McKinsey & Company

China biopharma - Stepping on the global stage

November 16, 2021

2021 in the mirror: Eight key trends

1

Healthcare central to 14th Five Year Plan

2

Demographic shifts spark new demand

3

Rise of tiered healthcare infrastructure and payers

4

Pivot towards scientifically differentiated innovation

5

Start of the “go global” journey

6

Momentum behind creative partnerships

7

Dawn of biologics manufacturing

8

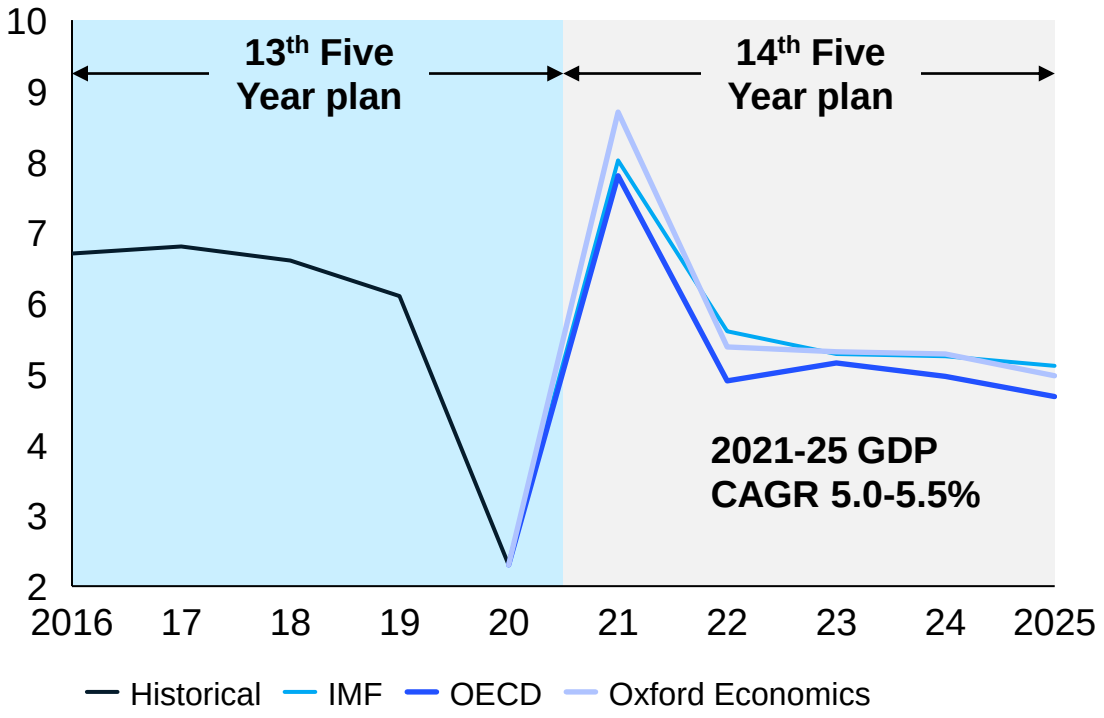
Tech players integration into healthcare

Source: McKinsey analysis, Nov 2021

1: Healthcare remains the government's top priority in 14th Five Year Plan (FYP)

Outlook for China GDP growth falling back post-COVID …

China Real GDP growth 2016-25
Percent



… yet healthcare remaining central with major goals set in 14th FYP

R&D expenditure increases at 7% p.a.
14th FYP targets 7% growth p.a. by 2025 for R&D expenditure, of which at least 8% devoted to basic research

3 healthcare-related frontiers of science and technology
Government policy and ~100 bn RMB funding support brain sciences, genetics and biotechnology, as well as clinical medicine advancement

BMI[1] reform for funding sustainability
Key initiatives include municipal / provincial funding coordination, outpatient mutual aids, dynamic NRDL update, and DRG/DIP roll-out

Ambitions for biopharma hubs in regional FYPs
Biopharma as strategic focus for China's 3 megalopolises,[2] e.g., Shanghai targets making biopharma a 186 bn USD business by 2025

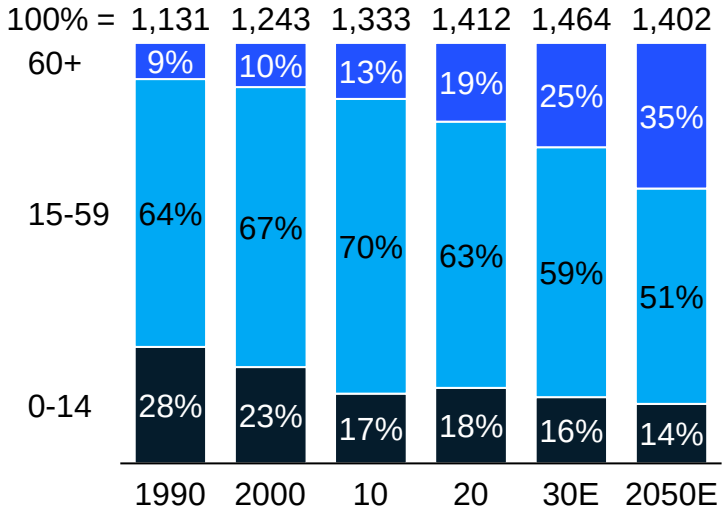
1. BMI: Basic Medical Insurance, 基本医疗保险
2. Beijing-Tianjin-Hebei, Yangtze River Delta and Guangdong–Hong Kong–Macau Greater Bay Area

Source: IMF; EIU; OECD; Oxford Economics; McKinsey analysis, Nov 2021

2: Accelerated ageing population and three-child policy spark new healthcare opportunities

Accelerated ageing China population

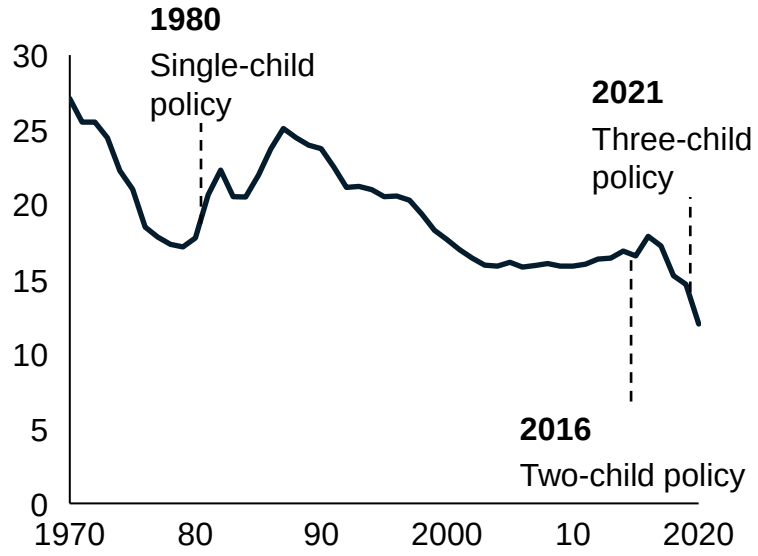
China population by age group
Mn persons, percent



Ageing and delayed retirement lead to expanding wealthier senior population with enhanced affordability for healthcare services

Three-child policy aims to boost birth rate

1978-2020 China births per year
Mn births



While uncertainty remains on the scale and duration of its impact, three-child policy will likely unlock high-end fertility demand

Healthcare demand grows across three domains

Healthy ageing
- Disease management
- Nutritional supplements
- Assistive devices
- Senior care communities

Fertility services
- *In vitro* fertilization
- Artificial insemination
- Preimplantation diagnosis
- Prenatal testing

Pediatric care
- Vaccinations
- New-born screening
- Neonatal nursing
- Allergy treatment

Source: MGI; National Bureau of Statistics; McKinsey analysis, Nov 2021

3: Tiered healthcare infrastructure and payer systems aim to achieve higher efficiency while addressing diverse patient needs

Strengthening of tiered healthcare system

Establishing national and regional centers

10
national medical centers YTD[1]

120
provincial medical centers by 2025

Enhancing county-level specialty care

500
county hospitals to upgrade to Class III during the 14th Five Year from 450 in 2018

Leapfrogging primary care network

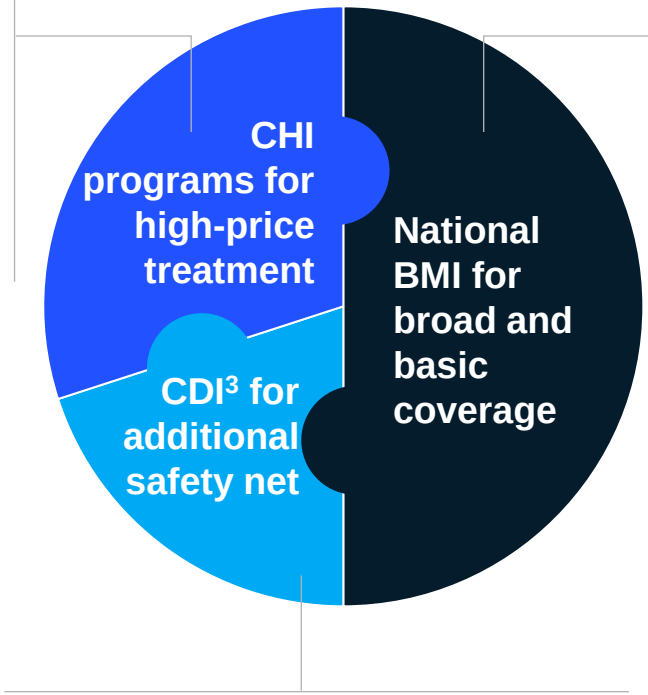
500
community hospitals to be built out of existing CHC/THC[2] by end of 2021

1. As of October, 2021
2. CHC: community healthcare center; THC: township healthcare center
3. CDI: critical disease insurance
4. CBMI: city benefit medical insurance

Emergence of multi-payer system

2 tn RMB total CHI premium by 2025 with

CBMI[4] expanded to **300+** cities in 2021



2.48 tn RMB for total BMI fund, with **10-15%** increase in fund raised for residents in 2021

Raising reimbursement benefits, e.g.,

60%+ in reimbursement ratio

Source: 14th Five Year Planning; NHC; MOH database; Xinhuanet.com, June 2020; Med.China.com, June 2021; McKinsey analysis, Nov 2021

4: China biopharma begins to pivot toward scientifically differentiated innovation

NON-EXHAUSTIVE

CDE encourages clinical-value-oriented innovation

Push towards clinical-value-oriented drug development

Clinical development guidelines on multiple TAs (e.g., oncology, pediatric, rare disease) released in 2021 re-emphasizing clinical value and patient centricity

以临床价值为导向的抗肿瘤药物临床研发指导原则

Clinical Value-oriented Anti-tumor Drug Clinical Development Guideline

Harmonization of development standards and review systems with global

Implemented 70%+ ICH[1] standards, enabling China to participate in MRCT[2] and globalization of China-developed assets

Local biopharma leaders elevate R&D ambition

Shift of focus to early-stage targets for developing potential FIC/FID[3]; global R&D centers in 4 continents led by industry veterans

Target of 50+ preclinical programs, ~50% with first-in-class potential; bolstering in-house clinical operations

Aims for transformative pipeline with FIC/BIC[3] and 2+ global blockbusters in 5-10 years

Internal R&D strategy aiming for at least 1 global IND every year; discovery and/or BD operations in 4 China and US biopharma clusters[4]

1. ICH: International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use
2. MRCT: multi-region clinical trial
3. FIC: first-in-class; FID: first-in-disease; BIC: best-in-class
4. Shanghai, Suzhou, San Francisco area, and Cambridge

Source: CDE; Company investor day presentation, 2021; Company R&D update, 2021; McKinsey analysis, Nov 2021

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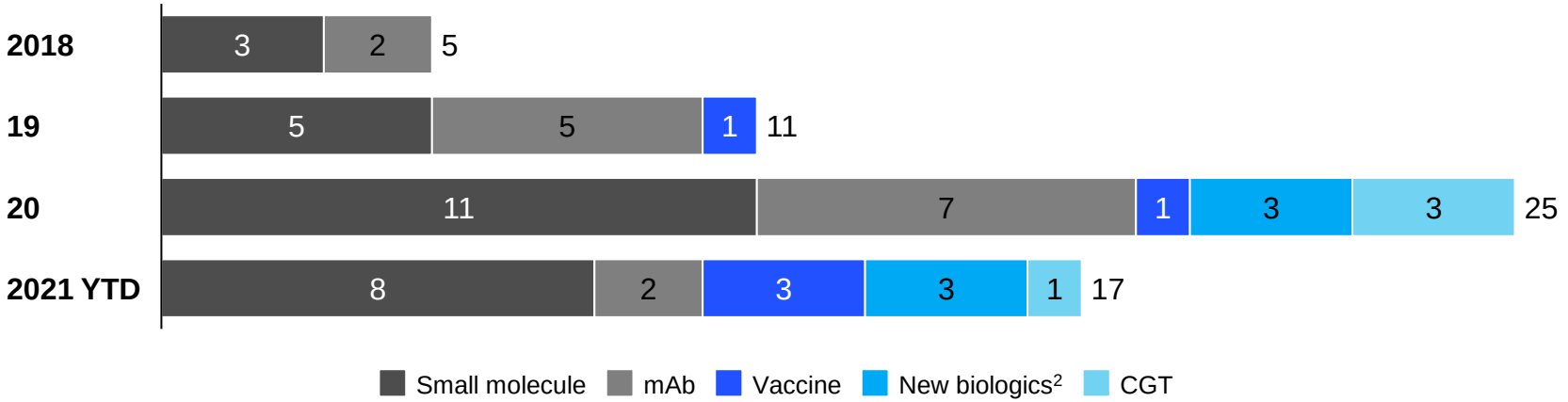
4: China-originated biotechs show increasingly diverse modality focus

NON-EXHAUSTIVE

China-originated biotech IPOs on major stock exchanges by modality focus, 2018-21 YTD[1]

IPO offerings



Listed biotechs focusing on new modalities

	2020	2021YTD
CGT	药明巨诺 JW Therapeutics; LEGEND BIOTECH; 永泰生物	GRACELL 亘喜生物
New biologics[2]	RemeGen; Frontier 前沿生物; 特宝生物 AMOYTOP BIOTECH	CARSGEN THERAPEUTICS; Kawin 凯因科技; 康诺亚 Conmed Biosciences

Notable private investments in biotechs focused on new modalities

- CGT: mRNA, Oncolytic virus, CAR-T, TCR-T, etc.
- New biologics: ADC, recombinant proteins, Bi-specifics, etc.

1. As of Nov 4, 2021, only initial IPOs on Nasdaq, HKEX and STAR included; for companies with assets across multiple modalities, modality focus defined as the one with the most assets
2. Including ADC, bi-/multi-specific, recombinant protein, and peptide

Source: Wind; GBI; company website; Crunchbase; Pitchbook; McKinsey analysis, Nov 2021

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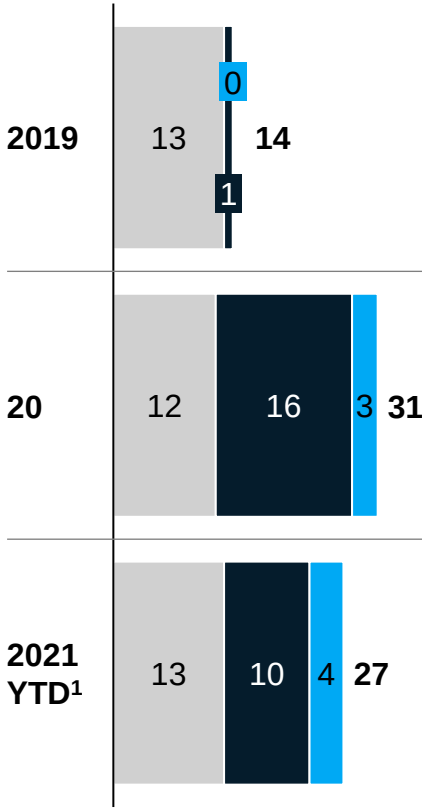
5: China biopharmas embark on "go global" journey by out-licensing and building in-house launch capabilities

NON-EXHAUSTIVE

Total deal value[2] Not disclosed < 1 Bn USD ≥ 1 Bn USD

Ex-China out-licensing deals by total deal value[2]

of deals 2019-21 YTD[1]



Mega deals (≥1 Bn USD) are concentrated in oncology

基石药业	1.3[3]	EQRx	天境生物	1.9	abbvie
innovent	1.0	Lilly			
BeiGene	2.2	NOVARTIS	RemeGen 荣昌生物	2.6	Seagen
HiFiBiO THERAPEUTICS	1.1[4]	FibroGen	君实生物 TopAlliance	1.1	Coherus BIOSCIENCES

Global commercial and manufacturing footprint

BeiGene

Deploying 100+ FTEs for commercialization of Brukinsa in the US

LEGEND BIOTECH

Setting up co-promoting and manufacturing operations both in the US and the EU

HUTCHMED

Building commercial team in the US to support potential Sulanda launch

BeyondSpring PHARMACEUTICALS

Building market access capability, contracting plans in place for launch

1. As of November 1, 2021
2. Total deal value includes upfront and milestone payments, excluding royalties based on sales
3. Includes 2 assets
4. Includes 1 asset and 2 options

Source: GBI; press release; company annual report 2020; company interim report 2021 H1; McKinsey analysis, Nov 2021

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6: Range of ecosystem partnerships to foster local innovation

NON-EXHAUSTIVE

Public-private partnerships	SANOFI PASTEUR	Debut of China's **1st** International Vaccine Innovation Center co-founded with Shenzhen government	Boehringer Ingelheim	Established strategic partnership with leading trial sites in China to drive integration of China into global early-stage development
Corporate Incubator	Roche	Established Roche's first accelerator with **30+ mn USD** investment and strategic partnership with Hillhouse and Zhangjiang group	Takeda Takeda Spark 武田中国创新孵化器	Incubating **100+** local start-ups to accelerate digital innovation for treatment and healthcare services
Financial Investment	AstraZeneca	Began investments with **340 mn USD** fund, and inked 3 deals with local players	SANOFI	Cathay Capital closed **765 mn USD** fund raise for China healthcare investments with Sanofi as an LP
Domestic BD	动方医药 GENFLEET innovent	**312 mn USD** for co-development and commercialization of a KRAS G12C inhibitor	BeyondSpring PHARMACEUTICALS 恒瑞	**200 mn USD** licensing deal for Plinabulin with first-in-class potential

Source: Press release; McKinsey analysis, Nov 2021

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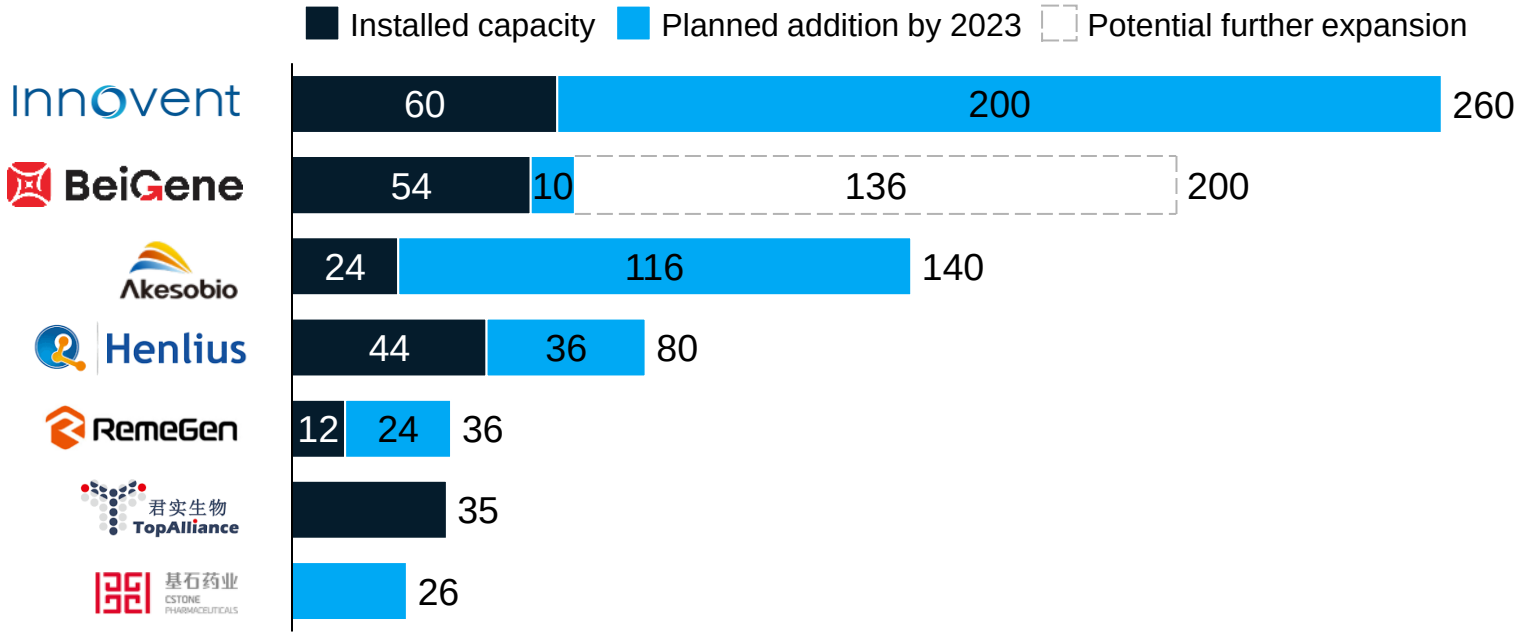
7: China-originated biotechs scaling up biologics manufacturing capacity

NON-EXHAUSTIVE

In light of growing portfolio, leading players are expanding mAb manufacturing capacity to establish full value chain capability, while ensuring cost competitiveness and quality

Biologics production capacity of select China-originated biotechs[1]



230 K liter installed to date, **650** K liter by 2023

1. As of Nov 12; from top 20 local biotechs (ranked by market cap as of August 2021) with publicly available mAb capacity information; RemeGen's capacity includes ADC

Source: Company annual report 2020; company interim report 2021 H1; expert interview; McKinsey analysis, Nov 2021

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8: Tech players integrate deeper into core healthcare value chain

NON-EXHAUSTIVE

Significant investment into data- / technology-empowered drug discovery and development

Accutar Biotech[1]
1 PROTAC molecule for breast cancer received clinical trial approval by FDA in Sep 2021

2 pre-clinical candidates discovered by AIDD[2]

Insilico Medicine
255 mn USD raised in Series C in 2021, filed for US IPO[4]

2 novel pre-clinical candidates discovered by AIDD[2]

XtalPi
400 mn USD raised in Series D in 2021

1 pre-clinical candidate discovered by AIDD[2]

医渡云 YIDUCLOUD
500 mn USD fund raised in IPO[3] in Jan 2021

60% reduction in clinical development timeline by AI-assisted disease modeling and patient recruitment

Tech giants participating in healthcare with different value propositions

Strengthening e-commerce platform for healthcare products with access to quality care

Transforming pharmacy and consumer health players to O2O delivery

Delivering tailored healthcare content to active user base

Transforming conventional medical care delivery with digital-enabled services

1. China-originated startup 2. AIDD: AI drug discovery 3. In HKEX
4. According to Bloomberg news, Insilico Medicine has filed confidentially for an IPO in the US expected to raise 300 mn USD

Source: Crunchbase; Bloomberg, Nov 2021; McKinsey analysis, Nov 2021

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China Biopharma

Stepping on the global stage

01

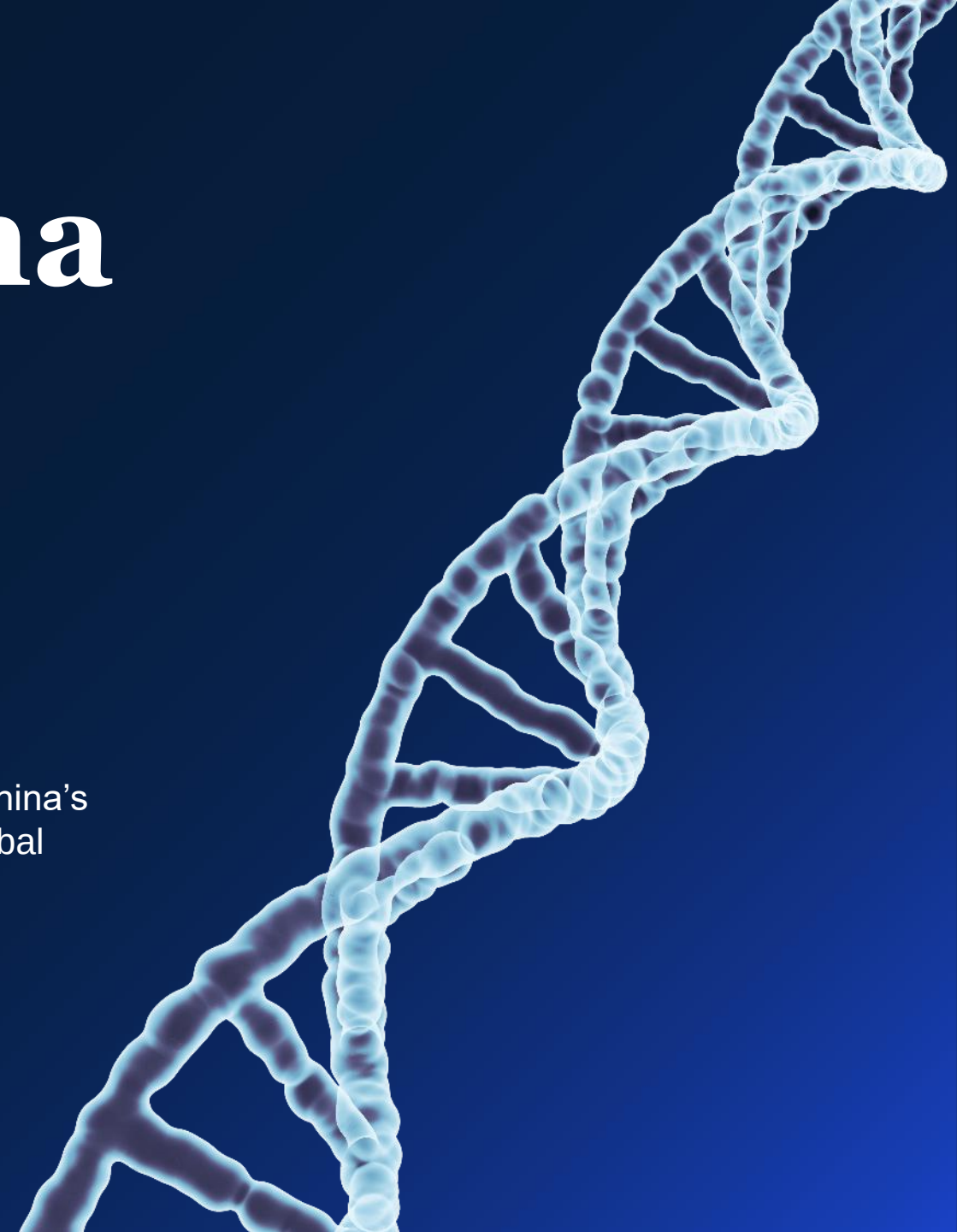
Latest trends shaping the China biopharma innovation

02

China value chain capabilities and contributions in global context

03

Outlook for China’s impact on global biopharma



Seven key trends shaping the China biopharma innovation

- Sustained government commitment to innovation
- Diverging capital market performance of China-originated biotechs
- New biotech archetypes emerging
- Local-to-local partnerships on the rise
- AI drug discovery at the door
- First wave of assets reaching the market
- Accelerated pace of globalization

Government continues to encourage biopharma innovation

Details to follow

A Sets clear direction on innovation and biotech

14th Five Year Plan - March 2021

Promotes biotechnology innovation in gene and biotech, clinical science, and brain science

Reinforces accelerated approval for innovative drugs and vaccines

B Continues to align with ICH[1]

>70% of ICH guidelines have been implemented in China

NMPA[2] re-elected as member of **ICH management committee** in Jun 2021

CDE[3] guideline on clinical development of oncology and rare disease drugs that re-emphasizes patient-centric, and clinical-value oriented development on par with ICH

C Harmonizes IP protection with global

New Patent Law - June 2021

Patent term extension

Extends innovative drug patent by max of 5 years after NDA approval (with max patented period up to 14 years after launch) to compensate for the long regulatory approval period

