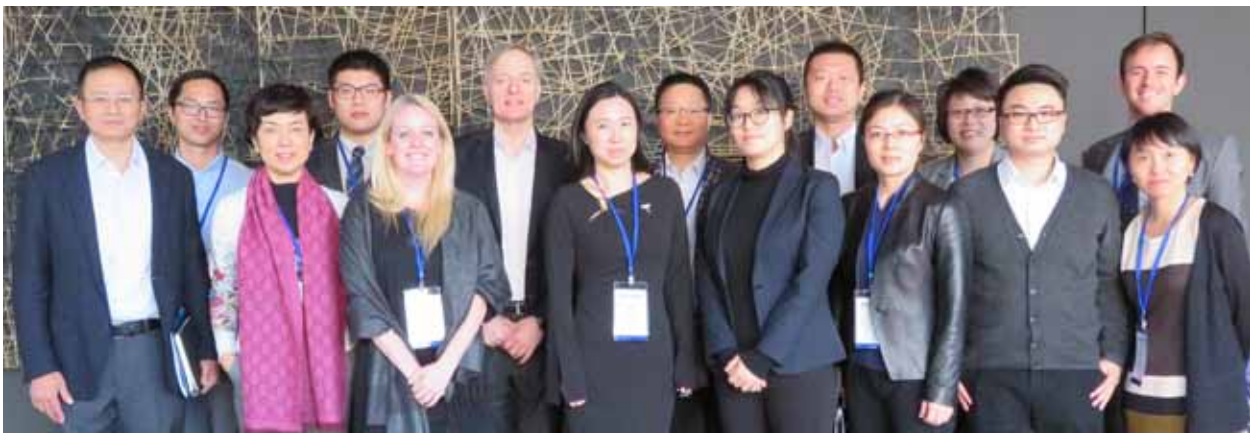
Financing Lung Cancer Screening in China

FINANCIAL INNOVATIONS LAB® REPORT

MILKEN INSTITUTE

Financing Lung Cancer Screening in China

FINANCIAL INNOVATIONS LAB® REPORT



Participants in the Milken Institute Financial Innovations Lab
Guangzhou, China, December 12, 2017

ABOUT THE FINANCIAL INNOVATIONS LABS®

Financial Innovations Labs bring together researchers, policymakers, and business, financial, and professional practitioners to create market-based solutions to business and public-policy challenges. Using real and simulated case studies, participants consider and design alternative capital structures and then apply appropriate financial technologies to them.

ACKNOWLEDGMENTS

We are grateful to those who participated in the Financial Innovations Lab for their contributions to the ideas and recommendations summarized in this report. We would especially like to thank Johnson & Johnson for their partnership on the project. Additionally, we would like to thank our Milken Institute colleagues Laura Deal Lacey, Li Jialin, Jeff Mou, Jansen Tham, and Lena Sun for their work on the project. Finally, we would like to thank editor Dinah McNichols for her work on the report.

This report was prepared by Belinda Chng and Caitlin MacLean.

ABOUT THE MILKEN INSTITUTE

We are a nonprofit, nonpartisan think tank determined to increase global prosperity by advancing collaborative solutions that widen access to capital, create jobs, and improve health. We do this through independent, data-driven research, action-oriented meetings, and meaningful policy initiatives.

TABLE OF CONTENTS

Lung cancer surpasses all other cancer deaths worldwide.
In China, lung cancer mortality increased by 465 percent in just 30 years.

INTRODUCTION

Lung cancer, one of the most preventable diseases, surpasses all other cancer deaths worldwide. Of the 8.8 million people who died from some form of cancer in 2015, 1.69 million of them, or about 20 percent, succumbed to lung cancer, according to the World Health Organization.[i] In China the statistics are particularly shocking; lung cancer mortality has increased by 465 percent in just 30 years, from 1975–2005. In 2010 alone, more than 486,000 Chinese died of lung cancer, according to a survey of cancer deaths,[ii] while other studies placed the annual death toll much higher, at 600,000, and predict it could reach a million per year by 2025.[iii] Patients and their grieving families are not the only casualties—China's economy also suffers the deleterious effects of high treatment costs and lower total workforce productivity.

LUNG CANCER SCREENING IN CHINA

Since the early 2000s, China has conducted multiple lung cancer screening studies in an ad-hoc manner, spearheaded by the municipal authorities. The results helped to establish a protocol for screening the Chinese population. In 2010, the central government launched a nationwide screening demonstration project in the rural areas focused on lung, upper digestive tract, colorectal, liver, and nasopharyngeal cancers. Two years later, the government turned its focus to the cities and announced an ambitious national public health initiative, the Cancer Screening Project in Urban Areas of China. Targeting early diagnosis and treatment, individuals in high-risk populations in select cities across nine provinces were screened for lung, breast, liver, gastrointestinal, and colorectal cancers.[iv] The project, under the auspices of the ministries of Health (renamed the National Health Commission in 2018) and Finance, necessitated massive coordination among numerous district and municipal governments and agencies, and involved screening a minimum of 210,000 people or an average of 3,000 people per province each year between 2012 and 2017, starting with nine provinces initially and extending gradually to 18.[v]

Under the Cancer Screening Project in Urban Areas of China, small-scale screening projects or cancer awareness campaigns were launched in select districts or for targeted groups of residents in the cities of Beijing, Tianjin, Chongqing, Guangzhou, Zhuhai, Ningbo, Kunming, and Nantong.[vi] For example, in Guangzhou, about 3,000 people within the high-risk group aged 40-69 were screened between 2013–14 for lung, breast, liver, gastrointestinal, and colorectal cancers, with about 3 percent testing positive for one of the five cancers.[vii]

After completing this project, the municipal government in Guangzhou initiated a number of screening studies of various sizes targeted at colorectal and lung cancers. A three-year city-wide screening and awareness program for colorectal cancer was launched in 2015 by the city's Center for Disease Control and Prevention. Colorectal cancer was chosen for the first mass screening program, partially because screening could be done by fecal occult blood tests which are relatively low-cost as compared to screening for other cancers. Early results released in 2017 show about 221,000 residents aged 50–74 had been screened.

The authorities were more cautious with lung cancer screening because of the higher cost of low-dose CT screening and additional costs that would be incurred to check on false positive results. But successful lobbying by the Guangzhou Medical University 1st Affiliated Hospital led the municipal government to initiate a lung cancer screening project in 2015 for 30,000 low income residents. Free screening was provided with support from the government-linked Guangzhou Charity Association and the hospital. Participation in the project was very low because residents knew little about preventative health care. The municipal government then launched a separate demonstration project in 2017 for residents of a select district, which is discussed in detail in this report.

LOW DOSE CT: CURRENT GOLD STANDARD FOR LUNG CANCER SCREENING

Early screening for lung cancer is essential for reducing mortality rates because the disease generally remains asymptomatic for years, even decades, until it has spread beyond the lungs to the lymph nodes and other organs. Sadly, more than 70 percent of patients who first see a doctor for symptoms are diagnosed with advanced lung cancer.[viii] These patients have fewer treatment options—surgery alone may not remove all the cancer cells—and their survival rates past five years generally range from 1 percent to 13 percent, reports the American Cancer Society, which cites a study of 16 countries.[ix]

Fortunately, screening is more effective than ever; where traditional chest X-rays can identify abnormalities of about 1.8 cm, about the size of a U.S. 10-cent coin, newer and more effective low-dose computed tomography (LDCT) scans, which take three-dimensional X-rays, can identify abnormalities as small as a grain of rice. In 2002, the U.S. National Cancer Institute undertook a trial of more than 53,000 smokers and former smokers aged 55–74. This National Lung Screening Trial (NLST) compared conventional X-rays and LDCT scans, finding that the death rate was 15–20 percent lower for people screened with the LDCT technique over the follow-up period of some six and a half years.[x]

Unfortunately, LDCT testing is much more costly, and despite its growing popularity, a recent literature review of LDCT studies finds that more research is needed to establish test protocols and efficacy among low-risk groups and to determine the risks for false positives and radiation exposure.[xi] Meanwhile, the central government and biotech investors in China and the U.S. have been investing in Research & Development (R&D) or complementary and/or improved screening tools and diagnostics, such as biomarkers and liquid biopsies. These aren't expected to reach the market for five years or more, leaving LDCT screening as the most viable option available.

