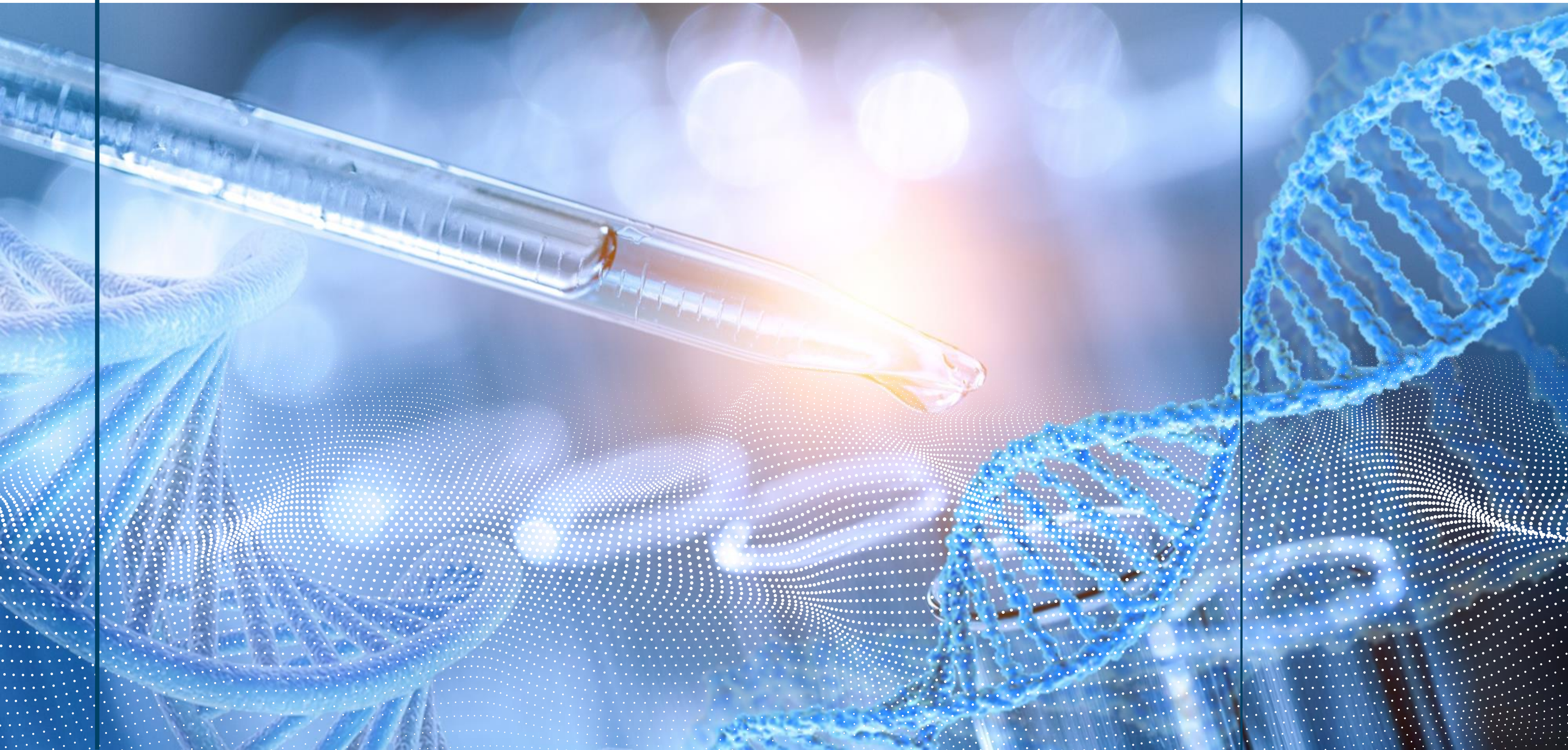
April 2023

The Quarterly Rx:
Q1 2023 U.S. Biopharma Recap



Q1 2023 Biopharma Market Summary – Key Takeaways

While the year began with optimism for a broader recovery in 2023, the quarter ended with greater uncertainty as SVB's collapse reverberates through the SMID-cap biotech space; at the same time, long-awaited "big M&A" finally surfaced with Seagen's acquisition

Reopening Old Wounds

- The biopharma sector began the year strongly thanks to a number of highly-anticipated clinical readouts in late Q4 as well as expectations for increased M&A following three billion-dollar acquisitions in early January; a significant amount of short-covering occurred in January
- However, sentiment soured in early March as SVB's collapse rekindled concerns of a capital crunch for private and SMID-cap biopharma companies

Everything Everywhere All at Once (to Preserve Capital)

- The pace of restructurings/layoffs and strategic alternatives processes continues to increase, with 61 public biopharma companies making these announcements in Q1 2023
- 12 companies have announced outcomes to strategic review processes in Q1 2023, split equally between traditional reverse mergers, public-public mergers and Chapter 11/closures

DANGER: (Private Financing) Cliff Ahead

- Private financing market remains one of the more challenged areas of the biopharma market with only 54 deals raising a total of $3.8 billion in Q1 2023; "crossover" activity steady with 11 deals announced in Q1 2023 (compared to 11 in Q1 2022)
- Over 525 companies that raised a Series A or B from 2020-2021 have not yet financed and likely need to in the near-term, creating a significant private financing overhang and pressure on existing investors to support existing portfolios
- Increased emphasis from prospective new investors on companies being near/in the clinic to justify new funding round; valuation remains squarely in focus

Let's Get Creative (in the Public Markets)

- Shift towards funding later-stage public companies continues in 2023, with both IPOs priced in Q1 2023 for clinical-stage companies and 76% of follow-on offerings for companies that were Phase II or later
- Follow-ons remain predominantly catalyst-driven; however, opportunistic raises have proven possible in Q1 2023
- Increased investor interest for "structured" financings where additional funding tranches are tied to pre-specified clinical, regulatory, and/or commercial milestones
- As of 3/31/23, 83 public biopharma companies with less than a year of cash and 217 companies trading below cash

Long Awaited "Big" M&A… Now What?

- Long-awaited, and highly speculated acquisition of Seagen finally came to fruition, representing the largest biopharma M&A deal since AbbVie/Allergan and BMS/Celgene, both announced in 2019
- Over $42 billion in institutional capital freed up from Q1 2023 public acquisitions; however, uncertainty persists on how much will be recycled into SMID-cap biotech given relatively limited HC specialist ownership of acquired companies
- Late-stage assets remain in focus as large pharma looks to fill revenue gap from near-term patent cliff

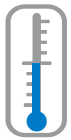
It Takes Two to Tango (and Partner)

- Overall, there has been a 20% decrease in the number of partnering transactions (compared to Q1 2022); although, upfront dollar volume remains in line with Q1 2022 at $2 billion
- 65%, of early-stage partnerships are platform deals, while 30% of licensing deals are Phase II and later; across all partnering, oncology remains the therapeutic area with greatest activity (43% of deals)

What We Are Hearing – Investor Sentiment and Outlook

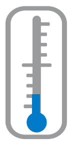
Market remains challenged with recession fears and banking contagion looming large; however, optimism persists that increased M&A coupled with positive upcoming clinical readouts may help turn the tide in biopharma

Overall Market



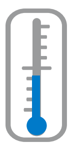
- Ongoing banking crisis has punctuated investor focus on Fed tightening campaign and consequent impact on economic growth, although **risk of broader financial contagion appears to be managed**
- Equity investors have fled to the relative security of mega-cap technology stocks which were battered in 2022
- ***"We think it's healthy that things remain cold, folks are trying to will a recovery into existence"*** *– East Coast hedge fund*

Biopharma Market



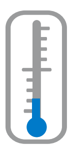
- Belief that **January rally in the XBI was driven by broad sector short covering**, although median short interest ratio across biopharma has risen since end of Q4 2022
- While SVB collapse initially reignited concerns of a funding crunch in biotech, **most investors surveyed do not anticipate a material impact**
- **Biopharma funds have experienced nearly $5 billion of outflows in Q1 2023**, erasing much of the inflows generated last year
- *"**I don't know when biopharma will be 'normal' again**… just uncertainty on top of another uncertainty" – New York healthcare specialist*

Biopharma Outlook for Remainder of 2023



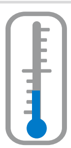
- Most investors expect additional volatility throughout 2023 but that the **XBI is unlikely to test the lows seen in 2022**
- Prolonged and elevated divergence between the XBI and QQQ suggests that **any dovishness from the Fed in 2H 2023 is unlikely to trickle down to biopharma**; likely to remain a specialist-driven market throughout 2023 as generalists focus on other out-of-favor sectors
- Long-awaited SGEN acquisition was overshadowed by the banking crisis; while **most investors expect additional M&A in 2023** there is concern over how much of that capital will ultimately get recycled into the ecosystem as generalists remain on the sidelines
- *"**Large pharma still needs to look at commercial stage assets given upcoming patent cliffs**" – West Coast VC*

Biopharma Private Financings



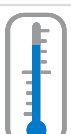
- **Interest level for private financing opportunities has deteriorated**, particularly for Series B and later rounds
- Most investors surveyed **anticipate additional down/flat rounds** as market continues to adjust to new public benchmarks
- *"**We're holding back more dry powder in order to support our existing portfolio companies**" – Boston biopharma VC*

Biopharma IPOs



- **Appetite from new investors exists for later-stage, more clinically de-risked assets**; however, expectation remains that majority of the offering will need to be spoken for by existing investors
- Investors surveyed **expect a busier IPO calendar in 2H 2023** once interest rates stabilize
- *"IPO market is open for a select few; **if you're best-in-class or first-in-class and commercial stage, you fit the profile**" – New York healthcare specialist*

Biopharma Secondaries

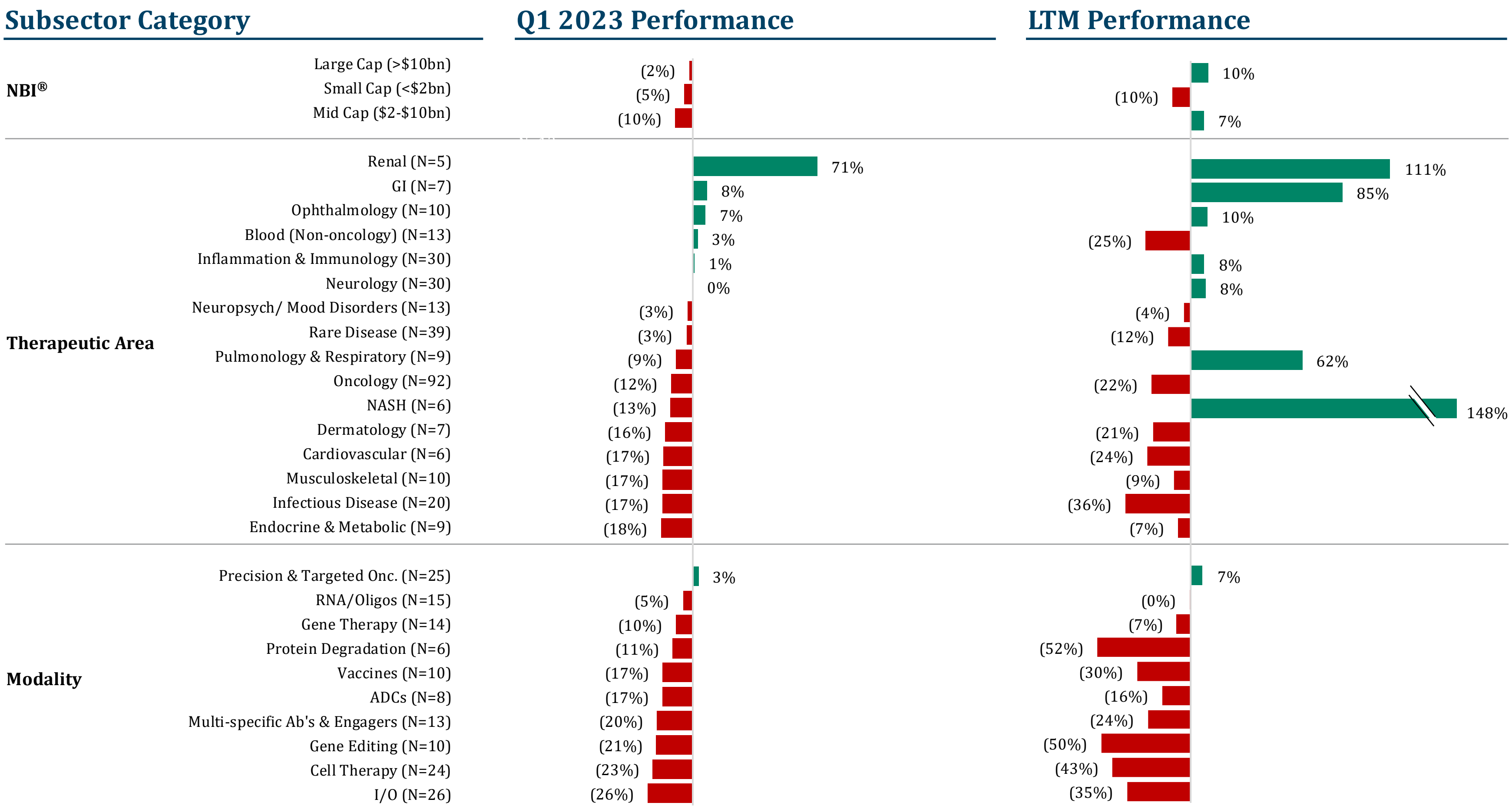


- **Significant appetite across investors surveyed**, although bar for positive clinical data to catalyze an offering has increased
- Increased interest from investors in recap transactions, especially if able to include **structure tied to future milestones**
- ***"It's a great time to be shopping as long as you can manage your risk appropriately"*** *– Midwest long-only fund*

