White Paper

IQVIA Pharma Deals

Review of 2023

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Introduction

Continuing market uncertainties focuses dealmaking with rising deal valuations

After reaching a multiyear low in 2022, deal activity in the life sciences sector continued to slow in 2023 as challenging headwinds persisted, deterring companies from signing M&A, licensing and collaborative R&D deals over the course of the year. M&A activity continued its decline from 2022 to 2023 as the fragile macroeconomic environment and enhanced antitrust scrutiny kept deal volumes down. Nevertheless, aggregate spending on M&A rose 37% to US$198 B with the help of the first mega-merger announced since 2019 which accounted for 21% of this total.

Licensing deal flow for life science companies remained below pre-pandemic levels in 2023 as licensees were selective in the types of assets they in-licensed as they reprioritized their portfolios. After a shift to earlier stage dealmaking in 2022, clinical stage deals accounted for a greater proportion of therapeutic licensing activity in 2023 as risk averse companies looked to invest in more established products. While the aggregate licensing deal spend was somewhat maintained from 2022 to 2023, average deal values increased thanks to a handful of high-valued multi-program licensing deals. In a stark contrast to 2022, average upfront payments soared in 2023 as companies were more willing to commit large sums of biodollars to promising or de-risked late-stage assets, suggesting a return to blockbuster license fees in the sector.

Merck & Co. was the leading pharmaceutical dealmaker in terms of deal volume while Pfizer committed to the highest total deal spend. In terms of deal volume, oncology was again the leading therapeutic area for partnering deals, but dealmaking in nearly all therapy areas was suppressed relative to 2022. Despite the need to drive long-term growth, collaborative R&D activity plummeted in 2023 as key players in the life sciences sector narrowed their therapeutic areas of focus, seeking only innovative therapies and technologies that complemented their existing portfolios.

Aggregate spending on M&A rose 37% to US$198 B with the help of the first mega-merger announced since 2019 which accounted for 21% of this total.
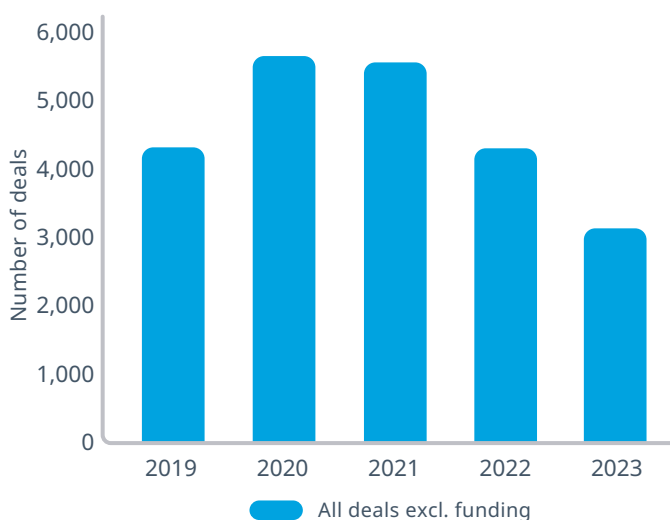
37%
INCREASE IN M&A SPEND

M&A deal values hold up

Alike 2022, deal activity in the life sciences sector remained muted in 2023 as continued macroeconomic challenges, soaring inflation and regulatory scrutiny deterred risk-averse companies from entering certain transactions. Excluding standalone research grants, the total number of agreements signed in the life sciences sector fell by 27% from 2022 to 2023 according to the IQVIA Pharma Deals database of publicly disclosed deal activity (Figure 1). Following the usual pattern, total deal volume was highest in Q1 2023 and steadily slowed as the year progressed whereas M&A activity was more stable throughout the year (Figure 2).

Biotech financing options continued to be constrained in 2023 as the tight capital environment caused investor appetite to cool considerably. Biotech indices performed poorly over the course of the year, despite a modest rebound in the fourth quarter; the Nasdaq Biotech Index, for example, ended the year only slightly above where it began. According to JP Morgan's 2023 Annual Biopharma Licensing and Venture report, after peaking in 2021, venture capital (VC) funding in the biopharmaceutical sector remained muted in 2023 as VC firms were more selective in where to dedicate their investments. In turn, IPOs in the life sciences

Figure 2: Deals signed in 2023 by month
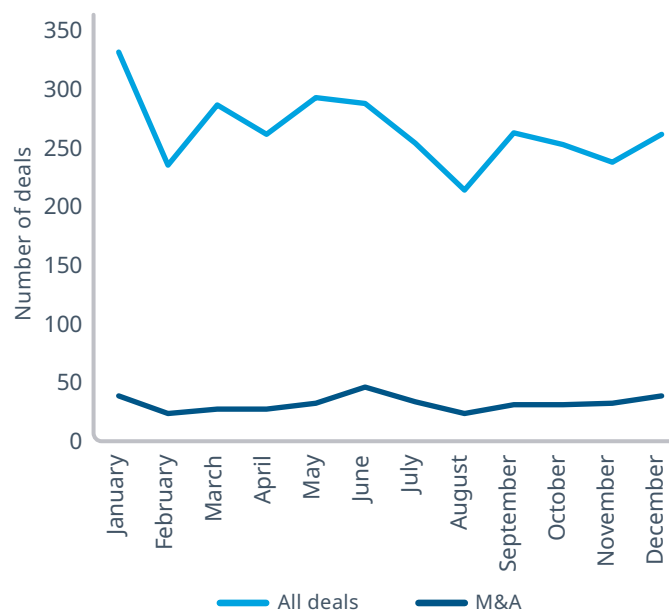
Source: IQVIA Pharma Deals.

sector remained sidelined in 2023, with only a handful of companies making their public debut. After having the upper hand in 2020 and 2021, biotech's were heavily reliant on prospective partners and buyers to help raise cash and stay afloat. The ongoing challenges forced some biotechs to shut down or divest programs to focus on more advanced assets or up the pace of lay-offs in the hope to extend their cash runways.

After a downturn in 2022, M&A activity remained slow in the life sciences sector in 2023 as continued market volatility and the rising cost of capital discouraged companies from entering transactions perceived as risky. Despite the announcement of the first mega-merger since 2019, big pharma continued to opt for modestly priced bolt-on acquisitions opposed to high-ticket transformational deals, as the threat of increased regulatory scrutiny meant mega-mergers would be potentially subject to prolonged timelines.

As such, the volume of life science M&A deals (defined here as Mergers, Business Acquisitions and Divestments, signed but not necessarily completed) announced in 2023 fell 27% from 2022, in line with the slowdown in overall deal activity to reach a 5-year low (Figure 3). However, at US$198 B, the aggregate total value, including contingent consideration, of all M&A

Figure 1: Number of deals (excluding funding awards), 2019–2023

Source: IQVIA Pharma Deals.

Table 1: Aggregate, mean and median values of M&A deals, 2022 vs. 2023

ALL DEALS	2022	2023	CHANGE
Aggregate value of all M&A deals	US$144,016 M	US$198,039 M	+37%
Mean deal value	US$738 M	US$1,214 M	+64%
Median deal value	US$122 M	US$110 M	-10%

Source: IQVIA Pharma Deals

Figure 3: Number and aggregate total value of M&A deals, 2019–2023
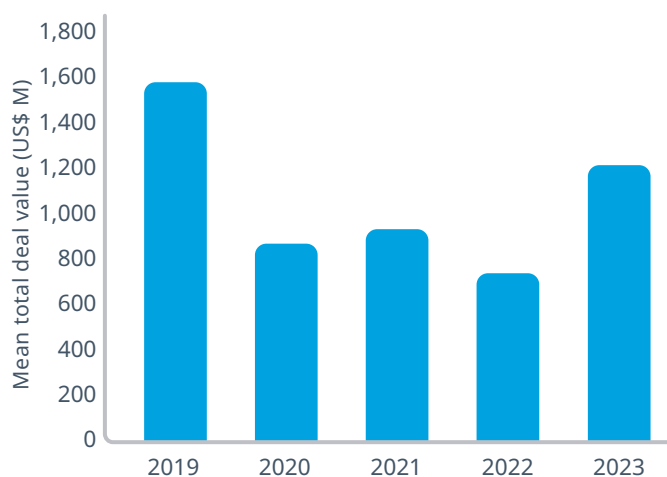

Source: IQVIA Pharma Deals.

Figure 4: Mean total deal value of M&A deals, 2019–2023
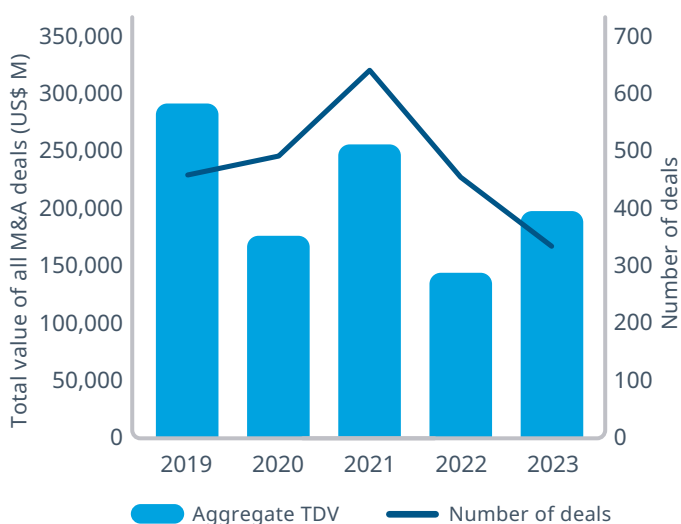
Source: IQVIA Pharma Deals.

deals signed in 2023 was up 37% compared to the figure achieved in 2022. In parallel, the mean total deal value for M&A deals increased 64% from US$738 M in 2022 to US$1.2 B in 2023, also exceeding the average deal values recorded in 2020 and 2021 when the COVID-19 pandemic raged (Figure 4). However, it must be noted that these values are heavily influenced by Pfizer's US$43 B takeover of Seagen. Therefore, the median total deal value, which removes any distorting effects from outliers, fell 10% from US$122 M in 2022 to US$110 M in 2023.