Patent linkage

Requires Gx new drug applicant to make declaration regarding related patent listed in Drug Patent Registry and publicly disclose to CDE to minimize infringement risk

1. ICH: International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use
2. NMPA: National Medical Products Administration
3. CDE: Center of Drug Evaluation

Source: McKinsey analysis, Nov 2021

CDE has started drafting guidelines that re-emphasize patient-centric and clinical-value-oriented clinical development

Context

In recent years CDE has observed:

- Over-crowding in a small subset of targets and therapeutic areas
- Opportunity to improve clinical trial design capabilities and rigor
- Limited application of new trial design/concept and development methodology, e.g., adaptive design/ICH E20, RWE, E9R1, E17 MRCT

Guideline principles

- **Patient centricity (以患者为核心):** emphasize patient-focused research decisions and trial design
- **Clinical value (以临床价值为导向):** consider both treatment benefits of trial participants and the target patient population post approval when selecting comparator in trial design

以临床价值为导向的抗肿瘤药物临床研发指导原则

Clinical Value-oriented Anti-tumor Drug Clinical Development Guideline (implemented, Nov 19th 2021)

罕见疾病药物临床研发技术指导原则

（征求意见稿）

Rare diseases Clinical Development Technical Guideline (draft for public feedback, Nov 10th 2021)

Industry perspectives

Consistent with existing regulatory framework and prior reform principles[1]

Goal is to guide the industry to focus on differentiated innovation rooted in science and clinical value

More guidelines for other TAs and technical guidelines expected to be released in coming year

1. For example, Clinical-value oriented development first mentioned in 2015 State Council's Opinions on Reforming The Review and Approval of Drug And Medical Devices, and later in Drug Administration Law (2019 revision), and Provisions of Drug Registration (2020)

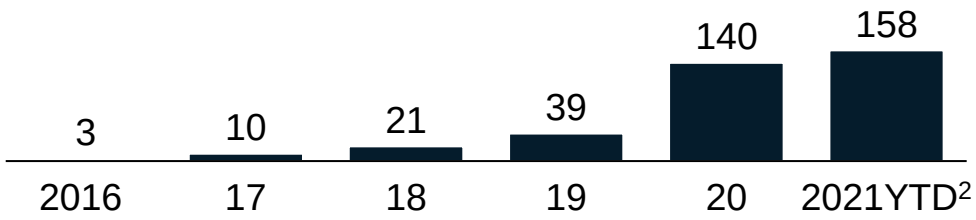
Source: CDE; Expert interviews; McKinsey analysis, Nov 2021

Combined market cap of China-originated biotechs ranked #2 globally among all biotech IPOs since 2015

Significant value creation by China-originated biotechs…

Total market cap[1] of listed China-originated biotechs on major stock exchanges[3], 2016-21 YTD[2]

bn USD

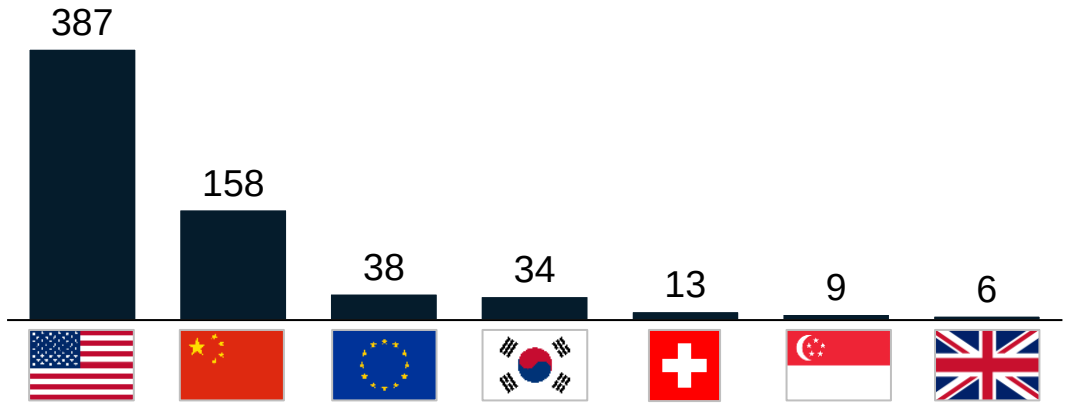


	2016	17	18	19	20	2021YTD[2]
# of biotechs	2	3	5	14	42	56
Average market cap bn USD	1.4	3.5	4.1	2.8	3.3	2.8

… stepping onto global stage

Total market cap of biotechs IPOed since 2015 by country of origin

bn USD



	285	56	38	73	10	17	2
	1.4	2.8	1.0	0.5	1.3	0.5	3.2

1. For companies listed on multiple stock markets, market cap value from the primary listing or the largest market cap is used in calculation
2. Year-end market value or YTD value as of Nov 1, 2021
3. Include STAR, HKEX, and Nasdaq

Source: BioCentury BCIQ; Wind; McKinsey analysis, Nov 2021

Strong IPO flow, with more China-originated biotechs seeking dual listing

Among global top 10 biotech IPO | AIM | Nasdaq | HKEX | STAR

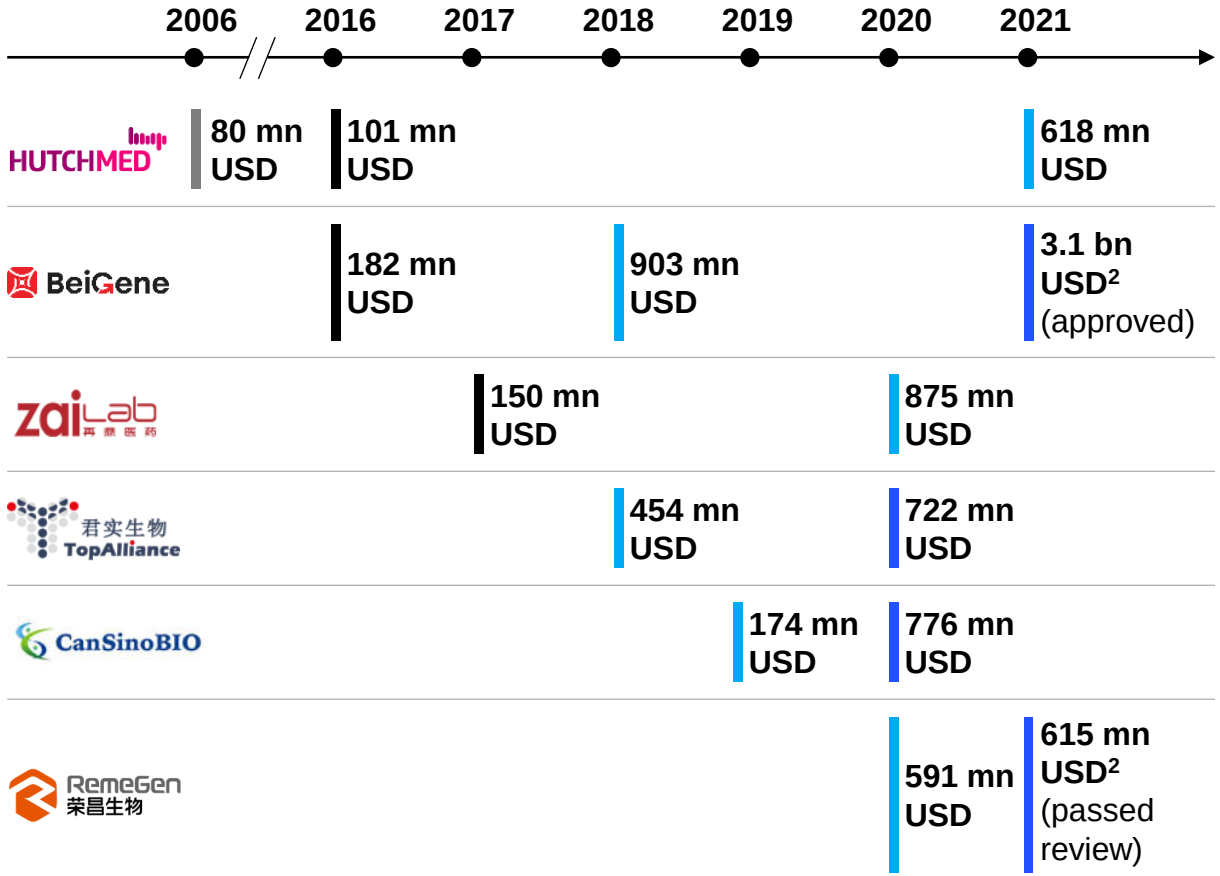
Notable IPOs of China-originated biotechs in 2021YTD[1]

2021	Company	Raised mn USD	Market cap[1] mn USD
Jan	Gracell	209	739
Feb	Kawin	124	602
Mar	Connect	220	855
Apr	Zhaoke	267	470
Jun	CARSGEN	400	2,545
	BCHT	231	4,324
	HutchMed	618	5,393
Jul	Conmed	460	1,388
	Brii Biosciences	360	2,416
Aug	GDK Bio	187	1,096
Oct	Abbisko	225	1,119
	Huiyu	380	2,138

5 of global top 10 biotech IPOs in 2021 YTD[1] originated from China

Dual listing provides increased access to capital

Fund raised on the first day of listing



1. Listed on STAR, HKEX, Nasdaq, as of November 21, 2021
2. Planned, not actual

Source: BioCentury BCIQ; Wind; McKinsey analysis, Nov 2021

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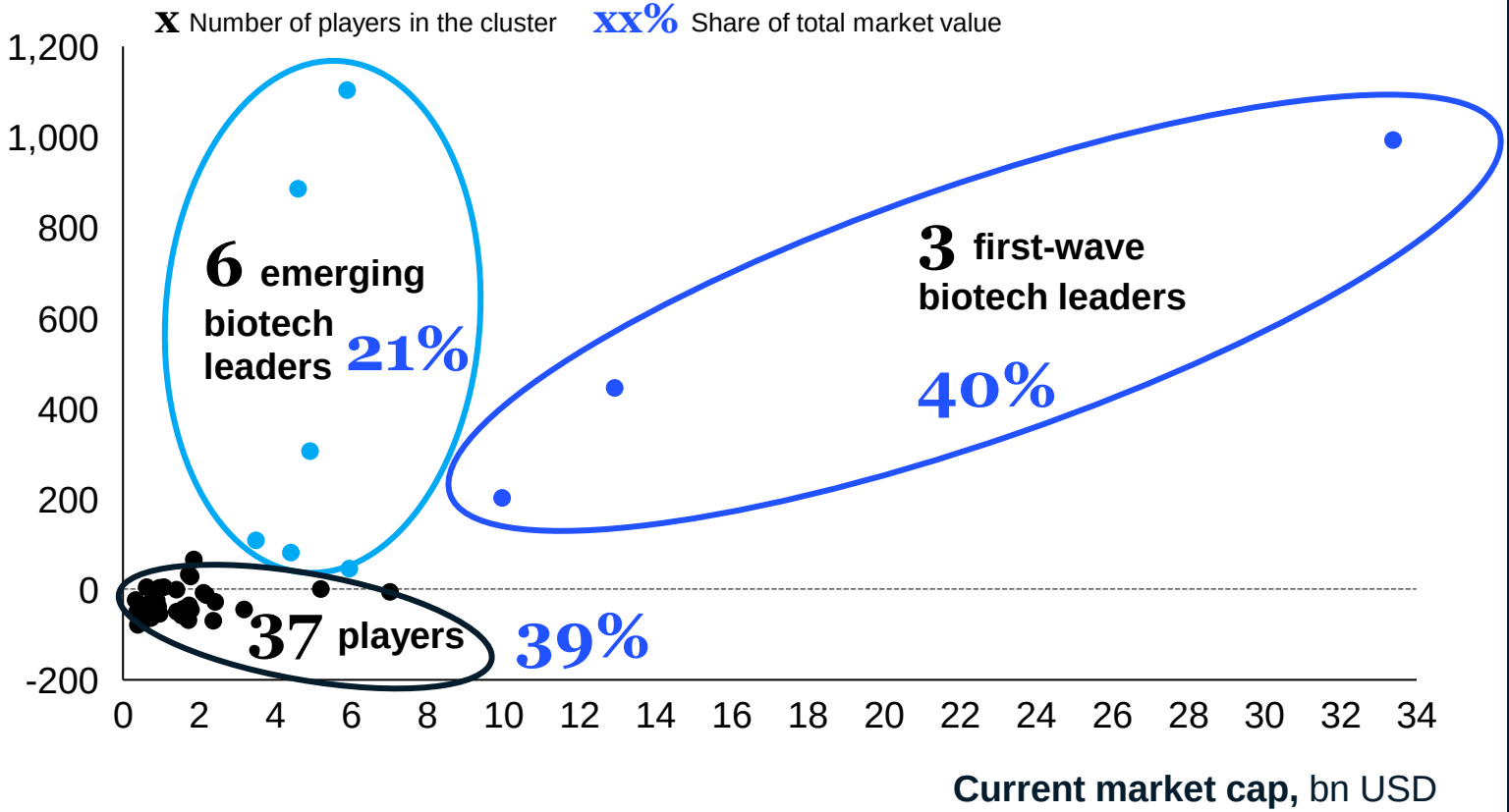
Capital market performance of China-originated biotechs has started to diverge

As of Nov 1, 2021

Market cap and growth of listed China-originated biotechs[1]

Adjusted market cap growth since IPO, percent



1. As of Nov 1, 2021; including 46 listed biotechs listed on Nasdaq, HKEX, and STAR for at least 6 months by Nov 2021; growth defined as YTD stock price over IPO day stock price and then adjusted by respective market index (Nasdaq index for Nasdaq-listed biotechs, Hang Seng index for HKEX-listed biotechs, and CSI300 index for STAR-listed biotechs); current market cap as of Nov 1, 2021

Source: Capital IQ; Wind; iFind; McKinsey analysis, Nov 2021

Key catalysts for capital market value creation

- **Competitive and differentiated portfolio**
- **Advancement of assets** toward development and commercial milestones (e.g., PoC, NDA approval, NRDL listing)
- **Global partnership** as a vote of confidence in R&D capability
- **Sustainable innovation engine** to fuel future pipeline

Three new biotech archetypes are emerging

NON-EXHAUSTIVE

Details to follow

Discovery focused

Industry veterans led

Abbisko

I-MAB BIOPHARMA

Research scientists led

INNOCARE 诺诚健华
Yigong Shi

CritiScience 原基华毅
Yi Rao

SIRONAX
Xiaodong Wang

PYROTECH 炎明生物
Feng Shao

New modality / technology-driven

ADC	RemeGen 荣昌生物	启德医药 GeneQuantum Healthcare
Bi-specifics	Akesobio	EpimAb Biotherapeutics
mRNA	ABOGEN	StemiRNA
CGT	LEGEND BIOTECH	GRACELL 亘喜生物
PROTAC	LYNK PHARMACEUTICALS	Hinova 海创药业
Probody	ADAGENE	张江生物 ZHANGJIANG BIOTECHNOLOGY

Anchor-investor incubated

EVEREST MEDICINES	CBC Group
JIXING 箕星 PHARMACEUTICALS	RTW Investments
联 LIANBIO	PERCEPTIVE ADVISORS
OVERLAND PHARMA	HILLHOUSE
Zenas 泽纳 BioPharma	Tellus BioVentures, FAIRMOUNT FUNDS

Increasingly more diversified approach to innovation, while each group has unique challenges to address

Source: Press release; McKinsey analysis, Nov 2021

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Rising China-originated mRNA players follow the steps of global pioneers

NON-EXHAUSTIVE As of Nov, 2021

Significant investment into mRNA in China

Financing
Fund raised in 2021, USD

ABOGEN: 1+ bn USD[1]

StemRNA: 200 mn USD

Joint venture

120+ mn USD

mRNA platform

Licensing

500 mn USD[2]

Asia emerging market rights of mRNA pipeline

China is following global on mRNA asset and technology development

		ABOGEN	StemRNA	moderna	BIONTECH
COVID-19 vaccine	Status	Global Phase III in 5 countries[3], read out expected in Oct 2021	Phase I in China, read out anticipated in 2021	← Emergency use authorization in Dec 2020 →	
	Day to FIH[4]	140	400	63	100
mRNA techno-logy	Vaccine dose[5]	15 ug	Not disclosed	100 ug	30 ug
	Delivery	Self-developed lipid nanoparticle (LNP) technology for targeted delivery to liver	In-licensed Lipopolyplex (LPP), efficacy yet to be proven	Improvements in LNP technology for thermostability[6] and target tissue delivery	LNPs for targeted livery to liver
mRNA portfolio	TA	← Infectious disease →	• Oncology	• Oncology • Immunology • Cardiovascular	• Oncology
	Pipeline (clinical stage, ex. COVID-19 vaccine)	Multiple IND submitted, e.g., Herpes zoster vaccine	1 personalized cancer vaccine in IIT since 2019	13 prophylactic vaccines and system secreted/cell surface therapeutics in phase I/II	12 oncology assets in phase I/II[7]

1. Three rounds of investments in 2021 combined 2. Upfront and milestone payment for COVID mRNA vaccine, additional mRNA products, and mRNA technology platform 3. Global MRCT include China, Mexico, Columbia, Pakistan and Cambodia 4. FIH: first-in-human 5. Based on COVID-19 vaccine 6. Moderna's COVID-19 vaccine can be stored -20 °C for 6 months compared to -70 °C required for BioNTech vaccine 7. Also include 15 additional cell therapy, antibody and small molecule assets

Source: Press release; company website; Pharmaprojects | Informa, 2021; McKinsey analysis, Nov 2021
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Investor-backed companies moving at speed

Company	Found year	Founding investors	Capital support[1]	Partners	# of assets licensed in[1]	Partnership highlight
EVEREST MEDICINES	2017	CBC Group	**493** mn USD pre-IPO **451** mn USD from IPO[2]	GILEAD, SPERO THERAPEUTICS, United Therapeutics, ARENA, NOVARTIS, Venatorx, Sinovent, La Jolla, calliditas	10	In-license assets with global rights
JIXING 箕星 PHARMACEUTICALS	2019	RTW Investments	**55** mn USD[3]	OYSTER POINT, Cytokinetics, Milestone	4	Equity investment by RTW in partners
OVERLAND PHARMA	2020	HILLHOUSE	**170** mn USD[4]	ADC THERAPEUTICS, Allogene	11	Formed 2 joint ventures
聯	2020	PERCEPTIVE ADVISORS	**368** mn USD pre-IPO **325** mn USD from IPO[5]	bridgebio, Pfizer, MYOKARDIA, LYRA THERAPEUTICS, REVIRAL, LANDOS, tarsus, NANOBIOTIX	9	Licensed assets from portfolio companies of founding investors
Zenas BioPharma 泽纳	2021	Tellus BioVentures, FAIRMOUNT FUNDS	Not disclosed	VIRIDIAN, xencor, DIANTHUS	7	

1. As of November 1, 2021 2. HKEX in 2020 3. Funds from RTW for equity investments in licensing partners Cytokinetics and Milestone Pharmaceuticals
4. Backed by Hillhouse to invest in joint ventures with licensing partners 5. Nasdaq in 2021

Source: Press release; Crunchbase; Pitchbook; McKinsey analysis, Nov 2021

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Characteristics of investor-backed biotechs

- **Strong fund raising capability**
- **Scale and speed** in building portfolio
- **Exploration of innovative partnership models** including portfolio partnership, joint ventures and equity investments

Expanding range of partnerships between local players

NON-EXHAUSTIVE

Scope includes ex-China

Co-development and commercialization

EVEREST MEDICINES	561 mn USD[1] BTK inhibitor	Sinovent
恒瑞	200 mn USD CTLA-4	基石药业 CSTONE PHARMACEUTICALS
innovent	189 mn USD[1] TKI taletrectinib	AnHeart Therapeutics
SPH 上药集团 Shanghai Pharma	178 mn USD[2] Oncolytic virus	ImmunoVir 亦诺微
CSPC 石药集团	155 mn USD[1] HER2 bispecific	康宁杰瑞 ALPHAMAB ONCOLOGY

Minority equity investment

中國生物製藥有限公司 SINO BIOPHARMACEUTICAL LIMITED	515 mn USD 15% share	sinovac
恒瑞	16 mn USD Equity share *201 mn USD licensing deal for GEF-H1 activator*[3]	BeyondSpring PHARMACEUTICALS
innovent	50 mn USD 3.5% share *145 mn USD licensing deal for BCR-ABL inhibitor*[4]	亚盛医药 Ascentage Pharma
CSPC 石药集团	31 mn USD Equity share and EGFR-TKI	BetaPharma Better Medicine Better Life

Joint venture (JV)

君实生物 TopAlliance; 嘉晨西海 immorna	124 mn USD mRNA technology	Development and commercialization of mRNA-based innovative drugs
正大天晴 CHIATAI TIANQING; Akesobio	53 mn USD PD-1 mAb penpulimab	Development and commercialization of penpulimab
康诺亚 Conmed Biosciences; INNOCARE 诺诚健华		Development and commercialization of innovative biologics, e.g., CD20 x CD3 bispecific
康希诺生物 CanSinoBIO; SPH 上药集团 Shanghai Pharma	93 mn USD 91 mn USD	Development and manufacturing of vaccines

1. Including up-front and milestone payment
2. Including R&D and sales milestone payment
3. 16 mn USD for equity investment, 201 mn USD up-front plus milestone payment for license deal
4. 50 mn USD for equity investment, 145 mn USD up-front plus milestone payment for license deal

Source: Press release; McKinsey analysis, Nov 2021

References to specific products or organizations are solely for illustration and do not constitute any endorsement or recommendation

China-originated AI drug discovery (AIDD) companies emerging on par with global trend

OUTSIDE-IN PERSPECTIVE

Key enablers

3 types of players entering the race (including start-ups, biotechs/pharma, and tech giants)

Strong government support for biotechnology and AI-enabled technology

Local CROs complementing AIDD companies with rapid and efficient R&D executions

Strong capital investments into AIDD start-ups

Capital support for China AIDD start-ups catching up with global

Global top 20 AIDD companies by pre-IPO funding[1]

Company	HQ	Funding, mn USD	Company	HQ	Funding, mn USD
XtalPi	Greater China	786	AccutarBio	Greater China	114
Insitro	North America	743	StoneWise	Greater China	110
Exscientia	Europe	520	Owkin	North America	74
Relay Therapeutics	North America	465	Standigm	Asia[2]	72
Recursion	North America	419	Innoplexus	Europe	64
BenevolentAI	Europe	351	Zilliz	Greater China	56
Insilico Medicine	Greater China	316	EngineBio	North America	53
Deep Genomics	North America	241	Evaxion	Europe	41
Schrodinger	North America	216	neoX Biotech	Greater China	40
Atomwise	North America	177	Nutshell Therapeutics	Greater China	35

7 of global top 20 originated from China

29% funding share by Chinese players

Future outlook for AIDD

Level playing field for all types of players, winner needs to demonstrate ability to integrate in-depth AIDD expertise and pharma R&D domain expertise

Clinical validation remains most critical milestone

Replicate efficiency and speed improvement to additional modalities and MoAs[3]

1. As of Nov 2, 2021
2. Exclude Greater China
3. MoA: Mechanism of action

Source: Crunchbase; Pitchbook; McKinsey analysis, Nov 2021

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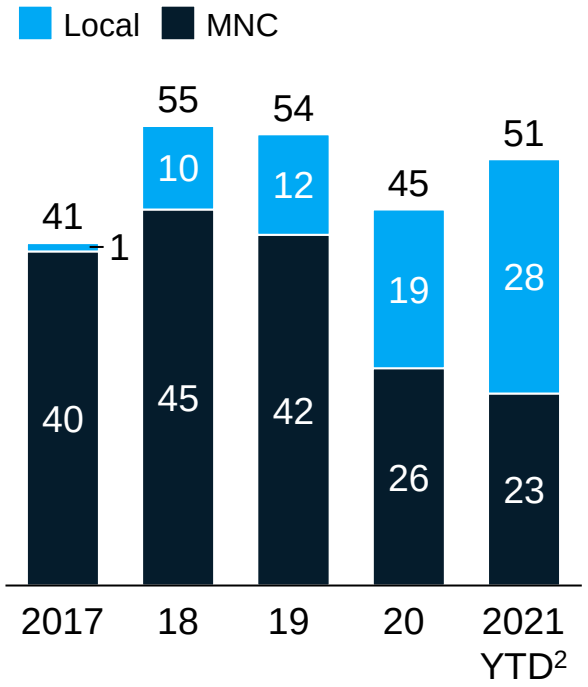
Assets from leading China-originated biotechs are reaching commercial stage in China

Locals surpass MNCs on NDA approvals in 2021

NDA approvals for innovative drugs[1], 2017-21 YTD[2]



Leading local assets start to generate revenue

Notable examples	Commercial launch year	2021 H1 revenue, mn USD
ELUNATE	2018	30
达伯舒	2019	>200
Zejula niraparib	2020	36
百泽安	2020	124
Brukinsa zanubrutinib	2020	65
Ensacove 贝美纳	2020	9
宜诺凯	2021	16
SULANDA	2021	8
百汇泽	2021	2

Three commercial models to drive uptake

NON-EXHAUSTIVE

	Asset	Developed and commercialized by
Partner with MNC	ELUNATE	HUTCHMED + Lilly
	沃瑞沙 Orpathys	HUTCHMED + AstraZeneca
	拓益	君实生物 TopAlliance + AstraZeneca
Partner with local pharma companies	安尼可	Akesobio + 正大天晴 CHIATAI TIANQING
In-house play	恒沐	HANSOH PHARMA
	百汇泽	BeiGene

1. Including both innovative chemical drugs and biologics (Class 1 Innovative drugs that have not been marketed in China or overseas, Class 5.1 Original drugs and modified drugs that have been marketed overseas, Class 3.1 Biologics that have been marketed overseas)
2. As of November 8, 2021

Source: GBI; company annual reports 2020; company interim reports 2021 H1; McKinsey analysis, Nov 2021

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China-originated biotechs embarking on a global journey through partnering and organic expansion

Two types of out-licensing partners for ex-China markets

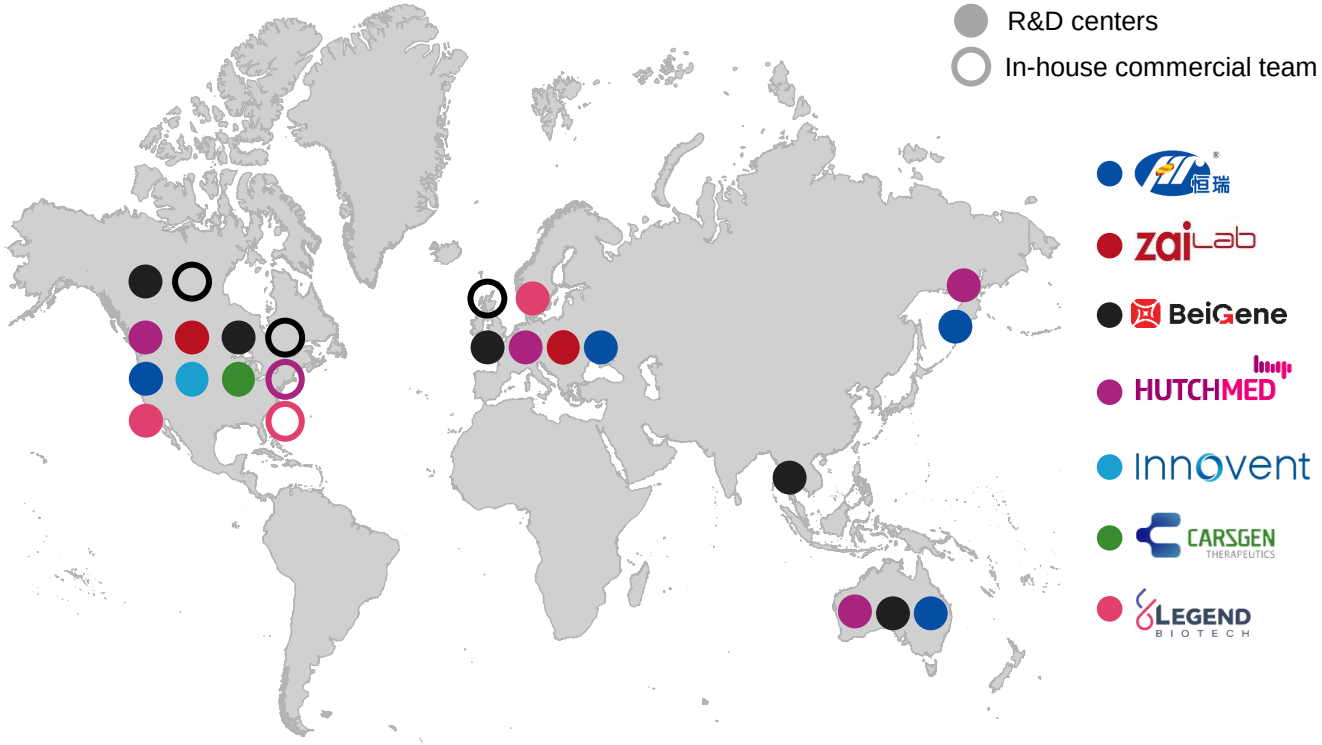
Established global biopharma companies

Partnering with leading global biopharma companies (e.g., Novartis, Seagen) to strengthen / complement their pipeline