Weak ⟷ Strong

NBI® Subsector Market Performance

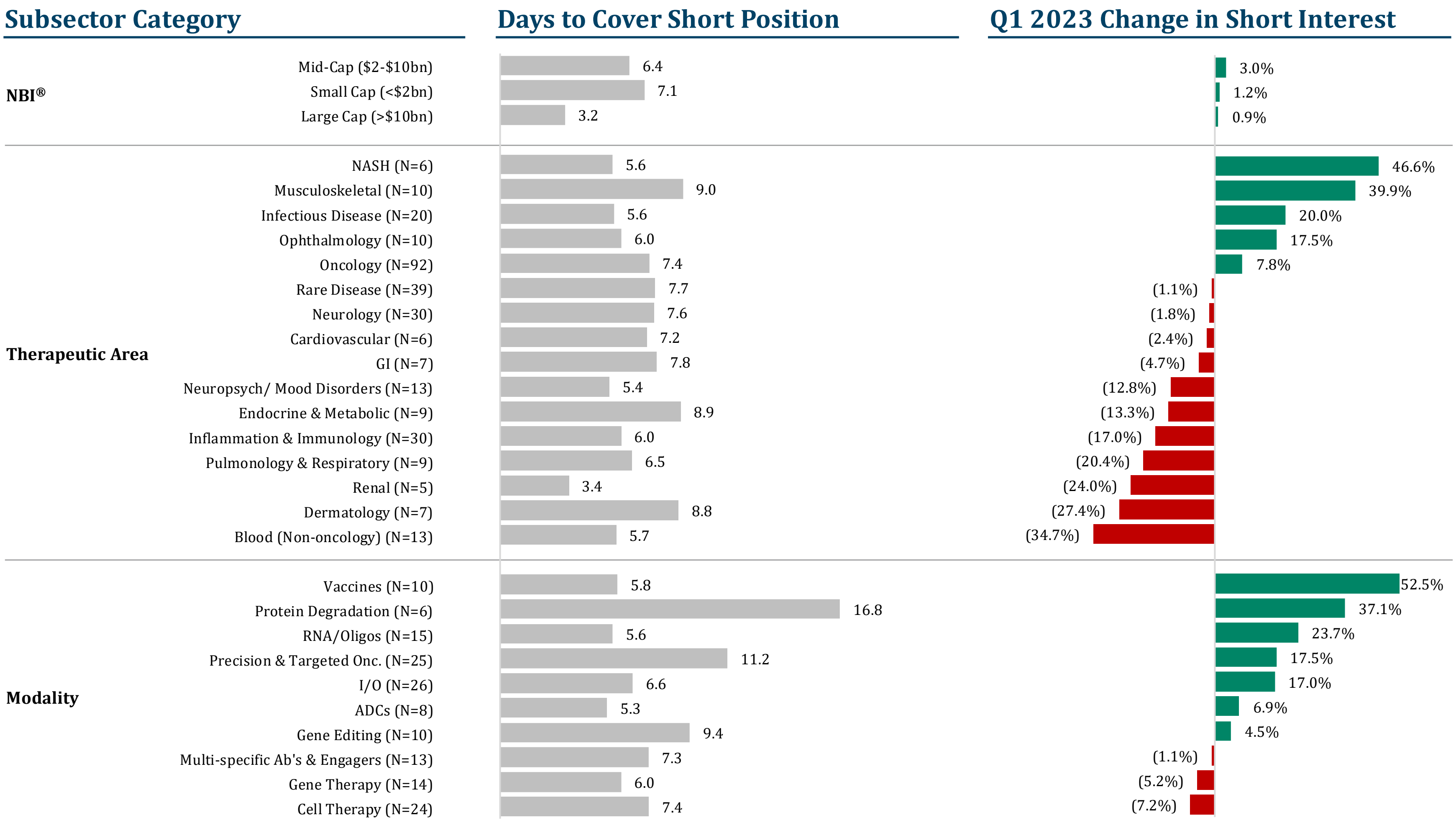
- *While the NBI has traded lower in Q1 2023, dragged down primarily by small and mid-cap constituents, the index has outperformed the broader healthcare market*
- *Renal companies, although a small subset, were the lone bright spot in the index following a pair of regulatory approvals, while immuno-oncology and endocrine/metabolic disease companies were the biggest laggards*



Note: Subsector indices are equally weighted. Includes NBI® constituents' market capitalizations calculated as of January 1, 2023.
Source: FactSet, CapIQ and William Blair internal reporting. Q1 2023 and LTM performance as of March 31, 2023.

NBI® Subsector Q1 2023 Short Interest Trends

Short covering amongst large-cap NBI® constituents helped drive the sector rally seen in January, although median short interest ratios have climbed across therapeutic indications and modalities since Q4 2022



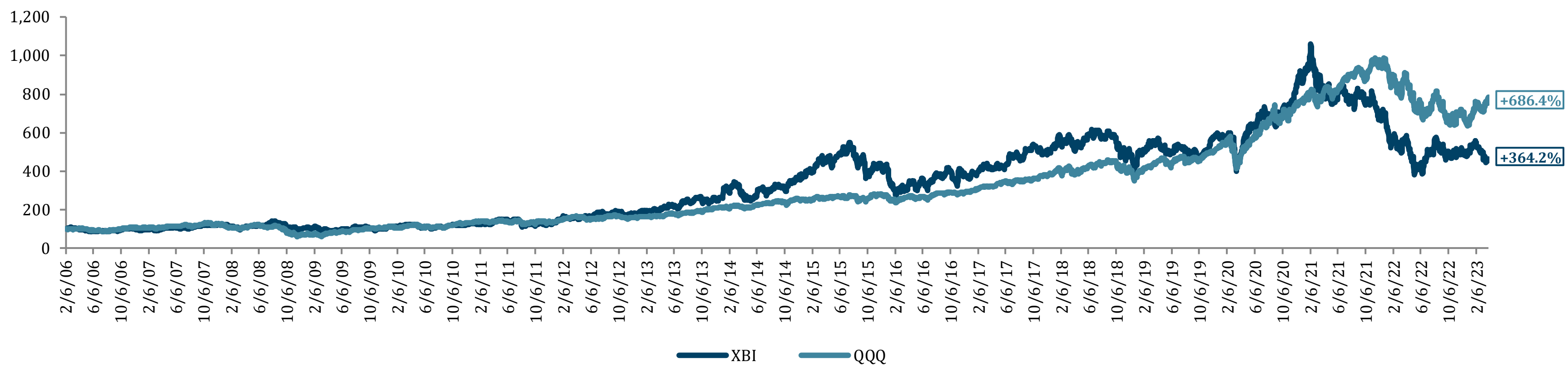
Note: NBI constituents are equally weighted. Days to cover short position calculated as total number of shares shorted / 30-day ADTV.
Source: FactSet, CapIQ, and William Blair internal reporting. Days to cover short position as of 3/15/23 settlement date. Short Interest change measured from 12/30/22 to 3/15/23 settlement dates.

Indexed Performance of the XBI and QQQ Since 2006

The widening spread between two closely watched ETFs underpins continued challenges facing the biopharma sector

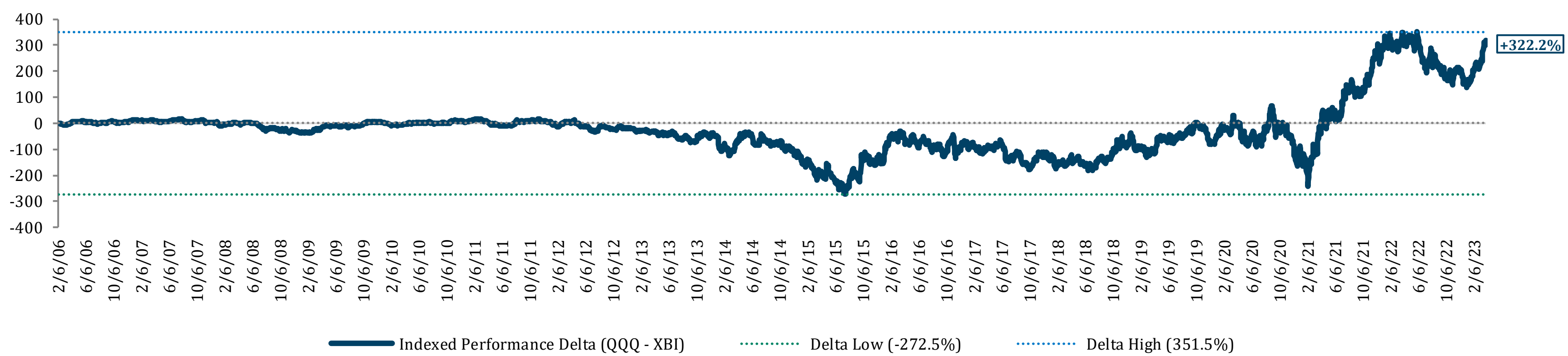
After Several Years of Outperformance, the XBI has Lagged Behind QQQ Since 2021

Indexed Performance Since 2006



Divergence Between the XBI and QQQ is Close to Highest Level Since Inception

Indexed Performance Since 2006



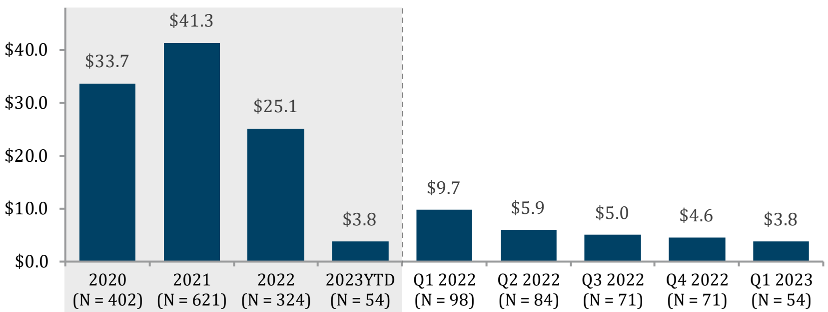
(1) Calculated as the difference between the indexed performances of the QQQ and XBI.
Source: FactSet Research Systems as of March 31, 2023.