After being mostly off the table post-pandemic, 2023 saw the return of mega-mergers, with the largest biopharma M&A deal announced since Bristol Myers Squibb's US$74 B purchase of Celgene in 2019 (Deal no. 89733). In March, Pfizer announced its planned takeover of antibody-drug conjugate (ADC) specialist, Seagen, at a 33% premium and total deal value of US$43 B (Deal no. 118119). With a forecasted steep fall in sales of its COVID-19 products, the deal will strengthen Pfizer's product offering with the addition of Seagen's ADC technology as well as its portfolio of marketed medicines across solid tumors

and hematologic malignancies, including three ADCs: Adcetris® (brentuximab vedotin), Padcev® (enfortumab vedotin) and Tivdak® (tisotumab vedotin). Since its announcement, the deal faced intense antitrust scrutiny and was subject to two documentation requests from the Federal Trade Commission (FTC). However, the companies managed to successfully close the deal nine months after the announcement in December.

Aside from this transformative deal, big pharma showed a continued interest in bolt-on transactions driven by revenue-generating late-stage or marketed assets. In an attempt to diversify away from Keytruda® (pembrolizumab), which is rapidly approaching patent expiry, Merck & Co. agreed to pay US$200 per share — a premium of 75% — to acquire Prometheus Biosciences and its anti-TL1A monoclonal antibody, PRA023, on the back of successful Phase II results in ulcerative colitis (Deal no. 118667). With its breadth of potential indications, Merck is betting US$10.8 B on the blockbuster potential of PRA023 in inflammatory bowel disease and system sclerosis. Similarly looking to extend its growth runway and to potentially compensate its declining sales of Xtandi® (enzalutamide), Astellas agreed to acquire Iveric Bio for US$5.9 B (Deal no. 118864) to access the latter's complement C5 protein inhibitor, avacincaptad pegol, which was under FDA review at the time. Three months after the deal announcement, the asset was granted US approval for geographic atrophy secondary to age-related macular degeneration under the brand name Izervay.

With some of its key top-selling drugs, such as Revlimid and Opdivo, struggling to meet sales expectations and with patent expiries on the horizon, Bristol Myers Squibb (BMS) was particularly busy on the dealmaking front in the fourth quarter of 2023. In October, the company announced its acquisition of Mirati Therapeutics for US$58 per share in cash, representing a 52% premium and total equity value of US$4.8 B (Deal no. 121554). After swirling rumors of a potential takeover by Sanofi, it was BMS that sealed the deal and picked up access to Mirati's marketed lung cancer therapy, Krazati (adagrasib), as well as three

other oncology candidates in early stage and clinical stage development, including KRASG12D inhibitor, MRTX1133 and SOS1 inhibitor, MRTX0902. Two months later, BMS committed a further US$14 B to takeover Karuna Therapeutics and its portfolio of muscarinic agonists, which offer unique and mechanistically differentiated treatment options to ease symptoms of mood disorders without common side effects (Deal no. 122845). Karuna's lead asset, KarXT (xanomeline-trospium), is currently under US FDA review for the treatment of schizophrenia in adults, with approval expected in September 2024.

The BMS-Karuna deal marked the second major neuroscience M&A deal in December, as only a few weeks prior, AbbVie paid US$8.7 B to acquire Cerevel Therapeutics and its neurology pipeline (Deal no. 122565). After being spun out of Pfizer in 2018 (Deal no. 96835) and going public in 2020 through a merger with a special purpose acquisition company (SPAC) that raised US$445 M (Deal no. 102096), Cerevel developed a pipeline of neurology candidates targeting schizophrenia, Parkinson's disease (PD) and mood disorders. The focal point of the deal is late-stage candidate emraclidine, which, similar to Karuna's KarXT, is a muscarinic M4 selective positive allosteric modulator for the treatment of schizophrenia which is under investigation in two Phase II trials. Only a week prior to the Cerevel deal, AbbVie announced its acquisition of ImmunoGen for US$10.1 B, gaining access to its FDA-approved ADC Elahere (mirvetuximab soravtansine-gynx), for the treatment of platinum-resistant ovarian cancer and pipeline of investigational ADCs (Deal no. 122422).

For late-stage and marketed assets, big pharma continued to opt for M&A over licensing in 2023 to gain near-term revenue generators at discounted prices. After a turbulent few years for the company, Biogen committed to spend US$7.3 B to takeover rare disease specialist, Reata Pharmaceuticals (Deal no. 120454). The addition of Reata's Skyclarys® (omaveloxolone), the first and only FDA approved treatment for Friedreich's ataxia in the US, will help to strengthen Biogen's marketed portfolio, as it faces declining sales for its multiple sclerosis treatments.

In a deal that is a business acquisition in form but a product acquisition in substance, Roche paid US$7.1 B upfront to acquire Roivant's Telavant Holdings subsidiary and its TL1A-directed antibody, RVT-3101, in development for people suffering from inflammatory bowel disease (Deal no. 121806). The deal, which also includes a near-term milestone payment of US$150 M, marks a significant milestone for Roivant's business model which aims to build subsidiaries or 'Vants' for its in-house or licensed medicines that can eventually be spun off or sold.

Private equity interest in the life sciences sector remained high in 2023, with a consortium of private investment firm affiliates composed of Elliott Investment Management, Patient Square Capital and Veritas Capital acquiring the contract research organization, Syneos Health, for US$43 per share in cash in a transaction valued at approximately US$7.1 B, including outstanding debt (Deal no. 119144).

Combined, the top M&A deals of 2023, as ranked by total potential deal value and recorded in the IQVIA Pharma Deals database, had a total value of US$119.95 B, equivalent to 61% of the aggregate value of all M&A deals signed during the year (Table 2). The top 10 M&A deals of 2022 had a combined value of US$84.9 B and accounted for a smaller proportion of the year's total aggregate value (59%). Four of the top 10 acquisitions of 2023 were worth in excess of US$10 B, up from three in 2022, and all but one of the deals in 2023 concerned therapeutics or vaccines similarly to the previous year. Moreover, while only two M&A deals in 2022 had a value of between US$5 B and US$10 B, a further seven deals were in this price bracket in 2023.

Table 2: Top acquisitions of 2023 ranked by total deal value

TOTAL DEAL VALUE	COMPANIES	DEAL DRIVER
US$43 B	Pfizer, Seagen	Antibody-drug conjugate (ADC) technology and four approved oncology medicines
US$14 B	Bristol Myers Squibb, Karuna Therapeutics	KarXT (xanomeline-trospium), a potential first-in-class M1/M4 muscarinic receptor agonist for schizophrenia
US$10.8 B	Merck & Co., Prometheus Biosciences	Investigational monoclonal antibody, PRA023, a humanized monoclonal antibody directed to tumor necrosis factor (TNF)-like ligand 1A (TL1A), a target associated with intestinal inflammation and fibrosis
US$10.1 B	AbbVie, ImmunoGen	Elahere® (mirvetuximab soravtansine-gynx), a first-in-class ADC approved for platinum-resistant ovarian cancer (PROC)
US$8.7 B	AbbVie, Cerevel Therapeutics	Late-stage asset emraclidine, a positive allosteric modulator (PAM) of the muscarinic M4 receptor for schizophrenia
US$7.3 B	Biogen, Reata Pharmaceuticals	Skyclarys® (omaveloxolone), approved in the US as the first and only treatment for Friedreich's ataxia
US$7.25 B	Roche, Telavant Holdings	Phase III-ready RVT-301, for the treatment of inflammatory bowel disease, including ulcerative colitis and Crohn's disease
US$7.1 B	Syneos Health, Veritas Capital/Patient Square/Elliot Investment	Clinical research and commercialization services
US$5.9 B	Astellas, Iveric Bio	Complement C5 inhibitor, avacincaptad pegol, for geographic atrophy secondary to age-related macular degeneration
US$5.8 B	Bristol Myers Squibb, Mirati Therapeutics	Krazati (adagrasib), a best-in-class KRASG12C inhibitor approved in the US for the treatment of patients with advanced non-small cell lung cancer (NSCLC)

Source: IQVIA Pharma Deals.
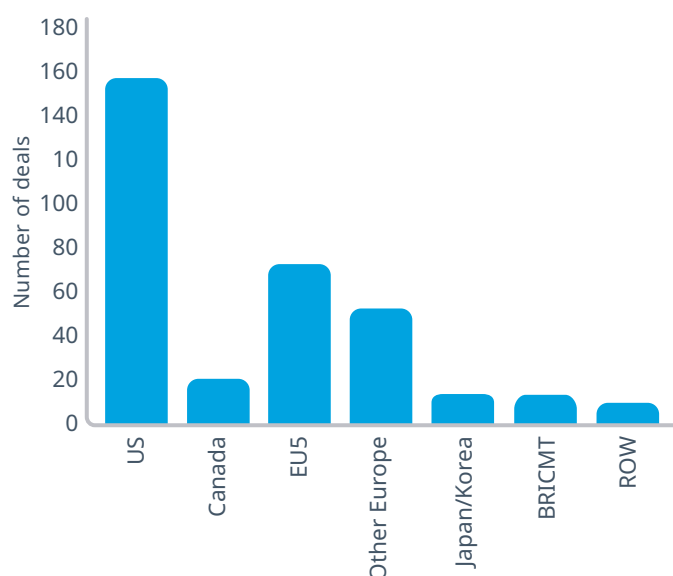
Source: IQVIA Pharma Deals.

