

Empowering a "Healthy China" through Pharmaceutical Industry Innovation

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Executive Summary

From a global perspective, the COVID-19 pandemic in 2020 not only exerts significant impact on health and economic development, but also shifts the world's attention to key topics that include "health", "innovation" and "cooperation" etc.. In China, the outbreak has had a profound impact on China's endeavor for modernization, while also highlighted innovative drug industry's ("the Industry" hereinafter) unique contribution to "Healthy China". According to research, in the fields of addressing aging population, easing chronic and infectious diseases burdens etc., through 3 health improvement levers, i.e. preventive measures, therapeutic measures and technological breakthroughs, innovative drugs could reduce ~55% of disease burden, helping to not only extend people's lifespan but also realize Healthy China targets.

Regarding the entire patient's life cycle, preventive measures could reduce ~25% of disease burdens. By enriching public health service programs and building primary healthcare system, the Government facilitated equal access to basic healthcare, narrowed inter-regional variance, promoted preventive measures and enhanced the mindset and action shift to "disease prevention". Through efforts including supporting health education with medical expertise, continuously introducing innovative vaccines for disease prevention, building technological standards and introducing early screening programs, as well as engaging in chronic disease management programs, the industry actively engages in public health service system.

As for disease treatment, through policy guidelines and deepening reforms in medical security, healthcare service and drug supply etc., the Government adopts multiple measures to improve safety, accessibility and affordability of drugs, so that patients could have a better sense of gain. Meanwhile, the industry contributed by constantly improving treatment methodologies, increasing investment on R&D and new pipelines, accelerating product launch processes and stabilizing supply chains. Through concerted efforts by policy makers, payors, service providers and drug suppliers etc., ~10% of decrease in disease burden can be achieved, while patient lifespan extended.

With further technology innovation and iteration, under expectation of future environmental improvement in policymaking, regulation and scientific research, the industry is expected to decrease disease burden by another ~20% and unveil the mystery of "unmet therapeutic needs". These would bring in safer and more effective methods in disease prevention, diagnosis and treatment; by working hand-in-hand with existing technology, product and service, the industry will support the sustainable development of China's health industry and the realization of "Healthy China" target.

In the past decade, along with the orderly advancement of healthcare system reform, China has made remarkable achievements across four key systems, i.e., medical security system, public health service system, healthcare service system and drug supply system. Meanwhile, the industry sees a clearer role in "Healthy China" strategy. However, if compared to developed economies, China still faces greater challenges in patients' accessibility to innovative drugs. In 2019, China's total health expenditure against GDP was 6.6%, revealing a large gap to those of high-income countries which reported 8.2% on average. Therefore, multiple efforts should be made, including increasing health investment, improving funds efficiency, being "patients centric", and promoting cross-party cooperation, to improve accessibility of innovative drugs with high clinical value while strengthening early diagnosis and prevention of disease and lowering burdens mainly from cancers, chronic and infectious diseases, endeavors of which would be the key to realize "Healthy China" target.

In the forthcoming decade, the industry would strive to be a important partner of "Healthy China" with a value proposition of being "patients centric" by focusing on key treatment areas of Chinese patients, providing high-quality products and services, and creating end-to-end solutions. Meanwhile, the industry would focus on more segments and unlock more value to continuously benefit patients and relieve disease burden of the country, to support realization of the "Healthy China" target.



Chapter I: The Innovative Drug Industry is Committed to Improving Human Health

Historically, continuous vaccines and drug innovation combined with health service improvement, have saved tens of millions of lives and improved human health to an unprecedented level. Currently, the unexpected COVID-19 hit the global health system, and sending socioeconomic development in many countries into a pause. The COVID pandemic has again proved how critical human health is to individuals, society and economic development. Looking to the future, strategic position of "Healthy China" has been established in socioeconomic development. Health serves not only as the prerequisite of all-round development, but also as the foundation of socioeconomic development. China's health industry is bound to welcome a new decade of rapid development under the guidance of "Healthy China 2030".

In 2016, the "Outline of The Healthy China 2030 Plan" specified the development mindset of "people orientation" and strategic theme of "Joint Contribution, Shared Benefits, and Health for All", indicating health as prerequisite for all-round development of human, and the foundation of socioeconomic development. It also specified strategic targets of Healthy China 2030 and 13 key metrics. The implementation of Healthy China 2030 requires concerted efforts by all stakeholders from all walks of life. The Industry is committed to improving people's health, fulfilling people's health demand, through shouldering multiple tasks, such as product R&D and innovation, new drug production and supply, and technical standards setting. It also undertakes several social responsibilities, such as providing inclusive health education for patients, facilitating shared progress across industry and supporting system upgrade and reforms, to play its due role in achieving Healthy China targets.

I. Despite remarkable achievements in medical and healthcare system development, there are still challenges to Healthy China implementation

Since the 18th National CPC Congress, the CPC Central Committee and State Council have been placing national health as a strategic priority, planning to accelerate development of "Healthy China" from a comprehensive socioeconomic development perspective, emphasizing the integration of health into all policies, and promoting the mindset shift from "treatment-centric" to "health-centric"; the medical and health system shift from silos to close collaboration. The public health services system covering urban and rural areas, the health services system, medical security system and medicine supply system would jointly improve people's health and improve happiness and sense of gain of the people. (See Exhibit 1)

1. China secured remarkable achievements in building its medical and healthcare system in the past decade

In 2009, China launched a new round of medical and healthcare system reform, setting an ambitious goal to provide equal and quality basic medical care to all, and lower economic burdens of patients. In the past decade, Chinese government doubled its investments in health and secured remarkable achievements across four key systems, i.e., public health, healthcare services, medical insurance and drug systems.