Biopharma Private Financings Trends

- *Capital raising in the private markets has become increasingly challenged; Q1 2023 was the 8th consecutive declining quarter in total deal volume for private biopharma financings*
- *There were 11 "crossover" deals announced in Q1 2023; we estimate there is a backlog of at least 90 companies that are potential IPO, reverse merger and SPAC candidates*

Total Proceeds and Deal Volume

($ in billions)



Private Financings by Therapeutic Area and Modality

($ in billions)

Therapeutic Area/Modality	2020 Value	2020 Number of Deals	2021 Value	2021 Number of Deals	2022 Value	2022 Number of Deals	Q1 2023 Value	Q1 2023 Number of Deals
Oncology	$13.3	201	$16.0	240	$8.1	115	$1.4	20
Cell/Gene Therapy	$7.5	114	$8.9	128	$4.1	50	$0.8	8
Neurology	$3.4	68	$5.0	76	$2.4	35	$0.6	9
Immunology	$2.7	48	$3.4	54	$3.4	42	$0.4	5
Gene Editing	$0.3	6	$1.3	12	$0.9	9	$0.4	3
RNA/Oligonucleotide	$0.6	12	$2.3	16	$1.4	21	$0.2	4

Crossover Deals Analysis[2]

($ in millions)

Quarter	Number of Deals	Median Deal Size	Median Pre-Money	Median Step-Up	Currently Private	Currently Public
Q1 2021	32	$111	$215	2.1x	6	26
Q2 2021	21	$113	$250	2.2x	12	9
Q3 2021	24	$103	$183	1.6x	16	8
Q4 2021	8	$141	$280	2.9x	6	2
Q1 2022	11	$115	$350	1.5x	10	1
Q2 2022	11	$125	$175	1.2x	10	1
Q3 2022	12	$139	$400	2.3x	11	1
Q4 2022	9	$120	$280	1.1x	9	0
Q1 2023	11	$108	$150	1.2x	11	0

Largest Private Company Raises in Q1 2023

($ in millions)

Company	Therapeutic Area	Round	Date	Deal Size
CARGO THERAPEUTICS	Oncology	Series A	03/01/23	$200
ERA THERAPEUTICS	Various	Series B	02/16/23	$193
ARRIVENT	Oncology	Series B	03/27/23	$155
AMOLYT PHARMA	Endocrinology	Series C	01/06/23	$138
CHROMA MEDICINE	Various	Series B	03/01/23	$135
HEMAB	Hematology	Series B	02/21/23	$135

Source: CapIQ, PitchBook Data, Inc., FactSet, and SEC Filings as of March 31, 2023.

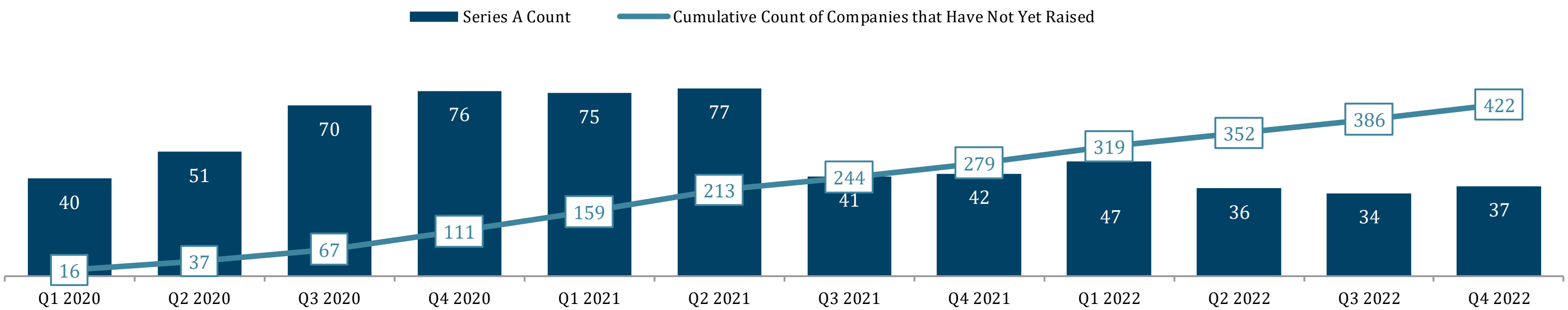
(1) Includes crossover rounds for companies that have completed an IPO as well as crossover rounds where the next round of financing will likely be an IPO (either a $50M+ raise (Series B onwards) or a $100M+ raise (Series A) with multiple crossover and/or large mutual funds in the syndicate).

Significant Private Company Financing Overhang

525+ companies raised Series As and Bs in 2020 and 2021, but have not raised again since, underscoring a significant financing overhang that persists in the private markets

Post-Series A Financing Overhang

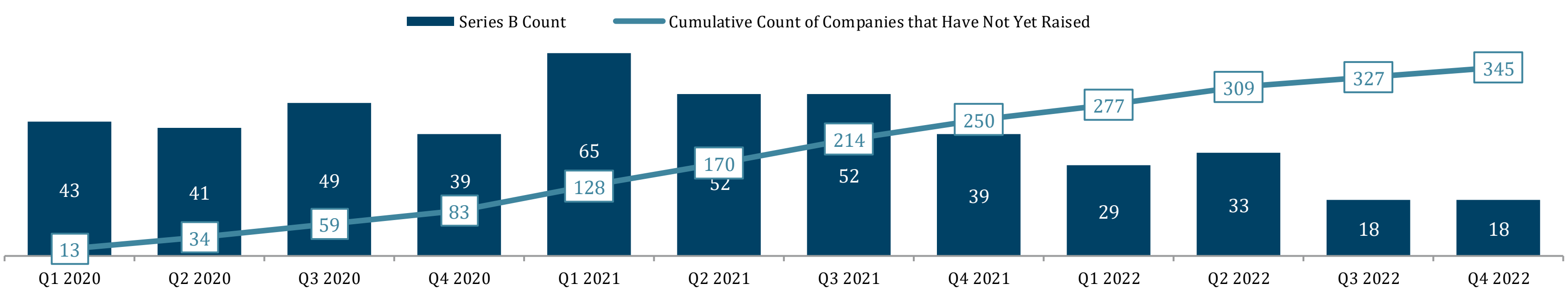
67% have not raised again (422 out of 626)



Median Deal Size ($M)	***$26***	***$21***	***$30***	***$32***	***$35***	***$26***	***$32***	***$41***	***$45***	***$50***	***$40***	***$40***

Post-Series B Financing Overhang

72% have not raised again (345 out of 478)



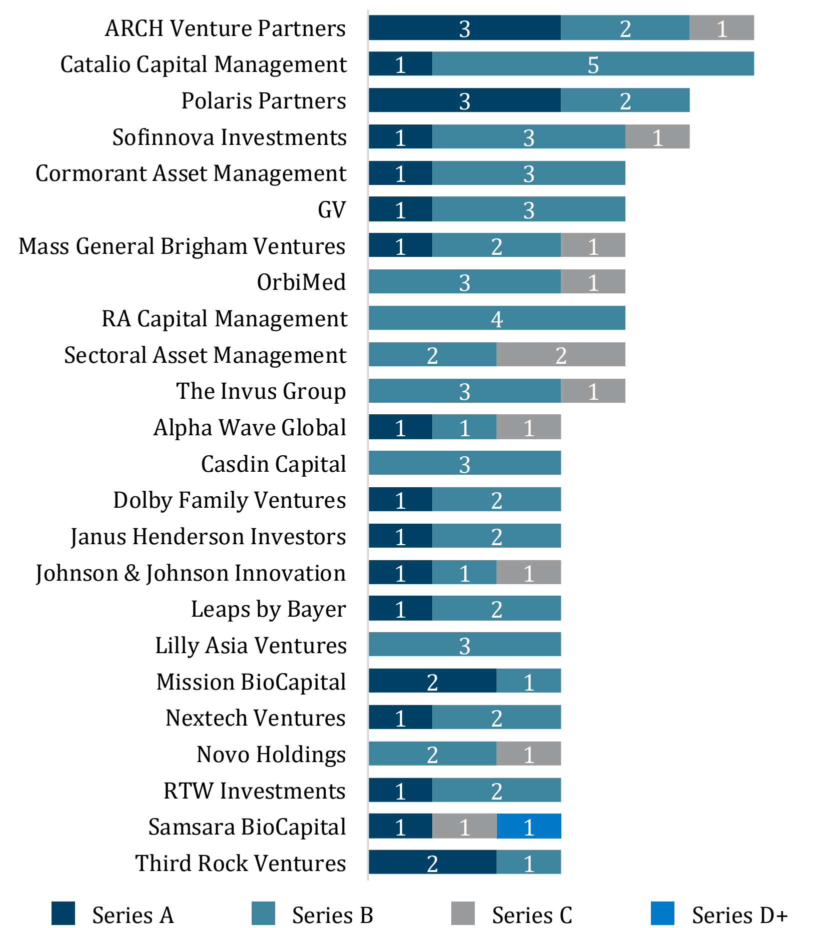
Median Deal Size ($M)	***$45***	***$58***	***$49***	***$55***	***$62***	***$66***	***$75***	***$75***	***$84***	***$70***	***$86***	***$36***

Source: CapIQ, PitchBook Data, Inc., FactSet, and SEC Filings as of March 31, 2023.

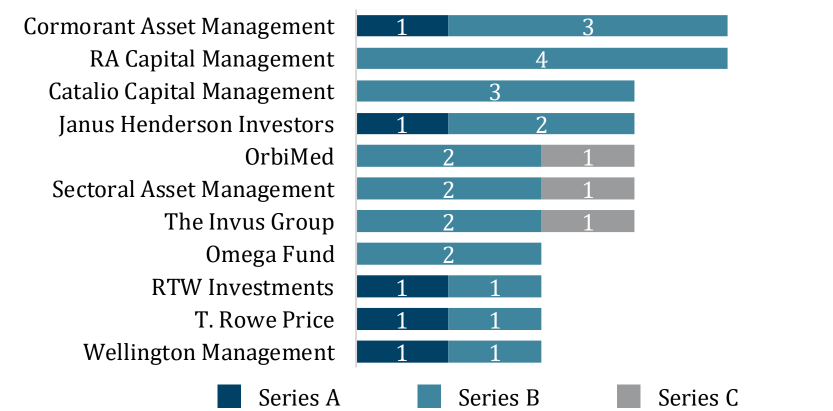
Q1 2023 Biopharma Private Financings and New Fund Formation Snapshot

- *Traditional biopharma investors remain the most active despite muted activity*
- *19 new company formations in Q1 2023, including those funded and led by ARCH, Flagship, Third Rock, and Versant*

Top Investors Across All Rounds



Top Investors in Crossover Rounds



Q1 2023 New Funds Closed

($ in millions)

Investor Name	Fund Name	Fund Location	Industries Involved	Close Date	Fund Size
8VC	8VC Fund V	Austin, TX	Technology and Life Sciences	3/1/2023	$880
Curie.Bio	Curie Bio Seed Fund I	Boston, MA	Biopharma	ND	$520
DIMENSION	Dimension Capital I	New York, NY	Digital Life Sciences	1/25/2023	$350
EQT Life Sciences	LSP Dementia Fund	Stockholm, SE	Neurodegenerative Diseases	3/29/2023	~$281
NEA	ND	New York, NY	Technology and Healthcare	1/23/2023	$6,200(1)
PATIENT SQUARE CAPITAL	Patient Square Equity Partners	Menlo Park, CA	Healthcare	2/1/2023	$3,900
sanofi ventures	Evergreen Venture Fund	Boston, MA	Biopharma and Digital Health	1/11/2023	$750
SR One	SR One Fund II	San Francisco, CA	Emerging Biopharma	3/27/2023	$600

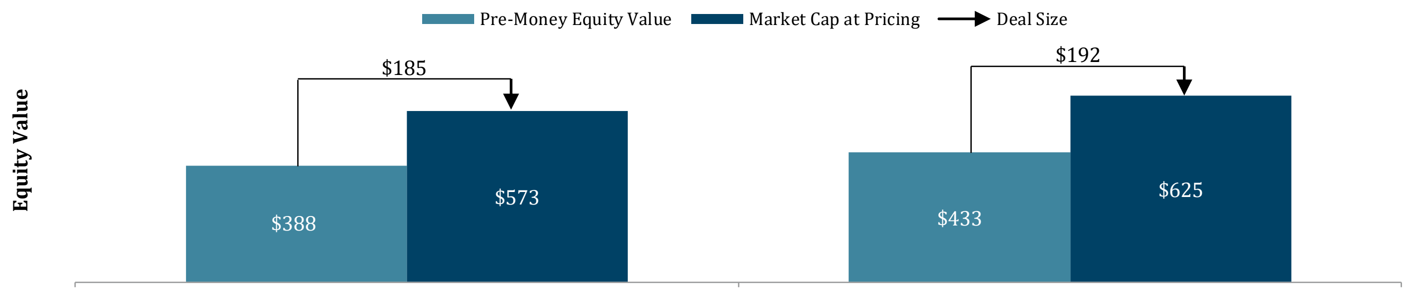
Source: CapIQ, PitchBook Data, Inc., FactSet, and SEC Filings as of March 31, 2023.
(1) Includes $6.2B across two funds focused on early-stage and venture growth-stage opportunities.

