chart for PD-1, but falls for PD-L1 and CD19. The top 10 is rounded out by two more cancer targets (VEGF-A and K-Ras) and a sole neurological one, in the form of the 5-HT2A receptor.

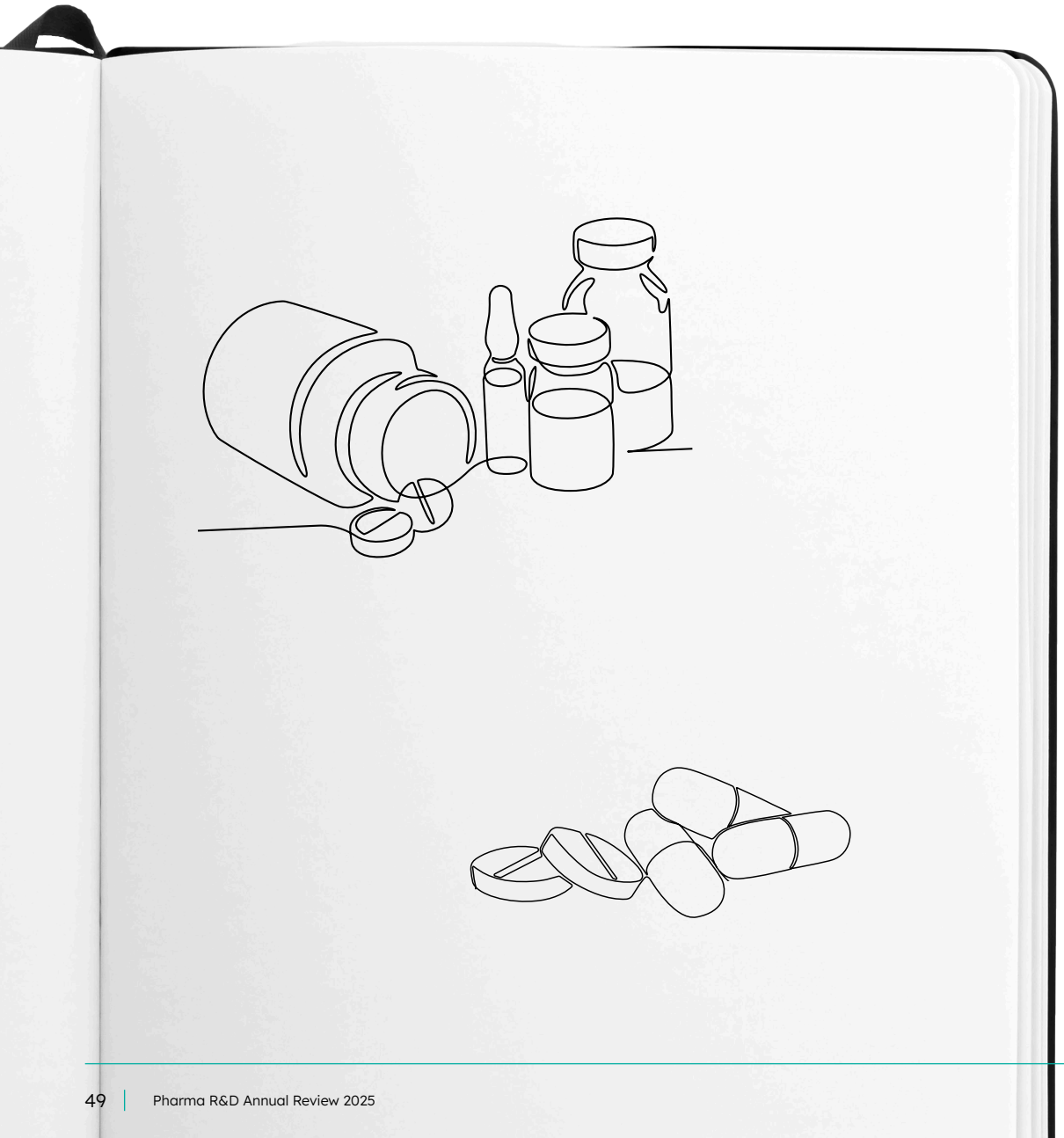


Table 29: Top 25 drug protein targets

POSITION 2025 (2024)	TARGET	NUMBER OF DRUGS 2025 (2024)	TREND
1 (1)	CD3 epsilon subunit of T-cell receptor complex	254 (223)	↑
2 (5)	EGF receptor	248 (205)	↑
3 (2)	erb-b2 receptor tyrosine kinase 2 *[Her2]*	230 (217)	↔
4 (8)	GLP-1 receptor	223 (169)	↑↑
5 (6)	programmed cell death 1 *[PD-1]*	222 (194)	↑
6 (3)	CD274 molecule *[PD-L1]*	203 (211)	↔
7 (5)	CD19 molecule	201 (199)	↔
8 (8)	vascular endothelial growth factor A	182 (168)	↔
9 (9)	KRAS proto-oncogene, GTPase	169 (133)	↑
10 (10)	5-hydroxytryptamine receptor 2A	114 (127)	↑
11 (16)	membrane spanning 4-domains A1 *[CD20]*	104 (90)	↑
12 (14)	TNF receptor superfamily member 17 *[BCMA]*	104 (94)	↔
13 (13)	cannabinoid receptor 1	98 (94)	↔
14 (12)	insulin receptor	97 (97)	↔
15 (11)	opioid receptor mu 1	97 (104)	↔
16 (15)	nuclear receptor subfamily 3 group C member 1 [glucocorticoid receptor]	96 (91)	↔
17 (30)	MET proto-oncogene, receptor tyrosine kinase *[c-Met]*	88 (66)	↑
18 (17)	TNF receptor superfamily member 9 *[CD137]*	86 (88)	↔
19 (27)	folate hydrolase 1	83 (70)	↑
20 (19)	tumor necrosis factor	83 (87)	↔
21 (18)	claudin 18	78 (87)	↓
22 (24)	kinase insert domain receptor	75 (73)	↔
23 (20)	androgen receptor	71 (76)	↔
24 (23)	CD47 molecule	71 (73)	↔
25 (22)	opioid receptor kappa 1	71 (75)	↔

