## Research Article (Special Issue) | Araştırma Makalesi (Özel Sayı)

# An examination of the BRICS-T countries with regard to the Sustainable Development Goals of health and quality of life and a future forecast with NGBM(1,1)

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#### Abstract

This study aims to examine the BRICS-T countries, consisting of Brazil (B), Russia (R), India (I), China (C), South Africa (S) and Türkiye (T), in terms of health and quality of life goals (SDG 3), which are sub-goals of the Sustainable Development Goals (SDGs), and to make future estimates for these countries by 2030. In this study, the health indicators of the BRICS-T countries were analysed. The base year of the data is 2005, and some indicators end in 2019, 2020 or 2021. Using this data, estimates were made up to 2030. The analyses were carried out using the NGBM(1,1) method. It was found that the BRICS-T countries had varying degrees of success in achieving their health targets. According to the estimates for the year 2030, all countries will be successful in reducing the maternal mortality ratio. However, there will be differences between countries in achieving other health targets. Although each country is likely to make significant progress in some areas, they will probably struggle to meet some specific health targets. Therefore, it is concluded that the BRICS-T countries need to review their current health policies, reduce regional inequalities, improve access to health services, strengthen inter-sectoral cooperation, implement more comprehensive social reforms and cooperate internationally to achieve the SDG 3 targets.

Keywords: Sustainable Development Goals, Health Indicators, Future Forecast, BRICS-T JEL Codes: 110, 118

# BRICS-T ülkelerinin sürdürülebilir kalkınma hedefleri kapsamında sağlık ve kaliteli yaşam açısından incelenmesi ve NGBM(1,1) ile gelecek tahmini

#### Öz

Bu çalışma, Brezilya (B), Rusya (R), Hindistan (I), Çin (C), Güney Afrika (S) ve Türkiye (T)'den oluşan BRICS-T ülkelerini Sürdürülebilir Kalkınma Amaçları'nın (SKA) alt hedeflerinden biri olan sağlık ve kaliteli yaşam hedefleri (SKA 3) açısından incelemeyi ve bu ülkeler için 2030 yılına kadar gelecek tahminleri yapmayı amaçlamaktadır. Bu çalışmada, BRICS-T ülkelerinin sağlık göstergeleri analiz edilmiştir. Verilerin başlangıç yılı 2005 olup, bazı göstergeler 2019, 2020 veya 2021 yıllarında sona ermektedir. Bu veriler kullanılarak 2030 yılına kadar tahminler yapılmıştır. Analizler NGBM(1,1) yöntemi kullanılarak gerçekleştirilmiştir. BRICS-T ülkelerinin sağlık hedeflerine ulaşmada farklı düzeylerde başarılar elde ettiği bulunmuştur. 2030 yılı için yapılan tahminlere göre, tüm ülkelerin anne ölüm oranlarını azaltmada başarılı olacağı öngörülmektedir. Ancak diğer sağlık hedeflerine ulaşmada ülkeler arasında farklılıklar olacaktır. Her ne kadar her bir ülkenin bazı alanlarda önemli ilerlemeler kaydetmesi beklense de bazı spesifik sağlık hedeflerine ulaşmada zorluklarla karşılaşacakları öngörülmektedir. Bu nedenle, BRICS-T ülkelerinin SKA 3 hedeflerine ulaşabilmeleri için mevcut sağlık politikalarını gözden geçirmeleri, bölgesel eşitsizlikleri azaltmaları, sağlık hizmetlerine erişimi iyileştirmeleri, sektörler arası iş birliğini güçlendirmeleri ve daha kapsamlı sosyal reformlar gerçekleştirmeleri ile uluslararası işbirliği yapmaları gerektiği sonucuna varılmıştır.

Anahtar Kelimeler: Sürdürülebilir Kalkınma Hedefleri, Sağlık Göstergeleri, Gelecek Tahmini, BRICS-T JEL Kodları: 110, 118

#### Introduction

There are global threats, such as the climate crisis, economic crises, pandemics, and wars, that affect every aspect of life and cannot be resolved by a single actor (Schomaker, 2015). Globalization has shown that these threats can spread across the world (e.g. the worldwide spread of HIV/AIDS and COVID-19 due to the mass mobilization of people). Especially in underdeveloped and developing countries, health issues such as absolute poverty, hunger, maternal and infant mortality, and sanitation problems (Kıdak and Demir, 2018) can be seen as problems that affect the whole world due to the external nature of health services. Another challenge is the lack of a definitive answer to the question of who should address these threats, how they should be addressed,

How to cite this article / Bu makaleye atıf vermek için:

Şahin, T. (2025). An examination of the BRICS-T countries with regard to the Sustainable Development Goals of health and quality of life and a future forecast with NGBM(1,1). KOCATEPEİİBFD, 27(Özel Sayı), 140-156. <u>https://doi.org/10.33707/akuiibfd.1565241</u>

and what tools should be used (Schomaker, 2015).

Throughout history, the planet, people, prosperity, and the complex and unique problems we face today have prompted innovative actions to transform and improve society towards a sustainable future from different perspectives and with different concerns (lonescu et al., 2020). Historically, the concept of sustainable development first emerged in the context of environmental concerns in the World Charter for Nature. These concerns were taken up in Our Common Future (the Brundtland Report) and further elaborated in Chapter 40 of Agenda 21 at the 1992 Earth Summit (Hák et al., 2016). In 2000, representatives of 189 nations, including heads of state and government, came together under the leadership of the United Nations (UN) to adopt the Millennium Development Goals, a historic summit aimed at ending extreme poverty and hunger in the 21st century (T.C. Prime Ministry State Planning Organization, 2010). The Sustainable Development Goals, which serve as a continuation of the Millennium Development Goals but are broader in scope, and the Paris Climate Agreement, call for profound changes that require complementary action from governments, civil society organizations, academia, and the business community in every country. With the adoption of the 2030 Agenda through the SDGs and the Paris Agreement, UN member states have created a framework for national action and global cooperation on sustainable development. The 2030 Agenda for Sustainable Development is more inclusive than the Millennium Development Goals, as it shifts the focus from low- and middle-income countries to high-income countries. Thus, the approach has shifted from viewing these global problems as a burden of sacrifice to a shared global responsibility for sustainable development (Eckermann, 2018).

The SDGs focus on time-bound goals for the planet, people, prosperity, peace, and partnership (Sachs et al., 2019; Weiland et al., 2021). They aim to be universal by embodying a shared vision of global progress towards a safe, fair, and sustainable space in which all people on the planet can live. The SDGs espouse two fundamental moral principles: "No one and no country should be left behind," and "Everyone and every country has a shared responsibility to play their role in realizing the global vision" (Osborn et al., 2015). These principles have led to the establishment of the following 17 core goals: No poverty, zero hunger, good health, quality education, gender equality, clean water and sanitation, clean energy, good jobs and economic growth, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption, protect the planet, life below water, life on land, peace and justice, and partnerships for the goals (UN, 2024).