Q1 2023 Biopharma IPOs

- *While Structure and Mineralys were unique situations, their successful IPOs suggested a re-opening of the IPO window*
- *Market sentiment and volatility since has slowed down additional new issuances*
- *Both deals upsized and priced at the high end of the range, and allocations to new investors increased materially to ~50% (compared to a median of ~20% in 2022)*

Q1 2023 IPO Activity Detail

($ in millions, except per share value)



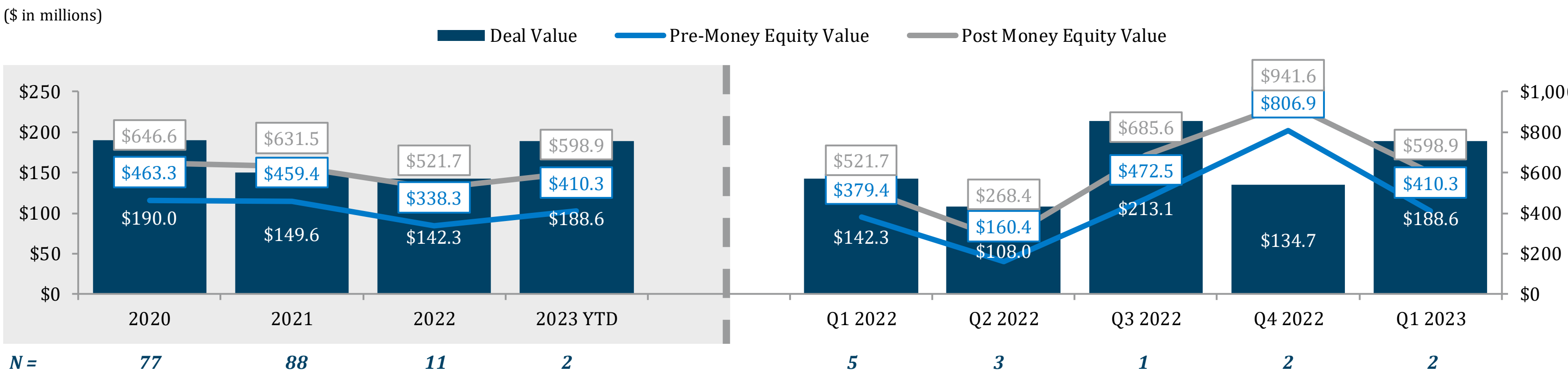
Deal Overview At Pricing	STRUCTURE THERAPEUTICS	MINERALYS
Pricing Date	2/2/23	2/9/23
Offer Price	$15.00	$16.00
Enterprise Value	$285.0	$312.0
Step-Up	1.2x	1.7x
Initial File/Offer vs. Range	In Range	In Range
Deal Value as % of Market Value	32.3%	30.7%
Key Pre-IPO Investors	BVF, Casdin, Deep Track, F-Prime, Janus Henderson, Lilly Asia Ventures, Qiming, Surveyor, TCG	Andera, HBM, RA, Rock Springs, RTW, Samsara, Sectoral, SR One, Ysios
Insider Shadow Book at Launch	100%	100%
Allocation to New : Existing Investors	60% : 40%	50% : 50%
Post-IPO Performance		
Offer/1 Day	+73.3%	+15.3%
Offer/30 Day	+77.0%	+1.8%
Offer/Current	+48.7%	+4.4%
Lead Asset at Pricing		
Name	GSBR-1290	Lorundrostat
Phase	Phase 1b	Phase 2
Therapeutic Area	Metabolic	Cardiovascular
Modality	Small molecule	Small molecule
Indication	Type-2 diabetes and Obesity	Uncontrolled and Resistant hypertension
Months to Next Major Catalyst	6 to 12	9 to 15
Next Major Catalyst	Phase 1b data in Type-2 diabetes and Obesity	Phase 2 data in uHTN and rHTN

Source: Dealogic and SEC Filings as of March 31, 2023.
Note: Uncontrolled hypertension = uHTN. Resistant hypertension = rHTN.

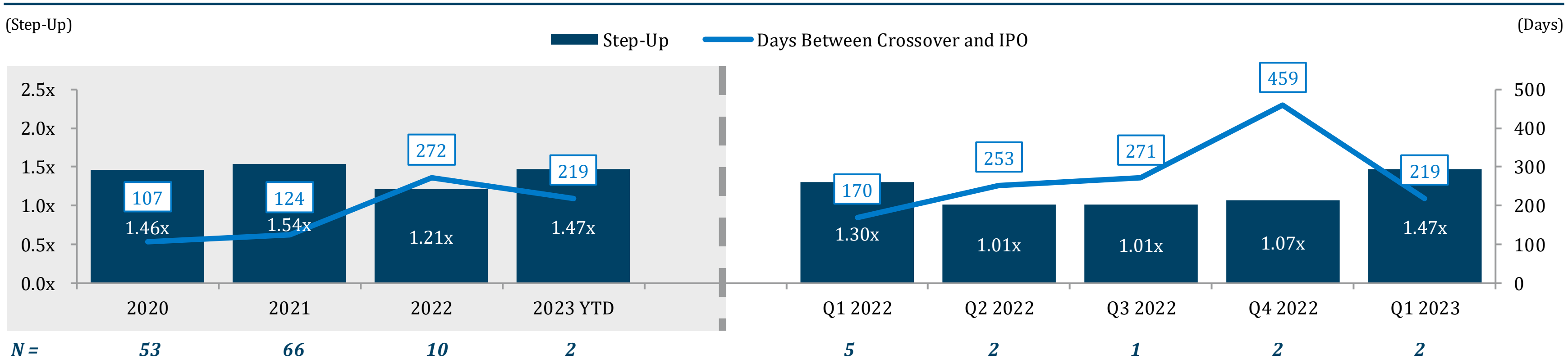
Biopharma IPO Trends

IPO step-ups have returned to normalized levels in Q1 2023 (albeit on a small N), while days between crossover and IPO have remained elevated but well off the Q4 2022 high

Deal Sizing and Valuation



Crossover-to-IPO Metrics[1]



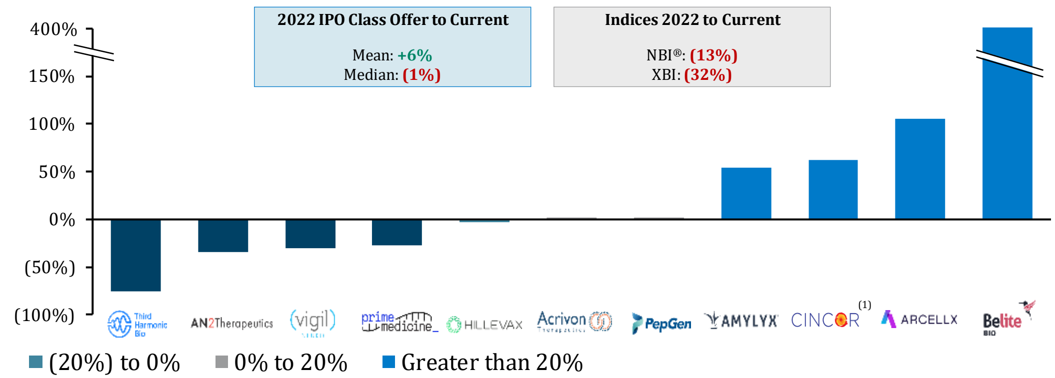
Note: Represents median values. Includes U.S. IPOs only. Excludes best efforts IPOs. Excludes IPOs less than $25 million in gross proceeds.
Source: CapIQ, Dealogic, FactSet, and SEC Filings as of March 31, 2023. Note: All valuations performed on basic share count basis.
(1) Crossover rounds defined as pre-IPO financings completed with multiple crossover and/or large mutual funds in the syndicate.

Biopharma IPO Aftermarket Performance

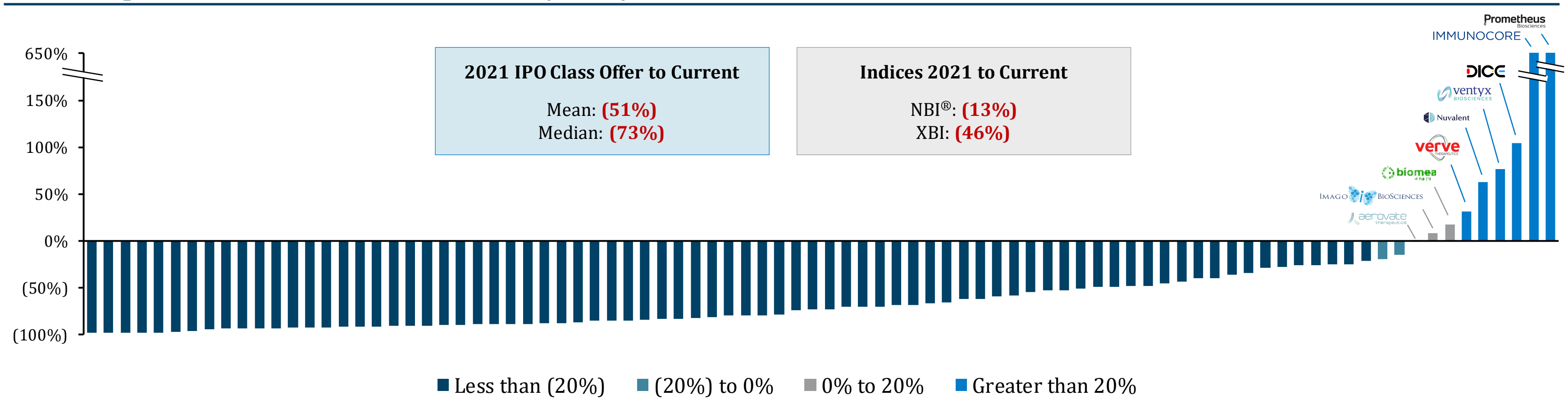
- *2022/2023 biopharma IPO class performance has outperformed broader indices with an average offer to current of 39%*
- *92% of issuers since 2022 have been clinical-stage (compared to 32% of issues in 2021 that were preclinical at IPO)*

2023 Biopharma IPO Class (N=2)

2022 Biopharma IPO Class Performance (N=11)



2021 Biopharma IPO Class Performance (N=88)



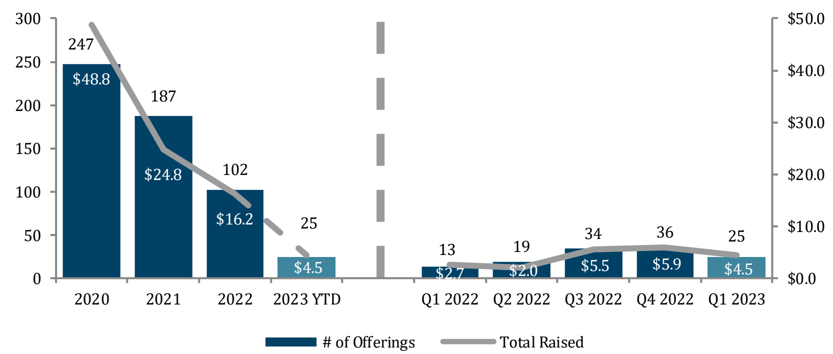
Note: Includes U.S. IPOs only. Excludes best efforts IPOs and IPOs less than $25 million in gross proceeds.
Source: CapIQ, Dealogic, FactSet, and SEC Filings. Current index performance compared to December 31st close of year prior and IPO class compared to IPO offer price as of March 31, 2023.
(1) Offer-to-current performance based on AstraZeneca merger announcement on January 9, 2023 to acquire all of CinCor's outstanding shares for a price of $26.00 per share.

