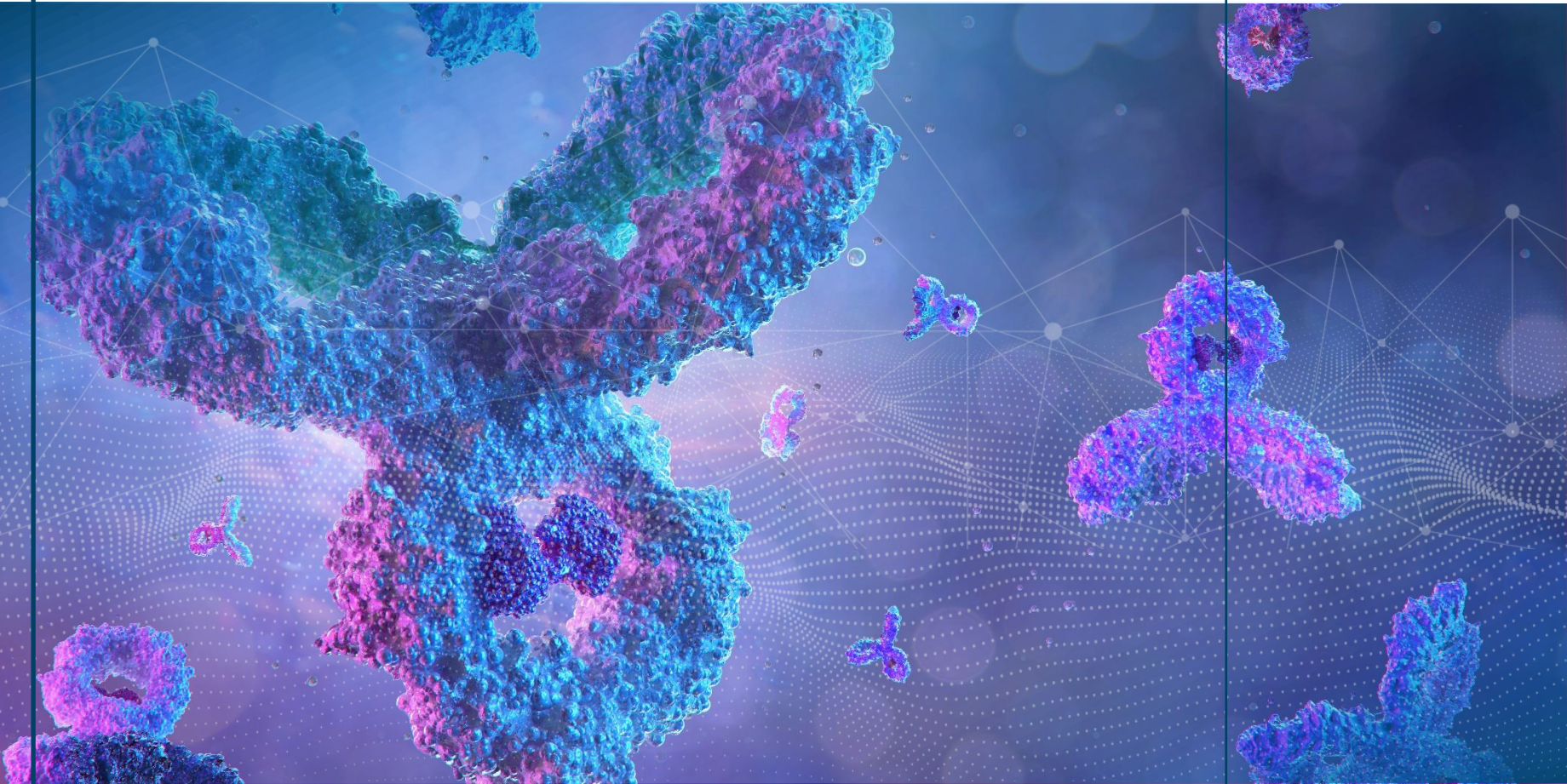


*William Blair*

April 2024

# The Quarterly Rx: Q1 2024 U.S. Biopharma Recap



# Q1 2024 U.S. Biopharma Market Summary – Key Takeaways

*The Fed's dovish pivot coupled with big pharma's shopping spree to end 2023 has fueled a broader recovery in biopharma in Q1 2024; the XBI hit a 26-month peak and closed the quarter at the highest level since Q4 2021*



## **2023? Forget About It!**

- The biopharma sector started the year strong thanks to the recycling of capital following the M&A rebound in Q4 2023 coupled with expectations of at least three rate cuts by the end of 2024; the XBI reached a two-year high during Q1 2024 and closed up 6.3% for the quarter
- For the first time since Q3 2022, small cap biopharma significantly outperformed mid/large cap peers – the recovery has led to a rebound in valuations, with only 70 companies now trading below cash



## **I Love the Smell of “Crossovers” in the Morning**

- After the term “crossover” had been all but eliminated from our vocabulary, this year has kicked off with a palpable increase in the pace of “crossover” rounds, with 10 deals announced in Q1 2024 for a total proceeds raised of \$1.8 billion
- Notable broadening of investor syndicates in crossover rounds, including increased participation from the large mutual funds
- Uptick in IPO volume coupled with stronger aftermarket performance has de-risked the path to near-term liquidity for “crossover” investors



## **Open the IPO Doors, Please, HAL**

- Six IPOs priced in Q1 2024, raising a total of \$1.3 billion proceeds – four out of six were upsized and all six priced in or above the range, with a median one-day return of 20%; public investors remain biased for clinical-stage stories
- Increase in crossover activity coupled with a more favorable market backdrop has created a significant backlog of companies likely to IPO in the next six months in advance of the U.S. Presidential election in November 2024
- Pace of reverse mergers has slowed with only 1 reverse merger announced in Q1 2024; however, aftermarket trading for the asset class has been strong post-closing with a median close-to-current of 69% for reverse mergers announced and closed since 2023



## **The PIPEs Must Flow**

- As we predicted in our year-end mailer, PIPE activity has increased with 40 financings announced in Q1 2024 for a median proceeds raised of \$100 million and total proceeds of \$5.4 billion, the highest quarterly activity ever
- Many companies are providing investors an early look at data during the confidential “wall cross” to catalyze a financing; increasingly these investors are locked up for extended periods of time before the data is publicly announced, appearing to the market as “opportunistic”
- Unsurprisingly, the most active PIPE investors have been blue-chip healthcare specialist funds, but there has also been an uptick in mutual fund participation



## **Show me the Positive Data!**

- Investors receiving outsized reward for taking clinical risk, with an average 1-day return for “positive” clinical catalysts of 30% in Q1 2024 and 5 key data readouts resulted in over 100% increase 1-day return
- Clinical catalysts are driving equity offerings, with 9 of the top 10 “positive” clinical catalysts resulting in equity raises concurrent with data release

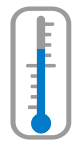
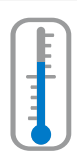
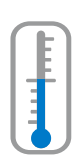
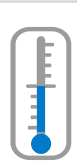
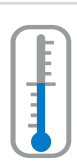
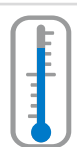


## **M&A Continues to Rally After Record Q4**

- Strong pace of meaningful M&A to kick off 2024, with 8 transactions announced for >\$1 billion in deal value in Q1 2024, the highest pace of activity we have seen to start the year in the last decade
- Robust partnering activity with 10 deals announced for over \$50M upfront, in line with prior Q1 activity, demonstrating big pharma's continued willingness to pay meaningful upfronts to access innovation
- We expect robust strategic partnering activity to accelerate, especially for later-stage products, as big pharma sits on \$130+ billion of cash and looks to replace nearly \$200+ billion in looming patent cliffs from 2024-2028, combined with IRA headwinds

## What We Are Hearing – Investor Sentiment and Outlook

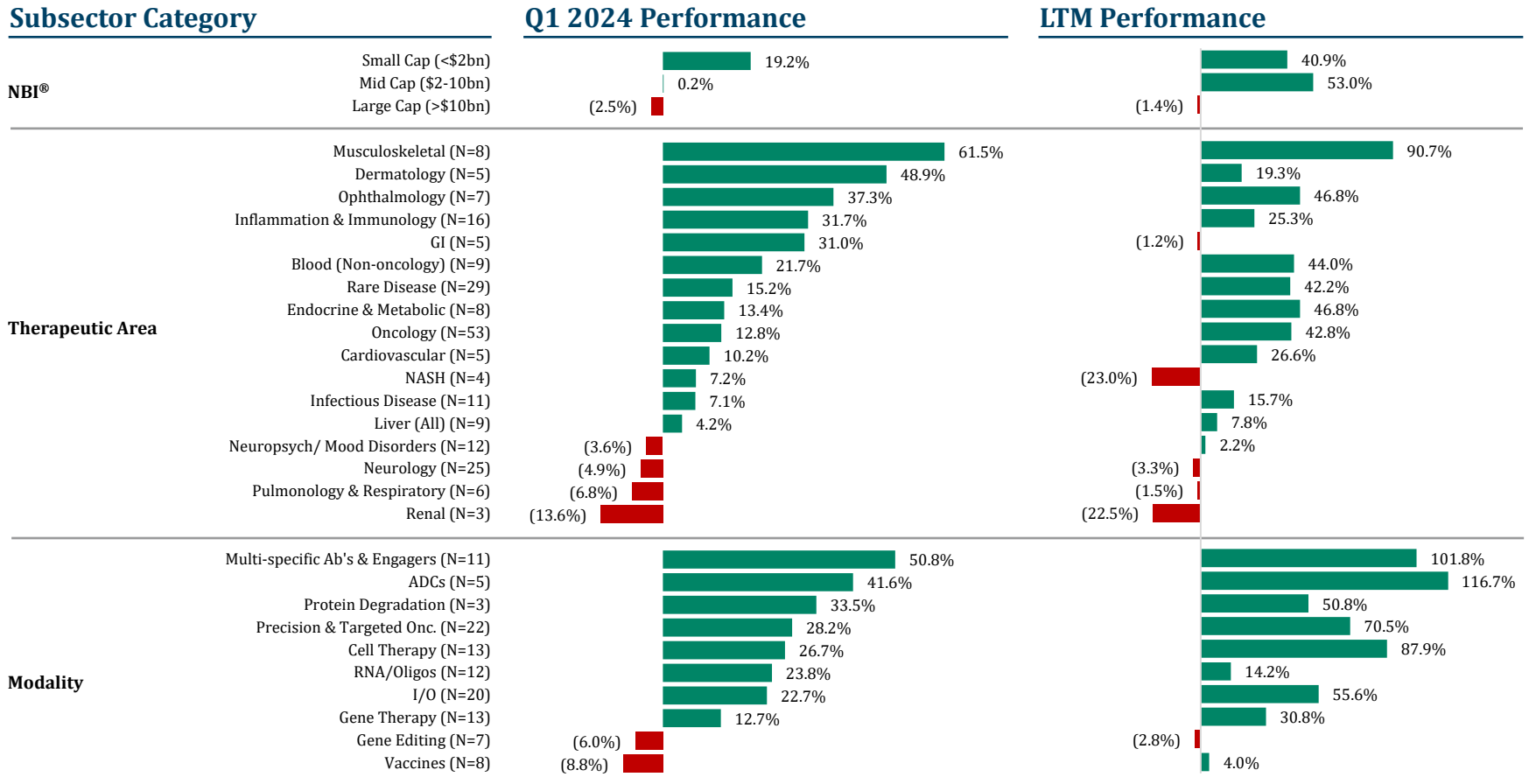
Investors have quickly left 2023 in the rear-view mirror thanks to favorable economic and sector specific tailwinds, although pace of the recovery has raised concerns of “too fast, too soon”. Friendlier financing environment for later-stage opportunities has resulted in increased appetite for public offerings, IPOs, and crossovers

