

2018 biopharma VC & startup report

Banner year for biotech, despite year-end volatility

Banner year for VC and IPOs, despite volatility

\$17 billion

Global venture investment in
biopharma

\$5B in Series A investment

46 VC-backed US IPOs¹

Raised \$5.6B in IPO proceeds
after raising \$8.6B in venture
capital

Aggregate post-money valuation
of \$33.5B

**Aggregate increase in market
cap of VC-backed IPOs of 12%
from IPO price to 12/31/2018
excluding MRNA (1% increase
including MRNA)³**

\$26 billion

Upfront consideration for 19 VC-
backed M&A exits²

\$37B total consideration
including milestones

¹Includes VC-backed biotech IPOs that raised over \$50M on NASDAQ or NYSE

²Includes mergers and acquisitions of VC-backed biotech startups that raised venture money since 2013 and were acquired for upfront consideration of at least \$75M

³Calculated as total market cap of VC-backed IPOs at 12/31/2018 / total market cap of VC-backed IPOs based on IPO price

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites, SEC filings, press releases, company websites

Next-gen platforms achieving rapid, outsized exits

**Novartis buys AveXis for \$8.7B,
April 2018 (founded 2010,
Series A in 2014)**



**Celgene buys Juno for \$11.1B,
January 2018 (founded and
Series A in 2013)¹**



**Moderna goes public at \$8.1B
market cap, December 2018
(founded and Series A in 2010)**



**Allogene goes public at \$2.2B
market cap, October 2018
(founded 2017, Series A in 2018)**

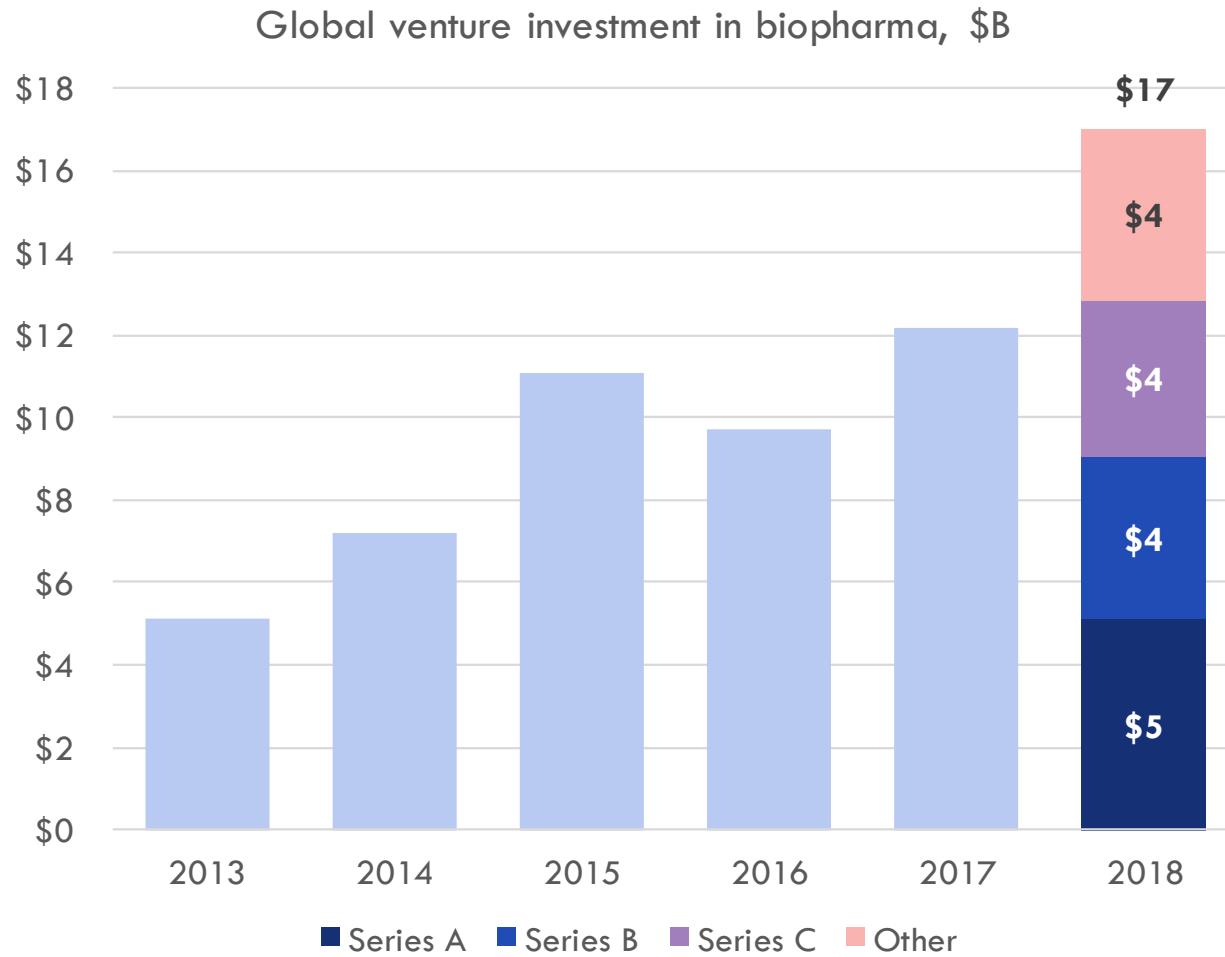


**Rubius goes public at \$2.0B
market cap, July 2018 (founded
2013, Series A in 2014)**



¹Celgene paid \$9B for 90.3% of Juno shares it did not own, net of Juno cash and marketable securities; total enterprise value of \$10.3B, total equity value is \$11.1B
Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

\$17B in global biopharma VC investments



Record year for biopharma venture capital investing

\$5B invested in Series A rounds in 2018: as much as all biotech venture investments in 2013

Source for 2013-2017 data: Evaluate Ltd. Vantage 2019 Preview http://www.evaluate.com/sites/default/files/media/download-files/Evaluate_Vantage_2019_Preview_0.pdf

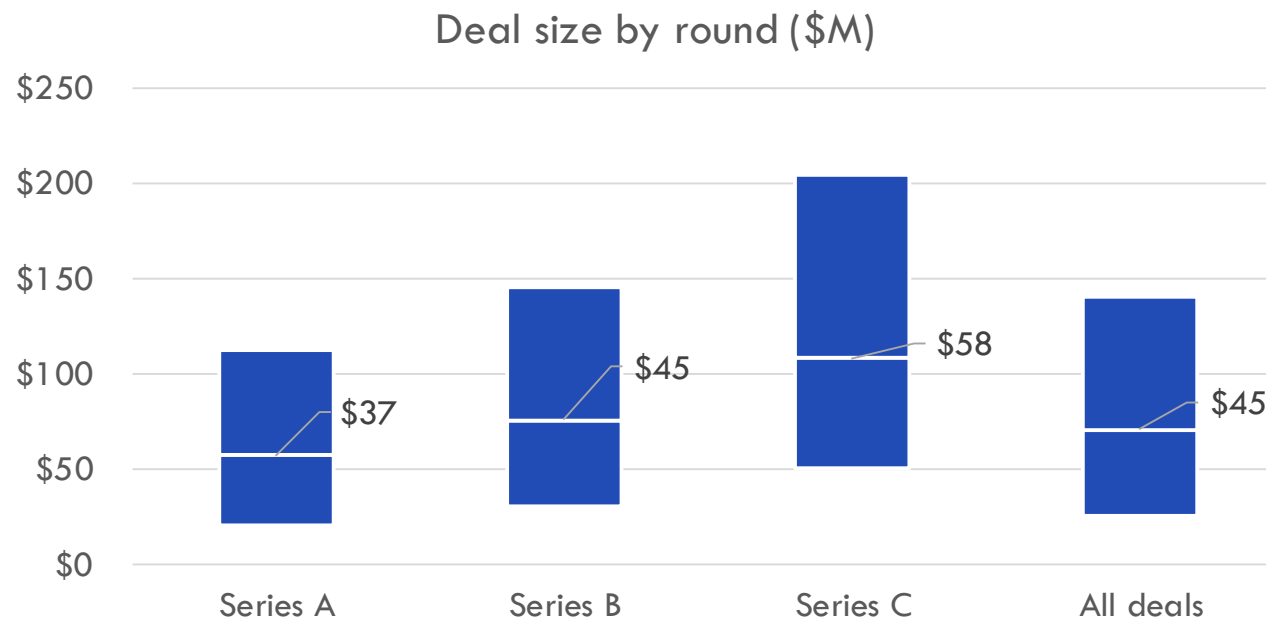
Source for 2018 data: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

The year of the megaround

41 deals over \$100M accounted for \$7.4B of investment

10 Series A investments over \$100M accounted for \$1.8B of investment

Transition from lean asset development model to platform model?