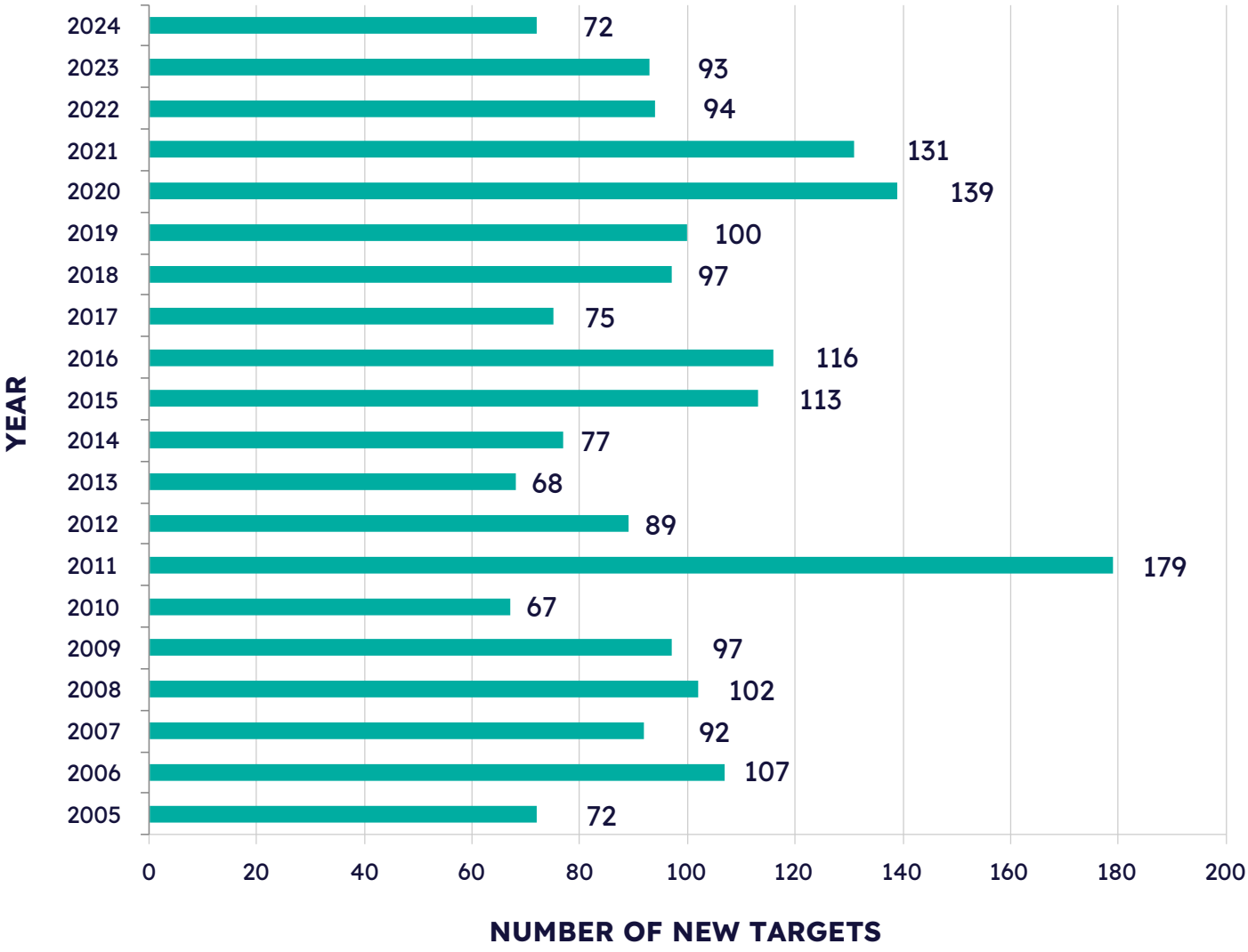
Note: NCBI names are used, except for additions in italics made by us for clarity
Source: Pharmaprojects, January 2025

The rest of the top 25 continues to show a predominance of oncology targets, with notable rises for CD20, BCMA, and, in particular, c-Met, which crashes into the chart at number 17. This is one table where fashions have shifted considerably during the lifetime of this report: the mu 1 receptor, a former number 1, is now down to a lowly number 15.

Fashion, like pharma, needs to continue to innovate to survive. According to fashion bible *Vogue*, among the key fashion innovations for 2024 were the transparent skirt, short-shorts, and metallic bags. I'm not sure who decides these things, but fortunately, innovation in pharma is less faddish, driven as it is by proper science.

One way to measure innovation in our industry is to look at the number of newly identified targets firms are developing drugs against for the very first time, and this is shown, by year, in Figure 26. By this measure, 2024 was a somewhat disappointing year, with just 72 novel targets reported, down from 93 the previous year, and well below the mean for recent years. However, the number of targets actively being worked on has hit a new high, reaching 2,093 this year, up from 2,035. Some estimates put the druggable proteome at around 10,000 potential targets, so the potential for further target discovery remains high. The pharma industry in that sense may still be in its infancy.

Figure 26: Number of new drug protein targets identified by Pharmaprojects, by year



Source: Pharmaprojects, January 2025

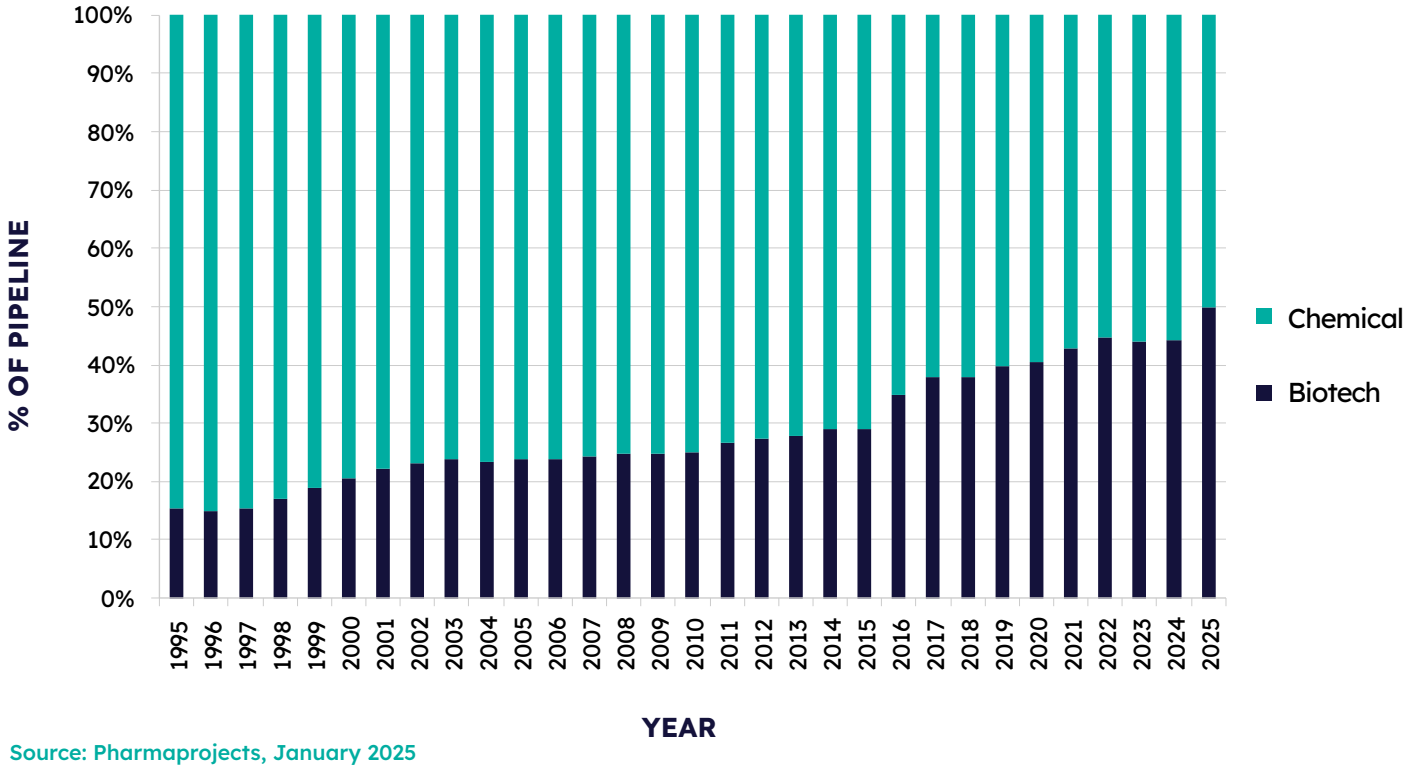
Types of Pipeline Drugs:
Biotech struts its stuff on the pharma catwalk

Innovation in all industries is strongly affiliated with great leaps forward in technology. In the 1760s, James Hargreaves developed a machine for carding cotton which became known as the spinning jenny (a machine more commonly associated with Sir Richard Arkwright, who made subsequent improvements to it). Not only did this machine revolutionize the garment-making industry, it also heralded the beginning of the modern industrial factory system, and kicked off the industrial revolution in general. Nowadays, the vast majority of clothing is mass produced — although there is still space for old-fashioned handmade garments and traditional tailoring skills.

In the pharma world, the emergence of biotechnological drug design has been the industry's own spinning jenny — a step change revolutionizing the development of new therapeutics. But will such drugs take over? In this section of the Review, we look into this question in a bit more detail and examine trends in various types of exciting biotechnology-based drugs.