Public health services system: The public health services system provides multiple services, including health education, disease prevention, early screening and disease management, etc. Through basic and major public health projects, people's accessibility to public health services could be improved. The per capita investment by government in basic public health has been raised from RMB 15 in 2009 to RMB 74 in 2020, increasing by 16% p.a. The system is currently exploring new model of "medical-prevention integration", focusing on disease prevention while targeting at chronic disease management of hypertension and diabetes as major breakthroughs.

Medical and healthcare systems are being transformed from "treatment centric" with fragmented efforts of major stakeholders to "health centric" with seamless coordination among all stakeholders, pushing the health system to next phase



- Health services system: China has built an effective and high-quality health services system by steadily pushing forward the tiering diagnosis and treatment system; striving to build "healthcare complex" at county level; promoting local doctors to pair up with families; leveraging "internet + health" to ease resource constraints; as well as applying big data in healthcare and AI technologies to upgrade overall level of healthcare. China has basically succeeded in building a grassroots healthcare network and making sure that there is one clinic per village, one health center per town. It has also improved competency of county hospitals. Nowadays, more than 80% of residents are able to access nearest health facility within 15 minutes. Healthcare accessibility has been significantly improved with the number of beds per capita doubled in the past decade. Public hospitals are seeing improvement of service quality, as inpatients mortality rate decreases gradually to a relatively low level, i.e. from 1.1% in 2005 to 0.44% in 2018.
- Medical security system: China has built the world's largest basic medical security net within a short time, with over 95% of its citizens covered by basic medical insurance. It also continues to develop commercial healthcare insurance, aiming to build a multi-tier medical security system. Medical protection level has been further uplifted, and basic medical insurance system for rural and urban citizens has been basically integrated. In 2020, fiscal aid allowance was raised to RMB550 per person, individual deposit was raised by RMB30 to RMB280 per person; in the meantime, inpatient and outpatient expense reimburse rates were maintained at 50% and 70% respectively. With disease burden of residents being relieved, personal out-of-pocket payment rate was reduced from 37.5% in 2009 to 28.7% in 2019.
- Medicine supply system: Both the availability and accessibility of drugs have been significantly improved. The Government will deepen the reforms on the review and approval systems for drugs and medical devices as well as encouraging R&D and innovation of new drugs. Policies for generic drugs are constantly revised, to ensure consistent evaluation on the quality and efficacy and boost generic substitution. The country also exercises a zero tariff policy on imported drugs. Through price negotiations, drug prices have been substantially reduced including prices of oncology drugs. In the past 5 years, over 200 innovative drugs have been launched, and the accessibility was improved thanks to frequent updates of National Reimbursement Drug List (NRDL), etc.



2. In terms of health outcome, China has made substantial progress in improving life expectancy

According to a NBER study, from 1960 to 1997, innovative drugs and therapies improved life expectancy of people in 30 countries by 45%; that number further rose to 73% from 2000 to 2009. Since the People's Republic of China was founded, we have seen substantial improvement in infectious diseases prevention and control and diseases management in major chronic diseases such as cardiovascular diseases. New therapies and drugs (e.g. targeted therapy drugs) benefit cancer patients with prolonged life expectancy. Average life expectancy of Chinese people rose from 31 years when the country was first founded to 77.3 years in 2019, close to that of developed countries. Infant mortality rate and under 5 mortality rate ("U5MR") dropped from 50.2‰ and 61.0‰ in 1991 to 6.1‰ and 8.4‰ in 2018 respectively. From 1990 to 2013, mortality rate of infectious diseases dropped by 60-80%; 5-year survival rate of malignant tumors rose by 10 percentage points compared to a decade ago. (See Exhibit 2)

Exhibit 2

Life expectancy of Chinese people has increased dramatically over the last 70 years, thanks to decreased child mortality rate, prevention and control of infectious diseases and improved diagnosis and treatment of priority diseases



Source: Gapminder; Vizhub; IMHE; World Bank; Statistical Bulletin of China's Health Development; McKinsey MGI analysis

3. Disease burdens of cancer, chronic conditions and infectious diseases will have far-reaching implications, and addressing them is also the top priority in order to achieve the Healthy China objective

Around the world, investments in efforts to improve health level must consider the evolution of disease burden. Globally, diseases with the fastest-growing burdens by 2040 include cancer, chronic respiratory conditions, diabetes, etc., whereas cardiovascular diseases will remain the ones with the heaviest burden.

China now face dual challenges of volume increase and quick growth of disease burden. In terms of total burden, China would catch up with some developed countries (e.g. US and Germany) in the future, with burden by cardiovascular and other chronic diseases as well as cancer being the heaviest. From the view of burden growth, most developed countries see slow growth in disease burdens, i.e. under 10%. However, as life expectancy extended and population aging in China, burden by diabetes and chronic respiratory diseases would be growing at highest pace, and cancer burden would become ever heavier. The four major chronic diseases remain major cause of death (see Exhibit 3 and 4). Moreover, the outbreak of COVID-19 reminds us of the fact that infectious diseases would remain a long-term threat. As a result, prevention and treatment of cancer, chronic diseases and infectious diseases would definitely improve health for all. It will also act as a major entry point for the Industry to achieve the objectives of "Healthy China 2030".