Biopharma Follow-ons Trends

- *Follow-on activity in Q1 2023 outpaced Q1 activity last year as 25 offerings priced raising $4.5B in the quarter*
- *Investors pushed companies to raise greater amount of capital to de-risk financing overhang; median proceeds raised of $143.8 million in Q1 2023 represents largest amount over the last 10 years*

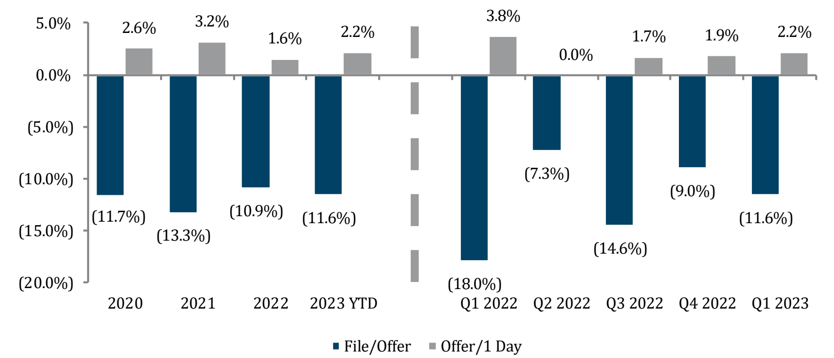
Deal Volume

of Offerings / Total Proceeds Raised ($ in billions)



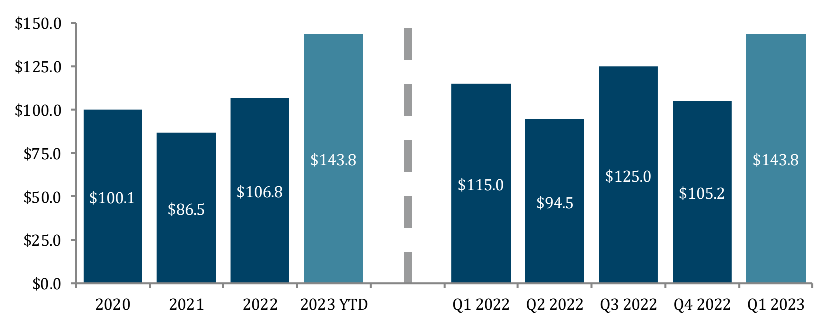
Pricing and Performance

Median



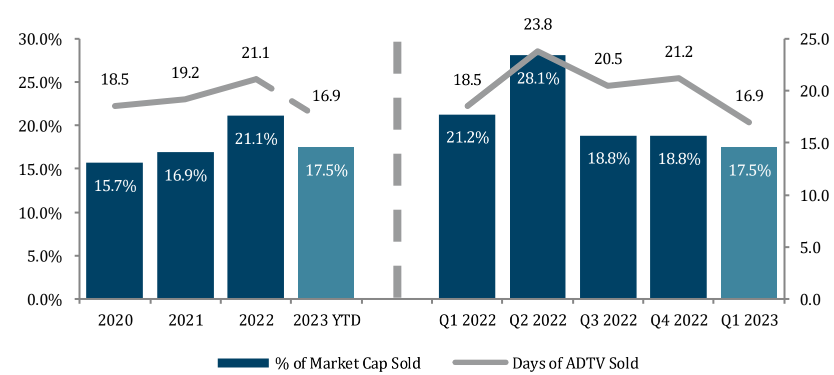
Median Proceeds Raised

($ in millions)



Deal Sizing Stats

Days of ADTV Measured Using 30-Day ADTV



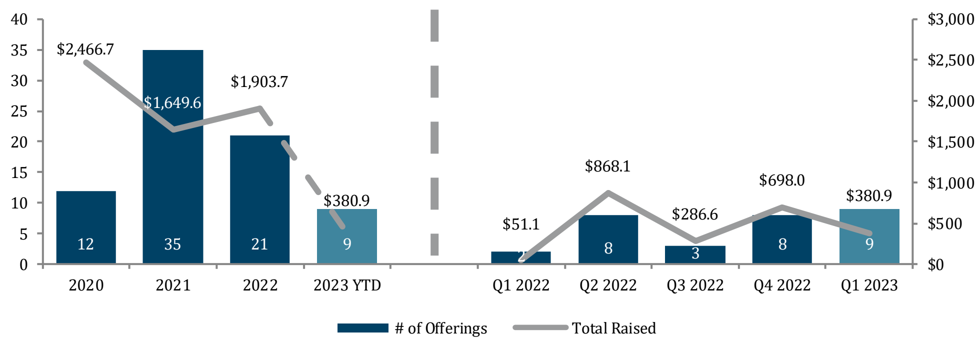
Note: Excludes Registered Directs, PIPEs, and offerings with gross proceeds below $20 million. Median Pricing and Performance includes offerings with warrants.
Source: Dealogic as of March 31, 2023.

Unregistered PIPEs and Registered Directs Trends

- *PIPEs and Registered Directs continue to be used by issuers as alternative financing vehicles, especially in situations where the offerings are announced concurrently with a catalyst*
- *Fully confidential process allows for extensive investor due diligence and highly concentrated investor allocations*

Registered Directs

of Offerings / Total Proceeds Raised ($ in millions)

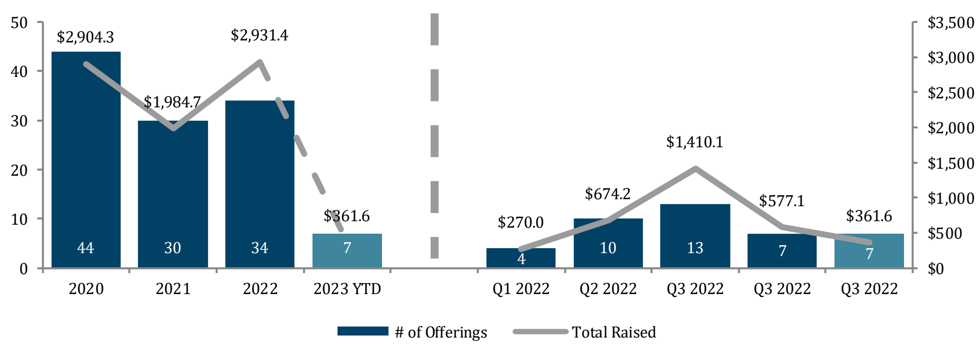


Key Highlights

- Activity exceeded historical norms as 9 offerings priced in Q1 2023 raising $380.9 million in gross proceeds
- Activity continues to be largely driven by reverse inquiries and desire to keep allocations highly concentrated amongst smaller investor syndicate
- 4 of the 9 offerings were executed concurrent with a catalyst
- Discounts have remained tight with a median pricing at last trade and warrant coverage on 3 of 9 offerings in Q1 2023 with mixed aftermarket performance of a median (0.7%) 1-day return

Unregistered PIPEs

of Offerings / Total Proceeds Raised ($ in millions)



Key Highlights

- PIPE activity remained muted in Q1 2023 with only 7 offerings raising $361.6 million in gross proceeds
- Discounts remained tight with a median of 0.0% in Q1 2023 as more offerings were subject to the 20% Nasdaq threshold
- 4 of the 7 offerings (57.0%) in Q1 2023 included warrant coverage; average of 77.8% coverage
- 71% of offerings in Q1 2023 were catalyst-driven which rose from 42% of offerings in 2022
- PIPEs allow issuers the flexibility to further structure their raises, as illustrated by ASLAN's and Orchard's Q1 2023 transactions with financing contingent upon upcoming clinical or regulatory milestones

Note: Excludes strategic transactions and transactions with gross proceeds under $20.0 million.
Source: Dealogic, Company press releases, and Factset as of March 31, 2023.

Structured Private Placement Financings for Public Companies

Five private placement offerings in Q1 2023 included creative structures tied to clinical, regulatory, and/or commercial milestones, providing issuers with increased capital while reducing upfront dilution

	VERASTEM ONCOLOGY	ASLAN PHARMACEUTICALS	Orchard therapeutics	UNICYCIVE THERAPEUTICS INC.	Delcath
Lead Asset	Avutometinib +/- defactinib	Eblasakimab	OTL-200	Renazorb (reformulated Fosrenol)	HEPZATO Kit
Stage/ Therapeutic Area	Phase II / Oncology	Phase IIb / Dermatology	Marketed / Neurology	Phase II ready / Metabolic	Marketed / Oncology
Announcement Date	1/24/23	2/24/23	3/6/23	3/6/23	3/27/23
Deal Size	$60.0 million	$20.0 million (up to $100.0 million)	$68.0 million (up to $188.0 million)	$30.0 million (up to $130.0 million)	$25.0 million (up to $60.0 million)
Security Type	Convertible Preferred Stock	Unit (Ordinary Shares/Pre-funded Warrants and Warrants)	Unit (Ordinary Shares and Warrants)	Convertible Preferred Stock	Convertible Preferred Stock
Transaction Details	• Two tranches of $30.0 million • Purchase price per common share in each tranche is $0.59 (3% discount to announcement) and $0.75 (23% premium to announcement), respectively • Initial tranche closed on 1/27/23 • The second tranche will close within seven days of the company's stock above a 10-day VWAP of $1.125 and aggregate trading volume during the period of at least $25.0 million within 18 months of the closing of the initial tranche	• Ordinary shares offered at 15% premium to the 10-day VWAP • Warrant Tranche 1 - exercisable for 60 days after the announcement of TREK-AD Phase 2b clinical trial topline data at least • Warrant Tranche 2 - exercisable for 60 days following the announcement of Phase 2 POC trial farudodstat topline data	• First closing of $34.0 million; unit price of $6.00 (25% premium to announcement) • Second closing of $34.0 million; unit price of $8.00 (67% premium to announcement). Closing is subject to the company's BLA with the FDA • 110% warrant coverage • Exercise price of $11.00/ADS if OTL-200 FDA approval by 2024 otherwise $9.50/ADS • 1-for-10 reverse stock split announced concurrently	• Three tranches of warrants exercisable for convertible preferred stock • Tranche A & B - $25.0m each, exercisable following FDA and TDAPA approval for Renazorb, respectively • Tranche C - $50.0m, exercisable following four quarters of commercial sales of Renazorb • Quarterly dividend following commercial sales of Renazorb	• Two tranches of warrants exercisable for convertible preferred stock • Tranche A - $35.0 million exercisable following the Company's announcement of receipt of FDA approval for HEPZATO • Tranche B - $25.0 million exercisable following the announcement of recording $10 million in quarterly U.S. revenue from the commercialization of HEPZATO
Announcement/ 1 Day Return	+4.1%	+19.6%	+14.6%	+153.1%	+24.0%
Notable Investors	BVF Partners L.P.	BVF Partners L.P.; K2 HealthVentures	Cowen Healthcare Investments; Deep Track Capital; RA Capital; Woodline Partners; Zentree Investments	BVF Partners L.P.; Logos Capital; RA Capital; Vivo Capital	Vivo Capital; Logos Capital; BVF Partners L.P.; Stonepine Capital Management; Serrado Capital; Rosalind

Note: Boxed logos denote new investors.
Source: SEC filings and FactSet Research Systems as of March 31, 2023.

Publicly Announced Strategic Alternatives Processes and Restructuring Trends

Over 29 companies actively pursing strategic reviews, along with numerous additional companies who have announced corporate restructuring and recent layoffs in Q1 2023

Strategic Alternatives & Restructuring Announcements

Total Announcements Per Quarter (Non-Cumulative)

Public Corporate Restructurings Announced in Q1 2023

* Denotes Companies Also Announcing Strategic Alternatives Processes

Ongoing Strategic Alternatives Processes

Date Announced	Company	Therapeutic Area	Cash as of 12/31/22
3/27/2023	Applied Molecular Transport	Immunology	$47
3/27/2023	gamida cell	Hematology	$65
3/22/2023	cyclerion	Neurology	$13
3/20/2023	Athenex	Oncology	$37
3/17/2023	PEAR Therapeutics	Digital Therapeutics	$84
3/16/2023	imv	Oncology	$21
3/15/2023	Bellicum	Oncology	$29
3/9/2023	INVIVO Therapeutics	Neurology	$16
3/9/2023	neoleukin Therapeutics	Oncology	$96
3/7/2023	fresh tracks Therapeutics	Immunology	$11
2/27/2023	APTINYX	Neurology	$67
2/27/2023	Apexigen	Oncology	$17
2/23/2023	EVOFEM Biosciences	Reproductive Health	$8
2/22/2023	GRAPHITE BIO	Hematology	$284
2/21/2023	AILERON	Oncology	$21
2/16/2023	talaris	Immunology	$181
2/13/2023	FREQUENCY Therapeutics	Otology	$83
2/9/2023	ORAMED	Metabolic	$156
2/2/2023	magenta Therapeutics	Oncology/Hematology	$128
1/30/2023	QUINCE Therapeutics (1)	Rare Disease	$90
1/24/2023	FINCH	Infectious Disease	$85
11/14/2022	Satsuma	Neurology	$64
11/2/2022	TRICIDA	Metabolic	$80
9/26/2022	exicure	Neurology	$16
9/15/2022	TENAX Therapeutics	Cardiovascular/Pulmonary	$4
6/30/2022	WINDTREE Therapeutics	Cardiovascular/Pulmonary	$8
5/17/2022	Galmed Pharmaceuticals	Metabolic/Immunology	$19
5/12/2022	METACRINE (2)	Gastrointestinal	$53
5/5/2022	ARCA biopharma	Cardiovascular	$42

Source: Capital IQ and public filings as of March 31, 2023.
(1) Echo Capital made a proposal to acquire Quince Therapeutics for $1.60 per share on March 21, 2023.
(2) Equillium agreed to acquire Metacrine in all-stock transaction on September 6, 2022, which was mutually terminated by both parties on December 23, 2022.

