

Health in Brazil 1



The Brazilian health system: history, advances, and challenges

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Brazil is a country of continental dimensions with widespread regional and social inequalities. In this report, we examine the historical development and components of the Brazilian health system, focusing on the reform process during the past 40 years, including the creation of the Unified Health System. A defining characteristic of the contemporary health sector reform in Brazil is that it was driven by civil society rather than by governments, political parties, or international organisations. The advent of the Unified Health System increased access to health care for a substantial proportion of the Brazilian population, at a time when the system was becoming increasingly privatised. Much is still to be done if universal health care is to be achieved. Over the past 20 years, there have been other advances, including investments in human resources, science and technology, and primary care, and a substantial decentralisation process, widespread social participation, and growing public awareness of a right to health care. If the Brazilian health system is to overcome the challenges with which it is presently faced, strengthened political support is needed so that financing can be restructured and the roles of both the public and private sector can be redefined.

Introduction

In this report, we examine the organisation, historical development, and present state of the Brazilian health system. We review published studies and original data from official sources to provide an overview of the Brazilian health system and outline future challenges.

Brazil is a federative republic that covers 8.5 million km²—or 47% of South America. With an estimated population of 190 732 694 in 2010,¹ Brazil is the world's fifth most populous country. Its political system is composed of several political parties and three levels of autonomous government—federal government, 26 states and a federal district, and 5563 municipalities. Brazil is governed by means of an independent judiciary, an executive branch led by the president, and a bicameral legislature. Brazil was a colony of Portugal from the year 1500 onwards and, although it gained political independence in 1822, it did not become a republic until 1889. Slavery was abolished in 1888. The Brazilian population is multi-ethnic; in 2008, about half the population self-classified their race or skin colour as brown (43.8%) or black (6.8%), and 0.6% thought of themselves as indigenous to Brazil.² In the 20th century, Brazil underwent rapid industrialisation during a time of political instability, military takeovers, and authoritarian governments, with brief periods of democratic rule—Brazil has had its longest period of democracy during the past 25 years.

Health sector reform in Brazil was driven by civil society rather than by government, political parties, or international organisations. The Unified Health System (*Sistema Único de Saúde*; SUS), instituted by the 1988 constitution, is based on the principle of health as a citizen's right and the state's duty.

Brazil—a brief overview

Brazil has undergone major political, economic, demographic, and social changes in the past 40 years.

Key messages

- Since 1988, Brazil has developed a dynamic, complex health system (the Unified Health System; SUS), which is based on the principles of health as a citizen's right and the state's duty. The SUS aims to provide comprehensive, universal preventive and curative care through decentralised management and provision of health services, and promotes community participation at all administrative levels.
- The Brazilian Health Sector Reform occurred at the same time as democratisation, and was spearheaded by health professionals and individuals in civil society movements and organisations.
- Implementation of the SUS has been complicated by state support for the private sector, the concentration of health services in more developed regions, and chronic underfunding.
- Despite these limitations, the SUS has managed to vastly improve access to primary and emergency care, reach universal coverage of vaccination and prenatal care, and invest heavily in the expansion of human resources and technology, including major efforts to produce the country's most essential pharmaceutical needs.
- Future challenges for the SUS include reforming its financial structure to ensure universality, equity, and long term sustainability, renegotiating public and private roles, reshaping the model of care to cater to Brazil's rapid demographic and epidemiological changes, and assuring quality of care and the safety of patients.
- Ultimately, the challenges facing the SUS are political because they cannot be resolved in the technical sphere but through only the concerted efforts of individuals and the society.

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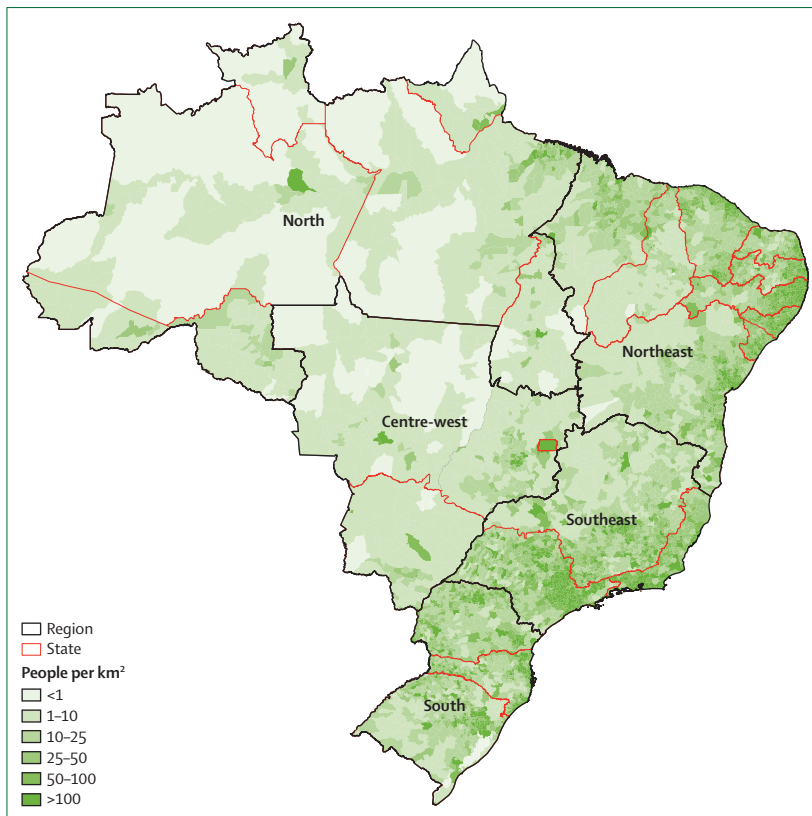


Figure 1: Populations densities in the five regions of Brazil

In 1970, under the military regime, Brazil's economic growth was among the highest in the world, but improvements in quality of life disproportionately benefited the most privileged populations. Although democracy was restored in the mid-1980s, during a period of economic instability, resumption of economic growth and improvement of social protection did not happen until the 21st century.

The country is divided into five geographical regions (north, northeast, centre-west, southeast, and south; figure 1) with differing demographic, economic, social, cultural, and health conditions, and widespread internal inequalities. For example, the southeast region covers only 11% of Brazil's territory, but accounts for 43% of the population and 56% of gross domestic product. The north region, which contains most of the Amazon rainforest, has the country's lowest population density (3.9 people per km²) and is the second poorest region, after the northeast region.

Between 1970 and 2000, Brazil underwent a demographic transition; the proportion of the population older than 60 years (10% in 2009) doubled and urbanisation increased from 55.9% to 80%.¹ Fertility rates decreased (5.8 in 1970 to 1.9 in 2008), as did infant mortality (114 per 1000 livebirths in 1970 to 19.3 per 1000 livebirths in 2007). As a result, life expectancy at birth increased by nearly 40%, to 72.8 years in 2008 (table 1).

Unemployment in 2007 was low at 8.2%, but many (43.8%) workers were employed in the informal sector—56% of those employed had social security coverage. By 2020, the old-age dependency ratio is expected to be 68 people older than 60 years to every 100 children and adolescents,⁹ and the proportion of the population of age to enter the labour market is expected to be larger than ever before.¹⁰ School attendance has increased since 1990, and illiteracy rates have decreased from 33.7% in 1970 to 10.0% in 2008 (table 1).

Between 1991 and 2008, Brazil's gross domestic product doubled and its Gini coefficient, although among the highest in the world, decreased by 15% from 0.637 to 0.547.⁵ The poverty index decreased from 68% in 1970 to 31% in 2008—this improvement can be attributed to a combination of social policies, including the social security system, the *Bolsa Família* conditional cash transfer programme (which, in 2008, distributed R\$13 billion [about US\$7.2 billion] among 10.5 million families),¹¹ and increases in the legal minimum wage.

Living conditions have also changed substantially. In 1970, only 33% of households had indoor water, 17% had access to sewerage, and less than half had electricity (table 2). By 2007, 93% of households had indoor water, 60% had access to sewerage, and most had access to electricity. Ownership of consumer goods has also increased; in 2008, more than 90% of households had a refrigerator and television, 75% had mobile phones, 32% had a personal computer, and 80% of Brazilians who were 15 years or older reported use of broadband internet.¹

Such changes in living conditions have had an effect on Brazilians' health and health behaviour. The prevalence of overweight and obesity is increasing; 47.3% of men in state capitals report being overweight.^{13,14} About a third of families report that they do not have enough food to eat.¹⁵ Although only 19% of adults in state capitals eat enough fruit and vegetables (ie, at least five portions of fruit or fruit juices and vegetables per day, five or more days per week), the quality of peoples' diet seems to be improving with time.¹⁶ Physical activity is low in state capitals,² but tobacco use has decreased as a result of the National Tobacco Control Programme—in 2008, 17.2% of the population smoked, compared with 34.5% in 1989, when the programme began. Alcohol misuse is another challenge; 17.6% of people aged 15 years or older report binge drinking.⁹

Changes in mortality and morbidity rates are related to these demographic, epidemiological, and nutritional transitions. Diseases of the circulatory system are the leading cause of death, followed by cancer and external causes (largely homicides and traffic accidents).¹⁷ Chronic diseases are the biggest contributor to the burden of disease, and communicable diseases, although decreasing with time, still affect a substantial proportion of the population. An estimated 40–50% of Brazilians older than 40 years are hypertensive and

	1970	1980	1990	2000	2010
Demographics					
Population	95 993 400 (1971)	121 611 375	147 593 859	170 143 121	190 732 694
Age					
0–4 years (n [%])	13 811 806 (14.4%)	16 423 700 (13.5%)	16 521 114 (11.2%; 1991)	16 375 728 (9.6%)	15 687 927 (8.2%)
60–69 years (n [%])	3 007 637 (3.1%)	4 474 511 (3.7%)	6 412 918 (4.3; 1991)	8 182 035 (4.8%)	10 625 402 (5.5%)
≥70 years (n [%])	1 708 571 (1.8%)	2 741 506 (2.3%)	4 309 787 (2.9%; 1991)	6 353 994 (3.7%)	8 802 684 (4.6%)
Infant mortality (n per 1000 livebirths)	113.90 (1975)	69.10	45.22	27.4 ³	19 (2007) ⁴
Fertility rate	5.8	4.35	2.85 (1991)	2.38	1.86 (2008)
Life expectancy (years)	52.3	62.6	66.6	70.4	72.8 (2008)
Men (years)	..	59.7	63.1	66.71	68.7
Women (years)	..	65.7	70.9	74.35	76.4
Life expectancy at age >60 years (years)	..	76.4	78.3	80.4	81.01 ³
Men (years)	..	75.2	77.4	78.3	79.3
Women (years)	..	77.6	79.9	81.7	82.3
Dependency rate*	88.31	73.18	72.5 (1991) ³	61.7 ²	47.9 (2008)
Sex ratio (men per 100 women)	98.9	98.7	97.5 (1991)	96.9	96.6 ² (2007)
Urban population	55.9%	67.5%	75.5%	81.2%	83.8%
Self-reported race or skin colour²					
White	61.1% (1960)	54.2%	51.6% (1991)	53.7%	48.3% (2008) ²
Brown	29.4% (1960)	38.8%	42.4%	38.5%	43.8% (2008) ²
Black	8.7% (1960)	5.9%	5.0%	6.2%	6.8% (2008) ²
Indigenous	..	..	0.2%	0.4%	0.6% (2008) ²
Yellow	0.7% (1960)	0.6%	0.4%	0.4%	0.3% (2008) ²
Female-headed households (% of families)	13.0%	15.4% (1977)	22.7% (1993)	27.34% (2001)	33.0% (2007)
Formal education					
≥7 years	19.2% (1976)	..	19.6%	37.5%	47.0% (2008) ²
≥10 years	16.7%	..	17.8%	21.7%	30.1%
Illiteracy in people ≥15 years old (%)	33.6	25.5	20.1	13.6	10
Functional illiteracy [†]	36.9 (1992)	27.3 (2001)	20.3 (2009)
Work					
Unemployment rate in individuals >10 years old (%)	4.2% (1968) ⁵	3.1% ⁵	9.9% ⁵	9.4% (2001) ⁵	8.2% (2007) ⁵
Proportion of individuals who work in the informal sector (%)	45.6% (1976)	50.2% (1982)	39.9% (1992) ⁵	42.5% (1999)	43.8% (2007) ⁵
Income					
Distribution of total income (%)					
Poorest income quintile	2.4% (1977)	2.6% (1981)	2.1%	2.3%	2.9% (2007)
Richest income quintile	66.6%	63.1%	65.6%	63.8%	59.6%
Mean monthly earnings					
Population >10 years old who earn half of the minimum wage or less (%)	7.8% (1976)	11.0% (1982)	6.3%	6.7% (2001)	9.0% (2008)
Population >10 years old who earn more than five times the minimum wage (%)	5.8%	4.3%	12.7%	13.0%	8.7%
Population >10 years old with no income (%)	49.0%	44.5%	40.4%	38.5%	31.1%
Gini index	0.57 ⁴	0.59 ⁴	0.64 (1991) ⁵	0.56 (2001)	0.55 (2008)
Bolsa Familia (conditional cash transfer)					
Beneficiary families (n)	..	..	..	10 945 505 (2006) ⁵	10 536 662 (2008) ⁵
Total value of benefits (R\$ per month)	..	..	..	685 435 000	904 079 028
Macroeconomic indicators					
Tax burden (% of gross national product)	25.98% ⁵	24.41% ⁵	29.60% ⁵	30.36% ⁵	33.83% (2005) ⁵

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	1970	1980	1990	2000	2010
(Continued from previous page)					
Gross domestic product per head (parity purchasing power; US\$) ⁵	2061.56 (1975)	3671.14	5282.68	7366.20	10 465.8 (2008)
Poverty rate (%) ^{‡5}	67.9%	39.4%	45.4%	34.0%	30.7%
Health spending					
Health spending per head (parity purchasing power; US\$)	473 (1995) ⁶	572 ⁵	771.56 (2008) ⁷
Proportion of gross domestic product spent on health	6.7% ⁸	7.2% ⁸	8.4% (2007) ⁸
Proportion of health spending in the private sector	56.9% ⁷	59.9% ⁷	57.14% (2007) ⁷
Proportion of private spending on health plans	32.0% ⁷	33.9% ⁷	29.8% (2008)
Federal public spending (credits liquidated; R\$)	26 027 957 018 (2002) ⁷	44 303 497 000 (2007) ⁷
Primary care	12.0% ⁷	14.3% ⁷
Outpatient and hospital care	49.1% ⁷	52.0% ⁷
Prophylactic and therapeutic support	1.6% ⁷	9.7% ⁷

Data are from reference 1, unless otherwise stated. The year in which data is from is given in parentheses if not from the year in the column heading. ..=data not available. * =number of people aged 65 years and older to every 100 children and adolescents. † =individuals aged 15 years or older with less than 4 years of formal education. ‡ =proportion of families with a per person income of less than half the minimum wage.

Table 1: Demographic, social, and macroeconomic indicators in Brazil, 1970–2010

	1970	1980	1990	2000	2010
Households with piped water	32.84%	79.6% (1981)	90.67%	91.45% (2001)	93.10% (2007)
Households with sewerage	17.46%	39.81% (1981)	47.95% (1992)	52.8%	59.5%
Households with refuse collection	..	..	64.48%	83.2%	88.4%
Households with electricity	48.6%	67.4%	88.8% (1992)	96.0%	98.5%
Households consuming firewood (10 ³ thermoelectric power units) ¹²	19 070	14 974	7960	6325	5713

Data are from reference 1, unless otherwise stated. The year in which data is from is given in parentheses if not from the year in the column heading. ..=data not available.

Table 2: Material goods, 1970–2010

6 million are diabetic,⁹ representing an enormous challenge to a health system organised to provide predominantly acute care (table 3).²²

Geographical and social inequalities in morbidity and mortality rates exist. In 2006, the northeast region had an infant mortality rate 2.24 times higher than that of the south region, although this disparity has decreased.⁴ In Brazil, people who identify their race or skin colour as brown or black tend to be from lower income and educational groups, and inequalities in some health outcomes (such as the prevalence of hypertension) exist between people of different race or skin colour. However, for other indicators, such as self-assessed health, outcomes are much the same after adjustment for socioeconomic status.^{23–25} Although race and social class are also related in other countries, the means by which racial relations in Brazil affect health are distinct.²⁶

Background to the Brazilian health system

The Brazilian health system consists of a variety of public and private organisations that were set up in

different historical periods (figure 2). In the early 1900s, public health campaigns, undertaken in an almost military fashion, were used to implement public health activities. The authoritarian nature of these campaigns brought about opposition from parts of the population and some politicians and military leaders. Such opposition led to the vaccine revolt in 1904, a period of unrest in reaction to a compulsory smallpox vaccination campaign sanctioned by Oswaldo Cruz, the Director General of public health at the time (figure 3).^{24,26} The Brazilian state's model for intervention in social policies dates from the 1920s and 1930s, when an individual's social and civil rights were related to their position in the labour market.²⁶

Brazil's social protection system expanded during the Government of President Vargas (1930–45) and the military (1964–84). Decision-making and management processes were done without public involvement and were centralised in large bureaucracies.³³ The social protection system was fragmented and unequal.³⁴ The health system consisted of an underfunded Ministry of Health and the social security system, which provided

	1970	1980	1990	2000	2010
Immunisation coverage by the SUS					
BCG	88.29% (1994)	111.74%*	105.86%* (2009)
<i>Haemophilus influenzae</i> type b (Hib)	87.85%	0.64%
Influenza	67.46%	82.77%
Hepatitis B (HepB)	8.85%	91.08%	97.88%
Measles	71.35%	105.35%*	..
Oral poliomyelitis (VOP)	58.23%	101.44%*	100.76%*
Diphtheria, pertussis, tetanus (DPT)	64.75%	94.71%	0.08%
Measles, mumps, and rubella (MMR)	77.5%	101.64%*
Measles and rubella	0.13%
Oral human rotavirus (RR)	84.26%
Tetravalent DPT-HepB	99.34%
Influenza A H1N1	37.0% (2010)
Private health-care plans					
Coverage (%) ²	24.4% (1998)	24.4% (2003)	25.9% (2008)
People covered (n) ²	38 680 406 (1998)	45 035 243 (2003)	49 186 989 (2008)
Family Health Programme coverage					
Population served by community health workers	29.6% (1998) ³	42.8% ³	60.4% (2008) ³
Population served by family health teams	6.6% ³	17.4%	49.5% ³
Population served oral health teams	0% ³	0% ³	45.3% ³
Hospital admissions (SUS)					
Brazil	5 582 942 (1968) ¹⁸	13 070 832 (1982) ¹⁹	12 646 200 (1995) ²⁰	11 937 323 ²⁰	11 109 834 (2009) ²⁰
North region ²⁰	839 013	914 104	993 575
Northeast region ²⁰	3 796 425	3 601 780	3 132 711
Centre-west region ²⁰	846 231	901 731	880 832
Southeast region ²⁰	5 125 620	4 536 395	4 215 241
South region ²⁰	2 038 911	1 983 313	1 887 475
SUS hospital admissions by specialty					
Clinical (n[%]) ²⁰	..	7 422 199 (56.8%; 1982)	4 736 535 (37.5%; 1995)	4 089 745 (34.3%)	3 967 626 (35.7%; 2009)
Surgery (n[%]) ²⁰	..	1 971 851 (15.1%)	2 485 977 (19.7%)	2 747 254 (23.0%)	3 198 391 (28.8%)
Obstetrics (n[%]) ²⁰	..	3 234 619 (24.7%)	3 271 479 (25.9%)	2 871 045 (24.1%)	2 163 655 (19.5%)
Paediatrics (n[%]) ²⁰	1 630 866 (12.9%)	1 762 573 (14.8%)	1 429 563 (12.9%)
Psychiatry (n[%]) ²⁰	..	419 775 (3.2%)	436 319 (3.5%)	394 889 (3.3%)	229 636 (2.1%)
Psychiatry (day-hospital; n[%]) ²⁰	6 575 (0.1%)	19 893 (0.2%)	22 5764 (0.2%)
Geriatrics (day-hospital; n[%]) ²⁰	211 (0.005%)
Other (n[%]) ²⁰	78 449 (0.6)	51 924 (0.4%)	..
Hospital admissions (per 100 population) ²	..	7.2 (1981) ¹⁸	6.9 (1998)	7.0 (2003)	7.0 (2008)
Admission rates for individuals with private health plans (%) ²	8.0%	8.3%	8.2%
SUS outpatient procedures (n) ²⁰	..	178 751 174 ¹⁹	1 230 880 494 (1995) ²⁰	1 583 844 132 ²⁰	3 230 759 585 (2009) ²⁰
Public (n[% of total]) ²⁰	914 060 997 (74.3%)	1 281 403 329 (80.9%)	2 861 269 985 (88.6%)
Municipal (n[% of public]) ²⁰	704 741 029 (77.1%)	1 058 439 150 (82.6%)	1 974 276 290 (69.0%)
Private (n[% of total]) ²⁰	316 819 497 (25.7%)	302 440 794 (19.1%)	369 489 627 (11.4%)
Level of complexity					
Primary care (n[%])	961 830 090 (78.1) ³	990 243 733 (63.0) ³	1 592 995 777 (49.3) ²¹
Medium complexity (n[%]) ²¹	939 701 073 (29.1)
High complexity (n[%]) ²¹	662 735 573 (20.5)
Other ²¹	35 327 162

Data are from reference 1, unless otherwise stated. The year in which data is from is given in parentheses if not from the year in the column heading. ..=data not available. * Estimates greater than 100% are a result of inconsistencies in population estimates.

Table 3: Coverage and use of health care service, 1970–2010

medical care through the retirement and pension institutes, delivered on the basis of occupational categories (ie, bankers, railroad workers, etc), each with different services and levels of coverage.²⁶ Individuals with casual employment had an inadequate supply of public services, philanthropic care, and out-of-pocket

private health-care services.³⁴ After the military takeover in 1964, government reforms made expansion of the predominantly private health care system possible, mainly in major urban centres. Rapid expansion of coverage followed, which included the extension of social security to rural workers (figure 2).

