

Future Health Spending Forecast in Leading Emerging BRICS Markets in 2030 - Health Policy Implications

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Abstract

Introduction: BRICS leading Emerging Markets are increasingly shaping the landscape of global health sector demand and supply for medical goods and services. BRICS' share of global health spending and future projections will play a prominent role during upcoming 2020s. The purpose of current research was to examine decades long, underlying historical trends in BRICS' nations health spending and explore these data as the grounds for reliable forecasting of their health expenditures up to 2030.

Methods: BRICS' health spending data spanning 1995 - 2017 were extracted from IHME's Financing Global Health 2019 database. Total health expenditure, government, prepaid private and out-of-pocket spending per capita and GDP share of total health spending, were forecasted 2018 - 2030. The ARIMA (Autoregressive Integrated Moving Average) models were used to obtain future projection based on time series analysis.

Results: Per capita health spending in 2030 is projected to be: Brazil: \$1767 (95% PI: 1615, 1977) ; Russia: \$1933 (95% PI: 1549, 2317); India: \$468 (95% PI: 400.4, 535) ; China: \$1707 (95% PI: 1079, 2334); South Africa \$1379 (95% PI: 755, 2004). Health spending %GDP shares in 2030 are projected to be: Brazil: 8.4% (95% PI: 7.5, 9.4) ; Russia: 5.2% (95% PI: 4.5, 5.9) ; India: 3.5% (95% PI: 2.9%,4.1%) ; China: 5.9% (95% PI: 4.9, 7.0) ; South Africa: 10.4% (95% PI: 5.5, 15.3).

Conclusions: All BRICS expose long term trend to increase their per capita spending in PPP (purchase power parity) terms. India and Russia are highly likely to maintain stable total health spending GDP% share until 2030. China, as the major driver of global economic growth will be capable of significantly expanding its investment into the health sector across an array of indicators. Brazil is the only large nation whose GDP% share of health expenditure is about to contract substantially during the third decade of the 21st century. The steepest curve of increase in per capita spending until 2030 seems to be attributable to India while Russia should achieve the highest values in absolute terms. Health policy implications of long term trends in health spending indicate the need for Health Technology Assessment dissemination among BRICS ministries of health and national health insurance funds. Matters of cost-effective allocation of limited resources shall remain the core challenge in 2030 as well.

Introduction

Most of the past three centuries of the world's economic history inclusive of the peak of Colonial Era and the dawn of The First Industrial Revolution were characterized by a distinguished pattern in the global economic hierarchy. Initial sparks of four consecutive industrial revolutions¹ originated primarily within European statehoods and their colonial descendant cultures². Typically, industrialized countries of the North invested their knowledge, financial resources and technology to establish manufacturing chains within the nations of Global South³. Produced high-quality goods and services reliant on local skilled, decently educated and relatively affordable local labor force, were usually consumed or exported back to the Rich North⁴.

Yet profound evolutionary changes in the world marketplace affecting the relationship between rich industrialized Northern Hemisphere and underdeveloped Global South began to take place deep into the Cold War Era, since the early 1980s⁵. Many of these changes were unfolding far more rapidly after 1991 well into the accelerated Globalization era⁶. Ultimately, they began to reach maturity during both decades of 21st (XXI) century becoming apparent both to the passionate protagonists of economic globalization⁷ and its fierce opponents among leading economists and geopoliticians⁸. Broadly accepted stratification of nations during almost half a century of Cold War, was the one splitting nations into the three distinctive layers, given the maturity of their overall development at the time. First World referred to the leading OECD nations mostly situated within the Collective or Political West⁹. They were all free-market economies and managed to establish prosperous welfare societies mostly up to 1960s, including Japan¹⁰. Asian Tiger economies, Greece, Finland, Israel and few minor exceptions managed to achieve the same during the 1980s¹¹. The Second World referred to USSR and Warsaw Pact nations whose economies were based on centrally-planned communism¹². Some of these nations, notably the USSR also managed to achieve massive industrialization of the scale based on effective Five-Year Plans¹³. This same long term planning strategy later adopted by the People's Republic of China¹⁴, decades later remained at the core of the Chinese economic miracle¹⁵. Soviet technology level was slightly lagging behind the Western one but in some areas such as cosmic technology¹⁶ it was cutting edge one at the forefront of global innovation¹⁷. The Third World were most of the rest of low-and-middle-income nations scattered across Africa, Latin America and Asia¹⁸.