FINANCING LUNG CANCER SCREENING IN CHINA

Cancer screening in China has proved to be a financing challenge. The population is rapidly aging, and most lung cancers are diagnosed in older people, meaning there could be a sudden upswing in health-care costs. Even though China's smoking rates have dropped, 316 million people, or 25 percent of the population, still smoke and show little inclination to quit.[xii] In addition, there are not enough radiologists or health-care professionals trained in LDCT screening methods, there is not enough education about cancer health risks and treatment, and there is a general resistance to undergo screening, even though the government has run free trials like the one initiated in 2012, and lowered the out-of-pocket price of LDCT screenings to under US$60 (CNY 380) in some cities.[xiii] This is still a large sum in a country whose national average annual disposable income is about US$4,000 (CNY 25,000).[xiv]

Typically, high-risk individuals are identified by primary care doctors or through surveys by hospitals or coordinators of a demonstration project. LDCT screening would be scheduled for those who meet the screening criteria at a hospital with accompanying tests such as the Carcinoembryonic Antigen (CEA) blood test that act as tumor biomarkers for lung cancer. Radiologists or thoracic doctors interpret the results and patients who test positive are recommended for surgery, radiotherapy, or chemotherapy. In cases where the results are not definitive, follow-up tests or procedures are scheduled within the next 3–6 months (e.g., more radiology tests or biopsies). Most hospitals and private health screening centers in the major cities provide LDCT screening services, but not in the community hospitals.

As of 2017, when the government-led Cancer Screening Project in Urban Areas of China initiative came to a close, municipal governments have continued the commitment to extend screening gradually to a wider population. Besides the ongoing colorectal and lung cancer screening studies in Guangzhou, between May and August 2017, Tianjin conducted free screening for 58,000 people aged 40–74 for lung, breast, liver, and stomach cancer, which are the most prevalent cancers in Tianjin.[xv] In 2017, Zhuhai initiated discussions with China Mobile to create a digital platform to better engage patients and manage the process of cancer screening. It is safe to say that the Cancer Screening Project in Urban Areas of China has encouraged municipal governments to prioritize early detection and treatment of cancer, by finding ways to educate the population on the benefits of screening, improve data collection and analysis, and identify ways to manage a mass screening exercise.

The $50 million funding provided by the government for the five-year project has ended.[xvi] While some municipal governments have the means to continue to fund some studies, additional financing is a must—first, to extend coverage of the demonstration projects to all residents within the high-risk group living in urban and rural areas, and, as an eventual goal, to establish formal screening programs that are affordable and sustainable throughout the country for the most common cancers. Currently, CT scanners are widely available in the major cities, but they are not available in smaller cities or rural areas.

For all its long-term goals, the government needs sustainable financing, especially for high-risk individuals—meaning those age 50–74 who have smoked for 20 years and will require annual scans or those suspected of developing lung cancer who will need follow-up scans three to six months after initial scans—and for the additional diagnostic tests for confirming results. Those medical costs can reach on average US$30,000 per year (CNY 190,000),[xvii] a huge burden for families already struggling under emotional and psychological stresses. In addition, the costs of lost productivity will continue to grow across local and regional economies.

To discuss possible funding mechanisms to facilitate these ambitious lung cancer screening programs, the Milken Institute convened a Financial Innovations Lab in Guangzhou (formerly Canton) in Guangdong province in December 2017. The city is one of the pilot cities chosen in 2012, and the Guangzhou Municipal Health and Family Planning Commission is now conducting its own screening demonstration project for 120,000 residents within one of the city districts. The Yuexiu district was chosen for its proximity to the Guangzhou Medical University 1st Affiliated Hospital, which is conducting the screening. The Financial Innovations Lab brought together investors, donors, industry and health practitioners, and government officials, and focused on financing models that have already leveraged public-sector funding to attract private investment while introducing new sources of potential capital for future funding flows. This report summarizes the discussion and outlines steps to move the funding models into implementation.

ISSUES AND PERSPECTIVES

In 2012, the most recent year with global cancer statistics, 1.8 million people were diagnosed with lung cancer. These "incident cases," tallied from 10 cancer databases by the International Agency for Research on Cancer, account for nearly 13 percent of all cancer diagnoses.[xviii] Incidence trends are generally dropping worldwide for men, but are on the upswing for women, as well as both men and women in developing countries, attributable to the effects of smoking and industrial air pollution.[xix] In China, there is also a slight dip in incidence rates, but it is more than made up for in the sheer rise in numbers of smokers—316 million at last count—attributable to population growth. Making matters worse, according to a *South China Morning Post* article citing a 2017 study, 60 percent of China's smokers surveyed said they weren't aware of a link between smoking and stroke, and 40 percent said they didn't know of a link between smoking and heart disease.[xx] In a country where smokers constitute a quarter of the population, and where high urban smog from industrialization and vehicular traffic already engender poor air quality, lung cancer is a crisis in the making for the health-care system.

SCREENING GUIDELINES AND TECHNOLOGY

In China as elsewhere, LDCT scans remain the preferred tool for detecting lung cancer. The U.S. recommends annual lung cancer screening for anyone between 55 and 74 who has smoked 30 or more "pack years," i.e., the equivalent of one pack per day, and who quit smoking for less than 15 years.[xxi] Other countries have adapted different guidelines based on the results from local trials, as shown in Figure 1. Japan, which is not included in the figure, screens individuals above age 40.[xxii] China, as noted previously, tightened its own guidelines in 2015 and plans to continue to adjust these according to the results of local studies.

Figure 1: Lung Cancer Screening Guidelines

Screening program	Age	Smoking history	Other	Follow-ups
U.S. National Lung Cancer Screening Trial (NLST)	55–74	Smoking index ≥ 30 pack-years; or cessation years < 15	N/A	Yearly screenings are recommended for high-risk patients. Three- to six-month re-scans may be recommended in suspected cases of lung cancer.
China National Lung Cancer Screening Guideline	55–74	Smoking index ≥ 20 pack-years; or cessation years < 5	N/A	
International Early Lung Cancer Action Program (I-ELCAP)	≥ 40	Smoking; secondhand smoke	History of family tumor; occupational exposure to asbestos, beryllium, uranium, or radon.	
Dutch–Belgian NELSON Lung Cancer Screening Trial	50–75	Current smokers ≥ 25 years, daily ≥ 15 cigarettes or ≥ 30 years, daily ≥ 10 cigarettes; or cessation years < 10	N/A	
Italian CT Lung Cancer Screening Trial (ITALUNG)	55–69	Smoking index ≥ 20 pack-years in latest 10 years; or cessation years < 10	No history of cancer, other than non-melanoma skin cancer.	

Source: *Journal of Thoracic Disease*, 2015.