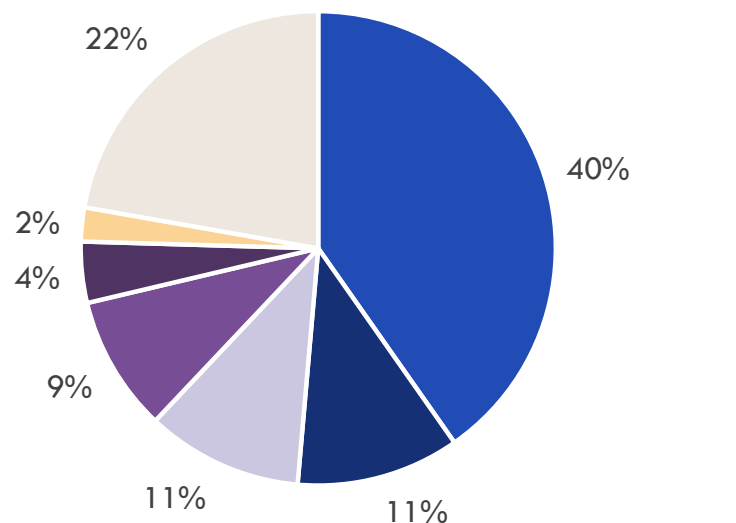
25%	\$20	\$30	\$50	\$25
50%	\$37	\$45	\$58	\$45
75%	\$56	\$70	\$96	\$70
Mean	\$50	\$57	\$83	\$61
Count	103	69	46	277

Larger rounds can provide cushion against contraction in funding markets, ability to lock in valuation through later-stage value inflection, and/or provide firepower to build a platform and advance multiple assets

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

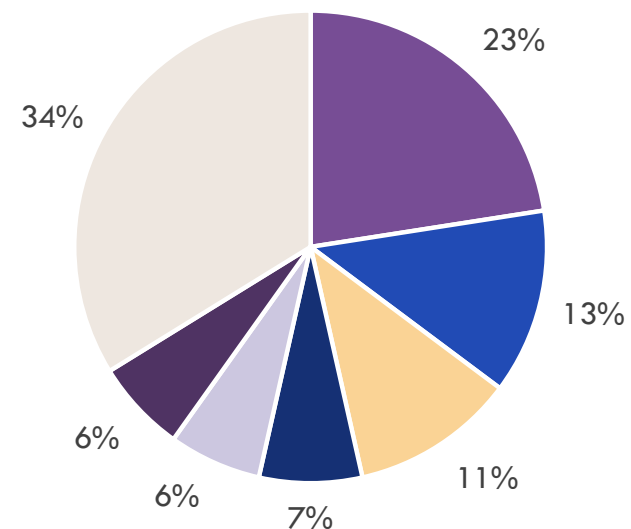
Specialists dominate Series A, generalists follow

Series A lead investors by category



- US biotech VC
- Pharma corporate VC
- US generalist VC
- Trans-Pacific
- EU biotech VC
- Crossover
- Other

Series B lead investors by category

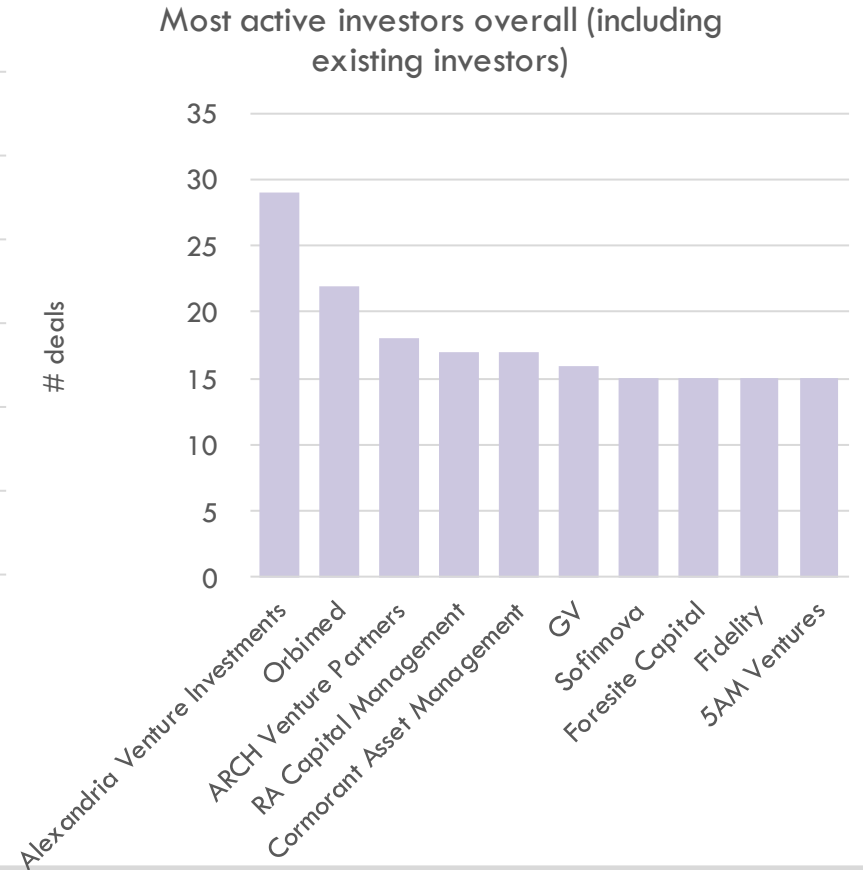
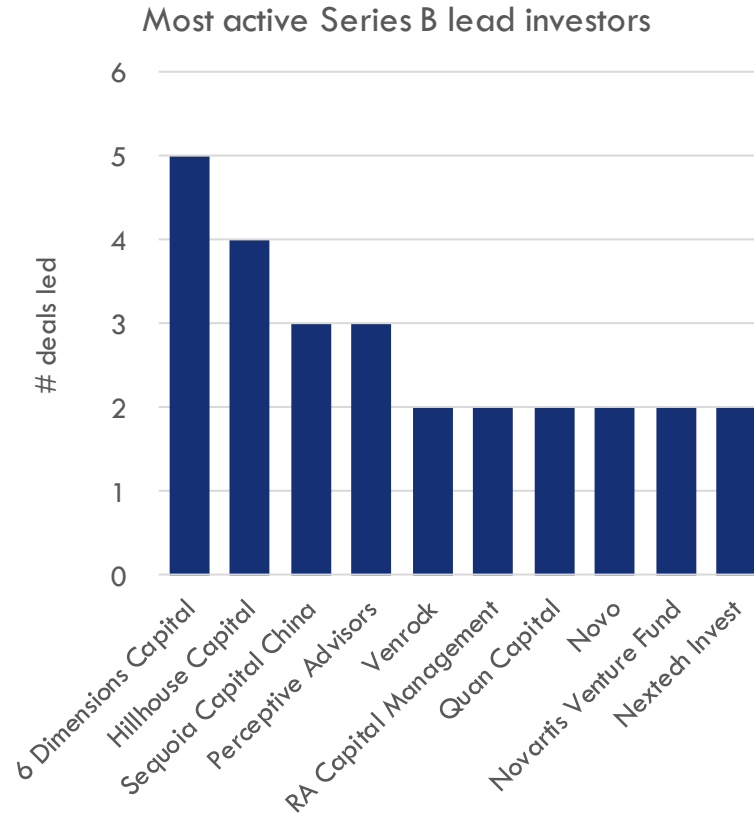
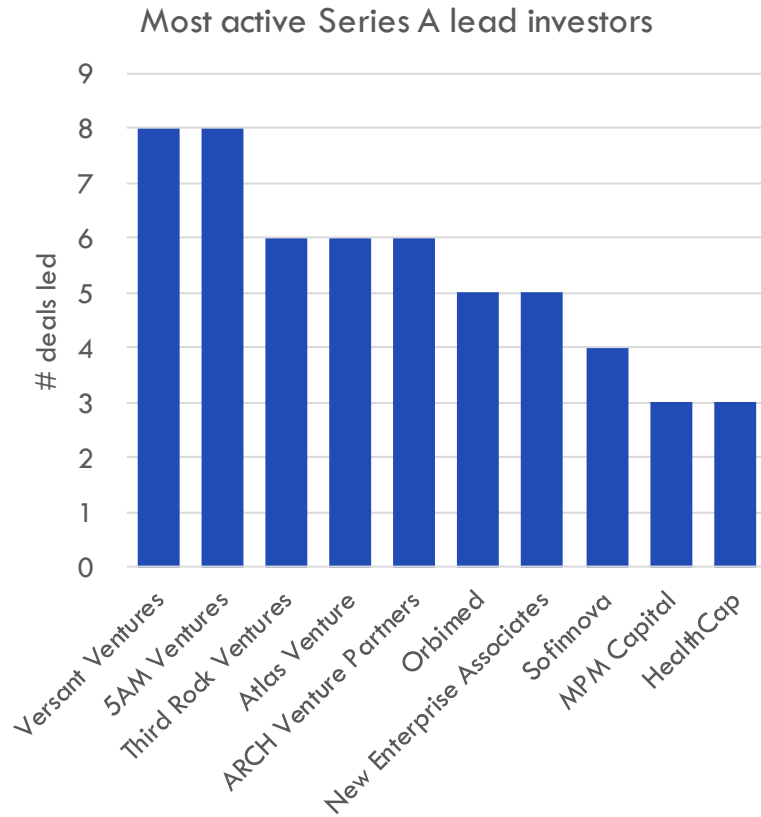


- Trans-Pacific
- US biotech VC
- Crossover
- Pharma corporate VC
- US generalist VC
- EU biotech VC
- Other

A handful of specialist US biotech VCs dominate Series A funding. Series B and later-stage investing is much more crowded, with Chinese investors and crossover investors playing active roles. Generalist “tech” VCs have kept their distance from therapeutics, preferring “picks and shovels” companies that provide services or products to drug developers.