Exactly among these Third World's LMICs nations, caught in between the Superpowers rivalry, happened the rise of Non-Aligned Movement¹⁹. Although neglected today, once it gave birth to the group of countries later to be designated newly-industrialized economies²⁰. Less than twenty of these countries, whose pace of real Gross Domestic Product (GDP) growth significantly outpaced the one in mature high-income nations, were recognized as the Emerging Markets²¹. This diverse and heterogeneous group of nations inherited an array of historical legacies in health care establishments, provision and financing²². Most important and largest among them, with significant global outreach, became known as the BRICS (Brazil, Russia, India, China, South Africa)²³. The purpose of this study is to closely explore long term trends in fiscal flows intended for healthcare based on the existing GBD and IHME's legacy and historical assessments. Meaning of such research effort is to make highly reliable forecasts on BRICS's health expenditure patterns up to 2030. This particular time horizon was observed to extend future projections as much as possible and preserve the substantial probability of scenarios, given the methodological framework and best data available. Also, 2030 is a convenient cross-section given the fact that UN-endorsed Sustainable Development Goals²⁴ and Agenda 2030 and its commitments related to public health foresees precise tracking of individual nations achievements over time²⁵. This study would also bring significant and novel insights, and also cover gaps in seminal literature as the best available BRICS health expenditure forecasts so far date up to 2025²⁶. More profound underlying research questions

behind this quest, refer to the assessment of their impact on the global demand and supply of healthcare-related goods and services in a Post-Corona world market²⁷.

Health policy implications of current challenge to increase health spending in order to meet growing citizen demand for medical services and pharmaceuticals across BRICS shall be studied in this analysis. Our goal is to better understand the current trends, reveal the hidden patterns of expenditure and financing in these rapidly growing economies. Last but not least, we shall attempt to propose a few effective coping strategies with ever lasting resource constraints and need for cost containment. Such issues remain high with the national policy makers agenda and even much higher in comparison to traditionally rich high-income economies. Even percentage point share of the national budgetary allocation for health care in BRICS remains significantly lower compared to leading Western and Asian OECD sectors. Combined with the growing burden of NCDs (roughly 75% of global NCDs burden in terms of DALYs is attributable to the LMICs nations) and less effective funding mechanisms, the size and scope of such challenge is clearly huge.

Material And Methods

Data sources and data

We extracted health spending data for the BRICs countries spanning 1995 to 2017 from the Institute for Health Metrics and Evaluation's Financing Global Health 2019 database²⁸⁻³¹. These data track government health spending from domestic sources, including general budget support and social health insurance; prepaid private health spending, which includes private insurance and non-governmental organization spending; out-of-pocket health spending, which consists of all expenditures at point-of-service and copayments; and developmental assistance for health. The sum of these sources makes up total health care spending. All health spending and all-sector government spending estimates from this database were reported in inflation-adjusted 2019 purchasing power parity adjusted US\$.

Statistical Analysis

We estimated total health spending, government, prepaid private and out-of-pocket spending per capita and per GDP from 2018 to 2030. We also estimated government, prepaid private and out-of-pocket spending as a shared of the total health spending from 2018 to 2030. The methods used for this future projection are based on time series analysis and the ARIMA (Autoregressive Integrated Moving Average) models³²⁻³⁴. ARIMA models use retrospective health spending data from 1995 to 2017 to forecast future values and trends. These models are the most general class for forecasting a time series which can be made to be stationary by differencing in conjunction with nonlinear transformations such as logging or deflating.

The best ARIMA model for each health spending source and each country was selected using the auto.arima function in R³⁴. This function uses a variation of the Hyndman-Khandakar algorithm³⁵, which combines unit root tests, minimization of the AICc (Akaike's Information Criterion) and MLE (Maximum

Likelihood Estimation) to obtain the best ARIMA model. The analysis was performed with R (version 3.3.1), and the 95% confidence level for prediction intervals was reported.

Results

Figure 1 and Fig. 2 show the total health spending per capita in inflation-adjusted 2019 purchasing power parity adjusted US\$ and total health spending per Gross Domestic Product for BRICS countries. These figures show how per capita health spending is expected to increase between 2017 and 2030. This growth is inflation and purchasing power adjusted. Health spending is projected to be highest in Brazil, China and Russia that already spend the most on health. The health spending in 2030 is projected to be \$1767 (95% PI: 1615, 1977) for Brazil, \$1707 (95% PI: 1079, 2334) for China, \$1933 (95% PI: 1549, 2317) for Russia, \$1379 (95% PI: 755, 2004) for South Africa and \$468 (95% PI: 400.4, 535) for India (Table 1). Health spending per GDP in 2030 is projected to be highest in Brazil and South Africa, following by China and Russia and last India. Health spending per GDP is projected to increase in South Africa and be 10.4% by 2030 (95% PI: 5.5, 15.3) while the health spending per GDP is projected to slightly decrease in Brazil and be 8.4% in 2030 (95% PI: 7.5, 9.4) (Table 1). China is also expected to steadily increase its health spending per GDP in the time period from 2020 to 2030, and it is projected to be 5.9% (95% PI: 4.9, 7.0) in 2030. Russia and India are not expected to experience any noticeable alteration in their health spending per GDP in the time horizon up to 2030, and their health spending per GDP in 2030 is projected to be 5.2% (95% PI: 4.5, 5.9) for Russia and 3.5% (95% PI: 2.9%,4.1%) for India.