Once again, the M&A landscape was dominated by the US, with acquisitions of US-based companies accounting for 46% of all life science M&A deals signed in 2023 (Figure 5). With a 21% volume share, companies located in one of Europe's five largest markets (France, Germany, Italy, Spain and the UK) comprised the second largest group of acquired parties. Of the EU5 M&A deals, 38% involved the acquisition of companies located in the UK and 25% involved German firms. The vast majority of the deals for target companies located in BRICMT countries — namely Brazil, Russia, India, China, Mexico and Turkey — involved Indian (54%) or Chinese (38%) companies being acquired.

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Merck & Co. retains title of prolific dealmaker

Despite a 27% reduction in its deal volume year-on-year, Merck & Co. retained its position as the most prolific dealmaker in the life sciences sector in 2023 with 40 publicly disclosed deals, one more than second place J&J (Figure 6). Falling one place in the deal activity rankings, Roche was the third most active dealmaker in terms of deal volume in joint place with AstraZeneca. Sanofi recorded the highest percentage decline in deal volume of the top 15 dealmakers with its number of disclosed deals falling 38% from 37 in 2022 to 23 in 2023.

To give some context to Merck & Co.'s high level of dealmaking, just over 40% of the deals that the company signed in 2023 were clinical trial collaborations pairing Keytruda® (pembrolizumab) with third-party oncology assets, thus bolstering the already sizeable portfolio of co-development deals centered on this asset that the company has accumulated in recent years. However, with Keytruda's patent expiry fast approaching in 2028, Merck looked to deploy its cash on external innovation to secure future revenue drivers. Aside from its US$10.8 B takeover of Prometheus Biosciences (Deal no. 118667) and in its only other M&A deal of the year, Merck bolstered its neurology portfolio with the US$610 M acquisition of Caraway Therapeutics and its pipeline of investigational assets targeting neurodegenerative diseases (Deal no. 122287). Merck was particularly bullish in its licensing and collaborative dealmaking in 2023, committing up to US$22 B in an ADC-focused partnership with Daiichi Sankyo (Deal no. 121795) as well as signing two protein degradation collaborations with a combined value of US$5.66 B (Deal no. 122634) (Deal no. 118476), all of which are discussed below. Attempting to diversify its offerings, in March, the company paid ModeX Therapeutics, a wholly owned subsidiary of OPKO Health, US$50 M upfront for the development of MDX-2201, ModeX's preclinical nanoparticle vaccine candidate targeting Epstein-Barr virus (EBV) (Deal no. 118018).

Figure 6: Most prolific dealmakers, 2022 vs. 2023
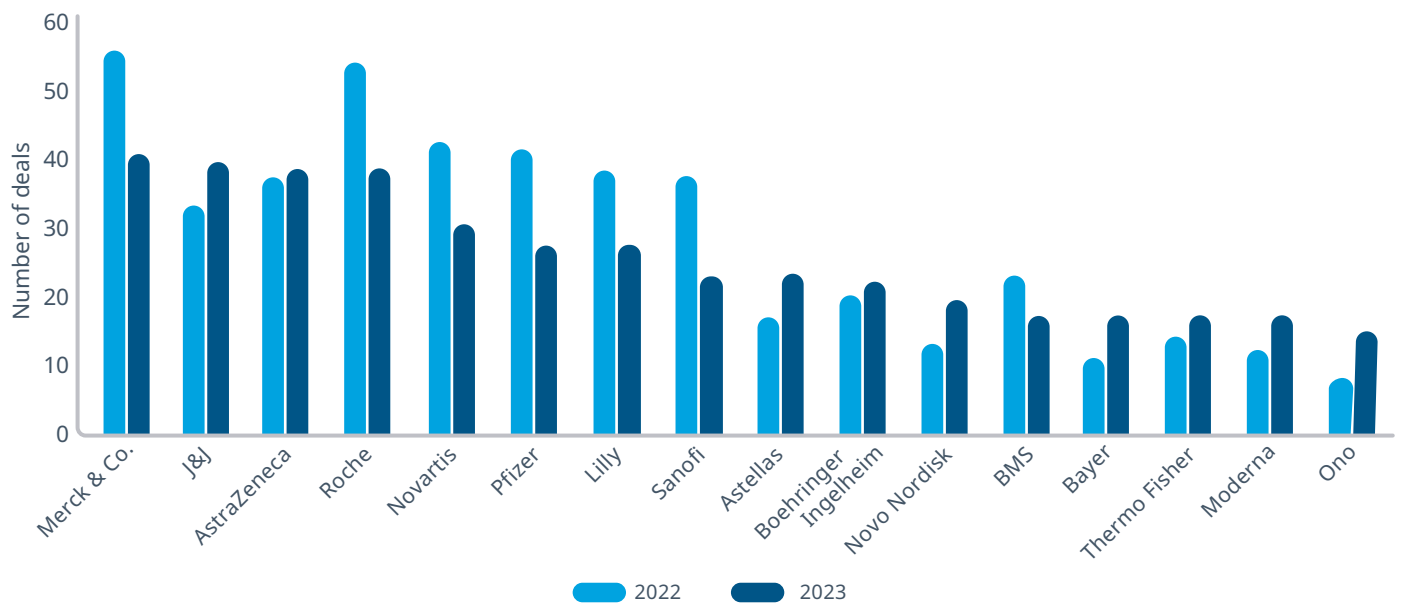
Source: IQVIA Pharma Deals.

Unlike many of its contemporaries which exhibited double-digit percentage decreases in deal number from 2022 to 2023, J&J saw its deal activity jump by 18%, climbing six places in the deal activity rankings. In its largest deal of 2023, J&J's Janssen Pharmaceutica paid Nanobiotix US$30 M upfront and promised up to US$2.67 B in success-based milestones for ex-China rights to NBTXR3, a potential first-in-class radioenhancer for the treatment of head and neck and lung cancers (Deal no. 120123). Joining in on the industry's hype around ADCs, Janssen ended the year with a US$1.7 B licensing pact with South Korean LegoChem Biosciences to develop and commercialize LCB84, a Trop2-directed ADC for the treatment of multiple cancers (Deal no. 122855).

Novo Nordisk recorded the biggest increase in the number of deals publicly disclosed in 2023 compared to 2022, with a jump of 46% compared to the previous year. The company recorded a surge in demand in 2023 for its weight loss drug Wegovy and diabetes injection Ozempic, which in turn led to Novo Nordisk splashing its earnings on dealmaking in an attempt to maintain its strong presence in the cardiometabolic field. In August, the company spent a combined total of over US$1.5 B to acquire Inversago Pharma (Deal no. 120630) and Embark Biotech (Deal no. 121050),

both of which are focused on the development of new treatments for obesity and diabetes. Looking to utilize new, innovative technologies, Novo Nordisk collaborated with Dewpoint Therapeutics to utilize the latter's discovery platform related to biomolecular condensates to treat insulin resistance and diabetic complications (Deal no. 118270) and then later formed an alliance with Aspect Biosystems to develop bioprinted tissue therapeutics for the treatment of diabetes and obesity leveraging Aspect's bioprinting technology (Deal no. 118588).

In line with its strategic commitment to growth, Astellas upped its deal activity in 2023 from the previous year by 35% with a particular focus on early-stage gene and cell therapy-focused collaborations. In January, Astellas established a US$350 M alliance with Selecta Biosciences for IdeXork, a next-generation immunoglobin G (IgG) protease that will be developed by Astellas for use with AT845, an investigational, adeno-associated virus-based treatment for late-onset Pompe disease in adults, as well as any other of its gene therapy products (Deal no. 117191). Also focused within the same field, Astellas signed an exclusive license agreement with Kate Therapeutics for KT430, a preclinical gene therapy that delivers a functional copy of the MTM1 gene via a novel MyoAAV capsid to

treat X-linked myotubular myopathy (XLMTM) (Deal no. 119558). In addition to the previously mentioned US$5.9 B acquisition Iveric Bio (Deal no. 118864), Astellas chose M&A to build upon its existing oncology pipeline with the takeover of Propella Therapeutics in November for US$175 M (Deal no. 122219). The deal provided the company with access to prodrug PRL-02 (abiraterone decanoate), a next-generation androgen biosynthesis inhibitor to treat prostate cancer which has potential to rival J&J's blockbuster drug, Zytiga.