Cost-effective medicine platform companies

Companies with new business model to deliver more cost-effective medicines to patients and expand access (e.g., EQRx, Coherus)

Organic expansion of global R&D and commercial footprint (selected examples)



- Establishing Global R&D infrastructure
- Beginning to build global commercial capabilities
- Hiring seasoned global talents

Source: Company annual reports 2020 and 2021 H1; McKinsey analysis, Nov 2021

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China Biopharma

Stepping on the global stage

01

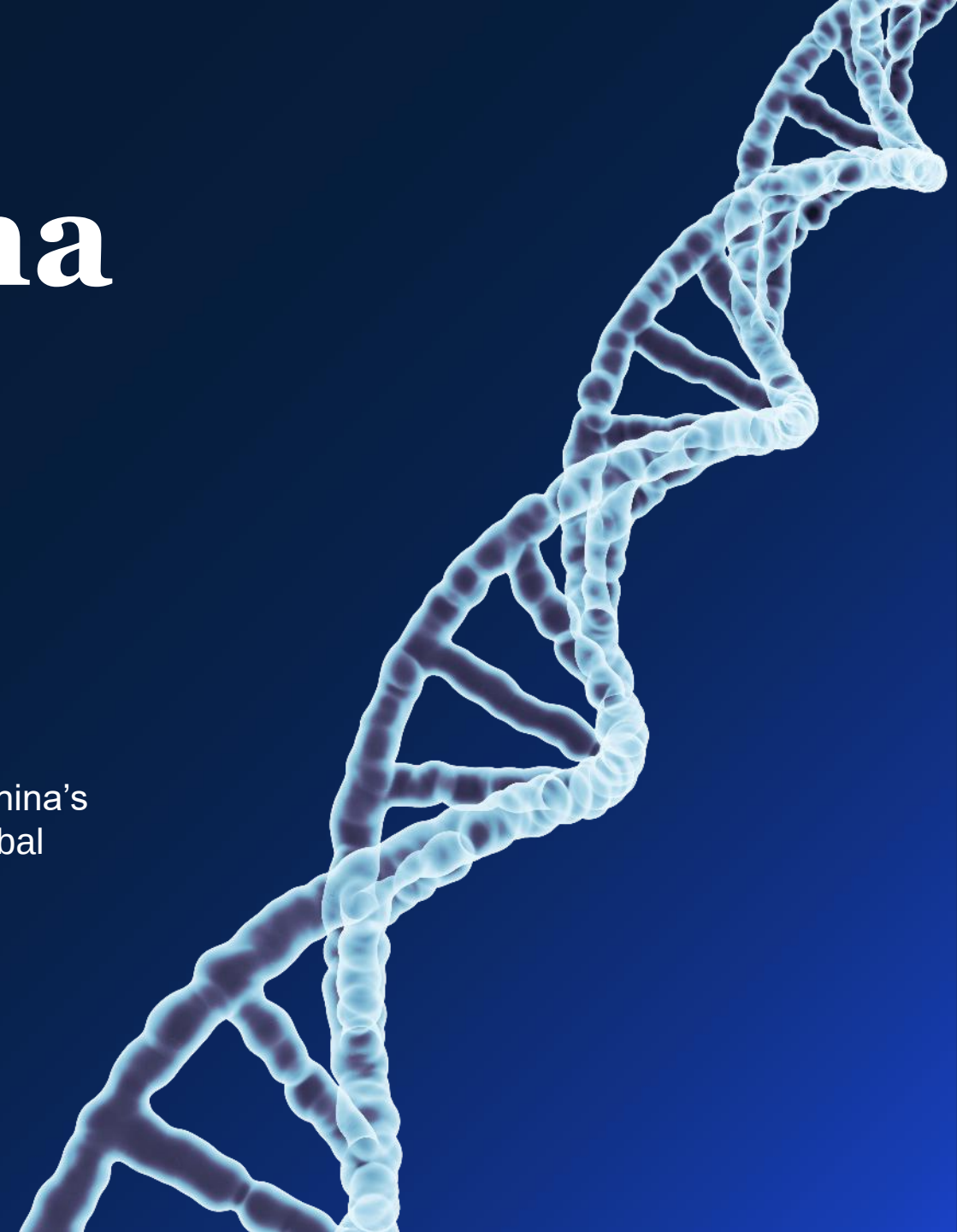
Latest trends shaping the China biopharma innovation

02

China value chain capabilities and contributions in global context

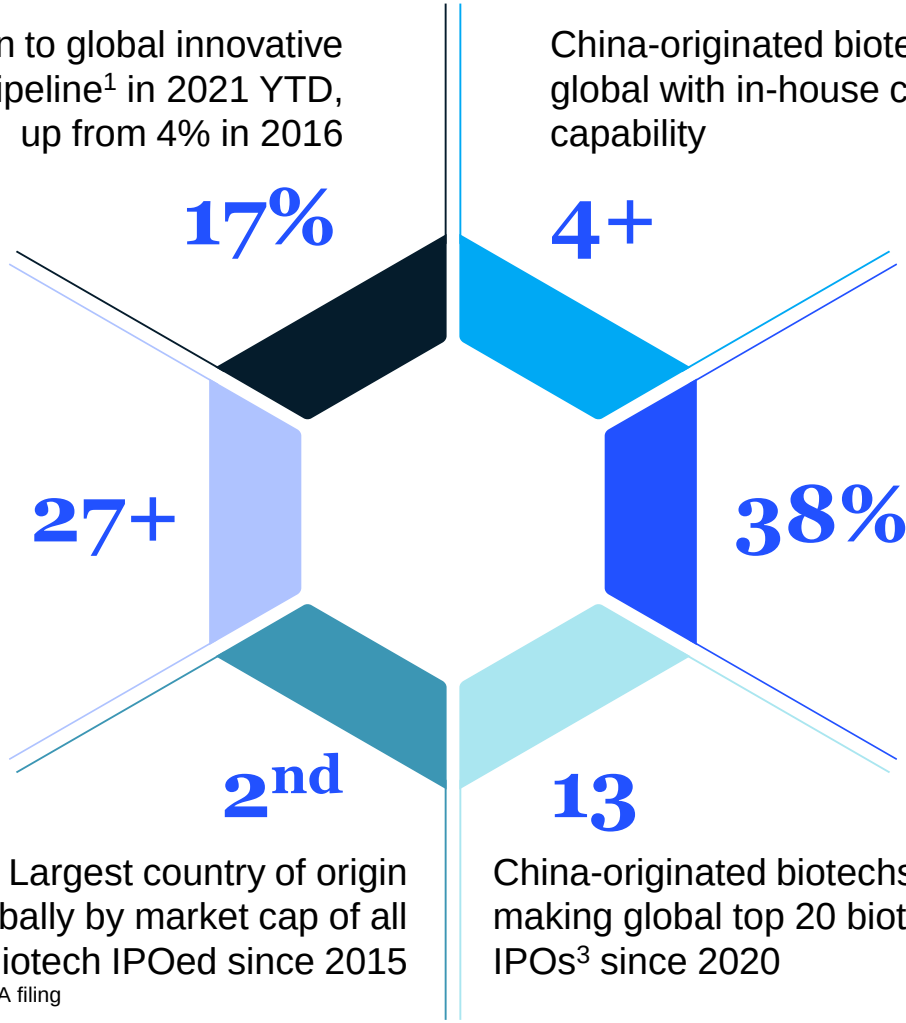
03

Outlook for China’s impact on global biopharma



China biopharma innovation is stepping on the global stage

As of Nov 2021



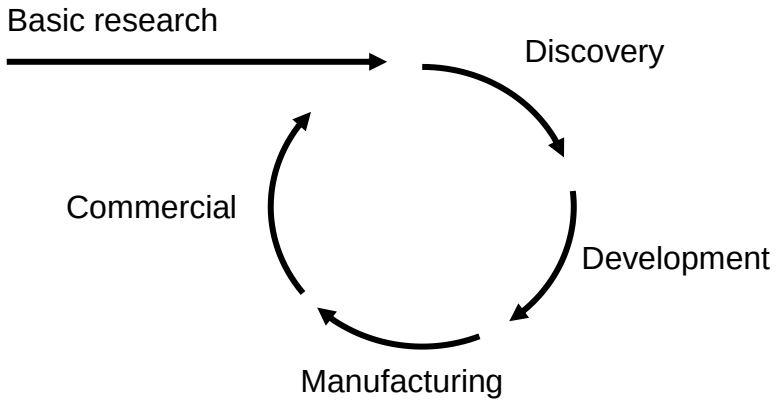
1. Pipeline assets in clinical stage from Phase I-III, pre-registration to NDA filing
2. 2016-20 CAGR for assets entering global Phase I
3. By IPO fund raised; global top 10 biotech IPOs in 2020 and in 2021 YTD combined

Source: BioCentury BCIQ; Pharmaprojects | Informa, 2021; McKinsey analysis, Nov 2021

We have assessed China's potential impact on global biopharma through 3 lenses

1

Value chain capabilities



2

Funding for biotechs

3

Innovation output

1. Including CRO/CDMOs

Sources of insights

Databases and research

In-depth interviews with 35 global and China biopharma leaders and investors

Focused C suite and investor survey (N = 33, including 23 from China and 10 from ex-China)

Input from 50 experts worldwide

26 China-originated biotech CEOs[1] and founders

5 US/EU Global biopharma company senior executives

6 Global biotech CEOs

13 Leading PE/VC managing partners (including 4 US-based)

China has started to establish R&D capabilities in selected areas, with continued momentum expected

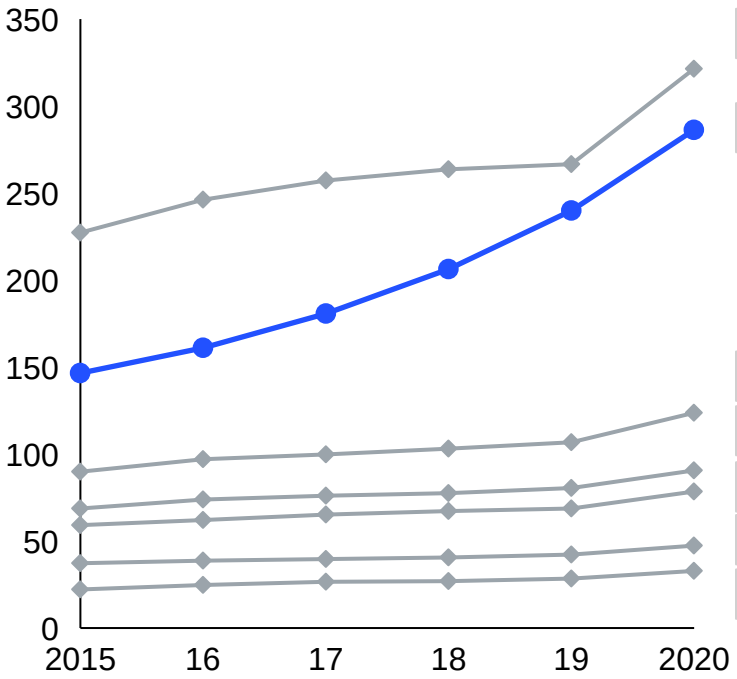
How would you rate China's capability in basic research, drug discovery, and clinical development today and by 2028? ● 2021 ● 2028
Count of respondents by rating, N = 33

	Score					Average score		
	1	2	3	4	5	2021	2028	Key observations
Basic research	Limited contribution to global innovation: 7, 1	8, 4	Innovation in select areas: 14, 7	4, 14	On par with global leading innovation hubs: 7	**2.5**	**3.7**	Today: Rapid increase in the intensity of research and discovery Future: Scientific breakthrough and biology-based translation yet to be expected
Drug discovery	3	16, 4	14, 9	14	6	**2.3**	**3.7**	
Clinical development	Activities largely in China, closely following global: 5	7, 1	On par with global in select TAs, closely following others: 17, 5	4, 22	On par with global across TAs and leading in select areas: 5	**2.6**	**3.9**	Today: Significant buildup of capacity and capability but largely fast-following global trial design Future: China expected to strengthen early development as more innovative assets progress

Source: McKinsey Impact of China Biopharma on Global survey (N = 33), 2021

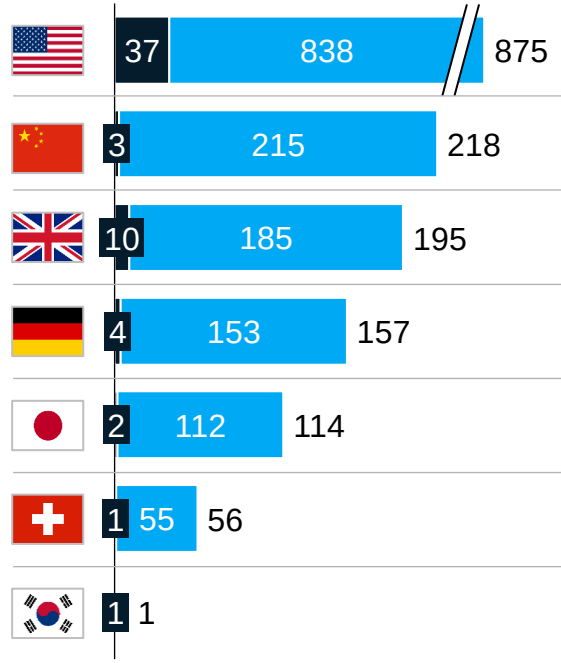
Research and discovery: China has ramped up basic research output but still lags in breakthrough research

Biomedical papers by country of author affiliations, 2015-20
Thousand



	Share of top 7 countries, 2020 Percent	CAGR, 2015-20 Percent	CNS share,[1] 2020 Percent
	33	7	0.7
	29	**14**	**0.2**
	13	7	**0.6**
	9	6	**0.6**
	8	6	**0.3**
	5	5	**0.2**
	3	8	**0.8**

Case example: Papers on PROTAC published in 2014-19[2]
Thousand

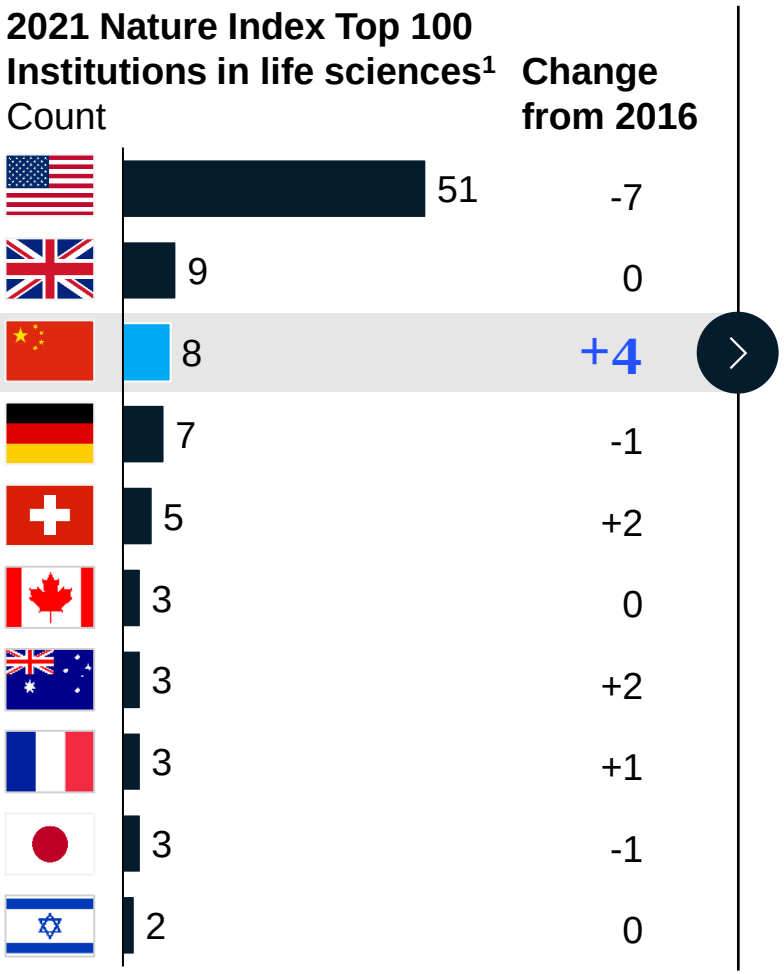


	Share of global, 2014-19 Core Percent	Follow-on Percent
	82	55
	7	**14**
	22	12
	9	10
	4	7
	2	4
	2	0

1. Including Cell, Nature, and Science
2. Based on the ESI database, the Science and Technology Strategic Consulting Research Institute of the Chinese Academy of Sciences, the Documentation and Information Center of the Chinese Academy of Sciences, and Clarivate Analytics selected 10 hot frontiers for biological sciences in 2020. With the research frontier of "targeted degradation of proteins by small molecule PROTACs" as an example
3. Core paper defined as top 1% cited biomedical papers on "PROTAC for targeted protein degradation;" follow-on refers to papers citing the core papers

Source: PubMed; RDPAC; 2020 Research Frontier

Research and discovery: China is climbing up the ranks to house global-caliber life sciences institutions



Chinese institutions in 2020

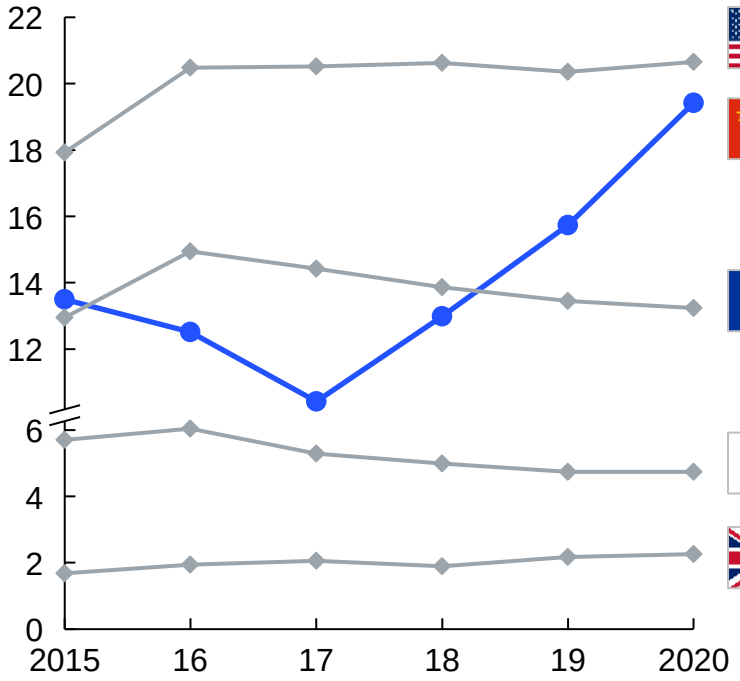
Rank	Institution	City	Life science faculty with experience in top 20 QS ranking[2] (Percentage)
5	Chinese Academy of Sciences (CAS)[3]	Across China	23%
37	Peking University	Beijing	52%
52	Zhejiang University	Hangzhou	27%
56	Tsinghua University	Beijing	53%
58	University of Chinese Academy of Sciences	Beijing	14%
65	Fudan University	Shanghai	23%
70	Sun Yat-sen University	Guangzhou	12%
71	Shanghai Jiao Tong University	Shanghai	16%

1. Based on a particular country's share of articles published in the 82 prestigious scientific journals selected by an independent panel of experts and tracked by the Nature Index database
2. Post-undergraduate experience at top 20 QS universities for faculty at life science colleges of respective institutions
3. For CAS, average of 3 life science-related institutes taken: Shanghai Institute of Materia Medica, Suzhou Institute of Biomedical Engineering and Technology, and Beijing Institute of Genomics

Source: Nature Index; university websites; McKinsey analysis, Nov 2021

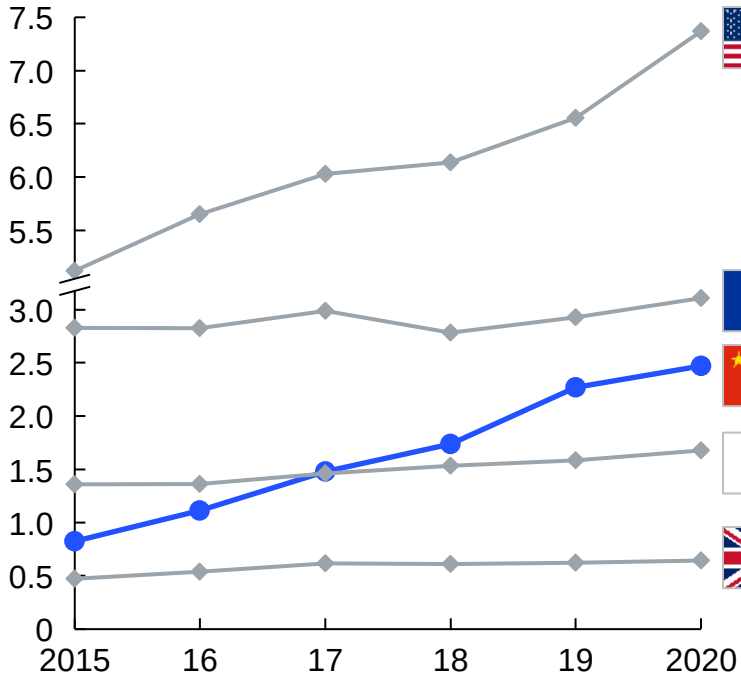
Research and discovery: Patent volume in life sciences has steadily increased in China

Patents granted by origin of applicants in biotechnology and pharmaceuticals, 2015-20
Thousand



	CAGR 2015-20[1] Percent	Share of global, 2020 Percent
	3	28
	8	**26**
	0	18
	-4	6
	6	3

PCT publications[1] by origin of applicants in biotechnology and pharmaceuticals, 2015-20
Thousand



	CAGR 2015-20 Percent	Share of global, 2020 Percent
	6	39
	1	17
	29	**13**
	4	9
	7	3

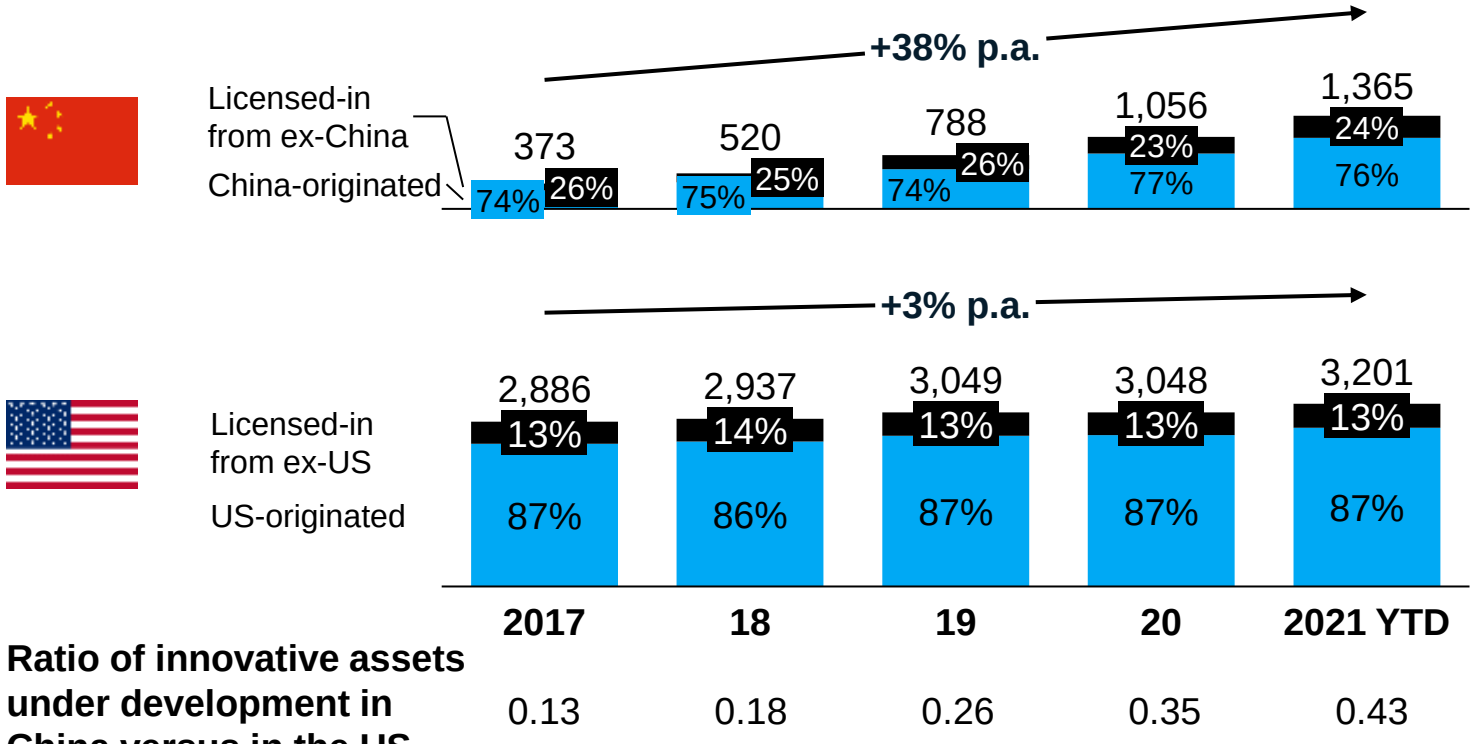
1. The Patent Cooperation Treaty (PCT) assists applicants in seeking patent protection internationally for their inventions

Source: WIPO; McKinsey analysis, Nov 2021

Development: Rapid growth of development activities and capability, with opportunity to further improve

China biopharma's clinical development activities have tripled in 5 years

Innovative assets under clinical development, 2017-21 YTD[1]



Ratio of innovative assets under development in China versus in the US	2017	18	19	20	2021 YTD
	0.13	0.18	0.26	0.35	0.43

Opportunities for China to improve clinical development capability and infrastructure

- **Reduce herding effect**
  - Clinical efforts concentrated in well-established targets, e.g., **~60%** of mAbs under development in 5 MOAs today
  - Mostly replicating globally proven trial design
- **Further elevate site capability:** Only **6%** of >1,000 certified clinical trial sites in China have participated in >20 global MRCT trials in the past 2 years

1. As of Nov 1, 2021; innovative assets include both chemical drugs and biologics labeled as NME whose global status is phase 1, 2, 3, or pre-registration; country of affiliation for development and origin defined by location of company headquarters (China or US)

Source: Pharmaprojects | Informa, 2021; CFDI; CDE; McKinsey analysis, Nov 2021

Development: Early signs of differentiated clinical development approaches

NON-EXHAUSTIVE

Differentiation in development	Examples	
Unique indication and combination strategy to amplify molecule differentiation	IMPACT THERAPEUTICS	Based on senaparib's wide therapeutic window, picked **unique 1L maintenance indication** for HRR+ mCRPC and designed differentiated combo strategy delivering continuous QD dosing of senaparib in 2L SCLC[2]
Expansion into new indications or combinations	君实生物 TopAlliance	Toripalimab received FDA breakthrough designation with data from the Phase 3 clinical trial "JUPITER-02" evaluating **toripalimab in combination with chemotherapy for the first-line treatment of NPC[3]**
	RemeGen 荣昌生物	Disitamab vedotin tested as **the first HER2+ ADC** for 2L treatment of HER2+ locally advanced or metastatic **UC** and received breakthrough designation from FDA
Global development	BeiGene	Zanubrutinib received FDA-accelerated approval for MCL based on pivotal data **with ~70% of efficacy data from Chinese patients**
	GRACELL 亘喜生物	GC012F and GC027 are under simultaneous development in both China and the US **after early concept proved in China[4]**
	LEGEND BIOTECH	LCAR-B38M **received FDA breakthrough therapy designation and EMA PRIME designation** with its data from Chinese IIT[5] trial and US trial (in collaboration with Janssen)