Exhibit 3

Share of deaths caused by 4 major chronic diseases is the highest among all deaths caused by diseases

Share of deaths in China caused by 4 major chronic diseases among all death caused by diseases (2019)



1. Malignant tumors include lung cancer: lung cancer is not included in CRDs.

2. Complications caused by diabetes and metabolic diseases are not included.

Source: Triangulated from the 2020 Year Book of Health in the People's Republic of China



Age and lifestyle related disease burden is expected to increase further by 2040

Disease baseline forecast in Greater China by 2040

Change in disease burden between 2020 and 2040 in Greater China Change in disease burden measured in DALY $\%^1$



1. DALY = Disability-adjusted life year.

Source: Global burden of disease database of Institute for Health Metrics and Evaluation (IHME) (this chart does not include "Other non-communicable diseases"); MGI analysis

II. Three entry points for the Industry to support "Healthy China"

1. With the top 3 health improvement levers, i.e. preventative measures, therapeutic measures and breakthrough technologies, the Industry can reduce disease burden by ~55% so as to achieve the "Healthy China" objectives

By 2040, China could reduce ~55% of total disease burden and extend people's lifespan through these three levers. All three levers are closely related to the Industry (See Exhibit 5). In China, every yuan invested in health improvement is expected to generate an 2.2 yuan of economic return, along with greater social benefits.

• Theoretically, preventive measures could reduce disease burden by ~25%:

Roughly 25% of disease burden can be reduced through prevention, core measures of which includes **disease education**, **disease prevention**, **disease diagnosis (early screening) and disease management**. Nearly all of the 15 "Healthy China" initiatives emphasize importance of preventive measures. These ongoing preventative measures could reduce disease burden significantly; however these measures call for joint efforts of all citizens which involve concept shift from awareness to action and require long-term coordination among people from all walks of life. For instance, adults typically have low awareness of vaccination, therefore a shift from health awareness to vaccination action would be needed.

Three types of preventive measures can reduce disease burden by ~ 55% and are closely related to the Industry

Non-exhaustive

		Examples: Preventive measures and representative innovative products that have the biggest impact		
400M DALY ¹ As of China's disease burden by 2040	25%	Prevention and health promotion	 Disease education: Health education, smoking cessation and weight management Disease prevention: e.g. COVID-19 mRNA vaccines Early screening: e.g. breast cancer, cervical cancer Disease management: e.g. diabetes management 	
~55%	10%	Therapeutic intervention	 Surgery: e.g. coronary artery stent implantationDrugs: e.g. PD-1 new drug 	
Disease burden is avertable, equivalent to 200M DALY	20%	Breakthrough technology	 New targeted therapy drugs: e.g. CD47 Cell and gene therapy: e.g. CAR-T New in vitro diagnostics (IVD): e.g. new POCT 	
'	Disease burden to be reduced until 2040			

1. Disability-adjusted life year.

Source: Global burden of disease database of Institute for Health Metrics and Evaluation (IHME) 2017; MGI analysis

• Theoretically, therapeutic measures can reduce ~10% of disease burden:

Currently available therapeutic measures could reduce 10% of disease burden in China, primarily contributed by the wider access to medications and surgeries. Among all of the 15 "Healthy China" initiatives, 5 are closely related to therapeutic treatment (prevention and treatment initiatives of cardio-cerebral-vascular diseases, cancer, chronic respiratory diseases, diabetes, infectious and endemic diseases). The market access and wide application of innovative drugs in China (e.g. oncology and immunology drugs) could not only extend lifespan but also improve life quality of patients. The key bottleneck to minimizing disease burden with existing therapeutic measures is not the investment in underlying research. It is the accessibility of innovative drugs and technologies, as well as payment methods that remain challenging. Levers to maximize values of existing treatment measures include acceleration of clinical trials and registration applications for innovative drugs within the Industry; "fast track" review of innovative drugs and technologies by regulators; application of new therapeutic measures by providers as well as higher level of medical security.

Theoretically, technological research breakthroughs could reduce another ~20% of disease burden:

Innovation breakthroughs are critical to address diseases that are not yet curable. By 2040, it is expected that, a further 20% of burden decrease would be possible in addition to 35% disease burden reduced by existing prevention and treatment measures if all innovations proved to be technologically feasible and widely used in clinical practices. Some of these innovations may not only be able to cure certain diseases, but also overcome aging, a fundamental biological challenge. By putting off the onset time of age-related diseases, they are expected to significantly extend people's healthy lifespan.



2. Regarding the three key levers, innovative pharmaceutical industry could contribute in three aspects, i.e., "disease prevention", "disease treatment" and "unmet therapeutic needs"

The Industry possesses unique value in process of reducing 55% of disease burden via three levers, which include actively participating in improvement of the public health services system to support ~25% burden reduced by preventative measures; improve drug accessibility to help reduce ~10% of disease burden achieved by therapeutic measures; and striving for technological breakthroughs in R&D to help reduce ~10% of disease burden realized by new therapeutic measures.