With advances in technology it is now possible to deploy mobile CT scanners, housed in trucks or other specially equipped vehicles and staffed by technologists and engineers, to produce scans on the spot. Mobile scanners have improved the accessibility of screening for people with poor access to hospitals, even in urban areas. Japan was the first country to use them in 1996 in the Nagano prefecture, which had the lowest death rate in the country.[xxiii] People over 40 were encouraged to participate, and a number of suspicious screenings were confirmed as cancer.[xxiv] In 2016, in Manchester, which had England's highest incidence of lung cancer, smokers or former smokers between ages 55 and 74 were encouraged to sign up for screenings conducted at mobile CT scanners sent out to shopping center parking lots.[xxv]

Both initiatives were found to be effective in reaching their target populations and identifying early-stage lung cancer; in Japan, the mobile screening picked up 10 times as many lung cancer tumors as did traditional X-rays,[xxvi] and in Manchester, one lung cancer was found for every 33 scans, exceeding the typical 1 percent prevalence.[xxvii]

In China, there are three ways to access LDCT screening: (1) participating in a demonstration project launched by the government or a NGO/charitable foundation offering free or fee-shared scans (costing CNY 400–700, or US$60–110); (2) using an employers' health insurance or health screening packages; or (3) paying out of pocket for screening at private health centers. Yet China faces huge variations in health outcomes, accessibility to health care, communication, data collection and analysis, infrastructure, and governance. This is due to its vast geographic size and governance (23 provinces, four municipalities, five autonomous regions, and two special administrative regions), as well as the significant economic disparities between coastal and inland, and urban and rural populations. Actual access to LDCT screenings is also limited in smaller cities and rural areas.

While the central government in Beijing sets overall health-care policy direction, such as health-care reforms and multi-year initiatives, and directs strategic partnerships with the World Bank Group and WHO, local governments are responsible for day-to-day health-care policy, administration, and infrastructure planning and implementation. They are the ones tasked with targeting populations and managing early screening and treatment initiatives, with support and financing from the central government.

THE HEALTH BURDEN OF LUNG CANCER IN CHINA

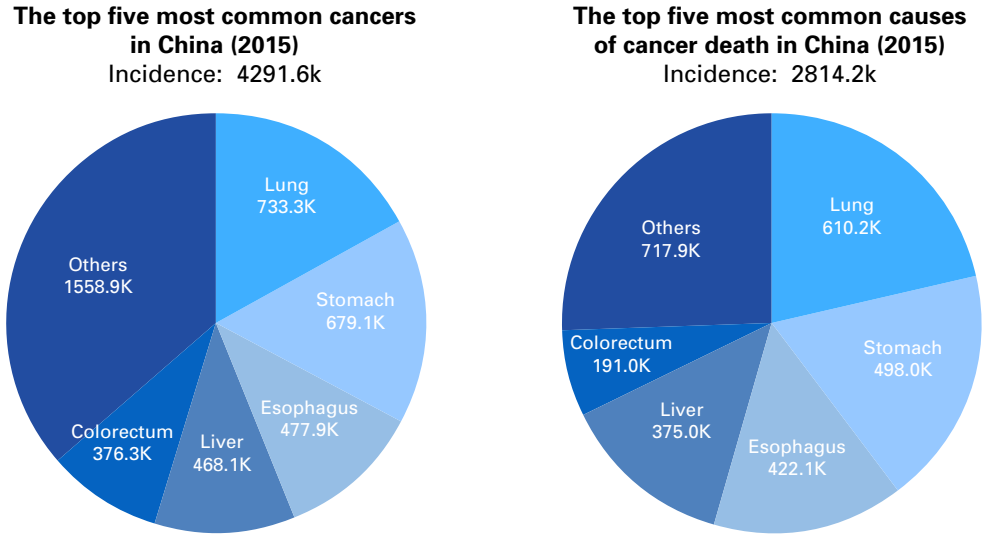
In 2015, lung cancer accounted for 17 percent of all new cancer cases and 22 percent of all cancer deaths in China, topping other high-mortality cancers in both categories, as seen in Figure 2.[xxviii] The alarming statistics, and resulting economic burden on patients, their families, businesses, and the state, have received significant attention from the central government. It prompted the decision in 2012 to build on previous screening projects and conduct large-scale trials in cities across a number of provinces. The program was set up so that "2000 high-risk people were scheduled to be screened in each city in nine provinces in 2012, and 3000 high-risk people were scheduled to be screened in each city in 12 provinces in 2013, thus a total of 54,000 high-risk people would receive LDCT lung cancer screening

by the end of 2013," according to a 2015 paper.[xxix] The results would help the central government develop a comprehensive program for education, training, and treatment.[xxx]

Then in 2016, *China Daily* reported, the government announced plans to build more lung cancer treatment facilities in high-risk areas, bringing the total from 42 to 100.[xxxi] Plans also included training 1,000 specialty oncologists. Such ambitious programs, coupled with the expected rise in cancer cases, will be costly, and as the reforms are more fully implemented, the costs, some warn, may be unsustainable.[xxxii]

In Guangzhou, 47 of every 100,000 residents were diagnosed with lung cancer in 2013, making it the most common cancer within the city and comprising 20 percent of all cancer diagnoses.[xxxiii] Overall cancer incidence was also 23.5 percent higher than the national average as is the mortality rate, which was 7.5 percent higher.[xxxiv]

Figure 2: Top Five Cancers and Cancer Deaths in China



Source: *Cancer Journal for Clinicians*, 2016.

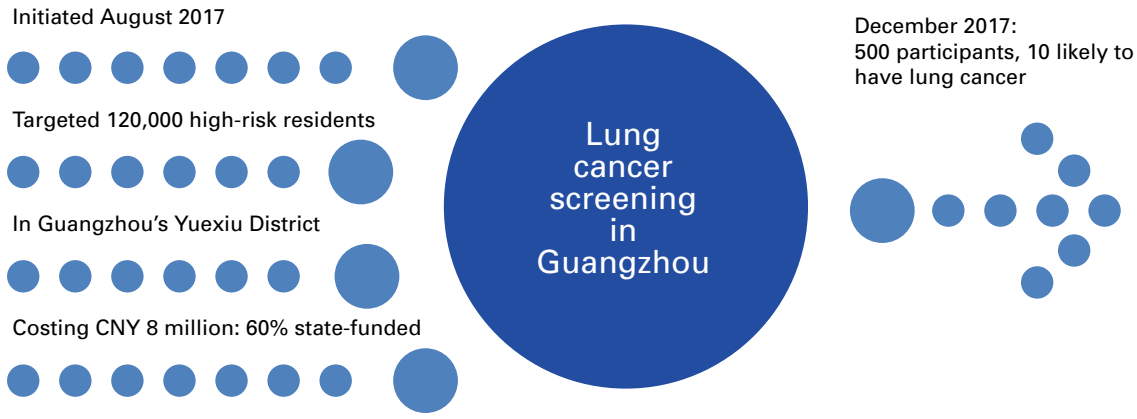
CURRENT FUNDING LANDSCAPE IN CHINA: CASE STUDY IN GUANGZHOU

As noted, the general public has low awareness of preventative health care, particularly with respect to cancer. Lung cancer screening is primarily financed by the government through small-scale demonstration screening projects, but that financing is not uniform across the nation. Demonstration projects have been held in a few select cities, such as Shanghai and Tianjin, both "direct-controlled municipalities" treated administratively as provinces; and in Guangzhou, the largest city and capital of Guangdong province; while in Zhuhai, a prefecture-level city in Guangdong province, the city government provides full subsidy for residents who participate in screenings. New financing mechanisms could provide greater capital to expand the screenings to a wider population.

In order to bring a real-world focus to specific funding challenges and solutions, the Lab selected Guangzhou, one of the 2012 pilot cities, as its own case study. The Guangzhou Municipal Health and Family Planning Commission is now conducting a screening demonstration project for 120,000 residents within its Yuexiu district, in partnership with the government-linked Guangzhou Charity Association, Guangzhou Medical University 1st Affiliated Hospital, and Guangzhou Jinyu Medical Examination Centre. Besides the ongoing project and existing partnerships, the city has a robust health-care system and infrastructure, strong municipal government, and support from China Mobile, the country's largest telco. The lessons and best practices drawn are expected to help in planning subsequent large-scale projects.