The source of health spending per capita and its share on health spending for the years 2020, 2025 and 2030 are displaying in Table 3 and Table 4, respectively. The highest value on government health spending per capita in 2020 is observed for Russia \$871 (95% PI: 716, 1028), following by Brazil \$663 (95% PI: 616, 711), South Africa \$648 (95% PI: 578, 719), China \$609 (95% PI: 553, 664) and last India \$85 (95% PI: 76, 94). In 2030, it is expected that the highest value on government health spending per capita will be observed for China \$949 (95% PI: 527, 1370), following by Russia \$870 (95% PI: 428, 1312), Brazil \$761 (95% PI: 662, 860), South Africa \$665 (95% PI: 311, 1020) and last India \$135 (95% PI: 69, 201) (Table 3). In terms of the share of government health spending, the highest value in 2020 is observed for Russia 58.2% (95% PI: 55.2, 61.2), following by China 57.6% (95% PI: 52.2, 63.0), South Africa 52.9% (95% PI: 48.1, 57.8), Brazil 41.7% (95% PI: 40.0, 43.2) and last the India 27.4% (95% PI: 25.1, 29.7). All countries are not expected to experience any noticeable alteration in their government health spending share up to 2030. In 2030, the share of government health spending for Russia is projected to be 63.2% (95% PI: 57.3, 69.2), following by China 57.0% (95% PI: 25.6, 88.4), South Africa 53.0% (95% PI: 31.8, 74.2), Brazil 41.6% (95% PI: 36.9, 46.2) and last India 30.7 (95% PI: 25.4, 36.0) (Table 4).

In terms of prepaid private spending per capita, the highest value in 2020 is expected to be observed by Brazil \$504 (95% PI: 468, 539), following by South Africa \$444 (95% PI: 396, 492), China \$82 (95% PI: 71, 91), Russia \$40 (95% PI: 18, 63) and last India \$32 (95% PI: 29, 36). In 2030, the prepaid private spending per capita of Brazil is expected to increase and be the highest again \$667 (95% PI: 514, 820), following by South Africa \$445 (95% PI 318, 571), China \$161 (95% PI: 86, 235), India \$53 (95% PI: 34, 72) and last

\$40 (95% PI: 1, 92) (Table 3). In terms of the share of prepaid private health spending, the highest value in 2020 is expected to be observed by South Africa 36.8% (95% PI: 32.0, 41.5), following by Brazil 32.4% (95% PI: 31.3, 33.5), India 10.9% (95% PI: 10.1, 11.5), China 8.0% (95% PI: 6.2, 9.8) and last the Russia 2.6% (95% PI: 0.5, 4.7). In 2030, Brazil and South Africa are expected to have the highest prepaid private spending shares, 39.7% (95% PI: 33.3, 46.1) for Brazil and 36.7% (95% PI: 18.9, 54.5) for South Africa. China and India are expected to have much smaller prepaid private spending shares, 14.0% (95% PI: 10.4, 17.7) for India and 13.0% (95% PI: 1.0, 27.1) for China while Russia is expected to have a minimal share of prepaid private spending 2.6% (95% PI: 0.0, 11.1) (Table 4).

The highest value of out-of-pocket spending per capita in 2020 is expected to be observed by Russia \$670 (95% PI: 625, 715), following by Brazil \$406 (95% PI: 394, 418), China \$370 (95% PI: 348, 393), India \$190 (95% PI: 179, 200) and last the South Africa \$96 (95% PI: 85, 107). In 2030, the out-of-pocket spending per capita of Russia is expected to increase and be the highest again \$848 (95% PI: 733, 763), following by China \$573 (95% PI: 425, 719), Brazil \$406 (95% PI: 393, 418), India \$268 (95% PI: 198, 339) and last the South Africa \$106 (95% PI: 19, 193) (Table 3). In terms of the share of out-of-pocket health spending, the highest value in 2020 is expected to be observed by India 60.9% (95% PI: 58.2, 63.7), following by Russia 42.3% (95% PI: 39.5, 45.1), China 34.3% (95% PI: 28.5, 40.1), Brazil 25.9% (95% PI: 23.7, 27.0) and last the South Africa 7.8% (95% PI: 6.4, 9.2). In 2030, India and Russia are expected to have the highest out-of-pocket spending shares, 55.7% (95% PI: 49.3, 62.0) for India and 49.0% (95% PI: 41.6, 56.4) for Russia, following by China 30.4% (95% PI: 3.0, 79.9), Brazil 20.6% (95% PI: 17.7, 23.6) and last the South Africa 7.8% (95% PI: 1.0, 18.3) (Table 4).