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

Few active lead investors



There are few active lead investors in biopharma, with most investors playing follow-on roles. Further, most of the leading Series A investors create many of the companies they fund in-house. This reflects the complexity of the space – early stage biotech requires significant expertise – and potentially drives the rising deal sizes in biopharma: there is more capital in the sector, but most of these investors will not lead, so more capital follows a relatively flat number of deals.

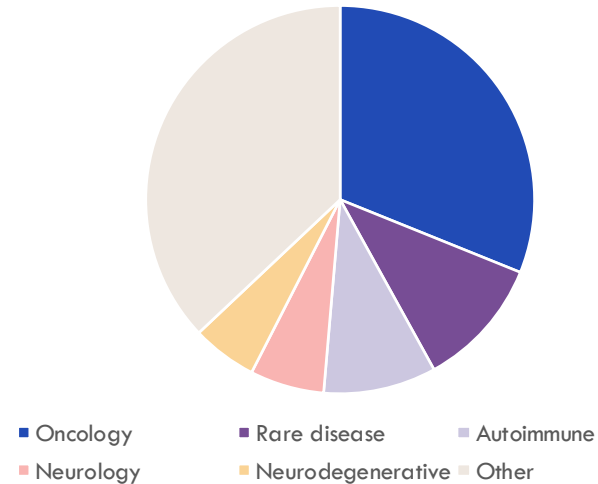
Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

Oncology still strong, CNS and autoimmune rising

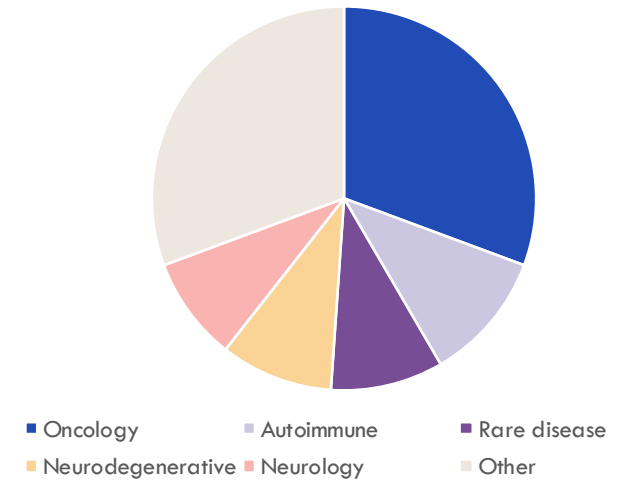
Oncology remains the most active area of investment across the investment lifecycle

Autoimmune and neuro (neurology + neurodegenerative) investments on the rise, with **more Series A investments in neuro and autoimmune companies than rare disease**

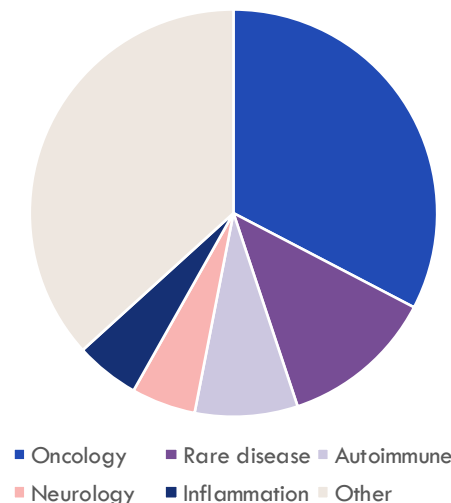
Investments by therapeutic area, all deals



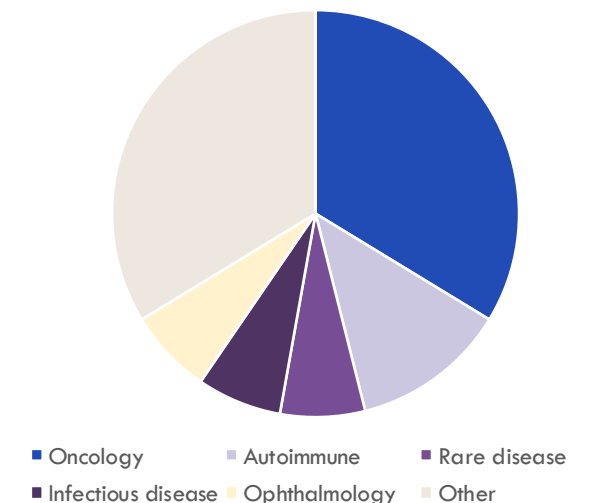
Investments by therapeutic area, Series A



Investments by therapeutic area, Series B



Investments by therapeutic area, Series C+D

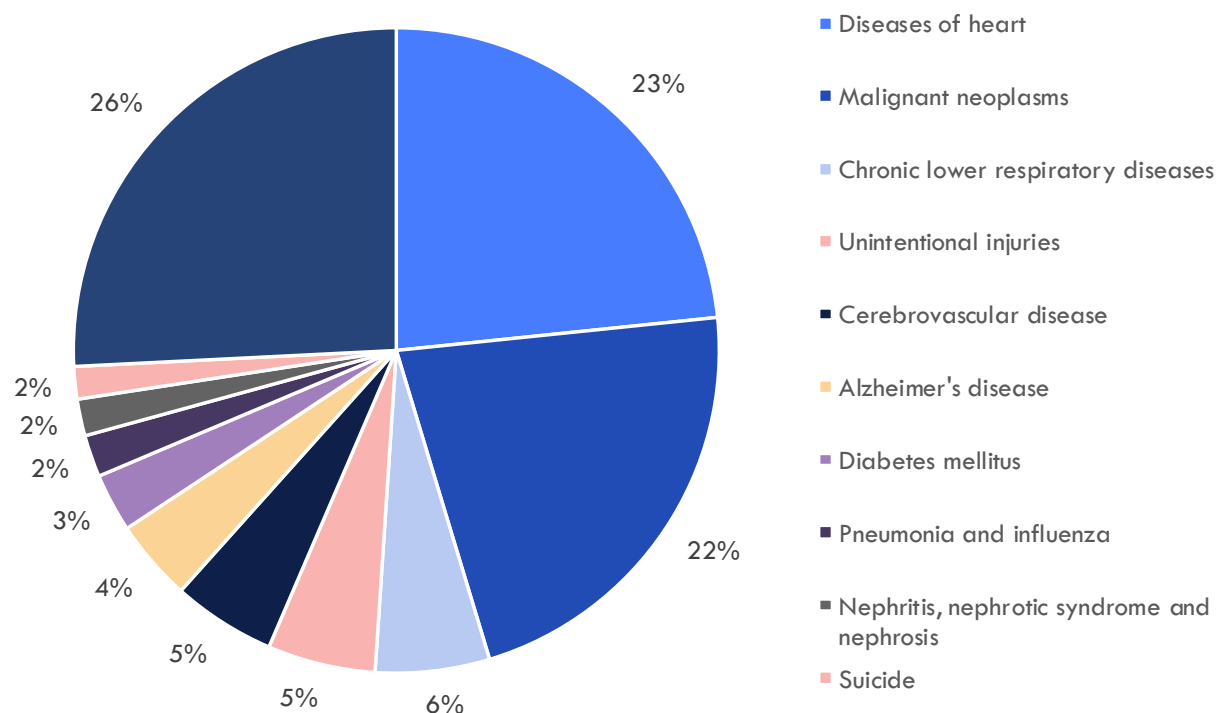


Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

Note: Some companies have multiple therapeutic areas, so some deals are counted more than once

Moving beyond cancer and rare disease?

Unmet need: top 10 causes of death in US, 2015



Significant unmet need beyond cancer and rare disease¹

Investors beginning to fund indications previously thought intractable due to regulatory, clinical or technical limitations, specifically in neuroscience and neurodegeneration

Investors also funding companies translating biological insights from immuno-oncology to autoimmune disease, neuro-inflammation and other indications

Business models are adapting as well: applying the cancer / rare disease “personalized medicine” playbook to other diseases: homogenous, often genetically defined subpopulations with significant unmet need, efficient path to clinical proof of concept

Source: CDC, <https://www.cdc.gov/nchs/data/hsr/hsr16.pdf>

¹ Rare disease as a whole is potentially a top 10 cause of lost years of life: ~30M people in the US with rare disease, 50% are children, 30% of whom die before age of 5 per Global Genes <https://globalgenes.org/rare-diseases-facts-statistics/>

Snapshot: innovation in neuro

Significant unmet need in neuro:

- Alzheimer's is only top-10 cause of death in US with no treatments to prevent, cure or treat underlying disease and is rapidly growing cause of mortality
- Mental illness, through suicide and drug overdose, causes about as many years of lost life before age 75 as heart disease, and over five times as many as diabetes, because mental illness largely effects young people¹

Investment limited in last few decades due to biological complexity, challenging clinical development and trial design, heterogenous patient populations, and subjective diagnoses