	Macroeconomic and socioeconomic context	Political context	Health System	Key health challenges
Portuguese colonialism (1500–1822) ²⁴	Exploitation of raw materials and trade monopoly by Portugal	Political and cultural control from Portugal	16th century: <ul style="list-style-type: none"> Hospitals of the Santa Casa de Misericórdia in Santos, São Paulo, Bahia, Rio de Janeiro, Belém, and Olinda were set up Incipient health-sector organisation 	Pestilential diseases and the provision of health care for the general public
Imperial phase (1822–89) ²⁵	Opening of the ports (1808), emergence of modern capitalism, and onset of industrialisation	Political centralism and political boss system, which gave large land owners political control in provinces and localities	<ul style="list-style-type: none"> Health-related structures organised as sanitary police Public health assigned to municipalities First institutions for sanitary control of ports and epidemics established during reforms (1828 and 1850) 	Pestilential diseases and priority for health surveillance (ports and commerce)
Old Republic (1889–1930) ²⁶	Agro-exporting economy (commercial capital), coffee crisis, and poor hygiene in ports	Liberal-oligarchic State, military revolts, and the emergence of social issues	<ul style="list-style-type: none"> General Directorate of Public Health (DGSP; 1897) Reform of DGSP competences (Oswaldo Cruz; 1907) Retirement and Pension Funds (Eloy Chaves Law; 1923) Incipient form of Social Security health care Dichotomy between public health and social security 	Pestilential diseases (yellow fever, smallpox, the plague) and widespread disease (eg, tuberculosis, syphilis, rural endemic diseases)
Vargas dictatorship (1930–45) ²⁷	Industrialisation, but agrarian structure maintained	(Estado Novo) Authoritarian state between 1937 and 1938 identified with Nazi-fascism	<ul style="list-style-type: none"> Public health institutionalised through the Ministry of Education and public health Social security and occupational health institutionalised through the Ministry of labour, industry, and commerce Public health campaigns against yellow fever and tuberculosis Pension institutes extend insurance security to most urban workers (1933–38) 	Predominantly rural endemic diseases (eg, Chagas disease, schistosomiasis, ancylostomiasis, malaria), tuberculosis, syphilis, and nutritional deficiencies
Democratic instability (1945–64) ²⁸	Import substitution, rapid urbanisation, immigration, advent of the automobile industry, penetration by international capital	Liberal, populist governments	<ul style="list-style-type: none"> First Ministry of Health (1953) Laws unified social security rights of urban workers (1960) Expansion of hospital care Emergence of private business sector in health 	Emergence of modern diseases (eg, chronic degenerative diseases, labour and traffic accidents)
Military dictatorship (1964–85) ²⁹	<p>Internationalisation of the economy</p> <p>Economic miracle (1968–73)</p> <p>Economic miracle ends</p> <p>Penetration by capitalism in rural areas and in services</p>	<ul style="list-style-type: none"> Military takeover, dictatorship (1964) Administrative reform (1966) Political crisis (1974 elections) <p>Slow, gradual, and restricted political easing (1974–79)</p> <ul style="list-style-type: none"> Liberalisation (1976)—<i>Centro Brasileiro de Estudos de Saúde</i> set up; social movements Symposium in congress (1979) Political transition (from 1974–84) <p>Brazilian Association of Post-Graduate Collective Health set up</p>	<p>Social security organisations (IAPs) unified in the National Social Security Institute (INPS), privatised medical care model dominates, and capitalisation of health sector (1966)</p> <ul style="list-style-type: none"> Capitalisation of medicine by the social security system Health system in crisis Primary Health Care (PHC) programmes for rural and small (<20000 people) populations Crisis in social security National Social Security Healthcare Institute (INAMPS; 1977); Health system centralisation, institutional fragmentation, private sector advantage INAMPS fund states and municipalities to expand coverage 	<p>Predominantly modern diseases (eg, chronic degenerative diseases, labour and traffic accidents)</p> <p>Rural endemic diseases persist and become more prevalent in urban areas</p> <p>Infectious and parasitic diseases in the Northeast, Northwest, and midwest regions</p>
Democratic transition (1985–88) ³⁰	Recession interrupted, social debt acknowledged, and plans for economic stabilisation	<ul style="list-style-type: none"> Start of New Republic (1985) Health on the political agenda 8th National Health Conference; Health Sector Reform emerges National Constituent Assembly New constitution (1988) 	<ul style="list-style-type: none"> INAMPS continue funding for states and municipalities AIS enhanced Unified and decentralised health systems (1987) Containment of privatisation policies New channels for public participation 	<ul style="list-style-type: none"> Reduction in infant mortality and immunisation-preventable diseases Cardiovascular diseases and cancers persist Increases in violent deaths and AIDS-related deaths Dengue fever epidemics <p>(Continues on next page)</p>

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<p>Democracy (1988–2010)²¹</p>	<p>Economic crisis (hyperinflation)</p> <p>Macroeconomic adjustment (Real Plan; 1994)</p> <p>Economic stability, income begins to recover, cyclic movement (highs and lows), inequalities persist, and monetarist policy continues</p>	<p>President Fernando Collor de Mello elected and impeached, social imbalance</p> <p>Remaining presidential term (1993–94) overseen by Vice-President Itamar Franco</p> <p>Governments of Fernando Henrique Cardoso (1995–98 and 1999–2002)—social-democratic party</p> <p>State reform (1995)</p> <p>Governments of Luiz Inácio Lula da Silva (2003–06 and 2007–10)—the Workers Party²²</p>	<ul style="list-style-type: none"> • Creation of the SUS • Decentralisation of the health system <p>9th National Health Conference</p> <ul style="list-style-type: none"> • INAMPS repealed (1993) • Family Health Programme set up (1994) • Crisis in funding and creation of Provisional Contribution on Financial Transactions (1996) • Free treatment for HIV/AIDS through the SUS • Per head PHC funding (1998) • 10th and 11th National Health Conferences • Health-care operating norms and regionalisation established • Regulation of the private health plans • National Health Surveillance Agency set up (1999) • Supplementary Health Care Agency set up to regulate and oversee private health plans (2000) • The generic drugs law passed • The Arouca Law instituted indigenous health care as part of the SUS • Constitutional amendment addressed the instability in SUS financing and defined the duties of the Union, states, and municipalities (2000) • Psychiatric reform law passed (2001) • Expansion and consolidation of PHC • Mobile emergency care (ambulance) system set up (2003) • Pact for Health established (Pact in Defence of the SUS, Management Pact, the Pact for Life; 2006) • National Primary Care policy (2006) • Health Promotion (2006) • 12th and 13th National Health Conferences • National Commission on Social Determinants of Health and National Oral Health Policy (Brasil Sorridente; 2006) • 24-h emergency care units set up in municipalities with populations >100 000 (2008) • Multi-professional Family Health Support Teams set up to support the Family Health Programme (2008) 	<p>Cholera and dengue fever epidemics, mortality from external causes (mostly homicides and traffic accidents)</p> <p>Cardiovascular disease most common cause of death, followed by external causes and cancers</p> <p>Decrease in infant mortality, no change in prevalence of tuberculosis, stabilisation in prevalence of AIDS-rates illness, increase in prevalence of dengue fever, and increase in incidence of visceral leishmaniasis and malaria</p> <p>Life expectancy was about 72.8 years (68.7 for men and 76.4 for women) at the start of the 21st century</p> <ul style="list-style-type: none"> • Infant mortality rate was 20.7 per 1000 livebirths (2006) • Decrease in the prevalence of Hansen's disease and immunisation-preventable diseases • Life expectancy increased to 72.8 years (69.6 for men and 76.7 for women; 2008)
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Figure 2: The historical process of health sector organisation and the background to the Brazilian health-care system

Between 1970 and 1974, money from the federal budget was made available to reform and build private hospitals;²⁶ responsibility for provision of health care was extended to trade unions, and philanthropic institutions provided care for rural workers.³⁵ Direct subsidies to private businesses for the provision of health care to their employees were replaced by income tax discounts, fostering expansion of medical-care supply and proliferation of private health-care plans.³⁶ Increased social security coverage and a health-care market based on fee-for-service payments from private sector providers gave rise to a funding crisis in the social security system, which, with the economic recession during the 1980s, fuelled reform aspirations.³⁷

The Brazilian health sector reform

The health sector reform in Brazil was ideologically at odds with the post-welfare health sector reforms happening worldwide at that time.³⁸ The Brazilian proposal, which began to take shape in the mid-1970s, was formed during the struggle to restore democracy. A widespread social movement grew,³⁹ bringing together initiatives in different sections of society—from grassroots sectors to middle-class populations and trade unions—and in some cases in conjunction with the

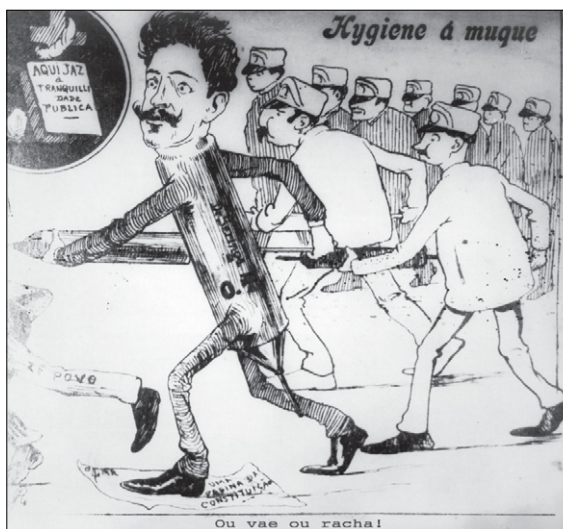


Figure 3: Oswaldo Cruz depicted in a campaign for smallpox vaccination

then-illegal left-wing political parties. The Brazilian health reform movement's political and ideological viewpoint was of health not as an exclusively biological issue to be resolved by medical services, but as a social and political issue to be addressed in public.^{37,40}

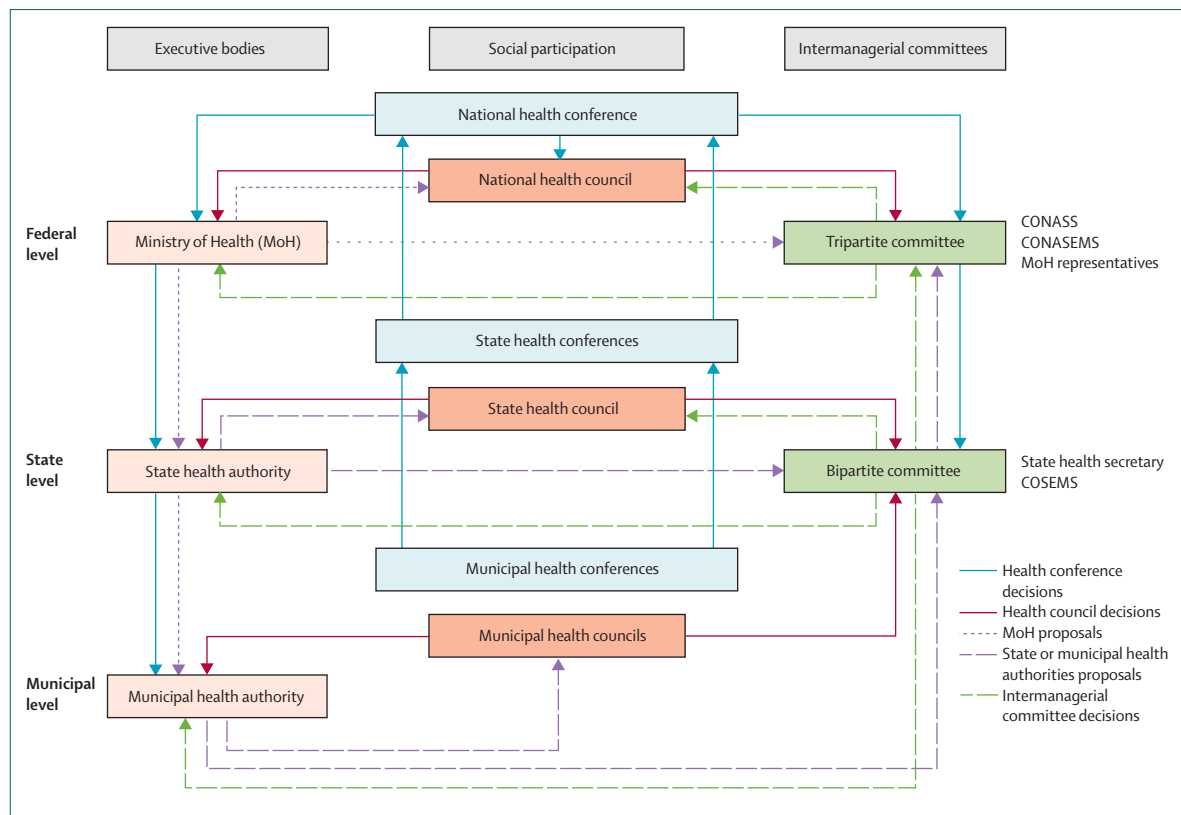


Figure 4: SUS policy-making and social participation process

CONASS=national council of state officers. CONASEMS=national council of municipal health secretaries. CONSEMS=state council of municipal officers. Data from reference 47.

Progressive public health professors, researchers from the Brazilian Society for the Advancement of Science, and health professionals engaged with grassroots and trade union struggles. The Brazilian Health Studies Centre (CEBES) was founded in 1976 to organise the health reform movement, and in 1979 the Collective Health Postgraduate Association (ABRASCO) was formed. Both organisations provided an institutional basis for leveraging reforms.³⁷

The health reform movement spread and formed an alliance with progressive members of congress, municipal health, and other social movements. Meetings of municipal health officers were held from 1979 onwards, and in 1980 the National Council of State Officers (CONASS) was constituted.²⁹

In 1986, the 8th National Health Conference approved health as a citizen's right, laid out the foundations of the SUS, and resulted in the development of several strategies that allowed for coordination, integration, and resource transfers between federal, state, and municipal health institutions, administrative changes that set the groundwork for future actions by the SUS. Then, during the National Constituent Assembly (1987–88) the health reform movement and its allies secured approval for reform, despite strong opposition

from a powerful and mobilised private health sector (figure 2).^{37,41} The 1988 constitution was proclaimed at a time of economic instability, with social movements on the retreat, neoliberal ideology spreading, and workers losing purchasing power. At the same time as this reform, private health companies were reorganising to meet the demands of new clients, receiving financial support from the government, and consolidating private health sector investments.⁴²

The present Brazilian health system

The Brazilian health system is made up of a complex network of complementary and competitive service providers and purchasers, forming a public–private mix that is financed mainly by private funds. The health system has three subsectors: the public subsector (SUS), in which services are financed and provided by the state at the federal, state, and municipal levels, including military health services; the private (for-profit and non-profit) subsector, in which services are financed in various ways with public or private funds; and the private health insurance subsector, with different forms of health plans, varying insurance premiums, and tax subsidies. The public and private components of the system are distinct but interconnected, and people can

use services in all three subsectors, depending on ease of access or their ability to pay.

The public health-care subsystem

Implementation of the SUS began in 1990, the same year as the investiture of Fernando Collor de Mello, the first president elected by popular vote since the military dictatorship, who pursued a neoliberal agenda and would not commit to the health sector reform. Nonetheless, in 1990, a framework health-care law (Law 8080/90) was approved, specifying the attributions and organisation of the SUS. The health sector reform project was revived in 1992 after the President's impeachment for corruption. Decentralisation was reinforced⁴³ and the Family Health Programme (PSF) was launched. A new economic stabilisation plan (The Real Plan) was introduced in 1994, outlining macroeconomic adjustment policies and projects for state reform.⁴⁴ President Fernando Henrique Cardoso was elected to office in 1994 (and was re-elected in 1998) and further encouraged macroeconomic adjustment and privatisation processes. President Luiz Inácio Lula da Silva (elected in 2002 and re-elected in 2006) maintained some aspects of his predecessor's economic policy, but suspended privatisation and, in his second term, favoured a developmental agenda.

Although health sector reform became less of a political priority during the 1990s, various initiatives were undertaken, including development of a national HIV/AIDS prevention and control programme, increased tobacco control efforts, creation of the national sanitary surveillance agency, development of the National Supplementary Health Agency, and creation of a model of care for Indigenous health. The Mobile Emergency Care Service and the National Oral Health Policy (*Brasil Sorridente*), were initiatives, among many others, implemented after 2003, during the administration of President Lula (figure 2).

Decentralisation and participatory management

Decentralisation of the health system was linked to a wider process of political transition and the redesign of the Brazilian Federation, which was started by democratic political movements in the 1980s and later shaped by macroeconomic adjustment programmes. This new federative agreement gave more independence to municipalities but also expanded federal resources and oversight. Health was the only sector that pursued such radical decentralisation, largely because of federal financial and regulatory actions.

Decentralisation of the health system was the underlying rationale for implementation of the SUS and involved complementary legislation, new rules, and administrative reform at all levels of government. Bylaws passed by the Ministry of Health—designed to redefine responsibilities—established funding mechanisms (including the Primary Care Quota, a per-person

amount that the Ministry of Health transfers to municipalities to finance primary health care), and set up new representative councils and management committees at each level of government. Since 2006, some of these laws have been replaced by a less hierarchical agreement (the Pact for Health) in which managers in each level of government sign commitments to health goals and responsibilities.⁴⁵

To manage the decentralised policy, frameworks for government decision making were expanded, together with social participation and alliance-building between stakeholders.⁴⁶ In addition to the national health conferences, an innovative structure was institutionalised by setting up health councils and intermanagerial committees at both the state (bipartite) and federal (tripartite) levels. Bipartite and tripartite decisions are reached by consensus (figure 4).^{48–53}

These political structures were groundbreaking innovations in Brazilian governance because they enabled a greater number and variety of stakeholders to take part in the decision-making process and defined areas of institutional responsibility more clearly than before, guaranteeing that each level of government supports national health policy implementation.^{51,54–56}

The private health-care subsystem

Historically, state protection of the private sector in Brazil has fostered the privatisation of health care in medical practices and the creation of specialist diagnostic and therapeutic clinics, private hospitals, and private health insurance companies. The private health-care subsystem interfaces with the public sector by providing services contracted-out by the SUS, out-of-pocket hospital and ambulatory services, drugs, and private health plans and insurance. Part of this supply is financed by the SUS and the rest is financed by private sources. The demand for private health plans and insurance is mostly from employees of public and private companies that offer private health plans and insurance coverage.

In 1998, 24·5% of Brazil's population had health insurance—18·4% had private insurance and 6·1% had insurance for civil servants. This proportion grew slightly to 26% in 2008, and, in 2009, resulted in revenues of R\$63 billion (about US\$27 billion). Private dental plans have grown substantially.⁵⁷

The private health plan and insurance market is concentrated in the southeast region, where 61·5% of health companies are based and 65·5% of all contracts are held.⁵⁸ Furthermore, of 1017 health-care companies, only a few dominate the market, with 8·2% of companies providing health plans and insurance policies to 80·3% of customers—many smaller companies are located on the edges of large cities and in small towns.

Most (77·5%) private plans and insurance policies (for both state-sector and private sector companies) are

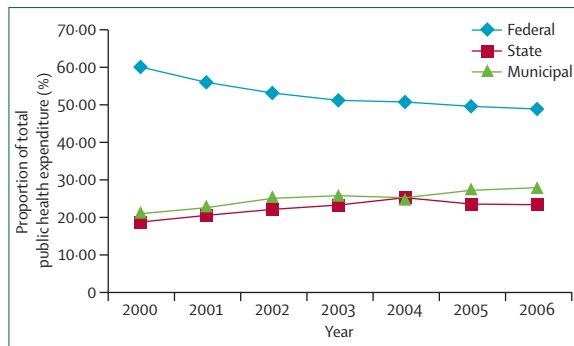


Figure 5: Public spending on health by level of government
Data from reference 7.

	R\$m (%)	% GDP
Taxes and social contributions	53 329 (39.05%)	3.14
Federal	27 181 (19.90%)	1.6
States	12 144 (8.89%)	0.7
Municipalities	14 003 (10.25%)	0.8
Private	83 230 (60.95%)	4.89
Family spending ^{66*}	65 325 (47.84%)	3.84
Employer company spending ^{60†}	17 905 (13.11%)	1.05
Total	136 559 (100%)‡	8.03

Data from references 6 and 7, unless otherwise stated. GDP=gross domestic product. *Estimated from the national household expense survey 2002–03 (corrected by the consumer-price inflation index). †Estimated from information on private health plan and insurance billing provided to the national health insurance regulatory agency. ‡GDP in 2006=R\$1.7 trillion.

Table 4: Estimated health spending in 2006

provided by commercial firms. Some employers who offer health plans to their employees (self-insured employer health plans) make up the non-commercial segment of the market.⁵⁹ Private health plans have been able to enrol a younger, healthier population² and offer plans with different levels of choice and type of health-care provider. Because demand is stratified by socioeconomic and occupational status, the quality of care and amenities available to employees of the same company can vary substantially, from executive-type plans that offer the best services³⁴ to less-costly plans available to employees lower in the occupational hierarchy.

People with private health plans or insurance policies report having better access to preventive services and higher health-care use rates than do those without such plans or policies (table 3).² However, people with private health plans and insurance policies often receive vaccines, high-cost services, and complex procedures such as haemodialysis and transplants through the SUS.⁶⁰

The National Supplementary Health Agency was created in 2000 to provide legal and administrative regulation of the private health insurance market.

Law 9656/98 made it illegal for insurance companies to deny coverage to patients with pre-existing disorders or to set limits on the use of specific health-care services or procedures. The continuous expansion of the private subsector is subsidised by the state, while the public subsector is often underfunded, which potentially compromises its ability to guarantee quality of and access to care.⁶¹

Health system components

The SUS is tasked with undertaking health promotion, health surveillance, vector control, and health education, and with ensuring continuity of care to all Brazilians at the primary, specialist outpatient, and hospital levels.

Financing

The Brazilian health system is financed through taxes, social contributions (taxes for specific social programmes), out-of-pocket spending, and employers' health-care spending. Funding for the SUS comes from tax revenues and social contributions from the federal, state, and municipal budgets. Other sources of funding are private—ie, out-of-pocket and employer spending. Funding for the SUS has not been sufficient to ensure adequate or stable financial resources for the public system. Because social contributions have been larger than contributions from taxes, which are divided between federal, state, and municipal governments, the SUS has remained under-financed. In 2006, revenue from social contributions (17.7%) was greater than revenue from taxes (16.7%). At the federal level, social contributions are about 60% of overall revenue from levies and less than 30% of tax revenue.⁶² Furthermore, the federal government receives 58% of tax revenues, whereas state governments receive 24.7% and municipalities receive 17.3%.⁶²

Even proceeds from a social contribution introduced in 1997 specifically for health funding (the Provisional Contribution on Financial Transactions) are channelled away from the health sector: in 2006, the health sector received only about 40% of the R\$32 090 billion (US\$ 13 645 billion) raised by the Provisional Contribution on Financial Transactions⁶³—a substantial proportion of the remaining funds went towards paying interest and public debts.⁶⁴ In 2007, this social contribution was repealed and the amount previously planned for health spending has not been replaced. Since 2007, reductions in the federal share of SUS financing have been only partly balanced by increased state and municipal health spending (figure 5).

Federal spending on health care since 2003 increased in nominal terms, but adjustment for inflation shows a net decrease (table 1). So in 2007, only 8.4% of the gross domestic product was spent on health care. In 2007, the public share of health spending was 41%,⁸ which is low when compared with such spending in countries like the UK (82%), Italy (77.2%), and Spain (71.8%), and is also lower than countries such as the USA (45.5%) and

Mexico (46.9%).⁶⁵ Private sources of finance—direct spending by families and companies, with direct and indirect government subsidies—fund most private health care plans, insurance policies, and drug purchases (table 4). Out-of-pocket spending as a proportion of total spending varies little between the poorest (5.83%) and wealthiest (8.31%) classes. However, differences exist in how each group spends these funds; the poorest spend most on medications, whereas the richest spend most on private health plans and insurance (figure 6).

The SUS has thus done less to increase public funding for people's health care needs than was envisaged when it was set up with the aim of establishing a universal and equitable health system in Brazil funded with public resources. National Household Survey (PNAD) data² show that, in 1981, 68% of total health services provided in the month before the survey were paid for by public funds, 9% by private health plans or insurance policies, and 21% by out-of-pocket spending. By 2003, the proportion of health service consumption paid for by public funds fell to 56%, and remained at that level in 2008. However, contribution by health insurance companies has become much greater (21% of total spending in 2008), with the volume of services paid for by this sector increasing by 466% from 1981 to 1998. The proportion of spending from out-of-pocket payments has increased steadily from 9% in 1981 and 1998, 15% in 2003, and 19% in 2008. In 1981, the social security system paid for 75% of hospital admissions, whereas in 2008 the SUS paid for only 67%. In 1981, 6% of hospital admissions were paid for by private health plans, a proportion that rose to 20% by 2008. The proportion of hospital admissions paid for out of pocket (about 10% in 2008) has remained constant since 1981.

Organisation and delivery of health services

Primary care

The development of primary health care, or basic care as it is called in the SUS, has been the subject of much attention in Brazil. Driven by the decentralisation process and supported by innovative programmes, the primary health care model aims to provide universal access and comprehensive health care, coordinate and expand coverage to more complex levels of care (eg, specialist care and hospital care), and implement intersectoral actions for health promotion and disease prevention. Several financial (eg, the Primary Care Quota) and organisational strategies have been used to meet this challenge, notably the Community Health Agents Programme and the PSF. The PSF and the Community Health Agents Programme were part of the government's strategy for restructuring the primary health care and the SUS health-care models. Initially introduced as a vertical programme that offered mainly maternal and child health services to more needy or at-risk populations,

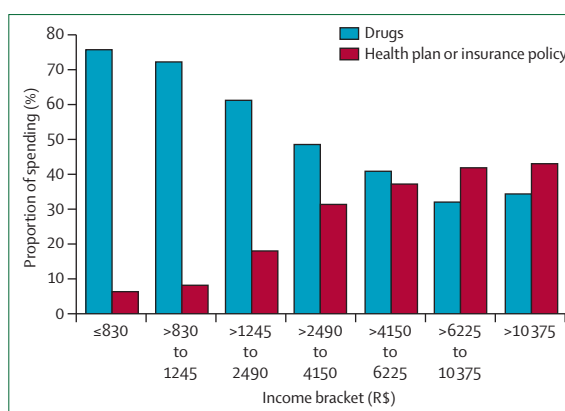


Figure 6: Out-of-pocket health spending

Data from reference 7.

since 1998 the PSF has been the main strategy for structuring municipal health systems. An innovative feature of the PSF is its emphasis on the reorganisation of primary clinics to focus on families and communities and integrate medical care with health promotion and public health actions.

The PSF works through family health-care teams—which are composed of one doctor, one nurse, one auxiliary nurse, and four to six community health workers—and, since 2004, the PSF has begun to include oral health teams, of which there were 17 807 in 2009.⁶⁷ Family health teams are located at PSF clinics, and are assigned to specific geographical areas and defined populations of 600–1000 families. The teams provide a first point of contact with the local health system, coordinate care, and work towards integration with diagnostic, specialist, and hospital care. Health services and health promotion activities take place at health facilities, in patients' homes, and in the community. The PSF has expanded substantially; in 2010 there were roughly 236 000 community health workers and 33 000 family health-care teams, reaching about 98 million people in 85% (4737) of municipalities in Brazil.

The trend towards the setting up and strengthening of regulatory structures in municipal health secretariats and family health clinics, although in its early stages, has been strongly influenced by the expansion of the PSF. Municipalities have invested in decentralised and computerised regulatory systems, which has meant that some of them can monitor waiting lists for specialised care, increase service supply, introduce clinical guidelines, and use electronic medical records as strategies for integrating primary health care with the network of specialised services. The Ministry of Health has also introduced evidence-based clinical guidelines for the management of chronic disease.⁶⁸

Investments in primary health care have brought about some positive results. In 2008, primary care was reported as the usual source of care for most Brazilians

	1970 ²	1980	1990	2000	2010 ³
Services					
Health posts and health centres	2149	8767 (1981)	19839	..	41 667
Public (%)	..	98.9	98.3	..	98.7
Specialist outpatient clinics	..	6261	8296	..	29 374
Public (%)	..	53.9	20.6	..	10.7
Polyclinics	32	..	..	..	4501
Public (%)	26.0
Diagnosis and therapy centres	4050 (1992)	7318 (1999)	16 226
Public (%)	5.4	4.9	6.4
General and specialised emergency units	100	292 (1981)	286	..	789
Public (%)	..	43.5	65.7	..	77.9
Hospitals	3397 (1968)	5660 (1981)	6532	7423 (2002) ⁵	6384
Public (%)	14.9	16.4	21.1	34.8	31.90
Equipment					
Mammography machines (n)	1311 (2006)	1753
Public (%)	25.9%	28.4%
Radiography machines (n)	13 676	15 861
Public (%)	54.3%	58.9%
CT scanners (n)	952	1268
Public (%)	22.4%	24.1%
MRI scanners (n)	212	409
Public (%)	14.6%	13.4%
Ultrasound devices (n)	6789	8966
Public (%)	48.9	51.0
Family health teams¹²					
Community health workers (n)	78 705 (1998)	134 273	244 000 ⁸²
Family health teams (n)	3062	8503	33 000
Health workers in oral health teams (n)	0	0	17 807 (2008)
Data are from reference 1, unless otherwise stated. The year in which data is from is given in parentheses if not from the year in the column heading. ..=data not available.					
Table 5: Supply of services, equipment, and human resources, 1970–2010					

(57%, up from 42% in 1998), whereas the proportion of people who reported hospital outpatient departments as their usual source of care decreased from 21% to 12% in the same period.² Some users of the family health-care clinics reported that referrals to secondary care services are more effective when the referrals come from the family health-care teams, and that waiting times were shorter than with referrals from other sources.⁶⁹ However, a substantial proportion still sought specialised services without a referral from primary care.⁶⁹

Use of PSF services is also associated with improvements in some health outcomes, such as lower post-neonatal infant mortality rates (largely attributable to a reduction of deaths from diarrhoeal disease and lower respiratory tract infections).^{70–72} This effect is more pronounced in municipalities that are capable of taking over outpatient service management from the federal or state governments.⁷³ Health system benefits include improvements in the reporting of vital statistics and reductions in potentially avoidable hospital admissions, which have decreased by almost 15% since 1999.^{74–76}

Even though the number of temporary labour contracts has decreased, the primary care workforce still has high turnover, mainly because of differing wage structures and employment contracts offered by different municipalities.⁷⁷ Expansion and consolidation of the PSF is further complicated by the presence of many traditional primary care facilities that were established before the PSF,⁷⁸ which are often in the same geographical areas as PSF clinics. Generally, these two distinct models of care are not integrated and the population resorts to one service or the other, according to ease of access and convenience.⁷⁸ In 2010, 15% of municipalities did not have PSF teams.⁶⁷ There is also little investment into the linking of primary care with other levels of care; the supply of specialist and other care is further weakened by the poor integration of municipal-level and state-level providers, especially in the provision of diagnostic examinations. Municipal-level management capabilities are often poor, as is national regulation. Such drawbacks prevent the primary health-care model from fully meeting its objectives⁶⁹ and draw attention to the continually evolving nature of

strategies such as the PSF. To address concerns and improve service access and quality, the government launched the national primary care policy in 2006 and created family health support teams in 2008. These multiprofessional teams partner with the PSF to expand the coverage and scope of primary health-care actions and to support the development of regional referral networks.