<b>Overall Market</b>		<ul style="list-style-type: none"><li>Major indices extended a 2023 year-end rally into Q1 2024 as <b>investors continue to scrutinize economic data and anticipate when the Fed will begin to cut interest rates</b></li><li>While the AI boom continues to drive performance of mega-cap technology stocks, the <b>market rally has been felt across sectors and cap groups</b> signaling a stronger foundation for the market to build on; the equal-weighted S&amp;P 500 recently closed at the highest level in two years</li></ul>
<b>Biopharma Market</b>		<ul style="list-style-type: none"><li>Biopharma also extended its gains into the new year thanks <b>to a glut of M&amp;A deals to close 2023 which helped recycle capital back into the sector</b></li><li>Continued enthusiasm around the GLP-1 drug class, which has helped propel Lilly into the top 10 largest listed companies by market capitalization; <b>cardio/metabolic, I&amp;I, neuro and certain areas of oncology remain key focus areas for investors</b></li><li>Despite positive sector performance, <b>biopharma funds have experienced approximately \$1.5 billion in net outflows year-to-date</b></li></ul>
<b>Biopharma Outlook for Remainder of 2024</b>		<ul style="list-style-type: none"><li>Investors surveyed <b>expect the XBI to remain relatively rangebound for the remainder of the year</b> given how quickly the market rebounded from recent lows; however, better-than-expected commercial adoption of new drug launches and/or increased M&amp;A may spur additional rallies</li><li><b>Financing activity will remain elevated compared to 2023</b> as the IPO market reopens and investors look to recycle capital from recent acquisitions, but overall activity will remain below levels seen in 2020/2021; generalist investor participation will increase</li><li><b>U.S. Presidential election in November not seen as an impediment</b> to the market, although may influence IPO timing for issuers</li></ul>
<b>Biopharma Private Financings</b>		<ul style="list-style-type: none"><li><b>Increased appetite for “crossover” rounds</b> as near-term path to liquidity for public investors has been revalidated with the success of recent biopharma IPOs; however, early-stage seed/Series A rounds have struggled as investors place greater emphasis on clinical-stage opportunities</li><li><b>Bid-ask spread between companies and new investors continues to narrow</b> as public benchmarks improve and management teams deliver additional data to reinforce valuation</li><li>Round sizes continue to increase given <b>heightened focus from investors on providing sufficient “inflection capital”</b></li></ul>
<b>Biopharma IPOs</b>		<ul style="list-style-type: none"><li>IPO market is reopening, although <b>investors remain focused on clinical-stage opportunities</b> ideally with proof-of-concept data in hand at time of offering</li><li><b>Significantly wider breadth of investor participation in recent IPOs</b> given important source of “alpha” in the market with over 50% of IPO allocations going to new investors</li><li>Investors surveyed <b>expect a busier IPO calendar for mid-2024</b> although market not expected to recover in earnest until 1H 2025</li></ul>
<b>Biopharma Secondaries</b>		<ul style="list-style-type: none"><li>Significant appetite to deploy capital in <b>catalyst-driven offerings</b>, either pre- or post-data, with investors increasingly <b>comfortable being subject to prolonged lockups</b> in possession of MNPI received during marketing process</li><li>Notable <b>uptick in opportunistic PIPE and Registered Direct transactions driven by large reverse inquiries</b>; however, these offerings have come under <b>increased scrutiny from market participants that are excluded from the marketing process</b></li></ul>

Weak ↔ Strong

## NBI® Subsector Market Performance

- Biopharma has rallied across nearly all therapeutic areas and modalities; the NBI® is up 7.4% over the last twelve months and 22% from its 52-week low in October 2023
- Small caps outperformed their mid/large cap peers in Q1 2024 as investors shift focus back to riskier assets

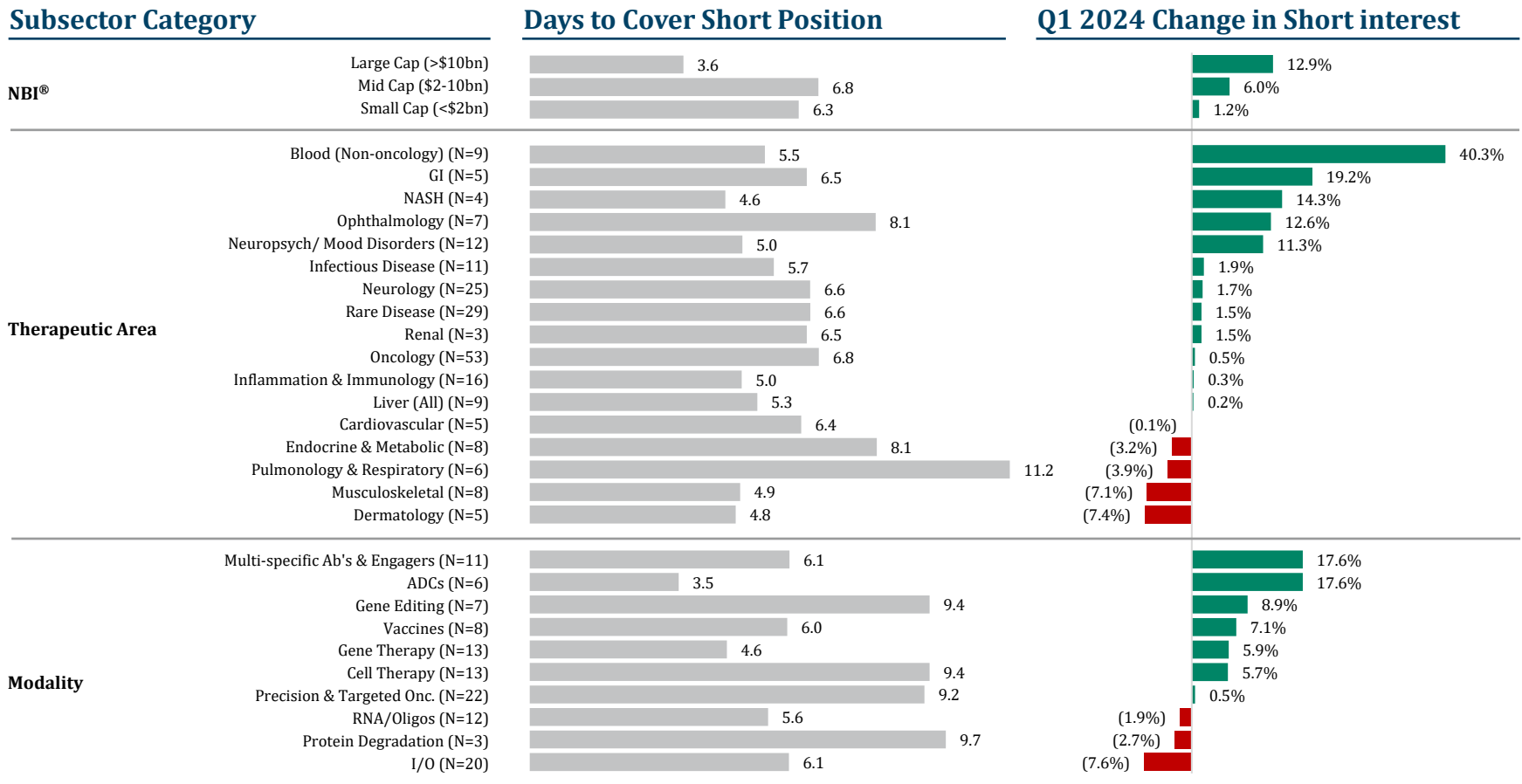


Note: Subsector indices are equally weighted and averaged. Includes NBI® constituents' as of March 31, 2024, and excludes non-therapeutic focused companies in the NBI®. Source: FactSet and William Blair internal reporting. Q1 2024 and LTM performance as of March 31, 2024. Therapeutic area and modality based on William Blair analysis.



## NBI® Subsector Q1 2024 Short Interest Trends

- Throughout the latest NBI® rally, investors increasingly looked to hedge their positions in select therapeutic areas and modalities by increasing their short interest exposure
- Overall, short interest trends remained mixed with largest increase coming from large cap companies



Note: NBI® constituents are equally weighted and averaged. Includes NBI® constituents' as of March 31, 2024, and excludes non-therapeutic focused companies in the NBI®.

Days to cover short position calculated as total number of shares shorted / 30-day ADTV.

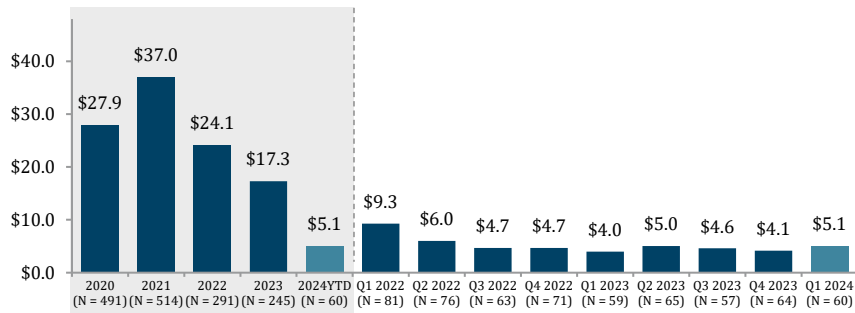
Source: FactSet, CapIQ, and William Blair internal reporting. Days to cover short position as of 3/15/24 settlement date. Short Interest change measured from 12/29/23 to 3/15/24 settlement dates.

# Biopharma Private Financings Trends

- Strong start to the biopharma private financing market in 2024, with total proceeds raised in Q1 2024 of \$5.1 billion, up 28% compared to Q1 2023
- Resurgence of mega-rounds this quarter – 35% (21/60) of all private financings had deal sizes over \$100 million

## Total Proceeds and Deal Volume

(\$ in billions)



## Analysis by Series Round

(\$ in millions, deal size represents median, includes extension rounds)

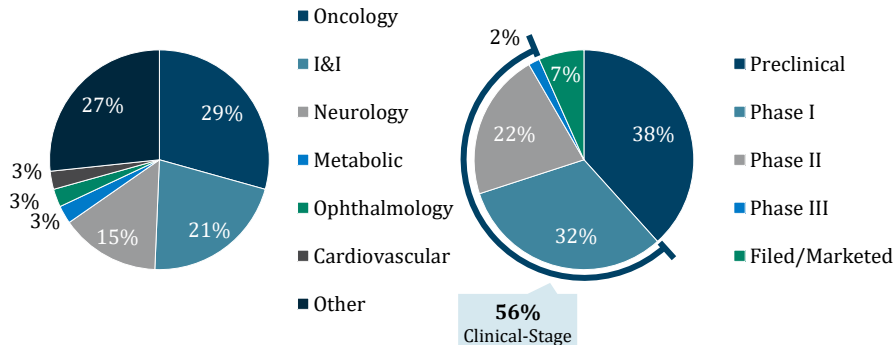
Series Round	2022				2023				Q1 2024			
	Deal Size	Series Count	% Ext. Rounds	% Clin. Stage	Deal Size	Series Count	% Ext. Rounds	% Clin. Stage	Deal Size	Series Count	% Ext. Rounds	% Clin. Stage
Series A	\$47	150	12%	21%	\$50	113	23%	31%	\$57	25	16%	40%
Series B	\$74	93	14%	41%	\$76	87	25%	53%	\$62	20	25%	55%
Series C	\$101	34	9%	59%	\$100	30	13%	83%	\$75	11	18%	82%
Series D+	\$122	14	0%	86%	\$101	15	0%	87%	\$149	4	0%	75%
<b>All Rounds</b>	<b>\$50</b>	<b>291</b>	<b>12%</b>	<b>35%</b>	<b>\$50</b>	<b>245</b>	<b>23%</b>	<b>49%</b>	<b>\$60</b>	<b>60</b>	<b>22%</b>	<b>56%</b>

56% of financings for clinical-stage companies, demonstrating continued focus on de-risked assets

## Q1 2024 Analysis by Therapeutic Area and Stage

Therapeutic Area

Stage of Development



Source: CapIQ, PitchBook Data, Inc., and SEC Filings as of March 31, 2024.

Note: Includes private financing deals and extension rounds with a minimum disclosed deal size of \$5M, involving at least one U.S./EU healthcare investor. Excludes seed rounds. Ext = Extensions.

(1) Includes crossover rounds for companies that have completed an IPO as well as crossover rounds where the next round of financing will likely be an IPO: either a \$50M+ raise (Series B onwards) or a \$100M+ raise (Series A) with multiple crossover and/or large mutual funds in the syndicate). Difference between the currently private and public columns are due to companies who were acquired or are no longer operational.