Strengths And Limitations

We have used ARIMA models to estimate total health spending, government, prepaid private and out-of-pocket spending per capita and GDP from 2018 to 2030 as well as the share of health spending by source. ARIMA models are the most general class for forecasting a time series, and we have used the best fitted ARIMA model for the data of each country and health spending source using an automatic procedure^{34,35}. These models are a general class of time series models and provide useful forecasts of future time series; however, they have some limitations in the case of forecasting health spending. First, there are some cases that we have observed high uncertainty in forecasting values, as the large prediction interval indicates this, and this may be attributed to the few available retrospective values for each country and the uncertainty in specifying the pattern and trend of the past values. The available data for each country and each source of health expenditure were from the period 1995 to 2017. For some cases, there was not an obvious pattern in the data to help predict future values with small uncertainty (i.e. small prediction intervals of the future values).

Moreover, the underlying retrospective data include some measurement error and imputation³⁰. Precise data that are comparable and complete across a long period and for all countries are not available. Finally, any estimation of future health spending is vulnerable to national and international policy decision making, the supply and demand of the health system, economic development, natural disaster,

pandemic, war and other environmental issues potentially related to climate change. Because the forecasting of health spending, in general, is far from exact, we quantify uncertainty with prediction intervals that increased the further we projected into the future.

Discussion

Five observed Emerging economies had exhibited different distinctive underlying patterns leading to the observed historical health spending³⁶. Each of these countries had experienced their unique turning point in recent history. We are able to track down historical business cycles³⁷ of real GDP expansions and contractions of most countries worldwide for many decades. Yet with health expenditure data accessibility, it is much different. Accounting practices are diverse and nation-specific, which leads to serious issues compromising comparability of older data³⁸. Thus, Japan counts down social support and long-term care for the elderly citizens outside official health spending statistics (almost 10% of entire consumption) while Canada does exactly the opposite. Even within OECD nations, this leads to substantial distortions of comparability which make comparative research difficult and less reliable. For example, the share of long-term health spending ranges from 24.9% in Portugal up to 92.5% in Spain among countries with highly similar populations and health system traditions³⁹. Also, most of the former socialist countries of Eastern Europe and USSR republics lack distinction of observed subsegments of health spending for lengthy periods preceding middle of the 1990s⁴⁰. The first broadly accepted attempt to track fiscal flows within the national health systems with great accuracy and satisfactory transnational comparability was the WHO introduction of National Health Accounts (NHA)⁴¹. This system of tracking down medical care attributable spending dates back only to 1995. It was officially endorsed and ratified by almost 190 UN country members. Furthermore, it was even more fine-tuned and stratified across subsections of expenditures, and this updated version was embraced by the Global Health Expenditure Database (GHED) whose official release so far covers the period from 2000–2018⁴². Thus, we can discuss and draw reliable conclusions on historical trends in health spending preceding our 2020–2030 forecast mostly for the period 1995–2020 with the satisfactory extent of transitional comparability among inherently different economic and health systems.

Brazil had experienced several business cycles since the early 1990s driving its economic growth upside and down with several shifts. It has entered the BRICS 1995 being the wealthiest country in the group by far exceeding others in terms of per capita health expenditures both in nominal and purchasing power parity terms (PPP). Over time, it has changed a lot, and Russia exceeded it during the early 2000s. Unlike most other members of the group, it is characterized by more robust private insurance sector among its upper-income layers of society⁴³.

Russia's legal predecessor in international law, the USSR, was second-ranked global economy behind the US, for the most of 1950s – 1970s. After USSR dissolution in 1991, Russia was driven into one of the most severe world's economic recessions of the XX century⁴⁴. It was dragging down the majority of formerly mutually dependent centrally planned Eastern European and Central Asian economies reaching

its bottom in 1998. Therefore, its public and governmental health spending in the middle of 1990s was exceptionally low while out of pocket spending grew tremendously⁴⁵. After painful consolidation of the free-market capitalism in the country, the situation has rapidly improved in the early 2000s. Share of governmental responsibility for health spending and support to unemployed, children and the elderly were becoming much more generous decreasing vulnerability of rural and lower-income citizens to the catastrophic health spending⁴⁶. Russian economy's long-term dynamics has exposed large margin of resistance to the volatilities⁴⁷ in the global market, including Corona-Induced recession that has just begun. Thus, broadly accepted academic consensus and assessments of most domestic and foreign analysts is that the country will be able to afford universal health coverage (UHC) milestones for most of its population⁴⁸.