Secondary care

Provision of secondary care by the SUS is problematic, because service supply is restricted and often given preferentially to individuals with private health plans.⁷⁹ Secondary care has little regulation and medium-complexity procedures are often neglected in favour of high-cost ones.⁸⁰ The SUS is highly dependent on contracts with the private sector, especially for diagnostic and therapeutic support services;⁶⁹ only 24.1% of CT scanners and 13.4% of MRI scanners in Brazil are public, and access is patchy.⁸¹

However, policies to improve supply have led to an increase in specialist outpatient procedures in the SUS in the past 10 years.⁶¹ In 2010, such procedures accounted for about 30% of outpatient visits (table 5).

Furthermore, the Psychiatric Reform Law was passed in 2001 to deinstitutionalise and reinforce the rights of individuals with mental illness, and led to the introduction of outpatient services, such as psychosocial care centres and psychosocial support and rehabilitation for those leaving psychiatric hospitals. The law has led to a reduction of 20 000 psychiatric hospital beds between 2001 and 2010.⁸³ The number of community-based psychosocial care centres has more than tripled (from 424 to 1541) and the number of therapeutic services has increased by five times (from 85 to 475) since the passing of the psychiatric law (figure 2).^{84,85}

The secondary care system has also seen the introduction of specialised centres for dental care, counselling for HIV/AIDS and other sexually transmitted diseases, and workers' health and rehabilitation services. 24 h emergency care clinics were introduced in 2008 to relieve demand on hospital emergency departments. They coordinate with the emergency mobile care service, assisting people on the street, at home, and at work, with ambulances with basic or advanced support, helicopters, boats, and even motorcycles. By May, 2010, there were 391 emergency care clinics, and the emergency mobile care service was present in 1150 municipalities, covering 55% of Brazil's population.⁸⁴ In 2008, the SUS provided 74% of all emergency home care assistance.²

During the health sector reform, the trend has been to structure parallel subsystems in the SUS to respond to specific needs, which leads to difficulties in coordination and continuity of care (panel 1). In 2007, the Ministry of Health set up a department that is responsible for the integration of primary care with

Panel 1: Additional health services and agencies

- The National Indigenous Health Policy, formulated in 1996 but not operationalised until the 1999 Arouca Law⁸⁶ defined 34 special sanitary districts, provides primary health care to Indigenous populations through multidisciplinary health teams and is organised in conjunction with the PSF.
- The National Transplant System is one of the largest public organ transplant systems in the world.⁸⁷ In 2009, 5834 solid organ transplants were done in Brazil, representing an increase of 62% since 2000.^{88,89}
- The National Health Promotion Policy is designed to promote quality of life and reduce individuals' vulnerability to health risks that are connected with social determinants.
- The Ministry of Health has encouraged integration of the Health Surveillance Secretariat and the National Sanitary Surveillance Agency to improve health promotion, epidemiological surveillance, environmental health, workers health, health surveillance, health situation analysis, and vital statistics.⁹⁰
- Specific policies and programmes ensure that care is provided to the black population,⁹¹ people with disabilities, people in need of emergency care, people with kidney⁹² and cardiovascular diseases,⁹³ people with mental health disorders, and people with oral health disorders, and improve access to pharmaceutical care for the entire population.

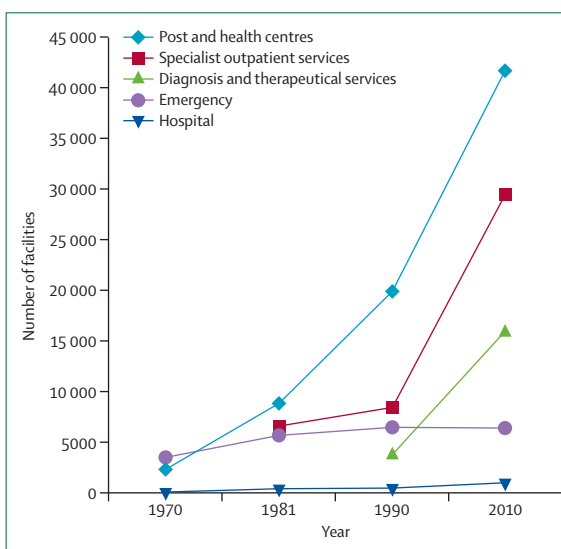


Figure 7: Type of health-care facilities in Brazil, 1970–2010
Data from references 21, 102, 103.

emergency and specialised care services and health surveillance actions, to foster improved clinical management, health promotion, and rational use of resources.⁹⁴

Panel 2: Human resources in the SUS

The 1988 Constitution assigned responsibility for the organisation of health worker training to the SUS

- The Nursing Staff Professional Training Project—Brazil's largest ever health training and technical capacity building project—employed 13 200 nurses to train 230 000 auxiliary nurses¹⁰⁶
- The Ministry of Health supports the academic boards of undergraduate health-care courses and public health schools to run internships and the Ministry of Education oversees the qualification of health personnel from the undergraduate level onwards
- The Ministry of Health provides financial incentives to higher education institutions to make curricular changes that favour primary care, in line with guidelines from the national board of education—more than 350 faculties (with more than 97 000 students) participate
- The SUS Open University, set up in 2008, comprises 12 public universities, two state health secretariats, and telemedicine units^{84,107,108}

Panel 3: Drugs, vaccines, and blood products

- The drug market in Brazil is dynamic. By 2013, the drugs market in Brazil is expected to be the 8th largest in the world. Between 1997 and 2009, revenue from drug sales grew at 11.4% per year (in current value), totalling R\$30.2 billion (US\$17.6 billion), 15% of which was from the sale of generic drugs.
- The National Listing of Essential Medicine ensures access to and rational use of drugs, resulting in increased public spending, improved access to drugs, and a successful generic drugs policy,¹¹² although universal access to pharmaceuticals has not been achieved.¹¹³
- The Ministry of Health has promoted the production of generic drugs and seeks to reduce the importation of other drugs by strengthening Brazilian drug companies to produce 20 products essential to the SUS within Brazil by 2013. The antiretroviral zidovudine has been produced in Brazil since 1994 and laboratories have produced efavirenz since 2007.
- The outlook for vaccines is promising. Brazil has exported yellow fever and meningitis vaccines. In 2007, 83% of vaccinations in Brazil used vaccines that were produced nationally.
- In 2014, Hemobras (a blood product manufacturer) will produce albumin and other essential blood products at costs lower than the price of imported products.
- There are 79 010 commercial drugstores and pharmacies in Brazil.

Tertiary and hospital care

Tertiary care includes some high-cost procedures, which are done predominantly by contracted private sector providers and public teaching hospitals, and are

paid for by the SUS at about market value.⁸¹ As in many health systems around the world, the Brazilian health system's challenges include the control of costs, improvement of efficiency, assurance of quality and safety, provision of access to comprehensive care, coordination with primary health care, and inclusion of doctors in problem solving.^{2,95,96} The system is not organised into a regionalised network of services nationwide, and systematic, effective regulatory and referral mechanisms do not exist.⁹⁷ Specific policies for some high-cost care in the SUS do exist (eg, a system to manage waiting lists for organ transplants), and some specialties, such as cardiac surgery, oncology care, haemodialysis, and organ transplantation, are being organised into networks.

The Ministry of Health has attempted to organise networks by strengthening the PSF and implementing Integrated Health Care Territories.⁹⁴ However, structural, procedural, and political obstacles, such as power differentials between network members, low levels of accountability, administrative discontinuities, and politically-motivated managerial turn-over, could compromise the effectiveness of such initiatives.^{22,97-99} In the private sector, the managed care model was adopted by only a few private health plan companies, along with a care model centred on individual demand rather than on population-based health promotion strategies.

The likelihood of a patient being admitted to hospital increases with the availability of beds and primary care clinics and decreases with the distance between the municipality in which the patient lives and the municipality in which care can be provided.¹⁰⁰ This situation is cause for concern, because one in five hospital admissions in the SUS are to hospitals outside of the patient's home municipality. Accordingly, residents of poor municipalities are less likely to be admitted to hospital than are residents of wealthier ones, which calls for policies to not only regionalise capacity and guarantee the transportation of patients to hospital, but to also change models of care to reduce such inequalities in access to hospitals. Regulation of the SUS has been influenced by various interest groups, from the private sector to advocacy groups associated with the sanitary reform movement.¹⁰¹ Unfortunately, existing regulatory mechanisms are not yet sufficiently robust to allow major changes to the historical patterns of hospital medical care.

Infrastructure (supply)

Primary care clinics and emergency units are mainly public, whereas hospitals, outpatient clinics, and diagnostic and therapeutic services are mainly private. In 2010, only 6.4% of diagnostic and therapeutic services were public. Between 1968 and 2010, 39 518 primary care clinics (health posts and health centres) were set up. In the past 10 years the model of care has changed, with increases in specialist outpatient services (29 374 clinics

in 2010) and diagnostic and therapeutic support services (16 226 in 2010; table 5). Between 1990 and 2010, the number of hospitals—especially private hospitals—has decreased (figure 7).

Brazil has 6384 hospitals, 69·1% of which are private. Only 35·4% of hospital beds are in the public sector—38·7% of beds in the private sector are available to the SUS through contracts.²¹ A quarter of public hospitals are controlled by municipal governments. After decentralisation, many new hospitals were set up, averaging 35 beds each. As a result, about 60% of hospitals have 50 or fewer beds.¹ These new, small hospitals—mainly municipal and for-profit hospitals—tend to be less effective and less efficient than larger, hospitals.¹⁰⁴ At the other extreme, in 2005, there were 67 hospitals with more than 400 beds, mostly in the wealthiest (southeast) region of Brazil. The north region has no hospitals with more than 400 beds, but contains 9·5% of smaller hospitals.¹⁰⁵

Supply of hospital beds financed by the public sector is not sufficient. In 1993, Brazil had an inpatient bed density of 3·3 beds per 1000 population, this number has decreased to 1·9 beds per 1000 population in 2009, which is lower than that of all countries in the Organisation for Economic Co-operation and Development, apart from Mexico (1·7 per 1000 population in 2007).⁶⁵ The number of health professionals has, however, increased substantially in the past 10 years. In 2007, there were 1·7 doctors per 1000 population, although geographical distribution was uneven.³ There were also 0·9 nurses and 1·2 dentists per 1000 population, with a distribution much the same as that of doctors. Private universities have played an important role in the increase in number of health professionals by offering many undergraduate places in health profession courses, especially in nursing courses. Between 1999 and 2004, the number of nursing graduates increased by 260% (table 5; panel 2).¹⁰⁹

In 2005 the public sector provided 56·4% of employment in Brazilian health care, mostly at the municipal level (38·8%). Doctors accounted for 61% of the jobs, nurses accounted for 13%, and public health specialists accounted for only 0·2%.⁹

In the 1970s and 1980s some of Brazil's most important health information systems were set up, including the SUS Hospital Information System. The Mortality Information System was introduced in 1975, and, in 1990, the Live Births Information System was launched to provide standardised data collection procedures at all hospitals—by 2002 it included data for 86% of all livebirths.¹¹⁰ More effective policies are needed to improve the coverage and quality of health information systems and administrative data, which, at present, vary substantially across health information systems.¹¹¹

Brazil has some prestigious research institutes, such as the Oswaldo Cruz Foundation (FIOCRUZ) and several world-class public universities. Research and technology

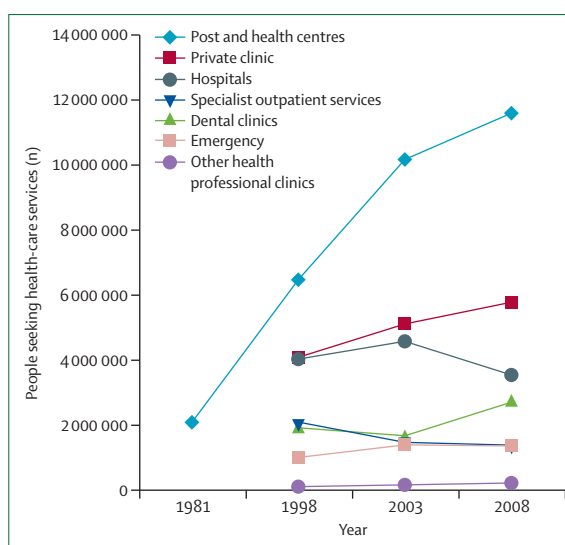


Figure 8: Health service demand by service type
Data from reference 1.

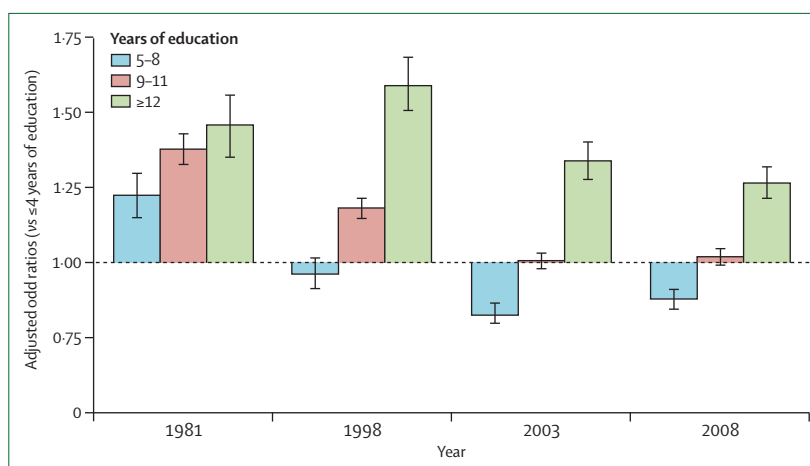


Figure 9: Health-care service use in the previous 2 weeks, by level of education and year

are supported by the Ministry of Health's Science and Technology Department and the National Scientific and Technological Development Council, which fosters health research and the incorporation of new technologies by the SUS and the health industry with a view to strengthening Brazil's pharmaceutical and equipment industry (panel 3).

Access to and use of health care

Access to health care in Brazil improved substantially after the creation of the SUS. In a PNAD survey done in 1981, before creation of the SUS, 8% (9·2 million people) of the population reported use of a health service in the previous 30 days, whereas, in 2008, 14·2% (26 866 869 people) of the population reported such use in the previous 15 days, representing a 174% increase in health-care service use.² The number of people seeking primary health care in clinics increased by about 450%

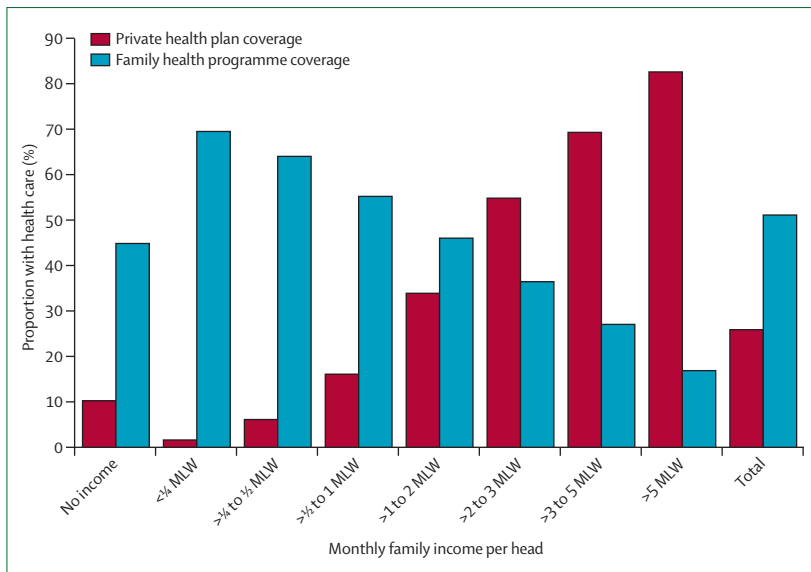


Figure 10: Health-care cover by financial income, 2008
Data from reference 2. MLW=minimum legal wage.

between 1981 and 2008 (figure 8). This increase was mainly attributable to a substantial increase in the size of the health workforce and the number of primary care clinics. In 1998, 55% of the population consulted a doctor and that figure rose to 68% in 2008. However, this number is low compared with such proportions in more developed countries, which range from 68% in the USA to more than 80% in countries such as Germany, France, and Canada.¹¹² In 2008, 76% of individuals in the highest income group reported visiting a doctor, compared with 59% of individuals in the lowest income group, which shows that socioeconomic inequity exists.² Such inequity does not exist among people who self-rate their health as poor,¹¹⁴ indicating that people with serious health disorders are able to seek health care and receive treatment, irrespective of their socioeconomic class.

In 2008, 93% of people seeking health care received treatment, suggesting that health care is available to most when needed, and that the recorded social inequities may in fact be because of differences in health-seeking behaviour. Perhaps people in lower income groups delay the decision to seek health care because of negative experiences in getting the care they needed or with the care they received, or because of other factors such as inability to miss work.¹¹⁵

Educational inequities in health care service use are steadily decreasing (figure 9). Although health service use varies widely between people who have private health insurance and those who do not, the difference between these two groups of people is also decreasing—in 1998, people with private health plans were 200% more likely to use a health service when in need than were people without such plans, but only 70% more likely in 2008.²

In 1981, only 17% of Brazil's population had consulted a dentist, and little had changed by 1998, when nearly 30 million people (19% of the population) declared that they had never been to a dentist.² In 2000, financing for oral health workers for the PSF began and, by 2008, 40% of the population reported having visited a dentist in the previous year—only 11·6% reported having never visited a dentist.² However, major socioeconomic inequities exist; in 2008, 23·4% of people in the lowest income group, compared with only 3·6% of those in the highest income group, had never consulted a dentist.² Socioeconomic disparities exist between individuals covered by private health insurance plans and those covered by the PSF (figure 10), which indicates that rich and poor populations receive different standards of care in the Brazilian health system.

Set up in 1973, the National Immunisation Programme stands out as one of Brazil's most successful public health programmes, as shown by its high vaccination coverage and sustainability—vaccines are supplied by the National Self-Sufficiency Programme in Immunobiologicals, which guarantees free access and high coverage. There have been no cases of poliomyelitis in Brazil since 1989, nor measles since 2000 (table 3).¹¹⁶

Despite an increase in population size and substantial population ageing, hospital admission rates for most disorders (about seven admissions for all disorders per 100 population) did not change between 1981 and 2008.³ The number of admissions financed by the public sector decreased during the same period. In 1982, the social security system financed 13·1 million admissions per year—a number that decreased to 11·1 million (financed by the SUS) in 2009. Admission rates are consistently higher for people with private health insurance (about eight admissions per 100 population) than they are for those without (table 1). The Ministry of Health has restricted hospital spending by each state, limiting hospitalisation payment according to population size, which could partly explain reduced access to hospital care and could have resulted in the underuse of hospital care by individuals who depend on publicly funded services.¹¹⁴

Despite growing awareness of the importance of quality of care in Brazil, much progress is still needed to ensure consistently high standards of care. The Ministry of Health and the national sanitary surveillance agency promote WHO initiatives to ensure the safety of patients, but adherence by services is low. For example, preventable adverse events in hospitals are very high (67% of all adverse events were thought to be preventable).^{94,115} The high frequency of adverse drug events is also a cause for concern,¹¹⁷ as is the frequency of nosocomial infections.¹¹⁸ Only a small proportion of health services have received accreditation. Highly skilled health professionals and high-quality health services do exist, but coherent ministerial policies for quality improvement and enforcement are lacking. As a

result, a few states (eg, São Paulo, Minas Gerais⁶) and municipal health secretariats have developed their own approaches to improve quality.

The Ministry of Health's National Humanisation Policy¹¹⁹ and the Code of Medical Ethics reinforce patients' rights¹²⁰ and reduce instances of discrimination, but improvements (such as new policies) are needed to guarantee better quality care, the safety of patients, and patients' rights in Brazilian health services.

Conclusions

The 1988 Brazilian constitution recognised health as a citizen's right and a duty of the state, and established the basis for the creation of the SUS, which was based on the principles of universality, integrality, and social participation. Such constitutional recognition of health care was made possible after lengthy political struggles and the actions of the Brazilian Health Reform Movement. The implementation of a universal health system in Brazil began in an unfavourable political and economic climate, which promoted a neoliberal rather than a universal approach—a perspective that was reinforced by international organisations that argued against publicly financed national health systems or advocated for intermediate stages to achieving it.

During the past 20 years advances have been made in the implementation of the SUS. Institutional innovations were introduced, including a substantial decentralisation process that granted municipalities greater responsibility for health service management and means by which to enhance and formalise social participation in health policy making and accountability. In this report we have shown how the SUS has vastly increased access to health care for a substantial proportion of the Brazilian population, achieved universal coverage of vaccination and prenatal care, enhanced public awareness of health as a citizen's right, and invested in the expansion of human resources and technology, including production of most of the country's pharmaceutical needs.

However, the SUS is a health system under continual development that is still struggling to enable universal and equitable coverage. As the private sector's market share increases, interaction between the public and private sectors are creating contradictions and unfair competition, leading to conflicting ideologies and goals (universal access vs market segmentation), which has a negative effect on the equity of health-care access and outcomes. Although federal funding has increased by about four times since the start of the past decade, the health sectors' share in the federal budget has not grown, resulting in constraints on financing, infrastructure, and human resources.

Further challenges arise from the changing demographic and epidemiological characteristics of the Brazilian population, which necessitate transition from a model of acute care to one based on intersectorial

health promotion and health service integration. The Pact For Health and its proposed health-care network based on primary care, coupled with recommendations from the National Commission on Social Determinants of Health to address the upstream causes of ill health might help shape more comprehensive models of care, although they will have to overcome formidable challenges.

Ultimately, to overcome the challenges that Brazil's health system faces, a revised financial structure and a thorough reassessment of public-private relations will be needed. Therefore, the greatest challenge facing the SUS is political. Such issues as financing, composition of the public-private mix, and the persistent inequities cannot be solved in the technical sphere only. The legal and normative foundations have been laid and substantial operational lessons have been learned; the SUS must now be guaranteed its political, economic, and scientific and technological sustainability.

Contributors

JP and CT had the idea for the report and led the writing of the final version. CA, LB, and JM participated in the design of the report, data collection and analysis, and writing of the final version.

Conflicts of interest

We declare that we have no conflicts of interest.

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Health in Brazil 2



Maternal and child health in Brazil: progress and challenges

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In the past three decades, Brazil has undergone rapid changes in major social determinants of health and in the organisation of health services. In this report, we examine how these changes have affected indicators of maternal health, child health, and child nutrition. We use data from vital statistics, population censuses, demographic and health surveys, and published reports. In the past three decades, infant mortality rates have reduced substantially, decreasing by 5·5% a year in the 1980s and 1990s, and by 4·4% a year since 2000 to reach 20 deaths per 1000 livebirths in 2008. Neonatal deaths account for 68% of infant deaths. Stunting prevalence among children younger than 5 years decreased from 37% in 1974–75 to 7% in 2006–07. Regional differences in stunting and child mortality also decreased. Access to most maternal-health and child-health interventions increased sharply to almost universal coverage, and regional and socioeconomic inequalities in access to such interventions were notably reduced. The median duration of breastfeeding increased from 2·5 months in the 1970s to 14 months by 2006–07. Official statistics show stable maternal mortality ratios during the past 10 years, but modelled data indicate a yearly decrease of 4%, a trend which might not have been noticeable in official reports because of improvements in death registration and the increased number of investigations into deaths of women of reproductive age. The reasons behind Brazil's progress include: socioeconomic and demographic changes (economic growth, reduction in income disparities between the poorest and wealthiest populations, urbanisation, improved education of women, and decreased fertility rates), interventions outside the health sector (a conditional cash transfer programme and improvements in water and sanitation), vertical health programmes in the 1980s (promotion of breastfeeding, oral rehydration, and immunisations), creation of a tax-funded national health service in 1988 (coverage of which expanded to reach the poorest areas of the country through the Family Health Program in the mid-1990s); and implementation of many national and state-wide programmes to improve child health and child nutrition and, to a lesser extent, to promote women's health. Nevertheless, substantial challenges remain, including overmedicalisation of childbirth (nearly 50% of babies are delivered by caesarean section), maternal deaths caused by illegal abortions, and a high frequency of preterm deliveries.