The SDGs provide a good opportunity to redefine and reshape the process of sustainable development in society for two main reasons. First, they encompass areas that can be analyzed, explored, redefined, renewed, and mainstreamed for all who are directly and indirectly involved. Second, the commitment of the UN and its member states to achieve the SDGs by 2030 is important because it emphasizes the urgent need to act across economic, political and social sectors and to implement them quickly (lonescu et al., 2020). However, despite the many plans that have been made to achieve the SDGs, different countries may face different challenges due to their current level of development and other national conditions. Therefore, when it comes to implementing the SDGs, the current status of countries their specific responsibilities and their different capacities and resources mean that they need to focus on and strive towards different goals and targets to varying degrees. The balance between the social, economic, and political efforts required to achieve these different goals is also likely to vary from country to country (Osborn et al., 2015). It can be considered useful to predict how the mentioned differences and uniqueness will affect the achievement of the 2030 targets, assuming that it will be beneficial for countries to implement different policies and strategies that are suitable for their own situation in the national context in a way that "leaves no one behind". To contribute to filling this gap this study aims to examine the BRICS-T countries with regard to the health and quality of life targets, which are sub-targets of the SDGs, and make future projections for these countries until 2030.

#### **1. Literature Review**

Health and Quality of Life as an SDG Goal (SDG 3: Ensure healthy lives and promote well-being for all at all ages) has been at the center of international development for more than 20 years, with significant efforts being made to reduce morbidity and mortality in general or by focusing on specific population subgroups (such as "the poor," "women and children") (Buse and Hawkes, 2015). This is because if, in the event of a pandemic, only one country has weak disease control, fails to implement quarantine measures, or does not distribute medicines adequately, all countries will pay the price for this failure. Even an increase in measures in other countries will not contribute significantly to the overall benefit (Schomaker, 2015).

The sub-goals of SDG 3, as defined by the United Nations (UN, 2024), are as follows:

3.1: By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births.

3.2: By 2030, end preventable deaths of newborns and children under 5 years of age, aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births in all countries.

3.3: By 2030, end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases, and combat hepatitis, water-borne

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diseases, and other communicable diseases.

3.4: By 2030, reduce by one-third premature mortality from non-communicable diseases through prevention and treatment, and promote mental health and well-being.

3.5: Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.

3.6: By 2030, halve the number of global deaths and injuries from road traffic accidents.

3.7: By 2030, ensure universal access to sexual and reproductive healthcare services, including family planning, information, and education, and the integration of reproductive health into national strategies and programs.

3.8: Achieve universal health coverage, including financial risk protection, access to quality essential healthcare services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all.

3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination.

3.a: Strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries, as appropriate.

3.b: Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to fully utilize the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) regarding flexibilities to protect public health.

3.c: Substantially increase health financing and the recruitment, development, training, and retention of the health workforce in developing countries, especially in least developed countries and small island developing states.

3.d: Strengthen the capacity of all countries, particularly developing countries, for early warning, risk reduction, and management of national and global health risks.

In examining these goals, it is clear that they address all major health priorities, including maternal, newborn, child and adolescent health, sexual and reproductive health, communicable, non-communicable and environmental diseases, universal health coverage and access to safe, effective, quality and affordable medicines and vaccines for all. In addition, the goals call for increased research and development, diversified and expanded health financing, an improved health workforce, and strengthened capacity in all countries to reduce and manage health risks. Universal health coverage is seen as the driving force for achieving all other goals (UN, 2017).

In addition, SDG 3 is the result of other goals that empower people to advance in various social, economic and productive areas. SDG 3 is a diverse and universal resource from which countries' sustainable development policies can draw (Guégan et al., 2018), and it is one of the multidimensional goals linked to other SDGs. For example, it is linked to reducing inequalities through quality education, gender equality, decent work and economic growth, peace, justice, and strong institutions (Filho et al., 2019). In this context, the WHO's "Global Action Plan for SDG 3 (SDG 3 GAP)" was presented at the UN General Assembly in September 2019. This plan consists of a series of commitments made by 13 multilateral organizations that play a crucial role in the areas of health, development, and humanitarian aid. The aim is to strengthen cooperation between these organizations in order to provide better coordinated support to countries based on their specific needs and thus accelerate progress towards the health-related SDG targets (Pinarbaşi and Piyal, 2022).

While institutions and organizations continue their work towards the realization of SDG 3 at international and national levels, the scientific community continues to conduct research on the situation analysis of countries regarding the SDGs and the possibilities of achieving the targets etc. Various scientific studies are currently being conducted on different countries using different methods to assess the SDG 3 targets. Fullman et al. (2017) pointed out geographical and socio-demographic inequalities in a key component of the SDGs in the area of health and predict that these inequalities will increase in the future if current trends do not change significantly. Based on past trends, only 21% of the SDG indicators for health are expected to be achieved with defined targets by 2030. In an EU-wide analysis, Ionescu et al. (2020) show that, on average, more than half of the SDG targets set for 2030 are unlikely to be achieved if current levels of participation persist. It was emphasized that the percentage success of the adopted targets may vary by analyzing the individual situation of each Member State, but it is expected that no EU country will fully achieve the SDG 3 targets. Machado et al. (2020) found that health inequalities between Brazilian states and regions could prevent Brazil from achieving the SDG targets for 2030. For Italy, Strologo et al. (2021) used the FORECAST.ETS function and the dynamic index method to predict that the country is likely to reach the EU average on SDG 3 indicators by 2030. Stenberg et al. (2017) developed

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projections for low- and middle-income countries and estimated that an additional USD 274 billion per year would need to be spent on health by 2030 to make progress towards the SDG 3 targets (progress scenario), while in the ambitious scenario USD 371 billion would be needed to meet the health system targets, corresponding to an additional USD 41 (range 15–102) and USD 58 (range 22–167) per capita in recent years. Firoiu et al. (2022) processed and interpreted the degree of achievement of the SDGs in Portugal using time series estimates (ARIMA model). They predicted that Portugal would approach the European average in five out of eleven indicators by 2030, which corresponds to an achievement rate of 45. Barthwal and Barthwal (2019) and Sarma (2023), who conducted SDG 3 assessments specifically for India, found that India compares very poorly to other developed countries and performs very poorly on many metrics used to measure the health goal. He argues that various parameters need to be changed in this regard.

Many studies and assessments, such as those mentioned above, have shown that even before the COVID-19 pandemic, no country was on track to achieve SDG 3 by 2030. Some countries struggled to achieve these goals because they lacked the necessary resources and strategies. However, the COVID-19 pandemic has made this situation even more complex. The ongoing economic, social, and environmental crises associated with the pandemic have significantly slowed and in many cases reversed, countries' progress towards achieving the SDGs. The pandemic has pushed health systems to their limits, caused economic recessions, and exacerbated social inequalities, all of which have negatively impacted global development efforts (WHO, 2024). Therefore, it is of great importance to carefully analyze countries' past performance in achieving the SDGs and make future projections based on this data. Forecasting the SDGs values of different regions not only enables international comparisons, but also contributes to the important task of "identifying priority areas for action" (Biggeri et al., 2019). In addition, it can help to identify policy measures to achieve the targets (Huan et al., 2021). By analyzing countries' health indicators from past to present, potential problems can be identified early, and preventive policies can be developed. In this way, proactive solutions can be provided to address potential challenges by introducing preventive mechanisms instead of corrective actions. The ambitious targets of the SDGs require significant action for SDG 3 (healthy lives and well-being). Every country is treated equally and is expected to achieve the SDG targets by 2030. But is this realistic? With this in mind, this study aims to examine the BRICS-T countries with regard to the health and quality of life targets, which are sub-targets of the SDGs, and make future projections for these countries until 2030. This gives rise to the following research questions for this paper:

What is the level of target achievement in relation to SDG 3 between the BRICS-T countries?

Will the BRICS-T countries achieve the SDG 3 targets in 2030?