1. Vs. 1L combo with abiraterone/enzalutamide for Olaparib
2. Vs. Ola+TMZ combo dosed only 1-7 days per cycle of 21 days; QD means once per day
3. Nasopharyngeal cancer
4. Concept proved with Investigator initiated trials (IIT) in China
5. IIT: Investigator initiated trials

Source: Expert interviews; clinicaltrial.gov; simultaneous development of zanubrutinib in the USA and China; McKinsey analysis, Nov 2021

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Manufacturing: capabilities expected to continue to strengthen and expand into more modalities

How would you rate China's capability in manufacturing today and by 2028?
Count of respondents by rating, N = 33

Score					Average score	
1	2	3	4	5	2021	2028
Mostly supply to China market at lower cost		A global supply hub only in selected areas (e.g., mature modalities), with global quality and competitive cost base		A global supply hub across modalities, with global quality and competitive cost base		
	6	16 5	9 10	2 18	3.2	4.4

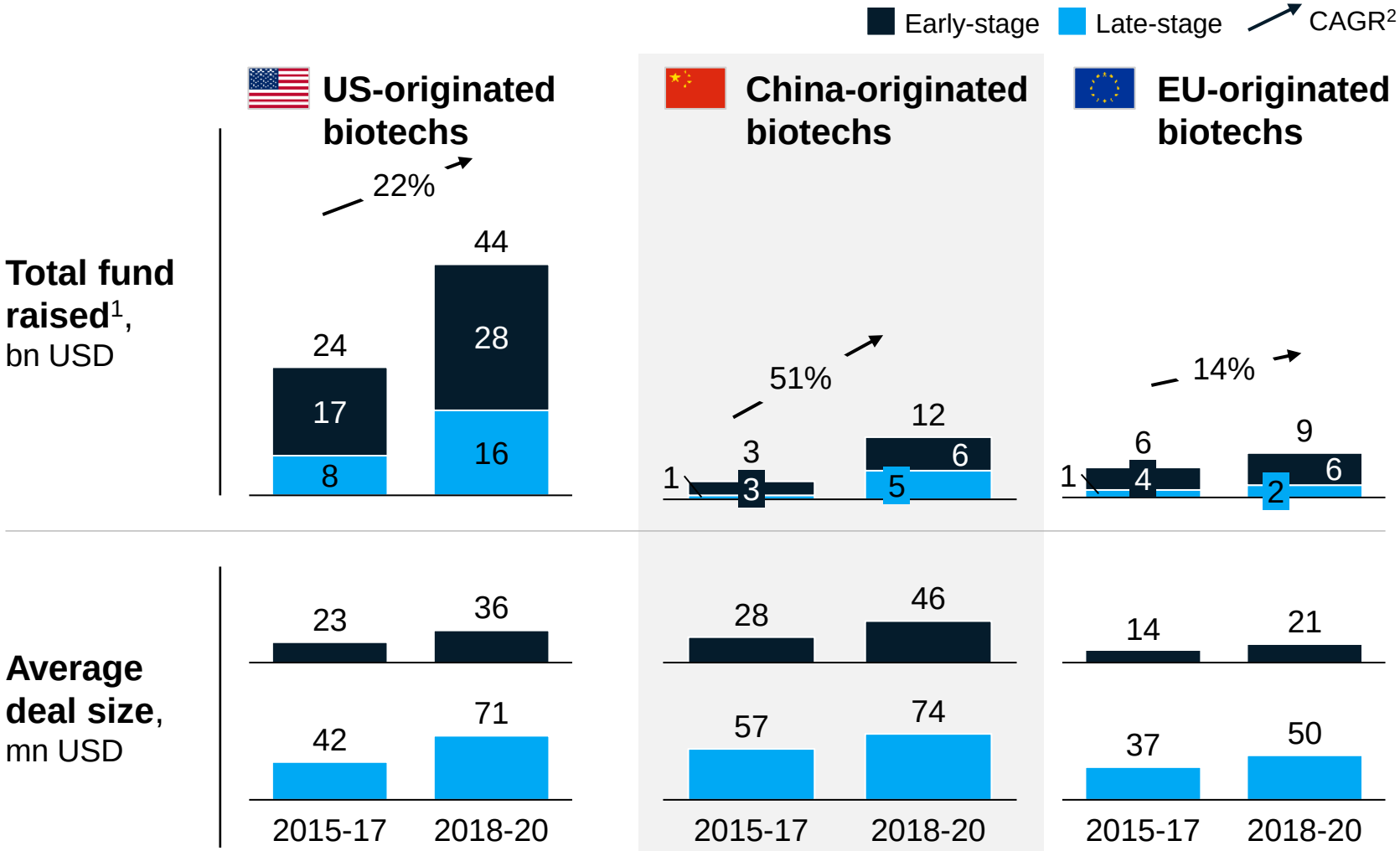
China has already proven itself as a high-quality manufacturing hub for small molecules, producing API and generics meeting FDA standard

China starts to show improvements in biologics manufacturing. Key inflection point is whether there will be a high quality localized supply chain

We believe China will ramp up manufacturing capability to be on par with global in the future. Manufacturing from China for global, however, highly depends on the future global market dynamics, companies might need to have global footprints to supply global markets

Source: McKinsey Impact of China Biopharma on Global survey (N = 33), 2021

Consistent with the global trend, China biotech sector has attracted significant funding



1. Early-stage funding defined as Venture seeds, Series A and Series B, late-stage funding defined as Ventures Series C and beyond
2. 3-year CAGRs shown between periods 2015–17 and 2018–20

Source: BCIQ; expert interview; McKinsey analysis, Nov 2021

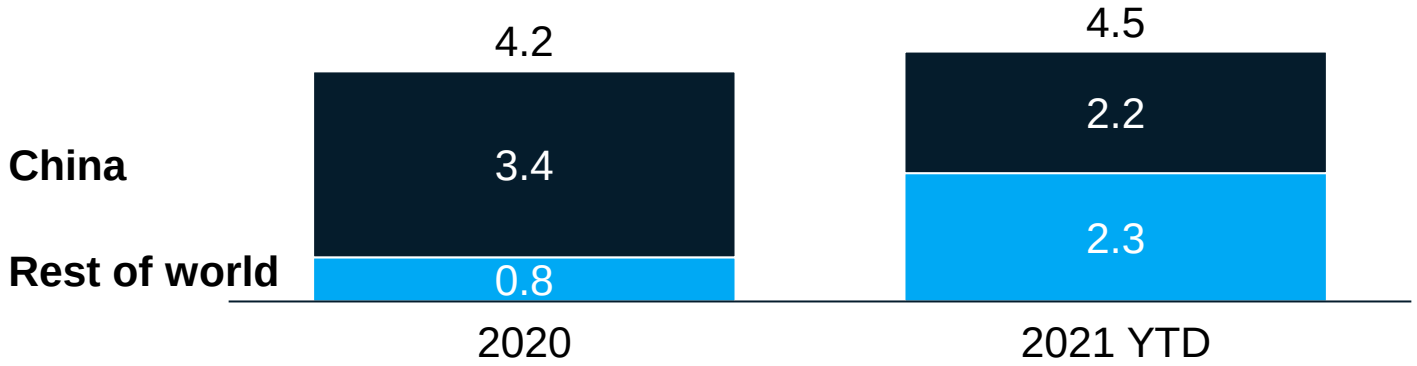
Key observations on China-originated biotechs

- Rapid growth since 2015
- Total funding exceeding EU yet still 25-30% of US
- Average deal size exceeds US and EU

China-originated biotechs raise significant fund in individual offering but lag on total IPO number

Fund raised by global top 10 largest biotech IPO by country of origin on major stock markets[1], 2020-21 YTD[2]

bn USD



No. of China-originated biotech

8

Akesobio
ANTENGENE
EVEREST MEDICINES
GENOR BIOPHARMA
INNOCARE 诺诚健华
药明巨诺 JW Therapeutics
LEGEND BIOTECH
RemeGen

5

Brii Biosciences Breakthrough innovation & insight
CARSGEN THERAPEUTICS
康诺亚 Conmed Biosciences
汇宇制药 HUIYU PHARMACEUTICAL
HUTCHMED

1. In STAR, HKEX, Nasdaq
2. As of Nov 1, 2021

Source: BioCentury BCIQ; Wind; press release; McKinsey analysis, Nov 2021

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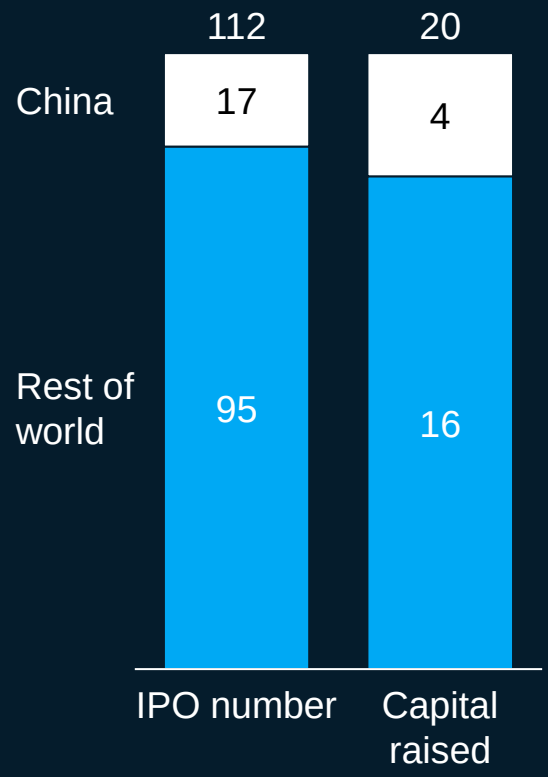
Total biotech IPO size and funding scale by country of origin, 2021 YTD[2]

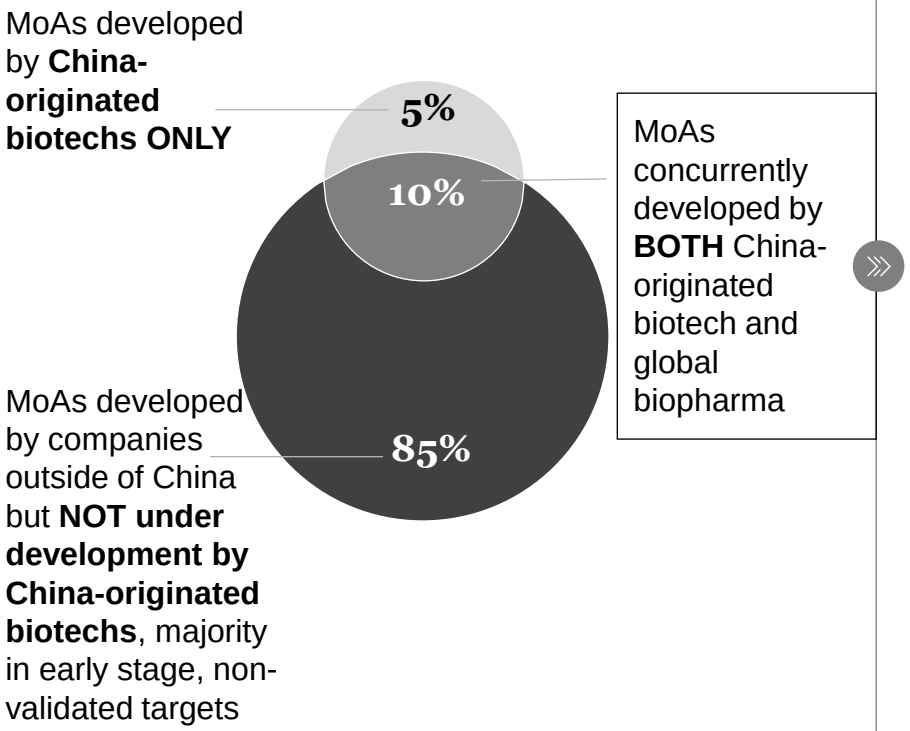
Count, bn USD



China-originated biotechs have started to develop assets with global first-wave potential; opportunity to broaden MoA coverage

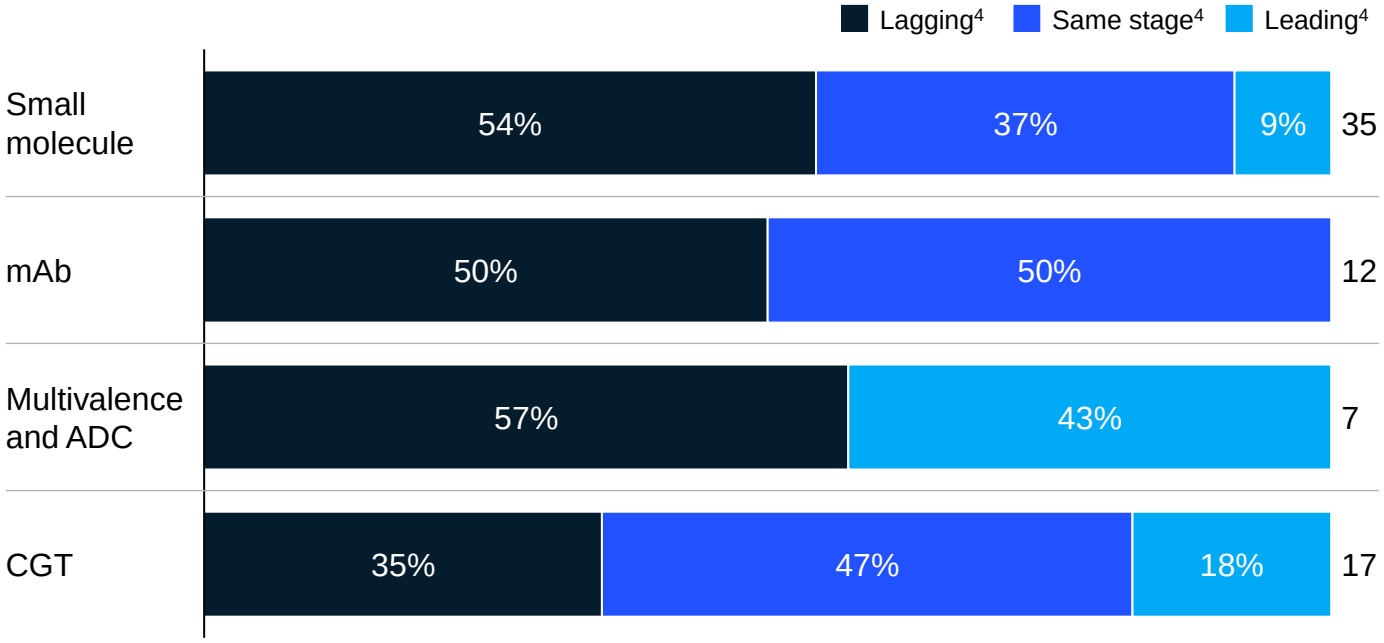
Illustrative with oncology as an example

Global clinical stage oncology MoAs[1] breakdown by company origin



Comparison of most advanced development stage[2] between China-originated biotechs and ex-China companies by MoA[3]

No. of MoAs



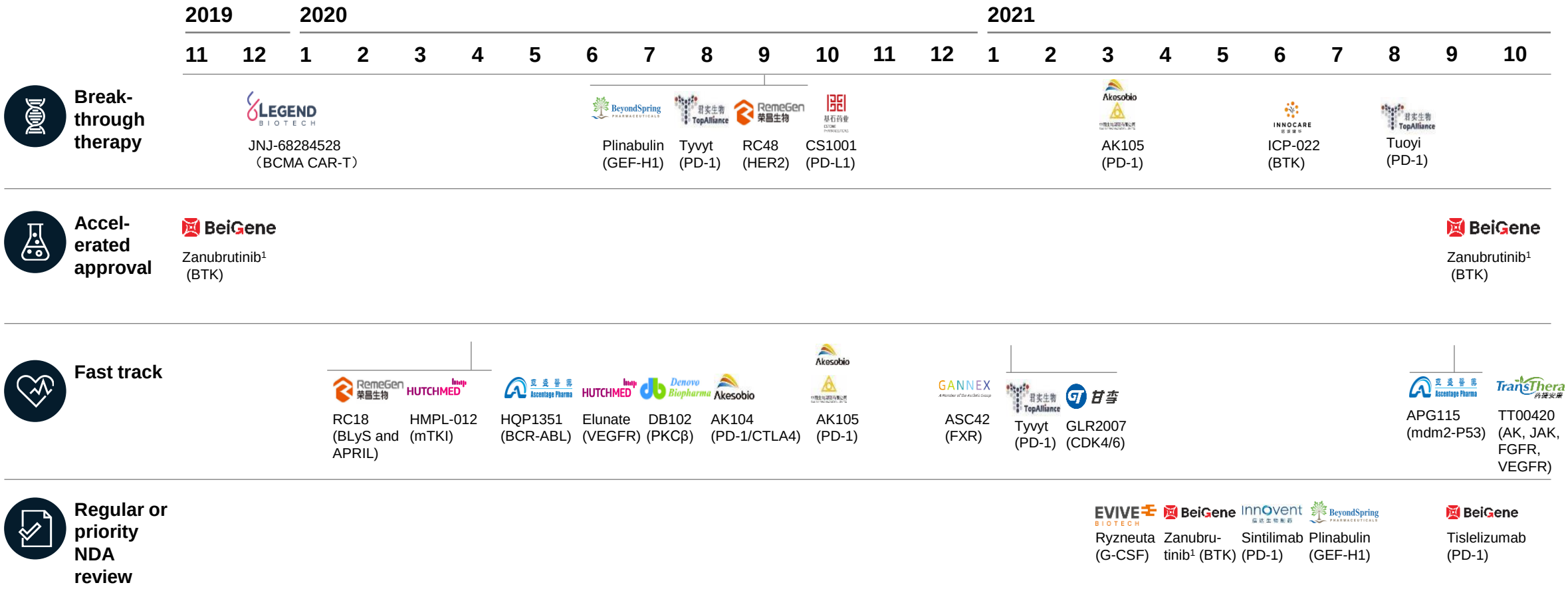
Out of the 10% (61) MoAs, **50%** were pursued by China-originated biotechs with first-wave potential (same stage or leading) globally

1. Including MoAs in Phase I-III and pre-registration stages, excluding MoAs with launched products
2. Comparison based on most advanced global status (China and ex-China status combined)
3. For small molecule, ADC, and mAbs, the MoA are counted by the unique targets; for multivalent mAbs and CGT, the MoA are counted by the target combinations
4. Based on comparison of the global development stages (either China or ex-China) of the assets in each MoA by China-originated biotechs with ex-China biopharmas

Source: Pharmaprojects | Informa, 2021; McKinsey analysis, Nov 2021

Global development efforts are gaining regulatory recognition

Examples of recent FDA designation/filings for innovative therapies by China-originated biotechs and biopharma companies



1. Indications for mantle cell lymphoma (Nov 2019), marginal zone lymphoma (Sept 2021) were under accelerated approval; Waldenström's macroglobulinemia (Apr 2021) were under regular/priority NDA review

Source: Press release; FDA; McKinsey analysis, Nov 2021
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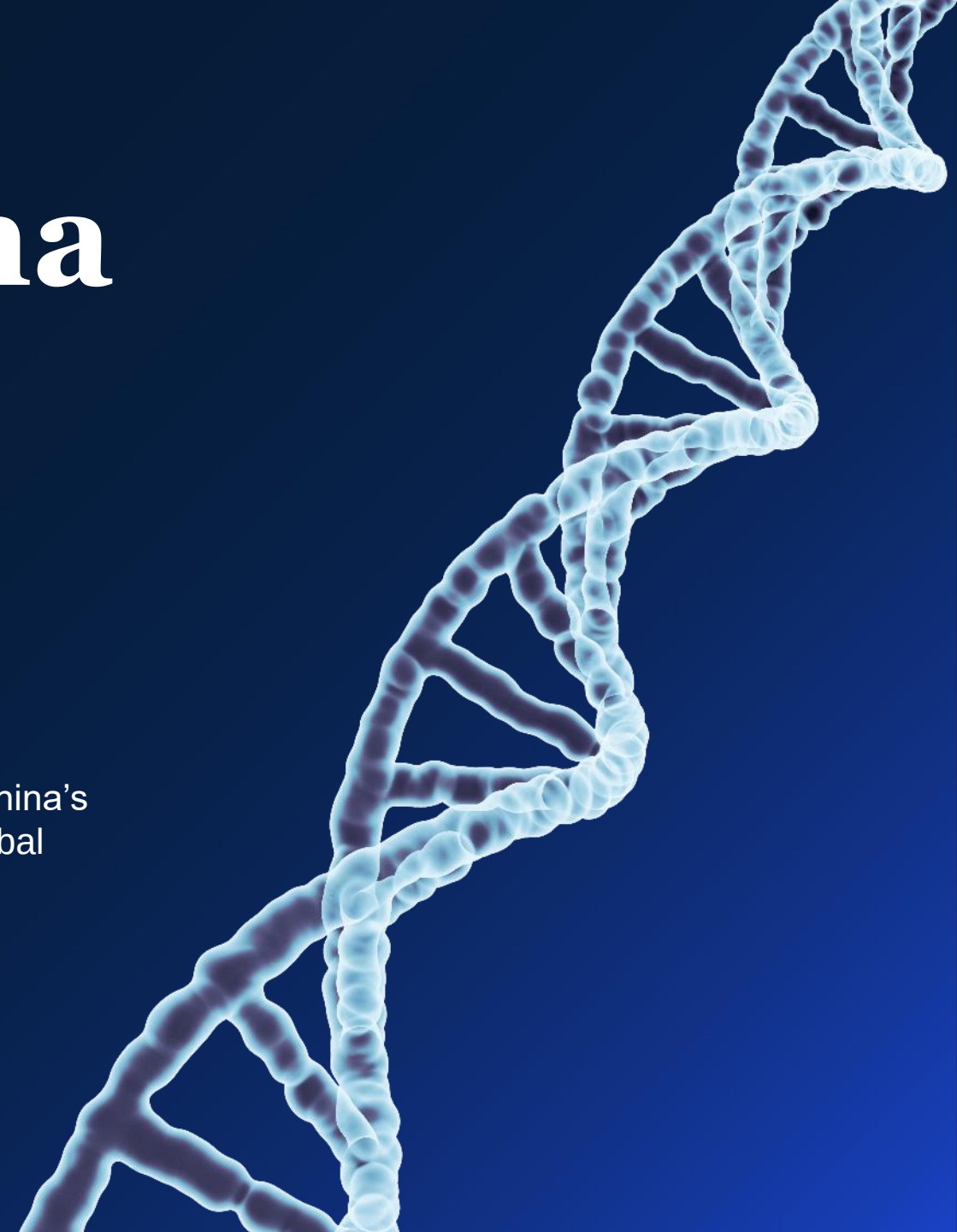


Impact of China innovation on global biopharma will be shaped by 5 interrelated factors

1

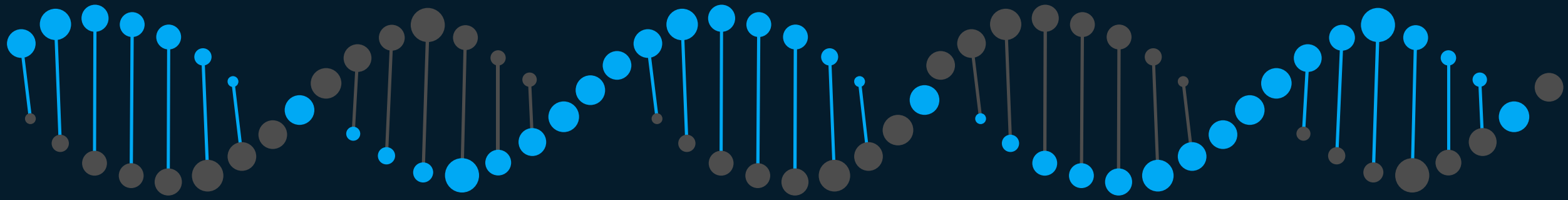
Integration of China in global regulatory ecosystem, enabling China-originated innovation to reach patients outside of China

2

Evolution of China access environment to sufficiently reward China-originated innovation

3

Acceptance of China-originated innovation by global health systems



4

Progress in building up upstream innovation capabilities (i.e., basic research, translational research, discovery) to drive innovation at scale

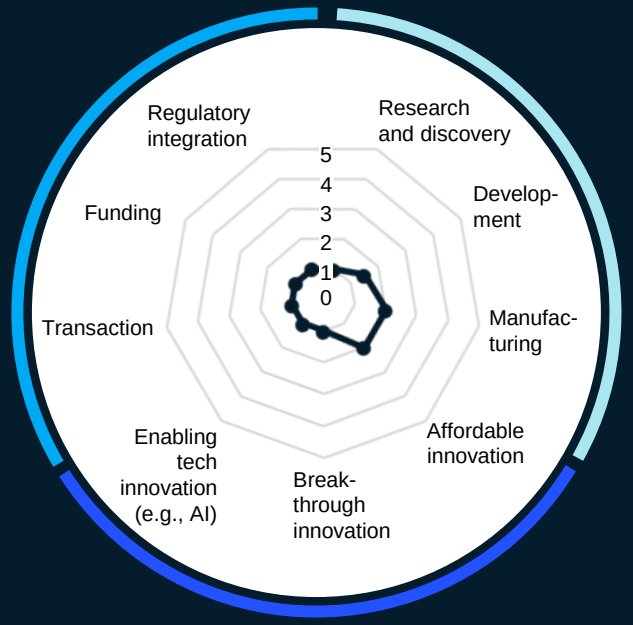
5

Ability to adapt operating model and talent approach towards global firms' practices as more companies venture outside of home market

China's impact on global biopharma by 2028 – 3 potential scenarios

Value chain capability | Enabler | Output

Stunted impact



Global integration stalls or goes in reverse

Funding dries up, capabilities are stunted, role remains limited to sourcing of selected services (e.g., API)

Limited global footprint among China-originated biopharma companies

Affordable innovation does not take off beyond China

Limited/no notable China-originated BIC/FIC reach global markets

At-scale impact

Global integration continues at pace, with some gaps

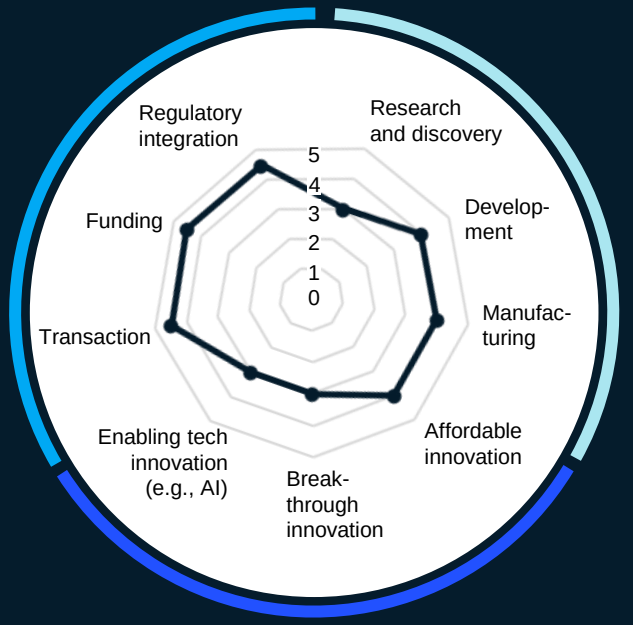
Expanded capabilities, some world-leading, established in selected areas to supply global needs

5+ China-originated biopharma companies have built scaled global operations, with sizable ex-China revenue

Other industry participants leverage China as core part of value chain

Affordable innovation adopted in selected global markets (e.g., SEA); several "blockbuster potential" breakthrough innovations reach global key markets

Transformational impact



Full integration within global innovation ecosystem

Full-blown capabilities and services addressing global needs across modalities at scale

Emergence of numerous next-generation global pharma leaders/shapers of China-origin

Leverage of China as a central platform for transformative impact by other industry participants

Affordable innovation impacts global pharma access system; China establishes itself as a global innovation hub with steady flow of high-quality breakthrough innovations substantiated by scientific merits, creating global impact at scale

Definition of scoring across 9 dimensions

Value chain capability | Enabler | Output

		1	3	5
Enabler	**Regulatory integration**	Global regulatory integration stalls or goes in reverse	No significant barrier for global regulatory integration	Full integration of China in global regulatory ecosystem, enabling China-originated innovation to access global patients
Enabler	**Funding**	Funding mainly from China, stagnant growth in VC/PE investment and market cap	HKEX continues to be viable, and remains as a venue for China-originated biotech IPOs	HKEX continues to be viable, becoming a venue for global-caliber biotech IPOs
Enabler	**Transaction**	M&A happens mainly within China	China-originated biotechs increasingly attractive to global MNCs	China-originated biotechs acquire ex-China originated biotechs
Value chain capability	**Research and discovery**	Limited contribution to global therapeutic innovation, subpar to US/EU hubs	Innovation in selected areas	On par with global leading innovation hub
Value chain capability	**Development**	Activity largely in China, closely following global	On par with global in selected TAs, closely following in others	On par with global development across TAs, and leading in selected areas
Value chain capability	**Manufacturing**	Mostly supply to China market at lower cost	A global supply hub only in selected areas (e.g., mature modalities), with global quality and competitive cost base	A global supply hub across modalities, with global quality and competitive cost base
Output	**Affordable innovation**	Mostly in China	Expanded to selected developed countries (e.g., Japan) beyond emerging market	Enter US/EU at scale
Output	**Breakthrough innovation**	No notable BIC/FIC from China to global market	Several scientifically differentiated innovation reaching global key markets with blockbuster potential	China establishes itself as a global innovation hub with steady flow of high quality outputs
Output	**Enabling tech innovation (e.g., AI)**	Fast following global on technology (e.g., AI)	Lead global in certain technology areas	Leading in disruptive technologies changing drug R&D and delivery

What would be implications for patients? Contrasting 2 very different scenarios

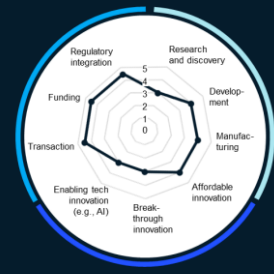
Stunted impact

- Few Asia-specific indications are being pursued
- Chinese patients lose timely access to innovative drugs developed in the rest of the world
- Patients world-wide miss out on access to a broader range of innovative therapeutic options
- Cost of discovery, development and manufacturing plateau as the global industry loses access to the China value chain benefits

vs.

