

U.S. – China Economic and Security Review Commission

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China’s Evolving Healthcare Ecosystem

Good afternoon, Chairman Cleveland and Vice Chair Bartholomew, distinguished members of the committee. Thank you for the opportunity to appear before you today to discuss “China’s Evolving Ecosystem: Challenges and Opportunities.”

I am an internal medicine physician, and have spent much of my career in academia and government. In 2014, I became executive vice president and senior fellow at In-Q-Tel (IQT), a non-profit investor for nine United States national security agencies, accelerating and shaping commercial startup technologies for the U.S. national security community. For the past five years, I have led a team of medical and scientific professionals who focus on technologies that could improve epidemic detection and response. Prior to joining IQT, I served as Under Secretary of Science and Technology at the Department of Homeland Security. In the decade before that I was a Professor of Medicine and Public Health and Director of the academic think tank now known as the Johns Hopkins Center for Health Security. From 1993-97, I served as Assistant Secretary of Energy for Environment Safety and Health. I was a senior analyst and program manager at the Congressional Office of Technology Assessment from 1989-93.

I appreciate the opportunity to come before you. My intent is to provide a picture of how China is trying to improve its beleaguered health care system, and in particular to describe its efforts in the diverse field of “digital health.” It is clear that China faces daunting problems in its effort to provide decent health care to its huge and aging population. It is also evident that the government recognizes the humanitarian, political, and economic necessity of improving health care access and quality. There are many open-source examples of companies, projects, and commercial products employing digital health approaches to accomplish these goals. What is less clear is how pervasive or successful these efforts have been, what the intended milestones and metrics for success might be (as viewed by the Chinese government), and to what extent the strategy articulated in “Healthy China 2030” is being funded and achieved.

Background – China is facing extensive unmet health care needs, inadequate medical infrastructure, and a large and growing disease burden.

China faces significant structural, social and technological challenges as it seeks to bring better health care to its 1.4 billion people. These challenges include inadequate and inequitable access to health care; insufficient numbers of medical professionals, many of whom are poorly trained; limited access to advanced medical technologies, including drugs; and an extraordinary burden of disease which will grow as China’s population ages.

Insufficient medical infrastructure - China's medical infrastructure is insufficient, unevenly distributed, and not well prepared to deliver access to modern health care, which the rising middle class has come to expect and demand. Almost all of China's best hospitals are in cities. Even in urban centers, advanced medical technologies are available in only a few top hospitals where thousands of people daily wait in line to be seen.

Inadequate numbers of well-trained health care professionals - China lacks sufficient numbers of health care professionals, who often work long hours with limited resources and little pay. According to the OECD, China has only 1.8 doctors per 1000 patients, compared to 2.6 per 1000 in the U.S. and 4.3 per 1000 in Sweden. Specialists in referral hospitals may see 200 patients per day. General practitioners are often minimally trained and shoulder huge workloads. Violent attacks on doctors are so common there is a term for these attacks: "yi nao" or "common medical disturbance". The hostility comes in part from widespread expectation that seeing a physician requires a "gift" from the patient, other forms of corruption, and from patients' dissatisfaction with physicians' low level of competency. In addition, multiple medical scandals – tainted vaccines given to children, false promises of cancer cures promoted by health care product companies, etc. – have eroded confidence in medical professionals.

Geographic inequities in access to care - Although high-quality medical resources are in short supply overall, this is especially true in rural areas. Socialized medicine in the form of minimally trained "barefoot doctors" deployed to rural areas significantly increased life expectancy and decreased infant mortality in China. The 1980s reforms, which cut state subsidies to hospitals and forced hospitals to close, saw the disintegration of rural health systems and the loss of local "township" hospitals.

Extensive, multiyear research found that 400 million children in rural China are so cognitively handicapped that they will be unable to participate in the economy. Left behind in the country while their parents migrated to the cities in search of jobs, these children tend to eat poorly, leave school early, and crucially, lacked intellectual and social stimulation in their first "1000 days" of life. Caring for these individuals as they age will be a monumental task.

Demographic challenges - China's rapidly aging population and the concomitant increase in chronic diseases will place great stress on health systems in coming years. The number of people over 65 is expected to increase at a rate of over six million per year by 2021 and will account for 30% of the population by 2050. As the population ages, chronic diseases such as stroke, cardiovascular disease, diabetes, and cancer become more common. Pervasive and intense levels of air and water pollution, combined with heavy smoking (53% of men smoke) contribute to ill health. China has world's highest incidence of lung cancer, and epidemics of neck and esophageal cancer. China also has over 100 million diabetics, with increased risk of stroke, heart disease, etc.

