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The healthcare sectors in many emerging countries are poised for growth, leveraging economic expansion and a focus on broader welfare policies.

# Healthcare in emerging countries

## Challenges and opportunities for operations research.

By
Rajib Ghosh, Dr. Amlan Datta and Kausik Lahiri

**Emerging countries are often considered as hot destinations for private investments owing to their history of rapid growth.** For example, while most of the developed economies experienced anemic growth and in some cases shrinkage during 2008 to 2011, the Chinese economy grew at an average rate of 9 percent [1]. During the same time the Indian economy grew at near a 7 percent rate and Brazil at close to 4 percent. In 2010 China's GDP of $5.88 trillion surpassed that of Japan's $5.47 trillion to become the world's second largest economy after the United States. Brazil's GDP surpassed the United Kingdom to become the sixth largest economy of the world [2].

The healthcare sectors in those countries are also poised for ongoing growth, leveraging the trend of economic expansion and leaderships' focus on broader welfare policies for the people. However, much needs to be done, especially in ramping up healthcare delivery infrastructure, access to preventive and curative care and providing health insurance coverage for a broader population. The latter is particularly lacking in emerging countries, causing over reliance on out-of-pocket payment for healthcare services.

No country can sustainably grow on a long-term basis without ensuring adequate and equitable healthcare delivery to its masses. Some emerging countries such as China have made promising progress in that direction, while many are struggling to keep up with the rising population burden. This article explores the key issues facing the healthcare systems of emerging countries. It also discusses the advent of technology-enabled care delivery to address healthcare inequities and how the principles of operations research, if embraced, can help.

## Population distribution

THE ECONOMIC GROWTH in emerging countries like the BRICS nations (Brazil, India, China, Russia and South Africa) have created wealth and health divide among the urban and rural communities. Most of the economic activities being concentrated in the tier 1 or tier 2 cities of those countries left very few opportunities for the poor in the rural areas to take advantage of the economic growth. The high-income middle class population in these countries are concentrated around a few very large cities, thus creating demand for Western-style healthcare in comfortable upscale facilities.

In the absence of modern and well-equipped state run healthcare facilities, private enterprises are stepping in to cater to this fledgling segment. Luxury hospitals are being built with state-of-the-art diagnostic and therapeutic equipment, imported from North America and Europe, to address this growing demand [3].

## Disease burden

COMMUNICABLE DISEASES like AIDS, tuberculosis, malaria, etc. are major contributors to the disease burden in Africa – mostly sub-Saharan and low-income countries such as Bangladesh. In South Asia, Southeast Asia and South America, however, non-communicable lifestyle-related diseases are on the rise (Figure 1). In India, for example, lifestyle-related diseases have overtaken communicable diseases in causing deaths (Figure 2). This is not an anomaly. Rather, it is a reflection of socio-economic changes that emerging countries such as India are experiencing as their economy is growing faster than their Western counterparts.

Most emerging nations have increased their per capita expenditure on healthcare, albeit it is still quite low compared to the developed countries such as the United States or Germany (Figure 3).

Many countries provide state-run rudimentary healthcare systems that are free for all, but a substantial percentage of healthcare expenses are still out-of-pocket (Figure 5). The share of private sector spending on healthcare is higher than the public sector counterpart in most of the emerging countries (Figure 4). With the uneven wealth distribution in those countries such patterns exert enormous pressure on the poverty level of the countries and overall wellbeing of the population in general. Rural poor sometimes sell their assets to obtain curative healthcare in the private centers. Broader principles of population