The project began in August 2017 and targets residents ages 50 to 74 who are long-term smokers or have a family history of lung cancer. Costs are expected to run to US$1.27 million (CNY 8 million), with the government covering 60 percent and the hospital and the government-linked Guangzhou Charity Association shouldering the rest. As of December 2017, about 500 people had participated in the screening held during the weekends, with 30 of them (6 percent) requiring further tests and 10 (2 percent) classified as likely to have lung cancer.

Figure 3: Guangzhou Screening Pilot



Source: Milken Institute, 2017.

BARRIERS TO SCALING UP LUNG CANCER SCREENING IN GUANGZHOU

Lab participants agreed that the costs of screening and follow-up diagnostic tests, and the lack of public awareness, are the two most critical barriers, followed by the need to bring in more highly trained health-care professionals, improve accessibility to screening centers, and enhance data collection and analysis.

BARRIER 1: COSTS OF SCREENING AND SUBSEQUENT FOLLOW-UP TESTS

An LDCT scan in Guangzhou costs US$80 (CNY 500), which is fully sponsored by the government and its partners. Depending on their results, patients may undergo follow-up tests in another three to six months, and these are paid in part by state-sponsored or personal insurance. The patient is expected to pay the balance. Results for the follow-ups have been mixed, presumably because of fear of testing positive, time away from work, and the extra personal expense. (Outside of the demonstration projects, people tend to balk at paying for scans, especially if they feel healthy and aren't aware that lung cancer can be asymptomatic for years.) Lab participants agreed that the government will unlikely have the capacity to fund a large-scale, sustainable screening program based on the current financing available.

BARRIER 2: LACK OF PUBLIC AWARENESS AND CULTURAL ACCEPTANCE

As noted, a general lack of awareness, or denial, prevails about the importance of early screening for increasing the odds of surviving lung cancer. Despite widely publicized screening campaigns and opening ceremonies on media channels and social media like WeChat, many people report they aren't aware that free screening programs exist. This is also true of other cancer screening programs; 43 percent of funding for the colorectal cancer screening program in Guangzhou was used for marketing and advertising, but participation remained low. In addition, Lab participants noted, many Chinese have a strong fear of entering hospitals when they're feeling healthy, believing it to be taboo. Additionally, older people who fall within the high-risk profile may believe that cancer is incurable or choose to go untreated for fear of incurring high treatment and hospitalization costs. There is also a strong reluctance to undergo screening if it causes some inconvenience, or if there are follow-up consultations.

There is a pressing need for better public awareness campaigns to raise awareness about the low radiation risk, the importance of early detection, free screenings, and available help for managing treatment costs. Lab participants suggested training staff at pharmacies, community clinics, and rural hospitals to help impart information; building partnerships between screening campaigns and large companies that would encourage their employees to register for the scans; and coordination with screening companies and/or insurance providers to offer discounts or even full coverage of LDCTs as optional replacements of conventional X-rays in mandatory annual health checkups (X-rays cost about US$16 (CNY 100) compared to the higher-cost LDCTs).

BARRIER 3: INSUFFICIENT HEALTH-CARE SPECIALISTS

China suffers a lack of well-trained and experienced radiologists who are responsible for interpreting scans and offering accurate diagnoses. They play an essential role in building trust and quality in the screening program, yet most hospitals have too few experienced radiologists on staff.

In addition, there is a need for screening teams, including nurses and coordinators, dedicated solely to the program. Current screening programs are mostly conducted with existing manpower, which places a heavy burden on hospital employees. Limited budgets have also meant no salary raises for coordinators; the current pay of about CNY 60,000 per year (US$9,500) leads to high staff turnover and loss of institutional knowledge in managing the screening programs.

BARRIER 4: POOR ACCESSIBILITY TO SCREENING AND OVERCAPACITY AT HOSPITALS

The accessibility of screening sites is also important for reaching a wider population and to minimize inconvenience. Since the hospitals with LDCT scanners in Guangzhou are already operating at full capacity, mobile screening programs that have rolled out successfully in the UK and Japan were suggested as alternatives. Mobile CT machines could also be deployed in the future into rural areas around Guangzhou. Of course, they present their own funding challenges, in terms of hiring personnel to maintain and operate the mobile units.

BARRIER 5: CHALLENGES IN DATA COLLECTION

Lab participants also highlighted the need for improved data collection and analysis. Currently, the high-risk group is defined as ages 50–74/20 pack-years/having quit smoking for less than five years, but the medical experts present were divided on lowering the age of the high-risk group from 50 to 45. In addition, questions remained about screening nonsmokers with family histories of cancer and whether the effectiveness of LDCT screening can be improved with complementary screening tools, such as biomarker tests.

These concerns may very well be addressed as more data are collected and analyzed. As the data come in, it will be more efficient to monitor patients via a digital platform. China Mobile, for instance, had created a medical management mobile app that individuals can use to make doctors' appointments, obtain customized health management plans, and even consult with their doctors via live video chat. The mobile app already has 110 million users in Guangdong province. Data from the app could help assess the effectiveness of LDCT screening and support the need for additional R&D or complementary diagnostics. It would also help refine the criteria to identify high-risk individuals for screening.

FINANCIAL SOLUTIONS

Government funding to cover costs of lung cancer screening is insufficient. Thus far private investment has been limited. Innovative financing solutions are needed to scale up existing programs in regions across China. Lab participants reviewed models that would address the barriers outlined in the previous section. At the conclusion of the Lab, there was a map of a pilot demonstration project that would increase screenings in Guangzhou and test specific financial innovations to meet capital needs.

ADDRESSING COSTS

The price of lung cancer screening, while not exorbitant, is prohibitive for lower-income communities in China. Without a full government subsidy on cost through insurance, Lab participants discussed models that could help to defray some of the expenses.

TIERED PRICING

China's economy has grown significantly over the past decade, and most communities have enjoyed the fruits of greater wealth distribution and the expansion of middle and upper-middle classes. Unfortunately, an estimated 43.3 million people continue to live on less than CNY 2,300 a year, or roughly $363.[xxxv] So while there is still work to do to eradicate poverty, the growing economic power of the middle class does allow for potential pricing tiers that could benefit lower-income communities.

In India, which has similar issues with wealth and poverty, there are some notable health-care pricing models in which higher fees that middle and upper classes pay help to subsidize discounted pricing for lower-income patients for the same medical services. The Aravind Eye Hospital chain in India's Tamil Nadu is one such example. The self-supporting medical network has famously provided eye surgery for rich and poor alike through a number of for-profit and nonprofit hybrid hospitals where the fees charged to paying patients help underwrite the same services at no or low cost, as well as eye camps, in-hospital training, eye banks, ophthalmic research, and school programs for children.[xxxvi]

Lab participants discussed the Aravind system as a potential model for funding screening and treatment. It is an especially intriguing solution in cities like Guangzhou that have a mix of income levels. Private clinics operate, of course, but no model yet exists to mix for-profit private clinics with not-for-profit services. It is important to note, however, that the Aravind model for eye surgery, and for cataract surgery in particular, provides "assembly line" services quickly and at high volume because the surgery is safe and simple. (Doctors at the Aravind Eye Hospital in the city of Madura, for example, perform nearly 170,000 surgeries in a single year.) It was unclear if that model would translate to cancer diagnosis or treatment, which requires more time with each patient.

Next steps: Develop a tier pricing model to better understand what volume and cost levels are necessary to achieve self-supporting status and/or profitability. Select a specific clinic or hospital to use in a pricing simulation to see what subsidy levels could be introduced for lower-income communities.