What can be deduced from the conclusions for the BRICS-T countries and what recommendations can be given to decisionmakers?

### 2. Method

In this section, you will find information on the health indicators and the countries used in the analysis, followed by an explanation of the analysis method.

#### 2.1. Selection of Countries and Health Indicators

The BRICS-T countries were selected to examine the goals for health and quality of life in the context of the SDGs. The term BRIC was first used in 2001 by Goldman Sachs' chief economist Jim O'Neill, and later became BRICS with the inclusion of South Africa. As Türkiye also participated in the BRICS summit (T.C. Ministry of Foreign Affairs 2018), Türkiye was included in this study, and the grouping was assessed as BRICS-T. These countries are described as a strong association of the world's leading emerging economies and this mechanism aims to promote peace, security, development, and cooperation. It also aims to make a significant contribution to the development of humanity and create a more equitable world (Republic of South Africa 2024; The Economic Times 2024). These goals are closely related to the SDGs, and since the population of the BRICS-T countries accounts for about 38% of the world's population, it is assumed that examining BRICS-T countries in the context of health and quality of life can contribute to understanding the global progress of SDG 3.

There are 13 targets and 28 indicators related to health and quality of life. The relevant indicator data for the BRICS-T countries were researched from databases such as the World Bank (WB), the World Health Organization (WHO), and the OECD. However, for some countries, no systematic annual data was available for some indicators. Therefore, the indicators for which there was insufficient data were excluded from the assessment. Countries without relevant data were also excluded from the analysis. Ultimately, the final assessment included 13 indicators, with the relevant countries, time periods and data sources listed in Table 1.

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#### Table 1. Indicators, Countries, Time Periods, and Data Sources Included in the Analysis

Indicator Code	Indicator	Countries	Years	Data Source
3.1.1	Maternal mortality ratio	BRICST	2005-2020	WB
3.2.1	Under-5 mortality rate	BRICST	2005-2021	WB
3.2.2	Neonatal mortality rate	BRICST	2005-2021	WB
3.3.1	Number of new HIV infections in both sexes	BIS	2005-2021	WB
3.3.2	Tuberculosis incidence	BRICST	2005-2021	WB
3.4.1	Mortality rate attributed to cardiovascular disease, cancer, diabetes, or chronic respiratory diseases (CCDR)	BRICST	2005-2019	WB
3.4.2	Suicide mortality rate	BRICST	2005-2019	WB
3.6.1	Mortality rate from road traffic injuries	BRICST	2005-2019	WB
3.7.2	Adolescent birth rate	BRICST	2005-2021	WB
3.8.1	Coverage of essential health services	BRICST	2005-2021	ourworldindata
3.8.2	Household health expenditure	BRICST	2005-2020	WB
3.9.1	Mortality rate attributed to household and ambient air pollution	BRICST	2005-2019	OECD
3.9.3	Mortality rate attributed to unintentional poisonings	BRICST	2005-2019	WB

#### 2.2. Nonlinear Grey Bernoulli Model (NGBM(1,1)) Method

The NGBM(1,1) method was used for forecasting the future values of the health indicators for the BRICS-T countries. This method, known as the Nonlinear Grey Bernoulli Model, is a time series prediction model that is often used when historical data is limited or incomplete. The NGBM(1,1) introduced by Chen (2008) is one of the best known models within the grey forecasting methods. Thanks to its ability to adjust parameters, it can consider different time series, making it a highly adaptable forecasting tool (Liu et al. 2022). These characteristics make it suitable for predicting future health outcomes based on past trends. The NGBM(1,1) model starts by creating an initial data set  $X^{(0)}$ , which consists of non-negative raw data:

$$X^{(0)} = \left\{ x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(n), n \ge 4 \right\}$$
(1)

In the second step, a first-order accumulation operator  $X^{(1)}$  is generated:

$$X^{(1)} = \left\{ x^{(1)}(1), x^{(1)}(2), x^{(1)}(3), \dots, x^{(1)}(n) \right\}$$
(2)

Here,  $X^{(1)}(k)$  is calculated as:

$$X^{(1)}(k) = \sum_{i=1}^{k} x^{(0)}(i) \quad k = 1, 2, ..., n$$
(3)

In the third step, the whitening and difference equations are established:

$$\frac{dx^{(1)}(k)}{dt} + ax^{(1)}(k) = b\left(x^{(1)}(k)\right)^{\mathbb{Y}}$$

$$x^{(0)}(k) + az^{(1)}(k) = b\left(z^{(1)}(k)\right)^{\mathbb{Y}}$$
(5)

where *a* represents the development coefficient, *b* the progression coefficient, and *y* the power coefficient. The first-order mean operator,  $z^{(1)}(k)$  is calculated as follows:

$$z^{(1)}(k) = \lambda * x^{(1)}(k) + (1 - \lambda) * x^{(1)}(k - 1), \quad k = 2, 3, 4, \dots, n$$
(6)

where  $\lambda$  ranges between 0 and 1, and in the traditional grey prediction model,  $\lambda$  is typically taken as 0.5 (Ma et al. 2013).

In subsequent steps, the coefficients *a* and *b* in Equation 5 are calculated using the least squares method:

The *B* and *Y* matrices are shown below.

$$B = \begin{bmatrix} -z^{(1)}(2) & (z^{(1)}(2))^{Y} \\ -z^{(1)}(3) & (z^{(1)}(3))^{Y} \\ -z^{(1)}(4) & (z^{(1)}(4))^{Y} \\ \vdots & \vdots \\ -z^{(1)}(n) & (z^{(1)}(n))^{Y} \end{bmatrix}, \quad Y = \begin{bmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ x^{(0)}(4) \\ \vdots \\ x^{(0)}(n) \end{bmatrix}$$

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Finally, the prediction data set is generated as follows:

$$\hat{\mathbf{x}}^{(1)}(\mathbf{k}) = \left[ \left( \left( x^{(0)}(1) \right)^{1-\gamma} - \frac{b}{a} \right) e^{-a * (1-\gamma)(k-1)} + \frac{b}{a} \right]^{\frac{1}{1-\gamma}} , k = 2, 3, \dots, m$$
(9)

Here, the initial estimated data generated by the formula  $\hat{x}^{(1)}(1) = x^{(0)}(1)$  is assumed to be equal to the initial value in the raw data set.

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In the NGBM(1,1), if the coefficient  $\chi$  in equation 5 is 0, the NGBM(1,1) model is reduced to the GM(1,1) model and the coefficient y in the NGBM(1,1) model is optimized using the Genetic Algorithm method with the Evolver package program. In this study, the success of the NGBM(1,1) model in prediction is measured by the mean absolute percentage error (MAPE) given in Equation 11 (Xu et al., 2019).

$$APE (\%) = \left| \frac{x(i) - \hat{x}(i)}{x(i)} \right| x 100$$
(10)

$$MAPE (\%) = \sum_{i=1}^{n} \left| \frac{x(i) - \hat{x}(i)}{x(i)} \right| x \frac{100}{n}$$
(11)

The value of the y-coefficient in the NGBM(1,1) model depends on the condition that the MAPE value in the prediction model is the smallest. In this study, the prediction models NGBM(1,1) and GM(1,1) were used. The model with the smallest MAPE value of these two models is the most successful prediction model (Wang and Li, 2019). However, a MAPE value of less than 10% indicates that the success of the prediction model is excellent, between 10-20% is good, between 20-50% is reasonable and more than 50% is inaccurate (Zhou et al., 2021).