Figure 7 presents an analysis of the leading dealmakers as ranked by the aggregate potential value of each company's deals in 2023, excluding those deals where the company is itself receiving payment e.g. out-licensing agreements or divestments. Each of the 20 companies committed to invest at least more than US$4 B on the deals they signed in 2023, with nine companies each pledging more than US$10 B. Pfizer was the leading company in terms of deal spend, thanks in major part to its US$43 B acquisition of Seagen (Deal no. 118119). Four multibillion-dollar deals accounted for over 90% of Merck & Co's deal spend in

2023: the already discussed takeover of Prometheus Biosciences along with three major licensing and collaboration deals for ADCs and protein degraders discussed later in this white paper.

Nearly 40% of Lilly's deal spend in 2023 was accounted for by three US$1 B+ dollar M&A deals which were focused on a broad variety of preclinical and clinical assets. In June, Lilly announced its US$2.4 B takeover of DICE Therapeutics and its DELSCAPE technology platform to develop new oral therapeutic candidates, including oral interleukin-17 (IL-17) inhibitors in clinical development, to treat chronic diseases in immunology (Deal no. 119811). Aligned with its focus on metabolic diseases and oncology, Lilly later acquired Versanis Bio and its lead monoclonal antibody, bimagrumab, for up to US$1.925 B (Deal no. 120267) as well as Point Biopharma, a radiopharmaceutical company with a pipeline of radioligand therapies in development for the treatment of cancer, for US$1.4 B (Deal no. 121458).

Figure 7: Top 20 companies ranked by aggregate total value of all disclosed deals in 2023 (excluding out-licensing deals and divestments by such companies)
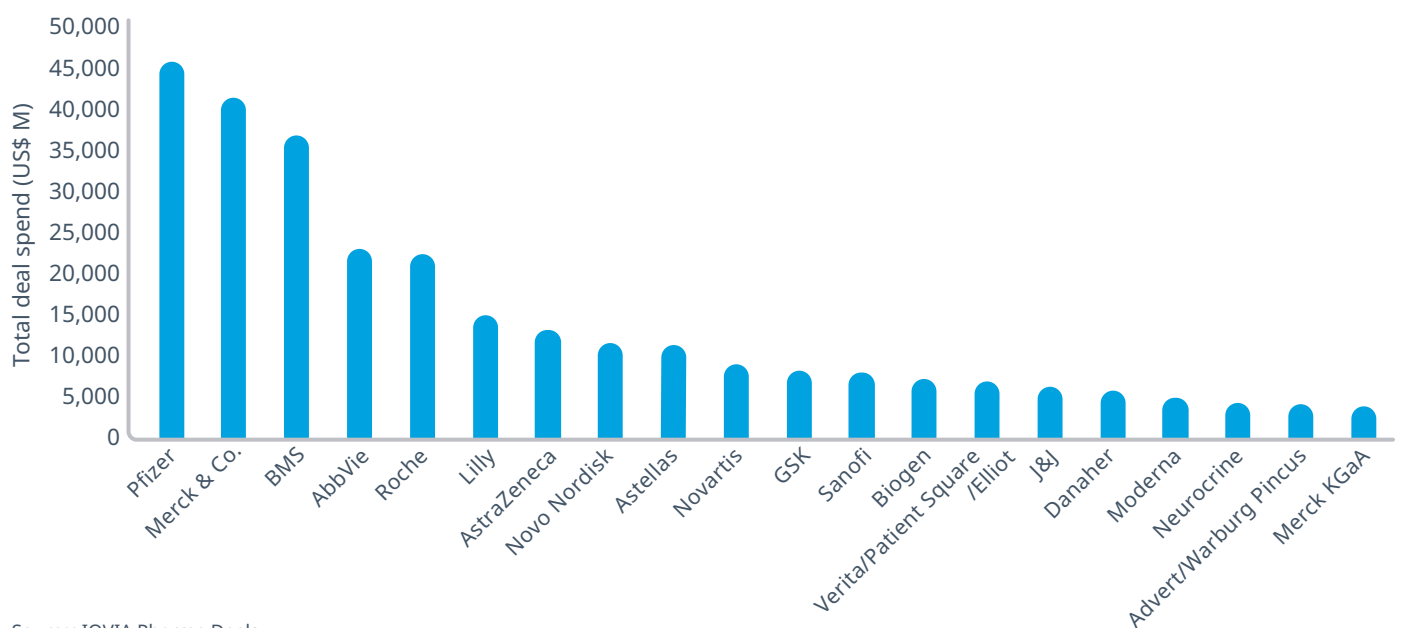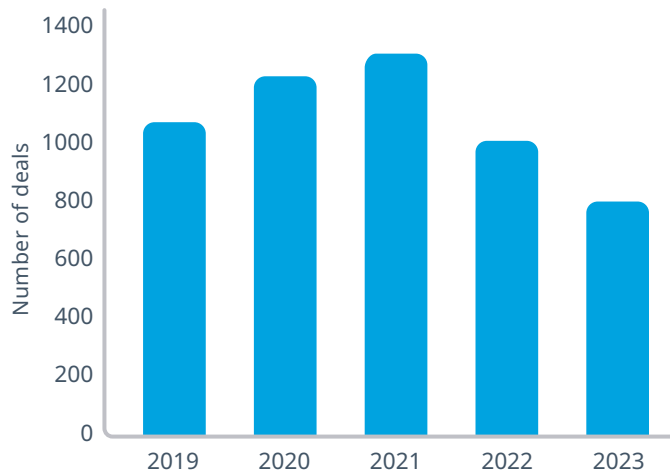

Source: IQVIA Pharma Deals.

Licensees drive deal volume down but values up

After dropping to below pre-pandemic levels in 2022, licensing activity in the life sciences sector diminished further in 2023 as companies appeared to be more selective in the types of assets they in-licensed. Mirroring the trend seen for overall deal activity, the volume of licensing deals in the life sciences sector dropped 21% from 2022 to 2023, as dealmakers were more cautious and reprioritized their portfolios (Figure 8).

Figure 8: Number of licensing deals, 2019–2023

Source: IQVIA Pharma Deals.

Despite the continued downturn in licensing deal volume, the level of licensing spend in 2023 was somewhat sustained compared to previous years, with the aggregate potential value of all licensing deals with disclosed financials amounting to US$157.4 B. This was just shy of the US$160.6 B spent in 2022 and the US$161 B achieved in 2020 when a record number of biodollars were pledged on licensing deals in the life sciences sector. The mean licensing deal value jumped 7% in 2023 to US$637 M, while the median deal value rose 15% to US$231 M (Figure 9). While the largest licensing deal of 2022 was worth up to US$9.4 B (Deal no. 116932), 2023 set an all-time record with Merck & Co. and Daiichi Sankyo's US$22 B alliance, the largest licensing deal in terms of total deal value to date on the Pharma Deals database (Deal no. 121795).

Figure 9: Mean total deal value and mean upfront payment for licensing deals, 2019–2023
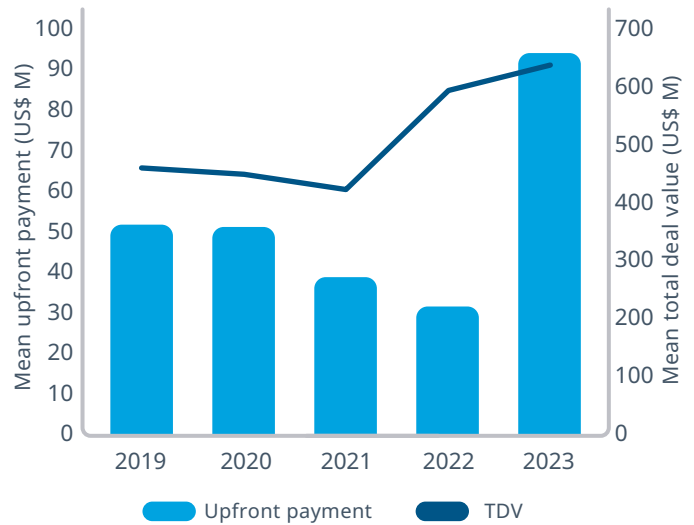
Source: IQVIA Pharma Deals.

With its US$5.5 B upfront payment, the mean cash upfront payment for licensing deals signed in 2023 soared by 200%, with a value of US$94 M compared to the figure of US$31.3 M achieved the previous year, whilst the median value rose by 60% to US$20 M. In total, licensees committed to pay US$15.4 B in guaranteed upfront payments in 2023, up 122% on the US$6.9 B paid by licensees to in-license life science assets in 2022 but on a par with the aggregate values seen in 2019 and 2020, suggesting a return to blockbuster license fees in the sector. This is further supported when the Merck-Daiichi deal is excluded from the analysis, as the average value of licensing deals decreased by 7% yet the average upfront payment still soared by 94%.

Mirroring the trend seen for overall deal activity, the volume of licensing deals in the life sciences sector dropped 21% from 2022 to 2023, as dealmakers were more cautious and reprioritized their portfolios.