Transformational impact

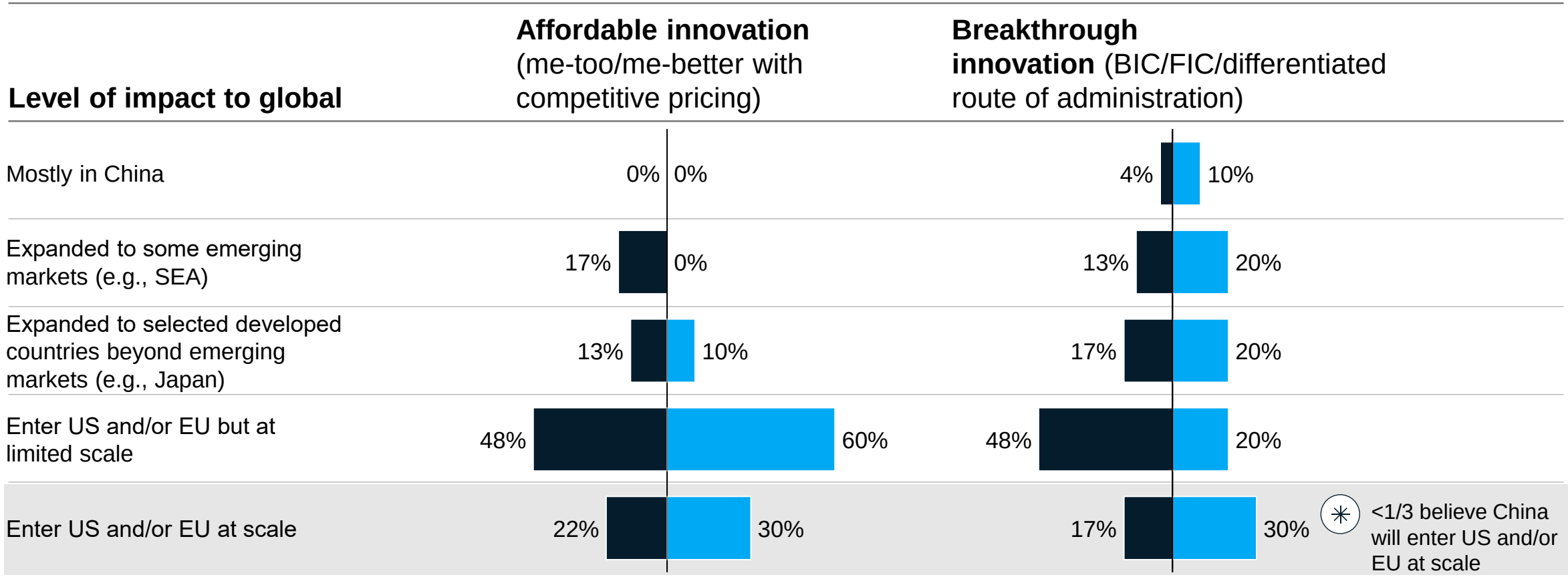
- Asia-specific indications are broadly pursued
- Higher competitive intensity leads to additional push for differentiation by industry participants globally and to more breakthrough discoveries benefiting patients
- Additional high quality innovative therapies are brought to much larger patient populations world-wide
- Speed of drug development continues to accelerate
- Costs of discovery, development and manufacturing decrease significantly in the 2025+ period



Our survey shows that <1/3 of experts believe China will enter developed markets at scale by 2028

China experts ex-China experts

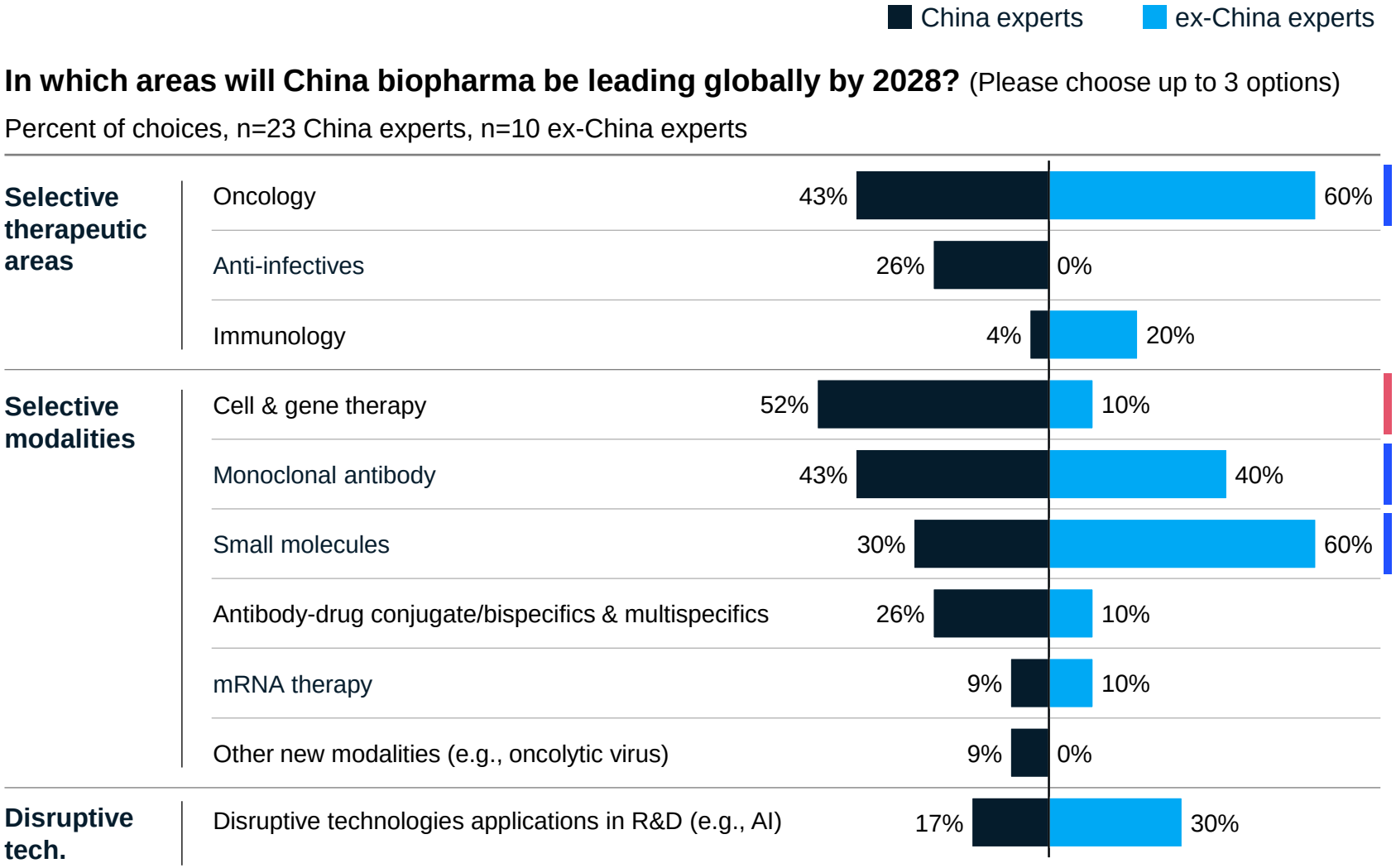
How would you describe the impact of 2 types of innovations from China by 2028?
Percent of respondents[1] choosing the option, N = 23 China experts, N = 10 ex-China experts



1. Numbers may not add up to 100% due to rounding

Source: McKinsey Impact of China Biopharma on Global survey (N = 33), 2021

Experts highlighted three potential areas where China could stand out – oncology, small molecules and mAbs



1. IIT: Investigator initiated trials

Source: McKinsey Impact of China Biopharma on Global survey (N=33), 2021

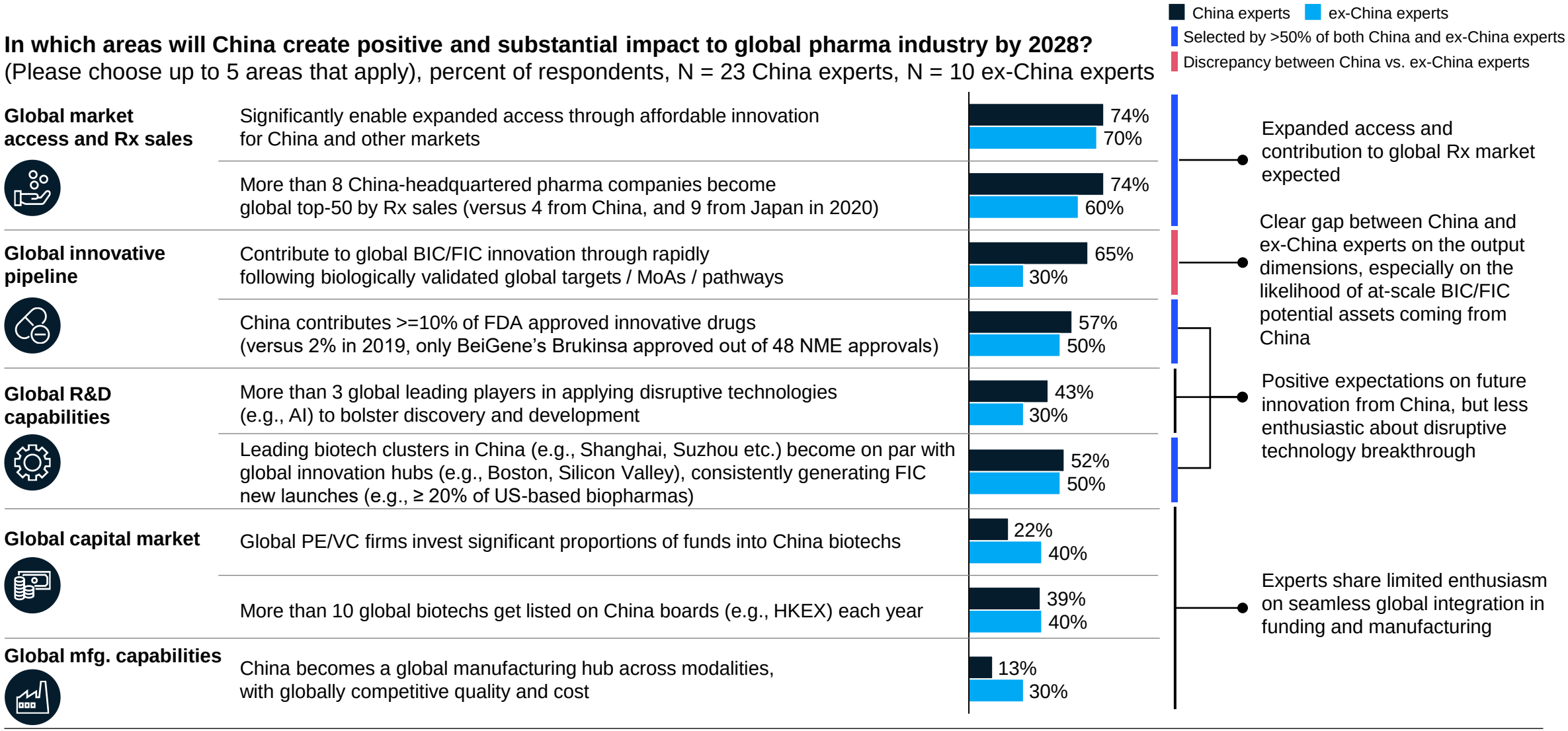
Selected by >=30% of both China and ex-China experts

Large discrepancy between China vs. ex-China experts

Large discrepancy on CGT between China (52%) vs. ex-China experts (11%) is potentially due to different understanding of investigator-initiated trials (IITs) and how these could support fast and flexible early data readout to de-risk clinical studies

Survey indicates positive views on contributions of China, ranging from expanded access, innovative pipeline, to capability hubs

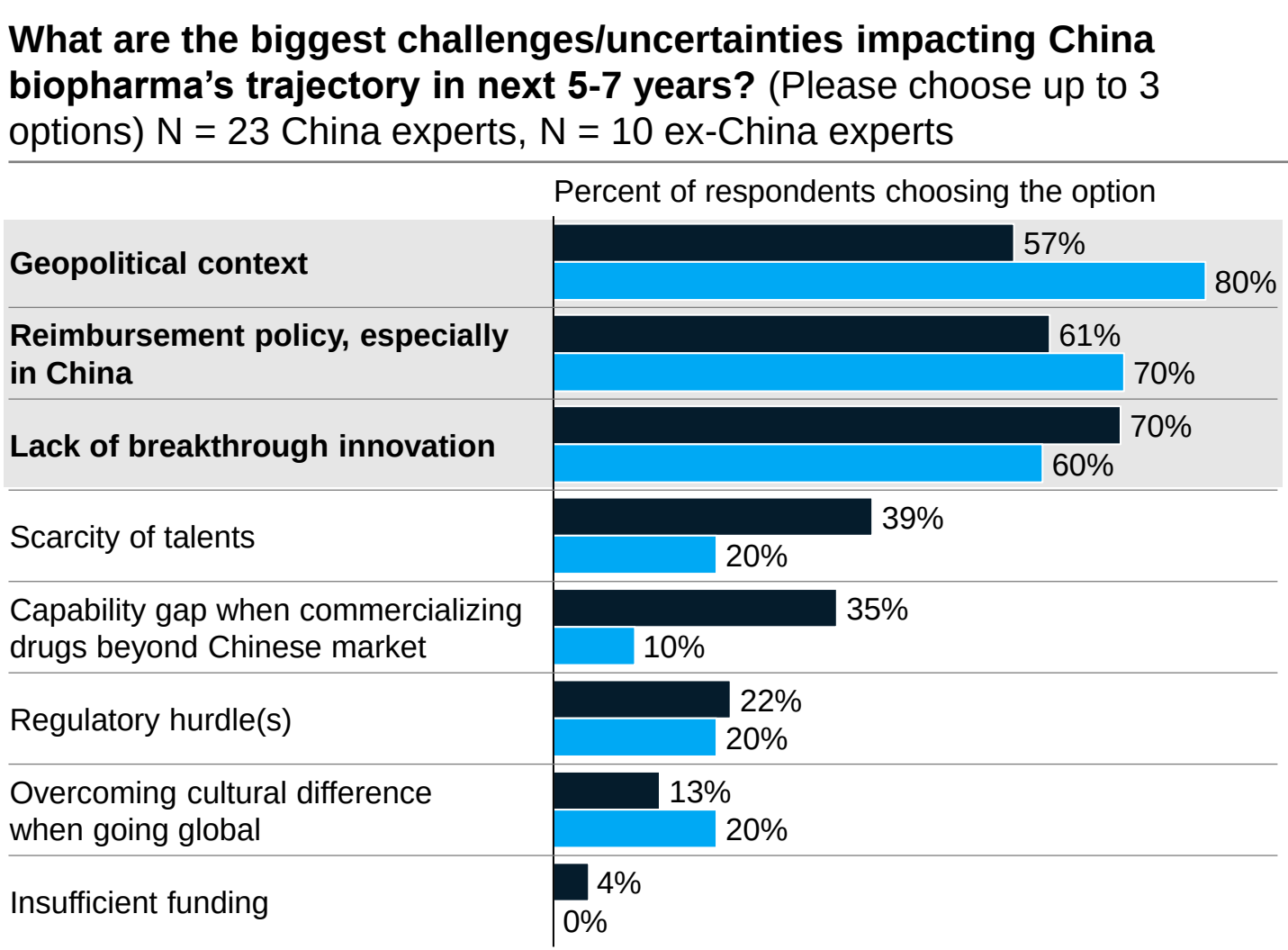
In which areas will China create positive and substantial impact to global pharma industry by 2028?
(Please choose up to 5 areas that apply), percent of respondents, N = 23 China experts, N = 10 ex-China experts



Source: McKinsey Impact of China Biopharma on Global survey (N=33), 2021

Geopolitical context, reimbursement policy, and capability for breakthrough innovation highlighted as the biggest uncertainties

What are the biggest challenges/uncertainties impacting China biopharma's trajectory in next 5-7 years? (Please choose up to 3 options) N = 23 China experts, N = 10 ex-China experts



Voices from industry experts

"Geopolitical context could be the wild card.

Upside scenario is that healthcare could be partially immune.

Downside scenario is that it will lead to regulatory decoupling, which would prevent China-originated innovation from reaching global patients.

"Reimbursement policy in China is conflicted with the government's agenda to encourage biotech and innovation. It is by far the largest bottleneck for the industry.

"Breakthrough innovation takes time, requires bridging between universities and the industry, and shift of risk appetites of both investors and biotechs. It would require more systematic and fundamental changes and funding.

Source: McKinsey Impact of China Biopharma on Global survey (N = 33), 2021

Closing thoughts

The emergence of the China biopharma ecosystem is no longer just a China story. It is a global one, that is considered to have profound implications for decades to come

The single largest uncertainty impacting this trend is related to the integration of China in the global regulatory and access context, and whether that trend will continue at pace, slow down, or even go in reverse

3 impact scenarios are in the cards by 2028:

1. **Stunted impact:** regulatory setbacks lead to decoupling and limit China's impact to a few narrow areas (e.g., APIs)
2. **At-scale impact:** continued integration allows China to impact the global industry with specific spikes across the value chain (e.g., CRO/CDMO, generation of fast followers)
3. **Transformational impact:** full integration and embrace allows China to become the industry's global co-driver of growth, and a change agent across the value chain (e.g., rise of affordable innovation, compression of development timelines), benefiting patients world-wide

While the first scenario is not a zero probability one, industry participants should prepare for scenarios 2 and 3, as they offer a range of opportunities across the value chain but also raise real strategic questions

With this cloud of uncertainty, one thing is clear: partnerships will play a vital role in bringing ecosystems together and allowing the conditions for transformational impact to flourish

Ultimately, patients across the world could be the primary beneficiary by allowing innovative medicines to reach a much larger pool, at much faster pace

Implications for industry participants

For global biopharma

- **Acknowledge the outlook for change:** be ready for rapid changes or even disruptions
- **Consider creative partnerships:** partner with China biotechs and innovation ecosystem players early on, align on interests and goals to capture the value creation for both China and global businesses
- **Adapt China strategy to be more local-driven** (vs. global-centric): be flexible to adopt a separate operating model locally with China-specific considerations to allow different formula of portfolio, talent and financial considerations

For China-originated biotech

- **Focus on real differentiating innovation that delivers patient value:** take a hard look at the value of the assets and business model, formulate clear strategy to differentiate
- **Be prepared for a marathon and not a sprint:** take on different risk appetite, plan pipeline advancement and financing for the long run
- **Take on step-wise approach to go global:** no easy path to capture global market value, learn from the first movers, embrace global talent and culture, leverage partnership/M&A and be mindful of the geopolitical environment

Innovation launch

Affordability and availability challenges remain

70% average price cut in newly launched oncology drugs[1] via 2020 NRDL negotiation, while OOP[2] expense post reimbursement remains formidable at **2X** of the median annual individual disposable income in China[2]

Affordability

What are the key access options for new launches, and how would the different options evolve?

92 of the 2020 NRDL-negotiation drugs available at only **16%** of BMI designated medical insitutions[3] by May 2021

Availability

How to maximize hospital listings to make innovative drugs available to patients?

1. New oncology drugs approved in 2019 and 2020
2. OOP: out-of-pocket payment on average 7 K USD for annual treatment of cost of 15-20 K USD, assuming average 60% reimbursement ratio
3. Available at 32K out of ~200K BMI designated medical facilities (not including retail pharmacies)

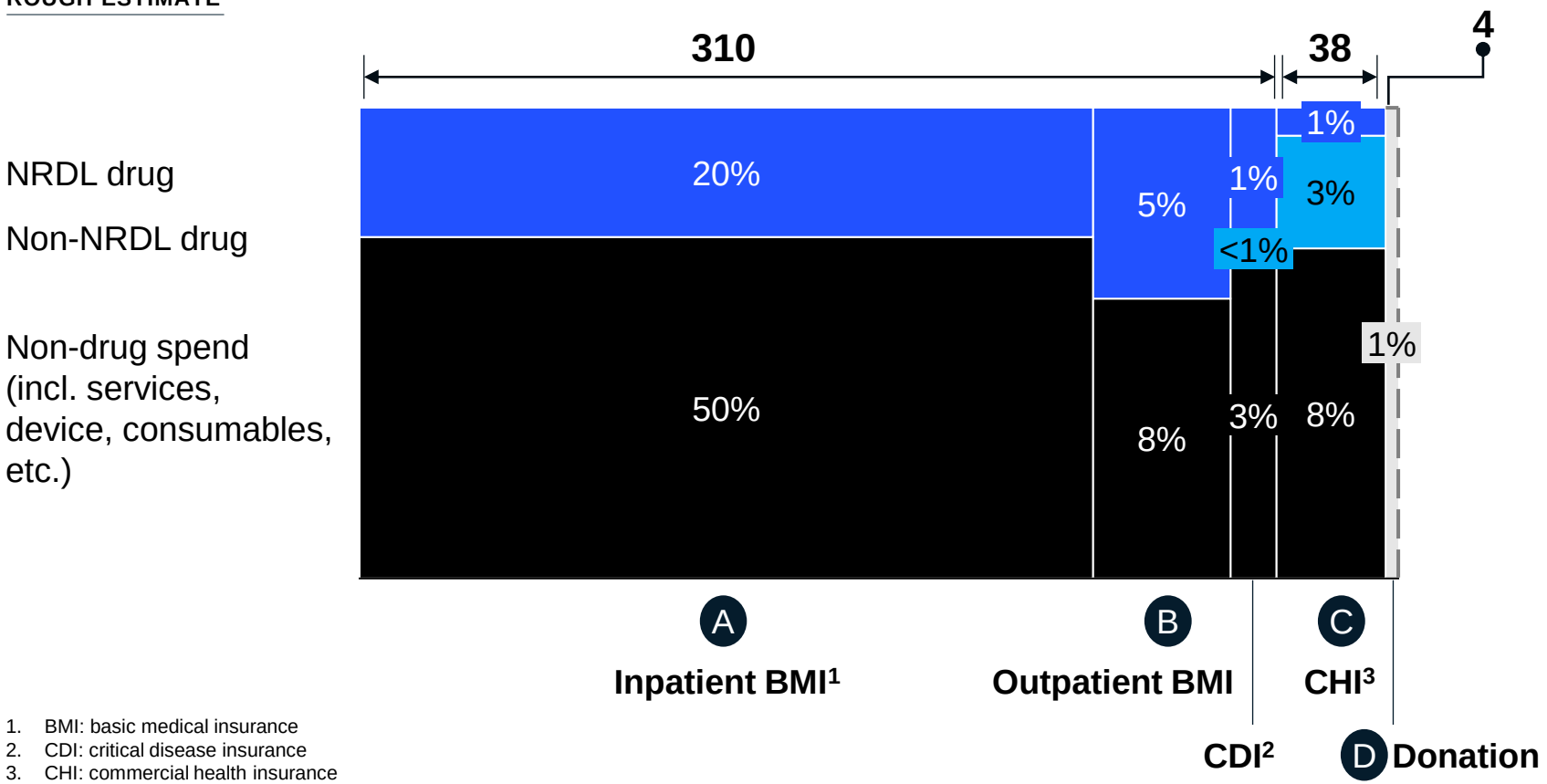
Source: China Pharmaceutical Association; NHSA; GBI; Xinhuanet.com, June 2021; RDPAC; McKinsey analysis, Nov 2021

Affordability: BMI remains central to healthcare expenditure

Healthcare expenditure landscape in China, 2020

By insurance scheme and funding source (OOP[4] spending not included), bn USD, percent

ROUGH ESTIMATE



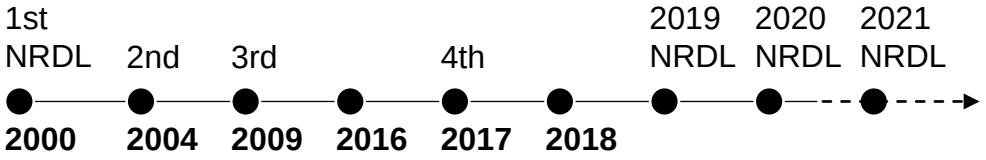
1. BMI: basic medical insurance
2. CDI: critical disease insurance
3. CHI: commercial health insurance
4. OOP: out-of-pocket

Source: NHC; NHSA; CBIRC; People.com, Sept 2021; McKinsey analysis, Nov 2021

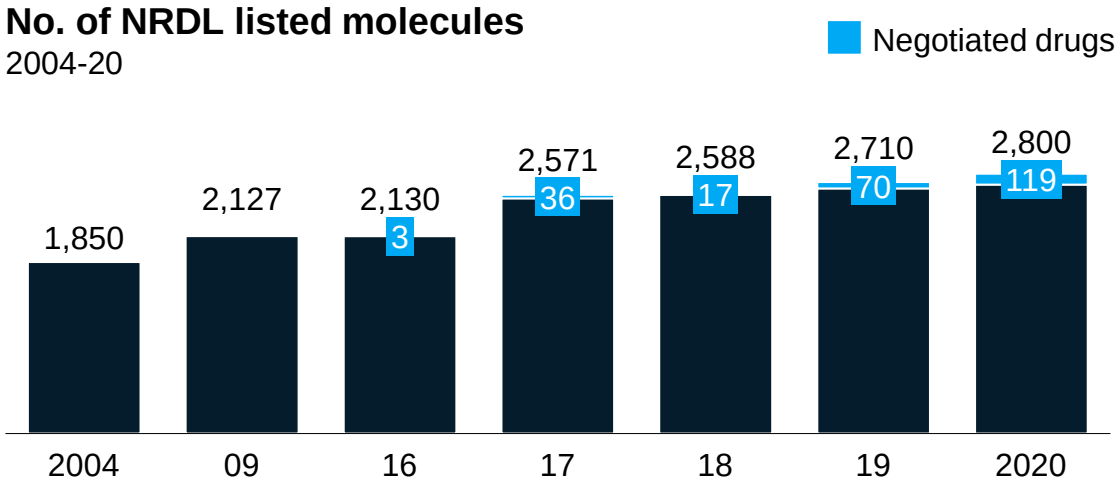
- A Inpatient BMI enables availability for the broadest patient pool
- B Outpatient BMI offers additional opportunities
- C CHI emerges as supplementary funding source for non-NRDL drugs and OOP[4] portion of NRDL drugs
- D Recent government announcements advocate for greater level of social donation and enhancement of charity funds for healthcare