After last year's data seemed to suggest that the march into biotech had stalled, this year's confounds that impression. Figure 27 shows that the percentage of the pipeline that can be considered biotech-based has shot up again this year, and is sitting at 49.8% — tantalizingly close to seizing the majority share from traditional small molecules. It now looks like the apparent plateauing seen last year was merely a blip, with biotech potentially poised to take control next year. (Note that a change in the way we index immunoconjugates, tagging them as both chemical and biological, will have contributed to the uptick this year.)

Figure 27: Biological vs. chemical drugs as a percentage of pipeline, 1995–2025



Source: Pharmaprojects, January 2025

In 2024, Pharmaprojects replaced its old "Origin of Material" (OOM) classification system for drugs with a new, unified and significantly enhanced Drug Type ontology. This retained elements from the old OOM classification, added in terms related to biotech and reformulation drug types that had previously resided in the therapeutic class taxonomy, and introduced new levels of granularity to cover the exploding areas of cell and gene therapy, bringing all this into a new hierarchical and simplified ontology.

The inaugural top 25 for individual terms in this new taxonomy is presented in Table 30.

The terms themselves are highlighted in bold, with how each sits in the hierarchy being delineated to the left. For reference, the five main branches of the tree in this new classification are Small molecule, Biological, Natural Product, Reformulation, and Diagnostic. Unlike the old OOM system, drugs can be tagged by more than one term to describe them more completely.

Table 30: Top 25 drug types of pipeline drugs

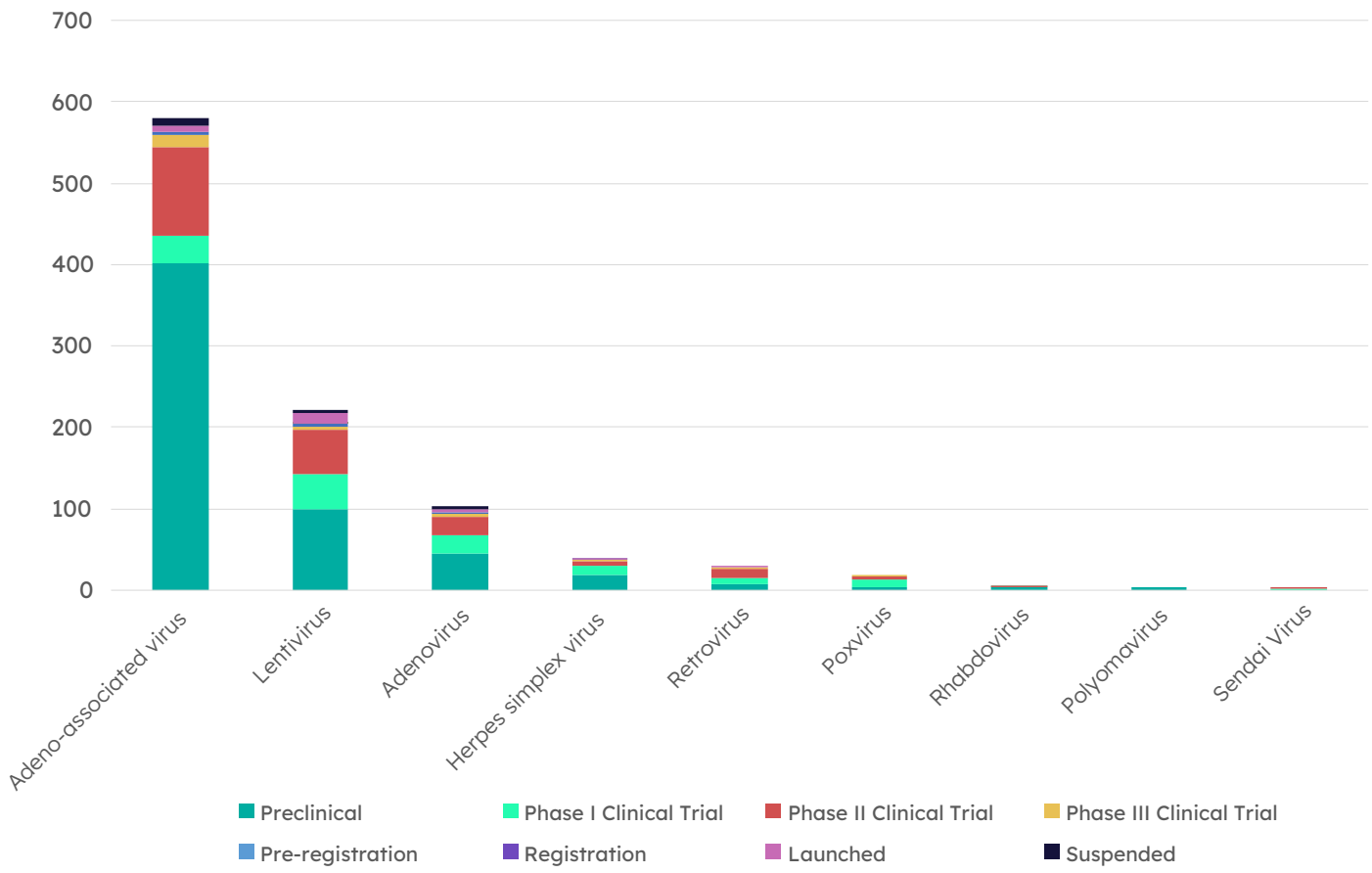
POSITION	DRUG TYPE	NUMBER OF DRUGS
1	Small molecule > **Synthetic small molecule**	10,581
2	Biological > Protein > Antibody > **Monoclonal antibody, other**	2,229
3	Biological > **Gene therapy**	2,178
4	**Small molecule**	1,499
5	Biological > Vaccine > **Prophylactic vaccine, anti-infective**	1,148
6	Biological > Nucleic acid > **Nucleic acid, vector type (type unspecified)**	1,107
7	Biological > Cellular > Cell type > Blood cell > Leukocyte > Lymphocyte > **T cell**	844
8	Biological > Protein > Antibody > **Humanized monoclonal antibody**	731
9	Biological > Cellular > Cell origin > **Allogeneic**	730
10	Biological > Cellular > Cell origin > **Autologous**	704
11	Biological > **Protein**	684
12	Biological > Protein > Antibody > **Antibody-drug conjugate**	678
13	Biological > Cellular > Cell technology type > Chimaeric antigen receptor > **CAR-T cell**	594
14	Biological > Nucleic acid > Nucleic acid, vector type > Viral vector > **Adeno-associated virus**	579
15	Biological > Protein > Antibody > **Human monoclonal antibody**	559
16	Biological > Protein > Antibody > **Bispecific antibody**	535
17	Reformulation > **Other reformulation**	508
18	Biological > Biological, other > **Biosimilar**	504
19	Small molecule > Synthetic small molecule > **Synthetic peptide**	483
20	Biological > Protein > **Recombinant protein**	481
21	Biological > Nucleic acid > Nucleic acid technology type > RNA > **Messenger RNA**	466
22	Biological > Cellular > **Cell origin (type unspecified)**	436
23	Reformulation > **Fixed-dose combination**	427
24	Biological > Protein > Recombinant protein > **Fusion protein**	407
25	Biological > Vaccine > **Therapeutic vaccine, anti-infective**	405

Source: Pharmaprojects, January 2025

While Synthetic Small molecules are by some measure the biggest single category, you'll see that the vast majority of the other entries in the table pertain to Biological/Biotech drug types. We're going to take a more in-depth look here into several of the most important classes of biotech-derived drugs in development today: namely, gene therapies, cell therapies, monoclonal antibodies and antibody-drug conjugates.