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Introduction

In the past three decades, Brazil has undergone rapid changes in terms of socioeconomic development, urbanisation, medical care, and the health of the population. The first report¹ in this Series described how the country evolved in a few decades from a low-income, mostly rural country with multi-tiered health services to a middle-income, urban country with a unified health system. This report addresses how trends in maternal and child health were affected by such changes. We expand on a previous analysis of time trends in inequalities in maternal and child health in Brazil,² and discuss the health of pregnant women in the context of reproductive rights, which include the right to reproductive choice, safe motherhood, and sexuality without coercion.^{3,4} Our analyses focus on abortion, contraception, pregnancy, and delivery care (see panel 1 for data sources). Injuries (including sexual violence) and infectious and chronic diseases in women will be discussed elsewhere in this Series.^{18–20} The discussion of child health is restricted to children younger than 5 years, and focuses on infants because infant deaths account for 90% of all deaths of children younger than 5 years.²

Maternal and child health, which have improved with time, show how Brazil has evolved in terms of health systems, health conditions, and broader social

Key messages

- The health and nutrition of Brazilian children has improved rapidly since the 1980s. A key indicator of Millennium Development Goal 1 (a reduction in the number of underweight children by half between 1990 and 2015) has already been met and Millennium Development Goal 4 (a two-thirds reduction in mortality rate of children younger than 5 years by 2015) will probably be met within the next 2 years.
- Progress in maternal mortality ratios is difficult to measure because time trends are distorted by improvements in vital statistics, but evidence exists of a decrease in maternal mortality ratios in the past three decades. However, Millennium Development Goal 5 (a reduction in maternal mortality by three-quarters between 1990 and 2015) will probably not be met.
- Regional and socioeconomic inequalities in intervention coverage, nutrition, and health outcomes in Brazil have largely decreased.
- The main factors that drive such trends probably include improvements in social determinants (ie, poverty, education of women, urbanisation, and fertility), non-health-sector interventions (ie, cash transfers, water, and sanitation), and the creation of a unified national health system with geographical targeting for primary health care (giving previously underserved populations better access to health care), in addition to disease-specific programmes.
- Major challenges exist, including a reduction of the high frequency of caesarean section, illegal abortions, and preterm births, in addition to achieving further reductions in regional and socioeconomic inequalities in health.

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determinants, which are discussed elsewhere in this Series.^{1,19–21} In the past 50 years, Brazil has evolved from a predominantly rural society to one in which more than 80% of the population live in urban areas, fertility rates have decreased from more than six to fewer than two children per woman, primary education became universal, and life expectancy at birth has increased by about 5 years every decade.^{1,21} The proportion of all deaths due to infectious diseases decreased substantially—Brazil is successful in the control of vaccine-preventable diseases and HIV/AIDS.¹⁸

Brazilian health policies and systems have changed much in the past three decades.¹ In the late 1980s, a three-tiered health-care system with private, social security, and charitable institutions was replaced with a universal, tax-funded, national health system. Primary health care became the cornerstone of the system, and geographical targeting of care led to the setting-up of family health teams in the neediest areas of the country. At the same time, investments were made to improve human resources for health and scientific and technological development in the health sector.^{1,21} Since the 1990s, governmental policies have become increasingly focused on the provision of social

protection mechanisms—not only the well known conditional cash transfer schemes but also the promotion of social inclusion in all sectors of society. As a result of such changes, the long-standing and pronounced differences in access to health care that exist between the wealthy south and southeast regions and the poor north and northeast regions have decreased, as has the financial gap between the wealthiest and poorest families in Brazil.^{1,21}

Reproductive and maternal health

Maternal mortality constitutes a severe violation of the reproductive rights of women²² because most maternal deaths can be prevented with early and appropriate care.²³ Until the late 1970s, maternal health issues were not on the scientific or health policy agendas in Brazil. This soon changed after 1980, when several maternal health policies and programmes were implemented. These initiatives, in addition to broader social changes such as improvements in women's education, urbanisation, and the changing role of women in society (ie, women entering the labour market and having fewer children), positively affected sexual and reproductive indicators. Although most Brazilian women described their religion as Roman Catholics, in 2006, 78.5% of married women reported use of modern contraceptive methods, compared with only 57% in 1986. The total fertility rate decreased sharply from 6.3 children per woman in the early 1960s to 1.8 children per woman in 2002–06.¹² The reduction in fertility rate has been slower for adolescents than for older mothers—39 in every 1000 women aged 10–19 years gave birth in 2006, which was a slight reduction from 45 in 1996, and for girls aged 10–14 years the birth rate increased slightly from 3 to 4 per 1000 women in the same period.²⁴ More than 20% of all infants in Brazil are born to adolescent mothers.²⁴ Access to antenatal care and delivery in a health facility also increased rapidly (as discussed later in this report). Greater use of health care, however, was accompanied by overmedicalisation (caesarean sections, episiotomies, multiple ultrasound scans, etc). Caesarean sections and routine episiotomies are common.¹²

Caesarean sections

About 3 million births occurred in Brazil in 2007—89% were delivered by physicians and 8% by nurse-midwives (mostly in the north and northeast regions).¹² Almost half (47%) of all births were by caesarean section—caesarean sections constituted 35% of deliveries in the Unified Health System (SUS; in which three-quarters of all births take place) and 80% of deliveries in the private sector. 48% of women with first-time pregnancies gave birth by caesarean section.¹² Brazilian caesarean sections rates are substantially greater than the upper WHO-recommended limit of 15%,²⁵ and higher than has been reported in any other country.²⁶ Almost half (46%) of all

Panel 1: Data sources

Our review is based on data from four sources: vital statistics, national maternal and child health surveys, population censuses, and a review of published studies. The Ministry of Health created the Mortality Information System (SIM) in 1976⁵ and the Live Births Information System (SINASC) in 1990.⁶ These web-based systems allow data to be disaggregated at the level of the 27 states and 5564 municipalities. SIM provides information on the underlying cause of death and on demographic characteristics (age, sex, etc). On the basis of comparison of indirect mortality estimates from censuses and surveys, an estimated 89% of deaths at all ages are reported to SIM; for infant deaths, coverage was 72% in 2006, up from less than 60% in the early 1990s.⁷ Burials in unofficial cemeteries, for which a death certificate is not needed, result in under-reporting of deaths—in the northeastern region, slightly more than half of infant deaths are registered.⁷ SINASC provides a broad range of information, including characteristics of mothers, pregnancies, and deliveries, and has a national coverage of 92%. In the report we used child mortality estimates that are based on a combination of vital statistics for eight states with full coverage, and indirect estimates that are based on censuses and probability surveys for the other 19 states. National mortality rates were estimated with a combination of state-level estimates, weighted by the number of livebirths.⁸ For obtaining cause-specific death rates, we applied the proportions of registered deaths by cause—after exclusion of those that were ill-defined—to the estimated infant mortality rates. Further details of the data sources, methods, and ascertainment of causes of death are available elsewhere.^{2,9}

Population censuses took place in 1970, 1980, 1991, and 2000,¹⁰ and annual multipurpose national household surveys often include health information.¹¹ Dedicated maternal-health and child-health surveys were done in 1986, 1996, and 2006–07,^{12–14} providing indirect child-mortality estimates and data for coverage of maternal-health and child-health interventions. The 1996 and 2006–07 surveys also assessed child nutritional status. Additional anthropometric surveys were done in 1974–75¹⁵ and 1989.¹⁶ A comprehensive review of published studies, governmental websites, and documents from our personal libraries since 1980 helped identify additional publications on maternal and child health in Brazil and on their determinants.¹⁷

caesarean sections were scheduled, according to the mothers interviewed in the 2006 demographic and health survey.²⁷

Figure 1 shows caesarean section trends in the past four decades. Although different sources of data were used—the social security system for 1970–80,²⁸ the Live Births Information System⁶ from 1995 onwards, and information from the 1981, 1986, 1996, and 2006–07 national surveys—a clear upward trend exists. In only 8 years (2001–08) the caesarean section rate increased from 38.0% to 48.4%, and in several states vaginal births are outnumbered by caesarean sections.

Births by caesarean section are more frequent among women from higher socioeconomic groups, women with more years of schooling, and white women.^{30–32} The extent to which the increase in number of caesarean sections can be attributed to mothers' demand or to medical preference is a matter of much debate. In questionnaire-based studies,^{33,34} most mothers report a preference for vaginal delivery, but in-depth interviews³⁵ suggest a widespread belief that caesarean sections are a better form of delivery than vaginal birthing because they are less painful. In two private hospitals in Rio de Janeiro, 70% of 437 women stated at the beginning of their gestation period that they would prefer a vaginal delivery—at the time of labour, however, only 30% of women maintained their original preference and only 10% of births were delivered vaginally.³³ Similar findings have been recorded in other states.³⁶ Caesarean sections are often done during daytime hours on weekdays, which suggest that they are convenient for doctors to do. (Barros AJD, unpublished).

The increasing rates of caesarean sections in the past 40 years have worried public health professionals and feminist groups alike.³⁷ In the 1970s, when the preference for caesarean sections became more common, doctors and hospitals earned more from the social security system for a caesarean section than they did for a vaginal delivery, which contributed to the increasing frequency of caesarean sections.³⁸ In reaction to this upward trend, equal pay for all types of delivery was instituted from 1980, but this led to only a temporary halting of the increase in number of babies delivered by caesarean section.³⁹ Other government policies were launched in an attempt to control the growing number of surgical deliveries; in 1998, the SUS established a limit of 40% for the proportion of institutional deliveries that they would reimburse, and this limit was gradually reduced to 30% by 2000. In 2000, an agreement between state administrations and the Ministry of Health (Pact for the Reduction of Caesarean Sections) was signed that aimed to reduce the frequency of caesarean sections to 25% of all births by 2007. These policies had a notable effect because the proportion of all caesarean sections that were reimbursed by the SUS decreased from 32.0% in 1997 to 23.9% in 2000 (figure 1). However, the Pact's effect was short lived, especially in the private sector, and the rates

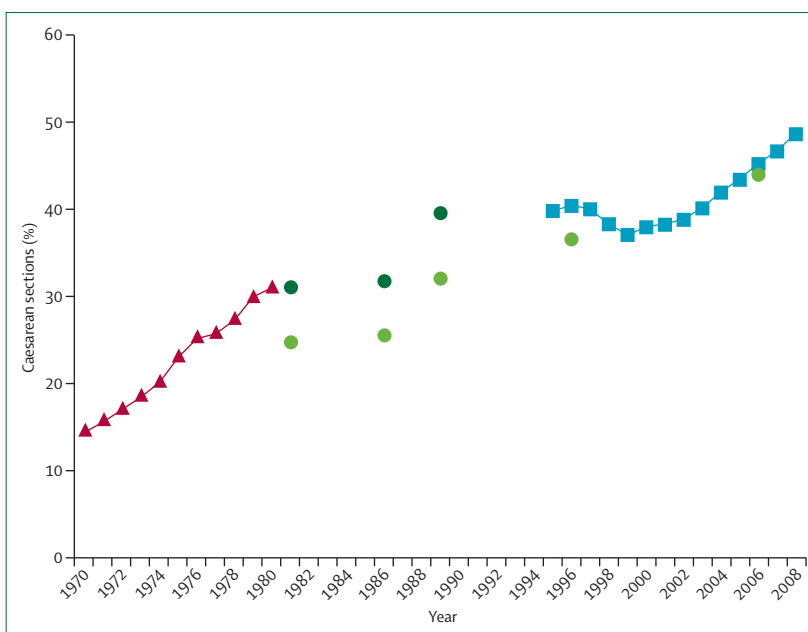


Figure 1: Caesarean sections in Brazil

Lines are data from hospital information systems (red line=social security;²⁸ blue line=live births information system⁶) and dots are data from national surveys^{27–14,16,29} (light green dots=% of all births; dark green dots=% of hospital births).

increased steadily after 2002. Women's movements have reacted strongly against overmedicalisation,³⁷ which has led to new policies such as the 2000 National Programme for the Humanization of Antenatal, Delivery and Post-Partum Care,⁴⁰ and the 2005 ruling that encourages the presence of a doula (an assistant who provides physical and emotional support) during labour in public hospitals.⁴¹ Despite evidence that caesarean sections, even if elective, are associated with increased maternal morbidity and mortality,^{42,43} there is no sign that the current upward trend is being stemmed.

Maternal mortality

Maternal mortality estimates in Brazil are affected by under-registration of deaths—especially in rural areas and small towns,⁷ where mortality ratios tend to be highest—and by under-reporting of maternal causes in registered deaths.² A reproductive-age mortality survey in all state capitals in 2002 estimated a maternal mortality ratio (MMR) of 54.3 per 100 000 population, ranging from 42 in the south region to 73 in the northeast region.⁴⁴ This survey showed that many maternal deaths had been overlooked by the vital registration system, being attributed to other causes.

As a result of a political movement to increase the awareness of maternal mortality, several initiatives have helped improve the reporting of maternal deaths, including compulsory investigations into deaths of women of reproductive age.⁴⁵ There are now maternal mortality committees in all 27 states, in 172 sub-state regions, and in 748 municipalities.⁴⁵ Such measures led

to improved detection and reporting of maternal deaths, but affects the interpretation of time trends and regional differences because the quality of reporting varies according to time and place. As of 2009, more than 40% of all deaths in women of reproductive age in the country were investigated. According to governmental statistics,⁴⁵ the maternal mortality ratio has been stable since 1996, at around 50 deaths per 100 000 livebirths. These estimates have not been corrected for changes in the proportion of deaths that are registered, nor for changes in the proportion of deaths of women of reproductive age that are investigated in detail.

Several alternative MMR estimates are available, with widely discrepant results.⁷ Two new sets of estimates were made available in 2010. Hogan and colleagues⁴⁵ predicted an MMR of 55 per 100 000 livebirths for Brazil in 2008, by use of a regression model based on total fertility rate, gross domestic product per head, HIV prevalence, neonatal mortality, and the level of a mother's education. The UN estimate a ratio of 58 maternal deaths per 100 000 livebirths for 2008,⁴⁶ with a model based on gross domestic product per capita, general fertility rate, and skilled birth attendance.⁴⁶ Annual reductions in Brazil's MMR were predicted by Hogan and colleagues (3·9% per year) and by the UN (4·0% per year), which are not surprising in view of the fact that there were favourable trends in these explanatory variables over time (as discussed later in this report).

According to the International Classification of Diseases,⁴⁷ the leading causes of registered maternal deaths in Brazil in 2007 were hypertensive disorders (23% of all maternal deaths), sepsis (10%), haemorrhage (8%), complications of abortion (8%), placental disorders (5%), other complications of labour (4%), embolism (4%), abnormal uterine contractions (4%), and HIV/AIDS-related disorders (4%). Other direct causes accounted for 14% of all deaths and other indirect causes for 17%. Abortion-related deaths are likely to be under-reported, as discussed later in this report.

Maternal deaths, however, are only part of the challenges facing the health of pregnant women. Obstetric complications are the leading causes of hospital admission for women of reproductive age, accounting for 26·7% of all admissions (total of 1060 538 admissions in 2008), second only to uncomplicated deliveries.⁴⁸ A nationwide study based on secondary data suggested that near-miss events (events in which a pregnant woman comes close to death but does not die) affect about 4% of all deliveries, especially those related to infection, pre-eclampsia, and haemorrhage.⁴⁹ This rate is about four times higher than such rates in developed countries.⁵⁰

What can be concluded about levels and trends in maternal mortality in Brazil? First, MMRs are still unacceptably high; even with under-registration, ratios are five to ten times higher than in high-income countries.^{51,52} Second, regional disparities are substantial, underlining the

socioeconomic differences and inequalities in access to health care that exist between the north and northeast regions and the south and southeast regions. Third, although the official MMR has been stable in the past 15 years, modelled estimates suggest that ratios are declining, but trend analysis is obscured because of improved surveillance. This finding would explain the apparent disconnect between time trends in the MMR and improved coverage with reproductive health indicators (table).

Illegal abortions

Induced abortions are illegal in Brazil, except for women who have been raped or when a pregnancy endangers a woman's life. Even for severe fetal malformations such as anencephaly, judicial authorisation is needed. The illegality of abortion has not stopped abortions from being done,⁵⁴ has contributed to unsafe practices, and has restricted the reliability of abortion statistics. In a 2010 national survey of urban areas, 22% of 2002 women aged 35–39 years reported having had an induced abortion.⁵⁵

Unsafe abortions are a major cause of morbidity. In 2008, 215 000 hospital admissions within the SUS were for abortion-related complications, of which only 3230 were for legal abortions. Assuming that one in every five abortions results in admission to hospital, this finding would suggest more than a million induced abortions are done in 2008 (21 per 1000 women aged 15–49 years).⁵⁶ In the same year, there were about 3 million births in the country,⁶ suggesting that one in four pregnancies was terminated.

Among all maternal causes of death, those caused by abortion-related complications are the least likely to be properly reported.⁵⁷ In the 2002 reproductive age mortality survey, 11·4% of all maternal deaths were a result of abortion-related complications.⁵⁸ Such deaths are unevenly spread in the population; reliable information on incidence is not available, but young, black, periurban, and poor women seem to be most commonly affected.^{55,59} Black women are three times more likely to die from unsafe abortions than are white women.⁵⁹ These inequalities arise from differentials in access to contraceptive methods—even though such discrepancies are decreasing over time²—and are compounded by hard-to-quantify factors such as intimate-partner violence.²⁰ National surveys in 1986, 1996, and 2006–07 recorded that about 20% of women with young children reported that their most recent pregnancy was unintended.

A variety of methods are reportedly used to induce abortions, ranging from dangerous methods used outside the health sector to safe procedures in illegal, private clinics. Misoprostol is widely available at low cost, and is often used to induce abortions in women who then go to government health facilities for curettage. In a national survey of urban areas, drugs were used to induce 48% of all reported abortions.⁵⁵

A heated political debate is underway in the Brazilian Parliament. On the one hand, there are projects aimed

	Before 1985	1986 ⁴⁴	1996 ⁵³	2006-07 ²²
Any contraceptive use in women living with their partner (%)	..	65.8%	76.7%	80.6%
Modern contraceptive use in women living with their partner (%)	..	57.0%	72.0%	78.5%
Pregnancy and delivery care (5 years before survey)				
Any antenatal care (% of all women)	74.7% (1981) ²⁹	74.0%	85.7%	98.7%
Antenatal care (>six visits; % of all women)	40.5% (1981) ²⁹	..	75.9%	80.9%
Started antenatal care during first trimester of pregnancy (% of all women)	..	..	66.0%	83.6%
Received ≥one dose of tetanus toxoid vaccine during pregnancy (% of all women)	..	..	58.5%	76.9%
Institutional delivery (%)	79.6% (1981) ²⁹	80.5%	91.5%	98.4%
Caesarean section delivery (%)	24.6% (1981) ²⁹	25.4%	36.4%	43.8%*
Vaccine coverage for children aged 12-23 months (informed plus confirmed doses)				
Measles vaccine (%)	16% (1975); ⁵³ 56% (1980) ⁵³	79.4%	87.2%	100%
Diphtheria, tetanus, and pertussis vaccine (%)	20% (1975); ⁵³ 37% (1980) ⁵³	68.9%	80.8%	98.2%
Other health-related indicators (all children younger than 5 years)				
Oral rehydration solution or recommended home fluids (%)	0% (not yet implemented)	10.9%	53.6%	52.1%
Received care for cough or fever (%)	..	..	18.2%	52.0%
Public water supply (%)	32.8% ⁸² (1975)	..	78.7%	81.8%

For the first column (Before 1985), the year in which data is from is given in parentheses. ..=data not available. *The survey-based estimate of caesarean sections is slightly lower than that reported by the Live Births Information System.

Table: Coverage of indicators for reproductive, maternal, and child health from national surveys

at expanding pro-choice rights, including the decriminalisation of abortion. On the other hand, however, some members of parliament are trying to pass laws that would make any type of abortion illegal, including those of pregnancies that are a result of rape and when fetuses have serious malformations. In the 2010 presidential campaign, the two leading candidates, including the newly elected president who pursued an otherwise progressive political agenda, expressed anti-abortion views. Nevertheless, there are early indications that a more liberal agenda will be pursued after the election, at the very least ensuring appropriate health care for women who underwent illegal abortions. Such anti-abortion views are common in countries with a Catholic majority, even though there has been substantial progress in other Latin American countries (eg, Mexico, where abortions are legal in the capital city). Epidemiological evidence on the social and health effects of illegal abortions should be used to refocus the debate on abortion, moving the discussion away from a purely moral perspective to focus on the sexual, reproductive, and health rights of women.

Child health

Unlike maternal health, the health of young children has been high on the political agenda for several decades. For example, the increase in infant mortality rates in some large cities during the 1970s—when the military regime was claiming record economic growth—was used by the democratic opposition as evidence that the so-called Brazilian economic miracle was failing to improve living conditions.⁶⁰ Greater awareness of the status of child health than of maternal health is probably because child health has historically been regarded as a general

indicator of living standards and is easier to measure than is maternal mortality.

Indirect estimates show a slight decline in infant mortality from 162 deaths per 1000 livebirths in 1930 to 115 deaths per 1000 livebirths in 1970¹⁰—about a 1% decrease every year. In the 1970s, the annual rate of reduction in infant mortalities increased to 3.2% a year, so that by 1980 the infant mortality rate was 83 deaths per 1000 livebirths. The yearly decrease accelerated after 1980s; deaths per 1000 livebirths were 47 in 1990, 27 in 2000, and 19 in 2007. The average annual rates of reduction were 5.5% a year in the 1980s and 1990s, compared with 4.4% between 2000 and 2008. Between 2000 and 2008, the yearly decrease in neonatal mortality (3.2% a year) was less than that for postneonatal mortality (8.1%); newborn deaths accounted for 68% of infant mortality in 2008. The median age of infant deaths in 1979 was 30 days, decreasing to 6 days in 2000 and to 3 days in 2007.⁶¹ Even though changes in registration and hospital deliveries can affect the median age at death, such a large decline is unlikely to be a result of reporting bias. National time-series data for birthweight-specific neonatal mortality are not available, but local-level studies have recorded pronounced improvements since the 1980s.⁶²

Mortality of children aged 1–4 years also decreased, from about six deaths per 1000 live births in 1990 to about three deaths per 1000 livebirths in 2000, and has remained stable since.² The leading causes of registered deaths in 2007 were injuries (21%), respiratory infections (15%), and other infectious diseases (such as diarrhoeal disease, sepsis, viral infections, and meningitis; 13%).⁵ Mortality rates in children aged younger than 5 years are

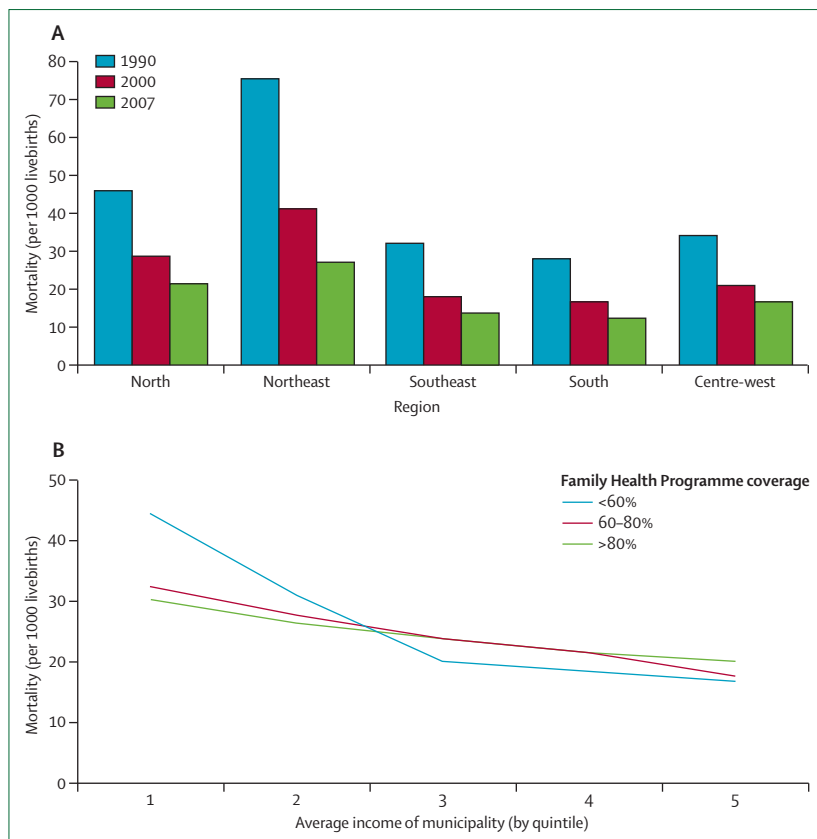


Figure 2: Infant mortality
 (A) Infant mortality by region and year.⁵ (B) Infant mortality between 2005–07 by municipality, according to average income (1=poorest; 5=wealthiest) and Family Health Programme coverage.

10% higher than infant mortality rates. As far back as data are available (the 1930s), the northeast region has had the highest rates of child mortality in the country. This region, however, has had the fastest yearly decrease in child mortality rates since 1990 (figure 2)—5.9% a year on average. In 1990, the infant mortality rate (IMR) in the northeast region was 2.6 times greater than in the south region; by 2007, its infant mortality rate was only 2.2 times greater than that of the south region—the difference in total deaths decreased even more rapidly, from 47 deaths per 1000 livebirths in 1990 to 14 deaths per 1000 livebirths in 2007. Pronounced differences in mortality rates also exist within urban areas, with higher rates in favelas, or slums, than in more wealthy neighbourhoods.⁶³

The narrowing of regional disparities was accompanied by a reduction in the difference in child mortality rates between families in the top and bottom wealth quintiles.² The difference in mortality rates between these two health quintiles decreased from 65 deaths per 1000 children in 1991 to 31 deaths per 1000 children in 2001–02. However, in 1991, the mortality rate for children younger than 5 years in the poorest quintile was 3.1 times higher than it was for children in the richest quintile, and this difference increased to 4.9 times higher in 2001–02.