A: Inpatient BMI: Annual NRDL updates provide broad access to newly launched medicines

Annual update of NRDL now the new norm …

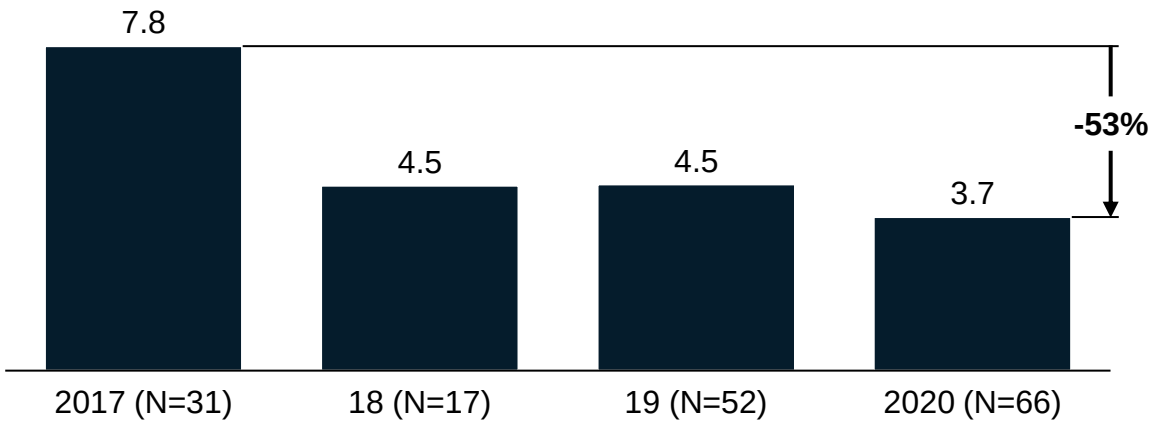


No. of NRDL listed molecules
2004-20



... leading to shortened time lag from approval to NRDL

Average number of years between drug approval and NRDL listing by negotiation batch
Years



14 western medicines approved in 2020 were added to the NRDL that same year

Source: GBI; McKinsey analysis, Nov 2021

B: Outpatient BMI: three outpatient reimbursement schemes aim to enhance affordability post NRDL listing

As of October, 2021

Three schemes for outpatient reimbursement through BMI

	1 Outpatient coordination (门诊统筹)	2 Outpatient chronic/ special disease (门慢门特)	3 Special drug management (特药管理)
Coverage	**250+** cities **960 mn** population **NRDL** drugs only	**29** provinces[1] **1,200 mn** population **10-90+** chronic and special diseases covered in each region	**20** provinces[1] **890 mn** population **10-100+** specialty care, innovative drugs covered
	Residents in most regions Urban workers in select regions	*Patients with pre-approval from designated institutes, prescription from authorized physicians, and purchase at designated facilities*	
Reimbursement ratio, percent	**10-90+%**	**10-90+%**	**50-85%**
Reimbursement cap, K RMB	**0.05-10**	**0.3-100+** *On par with inpatient reimbursements for select diseases in select regions*	**150-600[2]+** *Typically on par with inpatient reimbursements*

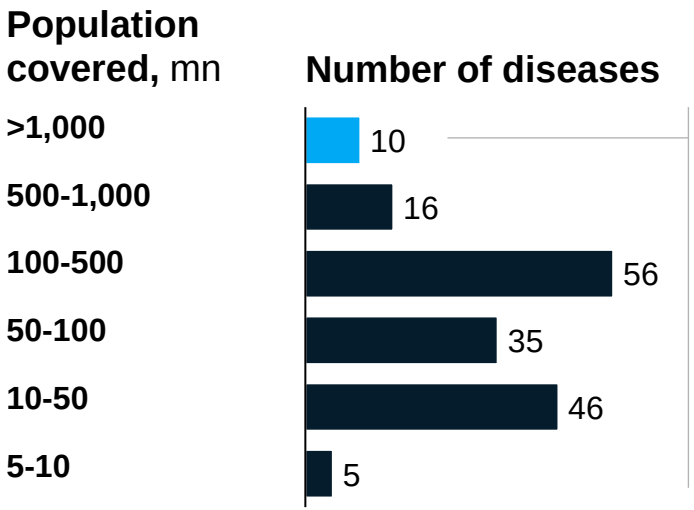
1. Including municipalities, only counting those with provincial level policies
3. Typically SDM reimbursement cap to be combined with inpatient spend

Source: NHSA; Provincial Healthcare Security Administration (PHSA); McKinsey analysis, Nov 2021

B2: Outpatient chronic / special disease (OPCS) scheme provides broad but thin coverage

As of October, 2021

160+ disease or medical conditions covered across 29 provinces



10 diseases covered for **1+ Bn** population:

Hypertension	**Diabetes**
Mental health	**Malignant tumor**
Parkinson's	SLE[2]
Hepatic cirrhosis	CAD[3]
Cerebrovascular	Tuberculosis

Nationwide harmonization on the way

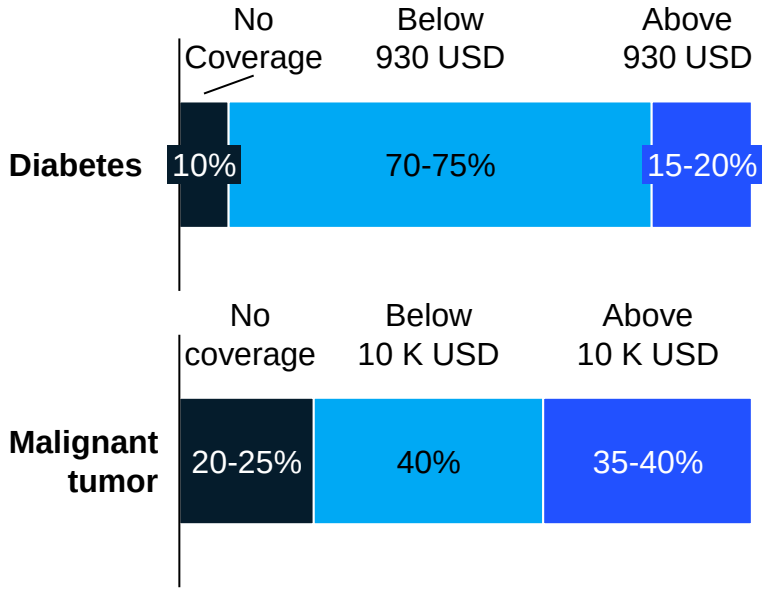
国家医保局 财政部关于建立医疗保障待遇清单制度的意见

医保发[2021]5号

- Harmonized reimbursement on national level across regions expected in 3 years
- 100% population covered for hypertension and diabetes
- Elevating reimbursement depth for select treatment (e.g., malignant tumor, tuberculosis)

BMI[1] covered population by OPCS annual reimbursement cap, percent

100% = 1.3 bn BMI covered population



80-90% of population covered by OPCS

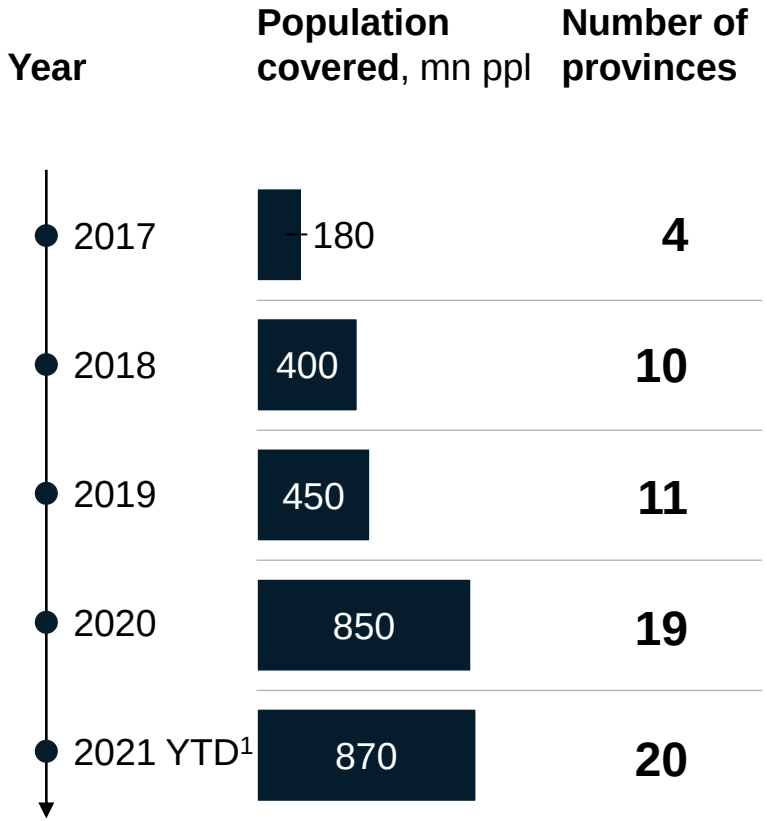
15-40% of population with meaningful reimbursement depth[4]

1. BMI: basic medical insurance
2. SLE: systemic lupus erythematosus
3. CAD: coronary artery disease
4. For diabetes patients, reimbursement cap higher than annual treatment cost (~930 USD); for cancer patients, reimbursement cap higher than average PD-1 annual treatment cost for NSCLC (~10 K USD)

Source: NHSA; PHSA; McKinsey analysis, Nov 2021

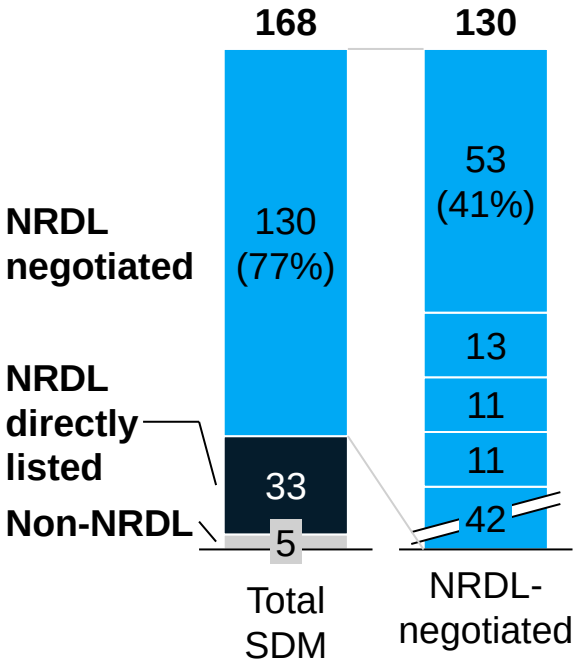
B3: Special drug management (SDM) aims to increase access to NRDL negotiation drugs

SDM launched at provincial level since 2017 …



… to increase availability and affordability of NRDL negotiation drugs

Number of drugs covered in provincial SDM list[2]



Therapeutic area	Maximum population covered by single drug, Mn ppl	Selected example
Oncology	590	ELUNATE, ALECENSA, 艾瑞昔布, JAKAVI ruxolitinib, Lynparza olaparib
Anti-viral	550	EPCLUSA, HARVONI, ZEPATIER
Cardiovascular	600	Adempas riociguat, Tracleer, Uptravi selexipag, Opsumit
Immunology	570	HUMIRA adalimumab
Others	620	EXJADE

In addition to inpatient setting, above drugs are also reimbursable in outpatient setting[3]; the outpatient reimbursement is on par with inpatient reimbursement in 10+ provinces

1. As of October 2021; 2. Excluding traditional Chinese medicine
3. Hospital listing required for reimbursement unless otherwise specified under "dual channel" policy

Source: NHC; NHSA; PHSA; McKinsey analysis, Nov 2021

References to specific products or organizations are solely for illustration and do not constitute any endorsement or recommendation

B3: Provincial HSA updates SDM post NRDL negotiation

SDM scheme is formulated at different administrative levels

Policy elements	Key decision makers	Openness for shaping
Special drug list	Provincial	◕
Designated hospitals and physicians	HSA at provincial and BMI fund coordination level[1], usually at city or county level	◑
Reimburse-ment depth	HSA at BMI fund coordination level[1]	◔

◔ Low ◕ High

Two key stakeholders for special drug management list decision

- Release of new NRDL
- Preliminary drug list drafted by **provincial HSA** based on latest NRDL
- Review of drug list by **clinical KOLs and leading hospitals** (medical insurance department) in the region
- Finalization and implementation of provincial special drug list by provincial HSA

1- to 6-month time window to develop SDM formulary

Three major considerations

- Monthly treatment cost >500 RMB (>78 USD)
- Large unmet needs
- Fit for outpatient prescription

1. BMI fund coordination region, 医保统筹区域

Source: NHSA; PHSA; expert interview; McKinsey analysis, Nov 2021

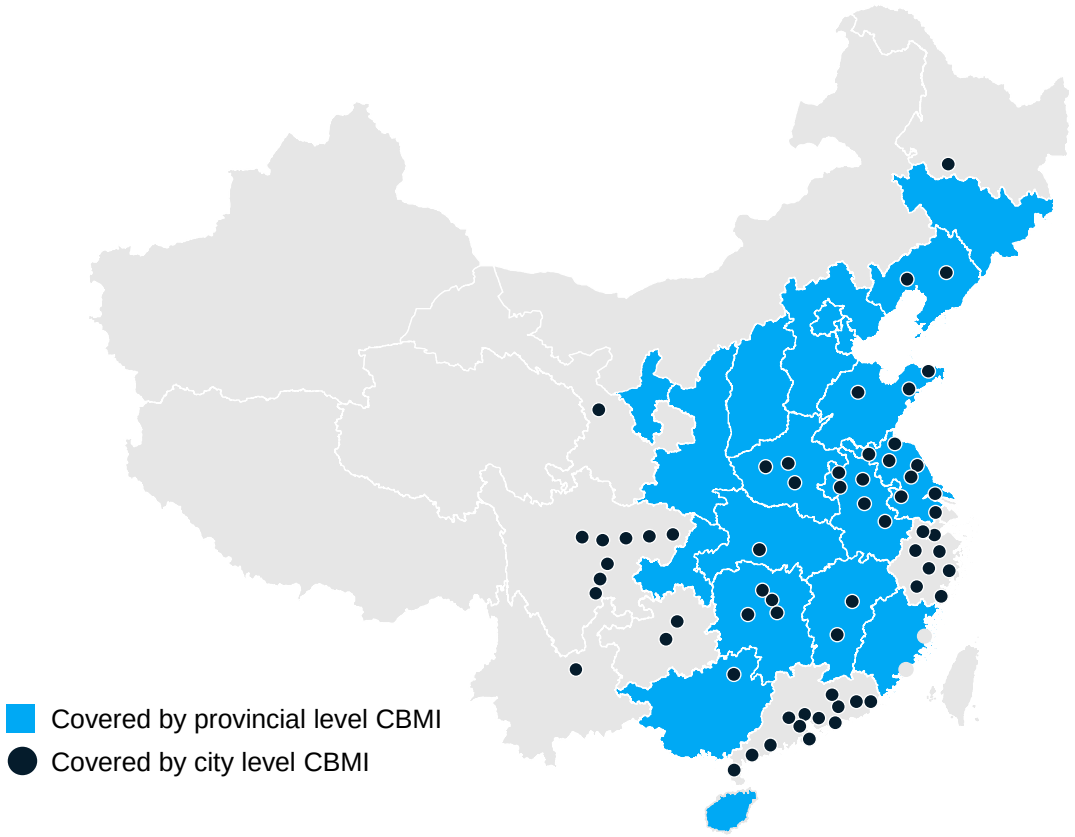
C: Commercial health insurance emerges as supplementary funding source for non-NRDL drugs and OOP portion of NRDL drugs

Details to follow

Commercial health insurance	Typical drug coverage	Total enrollment Mn ppl 2020	Total enrollment Mn ppl Est. 2025	Reimburse-ment cap USD	Reimburse-ment ratio	Priorities for innovative drug
City Benefit Medical Insurance (CBMI)	10-50 drugs beyond NRDL coverage; determined by each city/ province Typically with annual deductible >3 K USD, which makes it most relevant for high-price drugs for critical diseases (e.g., cancer)	30-80	200-300	~150-230 K	70-80%	
Specialty drug insurance	10-50 drugs beyond NRDL coverage, including innovative drugs No coverage for pre-existing conditions	~10	~200	~150 K	100%	
"Million RMB" Medical Insurance	All drugs listed on public hospital formulary Select programs offer specialty drug coverage with deductible ~1.5 K USD	50-100	200-250	Up to 1 mn	100%	
High-end Medical Insurance	All NMPA approved drugs with very few restrictions	<1	5-10	1-2 mn	100%	
Supplementary Insurance to BMI	NRDL drugs only	100-200	180-200	15 K-30 K	Up to 90%	
Critical illness insurance	Coverage by disease with lump sum payment, no specific drug coverage	Typically covering life-threatening diseases and less relevant for specific treatment/drug, as lump sum payout does not limit specific use				

Source: Press release; China Insurance Yearbook; expert interview; McKinsey analysis, Nov 2021

C: City Benefit Medical Insurance (CBMI) continues with strong momentum



300+ cities launched CBMI, across **27** provinces

95% of programs cover specialty drugs

Maturing CBMI programs across the nation

- **Strong government support** to drive enrollment (e.g., allowing use of BMI personal funds for CMBI purchase)
- **Insurance product upgrade with expanded specialty drug list** accompanied by premium increase and tiered product offerings
- **Coverage enhancements** (e.g., coverage for pre-existing condition, diversified disease, and treatment options)

Future outlook for CBMI

200-300 mn enrollments by 2025 expected, up from 30-80 mn in 2020

3-5x total CBMI premium by 2025, currently ~3-5 bn RMB gross premium written

>80% government target for CBMI payout ratio, versus 40-50% medium payout ratio in 2020

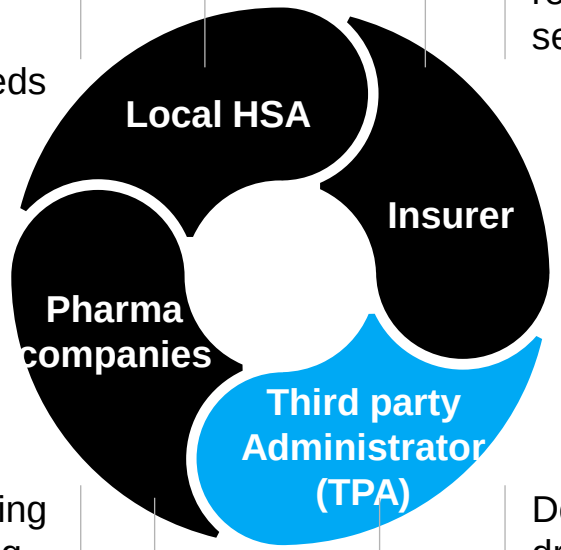
Source: Expert interview; CBIRC; McKinsey analysis, Nov 2021

C: Multi-stakeholder management required to drive CBMI listing

Stakeholders for CBMI specialty drug list

Ensure listing of drugs targeting high-incidence disease or with high unmet needs in the region

Outsource specialty drug list design and reimbursement services



Drive CBMI listing and ensure drug availability in designated channels

Design specialty drug lists; assume responsibility for distribution, auditing, and/or settlement in select programs

1. In certain regions, TPAs are responsible for settlement of specialty drug-related claims with allocated premium portion

Source: Expert interview; McKinsey analysis, Nov 2021

Strategic moves for CBMI specialty drug listing

- Partner with leading TPAs to broaden CBMI listing across the country, typically with 2 archetypes of collaboration models
  - Designate DTP pharmacies of TPAs for specialty drug distribution and profit sharing
  - Innovate on risk sharing schemes (e.g., volume-based tiered discounts to TPAs / insurers[1])
- Government affairs team to shape for inclusion of region-specific non-NRDL drugs with high unmet needs (e.g., rare disease)
- Monitor and adapt to potential future shift if insurers step up and play a more significant role (vs. TPAs) in administration and formulation of drug listing

Moving from “affordability” to “availability” …

We conducted a survey among pharmacy heads to validate hypothesis and understand key success factors (KSFs) for hospital listing

Conducted in **August 2021**

Pharmacy heads from **75 hospitals** surveyed across different city tiers and hospital class

Aim to **validate hypotheses** and **understand KSFs** around hospital listing of NRDL drugs

Summary of findings from the listing survey

	Questions	Survey findings
A	Are these **5 "hypotheses"** of hospital listing for innovative drugs true?	
1	Most hospitals have **less frequent Pharmaceutical Affairs (PA) Committee meetings** than before, some have not conducted the meeting for more than 1 year	**>95%** hospitals have conducted PA Committee meetings **every year** during 2019-21 YTD
2	Most hospitals maintain **constant numbers of drugs** in their drug formulary and have diminishing incentives to list innovative drugs	✓
3	An innovative drug that conducted **clinical trials** at that specific hospital is more likely to get listed there	✓
4	If an innovative drug is already in the **dual channel** (双通道), chance to get listing in that city is lower	✓
5	If an innovative drug's listing status is **tracked by central government,** the hospital will prioritize its listing	✓
B	For an innovative drug to pass **PA Committee review,** what are **key constraints and success factors?**	**Clinical differentiation and economic benefits** are core drivers for PA Committee approval
C	**Post PA Committee approval, how long does it take to implement** hospital listing (i.e., entry to electronic Rx system) and what are potential bottlenecks?	**1.5 months** on average; KA and market access team shall collaborate to ensure **smooth interface with local BMI system**

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

A1: Almost all hospitals surveyed have Pharmaceutical Affairs Committee meetings at least once a year

Hypothesis

Most hospitals have **less frequent Pharmaceutical Affairs Committee meetings** than before, some have not conducted the meeting for more than 1 year

False

The truth is …

95%+
hospitals have conducted **PA Committee meetings every year** from 2019-21 YTD

The meeting happens **2 times a year** on average in 2019 and 2020 across hospital class and city tiers

Half of the hospitals have dedicated PA Committee meetings **dedicated to NRDL innovative drugs**

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

A2: Most hospitals prefer to maintain constant number of drugs in their formulary, with diminishing incentives to list innovative drugs

Hypothesis

Most hospitals maintain **constant numbers of drugs** in the formulary. New drugs getting listed means other drugs need to be removed

Hospital are less incentivized to list innovative drugs given zero markup policies and KPIs to track drug expense ratio

True

The truth is …

90% of hospitals try to **maintain total numbers of drugs constant** in their formulary, i.e., new drugs listed accompanied by existing drugs removed from the formulary

~8 new innovative drugs on average listed **every year** 2019-21 YTD in Class III hospitals, a small portion of all newly added NRDL drugs

80%+ of respondents agree or strongly agree[1] that **hospitals are less incentivized to list innovative drugs** given zero markup policies and KPIs to track drug expense ratio

1. Rate on a scale of 1-10: 9-10 strongly agree; 7-8 agree; 5-6 neither agree nor disagree, 3-4 disagree, 1-2 strongly disagree

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

A3: Track record built at clinical trial phase could accelerate hospital listing

Hypothesis

An innovative drug that conducted clinical trials at that specific hospital is more likely to get listed there

True

The truth is …

85%

of respondents agree or strongly agree[1] that:

If an innovative drug has clinical trials conducted at the hospital, the PA Committee is more likely to approve its listing

> Our company starts to **plan for market access at the development phase.** We plan clinical trial sites based on both clinical considerations and access considerations
>
> **KA head of a leading MNC pharma company**

1. Rate on a scale of 1-10: 9-10 strongly agree; 7-8 agree; 5-6 neither agree nor disagree, 3-4 disagree, 1-2 strongly disagree

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

A4: Innovative drugs in dual channel are less likely to get listed

Hypothesis

If an innovative drug is already in the dual channel（双通道）, chance to get listing in that city is lower

"

Provincial dual channel list shall be developed in all provinces by end of Oct 2021

– NHSA[1], NHC[1], Sep 2021

True

The truth is …

60%+

of respondents agree or strongly agree[2] that:

If an NRDL innovative drug is already in the dual channel (双通道), they will likely deprioritize the drug in listing decisions

80%+

of respondents agree or strongly agree[2] that:

The "three designations" / "five designations (三定五定)[3]" in dual channel will further restrict hospital listing for innovative drugs

1. NHSA: National Healthcare Security Administration; NHC: National Health Commission
2. Rate on a scale of 1-10: 9-10 strongly agree; 7-8 agree; 5-6 neither agree nor disagree, 3-4 disagree, 1-2 strongly disagree
3. The "three/five designation" (三定五定) scheme designates medical institutes, responsible physicians, retail pharmacies, review entity, and/or patients to standardize drug use management (specifics vary by regions, may also include designation of drugs and doses)

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

A5: For NRDL drugs whose listing status tracked by central government, hospitals would prioritize these

Hypothesis

NRDL innovative drugs tracked by government (e.g., 92 drugs from 2020 NRDL negotiation tracked by NHSA[2] with publically available listing status) are priorities for listing decisions

True

The truth is …

75%+

respondents agree or strongly agree[1] that:

NRDL drugs tracked by government are prioritized for hospital listing

> We had selected drugs **with urgent clinical needs from 2020 negotiation** … and asked related entities to **report hospital listing status** on an ongoing basis
>
> – NHSA[2], May 2021

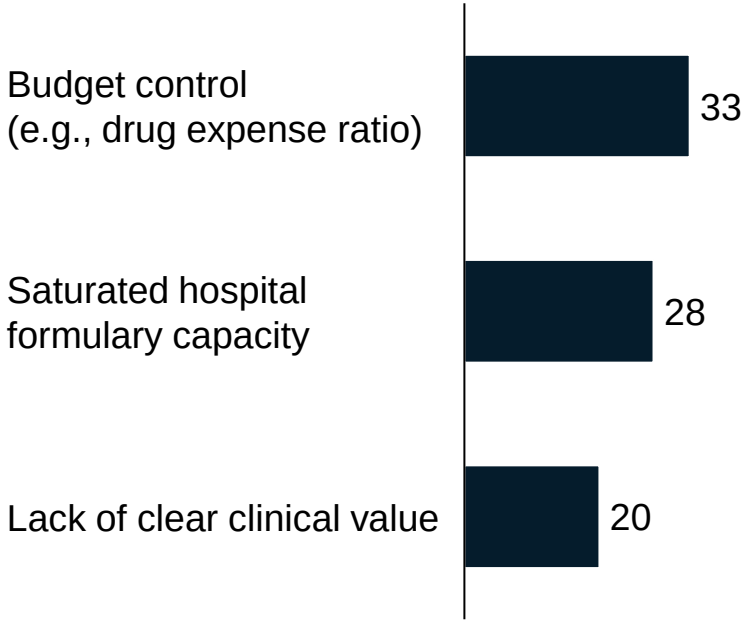
1. Rate on a scale of 1-10: 9-10 strongly agree; 7-8 agree; 5-6 neither agree nor disagree, 3-4 disagree, 1-2 strongly disagree
2. NHSA: National Healthcare Security Administration

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

B: Clinical differentiation and economic benefits are core drivers for PA Committee approval

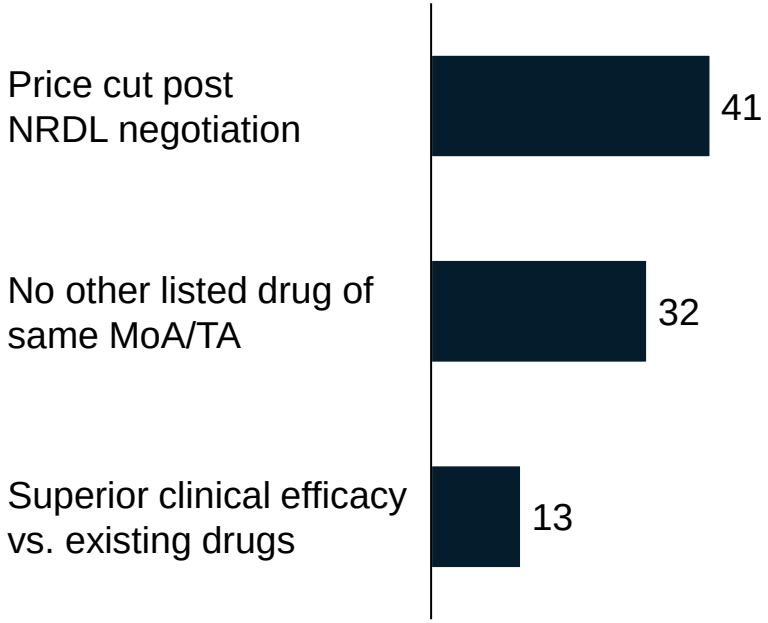
Key constraints for PA Committee approval of innovative drugs