- Promote existing preventive measures and enhance people's health awareness of "disease prevention". The Industry can reduce disease burden by 25% by joining efforts to optimize public health service system and promoting preventive measures. These efforts include supporting disease education with expertise; continuously introducing innovative vaccines to help with disease prevention; building technology standards and introducing early screening programs; as well as improving and optimizing disease management programs.
- Promote extensive access to existing therapeutic measures to benefit hundreds of millions
 of patients via "disease treatment". Support the enhancement of product supply security
 system, accelerate introduction of innovative drugs, promote therapeutic measures to reduce
 disease burden by 10%, and enhance patients' sense of gain. Relevant efforts include introducing
 pipelines of innovative products, improving supply chain stability to secure drug availability, and
 engage in improving drug accessibility.
- Drive future technological breakthroughs and accelerate the launch of the therapeutic measures for unmet therapeutic needs. As a key facilitator, the Industry would keep introducing groundbreaking technologies into China, strengthening international exchanges, improving local R&D capabilities, and supporting drug regulation to meet global best-in-class standards. As China's regulation gets more relaxed and payment methods are on constantly improvement, launch of therapeutic measures for unmet therapeutic needs will be accelerated, thus promoting the adoption of future groundbreaking measures to reduce disease burden by 20%.

Chapter II: Strengthen "disease prevention" with the help of innovation

Individual health serves as foundation for one, while national health is the foundation of the nation. Promoting existing preventive and intervention measures is a key lever to improve national health; which is in line with the spirit of "Healthy China" which calls for transformation "from treatment-centric to health-centric". The past decade has seen improvements in China's public health system and wider application of public health services. The Industry has also played an active part in disease prevention.

Studies from the World Health Organization identified multiple determinants of health, among which 60% are related to personal behaviors and lifestyles. Healthy behaviors and health literacy are the cornerstones of national health; and the promotion of existing preventive measures are of strategic importance at both individual level and national level. On one hand, "disease prevention" could truly realize "achieve more with less", focusing on prevention stage and hence reducing future possible health expenses. According to WHO, from 2012 to 2025, cumulative economic losses caused by chronic diseases in middle-income countries would reach USD 7 trillion, while chronic disease prevention and intervention needs only USD 11.2 billion; on the other hand, the Government also has to ensure sustainability of medical and healthcare system by lowering disease burden with preventative measures, to achieve health for all.

I. Proactive measures taken by the medical and healthcare system

The public health system involves multiple parties, including government, healthcare facilities, communities, and individuals. The Government promotes equal access to public health services for all, implements prevention and intervention measures, strengthens mindset and action shift to "disease prevention", through continuously enriching public health services programs and building grassroots health service system.

In the past decade, China has witnessed continuous improvement in its public health services system. In addition, a professional and modern disease prevention/control network has been established step by step: Vertically, it connects various levels from the Center for Disease Control ("CDC" hereinafter) to grassroots health facilities; Horizontally, it covers 71,000 medical institutions, including 98% of the medical institutions at or above the county level, 96% of the township health centers and all disease control and prevention institutions at or above the county level.

Basic public health services programs has been improved in both coverage and quality, as basic public health service subsidy from Government fiscal expenditure raised from RMB15 per capita in 2009 to RMB74 in 2020, and per capita funding increased by 16% p.a., improving basic public health services accessibility for all. Major public health service programs see further improvement, as prevention/control efforts of major infectious diseases, e.g. HIV/AIDS and tuberculosis (TB" hereinafter) are strengthened, and immunization planning, chronic as well as mental health item scope expanded.

People's health has been significantly improved thanks to health education, disease prevention/ control, full-course disease management etc. Other achievements include, effective control of vaccine-preventable infectious diseases; broadening coverage for early diagnosis of chronic diseases and early screening of cancers, as well as raising standardized disease management rate. National incidence of Category A and B infectious diseases declined from 269.9/100,000 in 2005 to 220.0/100,000 in 2019. The screening coverage rate of cervical cancer and breast cancer for rural women expanded from 200 counties (districts) in 2009 to 1,700+ counties(districts) in 2018; offering screening services of cervical cancer and breast cancer for 85 million and 20 million rural women, respectively. From 2010 to 2016, hypertension patients under standardized management rate reaching from 42.16 million in 2010 to 90.23 million in 2016, with standardized management rate reaching



70.31%; diabetes II patients under standardized management increased from 10.84 million in 2010 to 27.81 million in 2016, with standardized management rate reaching 65.57%.

Despite remarkable achievements in medical and healthcare system development, the key challenge to implement "Healthy China" is to continuously improve disease prevention as we are still facing mounted difficulties in disease monitoring, vaccination, disease early screening and prevention guarantee. Early warning capability in disease monitoring is still below expectation. For example, the monitoring and early warning system for certain diseases (e.g. viral infectious diseases) still has plenty space for improvement. Low vaccination rate is observed among adults. Take flu as an example, vaccination rate in some developed countries is as high as 60-70% with that of certain groups such as elderly people and medical workers even higher, reaching more than 90%. In contrast, flu vaccination rate in China remains as low as $\sim 2-3\%$ per year. Coverage of early screening is still limited. Take breast cancer and cervical cancer as examples, screening rate for high-incidence aged women remained under 30%, much lower than $\sim 70-80\%$ screening rate in developed countries. Medical security system remains to be improved as fiscal budget shortage, medical insurance reimbursement limitation are also barriers to vaccination and early screening.

II. The Industry's participation of public health services programs supports the implementation of preventative measures

The Industry can help enrich public health services programs by supporting "disease prevention" from multiple aspects including health education, disease prevention, early screening and disease management, etc. with knowledge and expertise in disease studies.

1. Health education

Active promote and participate in health education programs. Popularize patient education and health advocacy in several major diseases, e.g. 1) Cancers, including thyroid cancer and breast cancer etc.; 2) Chronic diseases, including hypertension, diabetes, and COPD, and; 3) Infectious diseases, including HIV/AIDS, TB, hepatitis, etc. In addition to adopting highly accessible methodologies such as knowledge sharing, AI and WeChat popular science columns, the Industry can also go offline to communities, neighborhoods, campus, corporates and grassroots, to promote health knowledge to the public.