The total number of gene therapies in development now sits at 2,178, up a modest 1.3% from last year's number. Of these, 1,210 are also classified as cell therapies; these kinds of therapeutics are those whereby cells are removed from the body, genetically altered ex vivo, and then reintroduced to the patient, such as with CAR-T therapies. The remaining 968 gene therapies that do not have a cellular component are focused on primarily in vivo gene therapies, where genes are delivered in vivo to cells via a vector, or where genes are edited using newer, cutting-edge technologies. Across both types of gene therapy, the viral vector is the most popular way of introducing a genetic change to a cell, and the new drug type classification includes a breakdown of the different kinds of viral vectors used, as detailed in Figure 28.

Figure 28: Viral vectors used in gene therapies



Source: Pharmaprojects, January 2025

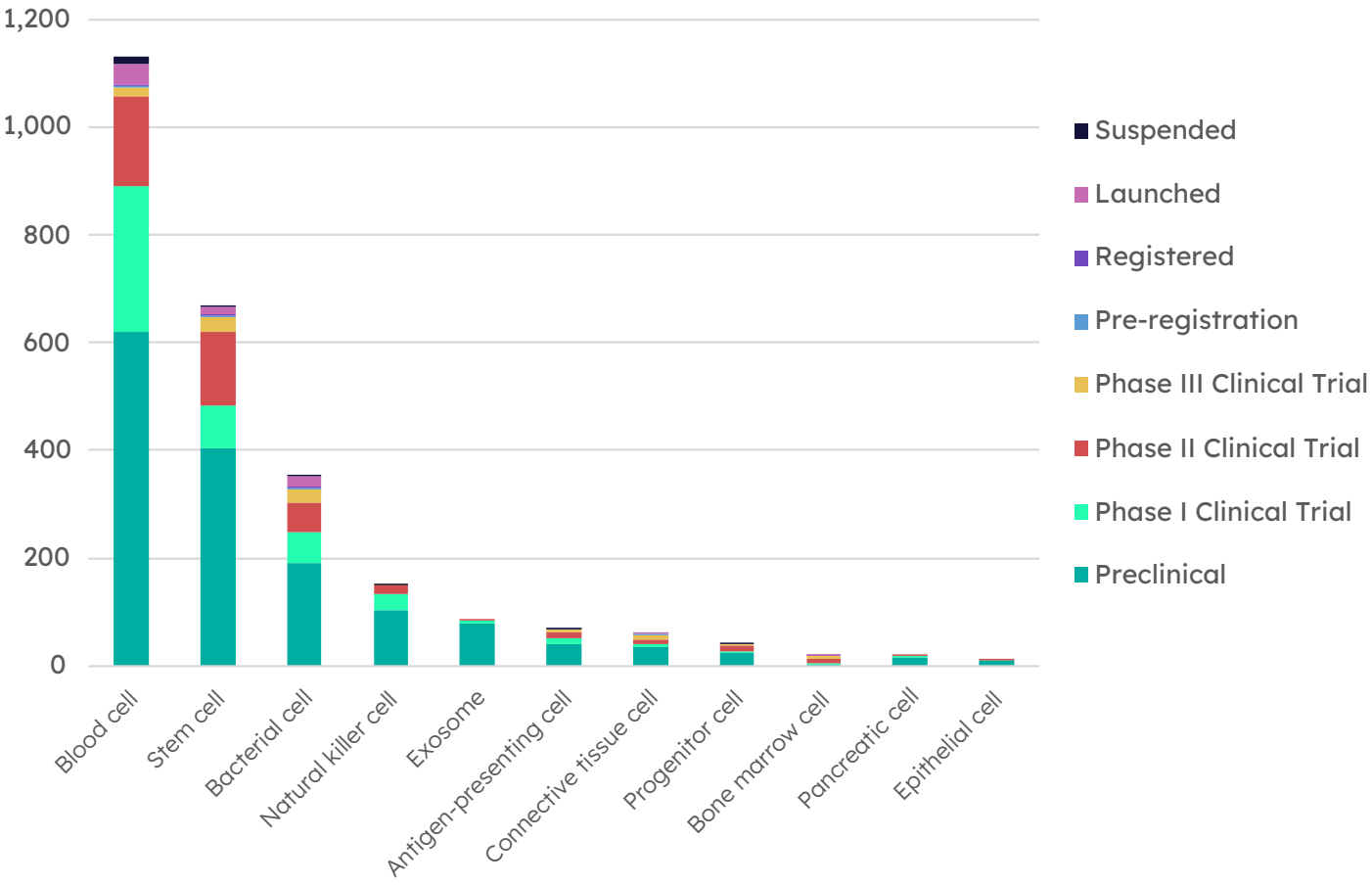
Adeno-associated viruses remain the most common choice of vector, with 579 gene therapies employing this approach in development as of January 2025, an increase of an impressive 15.6%. However, adenoviruses in third place posted a much larger growth rate, ballooning their pipeline by 10 times that percentage.

Second-placed lentiviruses, commonly used to effect ex vivo gene therapy, also gained popularity, up by 19.5%. There were also increases for herpes simplex viruses, poxviruses, and rhabdoviruses, but retroviruses retreated.

Moving to cell therapies, there was a sizeable increase in this drug type's total pipeline size, which hit 2,719 this year. The classification of the different cell types used has changed somewhat with the introduction of the new drug type ontology, which is now another hierarchy, so numbers are not directly comparable from last year to this, but Figure 29 does give the breakdown. The largest category is blood cells, which includes the various kinds of leukocytes, and in particular, T cells, which are of course used in the popular CAR-T therapeutics.

Our new classification is extremely granular, further subdividing T cells into a further 10 subclasses, permitting a highly detailed view of this exciting and expanding technique. Similarly, second-placed stem cells are also further classified into 15 subtypes, based on where in the body they originate. Thus Figure 29 gives very much a top-level view of the cell therapy landscape, with the overall classification for different cell types used in our expanded ontology having 90 categories now. This is clearly a huge and diverse field.