## Crossover Deals Analysis<sup>(1)</sup>

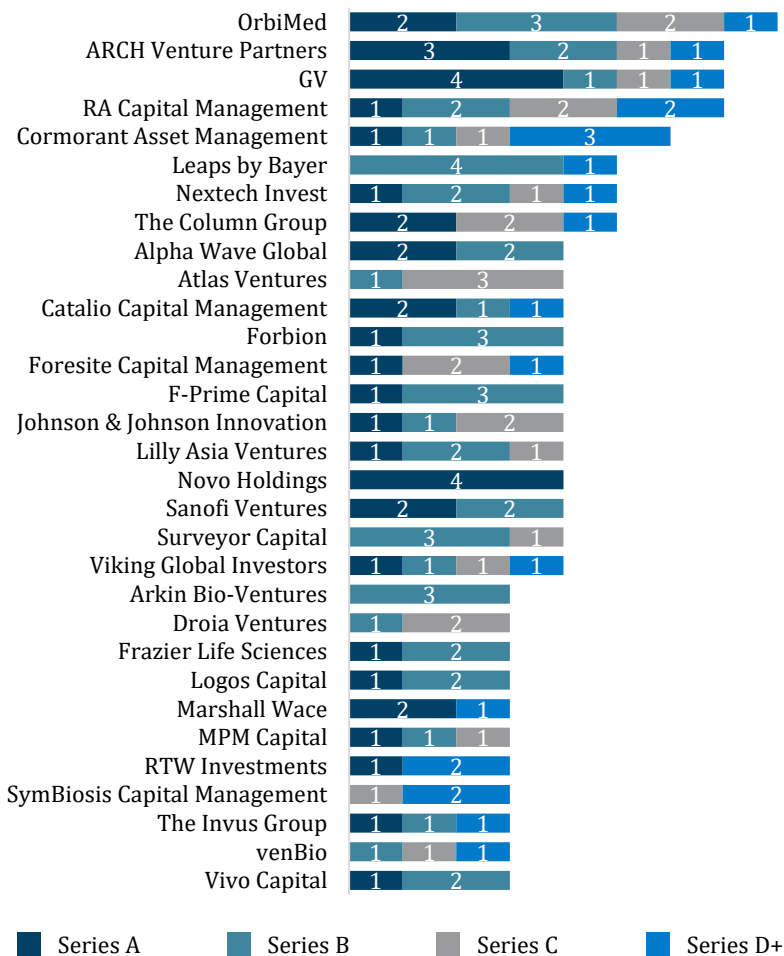
(\$ in millions)

Quarter	Number of Deals	Median Deal Size	Median Pre-Money	Median Step-Up	Currently Public
Q1 2021	33	\$106	\$226	2.1x	26
Q2 2021	20	\$120	\$250	2.2x	8
Q3 2021	24	\$103	\$234	1.7x	9
Q4 2021	8	\$120	\$150	3.1x	2
Q1 2022	11	\$115	\$350	1.6x	1
Q2 2022	7	\$125	\$140	1.8x	1
Q3 2022	6	\$146	\$440	1.2x	2
Q4 2022	5	\$120	\$129	2.0x	1
Q1 2023	9	\$135	\$150	1.2x	4
Q2 2023	6	\$150	\$480	1.7x	1
Q3 2023	12	\$164	\$242	1.4x	1
Q4 2023	7	\$101	\$195	1.1x	1
Q1 2024	10	\$158	\$521	1.3x	0

# Q1 2024 Most Active Private Biopharma Investors and New Funds Closed

- Life sciences specialists remain the most active; mutual funds continue to be selective in private financings
- 20 new company launches in Q1 2024, including those funded by Forbion, Novo Holdings, Third Rock and Sofinnova

## Most Active Investors Across All Rounds







## New Funds Closed

Investor Name	Fund Name	Close Date	Location	Fund Size (\$M)
EARLYBIRD	Earlybird Health Fund II	2/14/24	Berlin, Germany	\$185 (€173)
Goldman Sachs	Asset Management West Street Life Sciences I	1/3/24	New York, NY	\$650
MIRAE ASSET	Mirae Asset Capital Life Science Inception I	1/18/24	Boston, MA	\$50
ORI Capital	ORI Healthcare Fund II	2/22/24	Wanchai, Hong Kong	\$260
SCION LIFE SCIENCES A PETROBRAS AFFILIATE	Scion Life Sciences Fund	2/7/24	New York, NY	\$310
TCGX	TCGX Fund II	1/4/24	Palo Alto, CA	\$1,000

# Q1 2024 Biopharma Crossover Financings

Crossover financings have been led by healthcare specialist funds and all have been for clinical-stage companies; median deal size of \$158 million

Deal Date	Company	Series	Deal Size	Lead Investors	Participating Investors	Days Since Prior Round	Lead Product at Financing			
							Indication	Stage	Modality	Therapeutic Area
3/21/24	 <b>Mirador Therapeutics</b>	Series A	\$400	 <b>ARCH VENTURE PARTNERS</b>	Alexandria Venture Investments, Blue Owl Capital, Boxer Capital, Fairmount Partners, Fidelity Investments, Logos Capital, Moore Strategic Ventures, OrbiMed, Point72 Asset Management, RTW Investments, Sanofi Ventures, TCG Crossover Management, The Invus Group, Venrock, Woodline Partners	NA	Various I&I Indications	Preclinical	Multiple	I&I / Fibrosis
3/20/24	 <b>Capstan Therapeutics</b>	Series B	\$175	<b>RACAPITAL</b>	Alexandria Venture Investments, Bristol-Myers Squibb Foundation, Eli Lilly, Forbion, Johnson & Johnson Innovation, Leaps by Bayer, Mubadala Capital, Novartis Venture Fund, OrbiMed, Perceptive Advisors, Pfizer Ventures, Polaris Partners, Sofinnova Investments, Vida Ventures	614	Various I&I Indications	Preclinical	In Vivo CAR-T	I&I
3/14/24	 <b>Tubulis</b>	Series B – Extension	\$139	 <b>EQT Life Sciences</b>  <b>nextech</b>	Andera Partners, Bayern Kapital, BioMedPartners, Coparion, Deep Track Capital, Evotec, Frazier Life Sciences, Fund+, High-Tech Gründerfonds, Occident Group, Seventure Partners	681	Ovarian Cancer and NSCLC	Preclinical	ADC	Oncology
3/6/24	 <b>alumis</b>	Series C	\$259	 <b>FORESITE CAPITAL</b>  <b>SAMSARA BIOCAPITAL</b>  <b>venBio</b>	Ally Bridge Group, Cormorant Asset Management, HBM Healthcare Investments, Lilly Asia Ventures, Matrix Capital Management, Nextech Invest, Omega Funds, Piper Sandler, SR One Capital Management	790	Psoriasis	Phase II	Small Molecule	I&I / Dermatology
3/6/24	 <b>sionna</b>	Series C	\$182	 <b>ENAVATE SCIENCES</b>	Atlas Venture, Cystic Fibrosis Foundation, OrbiMed, Perceptive Advisors, RA Capital Management, TPG, Viking Global Investors	687	Cystic Fibrosis	Phase I	Small Molecule	Pulmonary / Rare Disease
3/1/24	 <b>FOG</b>	Series E	\$145	<b>nextech</b>	Alex Gorsky, ARCH Venture Partners, Catalio Capital Management, Cormorant Asset Management, Farallon Capital Management, Fidelity Management & Research, Foresite Capital, General Catalyst, GV, Marshall Wace, Milky Way Investments Group, RA Capital Management, Rock Springs Capital, Samsara BioCapital, Sixty Degree Capital, Symbiosis Capital Management, The Invus Group, venBio	466	Solid Tumors	Phase I/II	Peptide	Oncology
2/22/24	 <b>FRONTIER MEDICINES</b>	Series C	\$80	<b>DEERFIELD</b>	DCVC Bio, Galapagos, MPM BioImpact, RA Capital Management	972	KRAS <sup>G12C</sup> Cancers	Phase I/II	Small Molecule	Oncology
2/13/24	<b>BIOAGE</b>	Series D	\$170	 <b>SOFINNOVA INVESTMENTS</b>	Amgen, Andreessen Horowitz, Cormorant Asset Management, Longitude Capital, OrbiMed, Osage University Partners, Pivotal bioVenture Partners, RA Capital Management, RTW Investments, Sands Capital, SV Health Investors	1,167	Obesity	Phase II	Small Molecule	Metabolic
2/13/24	<b>ProfoundBio</b>	Series B	\$112	 <b>Ally Bridge Group</b>	Janus Henderson Investors, LifeSci Venture Partners, Lilly Asia Ventures, Logos Capital, LYFE Capital, Medicxi, Nextech Invest, Octagon Capital Advisors, OrbiMed, Piper Heartland Healthcare Capital, RA Capital Management, Surveyor Capital, T. Rowe Price	621	Solid Tumors	Phase II	ADC	Oncology
2/8/24	 <b>NEURONA THERAPEUTICS</b>	Series E	\$120	 <b>Cormorant Asset Management</b>  <b>Viking</b>	Alexandria Venture Investments, Berkeley Frontier Fund, Euclidean Capital, LYFE Capital, Schrodgers Capital, Sphera Funds Management, Spur Capital Partners, Symbiosis Capital Management, The Column Group, UC Investments, UCB Ventures, Willett Advisors, Ysios Capital	961	Chronic Focal Epilepsy	Phase I/IIa	Cell Therapy	Neurology

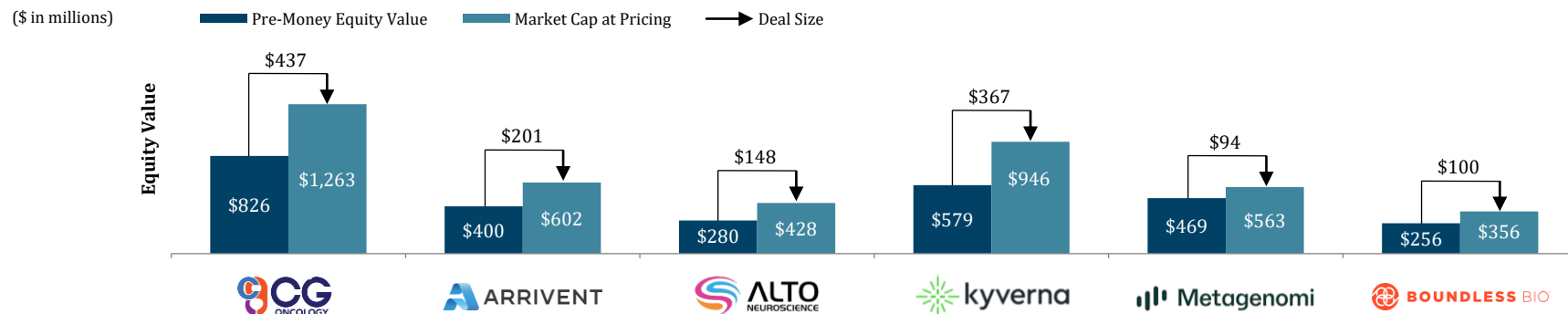
Source: PitchBook Data, Inc., and internal William Blair research as of March 31, 2024.

Note: Includes crossover rounds for companies that have completed an IPO as well as crossover rounds where the next round of financing will likely be an IPO: either a \$50M+ raise (Series B onwards) or a \$100M+ raise (Series A) with multiple crossover and/or large mutual funds in the syndicate).



## Q1 2024 Biopharma IPOs

- First 4 of 6 IPOs to kick off 2024 were upsized, and all 6 priced in or above the range; median one-day return of 20%
- Continued interest in clinical-stage stories, with 83% (5/6) of this quarter's IPOs for companies in the clinic
- Significantly wider breadth of investor participation in recent IPOs with 50%+ of shares allocated to new investors



### Deal Overview At Pricing

	CGC ONCOLOGY	ARRIVENT	ALTO NEUROSCIENCE	kyverna	Metagenomi	BOUNDLESS BIO
Pricing Date	1/24/24	1/25/24	2/1/24	2/7/24	2/8/24	3/27/24
Offer Price	\$19.00	\$18.00	\$16.00	\$22.00	\$15.00	\$16.00
Enterprise Value	\$623	\$234	\$208	\$502	\$176	\$135
Step-Up	1.5x	1.1x	1.5x	2.6x	0.6x	1.2x
Initial File/Offer vs. Range	Above	In Range	In Range	Above	In Range	In Range
Deal Value as % of Market Value	34.6%	33.5%	34.5%	38.8%	16.7%	28.1%

Key Pre-IPO Investors	Ally Bridge, Decheng, <b>Foresite</b> , Kissei Pharmaceutical, Longitude, ORI Capital, TCG, WI Harper Group	<b>General Catalyst</b> , Hillhouse, Lilly Asia Ventures, Octagon Capital, OrbiMed, Sirona Capital, <b>Sofinova</b>	Alkeon Capital, Alpha Wave, Apeiron, <b>InVivium Capital</b> , Lightswitch Learning	<b>Bain Capital</b> , Gilead, <b>Gordon MD</b> , Northpond Ventures, RTW, Vida, Westlake BioPartners	Leaps by Bayer, <b>Catalio</b> , <b>Farallon</b> , Humboldt, Moderna, <b>Novo Holdings</b> , <b>PFM Health Sciences</b> , <b>Symbiosis</b>	ARCH Venture Partners, Fidelity, <b>Leaps by Bayer</b> , Nextech Invest, <b>RA Capital</b> , Vertex Ventures
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### Post-IPO Performance

Offer/1 Day	95.6%	11.1%	29.4%	36.4%	(31.3%)	(10.9%)
Offer/Current	131.1%	(0.8%)	(4.1%)	12.9%	(29.7%)	(10.9%)

### Lead Asset at Pricing

Name	Cretostimogene	Furmonertinib	ALTO-100	KYV-101	ND	BBI-355
Phase	Phase III	Phase III	Phase IIb	Phase I/II	Preclinical	Phase I/II
Therapeutic Area	Oncology	Oncology	Neurology	Immunology	Hematology	Oncology
Modality	Oncolytic vaccine	Small molecule	Small molecule	Cell therapy	Gene editing	Small molecule
Indication	NMIBC	NSCLC	MDD/PTSD	Lupus Nephritis	Hemophilia A	Oncogene-amplified Cancers
Next Major Catalyst (Months)	10 to 12	12 to 24	4 to 10	4 to 10	ND	2 to 8

Source: CapIQ, Dealogic, FactSet and SEC Filings as of March 31, 2024. ND = Not Disclosed. NA = Not Applicable.