Biological / biochem insights creating new therapeutic opportunities



New therapeutic modalities create new ways to modulate biology



Focus on rare subsets of disease with homogenous patient populations



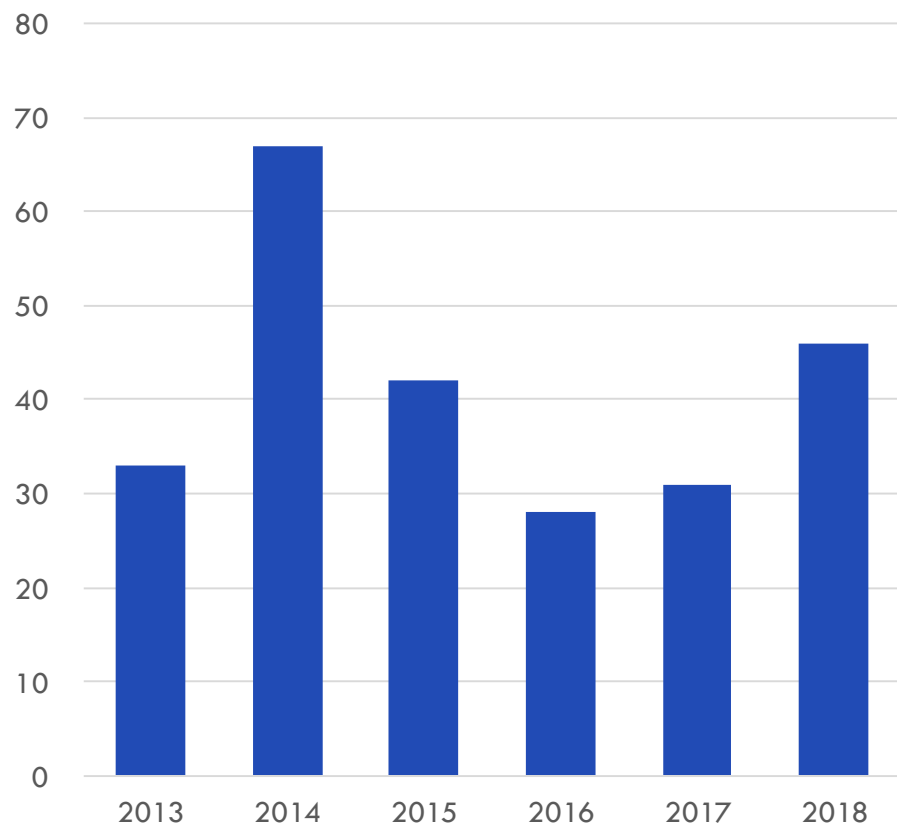
Source: CDC, <https://www.cdc.gov/nchs/data/hus/hus16.pdf>; NAMI, <https://www.nami.org/learn-more/mental-health-conditions/related-conditions/suicide>;

¹90% of suicides related to mental illness (suicide is #10 cause of death), more than half of years of lost life before age 75 due to "unintentional injuries" related to poisoning (typically due to drug overdose)

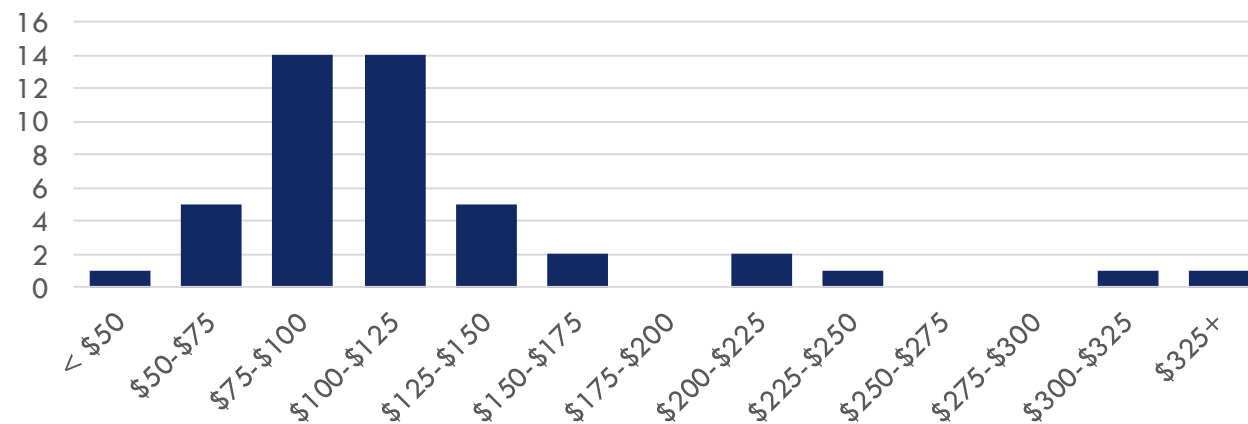
Not all listed companies focus exclusively on neuro, but have at least one neuro program

IPO window remains open throughout 2018

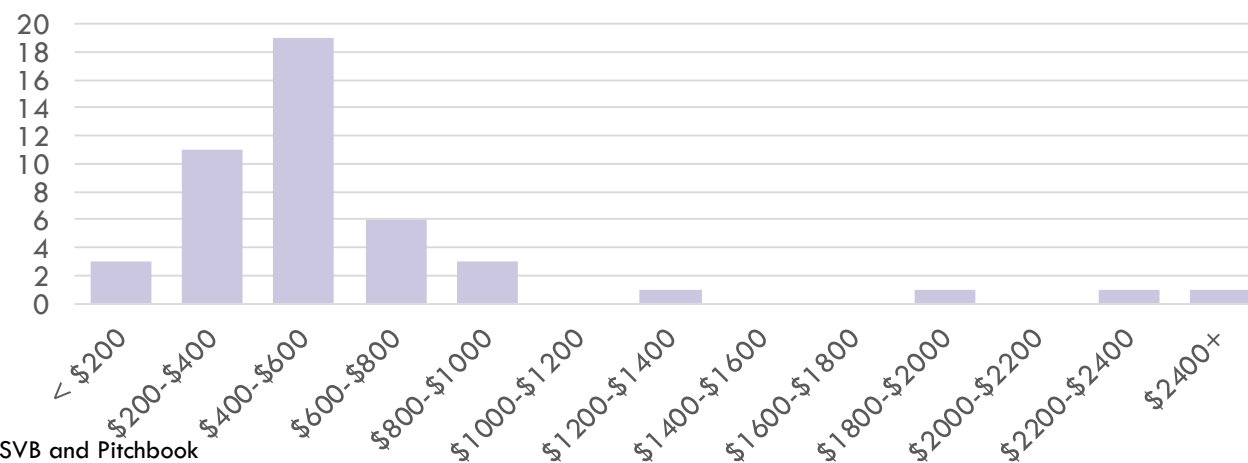
Number of VC backed biotech IPOs over \$50M



Number of IPOs by proceeds raised (\$M)



Number of IPOs by post-money valuations (\$M)



Source for 2014-2017 data: SVB Trends in Healthcare Investments and Exits Report Mid-Year 2018, SVB and Pitchbook

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

VC-backed biotech IPOs over \$50M include VRCA SURF LOGC TORC ARDS KZR UMRX THOR REPL AVRO EIDX CRNX KOD ETTX XERS SRRK MNLO YMAB ARVN MGTX ITRM APTX FIXX SLDB MGTA ALLK LQDA TBIO FTSV TCDA NTGN EVLO ARMO GRTS PRNB AUTL STRO UBX RCUS RUBY CNST TWST KNSA ORTX ALLO MRNA

Which funds benefited most from 2018 IPOs?

Flagship tops list of VCs benefiting from IPOs, with two investments with market caps at IPO over \$2B (Moderna and Rubius)

Alta and Rivervest benefit from large stakes in Allakos, which is up almost 200% since IPO

Sycona benefits from large investment in Autolus

An IPO is not always an exit: with IPOs just 3-4 years after Series A; investors can let returns season on public markets

Fund name	Total market value of investments in companies that went public		Est. total \$ invested pre- IPO	Est. cash-on-cash return	
	at IPO price	at 12/31/2018 price		at IPO price	at 12/31/2018 price
Flagship Pioneering	\$2,522	\$1,749	N/M	N/M	N/M
Baker Bros. Advisors	\$537	\$782	N/M	N/M	N/M
Orbimed	\$546	\$762	N/M	N/M	N/M
Alta Partners	\$233	\$608	N/M	N/M	N/M
Syncona	\$207	\$400	\$69	3.0x	5.8x
RiverVest	\$131	\$379	\$22	5.9x	17.0x
ARCH Venture Partners	\$305	\$360	\$72	4.2x	5.0x
F-Prime Capital Partners	\$361	\$344	N/M	N/M	N/M
5AM Ventures	\$245	\$316	\$61	4.0x	5.2x
Woodford	\$134	\$260	\$61	2.2x	4.3x