Strategic Alternatives Outcomes By Quarter

Since the beginning of 2022, many companies have launched strategic alternative processes due to clinical trial failures and/or lack of funding; the pace of outcomes continues to pick up heading into 2023

Outcome	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Total Since 2022
Reverse Merger Traditional reverse mergers with private companies		Yumanity Therapeutics / Kineta	idera / Aceragen gemini / disc medicine sesen bio / carisma therapeutics Silverback Therapeutics / ARS Pharma	Catalyst Biosciences / GNI imara / Enliven Therapeutics graybug / CalciMedica Vallon / GRI	angion / elicio therapeutics vbl / Notable Adamis / DMK Diffusion Pharmaceuticals Inc. / EIP Pharma	**13 Deals**
Public-Public Merger Public-public mergers following strategic alternatives reviews			TYME / SYROS	ayala pharmaceuticals / ADVAXIS Immunotherapies	erytech / Pherecydes Pharma Infinity / MEI Pharma TCR2 Therapeutics / Adaptimmune	**5 Deals**
Acquisition Full company buyouts following strategic alternatives reviews					Jounce Therapeutics / Concentra Biosciences (1)	**1 Deal**
Chapter 11/Closure Companies pursuing dissolution or liquidation		genocea	Allena Pharmaceuticals clarus Therapeutics	Clovis Oncology PhaseBio Otonomy (2) Sio Gene Therapies	Calithera Codiak Nabriva Therapeutics Rubius Therapeutics	**11 Co.'s**
# of Outcomes	0	2	7	9	12	**30**

Source: Cortellis, SEC Filings, and Company Press Releases as of March 31, 2023.

(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) As part of Otonomy's dissolution, Spiral Therapeutics acquired data, patent rights, and inventory related to OTO-104, OTO-510, and OTO-413 in an asset purchase transaction on March 29, 2023.

Biopharma Reverse Mergers Detail Since 2022

Total of 13 reverse mergers announced with a median premium paid for net cash of ~$15 million since the start of 2022

($ in millions)

Announced Date	Closed Date	Operating Company	Public Shell	Pro Forma Ownership (%) [1]: Operating Company	Pro Forma Ownership (%) [1]: Public Shell	Implied Valuation: Operating Company	Implied Valuation: Public Shell	Net Cash Acquired[1]	Premium Paid Over Net Cash	% Premium To Cash	Concurrent PIPE?	PIPE Size	NewCo. Cash Runway (Months)
03/30/23	Expected Mid-2023	EIP Pharma	Diffusion Pharmaceuticals Inc.	77%	23%	ND	ND	$14.0	ND	ND	×	-	20[1]
02/27/23	Expected Q2 2023	DMK Pharmaceuticals	Adamis	ND	ND	$27.0	ND	ND	ND	ND	×	-	ND
02/23/23	Expected Q2 2023	Notable	vbl	76%	24%	$110.0	$35.0	$15.0	$20.0	133%	✓	$10.3	22
01/17/23	Expected Q2 2023	elicio Therapeutics	angion	66%	35%	$95.0	$50.0	$29.0	$21.0	72%	×	-	11
12/27/22	Expected Q2 2023	GNI	Catalyst Biosciences	97.5%	2.5%	$334.4	$8.6	ND	ND	ND	×	-	ND
12/13/22	Expected Q1 2023	GRI	Vallon	83%	17%	$62.3	$12.7	($3.0)	$15.7	NMF	✓	$15.0	19
11/21/22	03/20/23	CalciMedica	graybug	71%	29%	$100.0	$40.0	$25.0	$6.0	18%	✓	$10.3	22
10/13/22	02/23/23	Enliven Therapeutics	imara	78%	22%	$324.6	$92.0	$82.0	$10.0	12%	✓	$164.5	40
09/28/22	01/17/23	Aceragen	idera	67%	33%	$55.7	$27.4	$27.0	$0.4	2%	×	-	13
09/21/22	03/07/23	carisma Therapeutics	sesen bio	58%	42%	$196.0	$140.0	$125.0 [2]	$15.0	12%	✓	$30.0	27
08/10/22	12/29/22	disc medicine	gemini	72%	28%	$260.0	$100.0	$92.0	$8.0	9%	✓	$53.5	30
07/21/22	11/08/22	ARS Pharma	Silverback Therapeutics	63%	37%	$435.0	$255.0	$240.0	$15.0	6%	×	-	36
06/06/22	12/19/22	Kineta	Yumanity Therapeutics	85%	15%	$194.0	$34.0	$10.0	$24.0	240%	✓	$30.0	25
Mean (n=13)				**74%**	**26%**	**$182.8**	**$72.2**	**$60.5**	**$13.5**	**56%**	**Yes: 54%**	**$44.8**	**25**
Median				**74%**	**26%**	**$152.0**	**$40.0**	**$29.0**	**$15.0**	**12%**	**No: 46%**	**$30.0**	**24**

Source: Cortellis, SEC Filings, and Company Press Releases as of March 31, 2023.
Note: Implied valuation and expected net cash at time of announcement. Estimated pro forma combined company runway based on guidance from merger press releases.
(1) Pro forma ownership split specified at announcement and prior to giving effect to additional share issuance associated with PIPE financing.
(2) Cash runway in part extended by a recent $21M grant which was awarded to EIP Pharma by the NIH in order to fund their ongoing Phase 2b program in Lewy Body Dementia.
(3) Sesen announced a $75M special cash dividend on February 14, 2023 in order to increase stockholder support for the then-pending merger. Net cash does not reflect takeaways from the dividend.

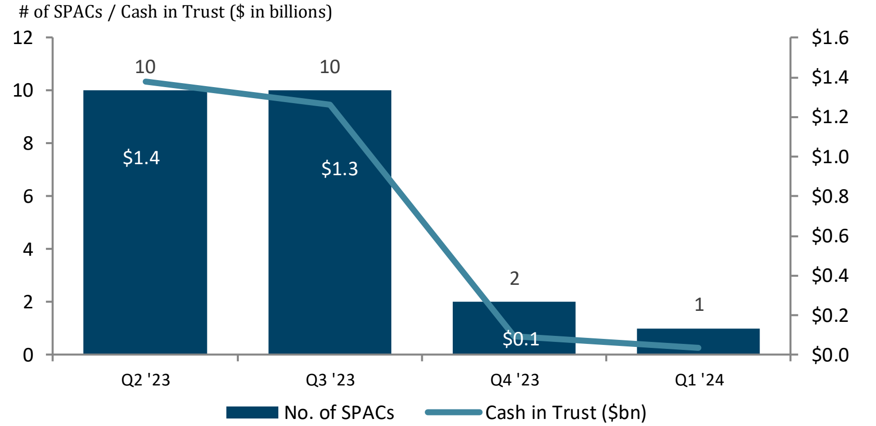
Current State of the BioPharma SPAC Market

As the SPAC market has become increasingly challenged with higher redemptions and terminated mergers, PIPE has become more important both in terms of valuation and closing

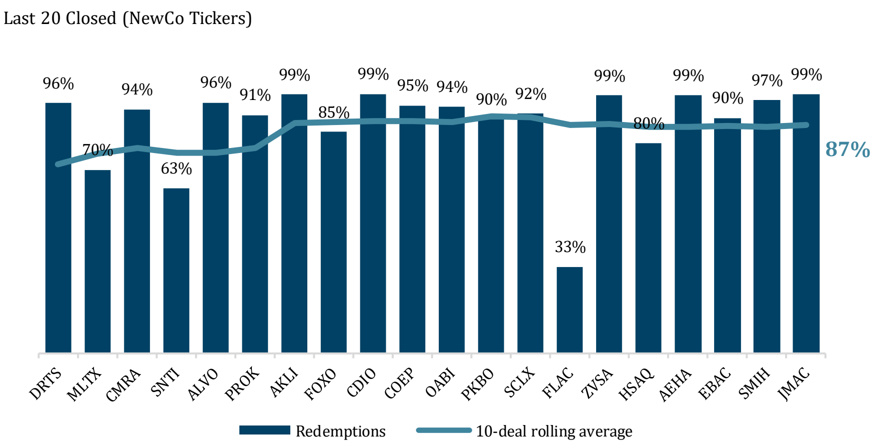
Perspectives on the Current Market

- The SPAC market remains challenged, continuing its correction from unprecedented levels of deal activity in 2020 and 2021 and proposed rule changes regarding SPAC disclosures and advisor liability introduced by the SEC in March of 2022
- The number of SPACs that have liquidated has skyrocketed. 212 SPACs have liquidated LTM versus 12 SPACS to have liquidated before.
- SPAC M&A activity remains at a pace more than two times pre-pandemic levels, with over 187 transactions announced LTM reflecting total enterprise value of ~$100 billion, **with biopharma representing ~12% of deals announced**
- During the last 12 months, the Biopharma sector has seen 20 transactions close, and twelve transactions terminated, three of which occurred in Q1 2023:
    - Good Works II, DTRT Health Acquisition Corp, and FoxWayne Enterprises
- All 23 biopharma SPACs seeking an acquisition will hit their initial expiration date within the next 12 months before extension options
    - Notable SPACs Sponsors include EcoR1, Forbion, MSD Partners, Peterson Partners, Valuence Partners and TPG

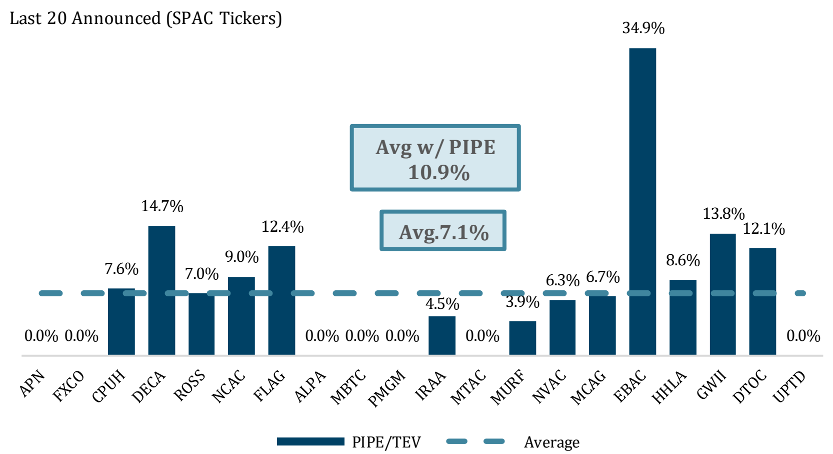
BioPharma SPACs Reaching Termination



Redemption Trends



M&A Structuring Trends: PIPE Sizing



(1) Includes extension options as of March 31, 2023.
Note: Excludes SPACs with incomplete information available.
Source: William Blair, SPAC Research as of March 31, 2023.