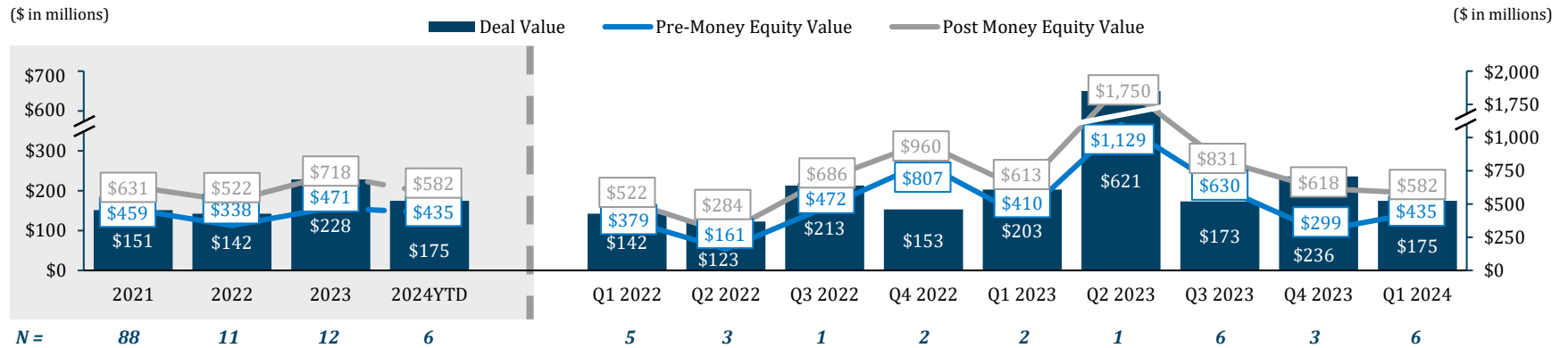
Note: All valuations performed on basic share count basis. Includes U.S. IPOs only. Excludes best efforts IPOs and IPOs less than \$25 million in gross proceeds.

Lead investors of prior private financing rounds in bold.

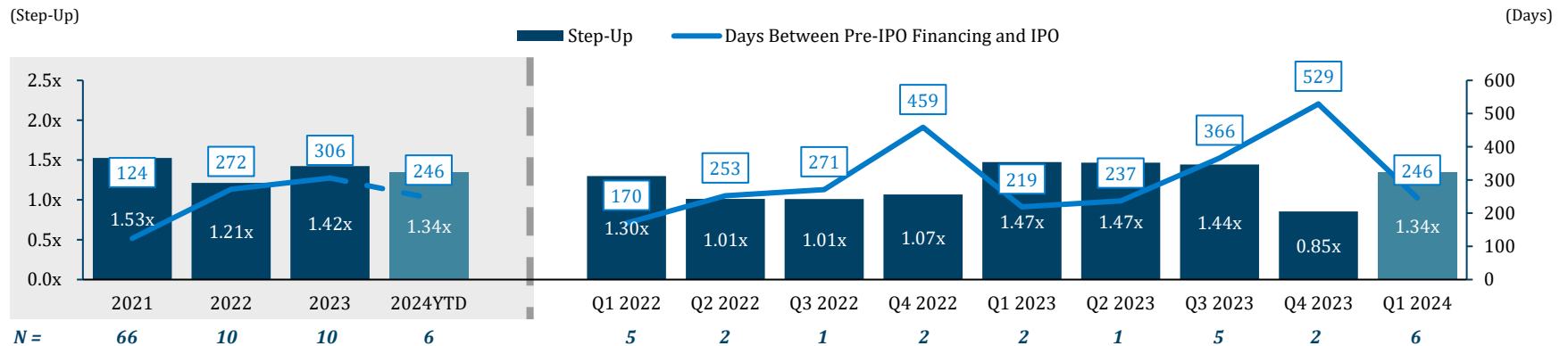
## Biopharma IPO Trends

- IPO step-ups in Q1 2024 remain in line with 2023 levels, while days between pre-IPO financing to IPO have decreased to ~250 days, a positive signal of a more favorable IPO backdrop
- IPO backlog continues to build with five biopharma companies publicly on file and one IPO, Contineum Therapeutics, currently on its roadshow

## Deal Sizing and Valuation



## Pre-IPO-Financing-to-IPO Metrics<sup>(1)</sup>



Note: Represents median values. Includes U.S. IPOs only. Excludes best efforts IPOs. Excludes IPOs less than \$25 million in gross proceeds.

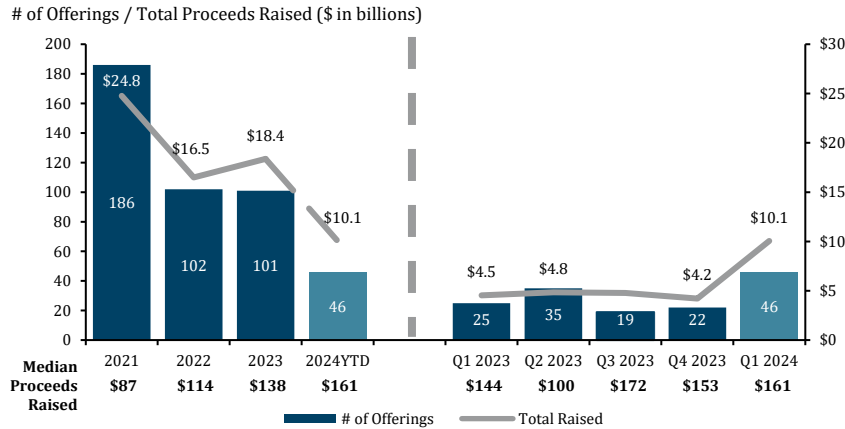
Source: CapIQ, Dealogic, FactSet, and SEC Filings as of March 31, 2024. Note: All valuations performed on basic share count basis.

(1) Pre-IPO-Financing rounds defined as pre-IPO financings completed with multiple crossover and/or large mutual funds in the syndicate.

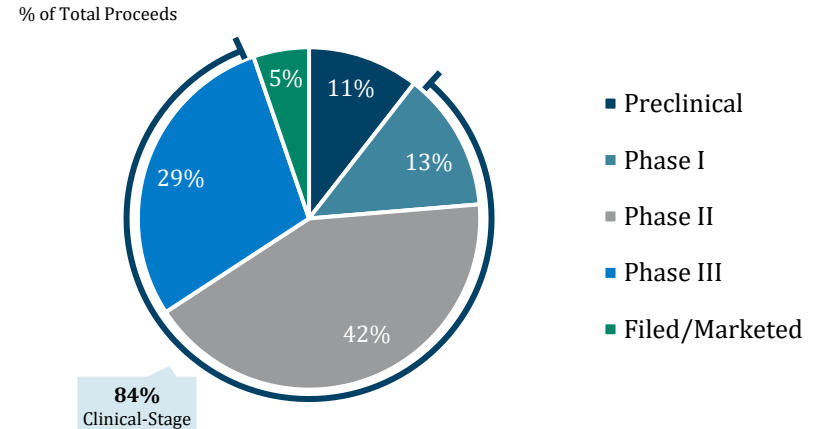
## Biopharma Follow-ons Trends

- Q1 2024 follow-on activity was robust with 46 offerings raising \$10.1 billion; most quarterly volume since Q1 2021
- Median proceeds raised remained elevated at \$161.0 million in Q1 2024, the second-highest quarterly median deal size in over 10 years behind only Q3 2023 as investors continue to de-risk any financing overhang and make fewer, more concentrated bets

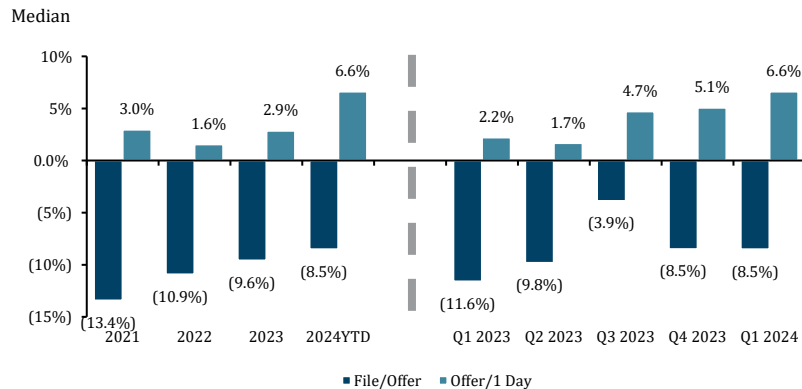
### Deal Volume



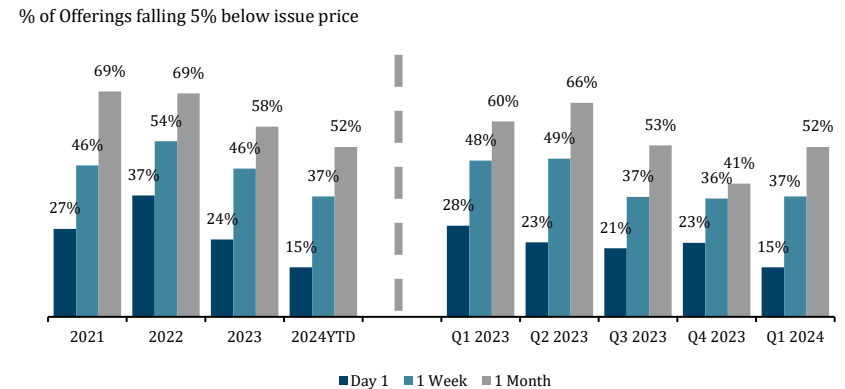
### Stages of Development



### Strongest 1-Day Performance in Over 10 Years



### Fewer Offerings are Breaking Issue Price

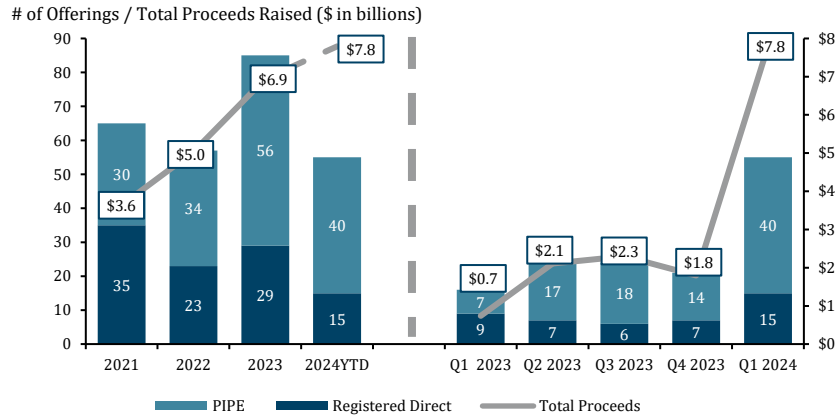


Note: Excludes Registered Directs, PIPEs, and offerings with gross proceeds below \$20 million. Median Pricing and Performance includes offerings with warrants.  
Source: Dealogic as of March 31, 2024.