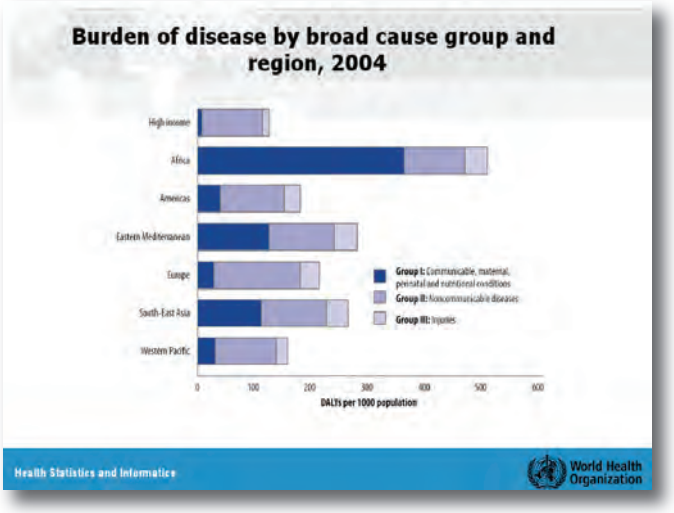


**Figure 1: Burden of disease by cause group and region.**

**Source:** *WHO 2004*

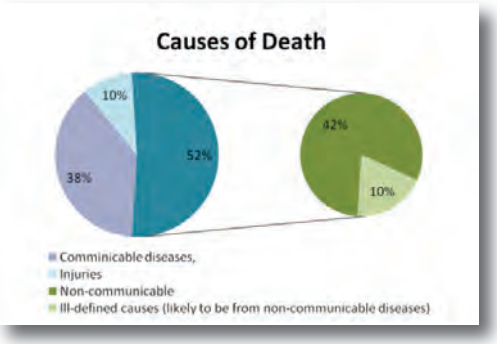


**Figure 2: Causes of death in India.**

**Source:** *Ministry of Health and Family Welfare, GOI, Annual Report to the People on Health, December 2011.*

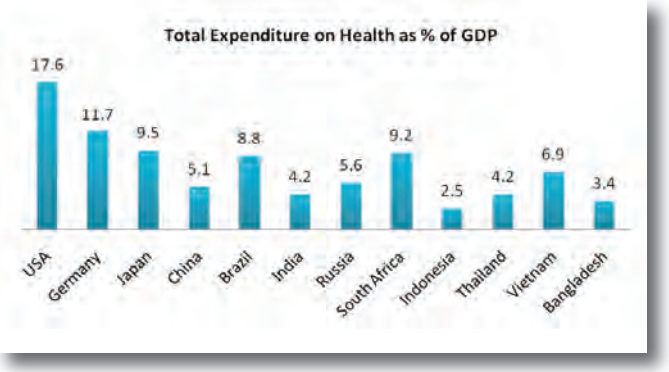


**Figure 3: Compiled from World Health Statistics 2012.**

**Source:** *WHO*

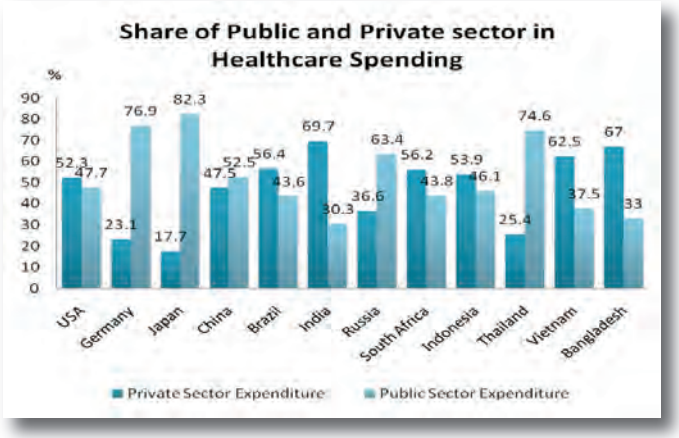


Figure 4: Compiled from World Health Statistics 2012

**Source:** *WHO*

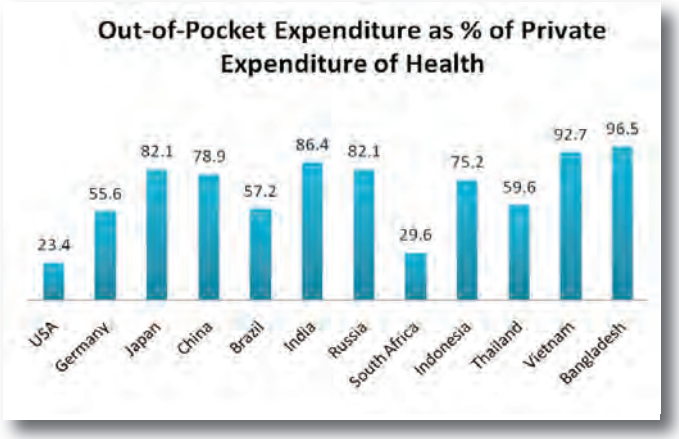


Figure 5: Compiled from World Health Statistics 2012.

**Source:** *WHO*

health management are mostly lacking among the healthcare providers of these countries.

## Key issues in emerging countries

THE FOLLOWING are key issues impacting healthcare delivery in emerging countries:

***Growing disparities in health and wealth:*** Vast geographical area and huge population with growing disparities in healthcare access and delivery between the rural and the urban areas characterize emerging nations, including the BRICS countries. Population pressure is high, and sparse economic activity zones lead to rapid growth of middle class population around a few but huge "megapolises" like Mumbai or Rio de Janeiro. With the increase in affordability among the growing middle-class population, sedentary lifestyles and unhealthy food habits are proliferating, leading to increased prevalence of lifestyle-related diseases such as pulmonary diseases, obesity, cardiovascular diseases, diabetes mellitus, neuropsychiatric disorders and cancer around the urban centers.

***Demand dichotomy:*** Upwardly mobile emerging countries are currently facing a dichotomy in healthcare demand – on one side the countries are trying to provide adequate care to cure and prevent communicable diseases while addressing the demand of state-of-the-art healthcare delivery for the affluent class to address the growing prevalence of chronic illnesses on the other. India has close to 62 million diabetics and 77 million pre-diabetics [4]. Those numbers are 92 million and 150 million in China [5]. Affluent patients are choosing