Amount invested not available for every company

Only includes data for companies where investors own 5%+ of common stock

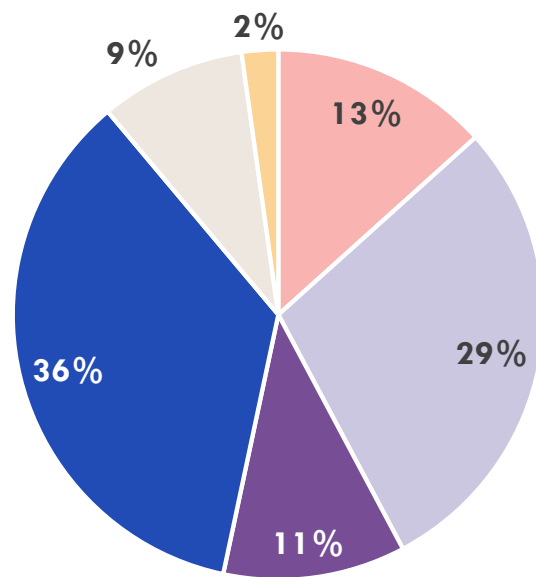
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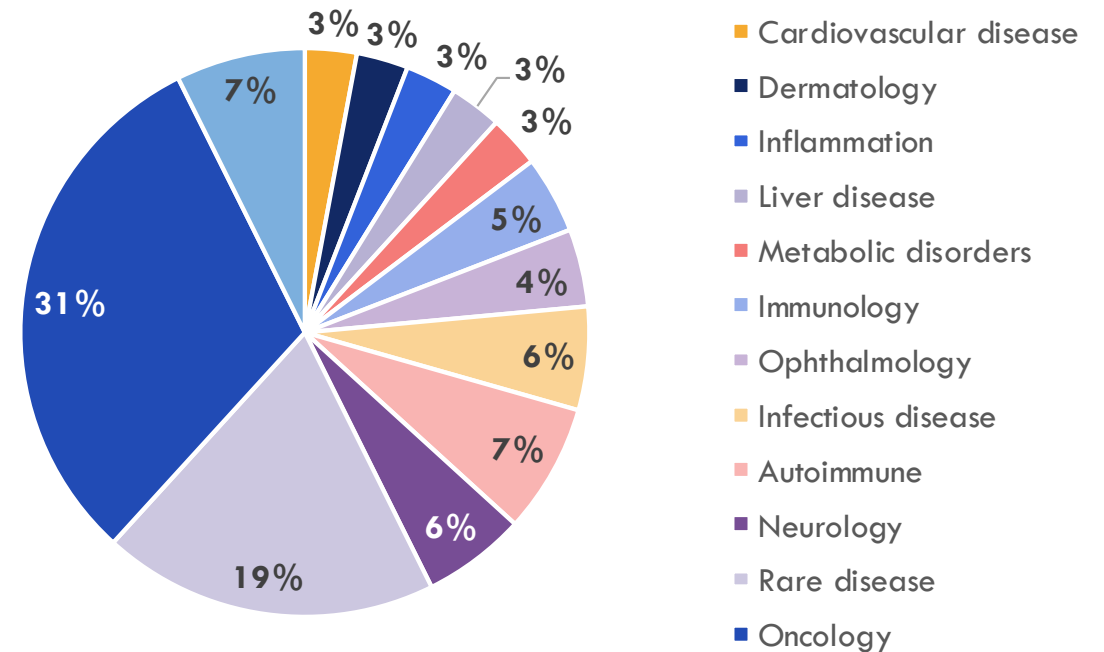
Phase 1-2, cancer and rare disease IPOs common

Development stage at IPO for 2018 VC backed IPOs over \$50M

Preclinical Phase 1 Phase 1/2 Phase 2 Phase 3 Commercial



Therapeutic area for VC backed IPOs over \$50M

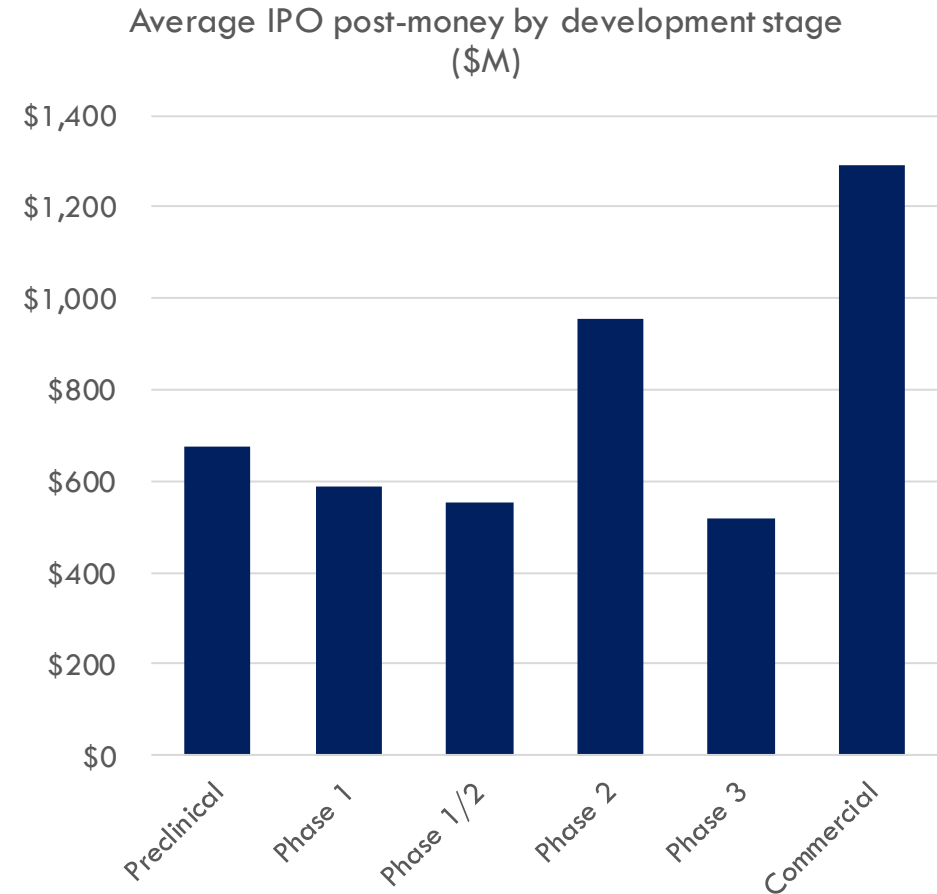
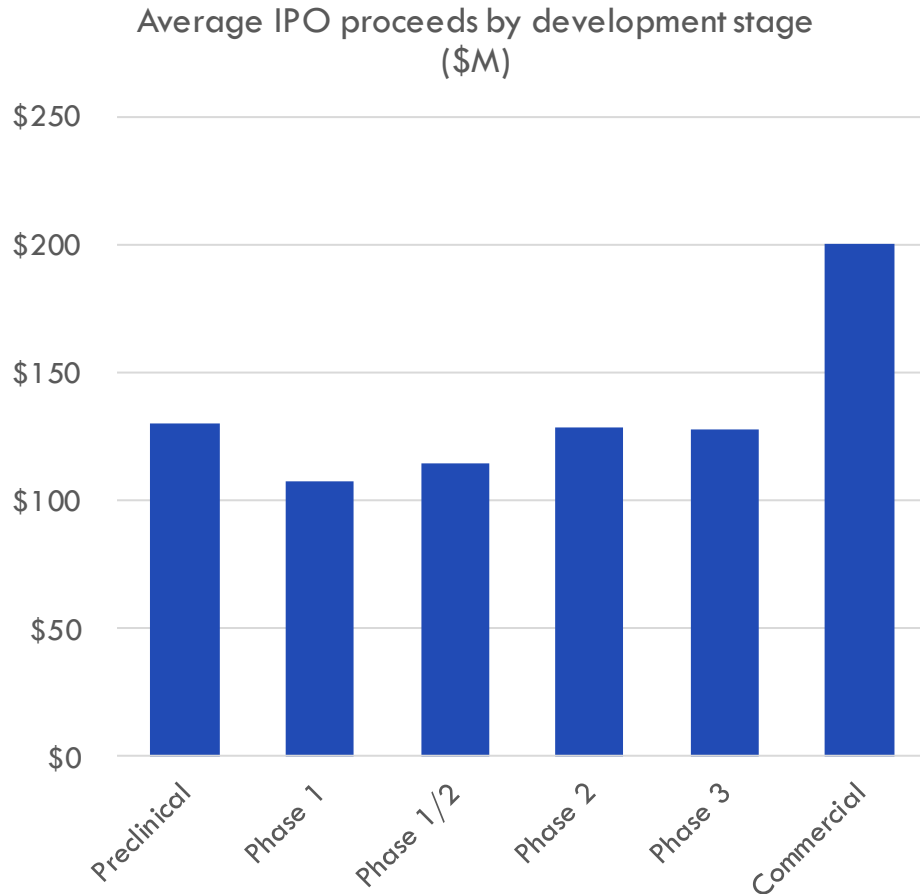


Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

Some companies have multiple therapeutic areas; only most advanced development stage is shown

VC-backed biotech IPOs over \$50M include VRCA SURF LOGC TORC ARDS KZR UMRX THOR REPL AVRO EIDX CRNX KOD ETTX XERS SRRK MNLO YMAB ARVN MGTX ITRM APTX FIXX SLDB MGTA ALLK LQDA TBIO FTSV TCDA NTGN EVLO ARMO GRTS PRNB AUTL STRO UBX RCUS RUBY CNST TWST KNSA ORTX ALLO MRNA