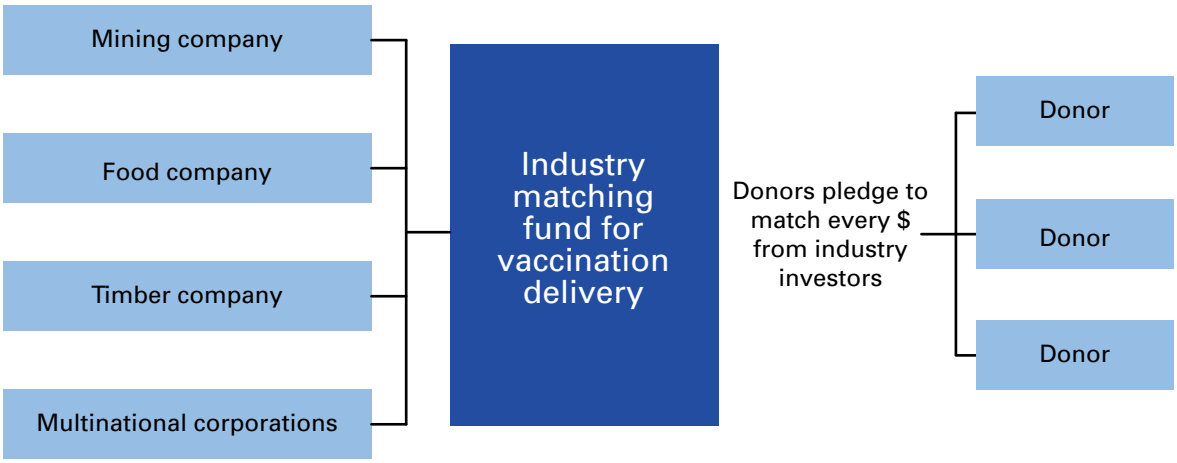
MATCHING FUND

Lab participants debated the appropriate model to provide assistance to cover screenings. Because of the cultural stigma against receiving something for free, the discussion focused on a model that would raise donor capital to provide a small portion of the screening, to ensure that the patient still feels as though the procedure is important and pays for the remaining portion.

One such model is found in a **matching fund**. This is an investment model in which an anchor underwriter (donor), perhaps the government, agrees to provide a certain funding level, based on matching pledges made by additional investors. For example, a government may agree to put $100 million into a fund if private investors match that amount, thus building a $200 million fund. This type of "leverage," whereby the government doubles the size of its funding, is an important fundraising method to pool and scale up funding.

As seen in Figure 4, the matching fund can bring in donors that may not have previously donated. For example, Lab participants discussed potential industry players who would benefit from a healthy population, but who have not previously focused their corporate social responsibility (CSR) on lung cancer. This could include mining companies, apparel, and technology production companies and other multinational corporations.

Figure 4: An Industry Matching Fund



Source: Milken Institute.

The Geneva-based GAVI Matching Fund, for example, was created in 2011 with the Bill & Melinda Gates Foundation and the UK government as anchor donors. Using their $111 million in pledges, the fund was then able to attract private-sector partners, including corporations and other foundations, to nearly double the amount to roughly $210 million for the GAVI Alliance, a nonprofit organization that delivers vaccines to communities in developing countries.[xxxvii]

Next steps: Conduct a survey to gauge interest and demand from potential donors, and model the fund size.

ADDRESSING PUBLIC AWARENESS

Raising public awareness is critical to combating the staggering mortality rates for lung cancer. Marketing campaigns should target specific programs that will allow patients easy access to doctors and diagnostics. Nevertheless, marketing campaigns take funding, and Lab participants discussed two potential funding models that could help address the funding gaps.

CORPORATE SOCIAL RESPONSIBILITY MODEL

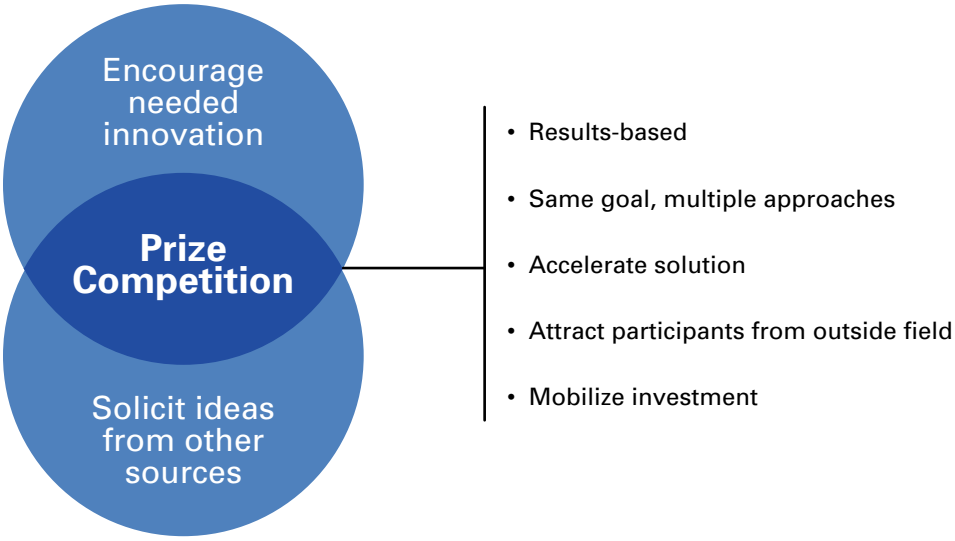
In a **social responsibility model**, local corporations would help the communities in which they work. Leveraging financial resources is one way to tap into corporate social responsibility, but another route is to use a company's own business strengths. Telecom companies, for example, could become partners and create mobile alerts and IMs that promote screenings to their users. Local retailers could become partners and help market the screening campaigns or support them with donations. China Mobile has already partnered with hospitals in Guangzhou to help track patients in the current Yuexiu district screening study. The company worked with the organizers to develop a mobile platform to facilitate registration, disseminate information to registered individuals, and enable e-consultation with the screening coordinators through the platform.

Next steps: Make a case study of China Mobile's partnership with public health practitioners, and use it show other potential corporate partners the possibilities here for their corporate social responsibility.

PRIZE COMPETITION MODEL

When it comes to challenges related to global development, Lab participants noted, if no for-profit market exists, individuals have few incentives to work on innovative solutions. The **prize competition model** is meant to address this market failure. Prize competitions traditionally pose a question or present an issue and ask for submissions that offer solutions. Entrepreneurs in need of seed money prefer these competitions because cash prizes can be crucial to getting their ideas off the ground. Sometimes a prize also includes the possibility of subsequent funding rounds if the proposal turns into a business. Prize competitions have addressed numerous social, scientific, and health-related issues. Figure 5 shows that a prize can encourage innovation, attract participants from a variety of sectors and regions, and help to mobilize investment.

Figure 5: A Prize Competition



Source: Milken Institute.

The Gates Foundation was one of the first organizations to issue a prize challenge—the Grand Challenges in Global Health in 2003, awarding $450 million in grants. It has since grown into Grand Challenges funded by the Canadian government, the U.S. government and several country-specific competitions.[xxxviii] Lab participants discussed the potential for a prize competition that would tackle the barrier of low public awareness, as well as technologies that disseminate information over social media, educational platforms, and initiatives to promote smoking cessation.

Next steps: Initiate conversations with business, foundation, and government leaders to explore donor commitment and grant funding. Develop models to determine prize fund capitalization, as well as size and number of potential grants.