institutions higher up the value chain, from nursing homes to big hospitals to "Super Specialty" and tertiary care hospitals. At the same time some emerging countries like India or Thailand are seeing increased demand for luxury healthcare services from medical tourists visiting from high-cost western countries such as the United States and United Kingdom. With limited resources at their disposal, this dichotomy is polarizing healthcare systems in the emerging countries where the bulk of resources are being diverted toward the private sector, increasing its share of healthcare expenses.

***Antiquated and sparse infrastructure:*** Another key issue facing the emerging countries is the need to upgrade antiquated infrastructure across vast areas, which is both time consuming and capital-intensive. Infrastructure-wise, China has made significant progress during the last decade. In China, 90 percent of the hospitals are currently owned by the state [6]. The remaining 10 percent that are privately owned mostly cater to the affluent Chinese and foreigners in the urban areas like Shanghai. But China is very close to the global average in terms of beds and physicians per 1,000 people. The Chinese government is now focused on upgrading their "mid tier" hospitals to bolster effective healthcare delivery among the masses.

Brazil and India are lagging behind the global average of beds and physicians with deficient public infrastructure and funding. Brazil faces overcrowded healthcare facilities and below par healthcare delivery even in urban areas.

Insufficient capacity of the public healthcare system is driving growth of private healthcare providers in India. India's globalization efforts during the last two decades have seen a decline in the government share of expenditure in healthcare, reduction of tariff barriers for technology import and attractive tax incentives to set up operations for private providers, both national and international. To trounce competition, private healthcare providers in India are rushing into becoming a "best service provider" by offering "the best and the latest" medical technologies [7]. This is analogous to what we see in other BRICS countries as well.