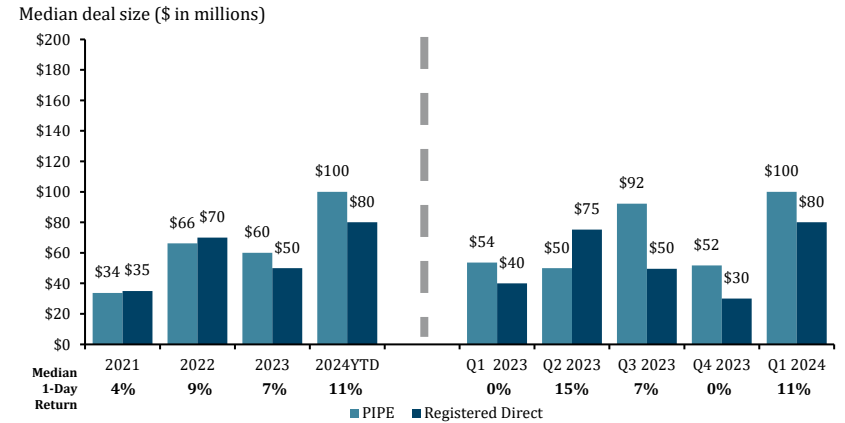
## Biopharma PIPE & Registered Direct Activity

- Q1 2024 was the most active quarter for PIPE and RD issuance ever; strong aftermarket performance with median current return of 18%
- Significant uptick in reverse inquiry driven financings as investors recycle capital from recent M&A; PIPE offerings leveraging the sharing of MNPI remains in vogue

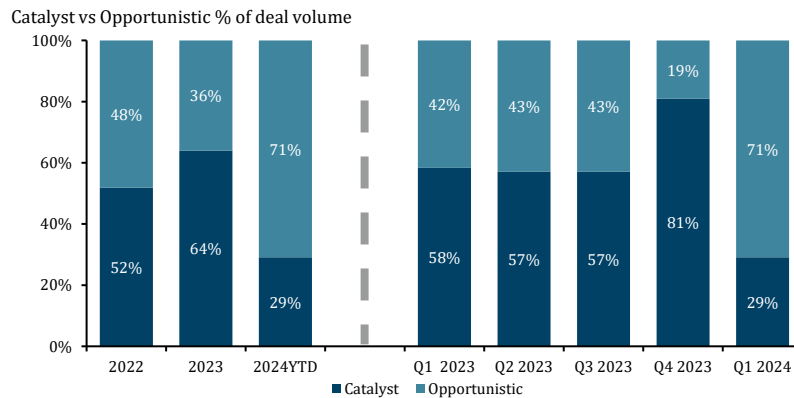
### Deal Activity on Pace to Eclipse Last Year's Total



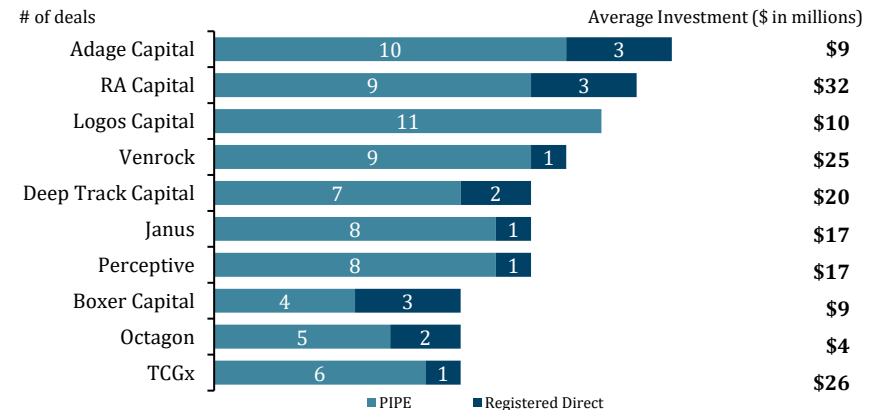
### Offering Sizes Surge to Record High



### Investors are Reversing into Companies more Frequently



### Top PIPE/RD Investors in Q1 2024<sup>(1)</sup>



Note: Excludes offerings with gross proceeds below \$20 million.

Source: Dealogic and SEC filings as of March 31, 2024.

(1) Includes disclosed participants only. Average investment based on publicly available data from SEC filings.

# 2023-2024YTD Strategic Alternatives Outcomes

Steady pace of company liquidations being announced, with reverse merger activity slowing in Q1 2024

Announced Outcome	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024	Total
<b>Reverse Merger</b> Traditional reverse mergers with private companies						<b>15 Deals</b>
<b>Public-Public Merger</b> Public-public mergers following strategic alternatives reviews						<b>4 Deals</b>
<b>Acquisition</b> Program or full company buyouts following strategic alternatives reviews						<b>16 Deals</b>
<b>Chapter 11/ Closure</b> Companies pursuing dissolution or liquidation						<b>32 Co's</b>
<b># of Outcomes</b>	<b>13</b>	<b>17</b>	<b>10</b>	<b>14</b>	<b>13</b>	<b>67</b>

Source: SEC Filings, Company Press Releases, and William Blair analysis as of March 31, 2024. Note: outcomes are categorized by quarter of announcement.

(1) Jounce entered into agreement to be acquired by Concentra Biosciences for \$1.85 per share, plus additional CVR consideration, after terminating merger agreement with Redx announced on February 23, 2023.

(2) 2Seventy Bio entered into an asset purchase agreement with Regeneron to sell its oncology and autoimmune research and development programs, clinical manufacturing capabilities, and related platform technologies on January 30, 2024. 2Seventy remains operational and will focus exclusively on progressing its lead asset, Abecma.

(3) On March 1, 2024, Kinnate entered into an asset purchase agreement with Pierre Fabre Laboratories for global rights to exafrenib and other pan-RAF program assets.

(4) DMK Pharma reverse merged with Adamis in February 2023, prior to its liquidation.



# 2023-2024YTD Biopharma Reverse Mergers Detail

Total of 15 reverse mergers announced with a median premium paid for net cash of ~\$18 million since the start of 2023

(\$ in millions)

Announced Date	Operating Company	Public Shell	Pro Forma Ownership (%) <sup>(1)</sup>		Implied Valuation			Premium Paid Over Net Cash	Concurrent PIPE?	PIPE Size	NewCo. Cash Runway from Announcement (Months)	Price Performance			
			Operating Company	Public Shell	Operating Company	Public Shell	Net Cash Acquired					Announced to 1-Day	Close to 1-Day	Close to Current	Raised post-RM/PIPE?
01/30/24	TECTONIC Therapeutics	AVROBIO	64%	36%	\$140.0	\$77.5	\$65.0	\$12.5	✓	\$130.7	41	(16%)	-	-	-
11/16/23	O32 BIO	MOMOLOGY Medicines, Inc.	71%	29%	\$195.0	\$80.0	\$60.0	\$20.0	✓	\$42.0	31	(35%)	(1%)	1%	✗
08/30/23	serina Therapeutics	AGEX Therapeutics	75%	25%	ND	ND	ND	ND	✗ <sup>(2)</sup>	-	28	(0%)	34%	21%	✗
11/15/23	L E N Z	GRAPHITE BIO <sup>(3)</sup>	65%	35%	\$231.6	\$126.5	\$115.0	\$11.5	✓	\$53.5	31	(3%)	8%	48%	✗
07/18/23	NEUROGENE	neoleukin	72%	28%	\$200.0	\$76.0	\$66.0	\$10.0	✓	\$95.0	35	(20%)	8%	265%	✗
11/13/23	Cartesian Sciences	Selecta Biosciences	73%	27%	\$170.0	\$62.6	ND	ND	✓	\$60.3	ND	(8%)	(8%)	(32%)	✗
07/14/23	KORRO	FREQUENCY THERAPEUTICS	89%	11%	\$325.6	\$38.5	\$23.5	\$15.0	✓	\$117.0	30	77%	6%	536%	✗
06/29/23	morphimmune	immunome	42%	58%	\$72.5	\$100.1	ND	ND	✓	\$125.0	27	30%	(3%)	201%	✗
06/22/23	TOURMALINE	talaris Therapeutics <sup>(4)</sup>	74%	26%	\$230.0	\$82.5	\$67.5 <sup>(4)</sup>	\$15.0	✓	\$75.0	42	23%	(10%)	60%	✓
06/22/23	SPYRE Therapeutics	aeglea	76%	24%	\$110.0	\$35.0	ND	ND	✓	\$210.0	32	329%	329%	1,326%	✓
05/03/23	DIANTHUS Therapeutics	magenta	74%	26%	\$225.0	\$80.0	\$60.0	\$20.0	✓	\$70.0	38	(14%)	(8%)	147%	✓
03/30/23	EIP Therapeutics	Diffusio,n Pharmaceuticals, Inc.	77%	23%	\$127.2	\$37.5	\$14.0	\$23.5	✗	-	21	(13%)	12%	294%	✗
02/27/23	DMK Pharma <sup>(5)</sup>	ADAMIS Therapeutics	ND	ND	\$27.0	ND	ND	ND	✗	-	ND	(15%)	(17%)	(78%)	✓
02/23/23	Notable	vbl	74%	26%	\$100.0	\$35.0	\$15.0	\$20.0	✓	\$10.3	24	30%	(9%)	(70%)	✗
01/17/23	elicio Therapeutics	angion	66%	34%	\$95.0	\$50.0	\$29.0	\$21.0	✗	-	11	(31%)	81%	(24%)	✓
<b>Mean (n=15)</b>			<b>71%</b>	<b>29%</b>	<b>\$160.6</b>	<b>\$67.8</b>	<b>\$51.5</b>	<b>\$16.8</b>	<b>Yes: 73%</b>	<b>\$89.9</b>	<b>30</b>	<b>22%</b>	<b>30%</b>	<b>195%</b>	<b>Yes: 36%</b>
<b>Median</b>			<b>73%</b>	<b>27%</b>	<b>\$155.0</b>	<b>\$76.0</b>	<b>\$60.0</b>	<b>\$17.5</b>	<b>No: 27%</b>	<b>\$75.0</b>	<b>31</b>	<b>(8%)</b>	<b>2%</b>	<b>69%</b>	<b>No: 64%</b>

Source: SEC Filings, Company Press Releases, and William Blair analysis as of March 31, 2024.

Note: Implied valuation, expected net cash and pro forma cash runway at time of announcement. Shaded rows indicate transactions which have not closed yet.

(1) Pro forma ownership split specified at announcement and prior to giving effect to additional share issuance associated with PIPE financing.

(2) Prior to the merger agreement, AgeX invested \$10M in Serina through a Senior Convertible Loan Note. Upon completion of the merger, AgeX stockholder, Juvenescence, was issued post-merger warrants totaling up to \$15M.

(3) Target cash balance is net of ~\$60M dividend to Graphite Bio shareholders concurrent with closing of the merger. Share price at close adjusted for dividend payout of \$1.03 per share to Graphite Bio shareholders.

(4) Target cash balance is net of \$64.8M dividend to Talaris shareholders concurrent with closing of the merger. Share price at close adjusted for dividend payout of ~\$1.51 per share to Talaris shareholders.

(5) DMK Pharma announced Chapter 11 filing on February 2, 2024.