These paradoxical findings—a reduction in absolute inequalities accompanied by an increase in relative inequality—are not uncommon,⁶⁴ often seen when mortality rates are falling in all socioeconomic groups, but show that there is still room for improvement among wealthier populations.⁶⁵

Ethnic group differentials in mortality are also pronounced. In 2000, mortality in children younger than 5 years was 44 deaths per 1000 black children and 29 deaths per 1000 white children.⁶⁶ In the south region of Brazil, mortality rates have decreased faster for white children than they have for black children since the 1980s.⁶⁷ In Rio de Janeiro, although all women are entitled to free delivery care in a hospital, black mothers have greater difficulty in being admitted to hospital (ie, having to visit more than one hospital before gaining access) and are less satisfied with the quality of delivery care they receive than are white mothers.⁶⁸

The largest decreases in cause-specific infant mortality in Brazil have been for deaths from diarrhoea, which decreased by 92% between 1990 and 2007, and deaths from respiratory infections, which decreased by 82% during the same period (figure 3). Also during this period, perinatal causes of death decreased by half (47%), whereas deaths due to congenital malformations remained stable. The proportion of deaths for which the cause could not be established also dropped substantially, from 9.0 deaths per 1000 children in 1990 to 0.8 deaths per 1000 children in 2007 (these deaths were proportionately allocated to the other groups of causes; figure 3).

Morbidity data show a rapid progress against some, but not all infectious diseases. Poliomyelitis was eliminated from Brazil in 1989 and the last autochthonous case of measles was in 1999.⁴¹ In the northeast region, hospital admissions for diarrhoea accounted for 57% of all admissions to hospital for children in 1980, 30% in 1990,⁶⁹ and only 7.6% in 2008–09.⁴⁸ HIV prevalence in pregnant women is estimated to be 0.4%,⁷⁰ and the vertical transmission rate in seropositive women is estimated to be 7%, ranging from 5% in the south region to 15% in the north region.⁷¹ Congenital syphilis is still a public health problem, affecting 1.7 babies in every 1000 livebirths in 2006—because of incomplete reporting, this number is probably an underestimation,⁷² and is unacceptable for a fully preventable disease,⁷³ especially in a country where antenatal care is almost universal. Trends in infectious diseases are discussed elsewhere.¹⁸ Data on stillbirths are available from vital registration.⁷⁴ In 2007, 32 165 stillbirths were reported (11 per 1000 births). The stillbirth rate has been steadily decreasing since data were first reported in 1979, when 69 159 stillborn infants were recorded (more than 20 per 1000 births). These data suggest a true decrease in the stillbirth rate, because the improvement over time in vital registration would lead to an increase, not a decrease, in these rates. In the city of Pelotas, where researchers were able to collect data for all stillbirths over

two decades, the rate of antepartum stillbirths decreased from 13·1 per thousand births in 1982 to 8·4 per thousand births in 2004, and for intrapartum stillbirths the reduction was from 2·5 to 0·7 in the same period.⁷⁵ Nevertheless, preventable stillbirths still occur. According to a study in Rio de Janeiro,⁷⁶ congenital syphilis causes 5·4% of all stillbirths. Data from a study from Belo Horizonte⁷⁷ suggest that fetal deaths due to intrapartum anoxia sometimes occur (41·4% of all fetal deaths), even in hospital settings. Of all registered stillbirths in Brazil in 2007, 29·4% occurred in children who weighed more than 2·5 kg, indicating potentially avoidable conditions.⁷⁴

Even though most indicators of health in Brazil are improving, some are getting worse. A systematic review of population-based studies on preterm deliveries showed an increase from about 4% in the early 1980s to more than 10% after 2000.⁷⁸ This upward trend was confirmed by data from repeated studies in two different cities,^{62,79} in which standardised methods were used over time. Prematurity is the most common cause of infant mortality in Brazil, and its growing frequency has largely offset the gains from improved survival of low-birthweight infants because of better newborn care.⁸⁰ The extent to which medical interventions such as caesarean sections have contributed to the increase in preterm infants is much debated in Brazil; some studies⁸¹ noted an association and others⁸² reported that preterm rates increased to a similar extent for vaginal and caesarean section births.

Most preterm infants are born at 34–36 weeks, with a birthweight of more than 2·5 kg. The prevalence of low birthweight has been stable since 2000, at around 8%.⁸³ A reduction in the frequency of intrauterine growth restriction has been reported,⁸² which could have offset the negative effect on birthweights of the increasing frequency of preterm deliveries.

Mortality rates of young Brazilian children have decreased rapidly in the past three decades, during which time regional and, to a lesser extent, social disparities have also decreased. Pronounced reductions in some causes of death—especially in those due to infectious diseases—have been accompanied by smaller reductions in neonatal mortality and by an increase in preterm deliveries.

Child nutrition

Much improvement has been made in the nutrition of Brazilian children. Data from four national surveys done during a 33-year period show a substantial decrease in the prevalence of child stunting (defined as height-for-age less than -2 Z scores of the WHO standard),⁸⁴ from 37·1% in 1974–75 to 7·1% in 2006–7. The annual rates of reduction have accelerated over time, with a 4·2% decrease between 1974–75 and 1989, a 5·4% decrease between 1989 and 1996, and a 6·0% decrease between 1996 and 2006–07.⁸⁵ Socioeconomic inequalities in stunting have also decreased. In 1974–75, children from families in the lowest wealth quintile were 4·9 times more likely to have stunted

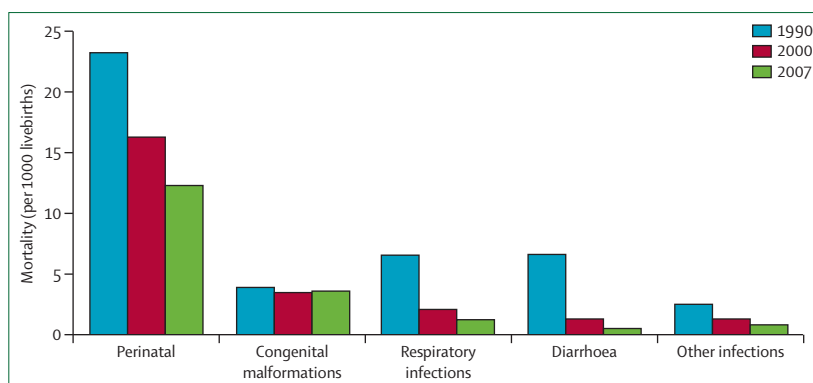


Figure 3: Infant mortality by cause and year

growth than were those from families in the highest wealth quintile—this ratio increased to 7·7 in 1989, stabilised at around 6·6 in 1996, and reduced sharply to 2·6 in 2007–08 (figure 4).

Historically, stunting prevalence is much higher in the poorest (northeast) region than in the wealthier southeast region; stunting was twice as common in the northeast region than it was in the southeast region in 1974–75, three times as common in 1989, and four times as common in 1996.⁸⁶ In the past decade, the frequency of stunting in the northeast region has reduced substantially—from 22·2% in 1996 to 5·9% in 2006–07—meaning that little difference now exists between the northeast and the wealthier regions (figure 5). The highest stunting prevalence is in the north region, which contains most of the Amazon rainforest.

Other indicators of child undernutrition have also improved. Prevalence of underweight (weight-for-age less than -2 Z scores of the WHO standard⁸⁴) decreased from 5·6% in 1989 to 2·2% in 2006–07.⁸⁵ Child obesity (weight-for-height more than 2 Z scores of the WHO standard⁸⁴) was stable at about 6–7% between 1974–75 and 2006–7,^{85,87} unlike obesity in adolescents and adults, which has increased during the same period.¹⁹

Breastfeeding practices have improved substantially. In the 1974–75 nutrition survey, the median duration of breastfeeding was only 2·5 months, one of the shortest in any developing country.¹⁵ It had increased to 5·5 months by 1989, 7 months by 1996, and 14 months by 2006–07.^{11,79,80} Exclusive breastfeeding in children younger than 4 months of age increased from 3·6% in 1986 to 48·1% by 2006–07.^{12,13,53}

No national estimates on micronutrient deficiencies exist. Data from local surveys show a high prevalence of iron deficiency, especially in children younger than 5 years,⁸⁹ despite national programmes such as flour fortification, which was instituted in 2004 and required all wheat and maize flour sold in the country to be fortified with iron and folic acid.⁹⁰ In the past, vitamin A deficiency was endemic in the rural semi-arid areas of the northeast. Up-to-date population-based information on vitamin A or zinc deficiencies is not available, but

major reductions in the prevalence of stunted growth in children, and in the number of deaths due to diarrhoea and other infectious diseases, suggest that such deficiencies do not represent a national public health problem.

Intervention coverage

Population-based data on selected maternal-health and child-health indicators are available from three demographic and health surveys done in 1986,¹⁴ 1996,¹³ and 2006–07.¹² Data for antenatal and delivery care are also available from a general household survey done in 1981.²⁹ The coverage of most indicators was, in the 1980s, high compared with present coverage in most low-income and middle-income countries.⁹¹ Nevertheless, the coverage of contraception, antenatal, and delivery care indicators increased substantially between 1986 and 2006–07. Vaccine coverage also increased rapidly and is now nearly universal. 80% of children younger than 5 years live in a home with treated water from a public source. Oral rehydration increased rapidly in the 1980s and 1990s, but has remained at about 50% coverage since, and about half of children with cough or fever are brought to a health facility—because deaths from diarrhoea and respiratory infections have become rare events, the low coverage of these two

case-management indicators does not confer a substantial health risk.

In addition to the high levels of intervention coverage, socioeconomic inequalities in coverage have decreased between 1996 and 2006–07.⁷ In 1996, 71·6% of women in the poorest family-income quintile received skilled care during childbirth compared with 98·1% of those in the wealthiest quintile; by 2006–07, the respective coverage was 96·8% and 99·5%. Contraceptive prevalence increased from 55·8% to 86·0% in the same period for individuals in the poorest quintiles, and from 76·8% to 87·3% for those in the richest quintile. The proportion of children in the poorest quintile who received care for a cough or fever increased from 33·4% in 1996 to 49·1% in 2006–07, whereas the proportion of those in the richest quintile seeking such care remained stable at 65·1% in 1996 and 63·1% in 2006–07.

Despite high coverage levels, the quality of maternal-health and child-health services is not consistently high. Data from in-depth studies show, for example, that despite an average of more than eight antenatal visits, half of the women in the city of Pelotas did not have a breast examination, and a quarter of women did not have a pelvic examination—even though 98% had one or more ultrasound scans.³⁹ Data from a national survey showed that only 62% of women giving birth in public-sector facilities had the results of a routine HIV test registered in their case notes, with pronounced variations according to education and ethnicity.⁷⁰ In a sample of women who gave birth in Rio de Janeiro, where hypertension is the leading cause of maternal deaths, only one in four had their blood pressure measured during labour.⁹³ A major paradox exists between overmedicalisation and underuse of simple but proven preventive measures such as breast and pelvic examinations, or measurement of blood pressure.

Even though coverage of antenatal and delivery care is high, such services are poorly integrated. For example, data from a survey in the Rio de Janeiro metropolitan area show that, before admission to a hospital, a third of women had to visit more than one maternity hospital during labour.⁹⁴ The most common reason they were turned away was because women with low-risk pregnancies sought care in high-complexity maternity hospitals, or because women with high-risk pregnancies sought care in low-complexity hospitals. This is a result of poor integration between antenatal services (usually provided in government health facilities) and birthing facilities, most of which are privately owned although affiliated with the SUS.⁹⁴

Understanding the changes

Time trends in maternal and child health indicators should be interpreted in view of broad social determinants of health and of governmental actions outside the health sector, and in terms of health sector interventions. Figure 6 summarises changes in these

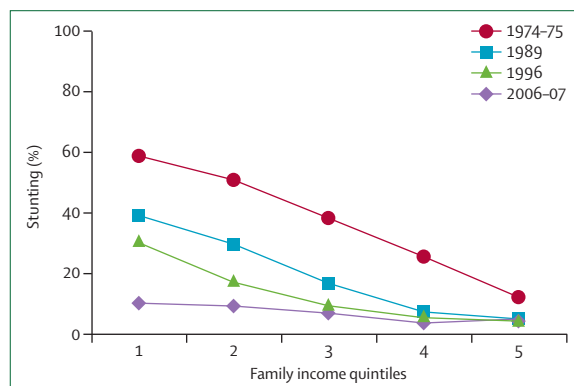


Figure 4: Prevalence of stunting by family income and year of survey
Data from reference 85.

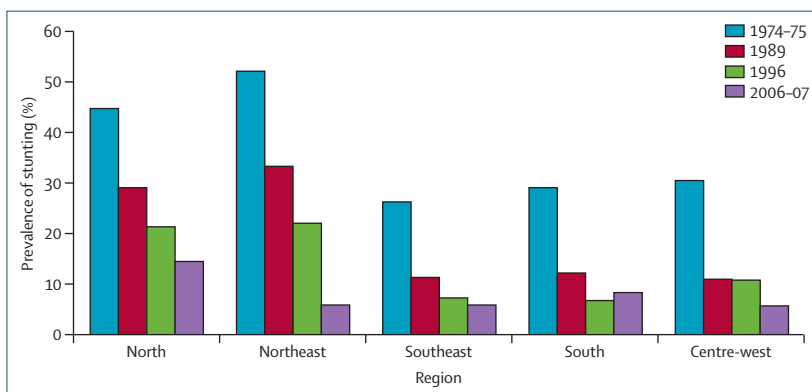


Figure 5: Prevalence of stunting by region and year
Data from reference 86.

	1970s	1980s	1990s	2000s
Political background	Military dictatorship	Transition to democracy (1985)	Early democratic period with substantial instability	Stable democracy
Economic growth	Rapid economic growth (the so-called Brazilian miracle) Increasing income concentration, accompanied by some reduction in absolute poverty	Hyperinflation and foreign debt crisis Economic stagnation and recession Increase in absolute poverty and maintenance of high income concentration	Gradual control of inflation, with slow or no economic growth Little if any changes in family income, income concentration, and poverty	Moderate economic growth with gradual reduction in income inequalities and absolute poverty achieved through a combination of unemployment reduction, progressive increase in the minimum wage, and expansion of cash transfer programmes
Demographic factors	Urbanisation and decrease in fertility rate	Urbanisation and decrease in fertility rate	Urbanisation and decrease in fertility rate	Urbanisation and decrease in fertility rate
Health systems	Three-tiered system: private; social security for regularly employed workers; and Ministry of Health and charitable services for the poorest	Three-tiered system until the creation of the Unified Health System (SUS) in 1988	Consolidation of the SUS with expansion of primary, secondary, and tertiary care Creation of the community health workers programme (1991) and family health strategy (1994) to increase access to health care in the poorest areas	Consolidation and expansion of the family health strategy
Non-health sector programmes	National food supplementation programme for mothers and children (1976) Expansion of water supply and sanitation (1975)	Continuity of food supplementation programmes Expansion of water supply and sanitation	Continuity of food supplementation programmes Expansion of water supply and sanitation Universal primary education	Creation of conditional cash transfer programmes: Bolsa Escola and Bolsa Alimentação (which replaced the food supplementation programme) and unification of programmes under Bolsa Família (2003) Expansion of water supply and sanitation Increase in secondary education
Maternal health programmes	None	National Women's Health Programme (1984)	Continued implementation of the National Women's Health Programme	National Programme for the Humanization of Pregnancy and Childbirth (2000) Pact for the Reduction of Maternal and Newborn Mortality (2004)
Child health programmes	National Immunisation Programme (1977)	Strong vertical programmes for immunisations, growth monitoring, oral rehydration, and breastfeeding promotion Mass immunisation and oral rehydration campaigns National Programme for Child Health (1984)	National Programme for the Reduction of Infant Mortality (1995)	Creation of local committees for the prevention of infant mortality (2005) Pact for Life (to reduce infant mortality; 2006)

Figure 6: Main changes in determinants of maternal and child health in Brazil

determinants since 1970, and the webappendix (p 1) shows the results of a key-informant survey of policies and programmes—including many governmental and non-governmental initiatives—that are believed to have had the largest effect on maternal and child health. From 1960 to 1980, Brazil's infant mortality rate was well above what would have been predicted on the basis of national income level (figure 7). In the 1980s, mortality rates dropped rapidly despite little change in family incomes (figure 7). Child health became more prominent on the public agenda, and strong, vertical intervention programmes were scaled up (eg, oral rehydration, breastfeeding promotion, and vaccination programmes), and were later integrated within primary health care.⁹⁷ Macro-level changes in determinants such as fertility and urbanisation probably contributed to the decrease in mortality rates (figure 6). Since the 1980s, reduction of infant mortality rates became one of the key development targets agreed on by federal, state, and municipal administrations. In several states, overall budgetary allocations to municipalities are partly related

to how rapidly infant mortality rates are reduced—other factors include demographic (eg, population size) and economic (eg, tax revenues) characteristics in each municipality.

The 1990s were characterised by the substantial expansion of primary health care, with the SUS and two related programmes: community health workers and family health. Several assessments suggest that the family health programmes contributed to mortality reduction, especially in the poorest municipalities (panel 2), even though economic growth in the 1990s was slow and the average income changed little.

After 2000, the financial gap between rich and poor populations in Brazil started to become less pronounced. There was a gradual but substantial reduction in the Gini coefficient in metropolitan areas (from 0.64 in 1991 to 0.49 in 2009),^{105,106} which can largely be attributed to cash transfer schemes and increased wages in the poorest populations. Major investments in primary schooling during the 1990s led to Brazilian mothers becoming more educated than ever before, and

See Online for webappendix

Panel 2: The Family Health Programme and infant mortality

The 1988 constitution established a universal health system that was free-of-charge for users. Because health facilities were concentrated in urban and wealthy areas, the Family Health Programme (PSF) was launched in 1994 to enable teams of doctors, nurses, and community health workers to work in the country's poorest areas. Substantial salary incentives are provided to attract workers to the programme. The programme targeted such underserved populations effectively, and uptake was notably higher in poor municipalities and in low-income neighbourhoods in urban areas, the well known favelas or urban slums that are ubiquitous in Brazilian cities.^{98,99} Municipal-level analyses suggested that the programme had a positive effect on infant mortality,^{99,100} especially through reduction of diarrhoea-related and pneumonia-related deaths,^{101,102} but no studies have been done on whether PSF helped reduce socioeconomic inequalities in infant mortality.

We used data from vital statistics to assess whether PSF implementation was associated with differentials in infant mortality (according to average municipal income) in an ecological analysis. For the 2005–07 period, 52% of Brazilian municipalities fulfilled objective criteria for reliable vital statistics, covering 72% of the national population.¹⁰³ For the other 48% of municipalities, indirect mortality estimates were used based on UN model life tables.¹⁰⁴ Census data¹⁰ were used to classify all municipalities in quintiles of average income, and information on the coverage of PSF was obtained from the Ministry of Health.

Figure 2 shows that irrespective of PSF coverage, infant mortality is higher in poor municipalities than it is in rich municipalities. However, there is an interaction between income and PSF coverage. Where PSF coverage is greater than 80%, mortality in the poorest quintile is 1.5 times greater than in the richest quintile of municipalities; this ratio is 1.8 for municipalities with coverage between 60% and 80%, and 2.6 for those with less than 60% coverage. These results should be interpreted with caution because contextual factors could affect both PSF implementation and mortality, but these findings accord with those from other evaluations that also suggest that implementation of PSF has had a positive effect on child health.

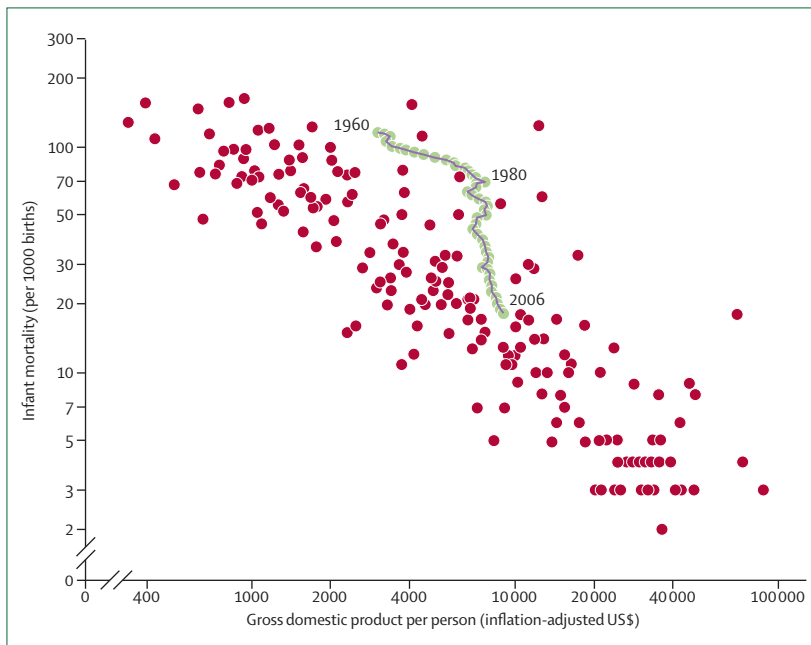


Figure 7: Income per person and infant mortality in Brazil (1960–2006) and the rest of the world (2006)
Data from reference 95 and reference 96. Each dot in the Brazilian trajectory (green circles) represents 1 year. All red dots are data from other countries in 2006. Adapted with permission from Gapminder World.

Panel 3: Important remaining challenges

- How to further reduce the regional, socioeconomic, and ethnic group disparities that persist despite overall progress?
- How to reverse the trend towards overmedicalisation of childbirth?
- How to deal with the increasing frequency of preterm births?
- How to further decrease rates of neonatal mortality, which now accounts for more than two-thirds of all infant deaths, and is decreasing more slowly than other causes?
- How to improve the quality of care, now that access to antenatal and delivery care has become almost universal?
- How to integrate antenatal and delivery care?
- How to tackle remaining problems such as unsafe abortions, avoidable maternal deaths, congenital syphilis, and adolescent pregnancies, and how to further reduce mother to child transmission of HIV?

reductions in the fertility rates meant they had fewer children to bring up. Coupled with several health-sector initiatives to reduce infant mortality (figure 6; webappendix p 3) these social and economic changes have contributed to the fact that Brazil has an infant-mortality to income-per-person ratio that is comparable with other middle-income countries (figure 7).

Among more than 50 programmes and initiatives to improve child health,¹⁰⁷ key informants (webappendix p 3) attributed the largest effect to specific programmes (for promotion of immunisation, breastfeeding, and rooming-in) and improved access to preventive and curative health care, including the SUS, the community health workers programme, and the Pastorate of the Child. The Pastorate of the Child is a Catholic-church based non-governmental organisation with 260 000 volunteers who work throughout the country to promote oral rehydration and other low-technology child survival interventions.¹⁰⁸

Child nutrition is one of the strongest proximate determinants of mortality.¹⁰⁹ A formal statistical analysis⁸⁷ of the decrease in stunting from 1996 to 2006–7 gave four major explanatory factors: increased maternal education, increased purchasing power in the poorest populations, a substantial expansion in coverage of maternal and child health services, and, to a lesser extent, the expansion of public water supply and sewage services. Changes in these distal determinants probably promoted child growth by improving diets (both breastfeeding and complementary foods), reducing infections (especially those that cause diarrhoea), and contributing to better child care.

Several explanations exist for the sharp increase in breastfeeding duration. The 1981 National Programme for the Promotion of Breastfeeding (PNIAM)^{88,110} trained health workers and interacted strongly with mass media, policy makers, and civil society organisations such as the

International Baby Food Action Network and mothers' groups. Maternity leave was extended from 2 months (as it had been since 1943) to 4 months in 1998 and to 6 months in 2006. The International Code of Marketing of Breast-milk Substitutes has been strongly enforced since 1988. Brazil also has a large network of more than 300 maternity hospitals certified by the Baby Friendly Hospital Initiative¹¹¹ and of more than 200 human milk banks.¹¹² These coordinated initiatives have meant that the median duration of breastfeeding in Brazil has increased by four times in the past three decades.^{12,13,15}

As mortality and nutrition improved, newborn health became more prominent on the national agenda. Because two-thirds of infant deaths occur in the neonatal period, and in response to the growing number of preterm births, large public investments have been made for the creation of neonatal intensive care units throughout the country. The number of beds in such units increased from 5·3 per 10 000 livebirths in 1999¹¹³ to 25·2 in 2010.¹¹⁴

In 2006–07, progress in the improvement of child mortality and nutrition meant that Brazil achieved a key indicator for the first Millennium Development Goal (MDG)—a reduction in the number of underweight children by half between 1990 and 2015.¹¹⁵ If progress continues at the present rate, the fourth MDG—a two-thirds reduction in mortality rate of children younger than 5 years by 2015—will be reached by mid-2011.² By contrast with progress in the first and fourth MDG, progress towards the fifth MDG—a reduction in maternal mortality by three-quarters relative to 1990 levels—has been slower. Since 1980, a series of national and international factors contributed to maternal health gaining prominence on the political agenda, before which time it had not featured heavily in governmental policies. In 1984, before the end of the military dictatorship and creation of the SUS,¹ pressure from feminist movements led to the establishment of the Programme of Integrated Care for Women's Health (PAISM)¹¹⁶ to ensure women's sexual and reproductive rights, more than a decade before international consensus was reached in the Cairo and Beijing conferences.¹¹⁷

Although fewer than for child health, many programmes and initiatives were launched to improve maternal health. The key informants who were surveyed for this report (webappendix p 3) mentioned, in addition to the 1984 PAISM, three broad initiatives to promote universal access to health care that had the biggest effect on maternal health—the creation of the SUS, the Community Health Worker programme, and the Family Health Programme. This finding underscores the key informants' perception of the importance of strengthening health systems for safe motherhood.²³

Some important questions remain about maternal health. Why does mortality seem to have stabilised at high levels, despite increased coverage with antenatal, delivery, and post-partum care? Even if the modelled estimates^{46,51} that predict a 4% annual decrease in MMR are correct,

present ratios of 50 per 100 000 are much larger than in high-income countries. Are there other explanations for such high MMRs—eg, poor quality of existing services? Does the likely increase in the number of maternal deaths caused by unnecessary caesarean sections⁴³ offset improvements attributable to other interventions? Rapid and sustained improvements in vital statistics in the coming years would enable inferences from maternal mortality data to be made with more confidence.