India's health sector is quite a unique representative of the group on several distinctive features. India has had a free market economy before 1991. It is the only country among the four large BRIC nations whose demographic dividend has not yet been consumed. India is in a far younger stage of its population ageing suffering from the much lower burden of noncommunicable diseases (NCDs)⁴⁹. Given its fertility levels, it is going to experience an expansion of its labour force by up to 150 millions of young and well educated people⁵⁰. Its health system has long been marked by substantial heterogeneity among its federal states and lack of strong federal control⁵¹. This fiscal control is becoming far more stringent in recent years⁵². The respectively younger population is accompanied by a lower share of elderly citizens and better old-age dependency ratios. Alongside India's strong real economic growth rates and traditional family caregiving⁵³, these facts shape India's demand for medical care and the structure of spending. However, the affordability issues of access to hospital care and essential medicines remain high at stake for its vast rural populations. To make the landscape more complex, India's generic drug manufacturing industry is a globally competitive one. Ranbaxy and other giant Indian companies achieve and maintain profound market penetration of their products in almost 200 countries worldwide, including the most regulated high-income Asian markets with exceptionally high-quality thresholds⁵⁴.

Chinese most known historical turning point since the establishment of the People's Republic back in 1949 was the introduction of profound social reforms under Deng Xiaoping around 1978⁵⁵. After these reforms matured, we can track down strong upward Chinese economic growth almost continuously since 1989⁵⁶. The short-lived slowdown in real GDP growth took place during Corona-induced lockdown and massive quarantines of large cities and intraregional travel. Yet this has rapidly changed after the current pandemic was effectively managed in this huge nation⁵⁷. China continues to be the major driver of global and Asian economic growth culminating with the recent establishment of the world's largest free trade zone named The Regional Comprehensive Economic Partnership, or RCEP⁵⁸. Several factors drive significant setbacks for the huge Chinese health system. The decades-old one-child policies have distorted the national demographic pyramid creating conditions for accelerated population aging⁵⁹.

As we approach 2050, China will exceed Japan, becoming the fastest aging large nation worldwide⁶⁰. Hospital sector in many rich coastal industrial provinces essentially funds itself through a large margin

between wholesale and retail prices of medicines through massive public procurement procedures⁶¹. The domestic pharmaceutical manufacturing sector is powerfully developed yet mostly focused on domestic traditional Chinese medicine products. Its ability to patent and sell brand-name innovative pharmaceuticals beyond domestic and regional markets remains somewhat limited⁶². Yet the scale of the Chinese pharmaceutical market is enormous. Recently it has surpassed the Japanese one, which used to be second-ranked per value-based turnover globally for decades. All other sectors of Chinese health care are following its continued rapid urbanization and industrialization. Demand and domestic manufacturing of imaging diagnostics and other medical devices is growing at a double-digit pace⁶³. Composite annual growth rates (CAGR) of Chinese domestic market in terms of uptake of foreign-patented brand-name pharmaceuticals and vaccines continue to be far higher in comparison to those of any mature high-income OECD nations⁶⁴. With most of 4.0 Industry E-Health appliances, artificial intelligence developments and its associated software algorithms and advanced 5G mobile network – it is the opposite scenario⁶⁵. In this arena, Chinese huge global companies even hold the cutting edge of innovation⁶⁶ and even the majority of patents in comparison to other significant players⁶⁷. Their domestic technology evolution is virtually driving the pace of innovation worldwide in some of these areas⁶⁸. Given the large-scale applications in intensive medical care, and provision of services to the elderly, vulnerable and citizens living in remote areas, these are likely to be drivers of the enormously increased domestic demand for healthcare goods and services. Current dynamics, in light of growing trade and intellectual property disputes between China and the US, nicknamed “Cold War 2.0”⁶⁹, are likely to shape revenue streams on exports of such technologies worldwide⁷⁰. The overall impression supported by our forecasts is one of the growing abilities of this country to increase its long-term investment in health care. Such a trend appears to be sustainable in both national and per capita terms in the long run regardless of several possible scenarios of the struggle for achieving multipolarity and foster Belt and Road policies⁷¹.