## Venture Debt in Biopharma

*A year after SVB's collapse, the venture debt<sup>(1)</sup> market is building momentum as the number of new lenders in the space has created significant competition for deals, especially later-stage opportunities*

### Market Overview

- After a slowdown in 2023, the venture debt market is positioned for a much more active year in 2024
- With more stability in interest rates and a desire to minimize dilution, demand for venture debt in the first quarter was extremely strong
- An uptick in the number of venture debt lenders has also led to a more competitive market with improved structures and terms
- However, the borrower-friendly environment has so far been limited to higher-quality, performing companies
  - The most favorable terms are being reserved for more established borrowers and those that recently raised equity
  - Companies facing growth headwinds and those without a recent equity raise to tout are not getting the same looks as their high-performing counterparts
- With a significant amount of dry powder available and its minimally dilutive nature, venture debt will continue to be an attractive source of capital in 2024

### Recent Venture Debt Financings for Public Biopharma Companies

Date	Company	Available at Close	Total Facility <sup>(2)</sup>	Interest Rate	LTM at Close <sup>(3)</sup>		Market Cap at Close	Debt / Mkt Cap	Facility / Mkt Cap	Phase of Development
					Revenue	EBITDA				
03/18/24	 bluebirdbio	\$75	\$175	12.40%	\$22	(\$132)	\$278	27.0%	63.1%	Approved
01/08/24	 Abeona THERAPEUTICS	\$20	\$50	13.50%	\$4	(\$44)	\$145	13.8%	34.6%	BLA Filed
01/02/24	 Verona Pharma	\$50	\$400	11.19%	\$0	(\$66)	\$1,617	3.1%	24.7%	NDA Filed
12/28/23	 enGene	\$23	\$50	10.40%	\$0	(\$22)	\$188	12.0%	26.6%	Phase I / II
11/13/23	 ACUMEN	\$30	\$50	9.65%	\$0	(\$57)	\$118	25.5%	42.5%	Phase II
11/02/23	 Aquestive	\$45	\$45	13.50%	\$48	(\$20)	\$96	46.8%	46.8%	Approved
10/02/23	 Amicus Therapeutics	\$400	\$400	11.86%	\$372	(\$104)	\$3,206	12.5%	12.5%	Approved
<b>Mean (N=7)</b>		<b>\$92</b>	<b>\$167</b>	<b>11.79%</b>	<b>\$64</b>	<b>(\$64)</b>	<b>\$807</b>	<b>20.1%</b>	<b>35.8%</b>	
<b>Median</b>		<b>\$45</b>	<b>\$50</b>	<b>11.86%</b>	<b>\$4</b>	<b>(\$57)</b>	<b>\$188</b>	<b>13.8%</b>	<b>34.6%</b>	
<b>Minimum</b>		<b>\$20</b>	<b>\$45</b>	<b>9.65%</b>	<b>\$0</b>	<b>(\$132)</b>	<b>\$96</b>	<b>3.1%</b>	<b>12.5%</b>	
<b>Maximum</b>		<b>\$400</b>	<b>\$400</b>	<b>13.50%</b>	<b>\$372</b>	<b>(\$20)</b>	<b>\$3,206</b>	<b>46.8%</b>	<b>63.1%</b>	

### Venture Debt Has Not Found its Champion Since SVB's Collapse

- One year removed from the collapse of SVB, which had been the dominant lender in the space, the market remains highly diversified and has not gravitated towards a single lender like it had historically
- Fueled by the expectation of a dovish Fed in 2024, a rising equity market backdrop led traditional lenders to become more aggressive in non-core lending practices, including venture debt
- SVB's current market share is estimated at 20% of the venture debt market (compared to 50% historically), leaving the door open for other lenders to increase their market presence

Source: CapIQ, PitchBook Data, Inc., and SEC filings as of March 31, 2024.

(1) "Venture debt" defined here as debt to borrowers who do not yet have positive cash flow.

(2) Represents total commitment and includes undrawn revolvers and additional tranches of debt / delayed draw facilities.

(3) LTM financials at time of close are as calculated by CapIQ.

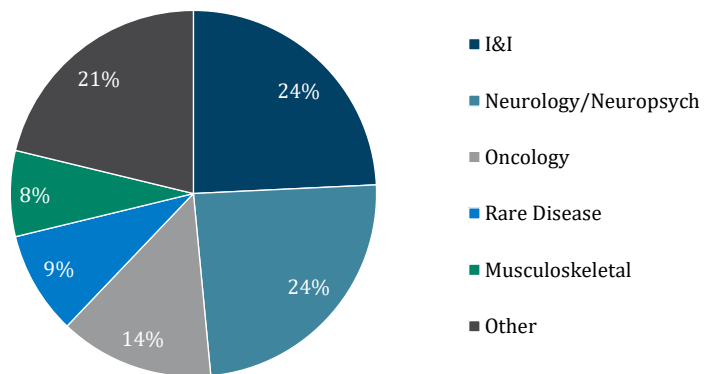
# Q1 2024 Clinical Catalysts Analysis

- Companies and investors were rewarded for “positive” clinical data, with median one-day return of ~30%
- I&I and neuro both outpace oncology with respect to number of clinical catalysts this quarter
- 9 of the top 10 movers successfully raised catalyst-driven follow-on offerings concurrent with or post-data

## Key Takeaways

- William Blair analyzed 66 key clinical data readouts in Q1 2024 for U.S.-listed biopharma companies with a market cap between \$10M-\$30B
- Average stock price performance for “positive” clinical data (N=55):
  - 1-day performance: **+29.9%**
  - 1-week performance: **+31.4%**
- Average stock price performance for “negative” clinical data (N=11):
  - 1-day performance: **(47.1%)**
  - 1-week performance: **(50.6%)**
- 14 Phase III trial readouts in Q1 2024 (of which 8 were positive)
- 5 catalysts drove over 100% 1-day share price gains
- ~\$8.6 billion in cumulative market cap **gained** across all clinical catalyst, driven by Viking’s Phase II data and Janux’s interim Phase I data

## Breakdown of Clinical Catalysts by Therapeutic Area



## Top 10 Positive/Negative Movers

(1-Day Share Price Change)

		Catalyst Type
Top Performers	LBPH	316% Phase Ib/IIa Data
	CRBP	249% Interim Phase I Data
	JANX	229% Interim Phase I Data
	SGMT	170% Phase IIb Data
	VKTX	121% Phase II Data
	FDMT	85% Interim Phase II Data
	RGLS	71% Phase Ib Data
	CRDF	65% Interim Phase II Data
	STOK	58% Phase I/IIa Data
	MNMD	52% Phase IIb Data

Worst Performers	AVXL	(35%) Phase II/III Data
	IRWD	(38%) Phase III Data
	PTN	(38%) Phase III Data
	APLT	(41%) Phase III Data
	SYBX	(49%) Lead Program Discontinuation
	IMRX	(51%) Phase I Data
	ALLK	(60%) Phase II Data
	ANTX	(75%) Lead Program Enrollment Pause
	AMLX	(82%) Phase III Data
	SPRB	(84%) Phase IIb Data

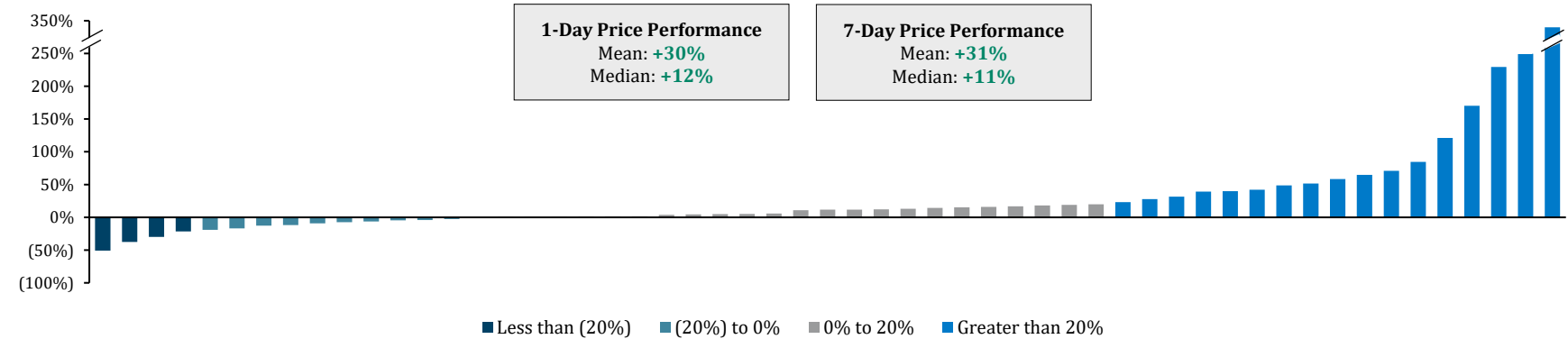
Executed Equity Follow on Concurrent With or Post Data

# Q1 2024 Positive/Negative Clinical Catalyst Performance Detail

31% of positive clinical catalysts had a >20% one-day stock price movement, while 82% of negative clinical catalysts experienced a one-day price decline greater than 20%

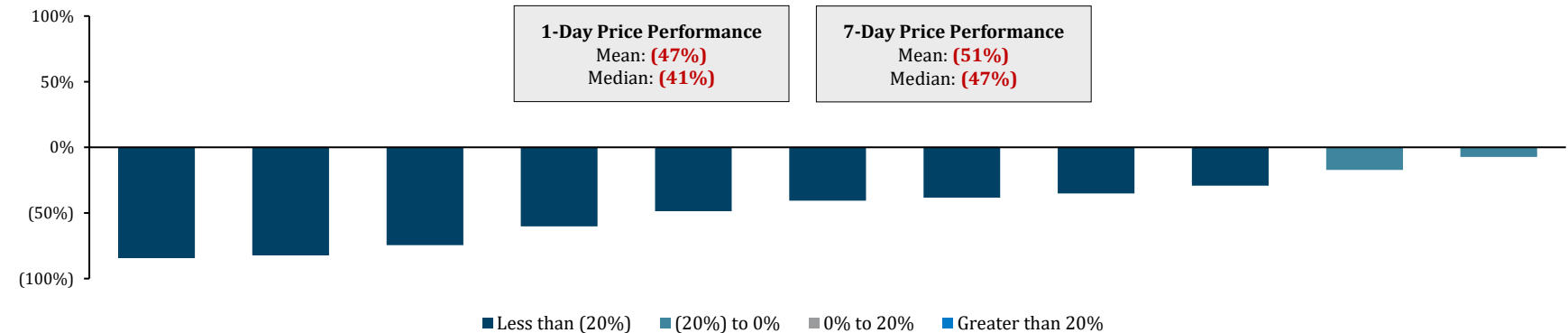
## Performance Following a Positive Clinical Catalyst

1-Day Share Price Change (N=55)



## Performance Following a Negative Clinical Catalyst

1-Day Share Price Change (N=11)



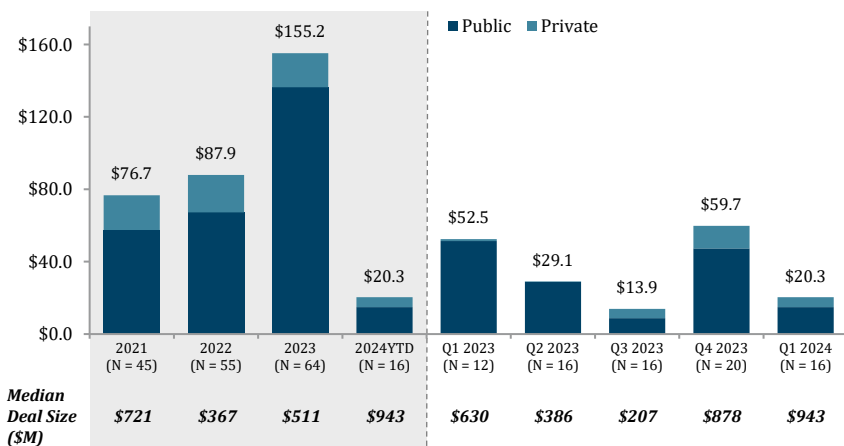
Note: Includes biopharma companies listed on major U.S. exchanges with market capitalization >\$10M and <\$30 billion at the time of catalyst. Positive/negative based on Company press releases. Source: FactSet, Company press releases, SEC Filings and William Blair analysis as of March 31, 2024.