### 3. Findings

This study examined 8 main and 13 sub-goals for health and quality of life in the context of the SDGs for the BRICS-T countries. GM(1,1) and NGBM(1,1) models were used to analyze the data. Table 2 shows the MAPE values of the two methods. Since the model with the best MAPE value is NGBM(1,1), all evaluations were carried out according to the results of this method. Table 2. Comparison of the MAPE Values of GM(1,1) and NGBM(1,1) Models

Indicator Code				Μ	IAPE (%)			_
Indicator Code		Brazil	China	India	Russia	Türkiye	South Africa	
2 1 1	NGBM(1,1)	4.03	3.55	3.10	10.62	2.55	6.27	- 145
5.1.1	GM(1,1)	4.88	3.67	3.85	11.65	2.66	6.51	
2 2 1	NGBM(1,1)	1.24	0.25	0.17	2.78	0.40	4.90	
3.2.1	GM(1,1)	3.42	0.79	0.79	4.59	0.94	9.75	
2 2 2	NGBM(1,1)	1.22	0.59	0.73	6.12	0.67	1.71	
3.2.2	GM(1,1)	2.94	1.20	1.40	8.83	1.89	3.89	
2 2 1	NGBM(1,1)	1.18		4.30			1.50	
3.3.1	GM(1,1)	1.29		4.93			4.67	
2 2 2	NGBM(1,1)	1.80	0.78	1.26	1.12	3.84	3.58	
3.3.2	GM(1,1)	2.64	0.87	1.59	4.37	4.74	10.54	
2.4.4	NGBM(1,1)	0.69	0.65	1.06	1.96	0.97	2.08	
3.4.1	GM(1,1)	0.71	0.67	1.55	2.08	1.14	2.45	
2.4.2	NGBM(1,1)	2.25	2.71	2.78	2.11	1.44	3.50	
3.4.2	GM(1,1)	2.99	3.44	2.84	2.12	2.97	3.55	
2.6.4	NGBM(1,1)	3.47	1.19	2.01	6.19	12.50	3.45	
3.6.1	GM(1,1)	8.11	1.72	2.91	6.96	16.56	6.36	
272	NGBM(1,1)	2.78	9.12	6.86	4.86	2.19	5.09	
3.7.2	GM(1,1)	2.86	8.35	8.50	10.84	3.79	8.90	
2.0.4	NGBM(1,1)	1.30	0.84	1.24	0.45	0.69	2.95	
3.8.1	GM(1,1)	1.33	1.92	2.94	0.89	1.24	3.69	
2.0.2	NGBM(1,1)	2.73	1.52	4.38	5.92	5.37	4.56	
3.8.2	GM(1,1)	2.78	5.48	4.46	6.55	9.24	5.84	
2.0.4	NGBM(1,1)	2.52	1.21	2.71	2.42	1.43	1.72	
3.9.1	GM(1,1)	2.84	2.76	3.28	4.75	5.28	2.65	
2.0.2	NGBM(1,1)	20.68	1.13	6.88	1.48	6.77	3.18	
3.9.3	GM(1,1)	23.15	2.96	8.01	2.14	9.05	3.35	

Below are the results for each goal, with details of the countries' actual and predicted values in the appendices.

The predictions for maternal mortality ratio are shown in Figure 1. A declining trend is expected for all countries except Brazil. Russia, Türkiye, and China are expected to perform best, while Brazil is expected to have the highest maternal mortality ratio.

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Figure 1. Maternal Mortality Ratio (per 100,000 live births)



The predictions for neonatal mortality rate are shown in Figure 2. A flat trend is predicted for South Africa, while a downward trend is expected for the other countries. By 2030, all countries except India are expected to reach the neonatal mortality target, with China and Russia approaching the zero mark.



In Figure 3, predictions for under five mortality rates show a downward trend in all countries. By 2030, all countries except South Africa are expected to reach the target of 25 deaths per 1,000 live births, with Russia having the lowest rate.

Figure 3. Under-5 Mortality Rate (per 1,000 live births)

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Figure 4 shows the expected number of new HIV infections per 1,000 uninfected people by gender, age and specific groups by 2030. Due to data limitations, only three countries were analysed. A downward trend is expected in all countries, with the sharpest decline expected in South Africa.



Figure 5 shows the data on the incidence of tuberculosis. A slight increase is expected in Brazil by 2030, while a downward trend is predicted in other countries, with the sharpest decline forecast for South Africa.

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Figure 5. Tuberculosis Incidence (per 100,000 people)



Figure 6 shows the predictions for mortality rates attributable to CCDR, with a decreasing trend expected for all countries. However, no country is expected to reach the target of reducing these deaths by a third by 2030, based on 2019 levels.



Figure 7 shows the predictions for suicide mortality, with a significant increase expected for Brazil and a relatively small increase for Türkiye, while a downward trend is predicted for the other countries. Based on 2019 data, India and Russia are expected to see a one-third decrease in suicide mortality by 2030, but other countries are not expected to reach this target.



Figure 8 shows the predicted mortality rate from road traffic accidents, with a downward trend expected for all countries. Türkiye, Brazil and Russia are forecast to reach the target of halving the mortality rate from road traffic accidents by 2030. Figure 8. Mortality Rate from Road Traffic Accidents (per 1,000,000 people)



Figure 9 shows the data on the birth rate among young people, with a downward trend expected in all countries except China. Russia, India, and Türkiye are forecast to have the lowest adolescent birth rates.





Figure 10 shows predictions for the coverage of essential health services, with an increase expected in all countries except India. By 2030, South Africa and Russia are projected to have the highest coverage rates at 74%.



Figure 11 shows predictions for household health expenditures. An increase is expected in Türkiye and Russia by 2030, while a downward trend is predicted for the other countries.

Figure 11. Proportion of Population with Large Household Expenditures on Health (as a share of total household expenditure or income)

KOCATEPEİİBFD



Figure 12 shows the predictions for mortality rates due to air pollution, with an increase predicted for India and a downward trend for the other countries. Brazil is expected to perform best in this area.



Figure 13 shows the predictions for mortality rates attributable to unintentional poisoning. By 2030, India and Brazil are expected to have eliminated these deaths, while other countries show a decreasing trend towards zero.

Figure 13. Mortality Rate Attributed to Unintentional Poisonings (per 100,000 people)

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#### 4. Discussion

This study examined the performance of the BRICS-T countries in terms of their progress towards achieving the health and quality of life targets under SDG 3 and provided projections for the future. The results show that each country has made different progress depending on its specific characteristics, such as health and economic policies and social dynamics. However, it is assumed that all countries will face challenges in achieving certain SDG 3 targets.

The analysis of Brazil's progress towards SDG 3 shows that the country is likely to succeed in reducing the mortality rate of maternal, neonatal, and under-5 years of age, halving the number of deaths from road traffic accidents, and reducing the number of deaths from harmful chemicals and air, water, and soil pollution. In particular, Brazil is expected to perform best when it comes to minimizing deaths caused by air pollution and improving the coverage of essential health services. However, the country is not expected to meet the targets for communicable diseases, CCDR mortality, suicide, and adolescent birth rate. The assessment by the Civil Society Working Group for the 2030 Agenda (2022) also highlights that Brazil's SDG 3 targets for 2030 are generally insufficiently advanced or at risk. Malta et al. (2024) found that, between 1990 and 2019, Brazil made progress in reducing underfive mortality, neonatal mortality, tuberculosis and malaria cases and improving vaccination coverage and sanitation. However, the country is struggling with maternal mortality and alcohol consumption targets. Machado et al. (2020) noted that Brazil's health-related SDG indicators have improved significantly over the past 28 years but warned. Nevertheless they warned that health inequalities between regions and states could hinder the country's ability to achieve the SDG 2030 targets. Therefore, Brazil will likely need comprehensive reforms and policies to reduce health inequalities and eliminate regional disparities.