Percent of respondents rank as top 1



Top KSFs for PA Committee approval of innovative drugs

Percent of respondents rank as top 1



A compelling story centered around **clinical differentiation** and **economic benefits** is key for hospital listing of innovative drugs

Key evidence for PA Committee consideration include:

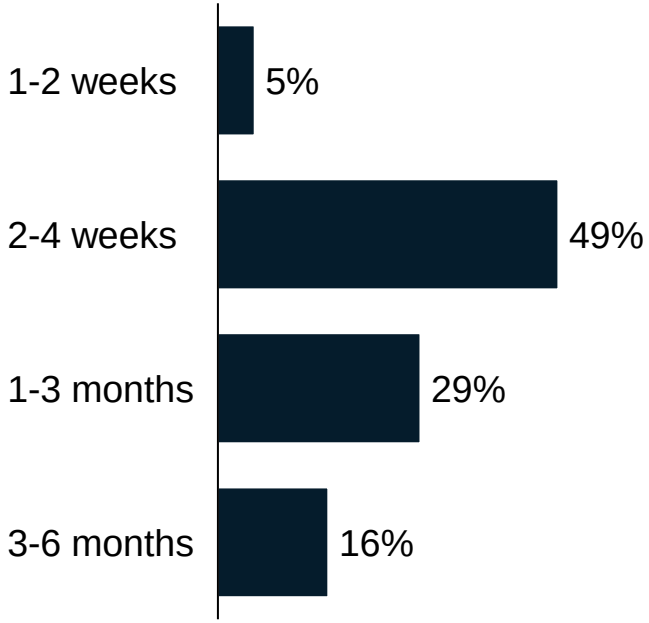
- **Superior clinical efficacy** from clinical trial data
- **Reduced treatment cost** (e.g., per HEOR research)
- **Demonstrated safety** from few AE occurrence

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

C: KA and GA need to closely collaborate to ensure smooth interface with local BMI system

Time lag to implement hospital listing

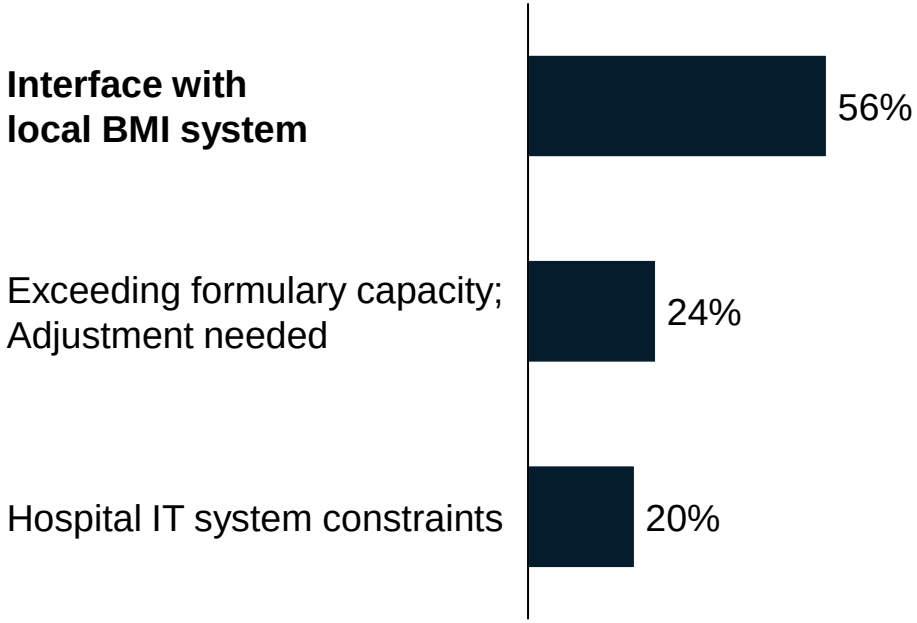
Percent of respondents by reported time taken from PA Committee approval to electronic Rx system entry



Avg: **1.5 months**

Top bottlenecks to implement hospital listing

Percent of respondents rank as top 1



Cross-functional collaboration by access, KA, sales team, and distributors could help accelerate hospital listing implementation, with

- **Local access** monitoring local BMI system update and ensuring drug information accuracy
- **KA** facilitating HIS[1] cataloging of newly listed drugs
- **Distributors** helping to ensure supply

1. HIS: hospital information system

Source: Pharmacy Head Survey (N = 75); expert interview; McKinsey analysis, Nov 2021

Closing thoughts on strategic imperatives for launch of innovative assets

BMI remains the most important funding source for innovation among all funding sources, and is still likely to adhere to the “broad and basic coverage” principle in the short-medium term. Pharma companies need to cautiously weigh the price-volume trade-off to make strategic decisions in NRDL negotiation

Getting onto NRDL is just the start of the journey, especially for drugs largely used in outpatient setting. Pharma companies should consider proactively shaping BMI outpatient reimbursement after NRDL listing to maximize the impact of NRDL inclusion. Among all schemes, BMI specialty drug management (特药管理) seems to be one of the most viable paths for outpatient reimbursement enhancement

CHI will continue to rise as a meaningful supplement to BMI, for both non-NRDL drugs and OOP portion of NRDL drugs. New capabilities in evidence generation, service offerings, strategic partnerships with insurance companies, TPAs, and other industry players will be key

Hospital listing increases in complexity, requiring a lot of cross-functional collaborations among local access, KA, sales team, and commercial team

Digital health ecosystem

Three key digital trends shaping the China healthcare ecosystem

1

Leading pharmacos moving to a more advanced approach to omnichannel engagement

Pioneering omnichannel for optimized HCP[1] engagement

2

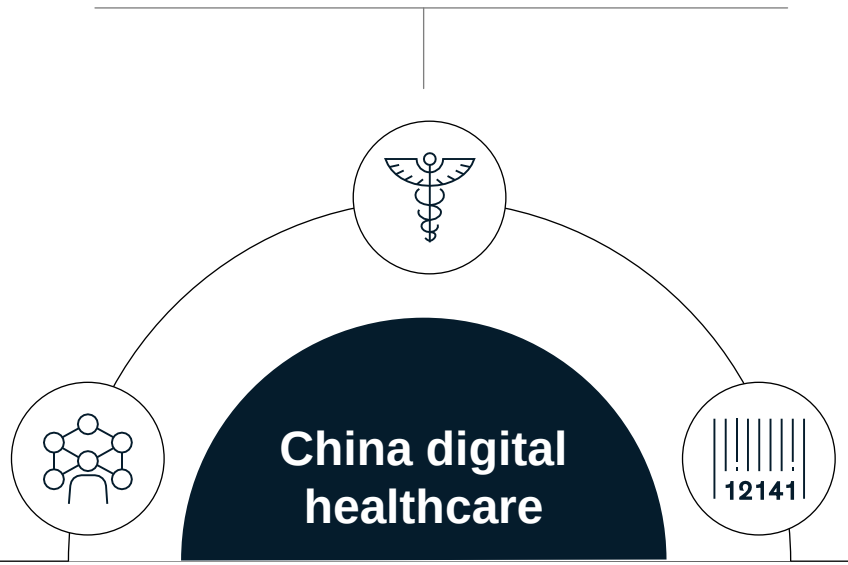
Transformative provider service model emerging

Internet platforms attempt to disrupt conventional care delivery to help enable better access to care

3

Digital health innovation on the rise

Tech giants and digital natives innovate with a wave of products and services to help shape the healthcare ecosystem



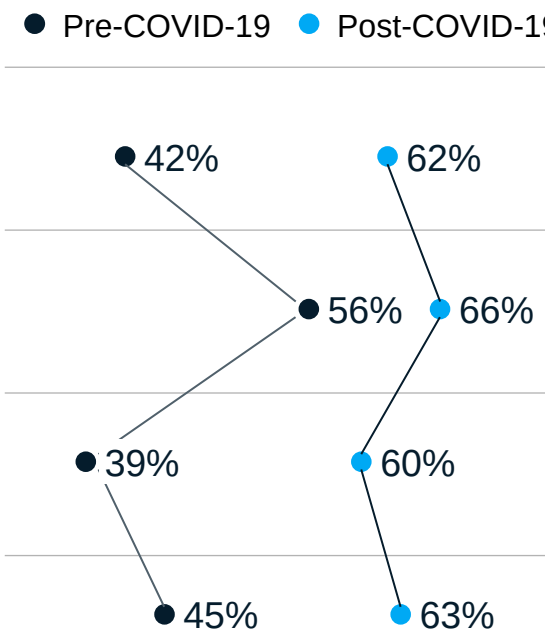
1. HCP: healthcare provider

Source: McKinsey analysis, Nov 2021

1: Physicians increasingly adopt and accept remote channels

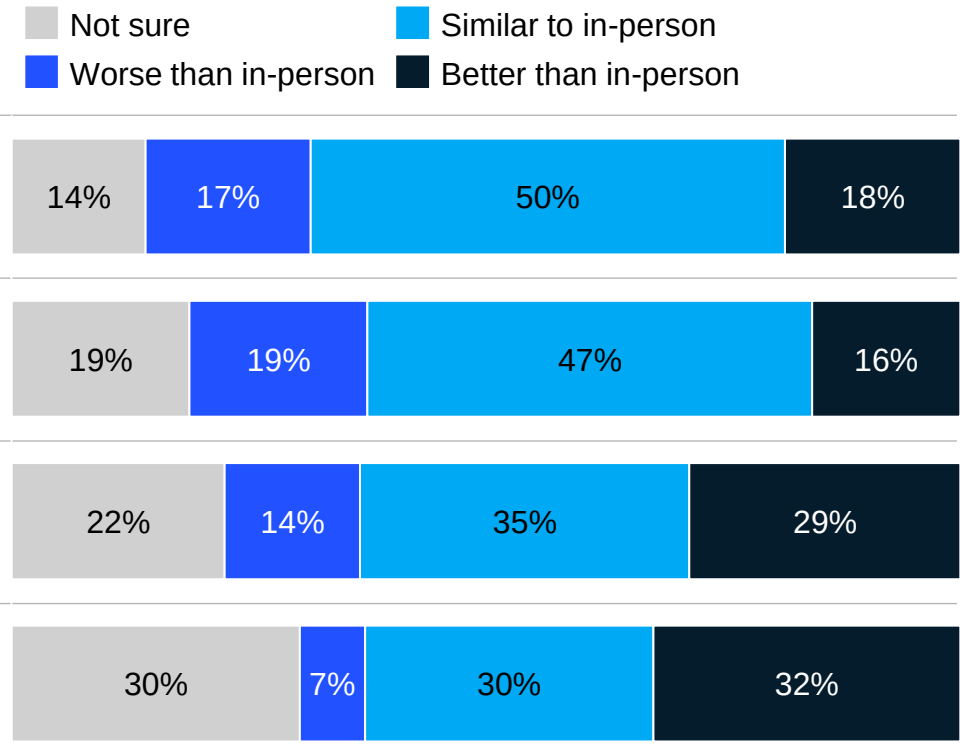
More adoption

Share of remote interactions among all interactions with sales reps pre- and post-COVID-19, N = 339, percent



Higher acceptance

HCPs assessment of in-person rep interactions pre-COVID-19 versus remote interactions post-COVID-19, N = 339, percent

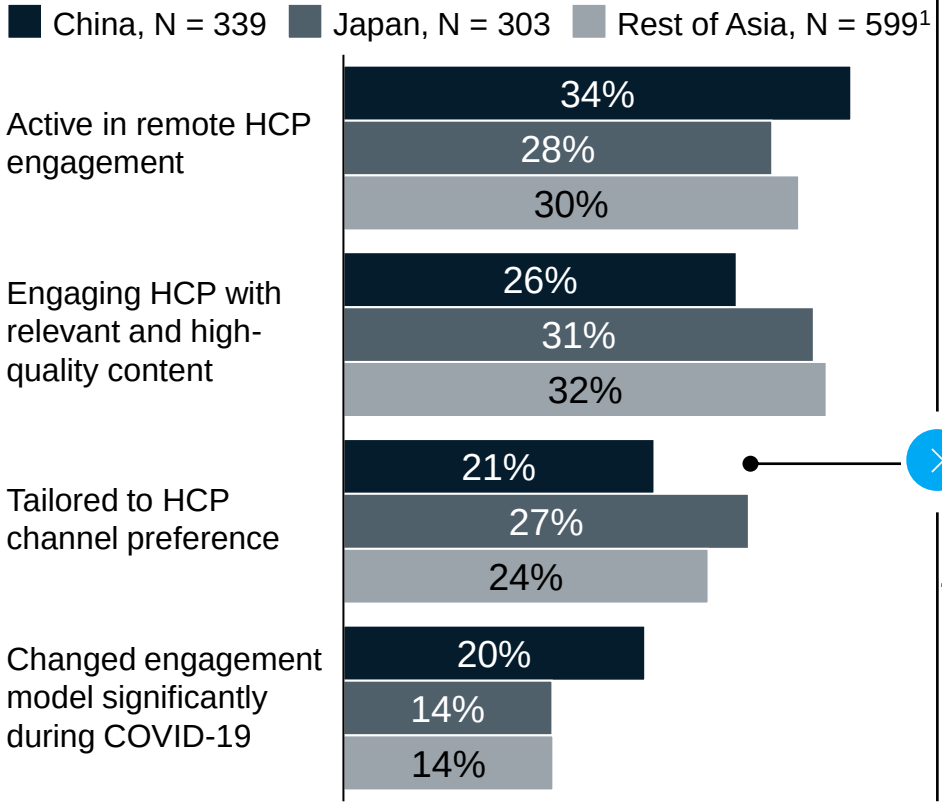


1. Big cities include tier 1 and tier 2 cities
2. Others include all other hospitals below Class III
3. Emerging markets include regions outside of tier 1 and tier 2 cities in China

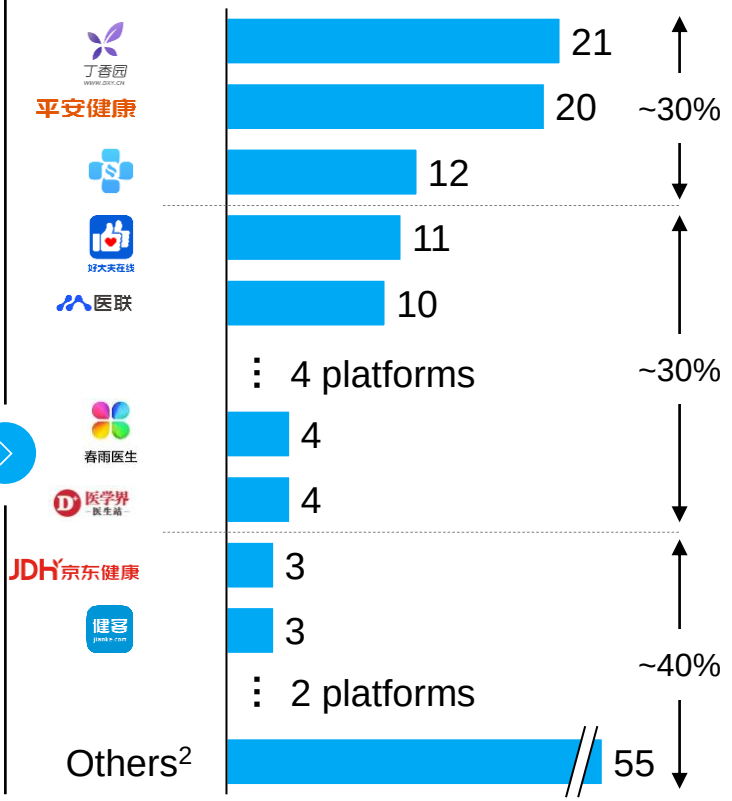
Source: McKinsey January 2021 Physician COVID-19 survey

1: Significant opportunity exists for pharma companies to improve channels and content

HCPs perception of MNC pharma companies in remote engagement[2]
Share of survey responses, percent



Frequently used online platforms and HCP communities in China,
Number of survey responses, N = 176



1. Including Philippines (N = 75), Thailand (N = 75), Indonesia (N = 76), Malaysia (N = 71), and India (N = 302)
2. Number of HCPs associated a particular pharma company with each statement divided by the total number of HCPs that mentioned the same company in any of the 4 statements, %; average for 9 MNCs

Source: McKinsey January 2021 Physician COVID-19 survey; McKinsey analysis, Nov 2021

References to specific products or organizations are solely for illustration and do not constitute any endorsement or recommendation

In absolute terms and compared to other regions, MNC pharma companies in China have room for improvement in **content and channel customization** while perceived as more active in remote engagement and adapting to the "next normal"

Fragmentation of online physician communities underscores the importance for pharmacos to build private traffic and leverage omnichannel to drive HCP engagement and experience

1: Leading pharma companies are moving toward omnichannel 2.0 to realize impact

Multichannel
Engaging HCPs through offline, remote, and digital channels

~40%[2] lagging

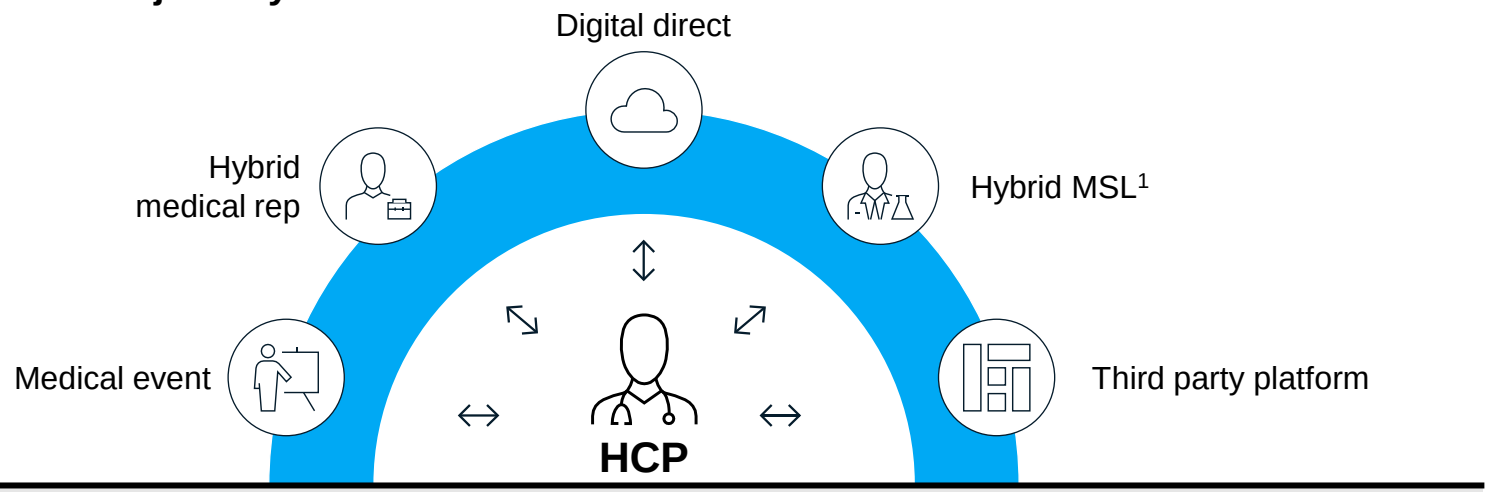
Omnichannel 1.0
Coordinated engagements across different channels

~50%[2] piloting at scale

Omnichannel 2.0
Optimized engagement model enabled by data analytics

~10%[2] emerging digital leaders

Omnichannel HCP journey



Enablers
- Omnichannel agile campaign orchestrator
- Data and analytics
- Content factory
- Technology infrastructure and agile organization

1. MSL: Medical science liaison
2. Estimated state of top 20 MNC pharma companies in China in 2021;
3. OL: Opinion leader

Source: McKinsey analysis, Nov 2021

Value creation

Empower HCP for positive patient impact

Improve OL[3] engagement effectiveness and increase MSL[1] productivity

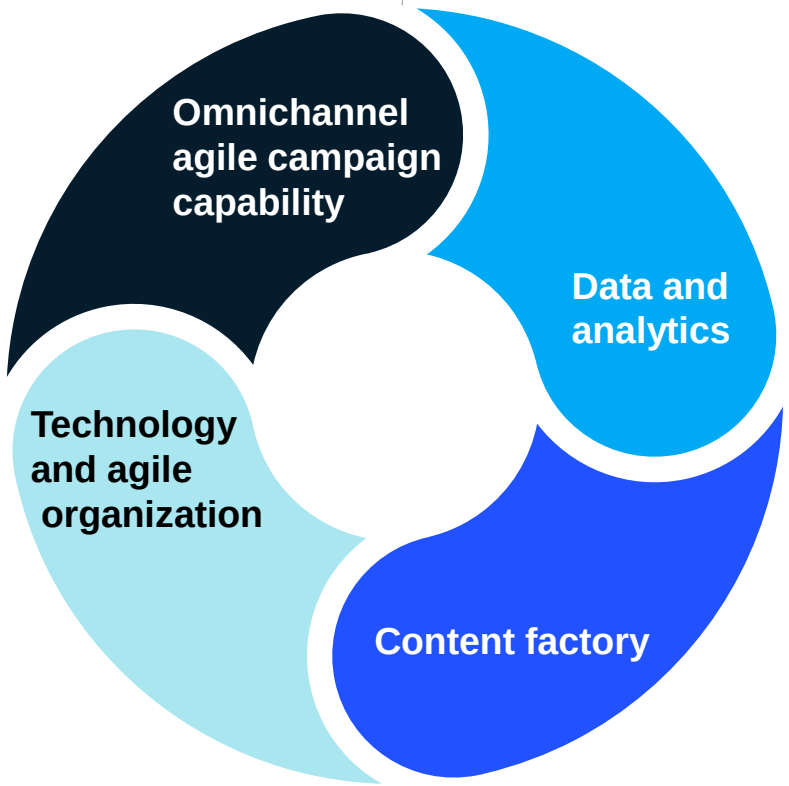
Increase commercial excellence

- Better central marketing strategy implementation
- Expanded HCP coverage
- Elevated commercial team productivity
- Higher management transparency

1: Omnichannel 2.0 requires new organizational capabilities

NON-EXHAUSTIVE

- **Design thinking** to translate HCP-centric insights into personalized campaign
- **Fast iteration of marketing campaigns** catering to evolving needs of HCPs
- Building **next-generation marketing capabilities** through potential partnership with content communities and marketing agencies



- Real-time data mining to drive **360° view of HCPs**
- Robust analytics to inform **micro-segmentation and next-best action** for each segment
- Implementing **tailored analytics use cases** (e.g., social listening and next-best action, through strategic partnership with data and analytics vendors)

- **Secured cloud infrastructure and technology stack** to enable integration across channels
- Talent upskilling to master **omnichannel engagement and agile way of working**
- Technology and infrastructure partnership to build **cloud-native solutions**

- **Rapid MLR process and agile content factory,** e.g., deliver module every other week with agile approval process
- Modular content factory with tagging to enable **content personalization**
- Agile content creation, tagging, and approval through seamless collaboration with content and solution providers

Source: McKinsey analysis, Nov 2021

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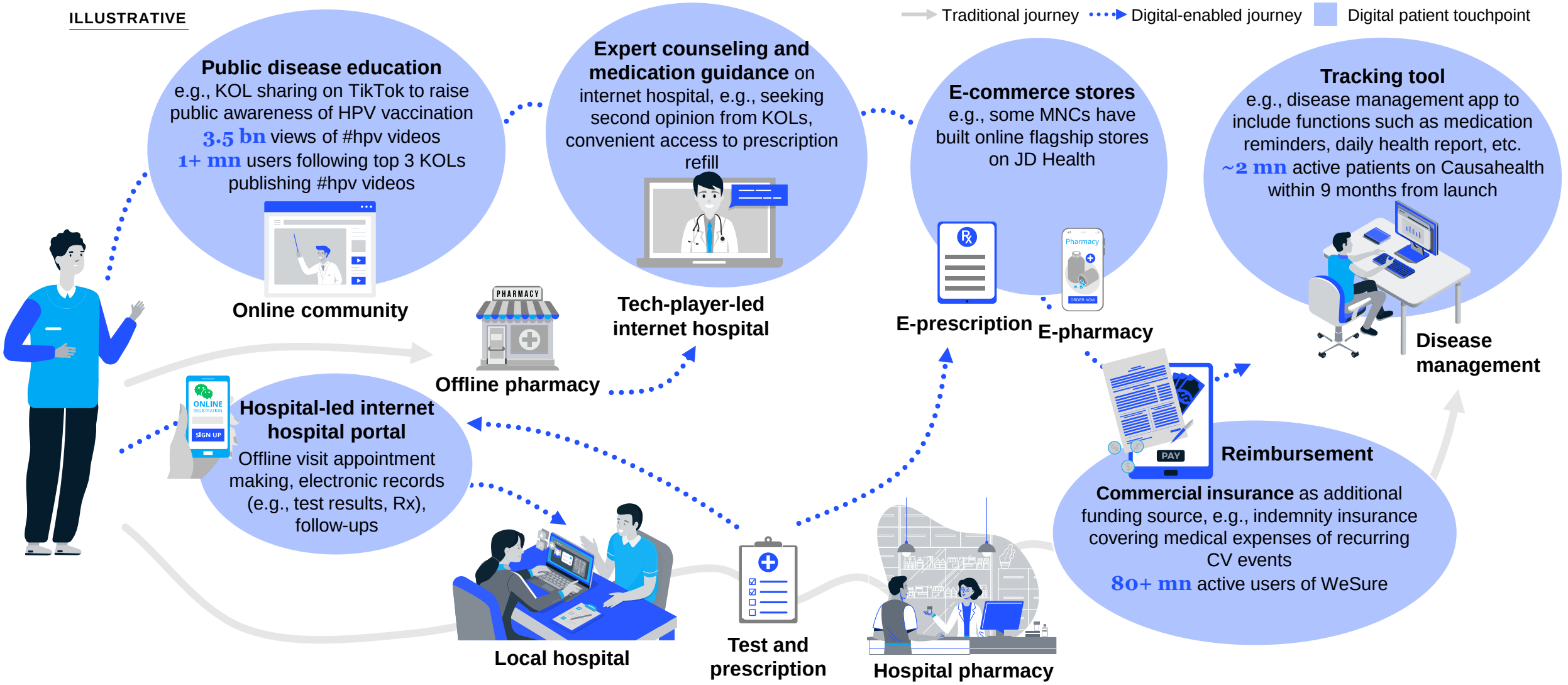
1: Omnichannel 2.0 start to transform patient journey at scale with digital enablement

ILLUSTRATIVE



Source: McKinsey analysis, Nov 2021

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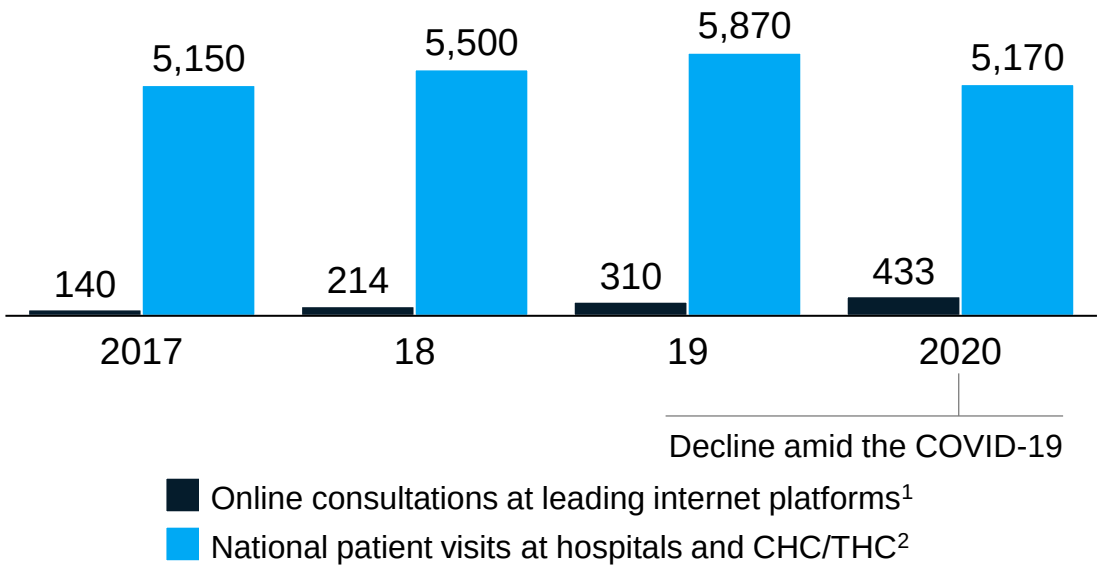
2: Internet platforms are attracting patient flow, however majority of healthcare product spending is still offline