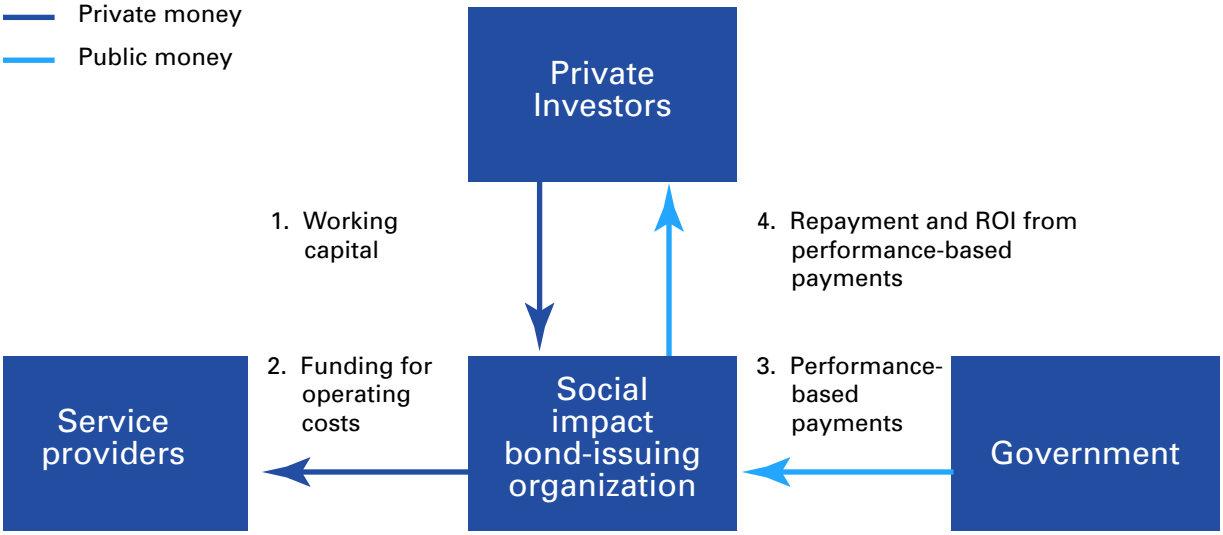
TRAINING HEALTH CARE PROFESSIONALS

Human capital is an important factor in the equation for success, but there is a current shortage of both doctors and nurses, as well as test administrators and technicians. Lab participants addressed possible solutions.

SOCIAL IMPACT BOND

In 2010 the UK partnered with the not-for-profit Social Finance Ltd. to help provide funding for social services that weren't in the government's budget. To help end recidivism at a specific jail, Social Finance and the government created the world's first **social impact bond**, a contract that would use investor capital to pay for programs that could reduce re-incarceration; if improvements could be verified at designated milestones, the government would repay investors. As seen in Figure 6, this type of bond, also known as a **pay-for-performance bond**, frontloads funding from investors when government lacks the capital. In the case of Social Finance, repayment came from the savings realized when fewer people were re-incarcerated. And in the event of failure, the government would have paid nothing because the investors assumed all the risks.

Figure 6: Social Impact Bond Model



Source: Social Finance Ltd.

Social impact bonds have been successful in health, education, and environmental projects. Lab participants discussed their use to address funding gaps for training medical staff associated with lung cancer screenings and treatment. As noted earlier, most hospitals can't afford to hire and train additional doctors, nurses, and technicians to administer and analyze screenings, even though doing so would help ensure more, and more efficient, screenings. If a hospital by itself or in partnership with the government assumes the role of end payer, the hospital would likely see long-term cost savings by adding more staff and offering trainings in LDCT scans and analysis. The government would see its own savings in the terms of preventive medical care and regained production. The metrics for success and return on investment are crucial to the bond's success.

Next steps: Determine the elements and metrics for success of a social impact bond in Guangzhou, i.e., how much more training and of what sort, how many more health-care professionals, how many additional screenings per hospital. Then develop a bond model.

CORPORATE PARTNERSHIPS

Using corporate partnerships (or sponsorships) to lower health-care costs via telemedicine and video consulting, even videoconferencing, is another possibility. This is a smart alternative for use in urban hospitals on limited budgets, as well as villages and rural areas with limited access to clinics and medical professionals. Telemedicine, for example, allows doctors in the U.S. to confer with doctors and patients in Nigeria through remote connections that enable record sharing and onscreen contact.

Lab members suggested outsourcing the LDCT scans to a dedicated team of radiologists set up across different hospitals. Scan results and related health information could be uploaded to a digital platform serving as a diagnostic center, and team members, all specialists in lung pathologies, would have access to them. The pooled expertise would reduce the need for hospitals to increase staffing, and the radiologists would receive appropriate compensation for their work.

Next steps: Partner with a technology company to test the telemedicine applications for lung cancer screening in Guangzhou.

DESIGNING A DEMONSTRATION PROJECT

At the conclusion of the Lab, participants had mapped out a potential demonstration project that would both expand the lung cancer LDCT screening program and test innovative financing models to ensure a sustainable and scalable project. During a subsequent working session, held in April of 2018 in Guangzhou, participants made further recommendations to flesh out the design of the project.

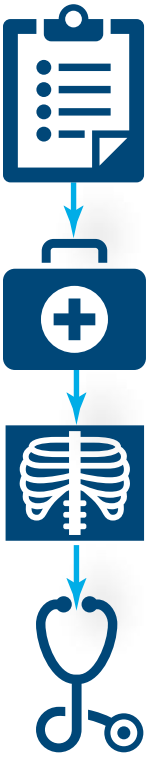
DECISION CRITERIA FOR THE PROJECT

The working session participants created a general structure of decision criteria to scope the target population age parameters and cancer histories, sample screening size, medical facilities for the demonstration project, and funding models that would support various stages of the project, from the screenings themselves to training and public awareness campaigns.

Table 1: Target Criteria Details

• Target city: Guangzhou
• Target sample size: 10,000
• Target age parameters: 40 to 80 years of age
• Target groups selected: » residents who undergo annual health screening/checkup through their employers' health insurance or out of pocket payments » workers of specific industries such as manufacturing and cleaning/sanitation who are at higher risk of air pollution due to the nature of their jobs
• Price subsidies: a CNY 300 payment on the cost of the screening for those not able to pay out of pocket
• Hospital selection: hospitals or screening centers with a sizable pool or database of residents who have been undergoing annual health checks, in-house LDCT scanners, and the ability to collect and analyze information gathered from health surveys and the results of the screening
• Awareness campaign: organized jointly with employers, with key messaging targeted at those above 40, retirees, as well as their family members and children, with incentives in the form of a gift or coupons considered to make participation more attractive
• Tracking results: a common data platform managed by a public hospital or a reliable third-party would be needed to collect the health information gathered from surveys and the results from the screening project

PROJECT FLOW



Step 1: Identify patients from existing hospitals and clinics, as well as through employers.

Step 2: Upgrade patients to an LDCT scan at a hospital or private screening clinic.

Step 3: Provide subsidy for patients who can't afford to pay out of pocket.

Step 4: Refer patients with a positive screen to a doctor or hospital for treatment consultation.

The screening process would involve identifying residents within the high-risk group through the database of the screening centers or hospitals, as well as through partnerships with local state-owned enterprises or MNCs that would like to participate in the project. Residents or employees who meet the criteria for screening may be offered the upgrade to LDCT screening which will be conducted at a hospital or private health screening center, such as the Guangzhou Medical University 1st Affiliated Hospital or Meinian OneHealth. After the LDCT screening is completed, participants will be informed of the results by the coordinators of the screening program. Participants who test positive will be referred to a doctor or hospital for follow up consultation and guidance on the treatment pathway. Participants who require financial assistance for treatment may apply for financial aid through existing schemes.

FUNDING THE PROJECT

The project would include a selection of the financing models, as shown in Table 2. The options chosen were deemed the most viable for implementation and would also meet the various funding needs.