Table 3 presents the top 10 partnering deals of 2023 as ranked by total upfront consideration (including both cash and equity). After caution prevailed in 2022 with licensees reluctant to commit large sums upfront, big pharma showed signs of willingness in 2023 to deploy its accumulated cash in return for access to promising and innovative assets. After upfront payments failed to exceed the US$500 M mark in 2022, in contrast, four licensing deals in 2023 involved an upfront consideration of US$500 M or more.
Six out of the top 10 partnering deals were focused on treatments for oncology indications – half of which were centered around ADC modalities. The largest licensing deal of 2023 in terms of upfront cash by a significant margin was Merck & Co.'s agreement to pay US$5.5 B upfront for three of Daiichi Sankyo's exatecan derivative (DXd) ADCs for cancer (Deal no. 121795). The staggering upfront fee consists of US$4 B cash upfront and US$1.5 B in continuation payments over the next 24 months, with the potential of additional payments of up to US$16.5 B contingent upon the achievement of future sales milestones, for a total potential consideration of up to an eye-watering US$22 B. After AstraZeneca bought rights to Daiichi's Enhertu in 2019 (Deal no. 91360) and Dato-DXd in 2020 (Deal no. 99879), Merck is hopeful that its three new Daiichi assets will similarly generate multi-billion-dollar revenue over the next decade, as it prepares for its post-Keytruda future.

Merck was not the only big pharma investing large sums of money in ADCs in 2023, as the modalities have proven to be a promising treatment option for cancer indications. In December, BMS handed over US$800 M upfront and up to US$500 M in contingent near-term payments to SystImmune for ex-China rights to BL-B01D1, a potentially first-in-class EGFRxHER3 bispecific ADC being investigated in non-small cell lung cancer (NSCLC) and breast cancer (Deal no. 122638). GSK similarly turned to China to add further ADCs to its portfolio, paying US$185 M upfront and the promise of US$1.525 B in success-based milestones to Hansoh Pharma for ex-China rights to HS-20093, a B7-H3 targeted ADC with a clinically validated topoisomerase inhibitor (TOPOi) payload (Deal no. 122800). The deal came only two months after the companies signed

their first partnership together, with GSK paying US$85 M for HS-20089, a B7-H4 targeted ADC in Phase II clinical trials in China (Deal no. 121818).

Seeking a low-risk asset by investing in an established product, Takeda signed a US$1.13 B licensing agreement with Hutchmed to develop and commercialize the latter's fruquintinib outside of mainland China, Hong Kong and Macau (Deal no. 117325). Luckily for Takeda, the US$400 M upfront investment paid off later in the year when the FDA granted approval for the drug for previously treated metastatic colorectal cancer, under the brand name Fruzaqla. BMS took a similar approach in 2023 by handing over US$350 M upfront to LianBio to gain China and other Asian markets rights to blockbuster cardiovascular drug, mavacamten (Deal no. 121811), thereby terminating the license agreement LianBio entered into with MyoKardia in August 2020 to acquire such rights (Deal no. 100320). After picking up mavacamten through its takeover of MyoKardia in 2020 (Deal no. 101670) and gaining FDA approval for the drug under the brand name Camzyos for the treatment of symptomatic obstructive hypertrophic cardiomyopathy in 2022, BMS is now looking to expand its footprint in the Asian market with an approval in China expected in 2024.

Unlike Merck & Co. and Roche who opted for M&A to gain access to upcoming anti-TL1A therapies in 2023, Sanofi instead signed a licensing pact with Teva, pledging US$500 M upfront to co-develop inflammatory bowel disease drug TEV'574, currently in Phase IIb trials for the treatment of ulcerative colitis and Crohn's disease (Deal no. 121451). Roche also chose licensing as a risk mitigating mechanism to access external innovation, signing a heavily backloaded deal with Alnylam Pharmaceuticals to co-develop and co-commercialise Phase II investigational RNAi therapy, zilebesiran, for the treatment of hypertension in patients with high cardiovascular risk (Deal no. 120366). The deal involved a US$310 M cash upfront payment from Roche with the promise of up to US$2.8 B more in milestones.

Table 3: Top partnering deals (excluding settlements and product acquisitions) of 2023 by upfront consideration

| TOTAL DEAL VALUE	UPFRONT PAYMENT	COMPANIES	INTEREST AREA	DEVELOPMENT PHASE
US$22000 M	US$5500 M	Daiichi Sankyo, Merck & Co.	Three DXd ADC candidates	Phase I; Phase II; Phase III
Undisclosed	US$1500 M	GPCR Therapeutics, BridgeBio Biotherapeutics	CXCR4-LPA1 inhibitor combination treatment for idiopathic pulmonary fibrosis	Discovery
US$8400 M	US$1300 M (US$800 M upfront + US$500 M in contingent near-term payments)	SystImmune, Bristol Myers Squibb	BL-B01D1, a potential EGFRxHER3 bispecific ADC	Phase I
US$1500 M	US$500 M	Sanofi, Teva Pharmaceuticals	TEV'574 for the treatment of ulcerative colitis and Crohn's disease	Phase II
US$1130 M	US$400 M	Hutchmed, Takeda	Kinase inhibitor, fruquintinib, for the treatment of colorectal cancer	Launched
US$477.5	US$350 M	LianBio, Bristol Myers Squibb	Mavacamten to treat obstructive hypertrophic cardiomyopathy	Launched
US$3110 M	US$310 M	Alnylam, Roche	RNAi therapeutic, zilebesiran, for the treatment of hypertension	Phase II
Undisclosed	US$245 M	Cellular Biomedicine, Janssen	C-CAR039 and C-CAR066 for the treatment of non-Hodgkin lymphoma	Phase I; Phase I/II
Undisclosed	US$200 M	BioNTech, OncoC4	Anti-CTLA-4 monoclonal antibody candidate, ONC-392, as monotherapy or combination therapy in various cancer indications	Phase I/II; Phase II
US$1710 M	US$185 M	GSK, Hansoh Pharma	HS-20093, a B7-H3 targeted ADC	Phase II

Source: IQVIA Pharma Deals.

Following the successful launch of its Legend Biotech-partnered CAR-T cell therapy Carvykti® (ciltacabtagene autoleucel) (Deal no. 83007), Janssen handed over US$245 M upfront to Cellular Biomedicine for two CD20-directed autologous CAR-Ts, C-CAR039 and C-CAR066, being investigated in non-Hodgkin's lymphoma (Deal no. 118873). Flush with cash from the success of its Pfizer-partnered COVID-19 vaccine (Deal no. 97661), BioNTech also continued its focus on oncology indications, paying US$200 M upfront to OncoC4 to co-develop and commercialize the clinical stage candidate, ONC-392, as a monotherapy or combination therapy in multiple tumor indications (Deal no. 118234).

Mirroring the overall decline in licensing deal flow in the life sciences sector, the volume of licensing deals for therapeutic programs fell 9% from 2022 to 2023. Figure 10 presents an analysis of licensing activity for therapeutic programs in 2022 and 2023 by development stage. Where deals concern multiple assets or assets in different stages of development for different indications, the highest achieved development phase of the licensed asset has been selected for the analysis, irrespective of the licensing territory.

Licensing activity related to commercial stage assets was significantly depressed in 2023 with deals involving registered/approved products recording the largest percentage decrease in volume. However, deal numbers in this development phase in 2022 were high due to the large numbers of non-exclusive sublicensing deals that the Medicines Patent Pool signed with generics manufacturers in 2022 for COVID-19 antivirals such as molnupiravir in low- and middle-income countries. In 2023, commercial-stage deals were mainly focused on single territory or regional licenses to products that had already gained regulatory approval in major markets. Licensing deal count at the discovery stage dropped 24% from 2022 to 2023, while the level of licensing activity for preclinical programs fell 14% over the same period. It must be noted that option-based platform deals are not included in this analysis.

After cautious licensees held back in clinical-stage licensing activity in 2022, it seemed that life science companies were less risk-averse in 2023 with an abundance of Phase I through to Phase III deals being disclosed. Similar to 2022, big-pharma continued to out-license their deprioritized clinical-stage assets as they attempted to streamline their portfolios; these