Venture Debt in Biopharma

The collapse of SVB coupled with sustained volatility in the equity markets are pushing biopharma companies to nonbank lenders as the primary source of venture debt[(1)]

Market Overview

- Venture debt activity was relatively modest during the first quarter as lenders and borrowers were forced to navigate volatile equity markets and the SVB collapse
- Amend-and-extend activity has increased significantly in 2023
  - Borrowers have no longer been able to rely on refinancing to push out maturity walls
- VC-backed companies continue to look to debt as a means of avoiding a down round amidst falling valuations
- Cash interest rates for venture loans remained relatively stable, even as base rates have continued to rise
  - Credit investors have been able to utilize several different structural "levers" to achieve their desired yield without increased impact on cashflow
- Transaction timelines have lengthened slightly as lenders dive deeper in diligence for new opportunities
  - Lenders are generally looking for broad pipelines, strong management teams, and the ability to raise additional capital
- With significant dry powder still available, the venture debt market is expected to continue to be an attractive source of capital in 2023

Q1 2023 Venture Debt Financings for Public Biopharma Companies

($ in millions)

Date	Company	Available at Close	Total Facility[(2)]	Interest Rate	LTM at Close[(3)] Revenue	LTM at Close[(3)] EBITDA	Market Cap at Close	Debt / Market Cap	Facility / Market Cap	Transaction	Phase of Development
02/15/23	Ardelyx	$23	$23	12.75%	$52	($56)	$600	4%	4%	Amend-and-Extend	Phase III
02/09/23	Madrigal Pharmaceuticals	$65	$250	10.45%	$0	($293)	$4,615	1%	5%	Upsize	Phase III
01/06/23	X4 Pharmaceuticals	$33	$33	11.15%	$0	($88)	$142	23%	23%	Amend-and-Extend	Phase II
01/06/23	89bio	$25	$100	10.25%	$0	($102)	$537	5%	19%	Growth Financing	Phase II
01/05/23	Tarsus Pharmaceuticals	$25	$175	11.45%	$ 26	($62)	$388	6%	45%	Amend-and-Extend	Phase III
Mean (N=5)		**$23**	**$23**	**10.25%**	**$0**	**($293)**	**$142**	**1.4%**	**3.8%**		
Median		**$34**	**$116**	**11.21%**	**$16**	**($120)**	**$1,256**	**7.8%**	**19.1%**		
Minimum		**$25**	**$100**	**11.15%**	**$0**	**($88)**	**$537**	**4.7%**	**18.6%**		
Maximum		**$65**	**$250**	**12.75%**	**$52**	**($56)**	**$4,615**	**22.9%**	**45.1%**		

Silicon Valley Bank Collapse

- SVB has been a linchpin in the venture debt market for 40 years, helping to revolutionize an arcane industry into a $30+ billion market
- SVB's collapse has created temporary gaps in the debt financing market for startups and VC-backed companies
- Former SVB clients are seeking new credit facilities from more stable lenders to continue to fund growth plans and day-to-day operations
- SVB's absence has created a significant opportunity for nonbank lenders to take significant market share
- It is too early to say whether SVB's collapse will lead to higher costs of capital for new opportunities, but we will have a much clearer picture of its impact by the end of the second quarter

Source: CapIQ, PitchBook Data, Inc., and SEC filings as of March 31, 2023.
(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.

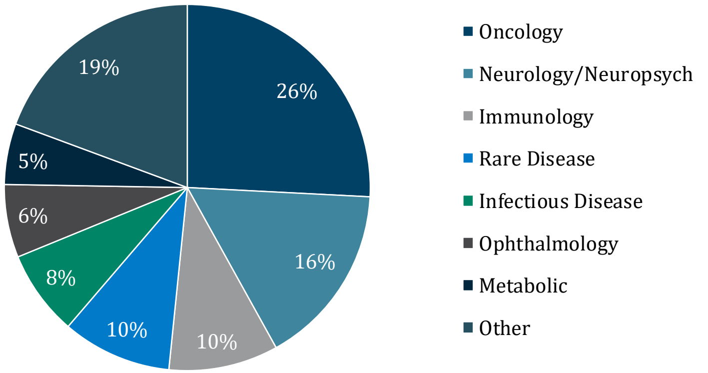
Q1 2023 Clinical Catalysts Analysis

- *String of meaningful clinical catalysts to close out the quarter, including data from 89bio, Biomea Fusion, Intra-Cellular and Viking Therapeutics*
- *6 of the top 10 movers successfully raised catalyst-driven follow-on offerings post-data*
- *2 of the top 10 decliners were companies that announced its trial had met its primary endpoint*

Key Takeaways

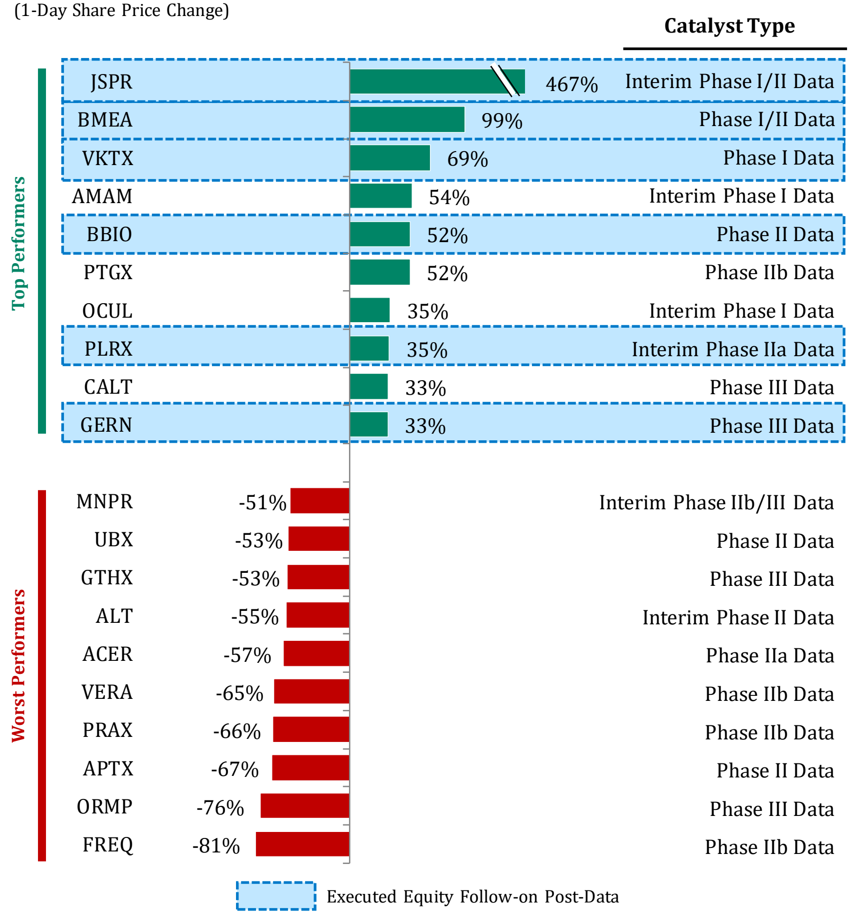
- William Blair analyzed 93 key clinical data readouts in Q1 2023 for US-listed biopharma companies with a market cap between $10M-$30B
- Average stock price performance for "positive" clinical data (N=71):
  - 1-day performance: **+12.6%**
  - 1-week performance: **+11.9%**
- Average stock price performance for "negative" clinical data (N=22):
  - 1-day performance: **(38.5%)**
  - 1-week performance: **(37.5%)**
- ~$1.8 billion in cumulative market cap created across all clinical catalysts (compared to $25 billion in Q3 2022 and $6 billion in Q4 2022), driven by string of positive catalysts to close out the quarter

Breakdown of Clinical Catalysts by Therapeutic Area



Top 10 Positive/Negative Movers

(1-Day Share Price Change)



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, 2023.

Q1 2023 Positive/Negative Clinical Catalyst Performance Detail

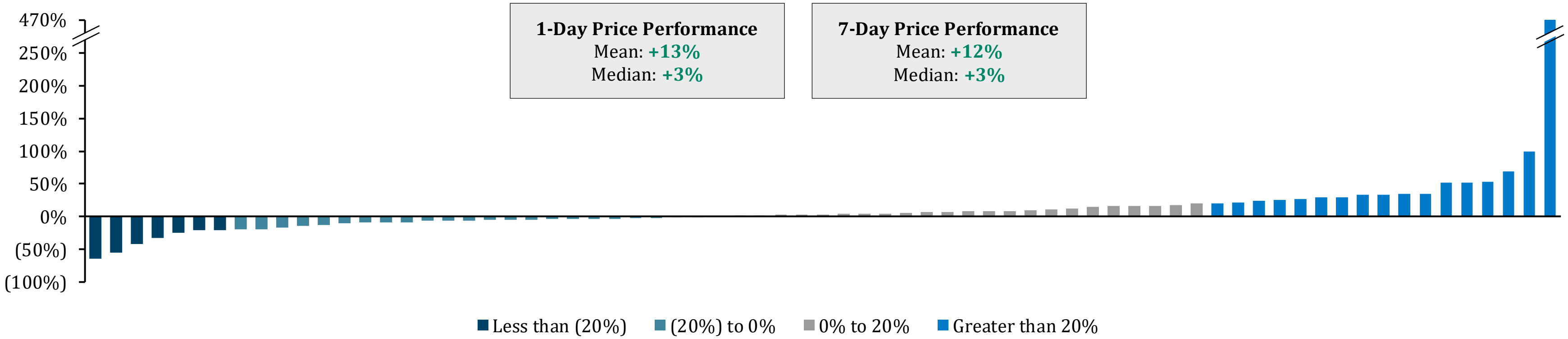
24% of positive clinical catalysts had a >20% one-day stock price movement, while 72% of negative clinical catalysts experienced a one-day price decline greater than 20%

Performance Following a Positive Clinical Catalyst

1-Day Share Price Change (N=71)

1-Day Price Performance
Mean: **+13%**
Median: **+3%**

7-Day Price Performance
Mean: **+12%**
Median: **+3%**

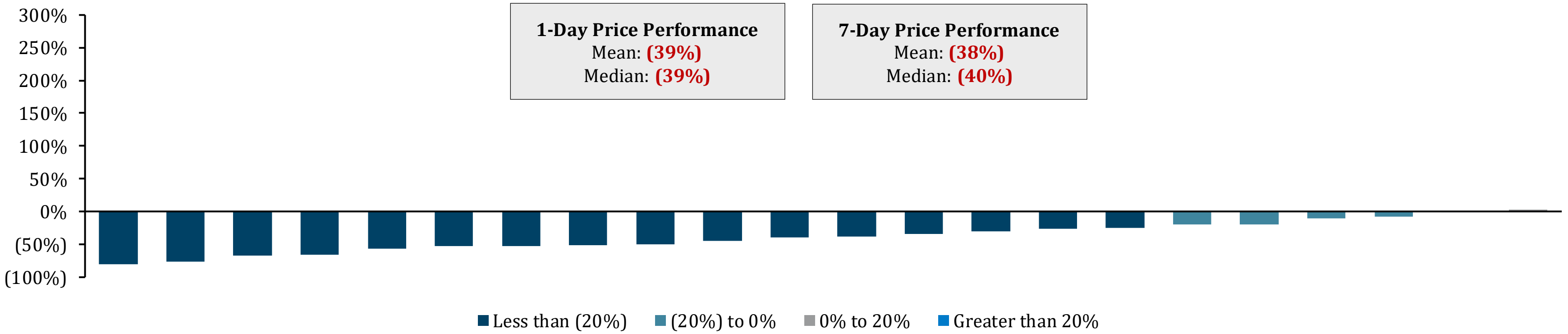


Performance Following a Negative Clinical Catalyst

1-Day Share Price Change (N=22)

1-Day Price Performance
Mean: **(39%)**
Median: **(39%)**

7-Day Price Performance
Mean: **(38%)**
Median: **(40%)**



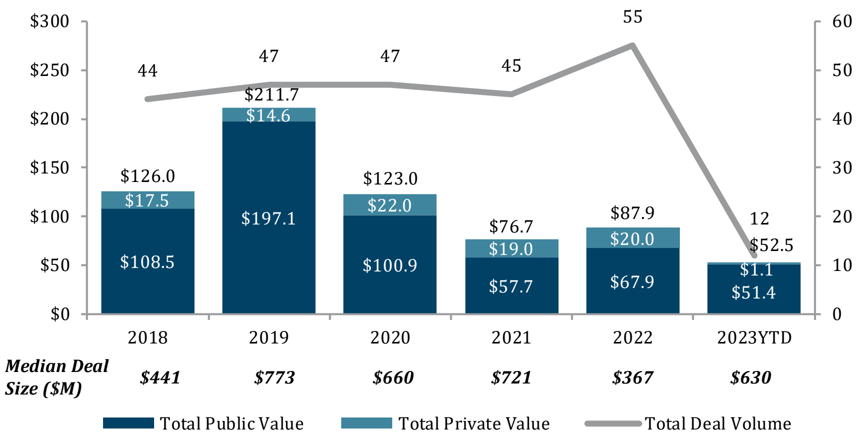
Note: Includes biopharma companies listed on major U.S. exchanges with market capitalization >$10M and <$30 billion at the time of catalyst. Positive/negative based on Company press releases.
Source: FactSet, Company press releases, SEC Filings and William Blair analysis as of March 31, 2023.