Table 2: Demonstration Project Funding Models

Costs	Launch a **matching fund** to subsidize the cost for those who need help paying for their LDCT scans
Awareness	Launch a **prize competition** to encourage innovative approaches public education and awareness
Training	Design a **social impact bond** that will scale up health-care professional hiring and training programs
Corporate social responsibility	Explore technology or other e-medicine resources to lower costs and provide funding for the screenings and health-care staffing

NEXT STEPS

Both Lab participants and those in the follow-up working group agreed that more details need formulation, and Table 3 outlines the next steps to sequence the tasks to implement the demonstration.

Table 3: Next Steps

• Identify the city district and specific hospitals
• Create a matching fund structure, and identify an anchor donor (e.g., government entity)
• Create partnerships with companies or donor groups that will support a matching fund through corporate social responsibility programs
• Target potential donors for a social impact bond and determine its most efficient structure
• Design metrics for a social impact bond that will work with existing partners, such as training programs

Participants agreed that the demonstration project could be replicated in other parts of China, and even scaled up to include more patients.

CONCLUSION

Given the severity of lung cancer, it is no surprise that the government is promoting the detection of lung cancer in its early stages. LDCT has gained global acceptance as an effective diagnostic tool, despite its flaws, and other complementary or improved diagnostics are not market-ready. The potential of increasing survival rates, reducing treatment costs, and improving economic productivity from patients' recovery will have a significant impact. However, organizing large-scale LDCT screenings is a challenge on many levels.

Challenges include the costs of screening and follow-up tests, the lack of preventive health knowledge, the stigma of cancer screening and charity, an inadequate health-care workforce and data sharing platform, and the competing priorities and demands on health-care institutions. The Lab identified a health-care value chain, supported with the help of corporate social responsibility, private investors, and governments that can provide new and sustainable sources of financing and educate the public on the importance of early detection and treatment.

The next steps involve engaging local philanthropists, corporations, and government officials, and demonstrating how innovative financing solutions can make an impact and allow everyone at high risk of lung cancer to access screening. Using Guangzhou as a pilot, a matching fund and social impact bond could subsidize screening costs and improve training for health-care workers. Combined with a prize competition for innovative marketing approaches toward screening awareness and corporate social responsibility partnerships, it may be possible within a few years to see the provision of early screening as the standard of care to everyone at risk of lung cancer.

FINANCIAL INNOVATIONS LAB PARTICIPANTS

	FIRST NAME	LAST NAME	ORGANIZATION	TITLE
1	Belinda	Chng	Milken Institute, Asia Center	Director, Policy and Programs
2	Caitlin	MacLean	Milken Institute	Director, Innovative Finance
3	Chao	Ge	China Global Philanthropy Institute	Analyst, Social Finance and Innovation Center
4	Haibo	Zhao	Siemens China	Product Manager, Medical Imaging
5	Ivy	Yin	Johnson & Johnson Medical Asia Pacific	Director, Health Economics & Market Access, Medical Devices, Asia Pacific
6	Jialin	Li	Milken Institute, Asia Center	Researcher, Policy and Programs
7	Zhenjun	Zhao	Guangdong General Hospital	Deputy Director, Radiology
8	Laurent	Metz	Johnson & Johnson Medical Asia Pacific	Health Economics & Market Access Lead, Medical Devices, Asia Pacific
9	Yan	Li	Guangzhou Center for Disease Control and Prevention	Deputy Section Chief, Vital Statistic & Cancer Registry
10	Michael	Wilson	Milken Institute	Associate, Innovative Finance
11	Qiang	Liu	AstraZeneca China	Deputy Director, Government Affairs, Policy and CSR
12	Rong	Zheng	Johnson & Johnson China	Public Health Director
13	Shasha	Shi	China Global Philanthropy Institute	Analyst of Social Finance and Innovation Center
14	Xueguo	Liu	The 5th Affiliated Hospital of Sun Yat-sen University	Deputy Director, Medical Imaging and Radiology
15	Wenhua	Liang	Guangzhou Medical University 1st Affiliated Hospital	Assistant Director, Thoracic Oncology
16	Xianliang	Liu	KingMed Centre for Clinical Laboratory	Account Manager, KingMed Clinical Trial
17	Xiaomin	Hu	Guangdong Yue Fa Health Information Technology Co., Ltd, China Mobile	General Manager

WORKING GROUP PARTICIPANTS

	FIRST NAME	LAST NAME	ORGANIZATION	TITLE
1	Belinda	Chng	Milken Institute, Asia Center	Director, Policy and Programs
2	Caitlin	MacLean	Milken Institute	Director, Innovative Finance
3	Jeff	Mou	Milken Institute, Asia Center	Associate, Business Development
4	Laurent	Metz	Johnson & Johnson Medical Asia Pacific	Health Economics & Market Access Lead, Medical Devices, Asia Pacific
5	Qiang	Liu	AstraZeneca China	Deputy Director, Government Affairs, Policy and CSR
6	Wenhua	Liang	Guangzhou Medical University 1st Affiliated Hospital	Assistant Director of Thoracic Oncology Dept.
7	Michael	Hua	Johnson & Johnson Medical Asia Pacific	Director, New Business Development
8	Ivy	Yin	Johnson & Johnson Medical Asia Pacific	Director, Health Economics & Market Access, Medical Devices
9	Xiaomin	Hu	Guangdong Yue Fa Health Information Technology Co., Ltd, China Mobile	General Manager
10	Kevin	Tan	Third Sector Capital Partners, Asia	Founder
11	Anqi	Liu	SynTao Green Finance	Researcher
12	Di	Wang	Tencent, Artificial Intelligence	Medical Industry Director, Internet+Cooperation Business Dept.
13	Zhangning (Alex)	Lai	Tencent, Artificial Intelligence	Head of Southern China
14	Juan	Li	Meinian Onehealth	Head of Dongguan Office
15	Mohan	Zhang	Meinian Onehealth	Head of Marketing, Dongguan Office
16	Lei	Shi	Siemens China	Manager and Specialist, Key Accounts
17	Hui	Ouyang	Medtronic	Sales Manager (Southern China)
18	Simon	Cheng	Medtronic	Sales Manager, Surgical Innovations ILS
19	Li	Sang	Modern Cancer Hospital Guangzhou	Vice General Manager
20	Liangqiong	He	Modern Cancer Hospital Guangzhou	Director, Quality Control

ENDNOTES

i "Cancer: Key Facts," World Health Organization website, last modified February 1, 2018, accessed March 2, 2018, www.who.int/mediacentre/factsheets/fs297/en/.

ii Ya-Guang Fan et al., "Lung Cancer in Urban China," *Cancer Control* (2015): 88–93, http://www.cancercontrol.info/wp-content/uploads/2015/07/87-93-Qiao_cc2015.pdf.

iii Jun She et al., "Lung Cancer in China: Challenges and Interventions," *CHEST Journal* 143 (2013): 1117–1126.

iv National Health and Family Planning Commission of the People's Republic of China (NHFPC), *Notice on Preliminary Administrative Regulation of City-based Early Diagnosis and Treatment of Cancer Project* (2011), accessed March 2, 2018, www.nhfpc.gov.cn/zwgk/wtwj/201304/02a18d0954d845e5bb48cf6817beb8dc.shtml; Dierdre F. Sheehan et al., "Evaluating Lung Cancer Screening in China: Implications for Eligibility Criteria Design from a Microsimulation Modeling Approach," *PLoS ONE* 12(3) (2017): e0173119, http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0173119.

v Jincheng General Hospital, "Technical Plan for Early Diagnosis and Treatment of Cancer Project and Working Plan for City-based Early Diagnosis and Treatment of Cancer Project," press release, October 24, 2016, accessed March 28, 2018, http://www.jmjtzyy.com/index.php/Index/newsContent/id/1237; Shi-Jun Zhao and Ning Wu, "Early Detection of Lung Cancer: Low-Dose Computed Tomography Screening in China," *Thoracic Cancer* 6 (2015): 385–389.

vi Jincheng General Hospital, "Technical Plan for Early Diagnosis and Treatment of Cancer Project."