Figure 10: Therapeutic licensing deals by development stage, 2022 vs. 2023
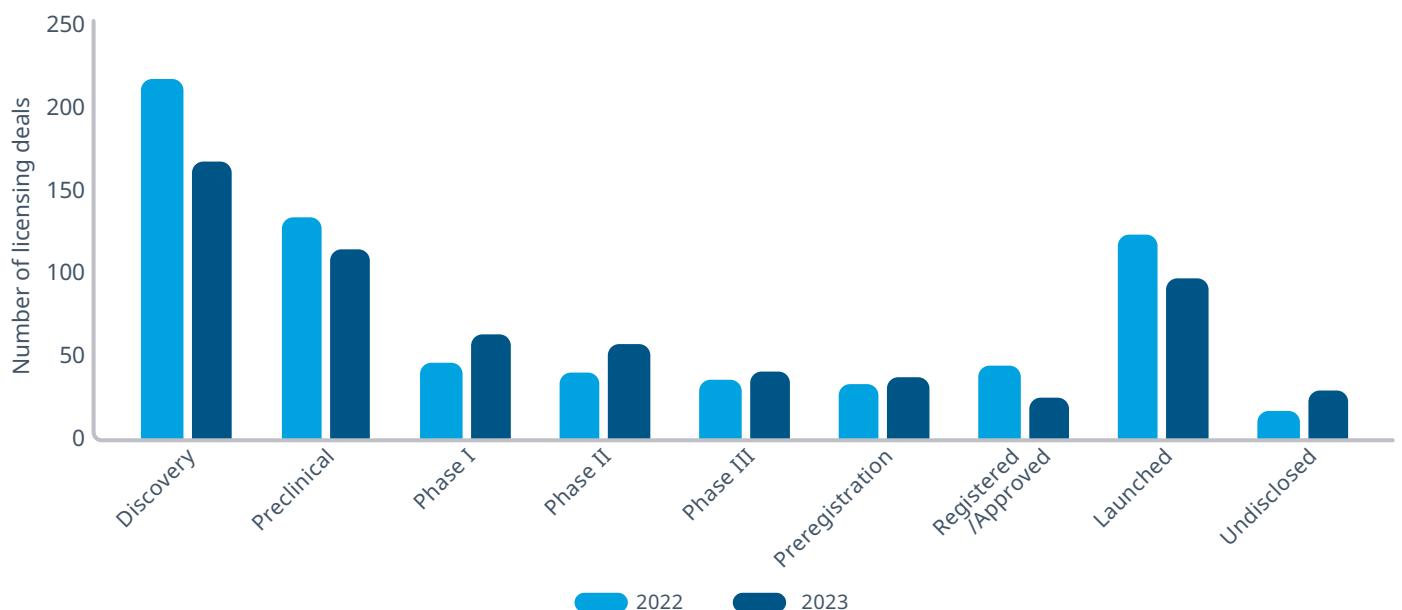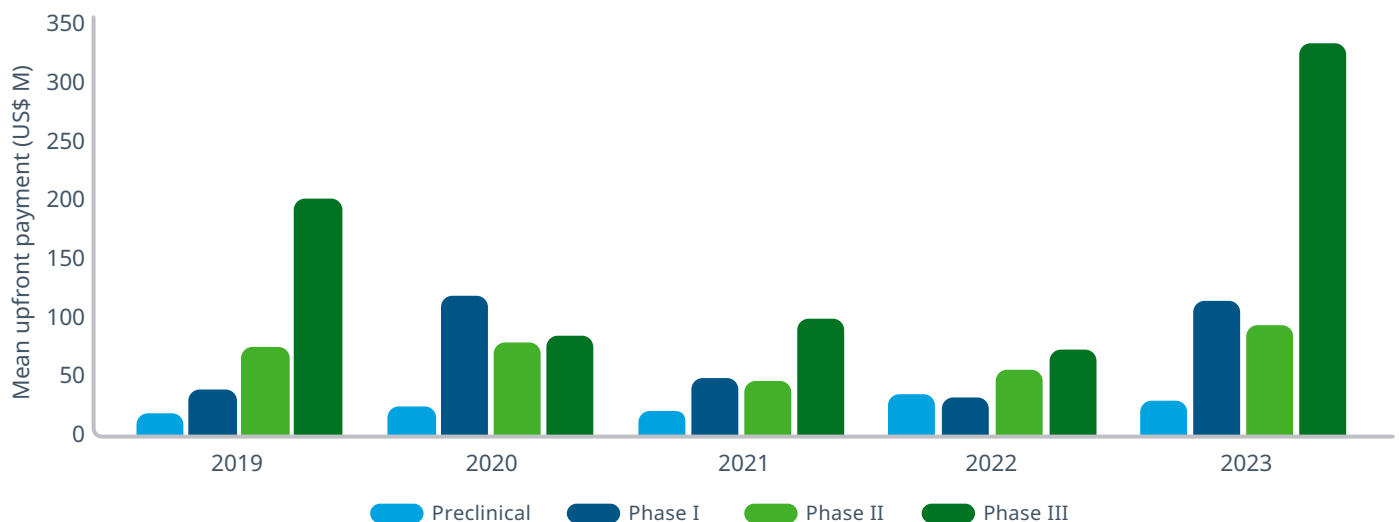

Source: IQVIA Pharma Deals.

included Novartis (Deal no. 117182), Amgen (Deal no. 117996), Novo Nordisk (Deal no. 119256) and Janssen (Deal no. 121914). Chinese companies also continued to be active in out-licensing oncology programs for development and commercialization in overseas markets, particularly ADC programs. Aside from the GSK-Hansoh deal discussed earlier, other notable licensing deals for innovative China-originated ADCs include Merck KGaA's US$169 M upfront global license agreement for Jiangsu Hengrui's PARP1 trapping inhibitor, HRS-1167 and Claudin-18.2 ADC, SHR-A1904 (Deal no. 121898), BioNTech's US$170 M upfront global licensing agreement for Duality Biologics' ADCs, DB-1303 and DB-1311 (Deal no. 118436) and AstraZeneca's US$63 M upfront global license agreement for KYM Biosciences' gastric cancer ADC, CMG901 (Deal no. 117834).

An analysis of cash upfront payments for therapeutic licensing deals by development stage, restricted to those deals involving a global license or rights in the US, Europe, Japan or China, suggests that there was an increased tolerance for high upfront expenditure on licensing deals in 2023. On average, Phase III assets commanded the highest upfront payments in 2023, although this can be considered as an anomaly skewed by the record breaking US$5.5 B upfront payment from Merck & Co. to Daiichi Sankyo in the ADC alliance discussed previously (Deal no. 121795) (Figure 11). Excluding this mega deal, the mean upfront payment for Phase III licensing deals in 2023 was US$26.2 M, a decrease of 63% on the equivalent figure for 2022, with no other Phase III deals having an upfront payment in excess of US$100 M.

Promising Phase II programs were coveted in 2023, with the mean upfront payment for deals at this development stage soaring by 71% to US$91 M, thanks in part to three deals with upfront sums exceeding US$200 M each. The mean upfront payment for Phase I assets was up a staggering 258% on 2022, however this is heavily influenced by BMS' US$1.3 B upfront payment to SystImmune (Deal no. 122638) as well as five deals each having triple-digit million licensing fees. Licensors were, however, less willing to invest larger sums upfront for preclinical assets in 2023, with the mean licensing fee for this development phase down 18% to US$27 M, with only two deals disclosing upfront fees in excess of US$100 M.

Figure 11: Mean upfront payment for licensing deals by development stage, 2019–2023
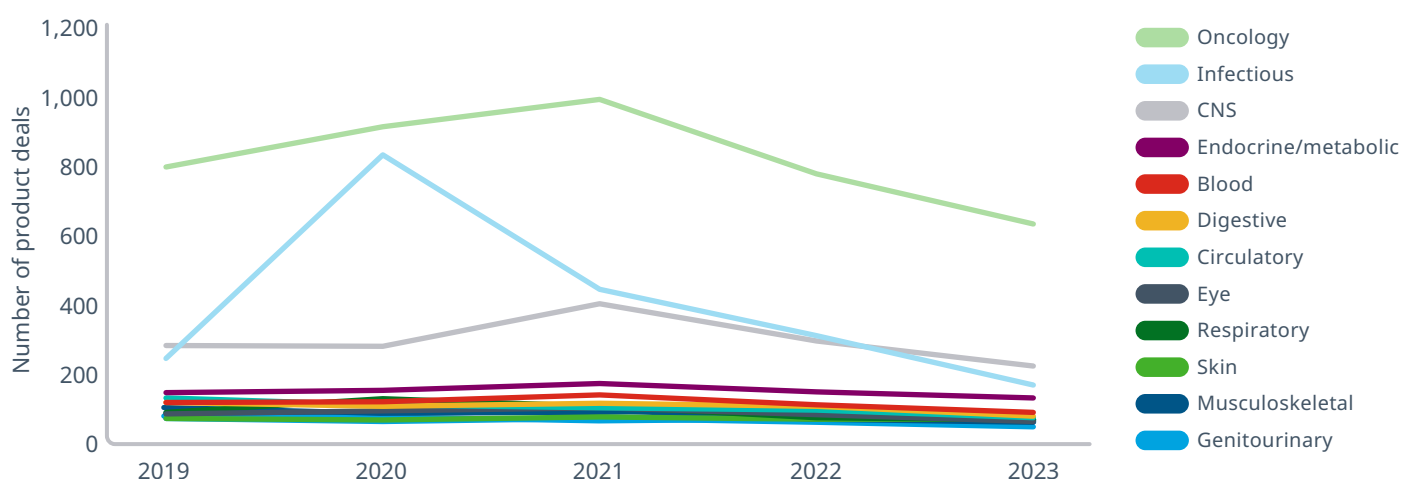

Source: IQVIA Pharma Deals.

CNS diseases jump up the rankings as oncology still leads

Figure 12 presents an analysis of product deals (including product acquisitions, licensing, option to license, co-development and collaborative R&D deals) by indication area. Oncology was once again the most popular therapy area for dealmaking in the life sciences sector in 2023, although deal volume was reduced on an annualized basis broadly in line with overall deal activity and has now fallen below pre-pandemic levels. Of the deals signed in 2023 that could be ascribed an indication, approximately 40% involved therapeutics, diagnostics or medical devices for cancer, the same proportion as in 2022. CNS diseases jumped to the second most popular therapy area for deals signed in 2023 with endocrine/metabolic diseases and diseases of the blood comprising fourth and fifth place, respectively. After surging in 2020 to an unprecedented level as COVID-19 took hold, the number of product-focused infectious disease deals fell a further 47% from 2022 to 2023, outpacing the decline in overall deal activity and dropping to third place in the top therapy area rankings. Approximately 20% of the infectious disease product deals signed in 2023 concerned COVID-19 in some way meaning that deal activity focused on other infectious disease indications remains significantly below pre-pandemic levels. Apart from diseases of the skin which maintained the same level of deal volume, all other therapy areas included in the analysis recorded a decline in deal activity from 2022 to 2023, with infectious diseases and digestive diseases showing the largest percentage decreases (47% and 28%, respectively).