NON-EXHAUSTIVE

Patients are increasingly attracted to internet platforms…

Online consultations and patient visits, 2017-20

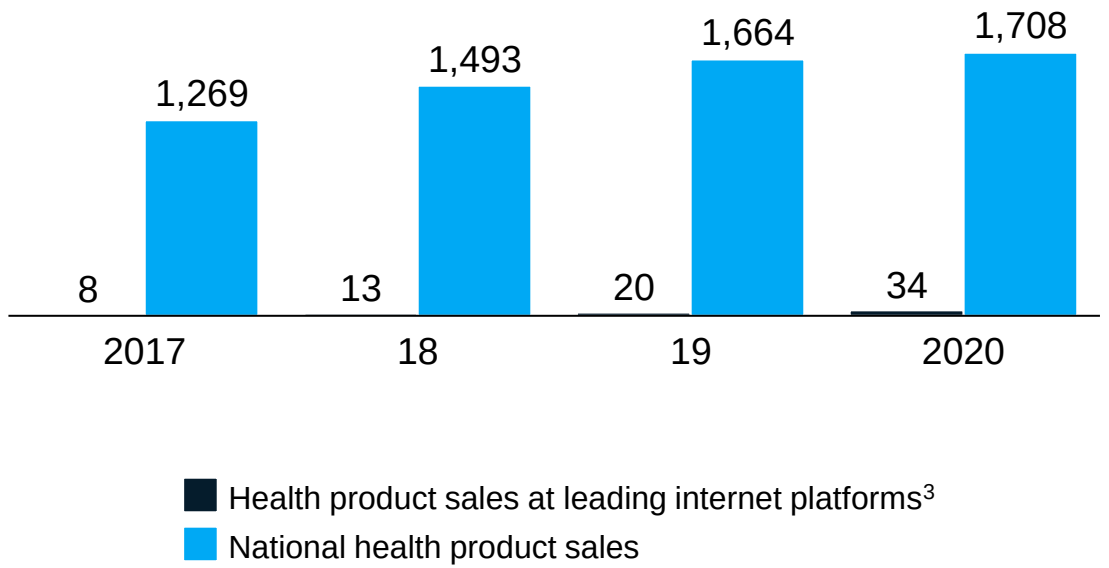
Mn



… however health product sales spend online is still relatively small

Health product sales, 2017-20

Bn RMB



1. Including Ping An, Ali, and JD Health; all forms of communications between patients and physicians on the platform, including but not limited to medical counseling and online diagnostics
2. Including consultations & treatment at public and private hospitals, and community health centers (CHC) and township health centers (THC)
3. Health products include drug (Rx and OTC), medical device, TCM, etc. Relevant reporting segments for the three internet platforms are "Health Mall 健康商城" segment (Ping An Health), "Self-operated Medicine 医药自营业务" segment (Ali Health); "Medicine and Health product sales 医药和健康产品销售" segment (JD Health)

Source: Annual report; National Health Commission; Ministry of Commerce; IQVIA; McKinsey analysis, Nov 2021

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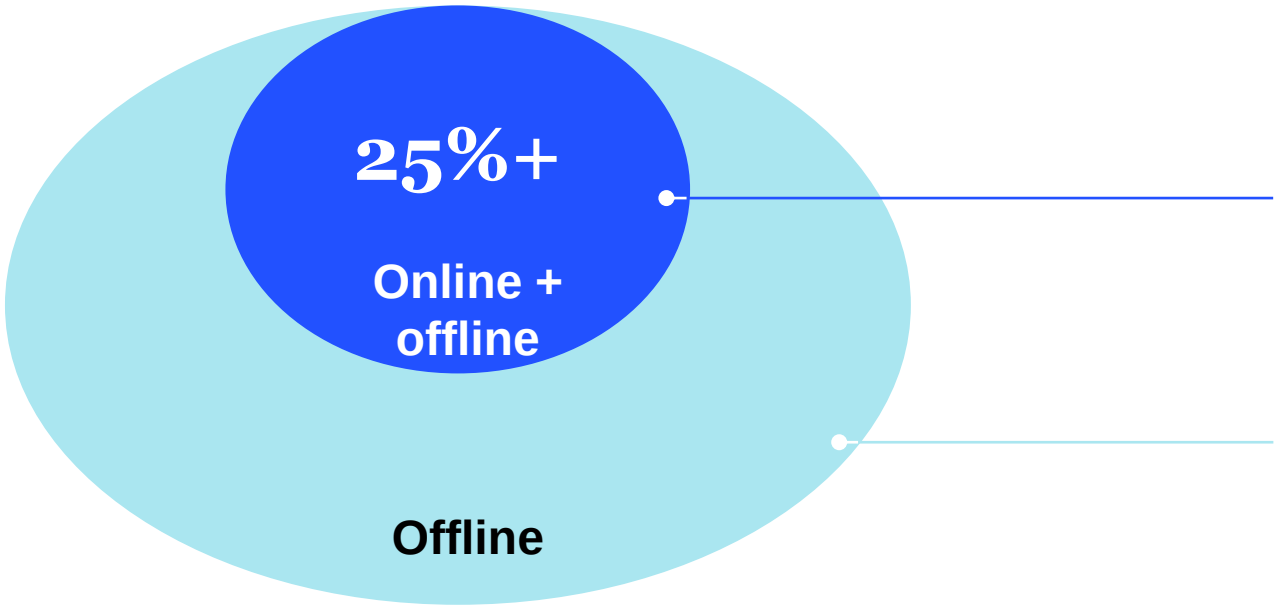
2: Online-offline integration uplifts medical consultations and drug refill

For reference

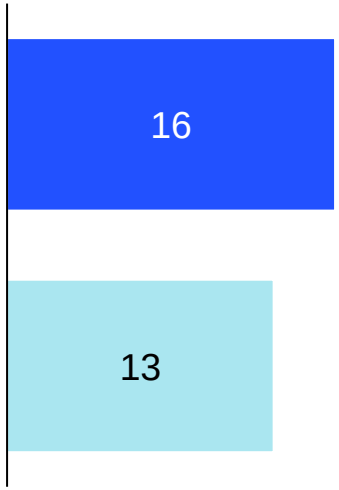
Online-offline integration deepens with >25% offline pharmacy customers using online services…

Online and offline users for medical consultation and drug refill[1], 2020
Percent of total users

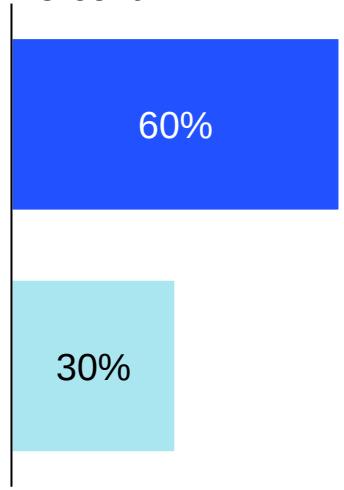


… and these online-offline users are more active in consultation and drug refill (hypertension and hyperlipidemia as an example)

Average number of consultation per year per person[2]



Percentage of users with drug refill after three months[2]
Percent



1. Online defined as medical consultation and drug ordering via online healthcare platforms; offline defined as online-platform based medical consultation and drug ordering in offline pharmacies via QR scan (e.g., We Doctor Pharmacy, Ping An Good Doctor Pharmacy Cloud)
2. Hypertension and hyperlipidemia patients

Source: Ping An Health ; expert interview; McKinsey analysis, Nov 2021

2: Online consultations for mild conditions is the main driver for patient flow to internet platforms

Relative popularity of online consultation by specialty[1]

Low High

Specialty	Rank	平安健康 PING AN	JDH京东健康	春雨医生 你的医生朋友	微医 WE DOCTOR	丁香医生
Dermatology	1	12%	11%	19%	8%	28%
OB-GYN	2	12%	5%	23%	7%	6%
Pediatrics	3	9%	5%	11%	6%	14%
TCM	4	19%	11%	4%	5%	0%
Urology	5	5%	15%	5%	4%	5%
General practice	6	5%	2%	1%	11%	5%
Gastroenterology	7	5%	7%	2%	4%	6%
Orthopedics	8	5%	4%	4%	2%	3%
ENT	9	2%	4%	4%	4%	3%
Cardiology	10	0%	10%	1%	3%	2%
Consultation fulfilled by low-tenure HCP[2]		**~50%**	**~70%**	**~65%**	**~60%**	**~70%**

Internet platforms are similar in core online consultation offerings

- High concentration on **mild / private health issues**
- High ratio of **low-tenure HCPs**

Ecosystem players strive to differentiate, e.g., targeted resource allocation for cardiology by JD Health

1. Percentage is relative to the total number of online consultations within respective internet platform, as demonstrated in the APP and / or website interface; selected 10 specialties represent 76%, 72%, 81%, 55%, and 71% of respective internet platforms; data as of Aug 2021
2. Percentage of online consultations completed by low-tenure HCPs, where low-tenure HCPs refer to attending physicians and below

Source: Online consultation APP and website; McKinsey analysis, Nov 2021

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2: Leading players pivot toward more comprehensive, specialized, and integrated O2O medical services

Doctor network for comprehensive services

Ping An Health created a 4-tier doctor network to enhance its service capabilities

平安健康 PING AN

Famous doctor studios
450+ studios for national KOLs

External doctors
38,000+ doctors, ~70% from Class III

In-house medical team
2,000+ doctors in 20 specialties

AI-based doctor assistant
3,000+ disease models

Specialized medical center for specialty care

JD Health opened >25 specialized medical centers for critical / chronical diseases

JDH京东健康

Heart disease center

Led by Dr. Hu Dayi, one of China's top cardiologists

Contributing ~10% of online consultations, ranked #4 among all specialties

Integrated online and offline healthcare

Ali Health forms an online and offline medical and health service system

AliHealth 阿里健康

Online traffic to offline

Local services

Vaccines, COVID-19 testing, physical examinations, nursing

Source: Company annual report 2020; McKinsey analysis, Nov 2021

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3: Partnerships between leading tech players and pharma companies are deepened and diversified

NON-EXHAUSTIVE

	平安健康 PING AN	AliHealth 阿里健康	Tencent 腾讯	JDH 京东健康	Trend
Patient empower-ment	**6+ product innovation** initiatives, e.g., customized insurance products, integrated cancer patient services	**10+ "one-stop shop" solutions for chronic disease management** (e.g., epilepsy), including counseling, online Rx, payment, nursing, etc.	**5+ health management platforms** for patient education, disease management, and medication services	**11+** partnerships with MNC pharmacos to **build online single-disease care centers** and provide specialized care services to patients	Shifting focus from point solutions to **whole-course management**
Provider support	**AI-enabled** disease screening, risk prediction, CDSS, etc.	Non-profit **physician training program**	**AI-assisted diagnostics and treatment** for **8+** diseases (e.g., Parkinson's)	**Online clinical trial patient recruitment center** to connect doctors and patients	
Pharmaco enablement	**3+** collaborations to **promote Rx sales** in retail and online pharmacies	**Tmall Good Medicine Alliance** to provide **5** digital solutions: digital marketing, traffic sharing, drug service, next-day delivery, and drug donation	**Combating counterfeits** by applying big data analytics	**5+ innovative drug debuts** on JD Health **5+ supply chain digital transformation** programs	**Emerging value propositions** of tech giants on B2B business

Source: Press release; McKinsey analysis, Nov 2021

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3: Leading tech players embark on new healthcare ventures

NON-EXHAUSTIVE

Expanded healthcare offerings in 2021 (selected examples)

	To patient	To provider
平安健康 PING AN	Rolled out **3 specialty centers** with 100+ nationally renowned specialists in dermatology, TCM, and OB-GYN	Acquired **12 medical institutions,** e.g., PKU International Hospital, through 50+ Bn RMB[1] investment
AliHealth 阿里健康	**Merged Yilu with Xiaolu TCM,** a leading TCM online hospital platform serving **7+ Mn patients**	Acquired minority stake in **LinkDoc,** an oncology big data company providing AI data curation and analytics
JDH 京东健康	Set up Rare Disease Care Center and provided each qualified patient with up to **7,700 USD donation annually**	Landed city-level national BMI platform for Suqian to cover **3,300+** designated medical institutions and pharmacies
Tencent 腾讯	Led **460 Mn USD** Series E round investment in **Yuanxin Technology**	Released **middle platform** for healthcare data management serving 5+ regional HC and CDC[2]

1. Ping An Group's acquisition of Founder Group
2. HC: Health Commission; CDC: Center for Disease Control and Prevention

Source: Press release; McKinsey analysis, Nov 2021

References to specific products or organizations are solely for illustration and do not constitute any endorsement or recommendation

Extension from core business

ByteDance

Build "Xiaohe" app for "**peer-to-peer medical experience sharing**"

美团 Meituan

Focus on **O2O** pharmacy and aesthetic medicine

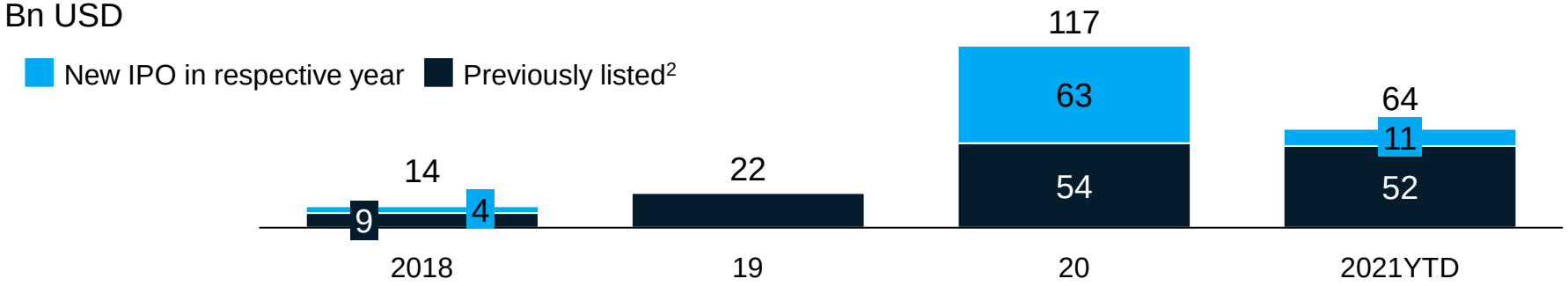
Pinduoduo Inc. Together More Savings More Fun

Provide affordable medication and medical services through "**group purchasing**"

3: Digital health companies reaching public market in 2021 in greater numbers, with market cap primarily driven by top players

Total market cap of listed Chinese digital health companies on major stock exchanges, 2018-21 YTD[1]

NON-EXHAUSTIVE



Number of IPOs by listing year

2018	19	20	2021YTD
2	0	4	8

10+ listing applications in 2021

Newly listed companies by sector

Health services

水滴 WATERDROP INC.

Medlinker

智云健康 CloudDr.

圆心科技

国生堂中医

Data, analytics, and infrastructure

平安健康 PING AN

JDH京东健康

健康信息 GENERAL HEALTH

ESSENCE

NEWlink 新纽科技

MediWelcome

IRON TECHNOLOGY

医渡云 YIDUCLOUD

思派 | Medbanks

ETAO INTERNATIONAL GROUP

数坤科技 SHUKUN

InferVision

Sinohealth 中康科技

XtalPi 晶泰科技

Airdoc 鹰瞳

E-commerce

1药网

合纵药易购 HEZONGYY.COM

百洋医药集团 BAIHEAL PHARMACEUTICAL GROUP

叮当快药 Dingdang Medicine Express

泉源堂

Online community

众策医学

医脉通 medlive.cn

1. As of Oct 31, 2021; including Chinese digital health company listings on Shanghai Stock Exchange, Shenzhen Stock Exchange, Hongkong Stock Exchange, and Nasdaq; year-end market cap for 2018-20 and Oct 31, 2021 value for 2021
2. "Previously listed" companies in 2018 only consists of Ali Health

Source: Wind; press release; McKinsey analysis, Nov 2021

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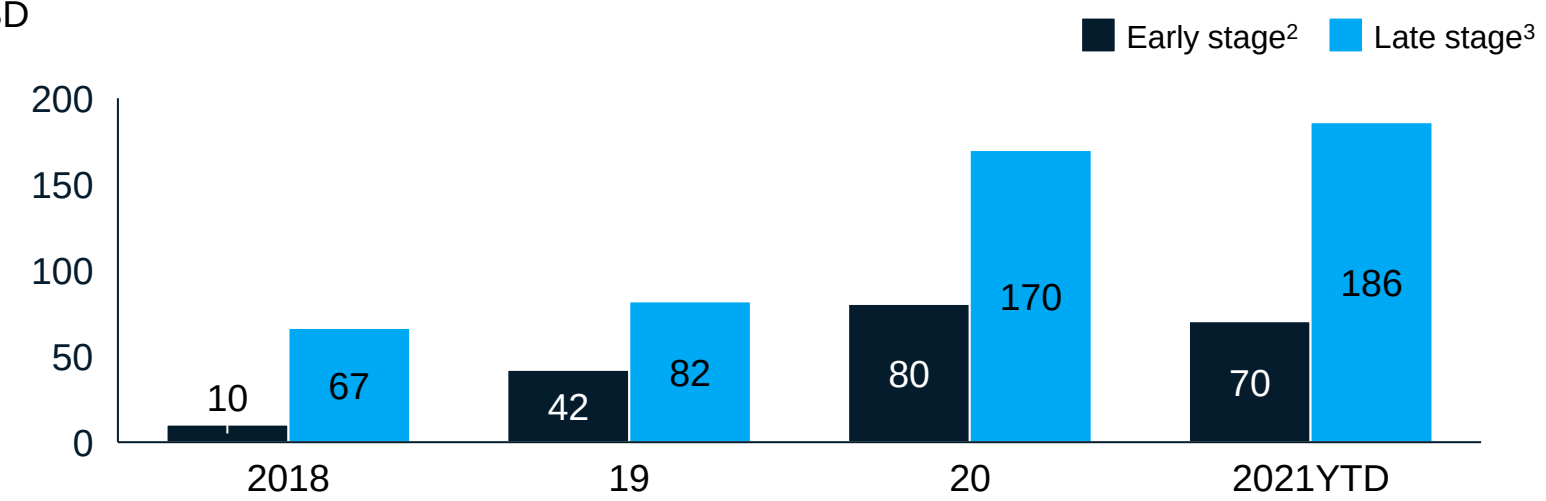
3: Maturing digital health companies are driving up deal size

NON-EXHAUSTIVE

2018-21YTD average venture funding for Chinese digital health companies[1]

Mn USD



Number of deals and notable examples (top 3 deals with value disclosed)

Early stage	83 健客 jianke.com 全域 ALLCURE InferVision	41 JDH京东健康 国药在线 国药集团 SINOPHARM	17 JDH京东健康 叮当快药 数坤科技 SHUKUN	14 益药 上药云健康 SPH Health Commerce Co., Ltd 望石智慧 STONEWISE MediTrust 镁信健康 Health (Serial B)
Late stage	25 依图 YITU 零氪科技 · LinkDoc · Medlinker	20 Taimei 太美医疗科技 水滴 WATERDROP INC. 思派 Medbanks	14 丁香园 www.dxy.cn 水滴 WATERDROP INC. 思派 Medbanks	11 圆心科技 InferVision MediTrust 镁信健康 Health (Serial C)

1. As of Oct 31, 2021; average based on deals that disclosed funding raised
2. Including Seed, Angel, Series A, Series B, and Series B+
3. Including Series C - Series F

Source: Crunchbase; press release; McKinsey analysis, Nov 2021

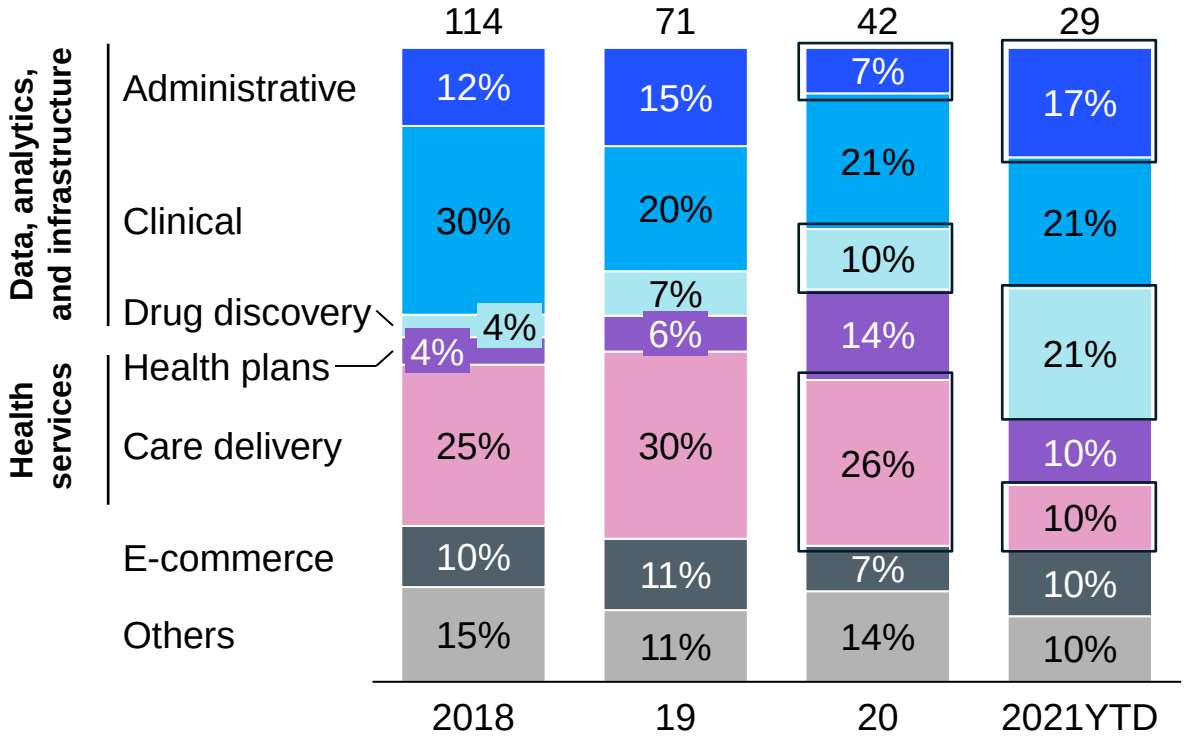
Shifting appetites of VC/PE to later-stage digital health companies, resulting in higher average deal value

Select segments of digital health companies receive growing traction, with share of venture fund raised grown >7x for AI drug discovery (now 21%) and health plans (now 10%) since 2018

3: Venture funds are gravitating toward digital infrastructure and analytics-enabled R&D while new deals in care delivery declined

Data and analytics have been the continuing hotspot …

PE/ VC deals by sector, 2018-21YTD[1]
Count



… and there are 3 key investment themes observed

Digital infrastructure ↗

As government heavily promotes digitization at provider's side, digital software / solutions that empower providers are on the rise, e.g., HIS,[3] imaging software for screening and diagnostics

Data-and-analytics-enabled R&D ↗

Digital healthcare ecosystem is becoming a repository for increasingly abundant data, thus new ways for data monetization are favored by capital market, e.g., AI-enabled drug discovery

Care delivery ↘

After the 2020 COVID-19 boost, certain internet+ health services are maturing, with proven feasible business model, e.g., internet hospital platform, B2C drug e-commerce

1. As of Oct 31, 2021
2. Including online community, supply chain management, digital marketing, etc.
3. HIS: hospital information system

Source: Crunchbase; McKinsey analysis, Nov 2021

Closing thoughts on digital healthcare ecosystem in China

Omnichannel becomes the new normal for biopharma companies to engage HCPs

New organizational capabilities are needed to enable omnichannel HCP engagement:

- Advanced analytics for HCP insights uncovering and closed loop feedback tracking
- Design thinking to reimagine the future HCP engagement journey
- Agile marketing capabilities for iterative rapid campaign
- Personalized content factory to rapidly create, approve, distribute, and analyze customized content
- Digital product development team to develop digital enablers

Internet platforms disrupt conventional care delivery to enable access to care, and digital natives innovate with a new wave of products and services

- Internet platforms are attracting patient flow; however, majority of healthcare product spending is still offline
- Online consultations for mild conditions drive majority of patient flow while leading players pivot toward more comprehensive, specialized, and integrated O2O medical services
- Partnerships between leading tech players and pharma companies are deepened and diversified to serve patients' needs along the entire journey

What a difference 10 years can make …

NON-EXHAUSTIVE

2011 – Pioneers

Pam Cheng

MSD INVENTING FOR LIFE

Penny Wan

Roche

2021 – Half the sky[1]

Isabel Afonso

NOVARTIS ONCOLOGY

Vivian Bian

Roche

Siyuan Chen

Bristol Myers Squibb

Hong Chow

MERCK

International head

Lorena Di Carlo

Lundbeck

Irene Hsu

AMGEN

Cecilia Qi

gsk

Vicky Tse

SANOFI GENZYME

Anna Van Acker

MSD INVENTING FOR LIFE

Shirley Xu

Baxter

Ingrid Zhang

NOVARTIS

Jenny Zheng

janssen

Christine Zhou

novo nordisk

Xiaolan Zhou

BAYER

1. By alphabetical order of last name

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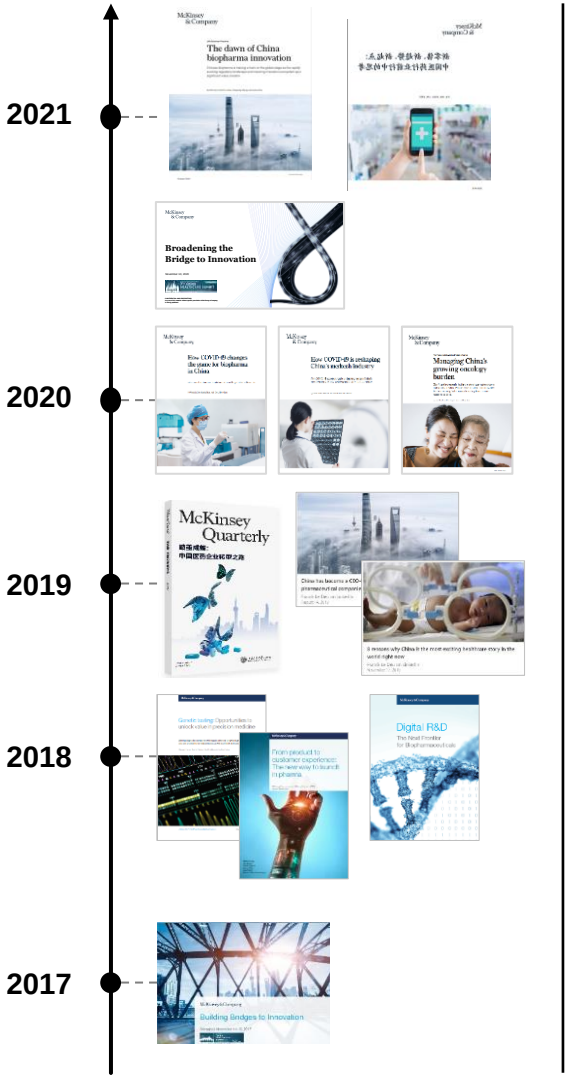

McKinsey China Life Sciences Practice leadership team (27 Partners and Associate Partners)

China Local Biopharma Roundtable

McKinsey 2021 China Launch Roundtable

McKinsey China Biotech CEO Roundtable

Source: McKinsey

McKinsey
& Company