China is pursuing a multifaceted, technology-based strategy to improve health care access and quality

China's efforts to provide its people with more access to better health care rest on a holistic, long-term plan that includes several inter-related strategies, outlined below. It is difficult, however, to assess how well resourced and financed these plans have been. Given the extraordinary societal and emotional impact of the Covid-19 pandemic, it seems likely that the Chinese state will reemphasize making progress on these ambitions.

- Ambitious state policy goals, articulated in the Healthy China 2030 blueprint, aim at increasing the number of physicians, hospitals, and population life expectancy;
- The development of digital medicine platforms and associated financial incentives are expanding access to care and enabling health professionals to tap into specialist knowledge. One source counts over healthtech 800 startups in China. Large companies such as Ping An, a large Chinese insurer, are also creating digital health enterprises.
- Government policies intended to help Chinese biotech and pharmaceutical companies and to expand the types of drugs available and become the designers of innovative new drugs rather than just manufacturers, are allowing Chinese firms to “move up the value chain” of the pharmaceutical industry and to expand the types of drugs available. This effort is well underway, and is being accomplished via a combination of changes in regulatory and financial policies, public/private investments, and rules that compel multinational pharmaceutical firms to build facilities in China to get access to the growing Chinese market.
- China is also making a big bet on personalized medicine. It seeks to leverage its decade-long investment in genomic sequencing capabilities into knowledge and tools that can identify individual health risks and possibly counter them before disease is manifest; identify effective treatments for chronic disease, cancer particularly; and eventually, enable alteration of genetic traits.

Digital health technologies and telemedicine are a key, rapidly expanding pillar of China's quest to improve health care access and quality.

Digital health technologies are used widely in China by both patients and physicians. Digital health has been defined, somewhat unhelpfully, as “the convergence of health and the internet.” Digital health capabilities, technologies, and applications range widely from individual health inquiries and diagnosis to population-based monitoring and messaging. In this paper, “digital health” will be used in the broadest sense to include cellphone-based, direct-to-consumer information and advice; telemedicine services involving remote contact with physicians or interactive services with intelligent algorithms, computer-based triage and diagnostic services; remote patient monitoring and management, and much else.

The ubiquity of smartphones, faster 5G networks, and the Chinese practice of using smartphones for a wide range of functions – banking, paying bills, etc. – has placed China in the forefront of digital health. Ninety-four percent of Chinese health professionals and 81% of

Chinese people report using digital health technologies or mobile applications, compared to 47% of patients in 15 other surveyed countries. Indeed, it is difficult to function in China without using these social media applications, which allow Chinese citizens real-time access to official health information (e.g. Covid-19 developments) and also serve as a feedback mechanism to government.

For example, WeChat, a messaging app created by Tencent in 2011, and often referred to as the Chinese Facebook, has 900 million users daily. WeChat is typically used for communications, banking and shopping and, increasingly, for booking doctor appointments, paying medical bills and accessing medical reports. Tencent has a network of over 30,000 participating hospitals. WeChat is being integrated with China's electronic ID system and it is anticipated that individuals will soon be able to access their entire medical record via WeChat.

Telemedicine allows patients to remotely access a physician via smart phone or computer who can use other technologies to examine the patient, gather vital signs, and even perform remote procedures such as ultrasounds, EKGs, etc. Telemedicine services also make it possible for patients and doctors to access specialty care. Numerous startup companies have developed mobile applications designed to diagnose and triage symptoms, assist in managing chronic diseases such as diabetes, or monitor signs of worsening illness. For example, "chatbots" aim to help people diagnose relatively simple medical problems. Such apps can lessen the load on physicians, and when combined with more extensive telemedicine services, can act as force multipliers for health care professionals.

Ping An Insurance, one of China's major insurers, offers on-line medical consults and saw a tenfold increase in telemedicine use during the coronavirus outbreak in January 2020. Ping An is advocating the creation of a national telemedicine network. Ping An already offers apps to order non-prescription medicines and wellness products. Users complete a quick, AI-driven questionnaire to determine their health needs and then the products ordered are delivered to their home within an hour. Ping An has also piloted a project called Good Doctor, which features unstaffed, "one minute clinics." These use AI-driven algorithms to assess patients' symptoms and, if necessary, to connect patients with Good Doctor's in house clinicians. Such clinics are now located in 8 provinces and cities, providing services to 3 million users. In rural areas, general practitioners are being trained to upload patient records electronically so they can be reviewed by distant specialists.