Conclusion

As a result of the changes described above, Brazil has been successful in terms of improving child health and nutrition.^{2,91} Even though questions remain about how much maternal mortality has decreased since 1990, changes in the coverage and equity of several reproductive, antenatal, and delivery care indicators are very encouraging.

Despite such progress, the mortality rate of children younger than five years is about seven times higher in Brazil than in countries with the lowest child-mortality rates,¹¹⁸ and the prevalence of stunting is about three times higher than in well-nourished populations,¹¹⁹ indicating that there is still much room for improvement (panel 3).

An overarching challenge is how to reach those who are hardest to reach, such as rural populations in the Amazon rainforest and northeast regions, including those living in the 10% of Brazilian municipalities that do not have access to a physician.²¹ The sixth article in this Series²¹ includes a call for action with specific calls to governmental, civil society, academic, and professional bodies, which must be met to overcome these challenges. The rate of reductions in stunting, infant mortality, and fertility are among the fastest ever recorded worldwide. However, as the French microbiologist Rene Dubos clearly stated more than 50 years ago, "health is a mirage that keeps receding as we think we are approaching it".¹²⁰ In Brazil, new challenges to health have appeared, and some old challenges remain unchanged.

Contributors

CGV had the idea for the report. Each co-author was responsible for drafting a section of the report. All authors revised subsequent drafts and approved its final version.

Conflicts of interest

We declare that we have no conflicts of interest.

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Health in Brazil 3



Successes and failures in the control of infectious diseases in Brazil: social and environmental context, policies, interventions, and research needs

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Despite pronounced reductions in the number of deaths due to infectious diseases over the past six decades, infectious diseases are still a public health problem in Brazil. In this report, we discuss the major successes and failures in the control of infectious diseases in Brazil, and identify research needs and policies to further improve control or interrupt transmission. Control of diseases such as cholera, Chagas disease, and those preventable by vaccination has been successful through efficient public policies and concerted efforts from different levels of government and civil society. For these diseases, policies dealt with key determinants (eg, the quality of water and basic sanitation, vector control), provided access to preventive resources (such as vaccines), and successfully integrated health policies with broader social policies. Diseases for which control has failed (such as dengue fever and visceral leishmaniasis) are vector-borne diseases with changing epidemiological profiles and major difficulties in treatment (in the case of dengue fever, no treatment is available). Diseases for which control has been partly successful have complex transmission patterns related to adverse environmental, social, economic, or unknown determinants; are sometimes transmitted by insect vectors that are difficult to control; and are mostly chronic diseases with long infectious periods that require lengthy periods of treatment.

Introduction

Infectious diseases are still a public health problem in Brazil, despite the proportion of total deaths that are caused by infectious diseases decreasing from 50% to 5% in the past 80 years.¹ Such reductions have been more pronounced for some infectious diseases than they have for others. Figure 1 shows the proportion of deaths from all causes between 1930 and 2007, and the proportion of deaths attributable to different infectious diseases between 1980 and 2008, from which time detailed data exists.⁴ A large proportion of deaths from infectious diseases in Brazil are due to respiratory infections, and respiratory infection deaths have become more common in adults than in children (figure 1). There have been some pronounced decreases in proportional mortality from specific diseases—ie, diarrhoeal diseases, vaccine-preventable diseases, and pneumonia in children. Deaths from HIV/AIDS have increased since the mid 1980s, dengue has emerged as a substantial cause of death, the number of deaths from tuberculosis and Chagas disease have remained stable, and the proportion of adult deaths due to respiratory infections is increasing (figure 1). The distribution of causes of death from infectious diseases has shifted towards one more commonly seen in high-income countries, especially in the predominance of pneumonia in the adult and elderly populations.⁴ In this report, we do not give a comprehensive review of trends for all infectious diseases in Brazil, but assess the relative successes of policies and interventions for selected diseases.

The relative contribution of different diseases to overall mortality in a country is associated with its gross domestic product (table 1). The past 60 years were a time of much change in Brazil. In the 1950s, 64% of the Brazilian

Key messages

- Brazil is undergoing a rapid and sometimes unorganised urbanisation process. Cash transfer programmes for the neediest populations, the Unified Health System (SUS), and other social and environmental improvements (such as in sanitation and education) related to this rapid urbanisation are, and should continue to be, crucial for efforts to control infectious diseases.
- Successful and moderately successful public health initiatives, such as those to control vaccine-preventable diseases, diarrhoea, respiratory infections, HIV/AIDS, and tuberculosis, have provided universal and free at the point of use vaccination, access to treatment, and primary health care. Such equitable policies must be supported and reinforced in the face of existing and renewed challenges, such as less than optimum adherence to treatment regimens and the emergence and transmission of drug-resistant pathogens.
- The control of disease vectors in areas of rapid urbanisation and poor-quality housing cannot be achieved through health policies alone. Such efforts must be fully integrated into broad policies that incorporate the mobilisation of society, health and environmental education, improvements in habitation and sewerage, and attempts to avoid further deforestation.
- Scientific research in Brazil has thrived in the past 10 years, with rapid and sustained growth in applied biomedical and epidemiological research on infectious disease prevention and management. Such academic achievements must be translated into deliverable products and policies so that they can be of benefit to the Brazilian population.

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This is the third in a *Series* of six papers on Health in Brazil

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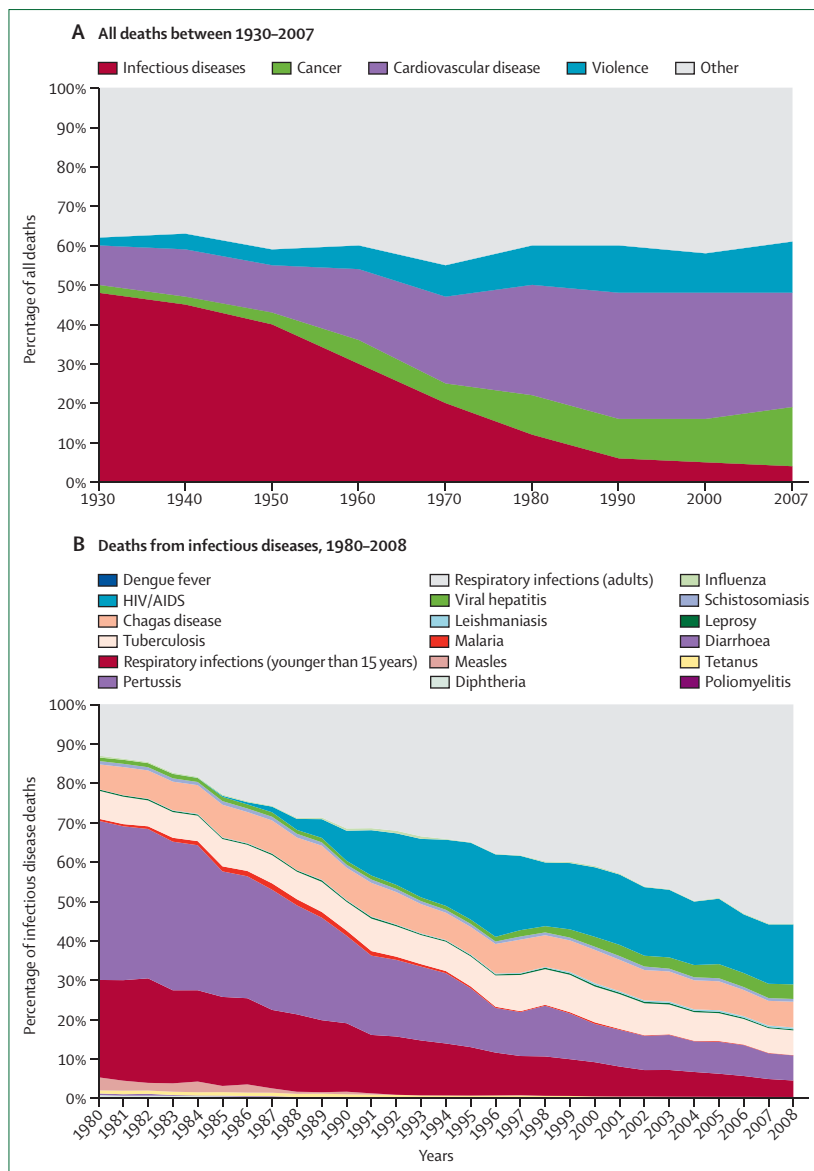


Figure 1: Trends in the causes of death in Brazil

(A) All deaths between 1930-2007. (B) Deaths from infectious diseases, 1980-2008.^{2,3}

population lived in rural areas. Vector-borne diseases and intestinal parasitic diseases with transmission cycles that require a stage of development in soil or water were common, and diarrhoea, respiratory infections, and measles caused most deaths in children younger than 5 years. Living conditions in both urban and rural areas were poor, with restricted access to health care (including vaccines), adequate housing, and water and sanitation, fostering the transmission of tuberculosis, poliomyelitis, measles, mumps, diphtheria, typhoid, and leptospirosis.^{1,6-9}

In 1953, with the creation of the Ministry of Health, a programme for rural diseases was established, which led to the systematic implementation of vector control measures.¹⁰ In the decades after industrialisation, which

started in the late 1950s, many people migrated from rural areas to urban areas, amid much urbanisation, improvements in the country's infrastructure (ie, ports, energy generation, road networks), increased access to health care, and modernisation of the state, which increased its presence in different aspects of economic and social spheres (eg, industrial development, roads and communication, housing, water and sanitation, health, and science and technology). By 2000, only 19% of the population lived in rural areas—most of the burden of infectious diseases was borne by those living in urban areas. Between 1980 and 2007 the proportion of households with piped water supply increased from 52% to 84% (93% in urban areas) and the proportion with access to sewerage or a septic tank increased from 25% to 74%.¹¹ These changes took place in a period of much social inequality—a common situation throughout much of Brazil's history—with a Gini coefficient of around 0.6, which, since only 2001, has begun to slowly decrease to 0.56.¹²

Such progress had some detrimental consequences. For example, much deforestation has taken place to enable agro-industrial activities, or the extraction of basic products and commodities, and increased population mobility has expanded areas of transmission for some endemic diseases (eg, yellow fever) and caused previously rural diseases to appear in urban areas (eg, visceral leishmaniasis and leprosy).¹³⁻¹⁶ The reintroduction of *Aedes aegypti* in 1976 resulted in successive dengue epidemics since 1986.¹⁷⁻¹⁹ The cholera pandemic in the 1990s and the rapid spread of the influenza A H1N1 virus in 2009 are examples of international infections that affected Brazil. Finally, changes in urban and rural environments were associated with emergence of new infectious diseases (eg, Brazilian haemorrhagic fever, hantaviruses).²⁰⁻²² Diseases that were previously well controlled were reintroduced to Brazil (dengue⁷) or underwent epidemiological changes that compromised their effective control (visceral and cutaneous leishmaniasis,¹³ hepatitis C²³).²⁴ Reductions in mortality from some diseases were not always accompanied by reduction in incidence; tuberculosis and HIV/AIDS are still a public health problem in many regions of the country, despite substantial decreases in mortality rates since the mid-1990s.²⁵⁻²⁷ A substantial proportion (13%) of resources allocated to health care are spent on infectious diseases.²⁸

The health system: surveillance, prevention, and care

The Brazilian National System for Surveillance and Control of Diseases (SNVS) is a decentralised, hierarchical, integrated network that operates a horizontal and universal approach, as part of the Unified Health System (*Sistema Único de Saúde*, or SUS).²⁹ All 27 states of Brazil have public health laboratories; there are 5 National Reference Laboratories and 51 Centres for Surveillance and Strategic Information (CIEVS).³⁰ State Health Secretariats coordinate and assess state-level activities.³¹ Teams based in the municipalities investigate

individual cases and outbreaks reported by the health service and implement relevant control measures. All reported cases (from public health services or from private health providers) are included in the notification database (SINAN), which is openly accessible on the internet. When necessary, CIEVS provide technical staff, material, and financial resources needed for clinical and epidemiological investigation and implementation of control measures. CIEVS are operational 24 h a day and 7 days a week, monitoring the information received and any relevant information, including information from the press and other media.

SNVS undertakes disease-specific surveillance and control programmes for vaccine-preventable diseases, dengue fever, malaria, HIV/AIDS, tuberculosis, leprosy, meningitis (panel 1; table 2), leishmaniasis, diarrhoea, leptospirosis, and other diseases. All drugs and immunobiological products used in such control programmes are given to individuals free of charge.

Control: successes and failures

Here we examine trends from 1980 to 2007 in selected infectious diseases of public health importance—grouped according to their control being either successful, partly successful, or a failure—and look for common factors in each group. We consider the control of diseases that were eliminated, are well controlled (less than one case per 100 000 population), or for which mortality has been reduced by at least 90% as successes. Control of diseases for which incidence or mortality rates have increased we consider as failures. The control of diseases that are defined by neither of the above two definitions are considered as partly successful.

Despite their importance, respiratory tract infections and health-care acquired infections were not selected for inclusion in this report. Respiratory infections in children are discussed elsewhere in this Series.³⁵ In short, a pronounced decrease in child mortalities due to respiratory infections has been recorded in the past two decades—between 1991 and 2007, mortality decreased by about 80%—which was largely attributable to the increase in access to health care, including the Family Health Programme.³⁶ In the elderly population, evidence exists that the incidence of fatal respiratory infections is also decreasing slowly, although becoming a larger proportion of all deaths. The universal availability of influenza vaccines since 1999 for this age group has substantially reduced the proportion of mortalities in this age group that are caused by respiratory infections.^{37,38} Universal access to vaccination led to a decrease in the socioeconomic disparity in number of deaths due to respiratory infections.³⁹ About a third of all hospital-acquired infections are pneumonia, making up a substantial proportion of the national burden of respiratory infections.⁴⁰

Expansion of the Brazilian health system has led to an increase in the occurrence of health-care acquired infections.⁴¹ Although there has been a national programme

	Gross domestic product* per head (US\$)	Infectious diseases (yearly mortality per 100 000 population)	HIV/AIDS (yearly mortality per 100 000 population)	Tuberculosis (yearly mortality per 100 000 population)
Brazil	10 070	139	8	3.8
Russia	15 630	71	28	15
India	2960	377	..	23
China	6020	86	3	12
Argentina	14 020	88	18	3.1
Chile	13 270	46	7	0.8
Mexico	14 271	73	10	1.4
Canada	36 220	22	<10	0.3
USA	46 970	36	7	0.3
UK	36 130	37	<10	0.7
Japan	35 010	39	<10	1.4
South Africa	9780	965	721	39
Mozambique	770	954	379	36

*Adjusted by the purchasing power parities.⁵

Table 1: Mortality from different infectious diseases (in individuals without HIV) and gross domestic product in different countries, 2004

Panel 1: Meningitis in Brazil

Of all types of meningitis, meningococcal meningitis has the most public-health importance because of its epidemic potential. There were several epidemics of meningococcal disease in the 20th century in Brazilian cities. In São Paulo, the largest metropolis in the country, there were four major epidemics, the largest of which was in the 1970s, when waves of serotypes A and C spread from peripheral urban areas to all social and demographic groups. To control this epidemic, the largest mass vaccination campaign with conjugated vaccines (serotypes A and C) was done—95% of the 11 million population of São Paulo city were vaccinated in 4 days. The epidemic was during the military dictatorship and lasted 7 years. During the first 5 years of the epidemic the government banned mention of the epidemic in the media and did not disclose the number of deaths or cases, fearing that links between the epidemic and accelerated economic growth could bring attention to the poor conditions in which the working population lived.³²⁻³⁴

	Proportion	Fatality rate (per 100 cases)	Incidence rate (per 100 000 population)
Tuberculosis	1.44%	31.85	0.21
Pneumococcal	4.66%	29.84	0.67
<i>Haemophilus influenzae</i> type b	0.09%	16.34	0.09
Meningococcal	12.24%	20.15	1.76
Not specified	10.90%	12.94	1.57
Bacterial	21.53%	13.24	3.09
Viral	44.61%	1.57	6.41

Table 2: Meningitis incidence, fatality rate, and cause in Brazil, 2001–09

of monitoring and control since 1983, available data are not sufficient for an adequate assessment of trends at a national level.⁴² However the little data available suggest that such infections are an important problem,⁴³ which will probably increase as the access to the hospital system increases and the use of high-technology, and invasive interventions becomes more frequent.

For the SINAN database see <http://dtr2004.saude.gov.br/sinanweb/>

Panel 2: Production of vaccines in Brazil

The domestic production of vaccines has increased substantially in the past 20 years. In 1992, roughly 60% of all vaccines used in the National Immunisation Programme were imported; by 2002, 70% were produced in Brazil.⁴⁴ The largest national producers are the Butantan Institute and BioManguinhos, both public laboratories that produce only immunobiologicals. The Butantan Institute is affiliated to the State of São Paulo Health Secretariat and produces vaccines against hepatitis B; diphtheria, pertussis, and tetanus (DPT); diphtheria and tetanus; rabies; and seasonal influenza A. BioManguinhos is part of the Oswaldo Cruz Foundation (FIOCRUZ), is affiliated to the Brazilian Ministry of Health, and produces yellow fever, *Haemophilus influenzae* type b (Hib), polio, and tetravalent (DPT plus Hib) vaccines.

Successful control*Vaccine-preventable diseases*

The National Immunization Programme (*Programa Nacional de Imunização*; PNI) has been very successful, achieving one of the highest immunisation coverage rates worldwide, without the use of coercive strategies. All vaccines are given to individuals free at the point of use. Routine universal vaccination programmes include BCG; poliomyelitis, measles mumps, and rubella (MMR); diphtheria, pertussis, tetanus (DPT) plus *Haemophilus influenzae* type b (Hib); hepatitis B; yellow fever; rotavirus; 10-valent pneumococcal; and meningococcal C conjugate vaccines. These vaccines are provided in about 30 000 health units, and also in an additional 100 000 temporary vaccination points twice a year during national vaccination days. In 2007, the government spent R\$710 million (US\$373 million) on vaccines, most of which were produced in Brazil (panel 2). Vaccination against human papilloma virus is provided exclusively through private clinics, but recent public-private partnerships have increased its availability through substantial discounts offered to patients from both low-income and middle-income groups at outpatient units, with medical assistance by the charities in the Santa Casa da Misericórdia network.

Actions by the Pan American Health Organization, who have a prominent role in the control of vaccine-preventable diseases in South America, have contributed much to the success in control of such diseases in Brazil.^{45,46} Between 1980 and 2007, the number of deaths from tetanus decreased by 81% and deaths from pertussis decreased by 95%—no deaths were registered from diphtheria, poliomyelitis, or measles in 2007.^{47,48} Poliomyelitis was eliminated in Brazil in 1990 (although a few cases of vaccine-related poliomyelitis have been reported since).⁴⁷ Measles transmission was interrupted in the past decade; sporadic cases, however, been reported from cases imported from Europe and Asia.⁴⁸ As in many places with high vaccine coverage, the incidence of and mortality from meningitis caused by *H influenzae* type b in children younger than 5 years substantially decreased after the introduction of the Hib vaccine to the routine schedule in 1999.^{49,50} Although, in general, vaccine coverage in Brazil is very high, it is not uniform across socioeconomic levels,

with lowest coverage in the highest and lowest socioeconomic groups (figure 2).

Diarrhoea and cholera

Mortality from diarrhoea decreased substantially in the 1980s with the generalised use of oral rehydration therapy. In addition to use of oral rehydration therapy, increased access to health services⁵² and especially to primary health care³⁶ contributed to this reduction in mortality. In children younger than 1 year, diarrhoea-related mortality decreased from 11.7 deaths per 1000 livebirths in 1980, to 1.5 deaths per 1000 livebirths in 2005, a reduction of about 95%.⁵³ Incidence of diarrhoea also decreased during this period,^{54,55} as a result of the pronounced increase in provision of treated, piped drinking water and, to a lesser extent, of hygienic sewage disposal.^{54–56} Such improvements in sanitation have caused a shift in the predominant causes of diarrhoea, from bacteria spread by faecal-oral transmission (eg, *Salmonella* spp and *Shigella* spp) to viruses spread by person-to-person transmission (mainly rotaviruses, but also adenovirus and norovirus).^{57–59} In 2006, after successful efficacy trials, vaccination against rotavirus was introduced to the routine schedule.⁶⁰

After an epidemic in mid-19th century, no new cases of cholera were recorded in South America until the end of the 20th century in Peru,⁶¹ and was detected in the Brazilian Amazon region, close to the Peru border, in 1991.⁶² The disease spread quickly through cities in the north and northeast regions, leading to an epidemic that peaked in 1993, with only 60 000 reported cases (39.8 cases per 100 000 population) and 1.1% case fatality rate;⁶³ the last case of cholera in Brazil was reported in 2005.⁶⁴

Chagas disease

The chronic form of Chagas disease presents with myocardopathy, mega-oesophagus, or megacolon. The myocardopathy is very severe with a high case fatality rate of 80% within 5 years of diagnosis, mostly in men aged 30–40 years. Chagas disease is caused by the protozoan parasite *Trypanosoma cruzi*, and the main insect vector in Brazil is *Triatoma infestans*, a haemophagous bug that lives mostly indoors. Infective forms of *T cruzi* are transmitted to human beings via the vector's faeces, entering through an individual's skin (at the point of a bite) or through mucosal membranes. Alternative routes of transmission are blood transfusions, mother-to-child transmission, and, very rarely, contaminated fresh foods. Until the 1970s, *T cruzi* transmission was intense in two-thirds of Brazil (18 states). At the end of the 1970s, an estimated 5 million people were infected with *T cruzi*,⁶⁵ although only 2% of infections progress to the severe, chronic form of Chagas disease.⁶⁶ An intensive vector control programme in Brazil, done in conjunction with other South American countries, eliminated the main vector of the disease and has thus interrupted vector-borne transmission since 2006.⁶⁷ Transmission through blood transfusions was also

For more on Santa Casa da Misericórdia network see www.cmb.org.br

interrupted through mandatory screening procedures.⁶⁸ The seroprevalence of *T. cruzi* infection in children younger than 5 years is presently 0.00005%, presumably a result of mother-to-child transmission before control measures were implemented.^{68,69} The national programme for Chagas disease control is one of the clearest successes of Brazil's public health system. However, because of Chagas disease's long latency period, 3.5 million individuals in Brazil still have the chronic form of the disease, meaning that diagnosis and care of such individuals is a continuing burden on health services.⁷⁰ Even so, mortality due to chronic Chagas disease (mostly due to myocardialopathy) is decreasing, and most deaths are among people older than 60 years.^{71,72}

Partly successful control

HIV/AIDS

The incidence of HIV-related illnesses has been stable in the past 5 years, with about 33 000 new cases registered every year.⁷³ An estimated 600 000 people have HIV infection in Brazil, and the mean national seroprevalence is less than 0.6%.⁷⁴ These estimates have been stable since 2000,⁷⁴ and accord with population-based studies of the general population.^{75,76} Although incidence of AIDS-related illnesses has decreased substantially in large urban areas, low-level transmission still occurs in municipalities of small and medium size,⁷⁷ suggesting that resources for diagnosis and treatment in such municipalities are not sufficient and need to be increased.^{78,79}

A continuing challenge is to decrease, or at least prevent the increase, of transmission in vulnerable populations, such as men who have sex with men, injecting and non-injecting drug users, and commercial sex workers.⁸⁰ Rates of HIV infection and other sexually transmitted infections are high in populations of men who have sex with men.⁸⁰ The prevalence of HIV infection in injecting drug users has decreased substantially—from about 25% to 8%,⁸¹ presumably a result of prevention programmes implemented nationally since the mid-1990s (eg, syringe-exchange programmes, targeted condom distribution, and referral to treatment centres), and because many drug users have switched to non-injecting drugs, particularly crack cocaine.^{82,83}

Because Brazil operates the largest programme of free-of-charge, highly active antiretroviral therapy in the world, the emergence of resistance to many antiviral drugs was predicted.⁸⁴ However, rates of infection with resistant strains have been consistently low, with a slow increase in resistance to first-line traditional drugs that is no higher than that seen in the USA or Europe.⁸⁴

Free and universal access to antiretroviral treatment represents a formidable achievement by the health system in Brazil. However, the undeniable gains have been challenged by the slow but progressive increase of resistance and side-effects associated with most drugs, especially those associated with the long-term consequences of their continued use, such as metabolic

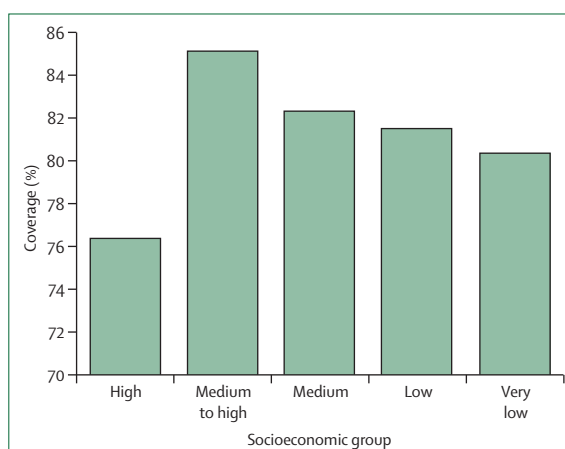


Figure 2: National Programme of Immunization coverage, by socioeconomic group, 2007–08

Data are for coverage of children aged 18 months in state capital cities and federal district in Brazil.⁵¹

(eg, insulin resistance and dyslipidaemias) and cardiovascular disorders.⁸⁵ Brazil has tackled this challenge with a well structured treatment programme, and a diverse portfolio of drugs, providing locally produced first-line generic drugs at low cost, second-line drugs produced through compulsory licences (eg, efavirenz), and drugs under patent protection bought at discount prices from other countries. Costs of antiretroviral treatment have increased in the past 5 years, before which time the progressive introduction of locally produced generic drugs caused prices to decrease (figure 3).⁸⁷

HIV control efforts in Brazil include prevention of mother-to-child transmission (with provision of testing and prophylaxis in prenatal care) and treatment of children and adolescents with HIV/AIDS. The incidence of vertically transmitted infections has decreased over the past decade, but prenatal care is sometimes substandard and the introduction of prophylaxis can be delayed in some underserved neighbourhoods.⁸⁸ Such drawbacks are partly compensated for by the country-wide use of rapid HIV-diagnostic tests for pregnant women in peripartum who are unaware of their serostatus.⁸⁹ Substantial improvements have been made in survival and quality-of-life in children with HIV/AIDS.⁹⁰

HIV/AIDS has been the subject of many campaigns that emphasise the need to practise safe sex and to seek prompt treatment. Such measures have had an effect on both incidence and mortality, which have decreased substantially over the past 15 years. Because mortality from and transmission of HIV/AIDS still occurs, we have categorised HIV/AIDS control efforts in Brazil as partly successful. However, such efforts have been as effective in Brazil as they have been in most developed countries.