Previously shunned by big pharma, CNS diseases climbed to second place as key players looked to expand their positions in the increasingly competitive market. In terms of total potential value, the largest partnering deal of 2023 focused solely on CNS indications was Lilly's Prevail Therapeutics' US$1.575 B collaboration with Scribe Therapeutics for exclusive rights to the latter's CRISPR (clustered regularly interspaced short palindromic repeats) X-Editing technologies to develop in vivo therapies directed to specified targets known to cause serious neurological and neuromuscular diseases (Deal no. 119159). With a particular focus on adeno-associated virus (AAV) capsid technologies, Prevail committed up to US$1.19 B for Sangamo Therapeutics' AAV capsid engineering platform, Sifter™, for multiple neurological diseases (Deal no. 120242) as well as a further US$55 M upfront for Capsida Biotherapeutics' AAV engineering platform to develop non-invasive gene therapies for CNS diseases (Deal no. 117177).

Figure 12: Number of product deals by therapeutic area, 2019–2023
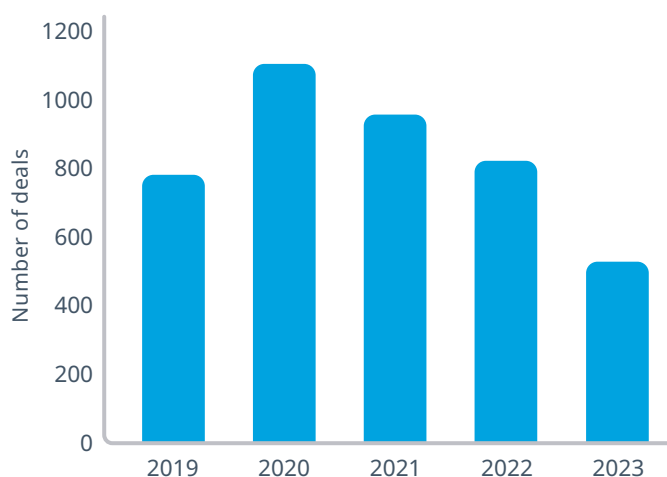

Source: IQVIA Pharma Deals

Other notable deals in the CNS space include Janssen's US$50 M upfront licensing agreement for Pipeline Therapeutics' PIPE-307, a Phase I muscarinic M1 receptor antagonist to treat nervous system disorders (Deal no. 118653), and Neuraxpharm's US$140 M upfront agreement with TG Therapeutics for ex-US commercialization rights to multiple sclerosis drug, Briumvi® (ublituximab-xiiy) (Deal no. 120481).

Of the therapy areas included in the analysis presented in Figure 12, endocrine, nutritional and metabolic diseases suffered one of the smallest percentage declines in deal volume. Novo Nordisk continued to dominate the field, disclosing a total of nine deals centred around new therapeutic modalities and drug delivery technologies targeting cardiometabolic diseases. Following the success of its type 2 diabetes injection, Mounjaro® (tirzepatide), which recently gained approval in November 2023 for obesity under the brand name Zepbound, Lilly also retained its core interest in the metabolic disease field, entering a multi-year partnership to discover obesity targets leveraging Fauna Bio's Convergence™ AI platform (Deal no. 122815) and signing a clinical trial agreement with BioAge Labs to study oral apelin receptor agonist, BGE-105 (azelaprag) with tirzepatide for the treatment of obesity (Deal no. 121865). AstraZeneca was also an active dealmaker in the cardiometabolic field in 2023. Entering the emerging autoimmune cell therapy space, the big pharma handed over US$85 M upfront to UK-based Quell Therapeutics to develop autologous multi-modular Treg cell therapy candidates for type 1 diabetes (T1D) (Deal no. 119590). Undeterred by the growing competition in the glucagon-like peptide 1 (GLP-1) receptor agonist market, AstraZeneca also signed a US$2 B licensing agreement with Chinese firm, Eccogene, for ECC5004, an investigational oral once-daily GLP-1 receptor agonist for the treatment of obesity, type-2 diabetes and other cardiometabolic conditions (Deal no. 122116). The oral route of administration is thought to provide a competitive edge to the early-stage asset because, if approved, it will offer a more convenient alternative to Novo Nordisk's and Lilly's diabetes injectables.

R&D alliance activity slows

The number of collaborative R&D alliances (defined here as discovery or preclinical-stage deals that involve two or more parties actively collaborating on R&D) fell 36% from 2022 to 2023, reaching a 5-year low (Figure 13). The year saw several big pharma companies divest deprioritized assets and terminate existing non-progressive collaborations in order to cut costs and streamline their operations. Despite looming patent cliffs and the need to drive long-term innovation, key players in the life sciences sector remained cautious and only sought out innovative therapies and technologies that complemented their already sizeable R&D portfolios.

Figure 13: Number of collaborative R&D deals, 2019–2023

Source: IQVIA Pharma Deals.

The aggregate total value of all the collaborative R&D deals signed in 2023 fell only 5% to US$65.7 B compared to 2022, albeit still up on pre-pandemic levels as multitarget and multimodality alliances continued to find favor (Figure 14). As was the case in 2022, approximately 42% of the aggregate value for 2023 was contributed by just 10 high-value R&D alliances. The mean total deal value of collaborative R&D deals with disclosed financial terms fell 15% year-on-year to US$876.6 M, after the all-time high recorded in 2022 of US$1036.9 M. This was accompanied by a 32% decrease in the median deal

Figure 14: Aggregate value and mean total deal value of collaborative R&D deals, 2019–2023
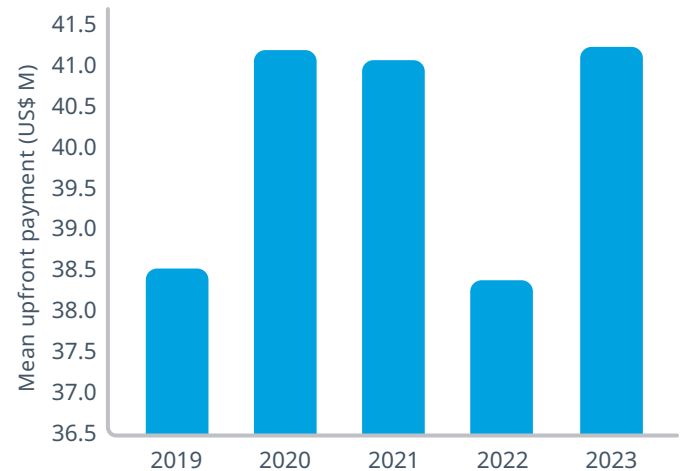
Figure 15: Mean upfront payment for collaborative R&D deals, 2019–2023
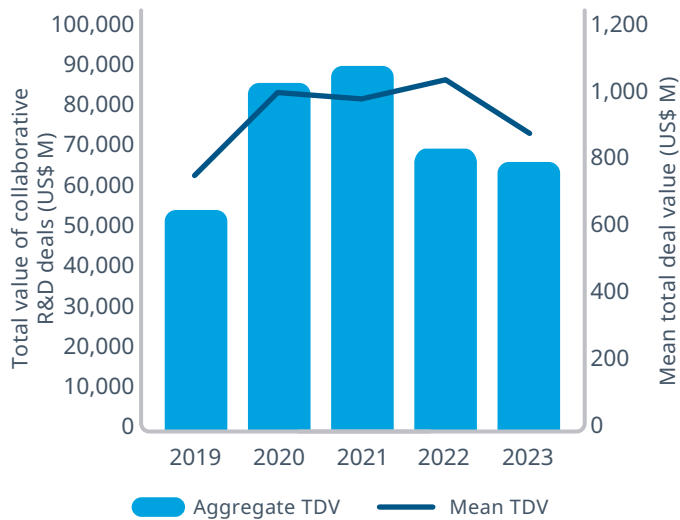
value, from US$783 M in 2022 to US$530 M in 2023, suggestive of greater fiscal discipline. During the year, 22 deals were signed with a headline value of US$1 B or more, down from 27 in 2022.

Indicative of inflationary pressures, upfront payments for collaborative R&D deals increased 7% on average, from US$38.3 M in 2022 to US$41.2 M in 2023, surprisingly returning to the level seen in 2020 and 2021 when COVID-19 drove high-valued collaborations (Figure 15). An aggregate of US$1.32 B was committed in upfront fees for collaborative R&D alliances in 2023, down from US$2.07 B in 2022. It must be noted that this analysis does not include payments made in 2023 to expand collaborative R&D alliances that were signed in previous years. For example, in order to dive deeper in its peptide-based research collaboration with Nimble Therapeutics, Roche's Genentech paid US$20 M upfront to broaden the alliance which

is centered around Nimble's peptide synthesis, screening and optimization platform (Deal no. 97195). Moreover, in December, Sanofi paid US$45 M in upfront and preclinical milestones to expand its artificial intelligence (AI)-driven drug discovery pact with Exscientia (Deal no. 110581).