Following the BRICS acronym, South Africa was the last to official joint BRICS in 2008 as a multilateral agreement on trade and cooperation⁷². Since than BRICS Heads of State, Ministers of Health, Chambers of Commerce and Business sectors continue to cooperate across increasingly broad areas of the economy. African member is not comparable to others in terms of population or economy size, but it has crucial complementarities in terms of resource exports. Also, it brings an important perspective as one of the engines of Pan-African development during the 21st (XXI) century. South African Republic famous historical turning point was Nelson Mandela’s victory to overthrow Apartheid regime in the country⁷³. This has paved the way for many future reforms. Within our estimates, South Africa has the largest margins of uncertainty in the future given its historical peculiarities and specific of demography, morbidity and mortality patterns in the African nations⁷⁴. Obviously, among the BRICS it hosts by far the youngest population in the earliest stage of population aging. Its health spending shall be driven by the entirely different spectrum of needs ranging from combat with infectious disease up to extensive development of health facilities network and increasing access to medical care for the broad layers of the society.

Health Policy Implications

Among the five observed Emerging nations, few distinctively different pathways of health spending are visible. India and Russia are highly likely to remain stable in terms of total health spending GDP% share until 2030. In reality, this trend has been present in both nations with minor fluctuation on a decades long-time horizon. These forecasted values expose a significant degree of probability under an array of geopolitical scenarios⁷⁵. Unlike these, China, as the major driver of global economic growth associated with the broader ASEAN region will both be capable of significantly expanding its investment into the health sector across an array of indicators⁷⁶. Likelihood of its success to achieve targeted SDG goals in terms of universal coverage are probably the highest among its counterparts in the group. All five BRICS expose long term trend to increase its per capita spending in PPP terms. Yet Brazil is probably the greatest surprise⁷⁷. It appears it is the only large nation whose share of GDP% health expenditure is about to contract substantially during the third decade of the 21st century. The steepest curve of increase in per capita spending until 2030 seems to be attributable to India while Russia should achieve the highest values in absolute terms. An overall impression among the BRICS is that most of them are about to evolve out of their historical legacies in health care in a rather predictable manner. We believe these future projections on health expenditures by some of the globally most influential healthcare markets, should contribute to informed policy makers decisions on resource allocations. It should also provide a hint for further health economics research on BRICS health sectors.

Although their historical legacies in health system establishment are very diverse BRICS nations share several common challenges. First one is rapidly growing burden of NCDs, whose approximately 75% remains with the world's LMICs nations. This workload and its associated costs of prevention, diagnostics and care comes along yet unliquidated pool of infectious communicable diseases. The second core societal transformation is the accelerated population aging bringing the shrinking base of tax payes who mostly contribute to the health insurance funds. The third challenge is rapidly increasing penetration of cutting edge medical technologies such as monoclonal antibodies, with its budget impact far exceeding the line of public affordability. For these major bottleneck inefficiencies far more effective policy strategies need to be developed. The goal of such programmes would be to narrow the deepening gap between the rich and poor citizens and secure equity in health care access to the highest extent possible. Probably the core political debate within BRICS ministries of health and insurance funds is centered around far more cost-effective resource allocation. To some extent capacity building of national health technology assessment policies might be the response. Yet such programmes have shown limited applicability in the traditional health systems far outside the Western legacy. There are inner governing mechanisms and strategies to cope with these challenges, which might not appear to be so effective but still resolve an array or issues ranging from drug shortages to the waiting times for expensive transplant surgery or home-based medical care for the elderly. These decision making pathways also largely rely on informal or family care giving and social solidarity which brings to the market workforce and capacities otherwise being unaffordable to the public sector. Within the most of BRICS nations urban, coastal and industrial population of megacities prosperity and increased living standards have brought upon a

significant share of prosperity. This is also reflected in substantially increased longevity in China, Russia and elsewhere. Smooth demographic transition ahead of India shall remain far milder given the fact its nation is still in a rather juvenile stage of population aging. It still anticipates to harvest its demographic dividend bringing up to 150 million of young skilled labor force to the market as we approach the middle of XXI century. Yet all of these nations India alike remain with huge rural, countryside populations lacking access to technologically advanced hospital care and expensive branded pharmaceuticals. Most of BRICS governments have largely adopted with generic replacement policies to tackle „the drug bill“ which, unlike 15%-25% share in the Western OECD, may reach even up to 50% of entire health spending in vast regions of China. Currently most of BRICS governments have adopted an array of more or less ambitious reform programmes designed to improve cost-effective decision making pathway particularly for the approval of innovative medicines. This same process took up to four decades in prominent Asian economies such as Japan or South Korea. Whether the pace of legislative framework reforms shall be sufficient to follow the BRICS' development agenda and Sustainable Millenium Development Goals of Agenda 2030 yet remains to be seen in years to come.