The results indicate that Russia is likely to achieve the SDG 3 targets for maternal, neonatal, and under-five mortality, adolescent birth rates and coverage of essential health services, outperforming other countries. Suicide mortality is also expected to fall. The number of deaths from road traffic accidents is expected to be halved, while the number of deaths from air pollution is expected to remain low. Household health expenditure is expected to increase. In the assessment of all targets, Russia is in the best position compared to the other countries. In the report Decade of Action in Russia Challenges and Solutions (CCSD, 2020), the authors highlighted Russia's problems in the areas of alcohol consumption, traffic accidents, infectious diseases and the healthcare system, and proposed various measures. Russia has implemented measures that cover all SDG 3 targets as part of the state program "Development of Healthcare," which was launched in December 2017. Russia is assessed as a country making significant progress, with increased life expectancy (from 72 to 78 years, set to rise to 80 by 2030), improving living conditions for five million households annually, and creating a healthy environment for individuals to achieve self-actualization and creativity (Kolmar and Sakharov 2019). Shamaeva and Surskova (2021) also noted a positive trend in Russia's SDG 3 indicators starting from 2015. The strategies and measures implemented in Russia have therefore had a positive impact, but further steps and increased efforts are needed to achieve the desired goals.

The results of the study suggest that under SDG 3, India will achieve the targets for maternal, neonatal, and under-5 mortality rates, perform relatively well in reducing adolescent birth rates, see a decline in suicide mortality and household health

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expenditure, while eliminating unintentional poisoning. However, India is not expected to make significant progress on other targets. In particular India is predicted to have the worst conditions in terms of air pollution. NITI Aayog (2024) and Rajeev et al. (2018) found that India faces significant challenges in achieving the SDG 3 targets due to its large population and systemic difficulties in health care. Kumar and Anand (2023) stated in their analysis that India will make "moderate" efforts to achieve various targets under SDG 3, but targets 3.7 and 3.8 seem difficult to achieve. Haldar and Hembram (2020) emphasized that low public health spending on health is one of the main reasons why India cannot achieve these goals. According to the authors, inadequate public spending limits access to healthcare for the poor and reduces the quality of healthcare services. In addition, the increase in lifestyle-related diseases is another critical challenge to achieving the SDG targets. Rajeev et al. (2018) emphasize that coordinated action is required to make healthcare a fundamental right, promote effective governance by the Ministry of Health and Family Welfare, restructure healthcare delivery using a 'systems approach', ensure financial protection of healthcare costs, and strengthen community engagement and accountability to achieve the desired outcomes.

According to the findings, by 2030, China is expected to meet targets for maternal, neonatal, and under-5 mortality rates, improve the provision of essential health services and reduce household health expenditure and unintentional poisonings deaths. While air pollution is expected to show a negative trend, China is not expected to perform as badly as some other countries, and neither communicable nor non-communicable diseases are expected to be eradicated. The number of road traffic deaths is also unlikely to fall to the expected level. The adolescent birth rate expected to remain constant. Chen et al. (2019) found that China is likely to achieve only 12 of the health-related SDG targets by 2030, with the number of targets achieved varying between provinces and municipalities. Tan et al. (2018) pointed out that there are still unresolved issues and areas for improvement in China's implementation.

South Africa's data suggests that the country is likely to meet maternal and neonatal mortality targets by 2030, reduce household health expenditure to the lowest level compared to other countries and reduce deaths from air pollution and unintentional poisoning. South Africa is expected to have the best coverage of essential health services next to Russia. However, it is unlikely that the country will achieve the desired reduction in deaths from communicable and non-communicable diseases or road traffic accidents. Of all countries, South Africa is expected to perform the worst in adolescent birth rates. Haywood and Wright (2019) report that South Africa has one of the highest burdens of non-communicable diseases (cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases) and the third worst country in sub-Saharan Africa for mortality rates from these diseases. According to the Global Burden of Disease data from 2015, South Africa ranks 134th out of 188 countries in the SDG 3 Health Index (Haywood and Wright 2019). These results show that South Africa's healthcare and overall health need to be significantly improved.

Türkiye is expected to meet the targets for maternal, neonatal, and under-5 mortality rates and road accident rates based on 2030 projection data. The coverage of essential health services is expected to increase and the number of deaths from unintentional poisoning is expected to decrease. Although the adolescent birth rate is expected to decline, Türkiye is expected to rank third among the BRICS-T countries in this area. However, despite a downward trend in deaths from communicable and non-communicable diseases, the country is not expected to reach its targets in these areas. Household health expenditure and deaths from unintentional poisoning are also expected to rise. Tezcan (2020) analyzed Türkiye's health indicators using the TOPSIS method within the framework of the SDGs for the period from 2013 to 2018. According to the results, Türkiye's performance score increased steadily from 0.20 to 0.88, indicating a positive trend. Cansever (2020) reports that Türkiye's performance in the annually published SDG-related reports shows an upward trend, with a realization rate of 84.4% for health-related indicators in 2020. These results indicate that while Türkiye has achieved success in certain health targets, there are also areas where the country faces challenges in meeting its targets. This underscores the need for additional improvements and adjustments in Türkiye's health policies and practices.

#### Conclusion

Despite global inequalities in healthcare, the ultimate goal of every country remains the same: to improve the health of the population, provide quality patient care and control costs. SDG 3 provides a global framework for action to achieve these goals. This study examined the performance of the BRICS-T countries in terms of their progress towards achieving the SDG 3 health goals and made future projections for the year 2030. The analyses revealed the differences and challenges in the health systems of these countries. Although significant progress has been made in certain areas, it was found that all countries will struggle to achieve some of the SDG 3 health targets.

The results show that none of the BRICS-T countries will fully achieve the SDG 3 targets by 2030. Differences in data collection and analysis methods, the implementation of various health policies, persistent global migration issues, equity and gender challenges, and the selective behavior of the pharmaceutical market are all obstacles to setting absolute targets and achieving the same results simultaneously in all countries. The key question is therefore how to design strategies to achieve these goals. While the

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United Nations has a role to play in overseeing this process, there is a lack of clarity on the tools available to achieve these goals.

In general, it was concluded that the BRICS-T countries need to strengthen their existing health policies, reduce regional inequalities, improve access to health services, strengthen inter-sectoral cooperation, and implement broader social reforms and international cooperation to achieve the health targets of SDG 3. Progress towards achieving the international development goals can be accelerated, but profound structural changes are needed in all sectors of society to achieve the SDGs. Supranational instruments must also be developed to minimize inequalities between countries and support joint efforts.

Although there is an extensive literature on the BRICS-T countries, no study was found that comprehensively examines the performance of these countries in achieving the SDG 3 health targets. To my knowledge, this is the first study to assess and forecast SDG 3 indicators for the BRICS-T countries together. This study fills a gap by analyzing the health sector in the BRICS-T countries and making future projections that provide valuable insights for planning and improving health policies in these countries. In addition, using the NGBM(1,1) method in analyzing the data provides more reliable results for future health indicators. Overall, a MAPE value of less than 10% indicates a high level of accuracy in the analysis and provides valuable guidance for policy and decision-makers in the health sector.