Take cervical cancer for example, through the "China Women's Cervical Health Promotion Plan" and the Shell Action co-launched with the All-China Women's Federation and the Organizing Committee of the National Community Care Campaign Office, pharmaceutical companies carried out a 3-year health campaign, contributing to the prevention and treatment of HPV infection and cervical cancer via both online and offline channels. In the first session of Shell Action from 2013 and 2016, a series of health promotion events and communication campaigns were organized for women in urban areas and female college students, benefiting more than 10 million families.

2. Disease prevention

Actively promote the development and introduction of vaccines. Over the past 5 years, innovative drug companies have introduced 6 new vaccines that urgently needed by residents in China (cervical cancer, duovirus, herpes zoster, pneumonia in infants). The launch of these vaccines contributes tremendously to disease prevention and treatment of adults and children. For example, disease burden of cervical cancer declined from 1.653 million DALY in 2016 to 1.622 million DALY in 2019; it is expected to be declining further thanks to increasing vaccination rate. Today, many more companies are setting up R&D centers and investing heavily in staff, devoting fully to the R&D and mass production of vaccines and antiviral drugs (See Exhibit 6).

During COVID-19 pandemic, innovative drug companies have taken on great responsibilities and invested human, material, and financial resources in scientific research. Around 20 leading innovative players worldwide devote to COVID-19 vaccine R&D through reinforced partnership with no hesitation for costs. Apart from widely-used types of conventional vaccines (e.g. inactivated virus vaccine, recombinant virus vector vaccine etc.), new types (e.g. mRNA vaccines) also made strides. These companies have been working around the clock to develop vaccines at an unprecedented speed. Previously, it took at least 4 years to go from virus sampling to final approval. In contrast, by the end of 2020, three COVID-19 vaccines have been granted MAs by regulators of

Over the past 5 years, multi-national innovative drug companies have introduced 6 new vaccines to China



Imported NDA-approved vaccines

Sources: GBI Health

some countries, and lead time from R&D to launch is reduced to less than 1 year. Innovative drug companies have demonstrated strong research capabilities and social responsibility in the fight against the pandemic, redefining the future of vaccine-related science.

Stop the spread of disease early by empowering multiple parties. For major infectious diseases, innovative drug companies have launched awareness-raising campaigns for high-risk groups and patients (e.g. door-to-door HIV testing and treatment encouragement, free screening, diagnosis and treatment for suspects with viral hepatitis infections in poor areas). Meanwhile, they are helping to build standardized treatment capabilities, training healthcare workers on standardized clinical pathways and establishing specialized centers (e.g. promoting a comprehensive diagnosis and treatment model for tuberculosis and drug-resistant tuberculosis via molecular diagnostic methods in poor regions).

3. Early screening

- Promote emerging technologies. Introduce imaging and IVD innovations (e.g. hepatocarcinoma specific contrast agent), develop new models of smart diagnosis assistance (e.g. Al-assisted breast ultrasound diagnosis), to improve early screening accuracy of cancers with high disease burden.
- Establish early screening centers. Companies are helping to enhance the accessibility of cancer early screening through multi-party cooperation and support for the establishment and certification of technical standards. Take early screening for gastric cancer as an example, pharmaceutical companies support the China Hp and Gastric Cancer Prevention/Control Office to organize and formulate a unified gastric cancer screening, early diagnosis and treatment technical guidelines under the guidance of health administration authorities to improve the standardization level of early screening. They also carried out large-scale education activities and free consultations for the "Eradicating Hp and Preventing Gastric Cancer" campaign nationwide,



offering free screening for 10,000 people and covering 100 hospitals in total. Meanwhile, they are also exploring the establishment of a hospital network for early diagnosis and treatment in regions of high gastric cancer incidence, and piloting grassroots Hp screening facilities to reduce the incidence and mortality of gastric cancer nationwide.

4. Disease management

• Explore chronic disease management solutions that combine medications with digital technologies. Innovative drug companies are developing various chronic disease management solutions including early detection, risk assessment, condition monitoring, medication prediction, and doctor-patient connection through partnerships and digital tools. For example, in treating hypertension and diabetes, pharmaceutical companies are collaborating with internet companies, hospitals, colleges/universities to create an online management platform based on mobile devices and smart wearables. The platform could be used to monitor health conditions in real time, provide life and medication advice, and trigger alarms during emergencies. In treating COPD, pharmaceutical companies are working with technology companies to establish AI model that could conduct modeling based on available patient information and acute attack conditions.

To sum up, with greater disease prevention and control efforts, quality medical services, comprehensive healthcare security and drug supply stability, the burden of disease can be theoretically reduced by ~25% through preventive health enhancement measures. By developing innovative products, introducing innovative technologies, leveraging innovative measures and multiparty cooperation, the Industry helps strengthen the public health service system and maximize the effect of preventive measures, making due contributions to meet the "Healthy China" objectives.

Chapter III: Improve "Disease treatment" with the help of innovation

Since China launched the healthcare reform in 2009, the country has been improving the medical security system, health services system and medicine supply system to allocate existing medical resources and treatment methods in a more holistic and efficient manner, i.e., for better disease treatment. As an important force in the medicine supply system, the Industry plays a crucial role in ensuring drug accessibility and contributes to the "Healthy China" aspiration by introducing new drugs to Chinese market and improving drug quality.