***Lack of health insurance coverage:*** In most of the emerging countries the percentage of people with healthcare insurance coverage is very low with the exception of China. By 2010 China successfully brought close to 90 percent of its population from less than 25 percent in 2004 under the purview of three state-run health insurance schemes. This has helped China's rural population have better access to healthcare. In Brazil 25 percent of the population is covered by private insurance. Public and private health insurance covers about 25 percent of the population in India as well [8].

## Emergence of new healthcare delivery models

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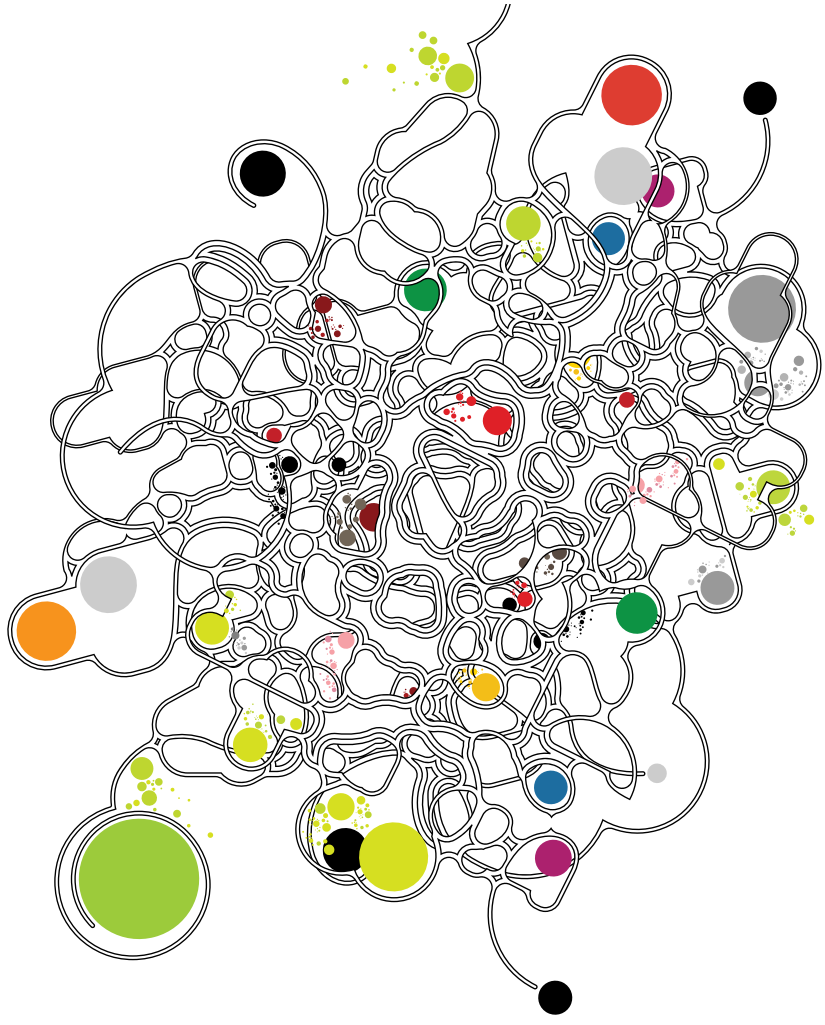

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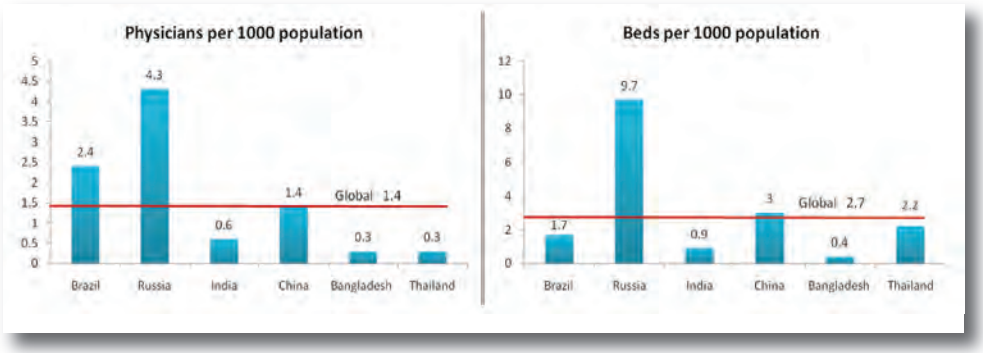


Fig 6: Compiled from World Health Statistics 2010.