The main limitations of the study are that the research was only conducted for the BRICS-T countries, that targets without data were excluded from the assessment and that not many estimation methods were used for the analyses. The health policy measures implemented by the countries were not evaluated in the analysis of this study. Only upward or downward trends were assessed. Future studies can examine the possible reasons for these trends and discuss what the results mean for each country's healthcare system. It is also assumed that detailed studies are needed on how the cultural and social context influences the SDG targets. They can be conducted using different methodologies and countries can be assessed in the context of different categories (economy, level of development, socio-cultural context etc.). In addition, the impact of health policies implemented by countries on the SDGs can be compared as part of the policy analysis. Of course, the future is inherently uncertain, and no model can fully predict what changes will occur. But what we achieve or fail to achieve today will help create a better world for all and 'leave no one behind' which is the basis of the SDGs philosophy.

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Author Contributions

The author has not declared any other contributors.

Acknowledgments

The author(s) did not provide acknowledgment.

**Funding and Support** 

The author(s) did not report any funding or support information.

**Conflict of Interests** 

The author(s) did not report any conflict of interest.

**Ethics Statement** 

The author(s) did not report ethical committee approval as the research content does not require.

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Appendices Table 3. Maternal Mortality Ratio (per 100,000 live births)

	Year	Brazil	China	India	Russia	South	Türkiye
						Africa	,
	2005	70	46	286	31	221	25
	2006	71	43	248	27	208	24
	2007	72	39	234	22	218	23
	2008	70	38	221	19	216	23
	2009	68	34	207	19	225	22
	2010	64	33	179	17	219	22
	2011	62	32	170	14	194	23
lal	2012	57	28	162	12	164	21
kctr	2013	61	28	154	11	151	20
4	2014	62	26	135	10	141	19
	2015	62	26	128	10	141	19
	2016	63	23	121	8	127	20
	2017	60	22	119	9	133	17
	2018	59	20	116	9	125	17
	2019	61	20	116	7	118	17
	2020	72	23	103	14	127	17
	2021	63	18	98	7	105	16
	2022	64	17	93	7	100	16
	2023	64	17	88	7	94	15
q	2024	64	16	84	6	89	15
iste	2025	65	15	80	6	84	14
ecasi	2026	65	14	76	6	79	14
For	2027	65	13	72	5	75	14
ш	2028	66	13	69	5	71	13
	2029	66	12	66	5	67	13
	2030	67	12	63	5	63	12

Table 4. Neonatal Mortality Rate (per 1,000 live births)

	Year	Brazil		China	India		Russ	ia	South	Türkiy	e
									Africa	-	
	2005	14.2		13.9	37.7		6.4		14.7	13.2	
	2006	13.5		12.5	36.5		5.9		14.2	12.3	
	2007	12.8		11.3	35.4		5.4		13.7	11.4	
	2008	12.2		10.2	34.2		4.9		13.2	10.6	
	2009	11.6		9.2	33		4.6		12.7	9.8	
	2010	11.1		8.4	31.8		4.6		12.2	9.1	
	2011	10.7		7.6	30.6		4.7		11.7	8.5	
_	2012	10.3		7	29.4		4.7		11.3	8	
tua	2013	10		6.4	28.2		4.6		11.1	7.4	
Ac	2014	9.7		5.8	27.1		4.4		11	7	
	2015	9.5		5.3	26		4		11	6.6	
	2016	10		4.9	24.9		3.5		11.1	6.2	
	2017	9.3		4.4	23.8		3.2		11.1	5.9	
	2018	9.1		4.1	22.7		2.9		11.2	5.6	
	2019	8.9		3.7	21.4		2.6		11.1	5.3	
	2020	8.7		3.4	20.2		2.3		11.1	5	
	2021	8.5		3.2	19.1		2		11	4.7	
	2022	5	3	3		19		2	11		4
	2023		3	3		18		2	11		4
	2024	5	3	2		17		1	11		4
stec	2025		3	2		16		1	11		4
scas	2026	5	3	2		15		1	11		4
Forec	2027	5	3	2		15		1	11		3
	2028	5	3	2		14		1	11		3
	2029		7	2		13		1	11		3
	2030		7	1		13		1	11		3

Fable 5. Under-5 Mortality Rate (per 1,000 live births)											
	Year	Brazil		China	India		Russia	3	South Africa	Türkiy	e
	2005	24.8		24	74.4		13.9		79.2	26.1	
	2006	23.2		22	71.1		12.8		78.9	24.2	
	2007	21.8		20.1	67.8		12		74.6	22.5	
	2008	20.6		18.5	64.5		11.3		68.3	20.9	
	2009	19.6		17.1	61.3		10.7		59.9	19.5	
	2010	18.6		15.8	58.1		10.4		51.6	18.1	
	2011	17.9		14.6	55		10.2		45.5	16.9	
_	2012	17.2		13.5	52		9.9		41.5	15.8	
tua	2013	16.7		12.5	49.1		9.5		39.6	14.7	
Ac	2014	16.3		11.6	46.2		8.9		38.3	13.8	
	2015	15.9		10.7	43.6		8.2		37.3	13	
	2016	16.7		9.9	41		7.5		36.6	12.2	
	2017	15.4		9.2	38.7		6.9		35.8	11.4	
	2018	15.2		8.6	36.4		6.3		35.1	10.7	
	2019	14.9		8	34.3		5.8		34.3	10.1	
	2020	14.7		7.4	32.4		5.4		33.7	9.5	
	2021	14.4		6.9	30.6		5.1		32.8	9	
	2022		14	6		29		5	32		8
	2023		14	6		27		4	31		8
-	2024		14	5		25		4	30		7
stee	2025		13	5		24		4	30		7
eca	2026		13	5		23		3	29		7
Ore	2027		13	4		21		3	29		6
<u>.</u>	2028		13	4		20		3	28		6
F	2029		13	4		19		3	28		5
	2030		13	4		18		2	27		5

#### Table 6. Number of New HIV Infections (per 1,000 people)

	Year	Brazil	India	South
				Africa
	2005	0.25	0.16	11.43
	2006	0.25	0.14	11.13
	2007	0.25	0.13	10.86
	2008	0.25	0.12	10.58
	2009	0.25	0.11	10.13
	2010	0.25	0,1	9.52
	2011	0.25	0.09	9.01
_	2012	0.24	0.08	8.52
tua	2013	0.24	0.08	7.97
Ac	2014	0.24	0.07	7.47
	2015	0.24	0.06	6.91
	2016	0.24	0.06	6.51
	2017	0.23	0.06	5.91
	2018	0.23	0.06	5.25
	2019	0.23	0.05	4.8
	2020	0.23	0.05	4.42
	2021	0.24	0.05	4.19
	2022	0.23	0.04	3.85
	2023	0.23	0,04	3.54
-	2024	0.22	0,04	3.25
stee	2025	0.22	0.04	2.98
eca	2026	0.22	0.03	2.74
ore	2027	0.22	0.03	2.51
	2028	0.22	0.03	2.30
	2029	0.22	0.03	2.11
	2030	0.21	0.03	1.93

 Table 7. Tuberculosis Incidence (per 100,000 people)