I. The medical and healthcare system is taking proactive actions

The health services system, medical security system, and medicine supply system are interconnected. In the past 10-year journey of healthcare reform, they've achieved breakthroughs in the following three aspects. (See Exhibit 7)

Exhibit 7

Medical insurance, healthcare and medicines work together to ensure efficient allocation of resources to service patients



Source: Team analysis; Year book of Health in the People's Republic of China

1. Health services system: improve service accessibility, refine primary healthcare system and enhance service efficiency

The Government aims to increase the supply of healthcare services, offering residents more convenient access to high-quality medical resources. The number of beds in medical institutions increased from 3.3 per 1,000 people in 2009 to 6.3 in 2019. The number of licensed (assistant) physicians grew from 1.75 per 1,000 people in 2009 to 2.77 in 2019. And the number of annual



outpatient visits rose from 2.5 per capita in 2009 to 3.8 in 2019. By 2019, growth of number of visits to community health centers (CHCs) and township health centers (THCs) has outgrown that of total visits. Significant improvement in the diagnosis and treatment capabilities of primary healthcare institutions at county-level has been observed. Basically, residents in lower tier cities/counties can stay in local institutions for critical disease treatment. While continuing to improve capabilities of grassroots institutions, explorations have been made to build a tiered diagnosis and treatment system. Strategic payment mechanism (e.g. DRG) are set up in hospitals to guide physicians to give reasonable diagnosis and treatment opinions, aiming to make care delivery more cost-effective and efficient while ensuring efficacy.

2. Medical security system: provide national safety net and improve the level of coverage and governance

The Government is determined to provide basic healthcare coverage for all by increasing government expenditure, expanding coverage to more population and improving quality of basic healthcare insurance. In 2011, China by and large succeeded in providing national healthcare coverage, with more than 95% of the population covered by medical insurance. Annual social medical insurance fund raised for urban and rural residents increased from RMB251 per capita in 2009 to RMB830 in 2020. Since 2017, national medical security authority has been updating the national reimbursement drug list every year. So far, around 200 new drugs have been included through negotiation. The negotiation mechanism for drugs covered by basic medical insurance has been gradually established and dynamic adjustment of drug list has been preliminarily achieved.

3. Medicine supply system: accelerate the introduction of innovative drugs

In recent years, as national drug review and approval team grows, the pressure of drug registration application backlog has been effectively relieved. The number of piled-up applications dropped from more than 20,000 during peak time in 2015 to around 4000 in 2019, significantly boosting the efficiency of drug review and approval. Meanwhile, Chinese government, through an array of combined policies to accelerate reform on drug review and approval system, successfully shortened length of time needed to bring new drugs to market from 26 months to 12-18 months, making great contributions in eliminating the time lag and achieving simultaneous launch of new drugs at home and abroad. Latest version of Measures for the Administration of Drug Registration and relevant policies in its supporting documents backed the simultaneous development of new drugs globally, meeting people's demand for healthcare services and driving the transformation and upgrade of healthcare sector.

In terms of challenges, many approved drugs, restricted by drug accessibility and BMI policy, can only cover a small fraction of potential patients. Drug accessibility and affordability remains a prominent issue. For instance, innovative drugs only account for 9% of China's healthcare market, while the share in other G20 countries is above 20%, with the share even exceeding 50% in developed economies like the US, Japan and Germany. The priority topic for the next phase will be how to deepen reforms in health services, medical security and medicine supply, as well as to enhance the synergies among drug review & approval, reimbursement, and clinical use, so as to improve drug accessibility, and deliver a stronger sense of gain to the Chinese people.

II. The Industry continues to introduce innovations, enhances patient's sense of gain, and helps to bring innovative treatment technologies and therapies to life

As an important part in the medicine supply system, the Industry is actively involved in improving the system, trying to accelerate the introduction of innovative drugs and drive the development of drug quality system, especially in ensuring the accessibility of drugs to help popularize existing treatments.

1. Bring in more innovative products

Over the past 5 years, 200 innovative drugs have been made available in China market, 33% of which are oncology drugs. Among them, MNCs contributed 156 innovative, accounting for 80%; and those players are increasingly diversifying their product portfolio to be launched in China: From 2010 to 2015, oncology drugs accounted for 47%, while from 2016 to 2020, more and more drugs for neurological, GI and metabolic, cardiovascular and respiratory systems have been launched with the share of oncology drugs declined to 33%. Thanks to the diversification, there are more varieties of innovative drugs currently available in China. (See Exhibit 8)



In the past 5 years, 200 new drugs has been introduced to China, mostly oncology drugs, cardiovascular drugs and digestive system/metabolism drugs

Source: GBI Health

The increasing introduction of foreign oncology drugs help more and more cancer patients get effective treatment. Their 5-year survival rate increased by 10% from 2005 to 2015, reaching 40.5%; However, many patients are still not able to get timely access to innovative drugs due to various constraints in channels and policies (see Exhibit 9). There is still a large gap compared with the 70% 5-year survival rate in developed countries, indicating a great improvement potential of innovative drugs in helping patients enhance their living quality(see exhibit 10).