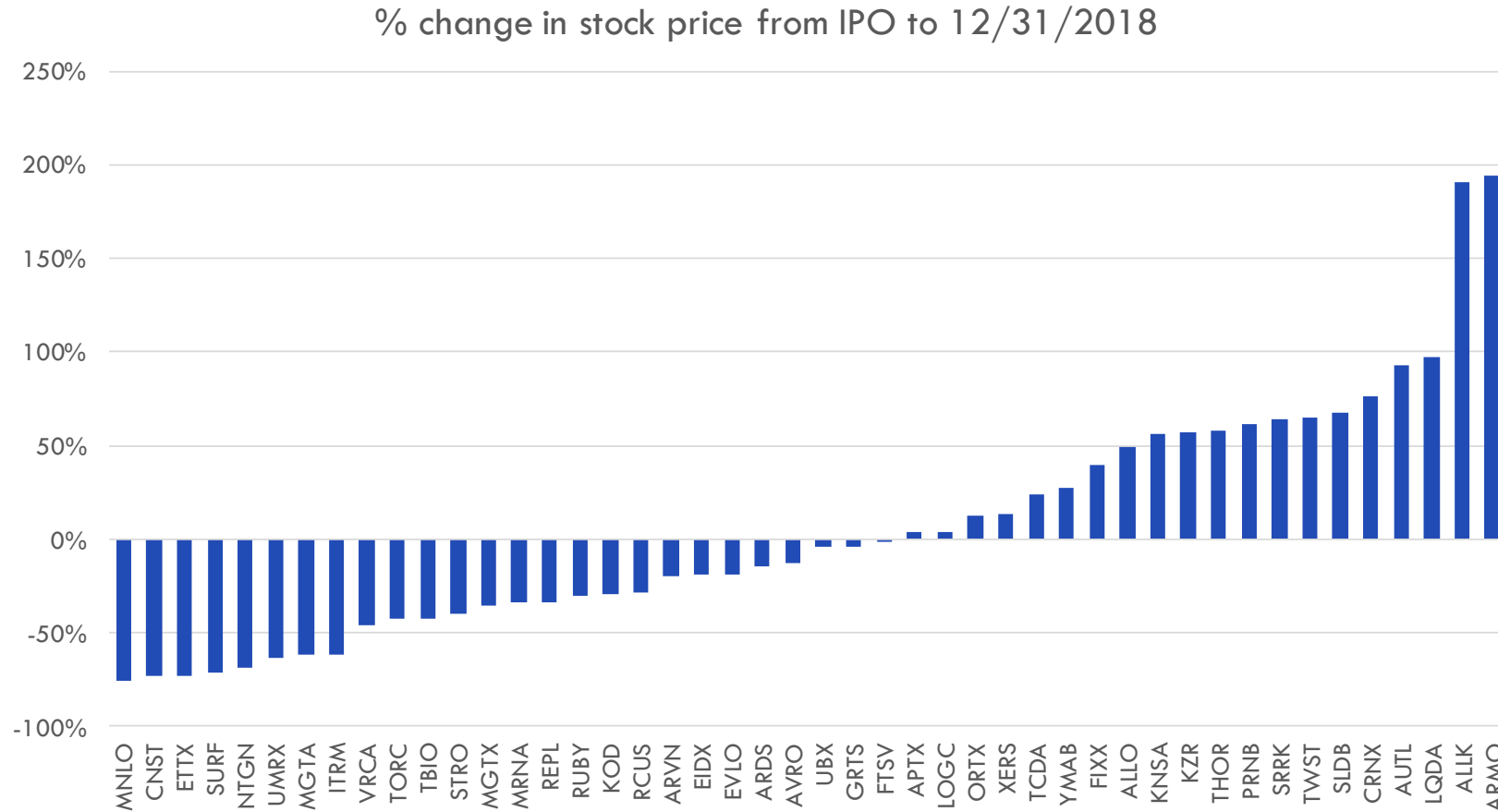
Valuations consistent across stages



Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites

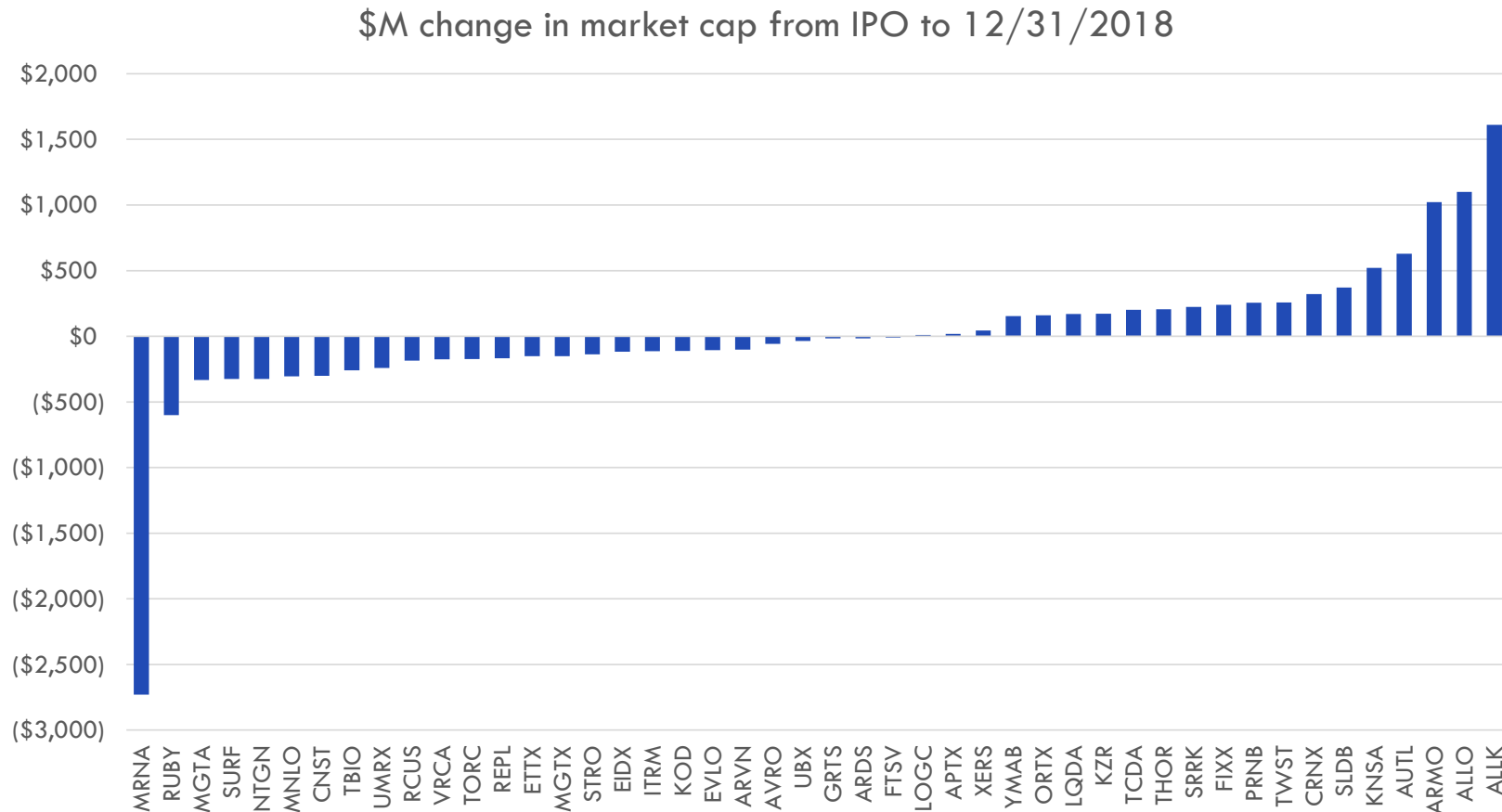
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Wide distribution in % returns of IPOs