	Voor	Drazil	China	Undia	people	) Duc	cia	Couth	Türk	
	rear	Brazii	China	India		Rus	sia	South	TURKI	ye
			-					Africa		
	2005	50	91	329		88		1210	33	
	2006	46	88	323		88		1250	33	
	2007	46	85	316		90		1270	31	
	2008	46	82	309		90		1270	29	
	2009	45	81	300		89		1260	27	
	2010	44	76	292		85		1230	25	
	2011	44	75	284		81		1200	24	
_	2012	44	73	277		77		1160	22	
tua	2013	44	70	270		73		1110	20	
Act	2014	43	67	263		70		1070	20	
	2015	43	65	256		67		988	18	
	2016	43	63	249		63		805	18	
	2017	44	62	234		59		738	17	
	2018	46	61	224		54		677	16	
	2019	46	58	214		50		615	16	
	2020	45	57	204		48		562	16	
	2021	48	55	210		47		513	18	
	2022	46	5 53		198		43	461		14
	2023	47	7 52		192		40	414		13
-	2024	47	7 50		185		37	371		13
stec	2025	4	7 49		179		35	332		12
cas	2026	48	3 47		173		33	297		12
ore	2027	48	3 46		167		31	266		11
<u>В</u> -	2028	49	9 45		162		29	237		11
	2029	49	9 43		156		27	212		10
	2030	50	) 42		151		25	189		10

#### Table 8. Mortality Rate Attributed to CCDR (30-70 years old, %)

	Year	Brazil	China	India	Russia	South Africa	Türkiye
	2005	19	21.8	22.5	37.3	32.3	18.2
	2006	18.7	20.7	22.8	34.6	32.4	17.9
	2007	18.4	20	23.1	32.8	32.2	17.5
	2008	18.4	19.6	23.3	32.8	32.3	17.4
	2009	18	19.3	23.2	31.6	32	18
	2010	17.7	19	23.7	30.9	31.3	17.9
_	2011	17.6	18.7	23.9	29.1	30	17.3
tua	2012	17.1	18.3	23.7	27.7	29.1	16.8
Ac	2013	16.8	17.7	22.7	26.8	28.5	16.6
	2014	16.3	17.2	22	28.4	28.7	16.6
	2015	16.2	16.8	22.6	26.4	28.8	16.4
	2016	16.3	16.6	22.6	27	28.5	16.1
	2017	15.8	16.3	22.2	25.4	27.8	15.9
	2018	15.7	16	22	25.3	25.5	15.8
	2019	15.5	15.9	21.9	24.2	24.1	15.6
	2020	15	15	2	2 24	25	15
	2021	15	15	2	L 23	24	15
	2022	15	15	2	L 23	24	15
	2023	14	14	2	L 22	23	15
ted	2024	14	14	2	L 22	22	15
cas	2025	14	14	2	21	22	14
orec	2026	14	14	2	21	21	14
ц	2027	13	13	2	20	21	14
-	2028	13	13	2	20	20	14
	2029	13	13	1	20	20	14
	2030	13	12	1	9 19	19	13

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 Table 9. Suicide Mortality Rate (per 100,000 people)

				10,000 p	eopie	<b>.</b> .	<b>C</b> 11	
	Year	Brazil	China	India		Russia	South	Turkiye
							Africa	
	2005	4.7	12.9	15.5		49.8	24.4	2.8
	2006	4.7	12.1	15.6		44.8	23.6	2.7
	2007	4.9	11.5	15.3		41.7	24.6	2.5
	2008	5.1	11.1	15.1		40.7	26.7	2.4
	2009	5.1	10.7	14.5		38.4	26.7	2.4
	2010	5	10.2	14.6		38.1	24.6	2.4
_	2011	5.2	9.6	14.7		35.9	22.4	2.2
tua	2012	5.4	9	14.3		34.4	22.9	2.2
Ac	2013	5.6	8.6	13.7		33.5	23.7	2.3
	2014	5.6	8.4	12.8		33.8	24.1	2.3
	2015	5.9	8.1	12.3		32	24.5	2.3
	2016	6	8.2	12.1		31	24.4	2.3
	2017	6.6	8.1	12		28.2	25.2	2.3
	2018	7	8.1	12.6		27.1	24.1	2.3
	2019	6.9	8.1	12.7		25.1	23.5	2.4
	2020	7	7		12	26	24	2
	2021	8	7		11	25	23	2
	2022	8	7		11	24	23	2
	2023	8	7		11	23	23	2
ted	2024	9	7		11	22	23	2
cast	2025	9	7		10	21	23	2
Dree	2026	9	6		10	20	23	3
ч	2027	10	6		10	20	22	3
-	2028	10	6		10	19	22	3
	2029	11	6		10	18	22	3
	2030	11	6		9	17	22	3

### Table 102. Mortality Rate from Road Traffic Accidents (per 1,000,000 people)

		,						· · ·		
	Year	Brazil		China	India		Russia	South	Turkiye	e e
								Africa		
	2005	22.4		20.8	15.9		28.8	38.1	6.8	
	2006	21.8		20.7	16.3		27.5	41.1	6.9	
	2007	22.5		20.9	16.7		28.2	32.4	7.4	
	2008	22.6		20.5	17.1		25.5	29.5	6.2	
	2009	22.2		20.5	17		21.7	28.6	6.3	
	2010	24.3		20.3	17.2		20.5	28.6	6.8	
_	2011	24.5		20.7	17.4		21.1	27.8	11	
tua	2012	24.8		20.3	17.6		21.4	26.5	10.7	
Ac	2013	23.1		19.6	17		20.7	22.8	10.3	
	2014	23.6		18.8	16.1		20.3	24	9.6	
-	2015	20.8		18.3	15.6		17.5	24.1	9.9	
	2016	19.9		18	15.3		14.4	25.8	9.4	
	2017	18.7		17.8	15.2		13.5	23.2	9.4	
	2018	17.1		17.6	15.5		12.9	22.7	8.4	
	2019	16		17.4	15.6		12	22.2	6.7	
	2020		15	17		15	11	22		7
	2021		14	16		14	10	22		6
	2022		13	16		14	9	22		6
	2023		12	16		14	9	22		5
ed	2024		11	15		14	8	21		4
ast	2025		10	15		13	7	21		4
rec	2026		10	15		13	7	21		3
For	2027		9	14		13	6	21		3
	2028		8	14		12	5	21		3
	2029		7	14		12	5	21		2
	2030		7	13		12	5	21		2

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#### Table 11. Adolescent Birth Rate (per 1,000 women, ages 10-14 and 15-19)

	Year	Brazil	China	India	Russia	South Africa	Türkiye
	2005	77.864	13.389	55.703	29.35	56.003	44.512
	2006	75.657	13.712	47.951	30.797	57.98	43.484
	2007	73.105	14.324	45.112	31.402	58.012	41.189
	2008	69.789	15.141	48.306	32.75	70.671	40.093
	2009	67.881	15.998	41.494	32.782	67.672	39.022
	2010	66.179	15.908	39.222	30.579	67.824	35.469
	2011	65.23	15.488	36.935	29.884	72.582	34.109
_	2012	63.675	16.256	34.535	29.423	71.595	31.824
tua	2013	62.936	16.013	33.962	28.497	77.424	30.457
Ac	2014	63.12	16.39	34.643	27.6	83.046	28.912
	2015	62.434	15.327	22.432	24.819	78.367	27.353
	2016	57.88	15.282	20.025	21.888	70.813	25.931
	2017	55.566	14.901	20.42	18.286	63.706	23.905
	2018	53.436	13.325	19.275	16.24	59.361	21.15
	2019	50.015	12.939	17.701	14.95	64.982	19.29
	2020	46.296	11.73	17.278	14.833	62.742	17.74
	2021	45.2	11.048	17.234	14.988	61.206	16.884
	2022	47	13	14	12	59	16
	2023	45	13	12	11	57	14
-	2024	44	13	11	10	55	13
stec	2025	42	13	10	9	53	12
scas	2026	41	13	9	8	51	11
ore	2027	40	13	8	7	50	10
ш.	2028	38	13	8	6	48	10
	2029	37	13	7	6	46	9
	2030	36	13	6	5	44	8