Declarations

- Ethics approval and consent to participate

IRB consideration and approval according to Helsinki Declaration are not applicable to the national scale research involving aggregate health spending data. There have been no underlying clinical trials or citizen data privacy issues tackled by this research.

- Consent for publication:

Conditional to positive outcome of peer review and Editorial acceptance for publishing authors convey their authorship right to HRPS, BMC and give full consent for publication.

- Availability of data and materials

Not applicable.

- Competing interests:

None involved.

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- Authors' contributions:

MJ has designed the research questions and study proposal, DL has conducted most of the data mining, purification and forecasting analysis, MJ has prepared early manuscript draft while RW, VC and AC have all revised multiple manuscript versions and contributed to its final appearance for important intellectual content. Thus all authors fulfil the ICJME conditions for full authorship.

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Tables

Tables 1-4 are not available with this version.

Figures

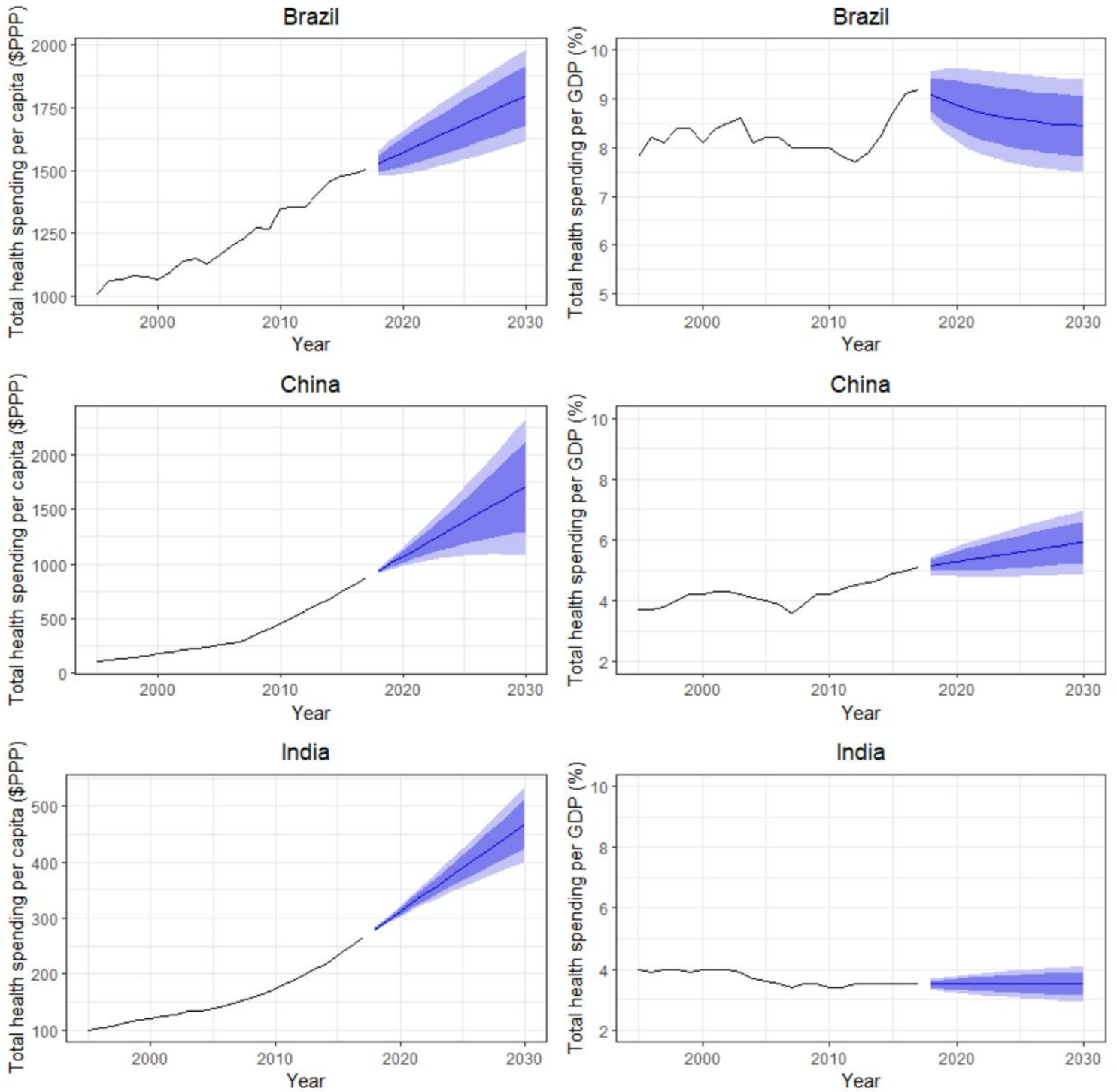


Figure 1

Total health spending per capita in inflation-adjusted 2019 purchasing power parity adjusted US\$ and total health spending per Gross Domestic Product for Brazil, China and India