Table 4 presents the top 10 collaborative R&D deals of 2023 as ranked by total potential deal value. Despite the significant slowdown in dealmaking activity, life sciences companies were still willing to sign off on large deal values for potential future revenue-generating programs and technologies. The collaborative R&D alliance of the year saw Voyager Therapeutics pay US$136 M upfront in cash plus an equity investment of approximately US$39 M to collaborate with long-term partner Neurocrine Biosciences (Deal no. 117216). Building upon an existing CNS-focused partnership looking at

Indicative of inflationary pressures, upfront payments for collaborative R&D deals increased 7% on average, from US$38.3 M in 2022 to US$41.2 M in 2023.

Table 4: Top therapeutic collaborative R&D deals of 2023 by total potential deal value

TOTAL DEAL VALUE	UPFRONT PAYMENT	COMPANIES	INTEREST AREA	DEVELOPMENT PHASE (NO. PROGRAMS/ TARGETS)
US$4410 M	US$175 M	Neurocrine Biosciences, Voyager Therapeutics	Gene therapy products directed to the gene that encodes glucosylceramidase beta 1 (GBA1) for the treatment of Parkinson's disease and other diseases associated with GBA1	Discovery (3); Preclinical (1)
US$3460 M	US$60 M	Nurix Therapeutics, Seagen	Degrader-antibody conjugates (DACs) for use in cancer	Discovery (multiple)
US$3110 M	US$10 M	C4 Therapeutics, Merck & Co.	DACs for use in cancer	Discovery (up to 4)
US$2800 M	US$30 M	AbbVie, Immunome	Antibody-target pairs arising from three specified tumor types using Immunome's Discovery Engine	Discovery (up to 10)
US$2760 M	Undisclosed	Valo Health, Novo Nordisk	Leveraging Valo's Opal Computational Platform to develop treatments for cardiometabolic diseases	Discovery (multiple); Preclinical (3)
US$2550 M	Undisclosed	Proxygen, Merck & Co.	Molecular glue degraders	Discovery (multiple)
US$2275 M	US$60 M	Avidity Biosciences, Bristol Myers Squibb	Discovery, development and commercialization of multiple cardiovascular targets	Discovery (up to 5)
US$2080 M	US$80 M	Belharra Therapeutics, Genentech	Chemoproteomics drug discovery platform to develop small molecule medicines in multiple therapeutic areas	Discovery (multiple)
US$2050 M	US$78 M	Monte Rosa Therapeutics, Roche	Molecular glue degraders for cancer and neurological diseases	Discovery; Preclinical (multiple)
US$1920 M	Undisclosed	Life Edit Therapeutics, Novo Nordisk	Gene editing therapies for rare genetic disorders as well as more prevalent cardiometabolic diseases	Discovery (up to 7)

Source: IQVIA Pharma Deals

Parkinson's disease and Friedreich's ataxia (Deal no. 90225), the companies joined forces again in January to develop the latter's glucosylceramidase beta 1 (GBA1) gene therapy program for Parkinson's disease and other GBA1-mediated diseases. A few days prior, demonstrating its keen interest in alternative cancer-targeting modalities, AbbVie announced its US$2.8 B R&D alliance with Immunome for the discovery of up to 10 novel antibody-target pairs arising from three specified tumor types leveraging Immunome's Discovery Engine (Deal no. 117157).

Flush with cash from the successful launches of its obesity and diabetes drugs, Novo Nordisk features twice on the list thanks to two wide-ranging discovery collaborations primarily focused on its core therapy area, cardiometabolic diseases. Aiming to overcome the limitations associated with existing gene editing approaches, in May, Novo Nordisk partnered with Life Edit Therapeutics in a deal worth up to US$1.92 B to discover and develop gene editing therapies against a select set of therapeutic targets with the aim of developing treatments for rare genetic disorders as well as more prevalent cardiometabolic diseases (Deal no. 119423). Later in September, looking to AI to accelerate its drug discovery, Novo Nordisk partnered with Valo Health to leverage the latter's AI-powered Opal Computational Platform to advance three preclinical programs in cardiovascular diseases (Deal no. 121340).

Similarly investing in new therapeutic classes for the treatment of cardiovascular disease, BMS signed a heavily backloaded partnership with Avidity Biosciences to leverage the latter's antibody oligonucleotide conjugate (AOC) platform (Deal no. 122396). Replacing the previous research agreement between Avidity and MyoKardia in 2021 (Deal no. 104561), BMS is committing US$60 M upfront and the promise of up to US$2.175 B in milestone payments for the right to develop and commercialise up to five cardiovascular targets.

Targeted protein degradation, which aims to hijack the body's natural protein degradation mechanism to develop therapeutics against "undruggable" targets, continued to attract significant R&D alliance activity in 2023. In April, Merck & Co. signed a US$2.55 B pact with Austrian biotech, Proxygen, to jointly identify and develop molecular glue degraders against multiple therapeutic targets (Deal no. 118476). Proxygen's drug discovery platform uses a ligase-agnostic screening approach to identify molecular glue degraders against "undruggable" targets at a much larger scale compared to existing discovery strategies. Similarly investing in the field, Roche paid US$50 M upfront to Monte Rosa Therapeutics to develop molecular glue degraders against targets in cancer and neurological diseases previously considered impossible to drug (Deal no. 121742). After handing over US$47 M for Orionis' Allo-Glue platform just a month prior (Deal no. 121256), Roche adds yet another protein degradation platform to its portfolio with Monte Rosa's QuEEN discovery engine.

The wave of technological innovation within the ADC and protein degradation spaces has led to the emergence of a new modality known as degrader-antibody conjugates (DACs). These novel entities combine a proteolysis targeting chimera (PROTAC) payload with a monoclonal antibody via a chemical linker and have piqued the interest of many big pharma in 2023, driving several high-ticket collaborations. In September, Seagen pledged US$60 M upfront and US$3.4 B more in milestones in order to develop a portfolio of DACs with Nurix Therapeutics leveraging the latter's DELigase platform (Deal no. 121058). Also looking to develop therapies with improved specificity and anticancer activity, Merck & Co. formed an R&D alliance with C4 Therapeutics for up to US$3.1 B to develop DACs directed to an initial undisclosed oncology target, with the option to expand the collaboration to three additional targets (Deal no. 122634).

Outlook for 2024

Despite the continued slowdown in 2023, there is cautious optimism surrounding the expected deal flow in the life sciences sector in 2024 with many industry observers hopeful that it will be a more active year on the dealmaking front. Although some uncertainties in the market remain, key drivers of deal activity persist including fast-approaching patent expiries and fierce competition for innovation, which in turn will force major players in the field to deploy their sizeable cash reserves to replenish pipelines and secure future growth generators.

The flurry of billion dollar plus acquisitions announced at the end of 2023 could act as a precursor for renewed interest in M&A among life sciences companies in 2024. With plenty of dry powder yet to be deployed and a greater understanding of anti-trust regulations, the way could be opened up for more transformative deals like the Pfizer-Seagen merger, however smaller, asset-driven bolt-on transactions worth up to US$10 B will continue to be the preferred route. GSK's US$1.4 B purchase of Aiolos Bio (Deal no. 123148) and J&J's US$2 B acquisition of Ambrx Biopharma (Deal no. 123154) are examples of this in early 2024. Moreover, big pharma companies are expected to continue to divest non-core businesses and assets as they look to free up capital and streamline their operations.

Although the funding environment for emerging biotech companies is already portraying early signs of recovery in 2024, it is likely that these firms will continue to look to partnerships and collaborations to maintain cash flow whilst the markets fully recover. Growth seeking cash-rich companies are also likely to prefer to sign heavily back-loaded deal structures to access new, innovative technologies and modalities at potentially discounted prices. For example, Roche's 5-year multi-program agreement with MOMA Therapeutics involved a US$66 M cash upfront yet up to US$2 B more in milestones to identify new drug targets involved in promoting cancer cell growth and survival (Deal no. 123078). That being said, with a shift towards clinical and later-stage development dealmaking, licensing fees are expected to remain elevated as companies are willing to commit higher sums upfront for more established, less risky assets. Takeda recently paid US$300 M upfront for Protagonist Therapeutics' Phase III mimetic peptide, rusfertide, for polycythemia (Deal no. 123528).

Oncology is expected to continue to account for the majority of therapeutic deal volume in 2024, although notable deal activity is expected in CNS and cardiometabolic indications due to their significant unmet medical need and the intensifying interest around a new wave of pioneering therapies. After significantly cooling off in 2023, collaborative R&D activity is expected to recover in 2024 as major pharma players are reliant on alliances to fuel the cycle of innovation and address pipeline gaps. This will also drive aggregate deal spend back up with growth-seeking companies' preference to sign broad platform or multi-target programs agreements in order to de-risk outcomes, such as Boehringer Ingelheim's recent US$2 B alliance with Ribocure Pharmaceuticals to develop siRNA therapeutics for multiple liver disease targets (Deal no. 123059). Fields of particular interest will be focused on novel therapeutic modalities, i.e those that are able to access targets previously deemed as "undruggable" such as DACs and protein degraders. ADCs in cancer are also expected to attract big pharma's attention, with Roche committing up to US$1 B within the first few days of 2024 for MediLink Therapeutics' c-Met-targeting ADC, YL211 (Deal no. 122982).

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