Q1 2023 Biopharma M&A Recap

Public M&A deal value up significantly in Q1 2023, driven by Pfizer's acquisition of Seagen; late-stage assets remain in focus as large pharma looks to fill revenue gaps from near-term patent cliffs

Total Deal Value & Volume

($ in billions)



Key Takeaways

- Median deal terms in Q1 2023 were elevated from 2022 levels, but remain depressed compared to years past:
  - **Total Deal Value:** $630M in Q1 2023 (vs. $367M in 2022)
  - **Upfront (Cash+Equity):** $508M in Q1 2023 (vs. $249M in 2022)
  - **Milestones:** $225M in Q1 2023 (vs. $126M in 2022)
- Appetite for public, later-stage assets remains high
  - 100% (8/8) of public acquisitions in Q1 2023 were for Phase II or later; 63% (5/8) of public acquisitions were commercial-stage
- Beyond routine acquisitions, Q1 2023 saw an uptick in public-public share-for-share mergers amongst companies pursing strategic alternatives
- Amongst private acquisitions, 50% (2/4) were for enabling technologies, including Moderna/OriCiro and BioNTech/InstaDeep

Q1 2023 M&A Activity Detail

Public Company Transactions

Date	Target	Acquiror	Total Deal Value	Total Upfront	Premium to Last Unaffected Date	Phase	Therapeutic Area	Modality
03/27/23	Jounce	Concentra Biosciences	$97	$97	75%	Phase II	Oncology	Antibody
03/13/23	proventionbio	sanofi	$2,900	$2,900	273%	Marketed	I&I	Antibody
03/13/23	Seagen	Pfizer	$43,000	$43,000	33%	Marketed	Oncology	ADC
02/15/23	EMERGENT (Travel Health Business)	BAVARIAN NORDIC	$380	$270	NA	Marketed	Infectious Disease	Vaccine
01/19/23	CoNCERT Pharmaceuticals Inc.	SUN PHARMA	$576	$576	10%	Phase III	I&I	Small molecule
01/09/23	CINCOR	AstraZeneca	$1,800	$1,300	121%	Phase II	Cardio	Small molecule
01/09/23	Albireo	IPSEN	$1,179	$952	84%	Marketed	Hepatology, Rare disease	Small molecule
01/08/23	AMRYT PHARMA	Chiesi	$1,475	$1,250	107%	Marketed	Metabolic, Rare disease	Small molecule

Private Company Transactions

Date	Target	Acquiror	Total Deal Value	Total Upfront	Phase	Therapeutic Area	Modality
03/07/23	XINVENTO	Rhythm	$211	$5	Preclinical	Endocrine/ Metabolic	ND
02/02/23	immunome	PURPLE	$101	$7	Preclinical	Oncology	Antibody
01/10/23	InstaDeep™	BIONTECH	$683	$440	$243	AI Drug Discovery	NA
01/04/23	OriCiro	moderna	$85	$85	NA	Synthetic Biology	NA

Note: 2023YTD data as of March 31, 2023. M&A activity includes biopharma deals with disclosed total deal value of $20M+. NA = Not Applicable. ND = Not Disclosed.
Source: PitchBook Data, Inc., Company press releases and websites.

Summary of Investor Capital Returned from Q1 2023 Public Biotech Acquisitions

Public biotech acquisitions announced and completed in Q1 2023 have freed up an estimated $42.0 billion in institutional investor capital, although skepticism exists over how much will be recycled into SMID-cap biopharma given that many healthcare specialist funds were under-indexed the acquired names

($ in millions)

		Total Estimated Capital Returned to Fund(1)							
#	Institution	All	Ex. SGEN	Albireo	AMRYT PHARMA	CINCOR	CoNCERT Pharmaceuticals Inc.	proventionbio	Seagen
1	Baker Bros. Advisors LP	$10,763.9	$21.0			✓			✓
2	The Capital Group Cos., Inc.	$5,809.8	$0.0						✓
3	The Vanguard Group, Inc.	$3,151.9	$186.4	✓		✓	✓	✓	✓
4	BlackRock, Inc.	$2,958.0	$251.9	✓		✓	✓	✓	✓
5	Wellington Management Co. LLP	$2,262.8	$0.0						✓
6	PRIMECAP Management Co.	$1,091.3	$0.0						✓
7	State Street Corp.	$879.1	$66.9	✓	✓	✓	✓	✓	✓
8	JPMorgan Chase & Co.	$850.1	$100.6	✓	✓	✓	✓	✓	✓
9	Fidelity Management & Research Co. LLC	$642.3	$2.7	✓		✓	✓	✓	✓
10	T. Rowe Price Group, Inc.	$612.2	$37.0			✓			✓
11	Norges Bank Investment Management	$500.8	$0.0						✓
12	Geode Capital Management LLC	$500.8	$61.8	✓	✓	✓	✓	✓	✓
13	Franklin Resources, Inc.	$437.9	$40.6	✓					✓
14	Avoro Capital Advisor LLC	$431.7	$0.0						✓
15	Sessa Capital IM LP	$372.0	$372.0					✓	
16	Invesco Ltd.	$294.6	$13.4					✓	✓
17	OrbiMed Advisors Private Equity	$258.8	$49.6			✓			✓
18	UBS Group AG	$248.1	$35.8	✓	✓	✓	✓	✓	✓
19	The Goldman Sachs Group, Inc.	$234.2	$12.3	✓		✓	✓	✓	✓
20	Northern Trust Corp.	$233.4	$29.6	✓		✓	✓	✓	✓
21	Macquarie Group Ltd.	$220.7	$1.8			✓		✓	✓
22	The Bank of New York Mellon Corp.	$211.0	$12.4	✓		✓	✓	✓	✓
23	Banque Pictet & Cie SA	$198.8	$0.0						✓
24	Candriam Belgium SA	$192.0	$7.0			✓		✓	✓
25	Morgan Stanley	$189.2	$22.4	✓	✓	✓	✓	✓	✓
26	Polar Capital LLP	$189.1	$0.0						✓
27	Legal & General Group Plc	$183.0	$1.2	✓		✓		✓	✓
28	TIAA Board of Governors	$182.0	$14.2	✓		✓		✓	✓
29	Voya Financial, Inc.	$168.2	$0.6					✓	✓
30	Sofinnova Investments, Inc.	$157.9	$157.9			✓			

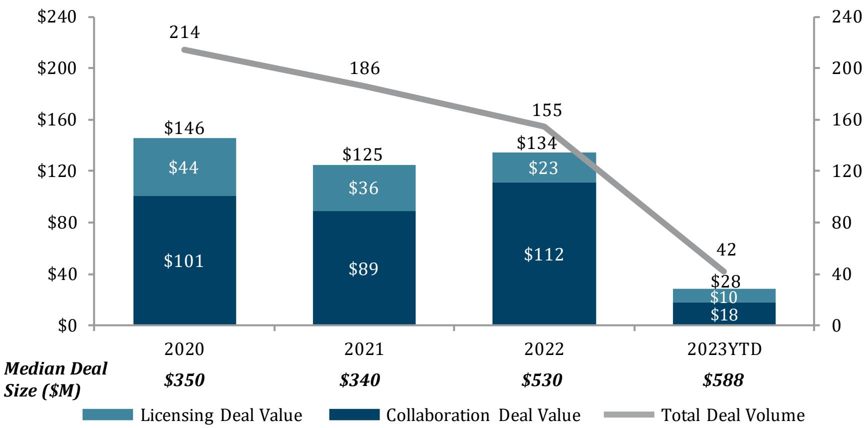
(1) Total estimated capital in millions returned to fund based on the cumulative $ value position of all target companies. $ value position calculated based on Q4 2022 publicly disclosed institutional ownership of target company multiplied by publicly disclosed final/latest announced per share acquisition price. The following outlines acquisition prices utilized in the analysis: Ipsen's acquisition of Albireo Pharma for $42.00/share, Chiesi Farmaceutici's acquisition of Amryt Pharma for $14.50/ADR, AstraZeneca's acquisition of CinCor Pharma for $26.00/share, and Sun Pharma's acquisition of Concert Pharmaceuticals for $8.00/share, Sanofi's acquisition of Provention Bio for $25.00/share, and Pfizer's acquisition of Seagen for $229.00/share.
Note: The analysis does not include retail, management, strategic investors, and non-filers.
Source: Factset and William Blair Analysis as of March 31, 2023.

Q1 2023 Biopharma Partnerships Trends

Overall partnering activity down in Q1 2023, with 42 deals announced compared to 51 deals in Q1 2022, however total upfront payments remain in line at $2 billion

Total Deal Value and Volume

($ in billions)



Q1 2023 Top 5 Partnerships by Total Upfront

($ in millions)

Date	Licensor	Licensee	Total Deal Value	Total Upfront	Equity Investment	Milestones	Phase	Therapeutic Area	Modality
1/23/23	HUTCHMED	Takeda	$1,130	$400	NA	$730	Approved	Oncology	Small molecule
1/9/23	voyager	NEUROCRINE BIOSCIENCES	$1,714	$214	$39	$1,500	Phase 1	Neurology	Gene therapy
3/20/23	OncoC4	BIONTECH	ND	$200	NA	ND	Phase 2	Oncology	Antibody
1/23/23	CLINIGEN	IOVANCE	$208	$166	NA	$42	Marketed	Oncology	Cell therapy
3/27/23	CRISPR	VERTEX	$330	$100	NA	$230	Discovery	Metabolic	Gene editing

Key Takeaways

Licensing (N=23)

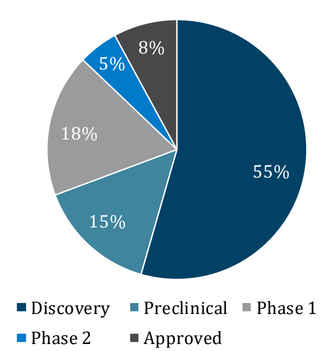
- Median deal terms for licensing agreements:
  - **Total Deal Value:** $535M in Q1 2023 (vs. $247M in 2022)
  - **Upfront (Cash+Equity):** $15M in Q1 2023 (vs. $17M in 2022)
  - **Milestones:** $466M in Q1 2023 (vs $245M in 2022)
- Small molecule therapeutics accounted for 48% of deals (N=11) in Q1 2023

Collaborations (N=18)

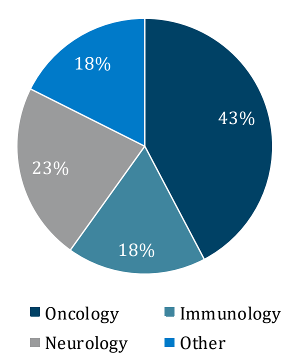
- Median deal terms for collaborations in Q1 2023:
  - **Total Deal Value:** $743M in Q1 2023 (vs. $530M in 2022)
  - **Upfront (Cash+Equity):** $53M in Q1 2023 (vs. $45M in 2022)
  - **Milestones:** $1,015M in Q1 2023 (vs $1,000M in 2022)
- Early-stage deals accounted for 94% of collaborations (N=17) in Q1 2023, all of which were platform deals

Q1 2023 Breakout of Partnerships

Stage of Development



Therapeutic Area



Source: Company press releases and SEC filings as of March 31, 2023.
NA = Not Applicable. ND = Not Disclosed. Excludes partnerships with undisclosed deal terms. Note: Early-stage defined as Phase 1 or earlier.

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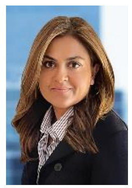

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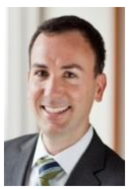

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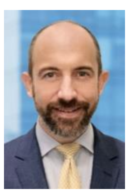
Healthcare Equity Capital Markets



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