Exhibit 9

Innovative drugs have not been widely applied in "disease treatment" due to lack of accessibility and limitation of BMI



After the State Food and Drug Administration (SFDA) was restructured, approval of innovative drugs was accelerated, but patients still **cannot get access to or afford** these drugs. **"Joint reform of medical security, health services and medicine supply"**needs to be improved so that **approval, reimbursement and clinical use of drugs can be integrated**



Survival rate of tumor patients keep improving in China thanks to the introduction of oncology drugs while great gaps exist when compared to developed countries

Survival rates

Five-year survival rate of patients with malignant tumor



Selected oncology drugs introduced in past 10 years (not exhaustive)

	Forei	gn pharma Local pharma companies companies
Drug name	Time to market	Company
Icotinib	2011	Betta
Bevacizumab	2012	Roche
Chidamide	2014	Chipscreen
Ibrutinib	2017	Janssen
Osimertinib	2017	AstraZeneca
Ruxolitinib	2017	Novartis
Pembrolizumab	2018	MSD
Nivolumab	2018	Bristol-Myers Squibb
Sintilimab	2018	Innovent
Toripalimab	2018	TopAlliance
Tislelizumab	2019	BeiGene
Durvalumab	2019	AstraZeneca
Niraparib	2019	Zai Lab
Zanubrutinib	2020	BeiGene
Atezolizumab	2020	Roche

1. UK Data is of 2010, while that for US is between 2007 and 2013, for Australia between 2012 and 2016.

Sources: Cancer Statistics Review, 1975-2016 - SEER Statistics; Zeng H, Chen W, Zheng R, et al. Changing cancer survival in China during 2003–15: a pooled analysis of 17 population-based cancer registries[J]. The Lancet Global Health, 2018, 6 (5): e555- e567.

2. Ensure medicine supply by increasing local capacity and improving drug quality

Innovative drug makers have strengthened their investment and capacity expansion in China, uplifted commitment to technology transfer, increased the share of locally produced originators to ensure production and supply. By 2019, MNC innovative drug manufacturers have already built 24 production facilities in China. Meanwhile, the innovative drug industry leverages its international experience in production quality and safety standards to promote development of the industry by organizing seminars on drug quality and hosting pharmacovigilance (PVG) training programs. Companies also contribute with their advice and recommendations, calling for long-term QC mechanisms for QCE qualified drug manufacturers, entire life-cycle quality management for the production, distribution and use of drugs, regular publishing of adverse drug reaction report for bid-winning drugs, to guarantee the quality of bid-winning drugs.

3. Honor corporate social responsibilities (CSR), and deliver sense of gain to patients

The Industry have been actively giving back to the society and serving local communities. Some innovative drug companies dedicated thousands of hours to volunteer organizations, helping employees organize and provide community services which include helping disadvantaged groups (e.g. autistic children), and closely following health conditions of community residents. Some even record thousands of volunteer hours each year. In face of unprecedented COVID-19 pandemic, the Industry took initiative to donate scarce medical equipment such as masks, disinfection supplies and anti-virus drugs, and to organize voluntary employees to support in the front-line. By doing these, communities and patients witnesses with their own eyes commitments of the Industry towards CSR. By the end of 2020, RDPAC membership companies have donated medical supplies and cash that worth ~RMB 200 million in total.

All in all, a full-fledged medicine supply system together with high quality healthcare services, supported by the medical security system, could theoretically reduce ~10% of disease burden through intervention measures. The Industry enriches the variety of drugs in China via continuous R&D efforts and introduction of innovative products, drives supply chain integration and capacity localization to guarantee supply, contributes to building a drug quality and safety system under the price pressure of volume-based purchasing, and ultimately helps realize the "Healthy China" aspiration.



Chapter IV:

Tackle health challenges of the people with the help of innovation, eyeing on "unmet therapeutic needs"

I. Government values importance of macro environment for innovation and shifts gradually to become an innovation-driven economy

In 2015, The 13th Five-Year Plan for Economic and Social Development stated that "innovation is the primary driving force for development". Since then, China has been actively optimizing macro environment for innovation and gradually shifting towards an innovation-driven development strategy. The Government seeks sustainable development which put more emphasis on quality of economic growth and technological innovation. China is now climbing the steepest part of the learning curve, "from creative imitation to business model innovation, and technological advances", believing innovative technological breakthroughs will unleash infinite possibilities for the next stage of economic development. So far, China's ranking has jumped from the 29th (2015) to the 14th (2020) in the Global Innovation Index (GII) released by the World Intellectual Property Organization.

- Optimizing macro environment for innovation. In recent years, China has continuously doubled down on basic research, intellectual property protection, and opening up for scientific research cooperation, creating a social atmosphere that respects science and upholds innovation. In the past few years, the Chinese government has played multiple roles in parallel across guidance, incentives, growth and services, helping companies on technological innovation. Many high-tech companies with high impact as well as great innovation capabilities, intellectual properties and brand images have mushroomed in such a favorable business environment. Companies are encouraged to constantly improve their own innovation capabilities and competency.
- Build an innovation-driven economy. The Outline of the National Strategy of Innovation-Driven Development clearly states that China should move to the forefront of innovative countries by 2030, with a fundamental shift in development drivers, a significant increase in the level of economic and social development and international competitiveness, to lay a solid foundation for making the country a major economic power and a society of common prosperity. Scientific and technological innovation (STI) and institutional innovation are the "two-wheel drive" reinforcing one another. With this concerted and sustained effort, it will encourage scientific exploration and technological research, and build a systematic capability for continuous innovation. Systemic reforms in technology, economy and government governance will also unleash innovation vitality, making innovation the primary driving force of development.