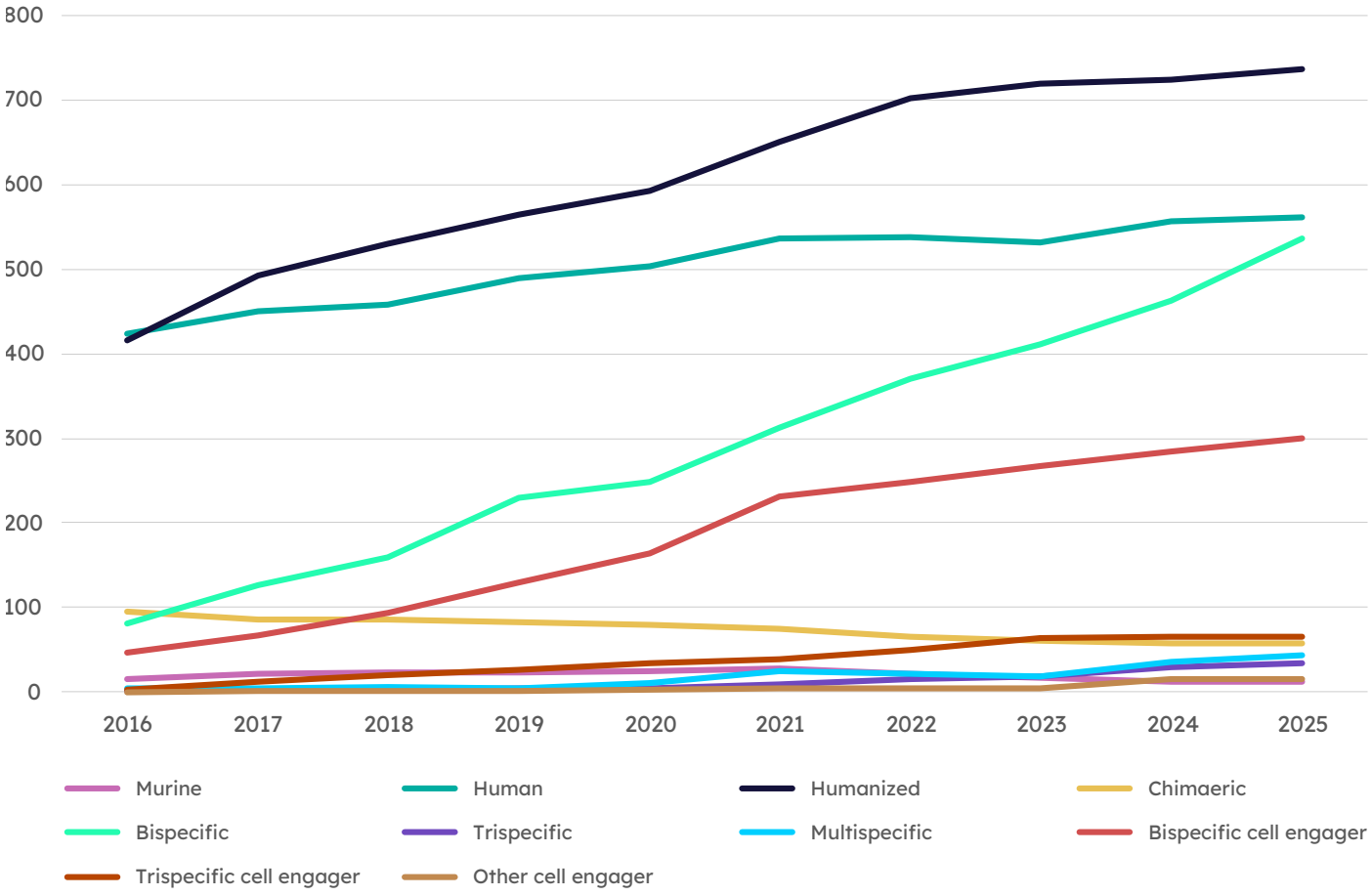
Figure 29: Cell types used in cell therapies



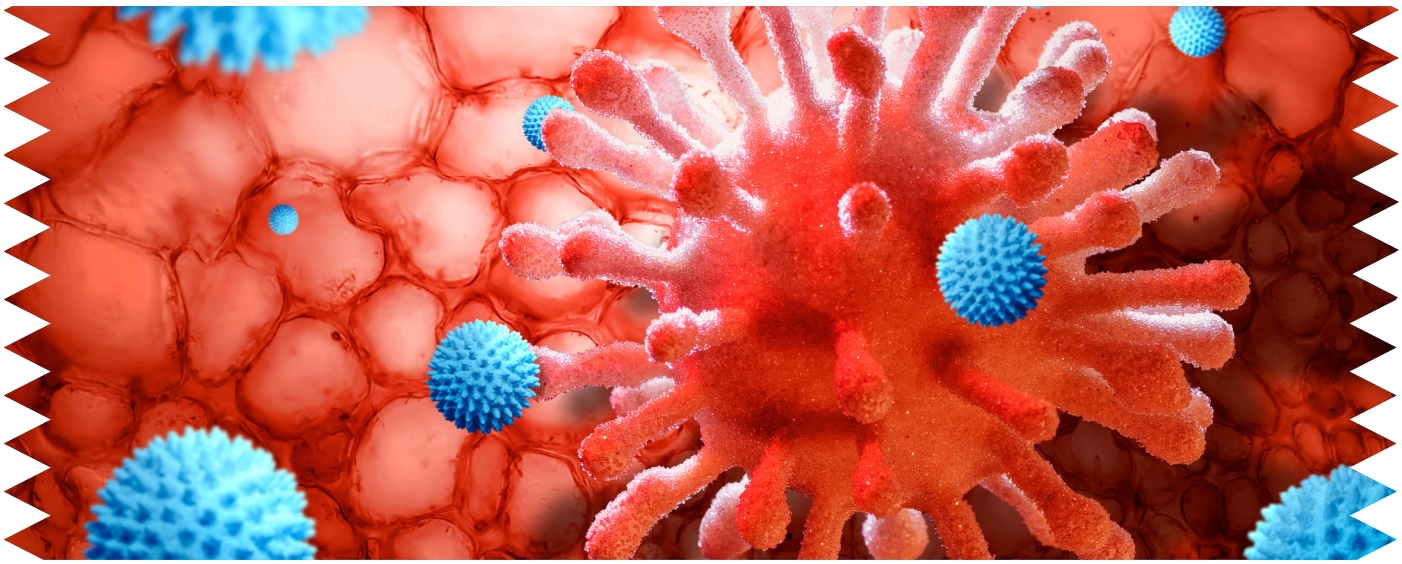
Source: Pharmaprojects, January 2025

Another game-changing type of drugs which has come to the fore over the past 30 or so years is antibodies, and in particular monoclonal antibodies. Fashions have certainly shifted over the years here, with the original murine antibodies ceding ground to first human and then humanized antibodies. However, in recent years, the story has all been about multispecific antibodies, starting with bispecifics, then trispecifics, and now branching out into MAbs with even more targets. The story of how the monoclonal antibody landscape has evolved over the past decade is shown in Figure 30, where you can clearly chart the remarkable rise of bispecific antibodies and, to a lesser extent, the related bispecific cell engager antibodies. Note that this graph does not include monoclonal antibodies whose type is as yet undisclosed, of which there are many examples, particularly in those still at preclinical development.