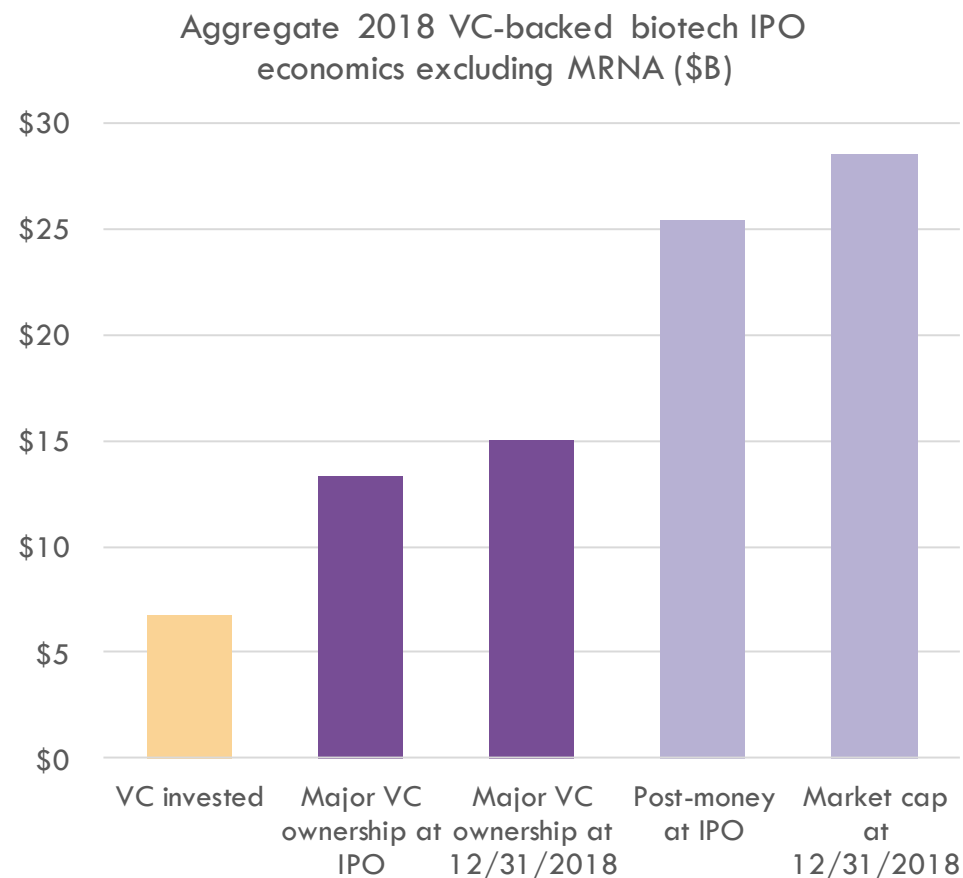
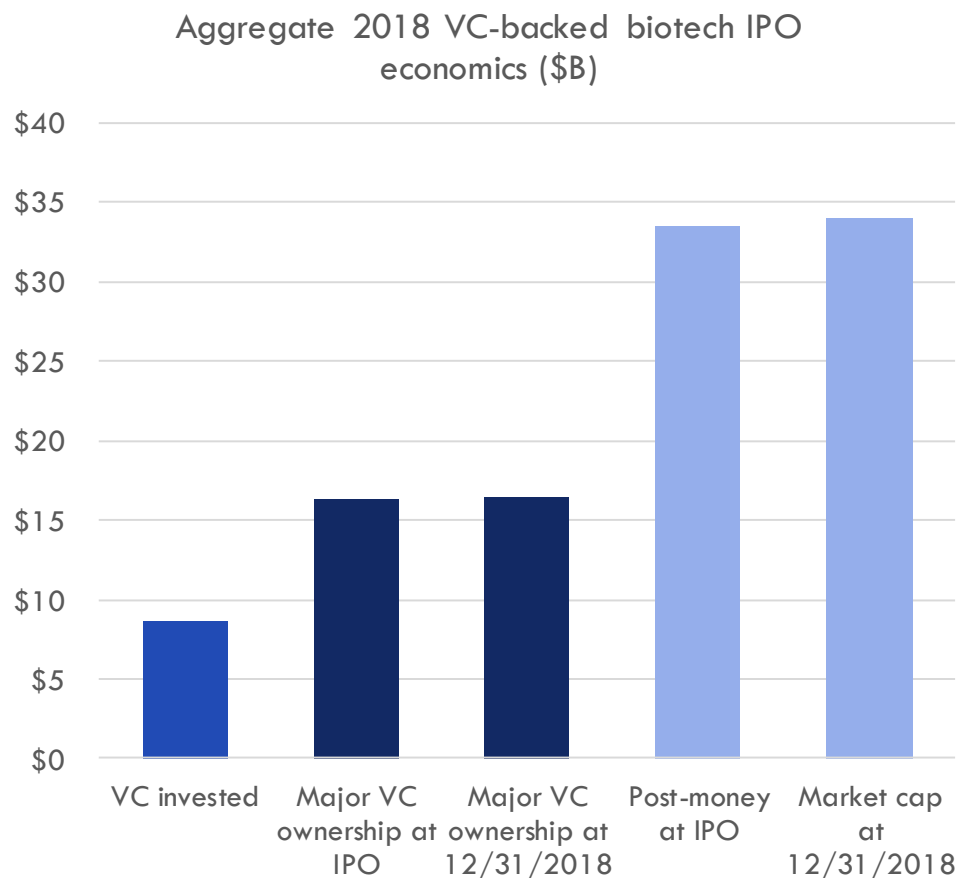
Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites; note that major VC ownership only includes investors owning 5% or more of outstanding stock, so understates total VC returns

Moderna \$ losses outweigh rest of sector gains



Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites; note that major VC ownership only includes investors owning 5% or more of outstanding stock, so understates total VC returns

Major VC-backed biotech IPOs outperform



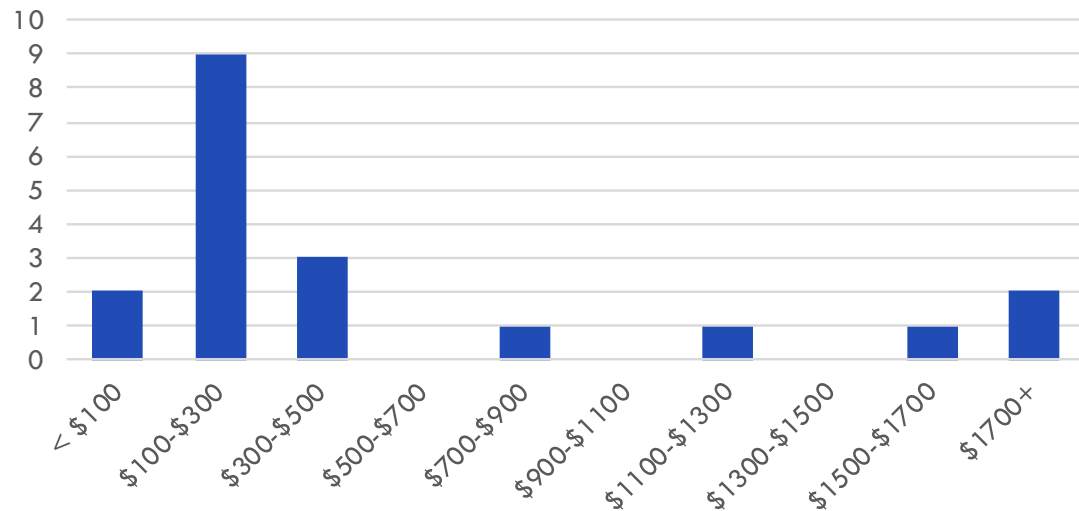
Excluding Moderna, major 2018 VC-backed IPOs as a market-cap-weighted class **returned 12% from IPO price to 12/31/2018** despite NASDAQ Biotech Index being down -12% and XBI down -25% from 6/30-12/31/2018. VCs returned ~3x from venture investment to 12/31/2018. Average company was **founded in 2012 and raised initial Series A in 2014**.

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites; note that major VC ownership only includes investors owning 5% or more of outstanding stock, so understates total VC returns

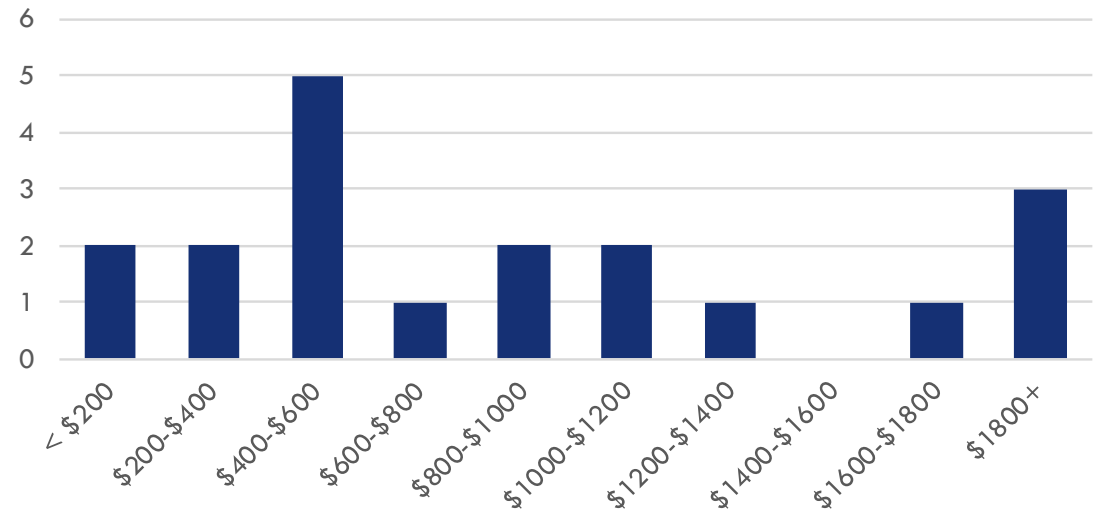
\$26B upfront, \$37B total in VC-backed M&A

Two deals, Juno's acquisition by Celgene and AveXis' acquisition by Novartis, account for **75% of total upfront consideration and 53% of total consideration**

Number of VC-backed startups acquired by upfront consideration (\$M)



Number of VC-backed startups acquired by total consideration (\$M)



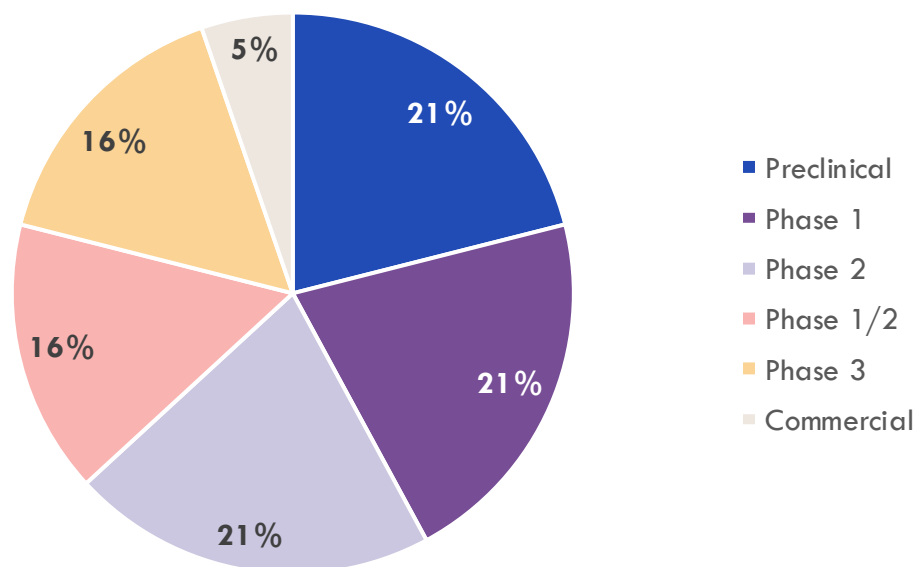
VC-backed M&A includes biotech companies acquired for at least \$75M upfront that raised venture capital since 2013