Source: *WHO*

in the emerging countries. While we see many adoption barriers of those services in the Western world, emerging countries are more open to utilize modern technologies to alleviate their pain. By digitizing patient information and utilizing remote services via telemedicine, healthcare providers are improving patient-provider interaction as well as speed of information dissemination. Mobile healthcare through satellite services connected to urban super specialty hospitals and ambulatory centers are breaking down access barriers for the masses.

In India, the government and private healthcare providers like Apollo and Narayan Hrudayalaya have taken major steps toward scaling up both information digitization and the spread of telemedicine across the country. In fact, telemedicine is now being utilized for remote consultations between India-based physicians and medical tourists in the developed nations prior and after their visits for medical procedures. Electronic medical records are being used to capture episodic interactions to share across various general and specialty care centers of the same provider network. This is a huge step forward. However, data liquidity among different providers, which require collaboration among competing organizations, is still not possible.

We anticipate that absence of strict data privacy legislations and public sensitivity around that topic in the emerging countries will lead to quicker adoption of data interchange among different providers compared to what we witness in the developed countries. Acquisition of digitized data is the first step toward improving efficiency of healthcare delivery, responsiveness and effective resource management practices. Once data becomes available, analytic tools can be deployed for generating such insights.

### Application of O.R. in healthcare projects

OPERATIONS RESEARCH (O.R.) helps organizations make decisions based on models of reality constructed with quantitative and qualitative data. Data needs to be acquired by employing systemic and scientific techniques that if necessary can be replicated. In healthcare, O.R. can help provider organizations and policy-makers improve outcomes of care programs that are designed to prevent illness in specific settings and/or population cohorts. O.R. can also help decision-makers assess feasibility and optimization of certain clinical intervention strategies or advocate policy changes. To achieve the best results, O.R. principles should be prioritized, designed, implemented and replicated within national health programs and institutionalized as an essential component of monitoring and evaluation efforts.

Unfortunately, the application of O.R. is not common in healthcare delivery settings of emerging countries. For example, the Global Fund to Fight AIDS, TB and Malaria allows 5 percent to 10 percent of each grant for monitoring, evaluation and O.R. However, based on recent estimates, projects budget an average of 3 percent for O.R. and actually spend considerably less [9]. Except for AIDS programs where a good deal of O.R. modeling is utilized, the disparity between O.R. budget and actual spending remains an issue. Interviews, questionnaires and observations are used but little to nothing is done on modeling or application of analytics. This can be attributed to a lack of O.R. knowledge and skills in emerging countries. Fortunately global organizations such as the World Health Organization (WHO), International Union Against Tuberculosis and Lung Diseases (IUATLD) and Medicins Sans Frontiers (MSF) are taking notice of this shortfall and instituting training and capacity-building initiatives. In countries like India policy-makers and national organizations such as the Institute of Health Management Research (IIHMR), International Institute for Population Sciences (IIPS) and Public Health Foundation of India (PHFI) are also working to fill this knowledge gap. In Bangladesh similar work is ongoing, led by organizations such as BRAC University.

Following are a few examples where principles of O.R. have been applied in healthcare delivery projects in low-income countries:

1. The Indian Institute of Health Management Research (IHMR) led a project named "Monitoring and Evaluation of Technical Assistance for Strengthening Health of the Rural Poor (METASHARP)" [10] in Afghanistan in collaboration with the Johns Hopkins School of Public Health. The project was designed to conduct performance assessment of all health centers in Afghanistan and create a balanced scorecard based on extensive data analysis utilizing principles of O.R. The project used various scientific investigations and modeling techniques based on quantitative and qualitative data. A balanced scorecard for 2009-2010 was completed, and in 2010 a major exercise was undertaken to revise the scorecard based on the changing healthcare situation in Afghanistan.