Figure 30: Types of monoclonal antibodies

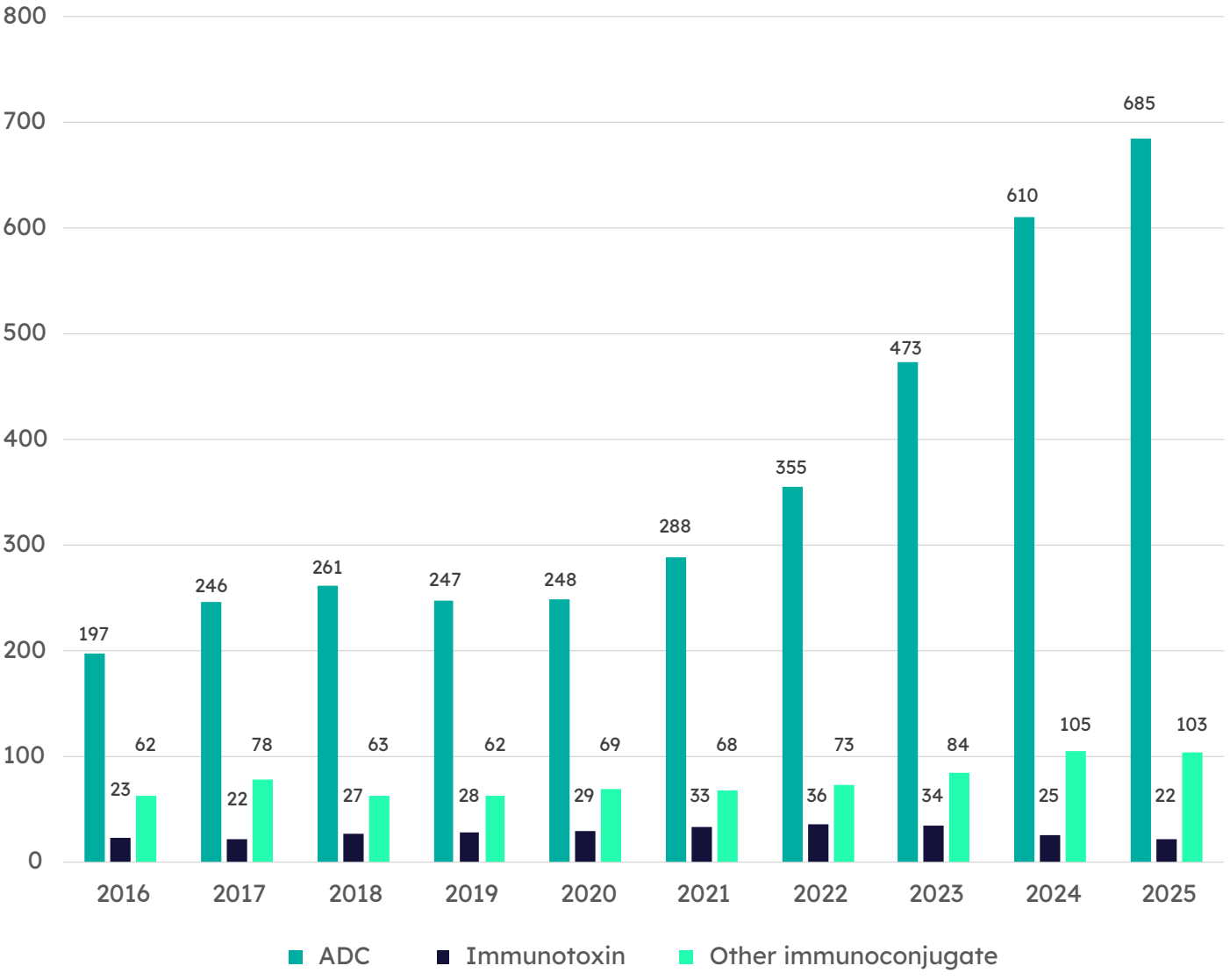


Source: Pharmaprojects, January 2025



Another massive part of the biological drug effort involves immunoconjugates, where part of the drug is designed to deliver the agent to its target cell, and it is conjugated to another part which causes the therapeutic effect — the so-called payload. Immunoconjugates break down into three major classes: antibody-drug conjugates, immunotoxins, and other types of immunoconjugates. Trends in the development of these three groups are shown in Figure 31. While immunotoxins have somewhat fallen out of favor, antibody-drug conjugates are all the rage, especially in the last four years, over which their numbers have more than doubled. Numbers rose by 12.3% over the preceding 12 months; impressive, if not quite reaching the heights of the 29.0% expansion seen over 2023–2024.

Figure 31: Types of immunoconjugates



Source: Pharmaprojects, January 2025

As noted earlier, the therapeutic activity of an immunoconjugate is delivered by its payload, which can be a toxin, a chemotherapeutic, or a radioligand. A further enhancement added to the Pharmaprojects database during 2024 was the addition of a new filter to enable our clients to search by the different immunoconjugate payloads being used, and the top 20 most popular choices here are shown in Table 31. By some measure the most popular, and the industry is utilizing it like it's going out of fashion, is monomethyl auristatin E, a synthetic anticancer drug based on peptides derived from a marine snail, which is too toxic to be administered generally and can only be used as part of a tumor-directed immunoconjugate.
This is true of many of the molecules used as payloads, which could be considered wolves in sheep's clothing. Famously, the most popular of these in the toxin class, ricin, is a highly potent toxin produced in the seeds of the castor oil plant and has been used is in its unconjugated form as a bioterrorism agent. Radioimmunoconjugates deliver a radioactive isotope to target radiotherapy directly to tumors. Among payloads in this class which make our top 20, yttrium-90 is the most popular, followed by iodine-131 and lutetium-177. Immunoconjugates are a perfect example of how biotechnological techniques are advancing therapy, delivering powerful drugs directly to tumors while minimizing their effects on surrounding heathy tissues.

For more details on antibody-drug conjugates, check out our white paper on this subject by my colleagues Jon Stephens and Arbesa Bela, which is available as a free download at https://www.citeline.com/en/resources/antibody-drug-conjugates-magic-bullets-become-reality.

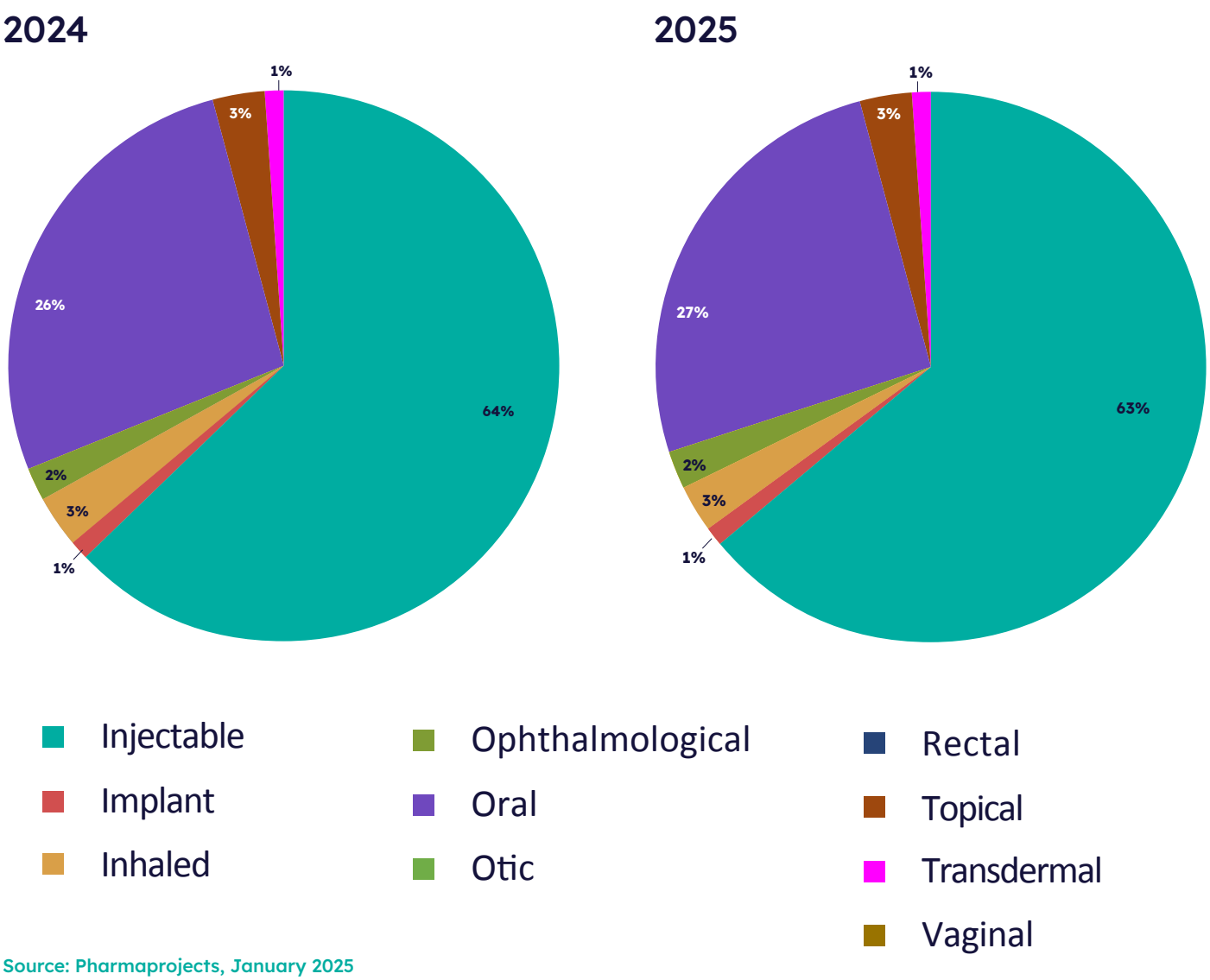
Table 31: Top 20 payloads for immunoconjugate drugs

IMMUNOCONJUGATE PAYLOAD	NUMBER OF DRUGS
monomethyl auristatin E	104
pyrrolobenzodiazepine	48
yttrium-90	33
mertansine (DM1)	26
exatecan	25
iodine-131	25
lutetium-177	24
ricin	22
actinium-225	22
technetium-99	21
pseudomonas exotoxin	19
monomethyl auristatin F	17
auristatin	17
doxorubicin	16
camptothecin	16
ravtansine (DM4)	15
diphtheria toxin	14
amanitin	13
indium-111	13
PE38	13

Source: Pharmaprojects, January 2025

The use of biotechnology is clearly changing medicine for the better, providing better targeted drugs, new ways of correcting disease, and even changing our genomes. The one downside might be that the complex macromolecules used in biotechnology drugs tend to have to be delivered via injection, rather than the more convenient and patient-friendly oral route. For our final analysis, let's see if the ongoing advance of biotechnology is affecting routes by which drugs are being delivered.