Hepatitis A and B

In the past two decades there has been evidence of reduced transmission of hepatitis A and B,^{91–93} although this

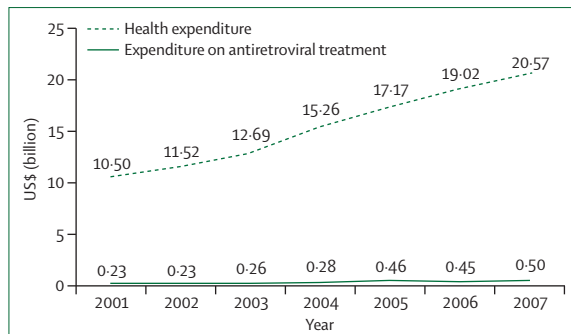


Figure 3: Health spending by the Brazilian Government

*Estimated costs, based on preliminary data.⁸⁶

reduction has not been apparent in surveillance data.⁹⁴ However, data from repeated seroprevalence surveys and from death registration show a decrease in both prevalence and mortality.^{91,65,96} A national survey of seroprevalence of viral hepatitis is being done in the 26 state capital cities and in the federal district (Brasilia), and will produce an accurate map of the prevalence of these infections by the end of 2011. Early findings from this survey in a large area of the country, including the northeast region, the centre-west region, and Brasilia,⁹² show an overall seroprevalence of hepatitis A in children aged 5–9 years of 41.4%, which is considered medium endemicity. Earlier surveys in the same areas noted high endemicity.⁹⁷ Because hepatitis A vaccine is given to high-risk groups and not to healthy children, the decrease in prevalence rates among children was not the result of vaccination programmes, but rather of improvements in water supply and sanitation, and in hygiene and living conditions in general.

For hepatitis B, data for the same three regions show a seroprevalence of HBsAg of less than 1%,⁹³ an improvement from earlier findings.⁹⁸ Vaccination against hepatitis B has been part of the national basic vaccination schedule and given free at the point of use since 1989 in the western Amazon (the region with the highest prevalence of hepatitis B),^{99,100} and rolled out in 2001 to the whole country as a routine schedule for children and adolescents. In the northeast and the centre-west regions, and in the Federal District (Brasilia city), the national hepatitis survey showed that 30% of people aged 10–19 years received at least one dose of the vaccine.⁹³ A national vaccination survey had shown that for those younger than 1 year, coverage is 86.7%.¹⁰¹ To further reduce transmission and mortality, a policy was implemented in 2001 that defined the standard treatment regimens for chronic infection, with all drugs given free of charge.¹⁰²

Leprosy

Leprosy is detected in every state of Brazil, but the highest detection rates are in the Amazon region and in a few urban centres in the northeast region; more than 50% of cases are reported in areas where 17.5% of the country's population lives.¹⁰³ In 2006, the annual new-case detection rates per

100 000 population were 70.1 in the north region, 61.8 in the centre-west region, and 32.2 in the northeast region. Because the incubation period of leprosy is long, the geographical pattern of occurrence is related to historical transmission levels and other epidemiological determinants (eg, migration patterns), which are poorly understood.¹⁰⁴

After the introduction of multidrug therapy, which is given free-of-charge to patients with leprosy by the SUS, the prevalence of leprosy in Brazil decreased substantially—from 180 cases per 100 000 population in 1988 to 26 cases per 100 000 population in 2008 (figure 4), with much reduction in disabilities associated with leprosy.¹⁰⁶ However, during this period incidence rates changed little, with a case-detection rate in individuals younger than 15 years staying at about 7 cases per 100 000 population every year. This finding suggests that although efforts to control leprosy by identification and treatment of cases reduced disease prevalence, this strategy had little effect on reducing transmission. Identification of new ways to control leprosy (ie, interrupting transmission) are necessary, as is keeping leprosy as a world priority on the public health and research agenda to avoid waning of interest and financial support for research, prevention, and care.^{107,108}

Tuberculosis

During the 1980s, the incidence of tuberculosis was high, largely because of the high prevalence of HIV infection in the population. However, with the rollout of antiretroviral therapy programmes, tuberculosis incidence decreased from 51.4 cases per 100 000 person-years in 1990 to 38.2 cases per 100 000 person-years in 2007 (a 26% reduction)—mortality also decreased during this period, from 3.6 deaths per 100 000 person-years to 1.4 deaths per 100 000 person-years (a 32% reduction).¹⁰⁹ However, pronounced regional differences in incidence of and mortality from tuberculosis exist, with larger incidences in states with higher prevalences of HIV infection, such as Rio de Janeiro, and in states with restricted access to health services, such as those in the Amazon region.^{110,111} Pronounced socioeconomic differences in incidence and mortality also exist within urban areas.¹¹² Although there are clear guidelines for tuberculosis diagnosis and treatment,¹¹³ delays from onset of symptoms to diagnosis and treatment still vary between and within regions, and reorganisation of the health-care system has not yet resulted in uniformly early diagnosis of tuberculosis.¹¹⁴

Completion of treatment is essential for tuberculosis control and is carefully monitored and reported in the SINAN database. 63% of patients are cured with complete treatment, but 8% of patients stop treatment before completion.¹⁰⁹ These estimates, although improving, do not meet the Ministry of Health's targets of 85% and 5%, respectively, and are lower than needed to interrupt transmission.¹⁰⁹

Because prevention of acquired resistance depends on early case finding and effective treatment,

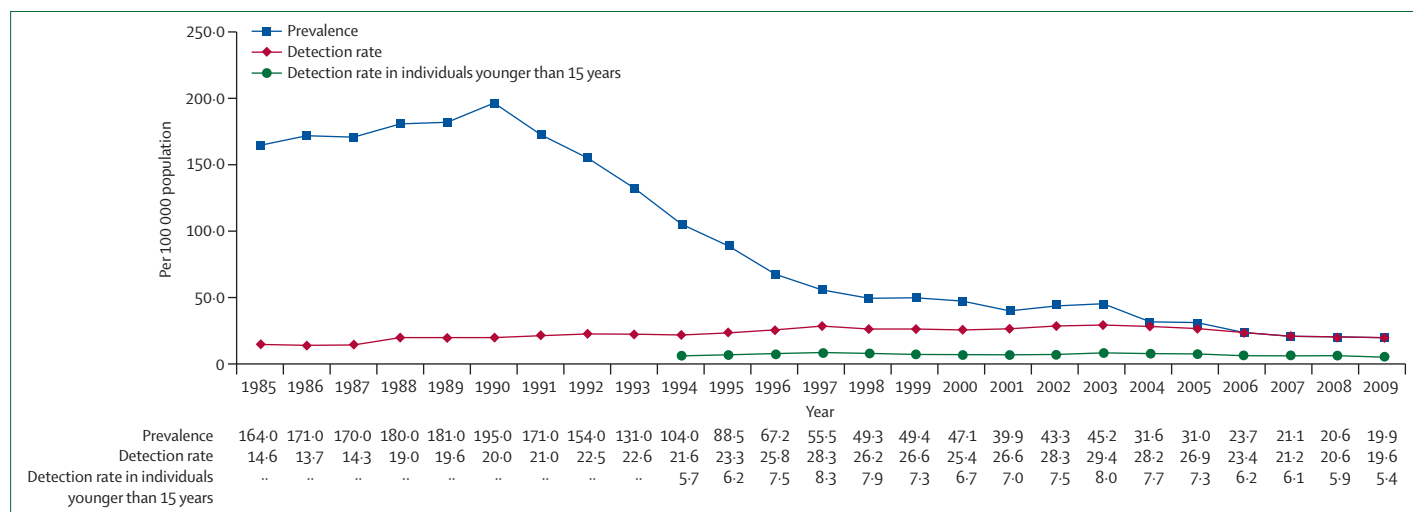


Figure 4: Prevalence and detection rate of Leprosy in Brazil¹⁰⁵

standardised treatment and the supply of drugs at no cost to the patient are crucial to avoid the development of resistance. In Brazil, multi-drug resistance seems to be largely associated with retreatment, probably because of irregular treatment schedules or patients' abandonment of treatment.^{115,116} Of all individuals with tuberculosis in Brazil, an estimated 6.0% are infected with strains resistant to isoniazid and 1.4% are infected with strains resistant to both isoniazid and rifampicin.^{116–118} The prevalence of such resistant strains might decrease with a decision made in 2009 to change the first-line treatment regimen, introducing ethambutol as a fourth drug during the first 2 months of treatment and the use of one pill containing the four drugs.¹¹⁷ Extensive data for the prevalence of extensively drug-resistant tuberculosis are not available, but cases have been reported.¹¹⁹

The proportion of health services that offer directly supervised treatment increased from 7% in 2000 to 81% in 2006,¹²⁰ although these seem to be reaching no more than a quarter of patients in treatment.¹²¹ Brazil has a very successful Family Health Programme, and there are plans to include tuberculosis monitoring in its activities, therefore extending the coverage of supervised treatment.

In the 1990s, 30% of individuals with HIV also had tuberculosis—this proportion decreased to 10% after the introduction of highly active antiretroviral therapy.¹¹⁰ Among tuberculosis patients attending health services for treatment, the proportion of individuals also infected with HIV is roughly 20%, but only half of patients with tuberculosis are routinely tested for HIV.¹²² The Ministry of Health now recommends the use of rapid diagnostic tests for HIV for all patients with tuberculosis in the first 2 weeks of treatment.¹²³

Treatment of latent tuberculosis infection with isoniazid in adolescents and adults in Brazil is recommended.¹²⁴

Treatment criteria are well defined, varying according to age and comorbidities that increase the risk for developing active tuberculosis (ie, HIV infection, diabetes, use of corticosteroids, etc). Assessment of the extent to which this recommendation is being implemented and its effect on tuberculosis control, treatment completion rates, and the occurrence of adverse events is not yet possible because it was implemented in only 2009, but either the Ministry of Health or other research teams will assess it in the future.¹²⁴

Brazil has a prison population of about 400 000 individuals (227 prisoners per 100 000 population).¹²⁵ The prevalence of active tuberculosis among prisoners in different studies has ranged from 2.5%¹²⁶ to 8.6%,¹²⁷ and a prevalence of 2.7% was recorded among inmates entering prisons from police remand centres.^{126,128} Further studies are needed to assess the role of prisons in tuberculosis transmission and development of drug resistance in Brazil.

Schistosomiasis

The only schistosome species in Brazil is *Schistosoma mansoni*. In 1997, about six million people were infected.¹²⁹ Different sources of data show a decrease in schistosomiasis occurrence and severity: from 1995 to 2006, the number of hospital admissions for complications of schistosomiasis per 100 000 population per year decreased from 21 to 4 (a reduction of 80%) and deaths per 100 000 population per year decreased from 0.38 to 0.27 (a reduction of 29%).¹³⁰ Prevalence estimates from stool examinations in repeated surveys in large areas showed a decrease in positive detection rates from 8.4% in 1995 to 5.5% in 2006.^{130–132}

Transmission requires specific freshwater snails as intermediate hosts and occurs mainly in the northeast region, in rural and poor peri-urban areas. The schistosomiasis control programme started in 1975 in



Figure 5: Trends in the prevalence of malaria in the Amazon region, Brazil (1960–2008)¹³⁸

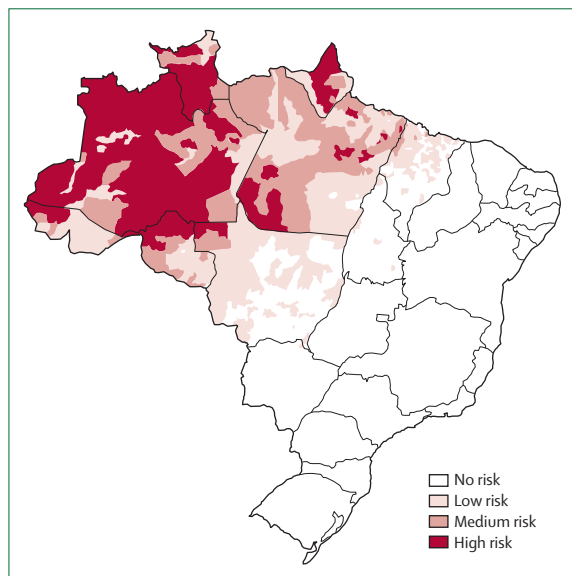


Figure 6: Malaria transmission in Brazil, 2008

High risk=annual parasite incidence (API) greater than 50 cases per 100 population.¹³⁸ Medium risk=API between 10 and 50 cases per 100 population. Low risk=API less than 10 cases per 100 population.

Brazil, it was vertical and based on mass treatment. In 1993 the programme was decentralised to states, then to municipalities, and was eventually integrated into primary health care in 2007–10. Much of the reduction in schistosomiasis prevalence is attributable to improvements in access to clean water and sanitation, which has meant that individuals now have less contact with fresh water bodies; mass treatment is likely to have reduced severity of disease and could have contributed to decreased transmission.^{133,134} A remaining challenge is to integrate specific control measures with more general measures (eg, expansion of the sewerage network) and to basic health care.¹³¹

Malaria

Malaria is a public health problem in Brazil, with roughly 300 000 new cases registered every year. Although still

substantial, this incidence is much lower than it was in the 1940s and 1950s, when about 5 million new cases were registered every year.^{135–137} After implementation of the malaria eradication programme in the early 1960s, the yearly number of cases decreased rapidly, to a low in 1969, when 52 469 cases were reported in the Amazon region (figure 5),¹³⁹ only to increase again as a result of a chaotic and rapid settlement process in the Amazon.¹³⁵ *Plasmodium vivax* accounts for more than 80% of cases and *Plasmodium falciparum* accounts for less than 20% of cases, unlike in 1960–88 when the prevalences of both species were much the same.¹⁴⁰ The case-fatality rate for malaria—which has been less than 1% since 1960—decreased substantially in the past 10 years, possibly because of improved access to diagnosis and treatment, which are given free of charge. Standardised treatment protocols kept levels of drug resistance low, and much work has been done to develop new drugs (eg, artemisinin combination therapies).¹⁴⁰

99% (315 809 cases) of all malaria cases are reported in the legal Amazon area, where geographical, economic, and social factors facilitate transmission and limit the use of standard control measures. Malaria incidence is lower in rubber extraction areas, and higher in areas that were colonised in the past 10 years and open-air mining areas. Peri-urban areas also have high incidence, largely because of migration from failed agricultural settlements in malarious areas.^{135–137} Malaria transmission occurs in 67% of legal Amazon's municipalities; 49% have low endemicity (an annual parasite incidence [API] <10), 10% have moderate endemicity (an API of 10–50) and 8% have intense transmission (an API >50; figure 6).

Failures

Dengue fever

Dengue fever is a major public health problem in Brazil. Since 1986, incidence has increased with successive epidemics (figure 7),^{17,18} and an increasing proportion of patients are presenting with severe disease (0·06% of patients in the 1990s rising to 0·38% in 2002–08).¹⁷ Three serotypes (DENV1–3) circulate throughout the country; DENV4 was isolated in the north region of Brazil in 2010.¹⁴¹ Three in four Brazilian municipalities are densely populated with *A aegypti* mosquitoes, the main vector of dengue fever.¹⁷ Between 2000 and 2009, 3·5 million cases of dengue fever were reported, 12 625 of which were dengue hemorrhagic fever, with 845 reported deaths.¹⁴² The annual incidence between 1986 and 2009 varied between 40 cases per 100 000 population and 400 cases per 100 000 population, with incidence peaking in 2008 and remaining stable since—a high proportion of severe cases are in children.¹⁷ The causes and mechanisms involved in progression from dengue fever to dengue hemorrhagic fever are not completely understood.^{18,143–145}

Prospects for future control are not encouraging. Reduction in density of *A aegypti*, the most targetable link in the transmission chain, remains a challenge. Even with

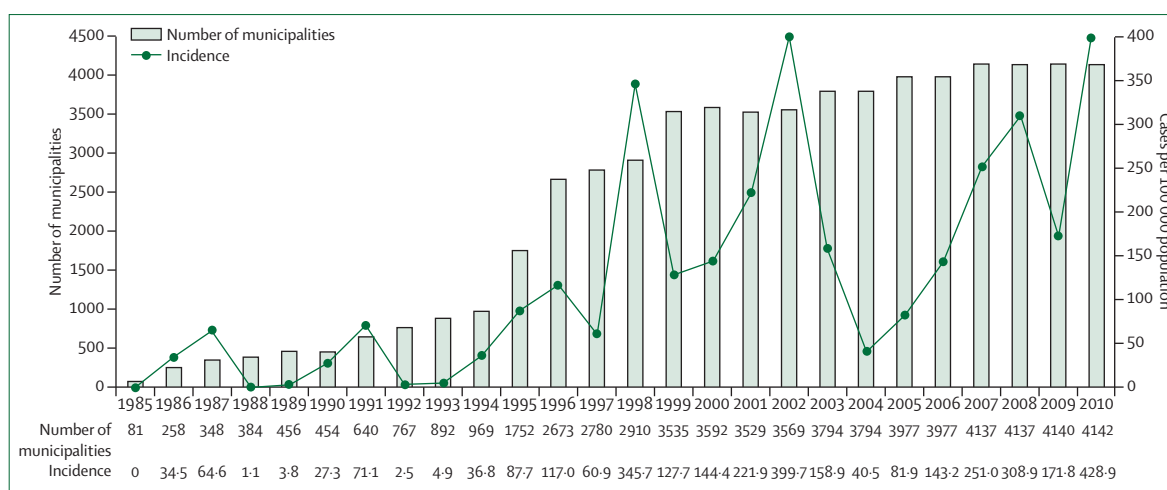


Figure 7: Incidence of dengue fever and number of municipalities with high density of *Aedes aegypti* mosquitoes, 1985–2010¹⁷

more than half a billion US dollars (about R\$900 million) dollars invested by the government every year in vector control, vector densities low enough to effectively limit or reduce the spread of dengue fever have not been achieved in a sustained manner.^{146,147} Such difficulties in controlling *A. aegypti* populations also exist in other countries, such as Singapore, where *A. aegypti* control is very efficient but dengue epidemics still occur.¹⁴⁸ No safe vaccine is available and there is little prospect for one in the near future. During epidemics, public health efforts in Brazil are directed towards increasing awareness of symptoms to improve early presentation to health services and to enable early diagnosis and treatment of severe forms.

Visceral leishmaniasis

In Brazil, incidence of visceral leishmaniasis, also known as kala-azar, is high, with an average of two cases per 100 000 population per year. The increase in incidence and the expansion of transmission areas are both causes for concern. Nearly 70% of all cases of visceral leishmaniasis in South America are in Brazil, where the geographical reach of the disease is substantial—between 1999 and 2008, more than a third of Brazilian municipalities have reported autochthonous cases.^{149,150} The disease has severe manifestations and is sometimes lethal in children. The case-fatality rate of visceral leishmaniasis in Brazil has varied between 3.2% and 6.9% in the past 10 years.¹⁵¹

Visceral leishmaniasis is a disease caused by the protozoan parasite *Leishmania chagasi* and is transmitted by phlebotomine sandflies. The transmission cycle of *L. chagasi*, formerly restricted to rural areas, has changed since the 1980s, spreading to urban areas. Small, medium-sized, and large cities have been affected, including state capitals such as Teresina (in the northeast region), Belo Horizonte (in the southeast region), and Campo Grande (in the centre-west region).^{149,150} Rapid urban expansion has brought domestic dog populations

into contact with zoonotic cycles in rural areas and, as a consequence, they have become a major reservoir for the disease in the urban environment.^{149,150} Furthermore, the main vector, *Lutzomyia longipalpis*, has adapted well to the peri-domiciliary environment.

Visceral leishmaniasis control in Brazil has focused on vector control and elimination of animals that are reservoirs for the disease, but available strategies and technologies have so far had little effect.^{51,152} Available treatment for the disease is lengthy, expensive, and must be taken under medical supervision because it is highly toxic, limiting access, especially in isolated rural areas.

Conclusion

A pressing need exists to develop new treatments and vaccines for those diseases which have proved difficult to control. In Brazil, biomedical and epidemiological research is thriving,^{153,154} as is public health research into infectious diseases, with much collaboration with developing and developed countries.^{155–158}

Several major bottlenecks in public health research exist: biomedical and public health research centres are concentrated in the southeast region of Brazil, which does not have the highest burden of disease; administrative procedures are lengthy for the importation of research equipment; private companies invest little into research; little research in Brazil generates international patents or translates into implementable interventions such as new medicines, vaccines, and diagnostic kits.¹⁵⁹

Further research is needed in the following areas: biomedical research for the development of vaccines, better treatments, fast diagnostics, and innovative vector-control methods; population based research to assess new technologies before adoption in the health system and to investigate the social determinants of diseases such as leprosy and tuberculosis; health-service research to develop and assess new strategies to deliver efficient diagnostics and treatment for chronic infectious diseases (such as

HIV, tuberculosis, leprosy, and visceral leishmaniasis) or outbreaks of severe acute disease such as dengue fever.

The substantial reorganisation of the Brazilian health system has had notable effects on the structure and functioning of initiatives to control infectious diseases. The previous vertical control structure has been replaced by horizontal actions at the municipality level. Even though successful actions have been implemented by local administrations (eg, vaccination programmes and schistosomiasis and dengue control measures), the provision of support and expertise from the federal government and state administrations is crucial. For instance, the series of dengue fever epidemics in Brazil's major urban centres has repeatedly challenged the health system to provide quality care to a growing number of severe cases, to be managed in specialised units staffed by well-trained professionals. Maintenance of such channels of communication and help will require preparedness studies and pilot projects to address emergent questions and renewed challenges.

Another key issue is the need to harmonise broad social and economic policies and specific demands and needs for the effective control of infectious diseases. Since 1970, access to clean water has increased substantially, and in the past 10 years access to sewage systems has become a priority of public policies. The full attainment of such goals will be key to the sustainable control of faecal transmitted diseases.

In the past 10 years, cash transfer programmes for the neediest populations in Brazil have helped reduce poverty and, albeit only marginally, reduce social and economic inequalities for the first time in Brazil's history.¹² More substantial improvements in education and actions to reduce socioeconomic inequalities might improve the control of diseases such as tuberculosis and leprosy. However, despite improvements recorded in the past decade, living conditions in urban slums create an ideal environment to maintain the transmission of many infectious diseases.¹⁶⁰ Initiatives such as the *Programa de Aceleração do Crescimento* (PAC) have been implemented to provide such underserved areas with proper sewage, running water, health centres, and schools. But much remains to be done and local infrastructure remains far from acceptable in many parts of Brazil. Challenges for the future include further reduction of individual and regional differentials in wealth, improvement of infrastructure and social services, and further expansion of programmes that support better prevention and care. Furthermore, the fast growth in medical research in Brazil must be sustained—efforts must go towards identification of new treatments (eg, for leishmaniasis), new vaccines (eg, for dengue), and more effective ways to deliver specific care.

Contributions

All authors contributed to the planning, review of data and evidences and writing of this manuscript. All authors read and approved the final version.

Conflicts of interest

We declare that we have no conflicts of interest.

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Health in Brazil 4



Chronic non-communicable diseases in Brazil: burden and current challenges

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Non-communicable diseases (NCDs) have become a major health priority in Brazil—72% of all deaths were attributable to NCDs in 2007. They are also the main source of disease burden, with neuropsychiatric disorders being the single largest contributor. Morbidity and mortality due to NCDs are greatest in the poor population. Although the crude NCD mortality increased 5% between 1996 and 2007, age-standardised mortality declined by 20%. Declines were primarily for cardiovascular and chronic respiratory diseases, in association with the successful implementation of health policies that lead to decreases in smoking and the expansion of access to primary health care. Of note, however, the prevalence of diabetes and hypertension is rising in parallel with that of excess weight; these increases are associated with unfavourable changes of diet and physical activity. Brazil has implemented major policies for the prevention of NCDs, and its age-adjusted NCD mortality is falling by 1·8% per year. However, the unfavourable trends for most major risk factors pose an enormous challenge and call for additional and timely action and policies, especially those of a legislative and regulatory nature and those providing cost-effective chronic care for individuals affected by NCDs.