China's giant internet companies, such as Alibaba and Tencent, etc. are actively engaged in applying their expertise in Artificial Intelligence (AI) methods to digital health technologies. AI is already in use in China (as well as in the US and Europe) for such tasks as interpreting medical imaging, determining possible patient diagnoses, aiding in drug development, etc. As more patients use these digital platforms, companies and the government acquire growing "big data" caches that can be used to improve diagnostic algorithms and provide population-level insights into disease patterns.

China aims to become the predominant developer of innovative medicines to address rising health challenges, and to improve economic competitiveness

China is aggressively pursuing global dominance in biotechnology. As documented in numerous government policy documents, changes in regulatory and financial rules, and state and private investments, China recognizes biotech as both an enabler of its quest for better health care, and as a “critical strategic technology” essential to 21st century economic competitiveness. These two pursuits – progress in health care technologies and dominance in biotechnologies, including genomics, drug development and human augmentation – will reinforce each other.

China sees biology and biotech as a route to expand its global power. China has long recognized biotechnology as one of the most important strategic technology areas and identified it as such in the thirteenth 5-year Research and Development Plan, declaring the goal of the biotechnology sector producing 4% of China’s GDP by 2020.

China is investing heavily in bioresearch, building new scientific facilities, recruiting talent from within and abroad, reforming drug approval regulations, establishing financial rules that favor Chinese companies, and linking its giant internet firms like Tencent and Alibaba to biotech development.

China has urgent and compelling humanitarian reasons to aggressively pursue advances in biomedicine and biotechnology. Its huge and aging population, suffering from a growing burden of chronic disease, will require access to the most innovative pharmacological remedies. Cancer treatments, especially the newer “biological” medicines, are particularly needed.

Until recently, China has been a low cost manufacturer of drugs invented elsewhere. In the past few years, China has become a major source of contract research organizations (CROs) for testing new drugs and contract manufacturing facilities (CMOs). But increasingly, Chinese companies are creating their own innovative products. For example, Beigene recently received U.S. FDA approval for a new, first-in-class oncology drug – the first approval for a China discovered drug. China has become a peer competitor in pharmacological development and manufacturing.

Genomics and Personalized Medicine:

Over the past decade, China has invested aggressively in DNA sequencing and genomics. Chinese companies are world leaders in commercial sequencing services and have accrued a huge database of genomic information. Since much of the science of genomics is comparative, these large libraries of genetic coding sequences hold great advantage. Here too, making sense of these enormous data bases requires application of AI expertise, and Tencent, Alibaba, etc. are strongly engaged in helping to decipher the genetic code of human health and disease. Genomic sequencing and synthesis technologies are increasingly integral to drug development and to understanding, treating and preventing adverse health conditions caused or influenced by genetics. China’s interest and investments in “personalized medicine” suggest that the

government is trying to get ahead of the curve and to develop ways to detect, treat, or even prevent genetically driven diseases such as cancer. Personalized medicine can also help predict which patients are likely to benefit from new (and expensive) cancer therapies.

China is investing heavily in biological research (particularly “translational” research, which is intended to transform basic research insights into products), building new science facilities and biomedical incubators, high-containment laboratories, recruiting biomed research talent from abroad and at home, and establishing financial rules that favor Chinese biotech companies, even as it insists that multinational pharmaceutical corporations establish large footprints in China. Increasingly, biomedicine will depend on genomics and synthetic biology approaches.

In 2016, the *Economist* magazine noted that “biology will be to the 21st century what physics was to the 20th,” reflecting the growing power of the life sciences and biotechnology to read, write, and edit the genetic code, and in so doing, to transform manufacturing processes, materials design, and practices across multiple industries. Leadership in biotechnology is not just a matter of improving biomedicine. It will be key to global economic competitiveness.

Recommendations

China is aggressively pursuing an integrated, technology-based strategy to improve health care access and quality. Interactive digital health platforms that allow individuals immediate access to useful, personalized health information are an important aspect of this strategy.

Digital health technologies are increasingly available in the U.S., and have become more widely used during the Covid-19 pandemic. In spite of their usefulness, significant barriers to their use exist, including payment restrictions, state-based limits on telemedicine use and geographic restrictions on medical licensure. The Covid-19 pandemic has loosened some of these constraints. CMS, for example, agreed to pay for Medicare recipients’ use of telemedicine services. Commercial digital health apps have assisted the Centers for Disease Control and Prevention, as well as many municipalities, in understanding the geographic spread of coronavirus. The U.S. should consider ways to permanently remove such barriers and to expand telemedicine and digital health apps, under appropriate oversight, to expand health care access, cost-effectiveness and patient convenience.

Public health practice could also be enhanced by digital health technologies, without impeding individuals’ privacy. For example, trends in the number of people in a geographic area or in a particular demographic category who access digital triaging services could be even more useful than people calling 911 with respiratory symptoms.

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