Figure 32: Pipeline by delivery route, 2024 and 2025



Source: Pharmaprojects, January 2025

In fact, this change does not seem to be adversely affecting drug delivery options.
The percentage of drugs delivered by injectable routes actually fell by 1% this year, while oral drugs conversely picked up a percentage point. Overall, there was really little change in delivery route percentages across the board. This is one area seemingly unaffected by the changing fashions in drug R&D.

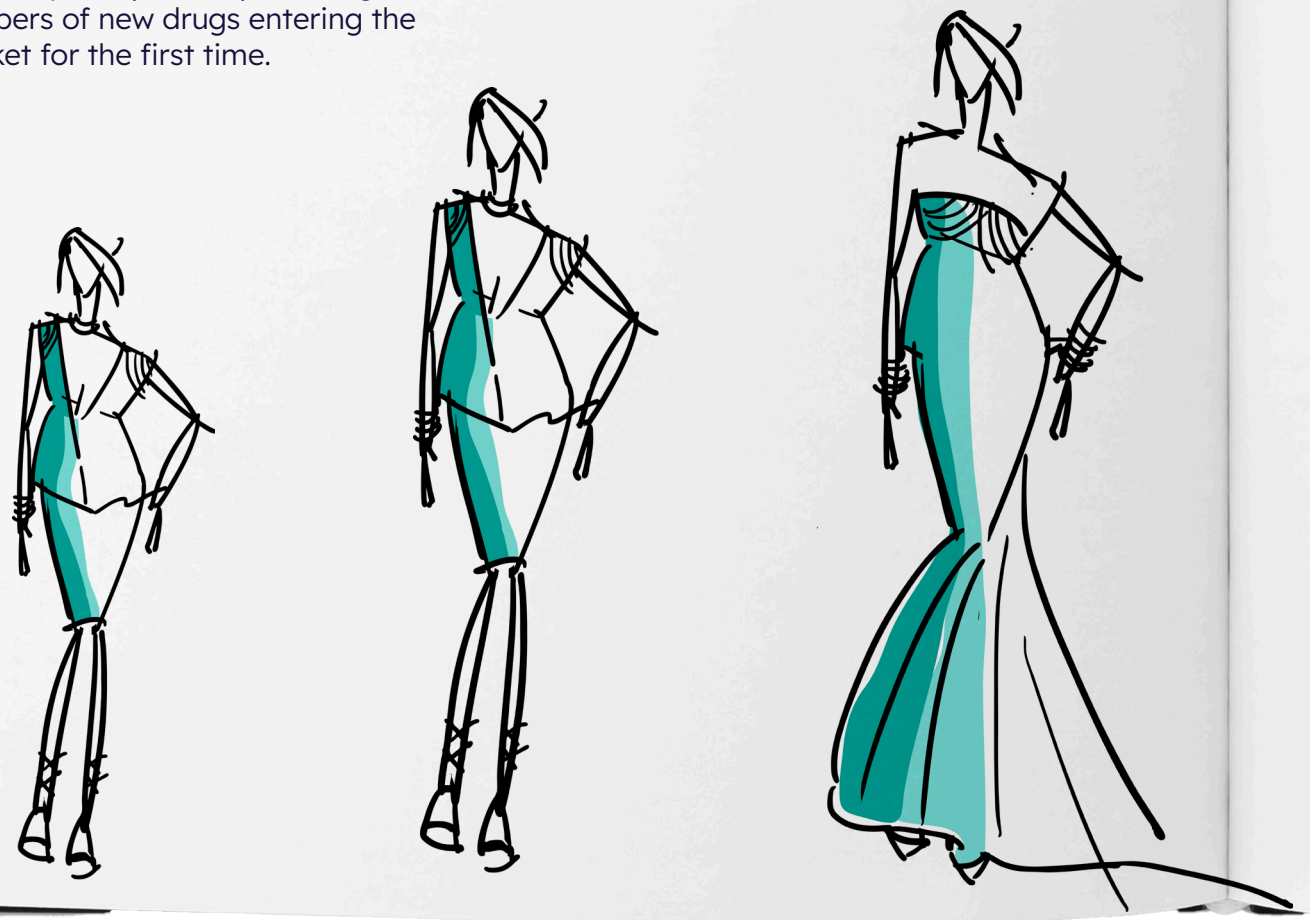
What's the Forecast for Pharma?

Is the pharma industry still wearing the trousers, or might it be caught with its pants down?

As we come to the end of another annual Pharma R&D Report, having taken more measurements than even the most fastidious of tailors, what are we to make of the pharma industry at the start of 2025? And what will it be wearing next season? Is it still dressed to kill, or might it have to tighten its belt? Is it proudly sporting its Sunday best, still dressed to the nines, or might it need to pull its socks up?

Well, I certainly don't think we've seen much in the way of an alarming fashion faux pas this year. Rather, it has been quite a steady year, with moderate growth across the board. Nothing dramatic, and no need to let out any seams, but nothing is really shrinking as dramatically as a supermodel's waistline. It's been a solid year for pharma, and our data do suggest that the industry is continuing to grow modestly. This stability is sure to have been helped by a few years of good numbers of new drugs entering the market for the first time.

The market entrants — or new active substances — for 2024 will be reviewed in full in a supplement to this report, and indications thus far are that it was another productive year, with new drug launches once again hitting the upper range of the numbers we've see in recent times. With innovation gliding serenely off the runway and onto the production lines, the cogs of the industry seem to be well oiled. This year even saw evidence of an uptick in drugs making it past that tricky Phase II to Phase III transition.



Forecasting the future of pharma can be as complicated as predicting what colors will be "in" next season — after all, no one saw the COVID-19 pandemic coming. But there are plenty of other potential disruptors we will definitely need to keep an eye on. Foremost among these, the self-styled prime disruptor himself has just returned to the White House, and at the time of writing in just the second week of his second term, was already threatening to spark tariff wars across the globe. According to our sister publication, *Scrip*, among the investors and healthcare corporate representatives surveyed by Jefferies for its latest Healthcare Temperature Check, geopolitical risk emerged as the greatest perceived risk for the pharmaceutical sector, with the proportion of respondents highlighting it as their biggest concern rising to 40% from 26% a year earlier. However, among industry spokespeople whom *Scrip* contacted as part of its annual "*Scrip Asks*" temperature check, the prevailing view was that the sector would remain resilient and continue to innovate in the face of political uncertainty.

Many surveyed sounded confident that the industry could weather whatever an unpredictable new US administration might throw at it. "We live in politically turbulent and uncertain times," commented Simon Kerry, CEO of UK drug discovery company Curve Therapeutics and newly elected director to the board of the UK BioIndustry Association (BIA). "I predict, however, that the world will not end in the next four or five years," he continued. "The fundamentals of the biotech industry remain strong and, I believe, the sector will remain resilient in the face of any occasional headwinds." Some view the incoming administration as likely to be more business-friendly, which "should generally lead to increased capital raises and overall optimism within the industry," according to Coeptis Therapeutics' Dan Yerace.