#### Table 12. Coverage of Essential Health Services

	Year	Brazil	China	India		Russia	South	Türkiye
							Africa	
	2005	52.25	51.96	39.02		47.28	29.6	61.41
	2006	52.41	54.22	40.02		48.92	30.33	62.53
	2007	52.77	56.21	41.48		50.65	31.83	62.54
	2008	53.16	57.97	43.44		52.41	34.04	61.58
	2009	53.66	59.35	45.04		53.74	35.61	61.11
	2010	54.28	60.45	46.18		54.48	36.38	61.34
	2011	55.26	61.74	47.14		55.18	37.72	61.72
_	2012	56.28	63.05	48,1		56.26	40.15	61.62
tua	2013	57.4	64.47	49		57.93	43.43	61.04
Ac	2014	58.24	65.73	49.89		59.18	45.67	60.98
	2015	58.63	66.15	50.71		59.65	46.55	61.49
	2016	59.33	66.07	50.62		60.32	48.69	62.26
	2017	60.4	66.46	49.78		61.59	51.94	63.08
	2018	61.53	66.97	49.44		62.81	54.41	63.68
	2019	62.19	67.65	49.77		63.88	55.58	64.09
	2020	59.28	65.91	50.15		63.74	51.49	63.87
	2021	60.51	68.19	51.99		65.14	54.19	65.74
	2022	63	69		51	66	58	65
	2023	63	69		51	67	60	65
-	2024	64	69		51	68	62	66
stec	2025	65	70		51	69	64	66
scas	2026	65	70		51	70	66	67
ore	2027	66	70		51	71	68	67
ц Ц	2028	67	71		51	72	70	68
	2029	68	71		51	73	72	68
1	2030	68	71		51	74	74	69

Table 13. Proportion of Population with Large Household Expenditures on Health (as a share of total household expenditure or income)

				0				
	Year	Brazil	China	India		Russia	South	Türkiye
							Africa	
	2005	35.88	57.69	73.15		31.93	11.31	24.18
	2006	34.37	55.99	72.26		31.13	10.58	23.65
	2007	33.09	51.29	70.82		31.45	9.7	23.88
	2008	30.88	47.37	69.15		31.55	8.84	19.18
	2009	31.21	43.46	66.76		34.58	8.11	14.51
	2010	29.39	40.8	65.18		35.33	8	16.87
	2011	29.3	40.27	62.22		34.19	7.75	15.9
ler	2012	29.68	39.23	63		33.4	7.72	15.93
Actu	2013	28.18	38.16	69.07		34.83	7.61	16.93
4	2014	28.18	36.56	67.01		35.83	5.66	17.73
	2015	24.71	35.09	64.66		38.65	5.74	16.95
	2016	24.42	35.91	63.21		40.48	5.79	16.47
	2017	24.47	36.05	55.11		40.49	5.83	17.38
	2018	24.83	35.75	53.23		38.31	5.83	17.49
	2019	24.88	35.23	53.38		36.57	5.72	17.05
	2020	22.39	34.79	50.59		27.76	5.36	16.43
Forecasted	2021	23	34		53	36	5	17
	2022	22	34		52	36	5	18
	2023	22	34		50	36	5	18
	2024	21	33		49	36	5	18
	2025	21	33		48	36	5	19
	2026	20	33		47	36	4	19
	2027	20	33		46	36	4	19
	2028	19	33		45	36	4	20
	2029	19	33		44	36	4	20
	2030	18	33		43	36	4	21

 Table 14. Mortality Rate Attributed to Household and Ambient Air Pollution (per 1,000,000 people)

	Year	Brazil	China	India	Russia	South Africa	Türkiye
Actual	2005	215.3	745.9	398.3	941.1	466.3	438
	2006	218.4	741.3	422.5	869	478.8	445.7
	2007	220.8	756.5	446.3	845.3	484	463.1
	2008	223.5	789.3	471.1	867.3	495.6	489.9
	2009	226.5	828.5	476.8	841.1	503.3	527.5
	2010	227.4	866.2	491.9	852.3	502.9	541.6
	2011	224.6	892.6	527.8	782.1	490.5	541.6
	2012	214.5	909.5	571.7	736.3	479.7	538.9
	2013	205.9	929.4	619.3	684.1	473.6	544.6
	2014	197.6	945.5	646.7	652.6	479.4	549.4
	2015	195.7	954	662.3	608.6	482.8	543.2
	2016	201	956.2	661.3	554.3	476.9	528
	2017	199.9	950.3	664.1	495.7	467.1	511
	2018	202.4	963	690.5	494	435.9	500.7
	2019	206.6	993.6	717.2	506.8	423.4	499.2
Forecasted	2020	191	980	754	427	433	488
	2021	187	984	780	396	425	477
	2022	184	986	806	367	417	466
	2023	181	988	832	340	410	454
	2024	178	989	859	315	402	442
	2025	174	990	887	291	394	431
	2026	171	990	916	269	387	419
	2027	168	989	946	248	379	407
	2028	165	988	976	229	372	395
	2029	162	987	1007	212	364	384
	2030	159	986	1038	195	357	372

Table 35. Mortality Rate Attributed to Unintentional Poisonings (per 100,000 people)

	Year	Brazil	China	India	Russia	South	Türkiye
						Africa	
_	2005	0.1	2	0.5	8.8	2.1	0.5
	2006	0.1	2	0.5	7.8	2	0.5
	2007	0.1	2	0.5	7.1	2.1	0.4
	2008	0.1	2.1	0.5	6.8	2.2	0.4
	2009	0.1	2.1	0.4	6.3	2.2	0.4
	2010	0.1	2.1	0.4	6.1	2	0.4
	2011	0.1	2.1	0.4	5.6	1.8	0.4
tua	2012	0.1	2.1	0.3	5.2	1.9	0.4
Ac	2013	0.1	2	0.3	4.9	1.9	0.4
	2014	0.2	2	0.3	4.8	1.9	0.5
	2015	0.2	2	0.3	4.5	1.9	0.4
	2016	0.1	1.9	0.3	4.4	1.9	0.5
	2017	0.2	1.9	0.3	4	1.8	0.5
	2018	0.2	1.8	0.3	4	1.7	0.4
	2019	0.1	1.8	0.3	3.8	1.7	0.4
Forecasted	2020	0	2	0	4	2	0
	2021	0	2	0	3	2	1
	2022	0	2	0	3	2	1
	2023	0	2	0	3	2	1
	2024	0	2	0	3	2	1
	2025	0	2	0	3	1	1
	2026	0	2	0	3	1	1
	2027	0	1	0	3	1	1
	2028	0	1	0	2	1	1
	2029	0	1	0	2	1	1
	2030	0	1	0	2	1	1