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites; note that major VC ownership only includes investors owning 5% or more of outstanding stock, so understates total VC returns

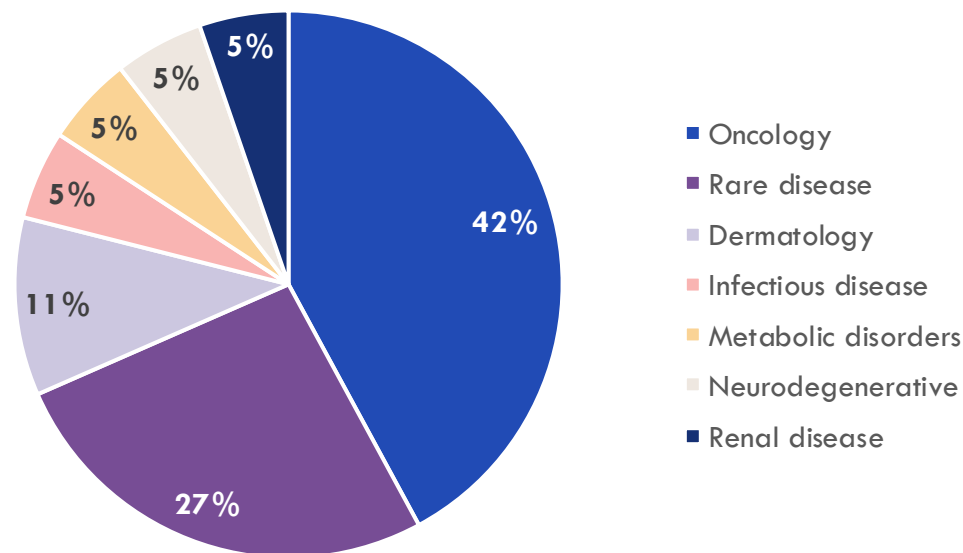
Oncology, rare disease primary M&A focus

The only deals commanding \$500M+ upfront were pivotal / Phase 3 assets (including Juno and AveXis)

VC-backed M&A by development stage



VC-backed M&A by development stage



VC-backed M&A includes biotech companies acquired for at least \$75M upfront that raised venture capital since 2013

Source: Bay Bridge Bio, LLC, SEC filings, press releases, company websites; note that major VC ownership only includes investors owning 5% or more of outstanding stock, so understates total VC returns

2019 outlook and key questions

Will IPO window remain open?

High-quality 2018 VC-backed biotech IPOs have been solid performers even amidst volatility. There is a robust pipeline of quality crossover-backed companies that will be in a position to IPO in 2019. One can certainly envision a scenario where fundamental supply / demand balance in the IPO market is intact throughout 2019, although the market seems at least temporarily fragile.

If there is significant shakeout from Moderna's performance or general deterioration in the NBI, XBI and S&P, the window could tighten, but remaining IPO investors will be able to access a quality pipeline of IPO candidates at potentially attractive valuations. Poor performance in the clinic from the 2018 IPO class could put a damper on interest in new IPOs, but there do not appear to be any specific causes for concern at this point.

The bigger risks include concern over drug pricing legislation and macro concerns (the Fed, trade, etc). On the other hand, increased M&A activity would likely reinvigorate the market, especially given low expectations now that Celgene is now "out of play" as an active buyer.

If the IPO window tightens, or closes, crossover investors may pull back from A and B rounds. This may deflate Series B and later-stage valuations, which have ticked up in the last few years in relation to Series A valuations. If Chinese investors retreat due to trade issues, this will be exacerbated. Combined with the increase in supply of high-quality Series A companies, established specialist Series B and later-stage investors (Sofinnova, New Leaf, Longitude, Orbimed, etc) may enjoy an abundant supply of attractively valued investment opportunities. Atlas' announcement of its Opportunity Fund for later-stage investments and Versant's announcement of \$700M in new funds suggests that early stage investors are preparing for a world with more restricted late-stage capital.

If the IPO window remains open, and there is a glimmer of hope for M&A, it would seem that the trend of investors moving increasingly earlier in the investment lifecycle would continue, potentially with more investors creating companies in-house.

2019 outlook and key questions

Pricing and M&A

In 2019, pricing and M&A activity will be, as always, important drivers of the industry's health. Pharma fundamentals are still shaky, with R&D productivity continuing to decline, a second patent cliff still a threat, and price increases under pressure. Pharma has plenty of dry powder to deploy in attempts to fix its ills. However, it is unclear whether pharma will return to a strategy of aggressive startup M&A or whether it will pursue other strategic alternatives (more BMS-Celgene-type deals, asset swaps, changing international strategies, more discovery collaborations, JVs, etc.).

It is unclear how the drug pricing debate will play out in 2019, but this has the potential to be the most important issue facing the industry. We have no unique insight on the political situation, but pricing is an issue even apart from potential legislation. Pricing potentially curative novel modalities like gene and cell therapy is still an unsolved problem with major ramifications around funding of innovation. Novartis / AveXis' Zolgensma will be a key launch to watch.

2019 outlook and key questions

Upside scenario: a new generation of standalone commercial biotech companies?

An M&A-averse pharma industry combined with a welcoming IPO window, abundant venture capital, and transformative new therapeutic modalities that are outside of pharma's traditional small molecule and biologics competencies could conceivably lead to the creation of a new class of independent, profitable biotech companies.

A number of innovative biotechs, some with true platforms, are nearing commercialization of their first major drugs. If they end up going it alone – and succeeding – could we see a new generation of REGN, AMGN, or CELG, (or, dare we say, Genentech)? Or a new breed of specialty pharma? This will be a trend that plays out beyond 2019, but will be interesting to watch. Companies to watch over the next year or two include Sage, Bluebird, Agios, Loxo, Ionis / Akcea, Alnylam, GW Pharma, and Ultragenyx.

The following is a sample of information available in premium reports

To access premium reports, visit

https://www.baybridgebio.com/2018_report.html

2018 biopharma venture investments

Profiles of \$17B in global biopharma venture investments

2018 biopharma venture investments

Company name	Date	Amount (\$M)	Round	Lead investors	Other new investors	Existing investors	Therapeutic areas	Stage	Company description
Pear Therapeutics	1/2/2018	\$50	Series B	Temasek		5AM Ventures, Arboretum Ventures, Bridge Builders Collaborative, EDBI, Jazz Venture Partners, Novartis Venture Fund	Neurology	Commercial	Prescription digital therapies for neurological disease, lead product reSET for substance use disorder
DNAexus	1/2/2018	\$58	Series E	Foresite Capital	Microsoft	Claremont Creek Ventures, GV, MidCap Financial, TPG Biotech, Yipu Capital	Not provided		Biomedical informatics and data management platform focused on cloud-based management of genomics data for clinical trials
NexImmune	1/2/2018	\$23	Series A	ArrowMark	Piedmont Capital Partners	Barer & Son	Oncology	Preclinical	Platform for simultaneously enriching, activating and expanding endogenous T cells directed at multiple tumor-relevant antigen targets using nanoparticle-based "artificial antigen presenting cells"
Centrexion Therapeutics	1/2/2018	\$67	Series D	NEA	6 Dimensions Capital, ArrowMark, Efung Capital, Quan Capital	Barer & Son, Undisclosed	Pain	Phase 3	Non-opioid, non-steroidal therapeutics for treatment of chronic pain using synthetic, ultra-pure injections of capsaicin; partnership with IveniAI for computational analysis of pain pathways; joint veterinary program including canine osteoarthritis models with better predictive power than other preclinical models; designing clinical trials for efficient proof of concept
Elstar Therapeutics	1/3/2018	\$39	Series A	Apple Tree Partners			Oncology	Undisclosed	Antibody-based, multi-functional therapies to treat cancer; platform enables generation of molecules with up to four distinct functional domains
Scholar Rock	1/3/2018	\$47	Series C	Invivo	Redmito	ARCH Venture Partners, Cormorant Asset Management, EcoR1	Rare disease,	Preclinical	Drugs that selectively modulate growth factor activation in the disease microenvironment; partnership with

To access the full list of 2018 venture fundings (and more), visit https://www.baybridgebio.com/2018_report.html

About

About Bay Bridge Bio

Bay Bridge Bio supports the next generation of biopharma entrepreneurs. We connect talented PhD students and postdocs from leading research institutions with top-tier biopharma investors and entrepreneurs to learn about the world of biopharma, build relationships, find jobs, and start companies.

Learn more at <https://www.baybridgebio.com/>

About the author



Richard started Bay Bridge Bio to introduce entrepreneurially minded young scientists to the world of biopharma startups and empower them to reach their career goals.

Previously, he co-founded a venture-backed orphan drug company, worked as a summer finance and BD analyst at Verily (fka Google Life Sciences), was a healthcare investment analyst at Investor Growth Capital (a late-stage venture capital and public equity fund) and a healthcare investment banking analyst at Wells Fargo Securities. He has a BSc in Economics from Duke University and MBA from Columbia.

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