Others were less optimistic: "After the US election in November and the resulting swath of nominees for posts that will impact biopharma in 2024, it could be said that the writing is already on the wall for biopharma in 2025, and it does not read well," said Andy Smith, *Scrip's* regular Stock Watch columnist. Certainly, the nomination of Robert F. Kennedy Jr. as head of the US Department of Health and Human Services (HHS), a man who has held various anti-vaccine positions and stated that he does not believe HIV causes AIDS, would surely at the very least be cause for some degree of consternation. Meanwhile, some European commentators see opportunities in their own backyards likely to arise from any US-based turmoil. But Smith went on to call out the possibility of trade wars as the greater risk. "The bigger elephants in the room for biopharma in 2025 are trade and currency wars. The president is planning a 10% universal import tariff and a 60% duty on Chinese imports. Those who have not worked in, or with colleagues in, worldwide manufacturing and supply underestimate the volume of active pharmaceutical ingredients and excipients that are manufactured outside and imported into the US, most commonly from the lowest-cost suppliers in China and India. The imposition of extra tariffs and duties will increase the cost of drugs in the US," he said.

China might be in Trump's sights, but the increasingly muscular presence of China in global pharma R&D is a concern to many, with some fearing its entry into novel drug development might make it a threat to traditional Western players. Probably the biggest and fastest changing trend this century has been the emergence of a massive Chinese pharma R&D industry which came from virtually nothing to be the second-biggest developer of new drugs in the world. We've seen in this year's report that this trend as yet shows no sign of abating, and our forthcoming NAS supplement will show that Chinese homegrown novel drugs are now striking a pose in the global arena. As noted, China also has a big stake in the manufacture of active pharmaceutical ingredients for Western companies. But all is not well in the Chinese economy, and a trade tariff war could make things worse.

Smith again: "In an attempt to counter US tariffs, China has already shifted its policy to weaken the yuan, but that may rattle the new US president even further since he has been vocal on the unfair advantages that some countries have in being able to depress the value of their currencies. If more yuan weakening to offset lower Western interest rates translates into higher sales of drugs in US dollar terms for exporters to the US, but tariffs lower sales inside the US because of higher costs and affordability issues, further central bank currency weakening could result in currency wars." Trump's attitude to China's incursion into global markets could yet result in a trade war where there are no winners, although this is unlikely to stop the nascent Chinese pharma R&D effort in its tracks. The kerfuffle over DeepSeek, China's entry into the AI app market, illustrates how much Western markets feel threatened by the country's continued advance.

Elsewhere in the world, the Ukraine/Russia conflict appears to be entering its endgame, and, after a bloody conflict, a ceasefire between Israel and Gaza looks as if it may finally bring some respite to this troubled region. Some are hoping that, as a result, and after a year in which over half the world's population went to the polls, 2025 might be a more stable year for the global economy. How is this likely to affect how pharma companies do business, particularly with regards to funding and dealmaking?

On funding, those talking to *Scrip* again tended to be optimistic. “There has been a significant amount of fresh capital raised over the course of 2024 that brightens the outlook for funding innovation for the foreseeable future, and I believe there will be opportunity in the capital markets in particular to continue to fund early clinical development,” said Verve Therapeutics’ chief financial officer Allison Dorval.

Manfred Rudiger, CEO of Ariceum Therapeutics, concurred: “2024 has seen a marked improvement for all forms of financing for biopharma companies, whether it be through private fundraising, mergers, or partnerships. There have also been some biotech IPOs, which are a sure sign that demand has been building during the fallow period after the pandemic,” he said.

On the mergers and acquisitions front, another of our sister publications, Biomedtracker, reported 2,341 pharma deals during 2024, including 1,381 financing deals and 199 acquisitions. These figures were up on their 2023 equivalents, but below those from 2022. Once again, those in the industry who spoke to *Scrip* on the subject were largely positive. “I’d expect a gradual increase in deal activity in 2025 due to some macro trends, including gradual lowering of interest rates and inflation, looming patent cliffs in big pharma necessitating the need for pipeline replenishment, attractive valuations of clinical-stage assets, and anticipated regulatory changes more favorable for dealmaking,” commented Azitra’s Travis Whitfill.

Stefan Fischer, managing partner (finance) at venture capital firm TVM Capital Life Science, went further: “Looking to 2025, we anticipate a surge in M&A activity, driven by distinct observable trends: the maturation of medtech platform technologies, accelerated adoption of AI-powered drug discovery, and pharma’s need to offset R&D stagnation in traditional pipelines,” he said.

AI, of course, is very much the hot topic of the age. Can it help pharma to line its own pockets, or might it give the industry ants in its pants? *Scrip* interviewees landed firmly in the former camp. Mat Davis, Jazz Pharmaceuticals’ vice president, data science, evidence and value generation, and global and scientific medical affairs, pointed out how broad its scope and impact already are. “AI will remain a key trend for the biopharma industry in 2025, impacting everything from precision medicine to the whole drug discovery and development process as we know it. Whilst this seems incredibly large scale, if we consider it another way, we can see that AI is simply allowing companies to become ever more focused on patients,” he stated. “The more data that can be reviewed, both in quantity and detail, the better the outcomes will be for patients through new, advanced medications.”

Jennifer Bath, CEO of IPA Therapeutics, further noted that, “The future of AI in drug discovery lies in its ability to integrate and analyze data from multiple modalities — ranging from genomic and proteomic data to structural and clinical datasets.”

This gets to the heart of the single most important factor by which pharma will stand or fall: innovation. We’ve seen in this report how the move into biotech-based drugs is yielding exciting new ways to treat diseases, with gene therapies, cell therapies, monoclonal antibodies, and antibody-drug conjugates among the new kinds of drugs tailored specifically to provide therapeutics targeted like never before. We also saw that there are more proteins being targeted by drug development than ever, even if 2024 yielded a below-average number of brand-new ones. Innovation must continue to prosper if pharma is to deliver to its consumers new drugs that are the equivalent of haute couture, rather than just a bunch of thrift store hand-me-downs. For more on how it performed in the delivery of novel drugs to the market in the past year, don’t forget to check back in April/May to download our report’s supplement on new active substances (NASs) launched during 2024, the definitive authority on this subject.

The pharmaceutical industry has begun 2025 with more items in its wardrobe than ever before. Some drugs will end up turning heads and fitting like a glove; others might end up just being tomorrow’s dirty laundry and burn a hole in their owner’s pockets. Pharma will need to continue to put its thinking cap on and roll up its sleeves if it is to avoid flying by the seat of its pants. But delivering new drugs will certainly never go out of fashion, and the Citeline Pharma R&D Review will be back to report on the trends in what’s hot and what’s not again next year. Don’t be a fashion victim — add it to your collection!

About the Author

Ian Lloyd
Senior Director, Pharmaprojects and Data Integration

Ian Lloyd is the Senior Director of Pharmaprojects and Data Integration, overseeing the content and analyst services for our drug development solution. He supports clients in their drug pipeline data requirements and inquiries, providing insight into the best search strategies to answer their drug-related business questions and also identifying and analyzing trends in pharma R&D. For the past 33 years, he has authored the “Pharma Annual R&D Review” and its new active substances (NAS) launches supplement. This has become a must-have industry report for those seeking to identify the changing fortunes of drug R&D. Ian joined Pharmaprojects in 1987, when it was part of PJB Publications. It was acquired by Informa in 2003, and spun out to form Citeline Pharma Intelligence, now part of the Norstella group, in 2022. He previously worked in molecular biology as a research assistant at the University of Bristol.

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Citeline’s global teams of analysts, journalists and consultants keep their fingers on the pulse of the pharmaceutical, biomedical, and medtech industries, covering them all with expert insights: key diseases, clinical trials, drug R&D and approvals, market forecasts, and more.

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