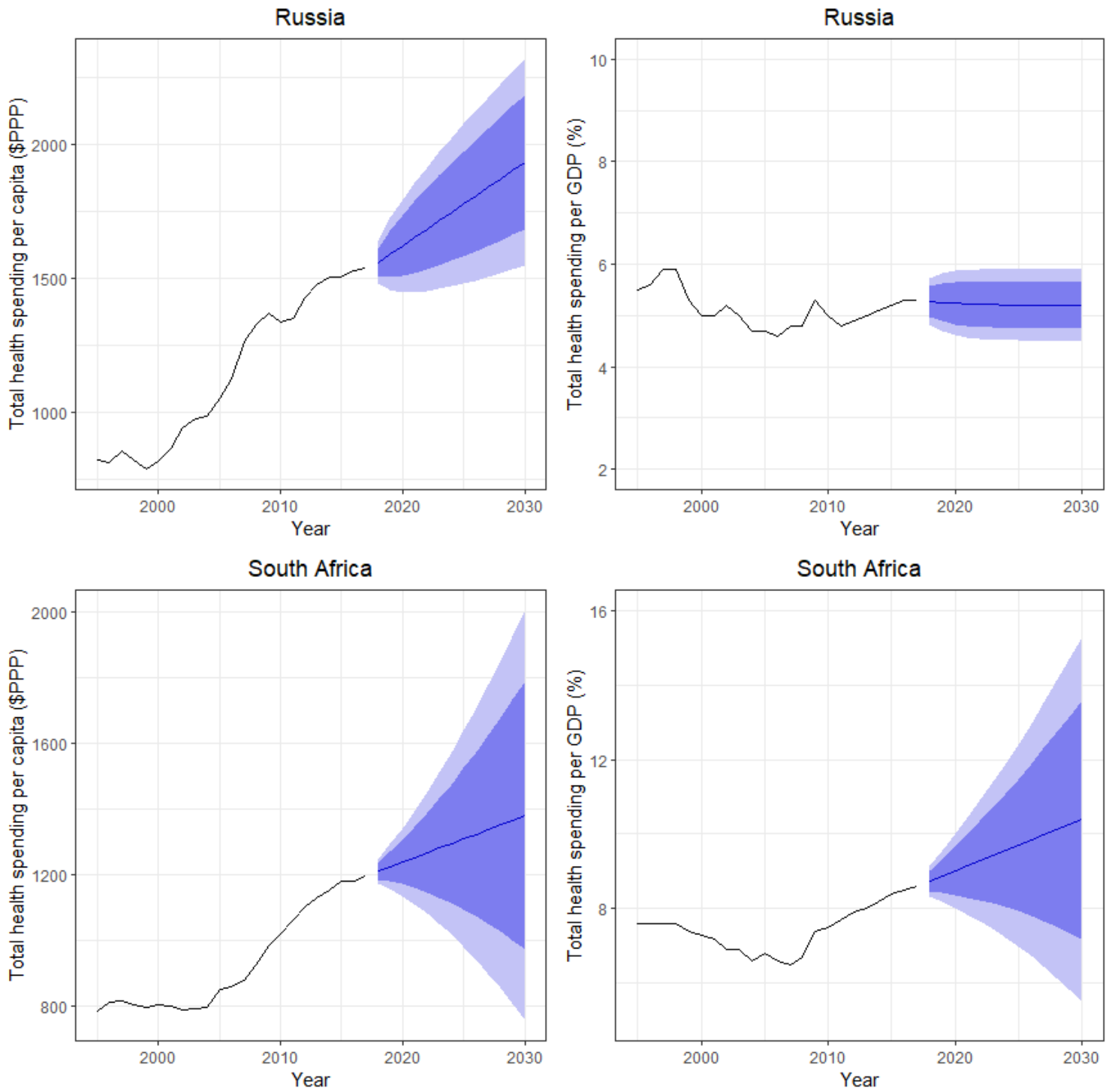


Figure 2

Total health spending per capita in inflation adjusted 2019 purchasing power parity adjusted US\$ and total health spending per Gross Domestic Product for Russia and South Africa