vii Guangzhou Center for Disease Control and Prevention, "Successful completion of 'Cancer Screening Project in Urban Areas of China' in Guangzhou City," June 2013, accessed March 30, 2108, http://www.gzcdc.org.cn/News/View.aspx?id=1492.

viii M. Schmidt-Hansen et al., "Lung Cancer in Symptomatic Patients Presenting in Primary Care: A Systematic Review of Risk Prediction Tools," *British Journal of General Practice* 67 (659) (June 2017): 396–404, www.ncbi.nlm.nih.gov/pubmed/28483820.

ix P. Goldstraw et al., "The IASLC Lung Cancer Staging Project: Proposals for Revision of the TNM Stage Groupings in the Forthcoming (Eighth) Edition of the TNM Classification for Lung Cancer," *Journal of Thoracic Oncology* 11(1) (2016): 39-51, *in* "Non-Small Cell Lung Cancer Survival Rates, by Stage," American Cancer Society, last revised December 18, 2017, www.cancer.org/cancer/non-small-cell-lung-cancer/detection-diagnosis-staging/survival-rates.html.

x "National Lung Screening Trial: Questions and Answers," National Cancer Institute, accessed March 21, 2018, www.cancer.gov/types/lung/research/nlst-qa.

xi Jiu-Wei Cui et al., "Screening for Lung Cancer Using Low-Dose Computed Tomography: Concerns about the Application in Low-Risk Individuals," *Translational Lung Cancer Research* 4(3) (2015): 275–286, accessed March 21, 2018, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4483481/.

xii Associated Press, "Most Smokers in China Have No Plans to Quit, Study Finds," *South China Morning Post*, June 1, 2017, accessed March 21, 2018, www.scmp.com/news/china/society/article/2096446/most-chinas-huge-number-smokers-dont-want-quit-survey-suggests.

xiii Chuanli Ren and Chongxu Han, "Opportunities and Challenges for Lung Cancer Screening in China," *Frontiers in Laboratory Medicine* December 1:4 (2017): 177–178, accessed March 22, 2018, www.sciencedirect.com/science/article/pii/S2542364917301127.

xiv Xinhua Net, "Shanghai's per Capita Disposable Income Nears 59,000 Yuan, Highest in China," February 25, 2018, accessed March 19, 2018, www.xinhuanet.com/english/2018-02/25/c_136999264.htm.

xv Xinhua Net, "Free Cancer Screening for Four Malignancies in Tianjin," May 9, 2017, accessed March 30, 2018, http://www.xinhuanet.com/health/2017-05/09/c_1120939484.htm.

xvi World Health Organization, "Cancer: the situation in China," last updated July 7, 2017, accessed March 30, 2018, http://www.wpro.who.int/china/mediacentre/factsheets/cancer/en/.

xvii Xin Zhang et al., "Economic Burden for Lung Cancer Survivors in Urban China," *International Journal of Environmental Research and Public Health* 14(3) (2017): 308, www.ncbi.nlm.nih.gov/pmc/articles/PMC5369144.

xviii "Cancer Today: Estimated Number of Incident Cases, Both Sexes, Worldwide (Top 10 Cancer Sites) in 2012," graphic, International Agency for Research on Cancer, accessed March 18, 2018, http://gco.iarc.fr/today/online-analysis-pie?mode=cancer&mode_population=who&population=900&sex=0&cancer=29&type=0&statistic=0&prevalence=0&color_palette=default.

xix Martin C. S. Wong et al., "Incidence and Mortality of Lung Cancer: Global Trends and Association with Socioeconomic Status," *Scientific Reports* 7 (2017): 14300, www.nature.com/articles/s41598-017-14513-7.

xx Associated Press, "Most Smokers in China Have No Plans to Quit, Study Finds," *South China Morning Post*, June 1, 2017, accessed March 21, 2018, www.scmp.com/news/china/society/article/2096446/most-chinas-huge-number-smokers-dont-want-quit-survey-suggests.

xxi "National Lung Screening Trial: Questions and Answers," National Cancer Institute, accessed March 21, 2018, www.cancer.gov/types/lung/research/nlst-qa.

xxii Ryutaro Kakinuma, "Update on CT Lung Cancer Screening in Japan—cSlide," PowerPoint Presentation, 2015, accessed February 10, 2018, http://oncologypro.esmo.org/Topics/Imaging-Diagnosis-and-Staging/Update-on-CT-lung-cancer-screening-in-Japan.

xxiii Kakinuma, "Update on CT Lung Cancer Screening in Japan—cSlide."; Tomotaka Sobue et al., "Lung Cancer Incidence Rates by Histologic Type in High- and Low-Risk Areas: A Population-Based Study in Osaka, Okinawa, and Saku Nagano, Japan," Journal of Epidemiology 9(3) (1999): 34–42, www.ncbi.nlm.nih.gov/pubmed/10412245.

xxiv Nichole T. Tanner and Gerard A. Silvestri, "An Up-to-date Look at Lung Cancer Screening," Cell Adhesion and Migration 4(1) (2010): 96–99, accessed February 10, 2018, www.ncbi.nlm.nih.gov/pmc/articles/PMC2852565/.

xxv MacMillan Cancer Support, "Manchester's Lung Health Check Pilot," August 2016, accessed February 7, 2018, www.macmillan.org.uk/_images/lung-health-check-manchester-report_tcm9-309848.pdf.

xxvi S. Sone et al., "Mass Screening for Lung Cancer with Mobile Spiral Computed Tomography Scanner," The Lancet 351(9111) (1998): 1242–1245.

xxvii MacMillan Cancer Support, "Manchester's Lung Health Check Pilot."

xxviii W. Chen et al., "Cancer Statistics in China, 2015," CA: A Cancer Journal for Clinicians 66 (2016): 115–132.

xxix Ya-Guang Fan et al., "Lung Cancer in Urban China," Cancer Control (2015): 88–93.

xxx Ibid

xxxi Shan Juan, "Expert: China to Open More Lung Cancer Treatment Centers," China Daily, November 10, 2016, accessed March 23, 2018, www.chinadaily.com.cn/china/2016-11/10/content_27335194.htm.

xxxii "China's health trajectory in 2017," The Lancet Oncology 18(2) (February 2017): 155, accessed March 2, 2018, http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(17)30034-7/fulltext.

xxxiii Caixiong Zheng, "Cancer now most deadly disease in Guangzhou," China Daily (2014), accessed March 30, 2014, http://www.chinadaily.com.cn/china/2014-04/15/content_17435123.htm.

xxxiv Ibid.

xxxv John Ruwitch, "In China, 12.4 Million People Brought Above Poverty Line in 2016: Xinhua," *Reuters*, February 28, 2017, accessed March 2, 2018, www.reuters.com/article/us-china-poverty/in-china-12-4-million-people-brought-above-poverty-line-in-2016-xinhua-idUSKBN1682T1.

xxxvi Aravind Eye Care System, accessed March 29, 2018, www.aravind.org/default/aboutuscontent/genesis.

xxxvii "GAVI Matching Fund," Gavi, last updated June 30, 2016, accessed March 1, 2018, www.gavi.org/funding/matching-fund/.

xxxviii Grand Challenges, accessed March 1, 2018, https://grandchallenges.org/initiatives.

MILKENINSTITUTE.ORG

SANTA MONICA
1250 Fourth Street
Santa Monica, CA 90401
P +1.310.570.4600

WASHINGTON
1101 New York Avenue NW
Suite 620
Washington, D.C. 20005
P +1.202.336.8930

LONDON
23 Savile Row
London W1S 2ET UK
P +44 (0) 207.043.5926

SINGAPORE
8 Marina View #15-05
Asia Square Tower 1
Singapore 018960
P +65.6636.2507