# Q1 2024 Biopharma M&A Recap

- Robust pace of meaningful M&A to kick off the year, with 8 transactions >\$1B in deal value announced in Q1 2024, the highest pace of activity we have seen to start the year in the last decade
- Fusion's acquisition by AZN marks the 3<sup>rd</sup> radiopharma takeout in the last 6 months, all by new entrants

## Total Deal Value & Volume

(\$ in billions)



## Key Takeaways

- Higher median Q1 2024 total deal values and upfront values compared to 2023:
  - **Total Deal Value:** \$943M in Q1 2024 (vs. \$511M in 2023)
  - **Upfront (Cash + Equity):** \$680M in Q1 2024 (vs. \$248M in 2023)
  - **Milestones:** \$273M in Q1 2024 (vs. \$200M in 2023)
- Two additional sponsor-driven take privates announced this quarter for NGM Bio and Kinnate
- Fewer late-stage/commercial-stage acquisitions, with only 13% (2/16) of deals in Q1 2024 involving lead assets in Phase III or later compared to 40% (8/20) in Q4 2023
- Significant uptick in deals for I&I focused companies within the private landscape, as well as continued interest in oncology in the public sphere from market leaders Novartis, Merck, and J&J
  - 69% (11/16) of all M&A deals in Q1 2024 were for I&I and oncology-focused companies, compared to 50% (10/20) in Q4 2023
- 38% (6/16) of all M&A deals in Q1 2024 were for small molecule companies, compared to 40% (8/20) in Q4 2023

## Q1 2024 M&A Activity Detail

(\$ in millions)

### Public Company Transactions

Date	Target	Acquiror	Total Deal Value	Total Upfront	Premium to Last <sup>(2)</sup> Unaffected Date	Phase	Therapeutic Area	Modality
03/25/24	LANDOS THERAPEUTICS	abbvie	\$213	\$138	161%	Phase II	I&I	Small Molecule
03/19/24	Fusion	AstraZeneca	\$2,400	\$2,000	97%	Phase II	Oncology	Radiopharma
02/26/24	ngmBIO	THE COLUMN GROUP	\$135	\$135	80%	Phase II	Oncology	Monoclonal Antibody
02/16/24	KINNATE THERAPEUTICS	XOMA	\$290	\$209	14%	Phase I	Oncology	Small Molecule
02/12/24	CYMABAY THERAPEUTICS	GILEAD	\$4,300	\$4,300	27%	Filed	Hepatology	Small Molecule
02/05/24	morphosys	NOVARTIS	\$2,900	\$2,900	61%	Phase III	Oncology	Small Molecule
01/23/24	INHIBRX <sup>(1)</sup>	sanofi	\$1,996	\$1,700	NA	Phase II	Rare Disease	Protein
01/08/24	AMBRX	J&J	\$2,000	\$2,000	105%	Phase I/II	Oncology	ADC
01/08/24	HARPOON THERAPEUTICS	MERCK	\$680	\$680	118%	Phase I/II	Oncology	Multi-specific Antibody

### Private Company Transactions

Date	Target	Acquiror	Total Deal Value	Total Upfront	Phase	Therapeutic Area	Modality
03/25/24	AnHeart	Nuvation Bio	\$434	\$434	Pivotal Phase II	Oncology	Small Molecule
03/25/24	Cardior	Novo Nordisk	\$1,111	ND	Phase II	Cardio-vascular	Oligo-nucleotide
03/14/24	AMOLYT PHARMA	AstraZeneca	\$1,050	\$800	Phase III	Endocrine, Rare Disease	Peptide
03/13/24	IFMDUE	NOVARTIS	\$835	\$90	Preclinical	I&I	Small Molecule
01/09/24	AIOLOS BIO	GSK	\$1,400	\$1,000	Phase II ready	I&I	Monoclonal Antibody
01/08/24	Calypso biosci	NOVARTIS	\$425	\$250	Phase I	I&I	Monoclonal Antibody
01/02/24	Replace Therapeutics	Tome Bioscience	\$185	\$65	ND	ND	Gene Editing

Note: Q1 2024 data as of March 31, 2024. M&A activity includes biopharma deals with disclosed total deal value of \$20M+. NA = Not Applicable. ND = Not Disclosed.

(1) Sanofi acquired all assets and liabilities associated with INBRX-101; all non-101 assets will be spun out into a new publicly traded company ("New Inhibrx").

(2) Premium only inclusive of non-contingent payments, relative to last unaffected trade date.








Source: PitchBook Data, Inc., Company press releases and websites.



# Summary of Investor Capital Returned from Q1 2024 Public Biopharma Acquisitions

Public biopharma acquisitions announced in Q1 2024 freed up an estimated \$8.0 billion in institutional investor capital, led by the Gilead Sciences' \$4.3 billion acquisition of CymaBay

(\$ in millions)

#	Institution	Total Estimated Capital Returned to Fund <sup>(1)</sup>							
1	Darwin Global Management Ltd.	\$467.3	✓						
2	BlackRock Fund Advisors	\$427.4	✓	✓	✓	✓	✓	✓	
3	Cormorant Asset Management LP	\$427.0	✓	✓		✓			
4	RA Capital Management LP	\$401.8		✓		✓	✓		✓
5	Avoro Capital Advisor LLC	\$361.1		✓					✓
6	Perceptive Advisors LLC	\$348.8	✓	✓	✓		✓	✓	✓
7	The Vanguard Group, Inc.	\$309.1	✓	✓		✓	✓		
8	Fidelity Management & Research Co.	\$272.5	✓	✓	✓		✓		
9	Federated Global Investment	\$237.5	✓		✓				
10	T. Rowe Price Associates, Inc.	\$223.0	✓	✓					✓
11	Viking Global Investors LP	\$214.5					✓		
12	Kynam Capital Management LP	\$211.6							✓
13	Janus Henderson Investors US LLC	\$196.9		✓			✓		
14	SSgA Funds Management, Inc.	\$141.4	✓	✓		✓	✓		
15	Franklin Advisers, Inc.	\$139.8		✓		✓			
16	D. E. Shaw & Co. LP	\$139.4	✓	✓			✓		
17	Avidity Partners Management LP	\$136.5			✓				
18	Jennison Associates LLC	\$136.1		✓	✓				✓
19	Woodline Partners LP	\$126.7	✓	✓	✓		✓		
20	Paradigm BioCapital Advisors LP	\$121.9	✓						
21	Geode Capital Management LLC	\$106.7	✓	✓	✓	✓	✓	✓	✓
22	Deep Track Capital LP	\$103.9	✓						✓
23	Adage Capital Management LP	\$100.7		✓	✓	✓	✓		
24	Vestal Point Capital LP	\$98.7		✓			✓		
25	Holocene Advisors, LP	\$97.3	✓	✓					
26	Point72 Asset Management LP	\$89.8	✓	✓	✓		✓		✓
27	Citadel Advisors LLC	\$88.9	✓	✓		✓	✓		✓
28	Octagon Capital Advisors LP	\$86.9		✓					✓
29	Fred Alger Management LLC	\$71.4	✓	✓	✓				
30	Canada Pension Plan	\$65.5			✓				

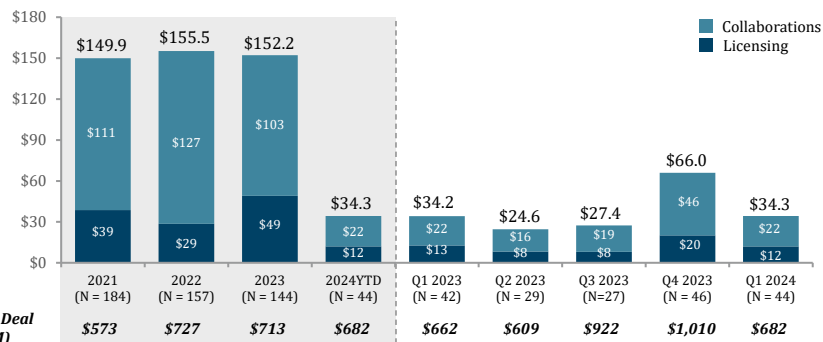
(1) Total estimated capital in millions returned to fund based on the cumulative \$ value position of all target companies for shareholders on all exchanges. \$ value position calculated based on Q4 2023 publicly disclosed institutional ownership of target company multiplied by publicly disclosed latest announced per share acquisition price, excluding contingencies. Includes strategic Big Pharma acquisitions in Q1 2024. The following outlines acquisition prices utilized: Johnson & Johnson's acquisition of Ambrx for \$28.00/share, Gilead Sciences' acquisition of CymaBay for \$32.50/share, AstraZenica's acquisition of Fusion Pharmaceuticals for \$21.00/share, Merck's acquisition of Harpoon Therapeutics for \$23.00/share, Sanofi's acquisition of InhibRx for \$30.00/share, AbbVie's acquisition of Landos Biopharma for \$20.42/share, and Novartis's acquisition of MorphoSys AG for \$18.50/ADS. Source: FactSet and William Blair Analysis as of March 31, 2024. Note: The analysis does not include retail, management, strategic investors, and non-filers.

# Q1 2024 Biopharma Partnership Trends

Overall partnering activity remains in line with prior Q1's, with 44 deals announced for a total of \$2 billion in upfront value and 10 deals for more than \$50M upfront in Q1 2024

## Total Deal Value and Volume

(\$ in billions)



Median Deal Size (\$M)

## Key Takeaways

### Licensing (N=17)

- Median deal terms for licensing agreements in Q1 2024:
  - Total Deal Value:** \$500M in Q1 2024 (vs. \$680M in 2023)
  - Upfront (Cash+Equity):** \$40M in Q1 2024 (vs. \$40M in 2023)
  - Milestones:** \$546M in Q1 2024 (vs. \$595M in 2023)
- Partnerships with Asian licensors accounted for 38% of licensings in Q1 2024, continuing a trend seen in 2023
- Obesity-focused deals comprised ~12% of licensings in Q1 2024, a meaningful increase from only 4% in the prior quarter

### Collaborations (N=27)

- Median deal terms for collaborations in Q1 2024:
  - Total Deal Value:** \$727M in Q1 2024 (vs. \$771M in 2023)
  - Upfront (Cash+Equity):** \$40M in Q1 2024 (vs. \$53M in 2023)
  - Milestones:** \$735M in Q1 2024 (vs. \$1,000M in 2023)
- Early-stage transactions comprised 89% of all collaborations in Q1 2024, in line with prior years
- No ADC-focused collaborations announced this quarter, a stark decrease from ~20% in Q4 2023
- By contrast, interest in small molecule collaborations was significantly higher at 41% in Q1 2024 (compared to only 14% in Q4 2023), of which nearly 1/3 were protein degradation deals

Source: Company press releases and SEC filings as of March 31, 2024.

NA = Not Applicable. ND = Not Disclosed. Excludes regional partnerships and partnerships with undisclosed deal terms. Note: Early-stage defined as Phase I or earlier.

## Top 5 Partnerships by Total Upfront in Q1 2024

(\$ in millions)

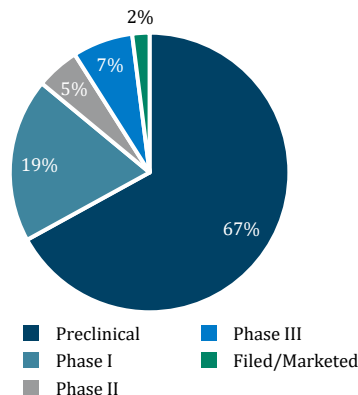
Date	Licensor	Licensee	Total Deal Value	Total Upfront	Upfront Equity	Milestones	Phase	Therapeutic Area	Modality
02/28/24	Indusia	VIATRIS	ND	\$350	NA	ND	Phase III	Cardiology, Immunology	Small Molecule
01/31/24	Protagonist Therapeutics	Takeda	\$630	\$300	NA	\$330	Phase III	Hematology	Small Molecule
02/08/24	Autolus	BIONTECH	\$250	\$250	\$200	NA	Filed	Oncology	Cell Therapy
01/07/24	Argo Biopharma	NOVARTIS	\$4,165	\$185	NA	\$3,980	Phase I/II	Cardiovascular	RNA
01/02/24	voyager	NOVARTIS	\$1,300	\$100	\$20	\$1,200	Discovery	Neurology	Gene Therapy

Most active partners: Novo Nordisk & Boehringer Ingelheim (N=4), followed by AbbVie, Novartis, & Roche (N=3)

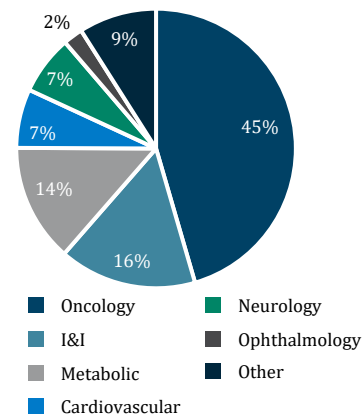
## Breakdown of Partnerships in Q1 2024

(N=44)

### Stage of Development



### Therapeutic Area

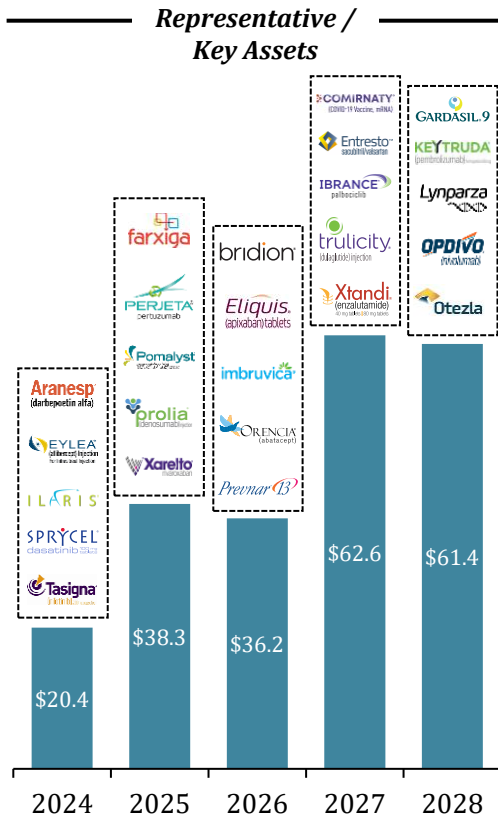


# Near-Term Big Pharma Patent Expirations

~\$200B in looming patent cliffs for big pharma as a significant number of blockbuster drugs face expiration by 2028