However, challenge still lies in the source of innovation, given a limited number of original innovations. China's investment in basic research is still relatively low, taking up only 5.5% of total R&D spending in 2018, while the number in the U.S. was 16.6%. In addition, commercialization of basic research has not yet scaled up while translational medicine and innovation breakthroughs not full developed, indicating requirements for higher standards of rules and institutional systems, where there is still a long way to go.

II. The Industry pro-actively boosts innovation through capability building

Seeing from a global perspective, the future is here. Going forward, we believe that ten technological breakthroughs will fuel R&D and innovation in healthcare. As introduced to the market, they are expected to reduce disease burden by ~20% (Exhibit 11). Among them, five revolutionary technologies which include omics and molecular technologies, next-generation pharmaceuticals, cell therapy and regenerative medicine, innovative vaccines, and electroceuticals, closely related to drug treatment, are led or deeply engaged by innovative drug companies; while connected and cognitive devices, advanced surgical procedures, tech-enabled care delivery, robotics and prosthetics, and digital therapeutics, more



Sources: MGI report "Prioritizing health: A prescription for prosperity"

relevant to surgical and care therapy, rely more heavily on efforts of medical device companies.

Top diseases for which no cure currently exists are mental and neurological disorders, cardiovascular disease, and cancer. Based on these unmet needs, biological understanding of disease pathways, and investment on each technology, these ten innovative technologies are expected to have a significant impact on public health by 2040.

The pharmaceutical industry has developed a full innovation chain consisting of "core basic research by universities - technology transformation by start-ups - commercialization at scale by large pharma companies". For example, CRISPR, a gene-editing technology in omics and molecular technologies, is originated from European and American universities. And its commercialization is currently driven by startups through strategic partnerships with multinational pharma companies.

In China, now is the future. The pharmaceutical industry has been taking the lead in improving innovation environment along the process of basic research, clinical research and regulatory approval, which, in particular, has been reformed in the past five years with absolute breakthroughs in prioritized approval pathways, certificate holders of drugs listing, clinical trial filing, and etc. Such a pro-innovation regulatory system provide sound ground for technological breakthroughs, and the innovative development of the Industry in China as a whole.

Being a part of China's innovation system, innovative drug companies are the major drivers to promote in-depth cooperation with domestic companies, cross-border commercialization of innovation outcomes, as well as laying a foundation for the launch of groundbreaking technologies. With China's increasingly open regulatory environment and improving payment methods, innovative drug companies are supporting development of groundbreaking technologies and solutions for "unmet therapeutic needs", which further reduces relevant disease burden in China.



Chapter V: Recap & Outlook

All in all, better national health leads to higher labor efficiency and participation with fewer diseases and early deaths. It not only benefits people's health and well-being, but also creates considerable economic benefits. According to the McKinsey Global Institute, the potential positive impact of better national health on China's GDP is ~USD1.8 trillion by 2040, which is expected to account for ~5.6% of the total GDP.

The Industry plays an integral role in improving health across the country, as it cooperates closely with other stakeholders within the medical and healthcare system via three major levers - prevention, treatment and groundbreaking R&D. In terms of disease prevention, disease treatment and unmet therapeutic needs, innovative drugs create multiple layers of values for patients, health system and the society, improving quality of life, increasing life expectancy, reducing medical expenses, and boosting economic growth. (see Exhibit 12)

Exhibit 12

Breakthrough technology is leading the research and development of innovative drugs and has multiple layers of values for patients, health system and the society



1. Disease burden refers to the number of years being sick before death due to chronic respiratory diseases per 100,000 people in China.

Source: RDPAC; Capital IQ

• Improve quality of life. Taking depression as an example, innovative drug utilizes a novel mechanism of action that, in addition to its most basic antidepressant function that help regulate mood, also has new features such as improving the patient's cognitive performance (especially the speed to process information) and restoring social function in order to help patients think, live and work better and improve their overall quality of life.

- Increase life expectancy. In terms of drug treatment, new targeted therapy drugs and immunology drugs are emerging, effectively improving the quality of survival (QoS) for patients with intermediate and advanced cancer. The success of immunotherapy, represented by PD-1/PD-L1 inhibitors, can lead to remission or even a possible cure for about 15% of patients with advanced cancer. The overall 5-year survival rate for Chinese cancer patients is currently 40%, up ten percentage points from that of 10 years ago.
- Reduce medical expenses. Mortality rate and disease burden of chronic respiratory diseases have been decreasing, thanks in part to the introduction of innovative drugs. Over the past decade, burden of the disease has been down by 30%, which effectively reduces the cost of medical care caused by complex complications.
- Boost economic growth. Domestic biopharma companies has been creating values at a phenomenal scale. The total market value of domestic innovative biotech companies and ecosystem participants listed on major stock exchanges exceeds USD200 billion, effectively driving economic growth.

Moving forward, the Industry would strive to be an important partner to achieve the "Healthy China" initiative. Being patient-centric, innovative drug companies will continue to focus on therapeutic areas that are of deep concerns to Chinese patients, providing high-quality products and services covering the full range and entire life cycle, and creating end-to-end solutions for patients. To exercise social responsibilities and promote industry development, the industry would work together with the Government, industries, academia, and research institutes to drive the development of biomedicine in China, and build a sustainable and win-win healthcare innovation eco-system.

In the meantime, the industry will strive to unlock values along the industry chain, so as to benefit patients, reduce disease burden, and help achieve the goal of a "Healthy China". Health is the key driver of China's development, the improvement of which is also considered responsibility of the Industry!



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