2. The Department for International Development (DFID) ran a five-year project in Bangladesh to address "health and killer diseases" and "improving access to healthcare" using O.R. [11].
3. The Bangladesh Rural Advancement Committee (BRAC) ran the "Saving Newborn Lives" (SNL) initiative in rural Bangladesh communities using an O.R. approach to strengthen safe delivery and essential newborn care at the community level [12].

## Roadmap for O.R. in healthcare delivery

HEALTHCARE DELIVERY in emerging and low-income countries can benefit significantly by the application of O.R. and analytics. The latter can only be applied if systemic data collection and storage are ensured. Application of broad-based analytical frameworks might take many years, and different countries are at different levels of maturity at this time. However, following are six key areas in healthcare delivery that are most commonly applicable to the emerging countries and where the biggest impact of O.R. can be realized:

**Improve access to medical products:** O.R. principles can strengthen health systems to overcome barriers to access affordable, good quality, efficacious and safe medicines, vaccines and other medical technologies for communicable and non-communicable diseases.

**Improve hospital or clinic efficiency:** Every hospital or clinic in emerging countries needs to do more with less. O.R. can help them to improve quality assurance, to design an effective medical informatics system, to schedule scarce and high-demand resources like emergency room or critical equipment, to model resource availability and utilization and, in some cases, to diagnose diseases more efficiently.

**Improve emergency service efficiency:** Emergency ambulatory services such as air ambulances wherever available can rely on O.R. to keep response times quick and determine adequate fleet levels.

**Increase effectiveness of clinical interventions:** Millennium development goals for health, nutrition and poverty reduction can be accelerated by application of O.R. principles [13].

**Prevent, control and eliminate communicable diseases:** Adoption of O.R. principles can help low- and middle-income countries progress toward universal healthcare by 2020, as well as prevent, control and subsequently eliminate communicable diseases like tuberculosis and malaria by 2040 and make the world AIDS free by 2060 [14].

**Build equitable and effective healthcare systems:** Above all O.R. can help build a global health research culture and facilitate development of equitable and effective health systems enabled by evidence-based policy-making, knowledge translation and practice [15]. IORMS

***Rajib Ghosh*** *(rghosh@hotmail.com) is an independent consultant and business advisor with 20 years of technology experience in various industry verticals where he had senior level management roles in software engineering, program management, product management and business and strategy development. Ghosh spent a decade in the U.S. healthcare industry as part of a global ecosystem of medical device manufacturers, medical software companies and telehealth and telemedicine solution providers. He's held senior positions at Hill-Rom, Solta Medical and Bosch Healthcare. His recent work interest includes public health and the field of IT-enabled sustainable healthcare delivery in the United States as well as emerging nations.*

***Dr. Amlan Datta*** *(adatta61@gmail.com) is a physician, public health specialist and an associate professor at the Institute of Health Management Research (IIHMR), Kolkata, India. He has a Ph.D. in public health from Jawaharlal Nehru University (JNU), New Delhi, India. Prior to joining IIHMR, Dr. Datta worked with the government of India and WHO first in the National Polio Surveillance Project and later with the Revised National Tuberculosis Control Programme for more than a decade. His research areas include operations and health systems research, health and hospital management, primary health care, quality issues in health care, health regulations, health financing and health informatics.*

***Kausik Lahiri*** *(alklahiri@yahoo.co.in) is an associate professor of economics at Surendranath College, University of Calcutta, India. Lahiri has a master's degree in economics from the University of Calcutta. His current research interests include trade in health services with a special focus on developing countries such as India. He has been awarded a teacher fellowship by the University Grants Commission (India) to complete his doctoral studies at the Department of Economics, University of Calcutta.*

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