## Value of Drug LOEs by Year

Represents 2023A Sales of Big Pharma Drugs Facing LOE from 2024-2028 (\$ in billions)



Total: 10 14 12 24 18

## Big Pharma Drug LOEs by Year (2024-2028) <sup>(1)</sup>

(\$ in billions)

	2024	2025	2026	2027	2028	Total LOE <sup>(2)</sup>
MERCK		Simponi* golimumab	bridion siga-171R-1003 Janumet sitagliptin/metformin, HCl		GARDASIL 9 quadrivalent HPV vaccine KEYTRUDA pembrolizumab	\$37.6
Bristol Myers Squibb	SPRYCEL dasatinib HCl	Pomalyst pomalidomide 1 2 3 4 mg YERVOY tremfemur	Eliquis apixiban tablets ORENCIA tocilizumab		OPDIVO pembrolizumab	\$32.4
Pfizer		Inlyta regorafenib 500mg XELJANZ tofacitinib 100mg/150mg	Premarin B medroxyprogesterone acetate Bosulif bosutinib HCl	COMIRNATY COVID-19 vaccine, mRNA IBRANCE pembrolizumab Viviant vivitanserin		\$26.3
GSK	Rotarix rotavirus vaccine		BREVE Bifidobacterium longum var. infantis Bifidobacterium infantis	AMANTADINE amantadine hydrochloride EXXERCO exemestane Doxela doxepin HCl	Nucala mepolizumab	\$15.4
NOVARTIS	ILARIS canakinumab Tasigna nilotinib HCl	Galvus sitagliptin HCl		Entresto sacubitril/valsartan PROGRAF cyclosporine	Jakafi tocitinib HCl	\$14.8
AMGEN	Aranesp (darbepoetin alfa)	prolia denosumab XGEEVA sargramostim		Kypolis cyclosporin A	BUNCYTO buprenorphine Nplate romiplostim for injection Otezla tezepelumab	\$13.5
AstraZeneca		BRILINTA netilmide farxiga dapagliflozin		SOLIRIS eculizumab	Lynparza olaparib NDA 201-123	\$13.2
Lilly			CYRAMZA trastuzumab	Glyxambi glyxalmer FXR INHIBITORS trulicity dulaglutide		\$9.4
J&J		EDURANT edurantinib Opsumit tocilizumab Xarelto rivaroxaban	imbruvica venclextinib Upravis upravitanib			\$9.3
Roche		Kadcyla trastuzumab emtansine PERJETA peritumumab		PHEGSO phenacetin PHEGSO phenacetin	POLIVY poliovinylidene fluoride	\$8.6
astellas		Myzbetrig methylphenidate hydrochloride EYLEA aflibercept		Xtandi enzalutamide		\$6.1
REGENERON		EYLEA aflibercept				\$5.7
abbvie			imbruvica venclextinib	Juveéderm VOLUMA XC hyaluronic acid	Lupron Depot leuprolide acetate for depot suspension	\$4.8
sanofi	AUBAGIO fingolimod				ALPROLIX alprolixin ELODYS elodysin TOUVEO tolvaptan	\$3.3
novo nordisk				Saxenda liraglutide injection		\$1.5
Boehringer Ingelheim	Prodaxa prodaxin oxcarbazepine					\$0.9

Total: \$203B

Source: CapIQ and Company filings as of March 31, 2024.

Note: LOE = Loss-of-exclusivity. LOE refers to first commercially significant patent expiry. Analysis includes products with >\$500 million in 2023 sales which face patent expiry between 2024 and 2028.

















(1) Based on first year of expected patent expiry.

(2) LOE based on 2023A sales figures of drugs with expected patent expiry from 2024-2028.

# Drug LOEs and IRA Exposure for Big Pharma (2024 – 2028)

Merck's Keytruda and BMS' Opdivo represent the largest upcoming LOEs, which combined with high IRA exposure, position the two to be especially poised for strategic activity in the coming years

■ = 2023A Sales of Big Pharma Drugs Facing LOE from 2024-2028  
 ■ = Estimated Medicare Part D Spend for Drugs Up for Negotiation Under IRA<sup>(1)</sup>

			Current Cash <sup>(2)</sup>	Debt / '24 EBITDA <sup>(2)</sup>	Key Acquisitions <sup>(3)</sup>	Peak Sales Gained <sup>(3)</sup>	Revenue Gap <sup>(4)</sup>
 <b>MERCK</b>	\$37.6	\$4.1	\$6.4	1.24x	Prometheus	\$6.0	\$31.6
 <b>Bristol Myers Squibb</b>	\$32.4	\$10.6	\$9.0	3.07x	MIRATI, KARLINA, RayzeBio	\$10.4	\$22.0
 <b>Pfizer</b>	\$26.3	\$5.8	\$12.7	3.77x	Seagen	\$5.0	\$21.3
 <b>GSK</b>	\$15.4	\$0.0	\$6.2	1.69x	Bellus	\$1.9	\$13.5
 <b>NOVARTIS</b>	\$14.8	\$2.9	\$11.1	1.42x	CHINOOK, Morphosys	\$2.8	\$12.1
 <b>AMGEN</b>	\$13.5	\$2.8	\$10.9	3.46x	HORIZON	\$6.6	\$6.8
 <b>AstraZeneca</b>	\$13.2	\$3.3	\$6.6	1.97x	CINCOR, FUSION	\$2.9	\$10.3
 <b>Lilly</b>	\$9.4	\$1.0	\$3.0	1.79x	DICE, POINT	\$2.2	\$7.3
 <b>J&amp;J</b>	\$9.3	\$7.1	\$21.2	0.95x	-	\$0.0	\$9.3
 <b>Roche</b>	\$8.6	\$0.0	\$9.8	1.46x	-	\$0.0	\$8.6
 <b>astellas</b>	\$6.1	\$0.0	\$2.0	2.67x	IVERIC BIC	\$2.6	\$3.4
 <b>REGENERON</b>	\$5.7	\$0.0	\$10.8	0.51x	-	\$0.0	\$5.7
 <b>abbvie</b>	\$4.8	\$1.6	\$10.8	2.90x	immunogen, cerevel	\$3.5	\$1.3
 <b>sanofi</b>	\$3.3	\$0.0	\$7.7	1.36x	proventionbio, INHIBR	\$2.9	\$0.4
 <b>novo nordisk</b>	\$1.5	\$2.6	\$4.5	0.20x	-	\$0.0	\$1.5
 <b>Boehringer Ingelheim</b>	\$0.9	\$6.0	NA	NA	-	\$0.0	\$0.9

**Total: \$133B**

**Total: \$156B**

Source: CapIQ, Centers for Medicare & Medicaid, and Company filings as of March 31, 2024.

Note: LOE = Loss-of-exclusivity. LOE refers to first commercially significant patent expiry. Analysis includes products with >\$500 million in 2023 sales which face patent expiry between 2024 and 2028.

(1) Proportion of Medicare Part D spend from 6/1/22 to 5/31/23 for first 10 drugs up for negotiation under the IRA. For co-commercialized drugs, proportion of spend allocated based on relative share of revenues.

(2) Adjusted to reflect the impact of recent M&A.

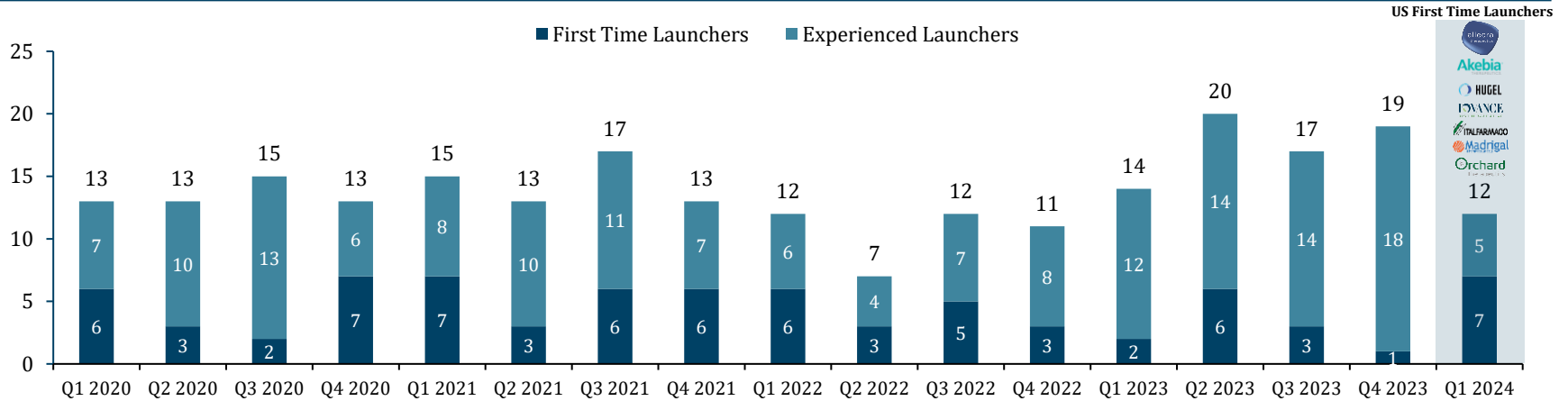
(3) Only includes public M&A transactions which closed or announced from 2023-2024YTD involving companies with lead assets in Phase II or beyond at announcement.

(4) Difference between projected LOE exposure and peak sales gained via recent public M&A.

## FDA Approval Trends and Upcoming SMID-Cap PDUFA Dates

- Following a record year of approvals in 2023, the FDA has been judicious, approving only 12 products in Q1 2024
- 19 upcoming PDUFAs for SMID-cap biopharma companies scheduled in 2024

### FDA Approvals by Quarter



### Upcoming 2024 SMID-Cap PDUFA Dates

Company	Product	Indication	Modality	PDUFA Date
Supernus Pharmaceuticals	SPN-830	OFF episodes in Parkinson's disease	Drug delivery	4/5/24
Immunity Bio	Anktiva	Bladder cancer	Antibody	4/23/24
Day One Biopharma	Tovorafenib	Pediatric low-grade glioma	Small molecule	4/30/24
X4 Pharma	Mavorixafor	WHIM syndrome	Small molecule	4/30/24
Ascendis Pharma	Transcon PTH	Hypoparathyroidism	Peptide	5/14/24
Abeona Therapeutics	Pz-cel	Recessive dystrophic epidermolysis bullosa	Cell therapy	5/25/24
Genfit/Ipsen	Elafibranor	Primary biliary cholangitis	Small molecule	6/10/24
Geron Therapeutics	Imetelstat	Lower risk myelodysplastic syndromes	Small molecule	6/16/24
Verona Pharma	Ensifentrine	Maintenance treatment of COPD	Small molecule	6/26/24
Rocket Pharma	Kresladi	Leukocyte adhesion deficiency I	Gene therapy	6/30/24
Adaptimmune	Afami-cel	Advanced synovial sarcoma	Cell therapy	8/4/24
Citius Pharma	Lymphir	R/r cutaneous T-cell lymphoma	Protein	8/13/24
Incyte/Syndax	Axatilimab	Graft-versus-host-disease	Antibody	8/28/24
Vanda Pharma	Tradipitant	Gastroparesis	Small molecule	9/18/24
Zevra Therapeutics	Arimoclomol	Niemann-Pick Disease Type C	Small molecule	9/21/24
Journey Medical Corporation	DFD-29	Rosacea	Small molecule	11/4/24
Autolus Therapeutics	Obe-cel	Adult B-cell acute lymphoblastic leukemia	Cell therapy	11/16/24
Applied Therapeutics	Govorestat	Classic galactosemia	Small molecule	11/28/24
BridgeBio Pharma	Acoramidis	Transthyretin amyloid cardiomyopathy	Small molecule	11/29/24



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## Healthcare Sales & Trading

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