Introduction

Chronic non-communicable diseases (NCDs) are a global health problem and a threat to human health and development. The burden of these diseases falls mainly on low-income and middle-income countries.¹ Leading scientists² and WHO³ have raised a call to action, as effective interventions are available,⁴ which define strategies to be taken. The United Nations is convening a high-level meeting of the General Assembly in September, 2011, on the prevention and control of NCDs.⁵ To contribute to the preparation of this meeting, *The Lancet* Series of papers was launched in November, 2010,⁶ in which 23 countries, including Brazil, were assessed with respect to NCD burden and national capacity to respond to the NCD challenge.⁷ A comprehensive and critical view of the NCD scenario in Brazil, a large middle-income country, is thus timely.

The burden of chronic NCDs

In 2007, about 72% of all deaths in Brazil were attributable to NCDs (cardiovascular diseases, chronic respiratory diseases, diabetes, cancer, and others, including renal diseases), 10% to infectious or parasitic diseases, and 5% to maternal and child health disorders. This distribution contrasts with that of 1930, when infectious diseases accounted for 46% of all deaths in Brazilian state capitals.⁸ As addressed in greater detail elsewhere in this Series,⁹ this radical change happened within the context of economic and social development, in which major advances toward the resolution of the then reigning public health concerns were made. In parallel with this change in disease burden was a rapid demographic transition in Brazil that produced an age pyramid weighted more towards adults and elderly people.¹⁰ Greater income, more mechanisation and

industrialisation, improved access to food, urbanisation, and globalisation of unhealthy habits have produced a rapid nutritional transition¹¹ and have increasingly exposed the population to a greater risk of chronic disease. Within this context, less privileged ethnic and racial groups bear a disproportionately large share of the resultant burden (panel 1).

From 1996 (when Brazil adopted the 10th revision of the International Classification of Diseases [ICD10] coding and enumerated its population) to 2007, the NCD mortality increased by 5%, from 442 per 100 000 people to 463 per 100 000, showing the augmented burden of NCDs. However, once age-adjustment was done to permit comparisons over time and across populations, the mortality decreased. Figure 1 shows that mortality

Key messages

- Non-communicable diseases (NCDs) are the main sources of disease burden in Brazil, and major policies for their prevention and control have been implemented
- Cardiovascular and chronic respiratory disease mortality rates are declining, probably as a result of tobacco control and improved access to primary care
- The widespread obesity epidemic with the resultant increased prevalence of diabetes and hypertension, threatens further increase in NCDs
- Unfavourable trends in most major risk factors show the need for additional and timely action, especially in the form of legislation and regulation and those allowing for quality chronic care
- Strengthening links between government, academic institutions, and civil society will facilitate the response of society to the challenge of NCDs

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Panel 1: Ethnic and racial inequalities and chronic diseases

As in other societies burdened with a history of colonisation and slavery, there is ethnic and racial prejudice and discrimination in Brazil, as well as inequalities unfavourable to black people, Indigenous peoples, and so-called browns (a denomination suggesting a racial mixture).¹² As an example, black and brown people are over-represented in the unemployed and illiterate groups of Brazil,¹³ suggesting ethnic inequalities that can potentially affect the distribution of NCDs.

The Indigenous Brazilian populations are undergoing intensive change in their relationship with the land, work, and urbanisation, which is affecting their health in an unprecedented manner. As in other countries, there is a rapid change in the Indigenous peoples with respect to food, characterised by rapid and generalised weight gain that is greater than the national norm. For example, Xavantes located in the Sangradouro-Volta Grande and Pimentel Barbosa Indigenous Reserves region, in 1998–99, had a prevalence of obesity of about 25% in men and 41% in women. An increasingly western diet and a reduction in physical activity because of macrosocial changes are thought to be the direct causes of these levels of obesity.^{14–16} As a result, obesity, hypertension, and diabetes are becoming serious public health issues in this population.^{14–17}

The debate on racial prejudice and discrimination is a recent one in Brazil. We know little about the inter-relations between socioeconomic and racial inequalities that have generated these health differences, which negatively affect the full development of Brazil's people. Affirmative action policies in Brazil are very recent and their effect is still unknown. Nevertheless, the topic is on the agenda of politicians and academics, as well as on that of the general Brazilian population.

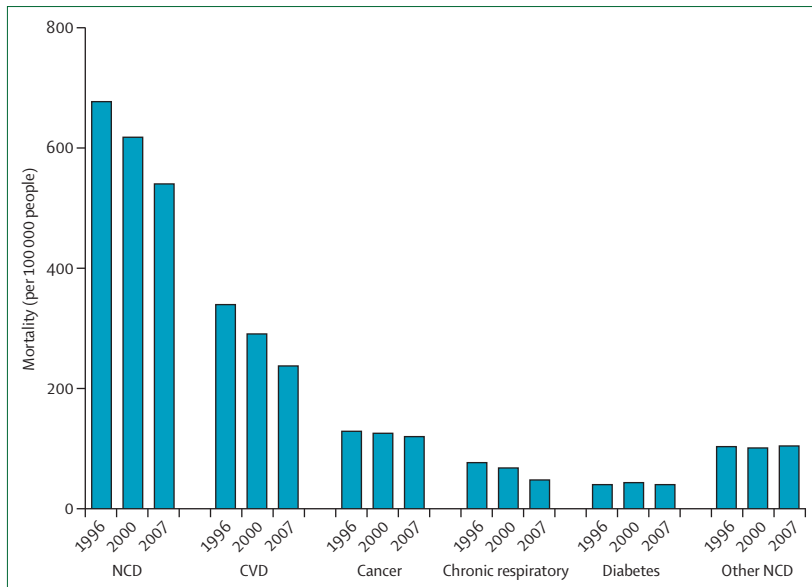


Figure 1: Recent trends in NCD mortality for 1996 to 2000 and 2007

Age-standardised to the WHO standard population,¹⁸ corrected for under-reporting, with redistribution of ill-defined causes of death pro rata across non-external causes. NCD=non-communicable disease. CVD=cardiovascular disease.

attributable to NCDs declined between 1996 and 2007 by 20%, primarily because of declines in cardiovascular (31%) and chronic respiratory (38%) diseases; for diabetes and other chronic disorders mortality remained stable (a 2% increase and a 2% decrease, respectively). These data and others that we report, unless specified, were age-

standardised to the WHO standard population,¹⁸ corrected for under-reporting and with redistribution of ill-defined causes of death pro rata across non-external causes. The webappendix accompanying the Series paper by Victora and colleagues has details of the mortality calculation.¹⁹

Age-standardised NCD mortality for 2004 in Brazil (625 per 100 000 people), as reported by WHO, was less than that in Russia, Nigeria, India, and Tanzania (all >700 per 100 000), but greater than that of the UK and Canada (both <400 per 100 000),¹ and almost all other South American countries.²⁰ Of note, the WHO rate for Brazil is somewhat higher than the rates shown in figure 1 (617 per 100 000 for 2000; 540 per 100 000 for 2007), due in part to different assumptions about under-reporting and ill-defined causes of death, which have undergone steady improvement. Additionally, our correction for ill-defined disorders (7·7% in 2007) is more precise, having been done separately for each calendar year in each age, sex, and state strata.

Figure 2 shows that, in 1996, the NCD mortality was greatest in the northeast, declined in all regions between 1996 and 2007, but more so in the south and southeast, leaving the north and northeast (the poorest regions of Brazil) with the highest NCD mortality in 2007. These latter two regions also had the largest increases in diabetes mortality over this period.

However, mortality provides an incomplete picture of disease burden. A major study of Brazil's disease burden²¹ that used 1998 health statistics and employed discounted disability-adjusted life years (DALYs) showed that chronic disorders accounted for 66% of DALYs; infectious, maternal, and perinatal disorders and nutritional deficiencies for 24%; and external causes for 10%. Principal among the chronic disorders were neuropsychiatric disorders (19%), cardiovascular diseases (13%), chronic respiratory diseases (8%), cancers (6%), musculoskeletal diseases (6%), and diabetes (5%).

Additionally, conservative estimates by WHO for Brazil suggest that changes in key economic inputs, such as losses in the labour force and decreased savings resulting from just three NCDs (diabetes, heart disease, and stroke), will lead to a loss of economic output of US\$4·18 billion between 2006 and 2015.²²

The burden of neuropsychiatric disorders

Most of the burden from neuropsychiatric disorders is due to depression, psychoses, and disorders attributable to alcohol misuse. In the World Health Survey,²³ done in 2003 with internationally standardised methods, 18·8% of Brazilians reported having received a diagnosis of depression in the past 12 months. The positive association of education or income with the need for care of or being diagnosed with depression suggests that these figures might be due to a greater awareness and access to care than actual change of disease burden. In fact, surveys with direct standardised assessments according to ICD10 criteria found that depression affects 5–10% of adults.^{24,25} A

recent survey in ten developed and eight developing countries found the highest prevalence of depression in metropolitan São Paulo.²⁶

Studies with broader criteria for common mental disorders (CMD; mixed depressive and anxiety states) reported that about 30% of Brazilian adults experienced such symptoms.^{27–30} Depression and CMD were more prevalent in people with lower levels of education and income, and in people who were unemployed.

Epidemiological data on psychoses in Brazil are scarce. In São Paulo, the 1-month prevalence of bipolar disorders and non-affective psychoses was estimated as 1·1%.¹⁷ The estimated incidence of psychoses in São Paulo (15 per 100 000 person-years) was lower than incidences reported from developed countries.³¹ Yet, mortality in people with psychoses, mostly because of suicide, was as high as that in developed countries.³²

In view of the rapid ageing of the population, dementia is quickly becoming a major public health issue. Local population-based surveys yielded prevalence estimates for people aged 65 and older varying from 5·1% to 8·8%, similar to those found in developed countries.^{33–35} Social adversity and poor nutritional status early in life seem to increase the risk of late life dementia in Brazilian people.³⁶ Age-standardised dementia mortality increased from 1·8 per 100 000 in 1996 to 7·0 per 100 000 in 2007.

Key NCDs and their shared risk factors

The WHO 2008–13 action plan for NCDs³ focuses on four NCDs (cardiovascular diseases, diabetes, cancer, and chronic respiratory disease) and their four shared risk factors (tobacco use, physical inactivity, unhealthy diets, and harmful use of alcohol).⁴ These four NCDs accounted for 58% of all deaths in Brazil in 2007 and are, along with neuropsychiatric disorders, the main causes of disease burden.²¹

Cardiovascular diseases

Hypertension, aside from being a treatable disease, is a major, clinically measurable milestone along the causal pathway to symptomatic cardiovascular disease. Nationally representative data obtained in 2008 from almost 400 000 interviews,³⁷ estimate that 24·0% (95% CI 23·7–24·4) of women and 17·3% (17·0–17·6) of men, aged 20 years or older, and about half of men and more than half of women aged 60 years or older, reported a previous diagnosis of hypertension. A validation survey suggests that self reporting probably overestimates hypertension by about 10% compared with clinical diagnosis.³⁸ Recent self-reported prevalence has increased by about 0·5% per year.³⁹ Moreover, the control of hypertension (<140/90 mm Hg) is poor, ranging from 20% to 39% in two recent household surveys.^{40,41} Hypercholesterolaemia (cholesterol >5·18 mmol/L), another clinically measurable risk factor, was reported in 22% of adults and a third of those aged 45 years or older in a 2004 sample representative of adults living in cities with 100 000 inhabitants or more.⁴²

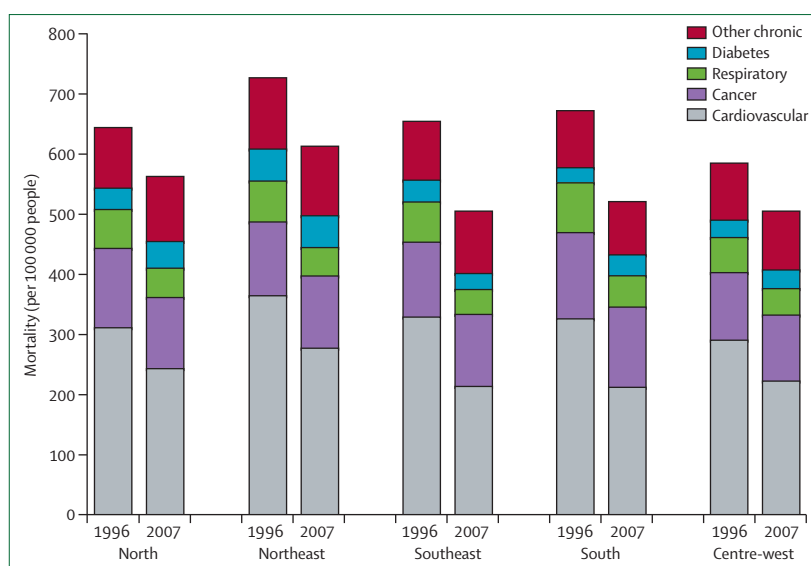


Figure 2: Mortality rates for non-communicable diseases by region for 1996 and 2007

Age-standardised to the WHO standard population,¹⁸ corrected for under-reporting, with redistribution of ill-defined causes of death pro rata across non-external causes.

Cardiovascular diseases have been and continue to be, despite their decline, the principal cause of death in Brazil (figure 1). The decline in cardiovascular disease is greatest for cerebrovascular diseases (34%) and the category of other forms of heart disease (44%). Mortality from ischaemic heart disease declined by 26%. Hypertensive heart disease mortality, by contrast, increased 11%, growing to 13% of total deaths attributable to cardiovascular disease in 2007, compared with 30% for ischaemic heart disease and 32% for cerebrovascular disease. By contrast, rheumatic fever and its complications represented less than 1% of deaths in 2007.

Despite these declines, Brazilian cardiovascular mortality remains high. Based on uniformly standardised WHO data,²⁰ Brazil's 2004 mortality attributable to cardiovascular disease, 286 per 100 000 people, is only surpassed among the reported South American countries by Guyana and Surinam. Similar rates were, 207 per 100 000 for Argentina, 209 per 100 000 for Venezuela, and 160 per 100 000 for Chile. Brazil's rate was higher than that reported for most North American and European countries (eg, 179 per 100 000 for the USA, 175 per 100 000 for the UK, and 200 per 100 000 for Portugal).

The mortality burden, especially premature deaths attributable to cardiovascular diseases, disproportionately affects poor people. For example, in Porto Alegre, a large Brazilian city, premature deaths attributable to cardiovascular diseases, defined as those in individuals aged 45–64 years, was 163% higher in neighbourhoods classified as being in the worst socioeconomic quartile than in those classified in the best.⁴³

Cardiovascular diseases generate the greatest cost of hospital admission within the national health system.

In 2007, 12.7% of all non-pregnancy related admissions to hospital and 27.4% of those for individuals aged 60 years or older were due to cardiovascular diseases. Of special note is the burden of congestive heart failure: in people older than 60 years, it is the most common cause of admission to hospital, and in people over 80, it causes 27% of admissions to hospital in women and 33% in men.¹⁰

Diabetes

In the late 1980s, the prevalence of diabetes in individuals aged 30-69 years residing in large metropolitan areas was 7.6% (estimated from both oral glucose tolerance testing and self report); prevalence of self-reported diabetes being 4.1%.⁴⁴ More recent, large, nationally representative data of Brazilians aged 20 years or older show an increase

in self-reported diabetes, from 3.3% (95% CI 3.1-3.5) in 1998 to 5.3% (5.2-5.4) in 2008.⁴⁵ The ongoing epidemic of obesity and greater access to diagnostic testing explain much of this rise.

Diabetes as the underlying cause of death rose 11% from 1996 to 2000 and then decreased 8% to 2007 (figure 1). When defined as any mention on the death certificate, diabetes-associated mortality increased by 8% from 2000 to 2007. Although the rising prevalence of diabetes probably explains this greater mortality, a mixture of improved diagnosis and changes in reporting practices might also be involved. The burden of diabetes can also be gauged by the fact that 7.4% of all non-pregnancy related admissions to hospital and 9.3% of all hospital costs in the period 1999-2001 could be attributable to diabetes.⁴⁶

A national registry for diabetes and hypertension, SisHiperDia, was started in 2002. The burden associated with the disease is documented in the data of the more than 1.6 million cases of diabetes registered: 4.3% of those registered had a diabetic foot disorder and 2.2% a previous amputation, 7.8% had renal disease, 7.8% had a previous myocardial infarction, and 8.0% had a previous stroke. Linking these data with the mortality registry shows the mortality burden attributable to diabetes: age and gender standardised mortality in people with diabetes was 57% greater than that of the general population. Of all deaths, 38% were due to cardiovascular disease, 6% to renal disease, and 17% were coded as multiple or other chronic complications of diabetes. Only 2% were due to the acute complications of diabetes.

Cancer

Figure 3 shows the change of mortality in Brazil for the principal cancers over the past 27 years, age standardised to the World Standard Population.⁴⁷ In men, mortality rates of lung, prostate, and colorectal cancer are increasing, that of gastric cancer decreasing, and that of oesophageal cancer stable. In women, mortality rates of breast, lung, and colorectal cancers have risen, while those of cervical and gastric cancer have declined.

The substantial decline in deaths attributable to gastric cancer in both sexes, detected initially in the 1990s,^{48,49} is similar to that described in other countries.^{50,51} Declines in deaths attributable to cervical cancer over the past two decades, especially in state capitals,^{52,53} have paralleled improved screening practises, which were introduced in the 1980s and enhanced since 1998.^{54,55} From 2003 to 2008, the frequency of women aged 25-59 years who reported at least one Pap smear over the previous 3 years rose by 25%,³⁷ reaching 84.6% in 2008. However, large variation exists across income levels. In rural parts of the north and northeast regions (areas with restricted access to screening) mortality rates are still rising. Breast cancer deaths are increasing throughout Brazil, particularly in metropolitan areas, despite somewhat improved coverage for mammography from 2003 to 2008 in women aged

For more on SisHiperDia see
<http://hiperdia.datasus.gov.br/>

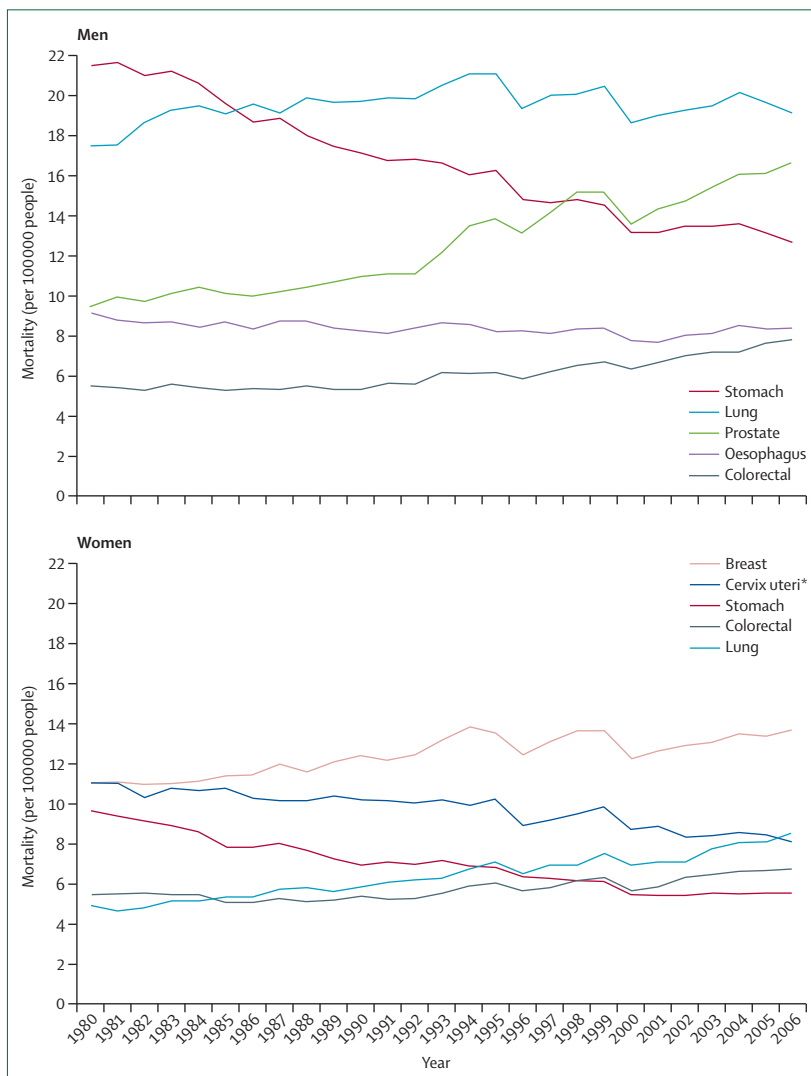


Figure 3: Mortality for main sites of cancer in men and women, 1980-2006

Age standardised to the World Standard Population,⁴⁷ with proportional redistribution of ill-defined deaths.

*Corrected with proportional redistribution of deaths classified as malignant neoplasm of uterus, part unspecified (ICD10 code C55).

50–69 years (self-reported rates increased from 42·5% to 54·8%). Lung cancer deaths for people younger than 60 years are falling in men but rising in women, probably related to antecedent smoking trends.⁵⁶ Mortality from colorectal cancer varies substantially by region, with higher rates in the most developed regions.⁵⁷

The first Population-Based Cancer Registry was created in 1960 in Recife, and now 17 cities regularly provide information.⁵⁸ Based on data from four of these registries, some international incidence comparisons are possible.⁵⁹ For breast cancer, incidences are similar to those of high-income countries. For lung, prostate, and colorectal cancers, Brazilian incidence rates are at an intermediate level. Oesophageal cancer rates, in men, are very high, approaching levels seen in Asian countries with the world's highest incidence. Cervical cancer incidence in Brazil, overall, is still very high, with rates close to those of countries with the highest incidence: Peru and some African states. This finding is consistent with the very high prevalence (14–54%) of human papillomavirus in surveyed Brazilian women.⁶⁰

The 5-year survival rates for patients with breast, prostate, and lung cancer in two Brazilian cities were low when compared with those of high-income countries,⁶¹ suggesting difficulties or inequalities in access to diagnostic procedures and treatment in Brazil in the 1990s. This finding is consistent with recent international data that show that survival from curable cancers (cervical, breast, and testicular cancer, and lymphoblastic leukaemia in children) is closely and positively related to country income.⁶²

Chronic respiratory diseases

The drop in age-adjusted mortality rate for chronic respiratory diseases (figure 1) was noted for both chronic obstructive pulmonary disease (COPD; 28·2% decline) and asthma (34·1% decline). Admissions to hospital in adults aged 20 years or older decreased by 32% for COPD and 38% for asthma between 2000 and 2007. The extent to which these secular trends are because of improvements in access to health care, decline of smoking, or other factors remains to be assessed.

There is a lack of prevalence data on COPD at the national level, partly because of difficulties in the use of spirometry (the gold standard for COPD diagnosis). One spirometry-based representative sample of adults aged 40 years or older in metropolitan São Paulo—part of the Latin American PLATINO Study—recorded a COPD prevalence (FEV₁/FVC <0·7 post-bronchodilator) of 15·8% (95% CI 13·5–18·1).⁶³ Similar with that noted for other Latin American cities,⁶⁴ most of the people sampled lacked a previous medical diagnosis. Aside from the usual COPD risk factors, tuberculosis and indoor pollution also inferred risk: adjusted odds ratio (OR) for COPD in people with a medical diagnosis of tuberculosis were 3·99 (1·92–8·30) for men and 1·71 (0·95–3·09) for women, compared with those without such a diagnosis.⁶⁵

	2006	2009	Change
Smoking			
Current smoker*	16·2% (15·4–17·0)	15·5% (14·5–16·5)	–0·6% (0·27)
Ex-smoker†	22·1% (21·3–22·9)	22·0% (20·6–23·3)	–0·1% (0·72)
Physical activity‡			
Adequate leisure time physical activity	14·8% (14·2–15·5)	14·7% (14·0–15·4)	–0·1% (0·72)
Alcoholic beverage consumption§			
Binge drinking¶ in the past 30 days	16·2% (15·5–16·9)	18·9% (17·9–19·9)	2·7% (<0·001)
Excess weight			
Excess weight (BMI ≥25 kg/m ²)	42·8% (41·8–43·8)	46·6% (45·2–48·0)	3·8% (<0·001)
Obesity (BMI ≥30 kg/m ²)	11·4% (10·8–12·0)	13·9% (13·1–14·7)	2·5% (<0·001)

Data are % (95% CI) or % (p value)—p value established by Poisson regression, which compared percentages over the years 2006, 2007, 2008, and 2009. BMI=body-mass index. *A person who regularly smokes tobacco, irrespective of the time he or she has been smoking; includes daily and occasional smokers. †A person who in the past smoked tobacco, occasionally for at least 3 months or daily for at least 1 month. ‡Validated by Monteiro and colleagues.⁷⁴ §Validated by Monteiro and colleagues.⁷⁵ ¶Defined as men consuming more than five alcoholic drinks and women more than four drinks on a single occasion.

Table 1: Prevalence of selected risk factors for chronic diseases as ascertained through Vigitel, a telephone interview of residents of Brazilian capitals, 2006 and 2009

Regarding asthma, the World Health Survey, which assesses representative samples of adults aged 18 years or older in 70 countries in 2002–03, showed Brazil to have the highest prevalence of self-reported wheezing (24·3%), and the 6th highest self-reported medical diagnosis of asthma (12%; 95% CI 11·0–13·1).⁶⁶ A Brazilian nationally representative survey showed that self-reported medical diagnosis of asthma, adjusted for sex, age, and region, was 28% lower in rural than urban areas,⁶⁷ consistent with findings of other Latin American studies,^{68,69} and in accordance with the hypothesis that industrialisation and urbanisation are related to its occurrence.⁷⁰

Risk factors

Two nationwide surveys show that the prevalence of smoking in people aged 18 years or older declined substantially in Brazil, from 34·8% in 1989 to 22·4% in 2003.⁷¹ A further decline to 17·2% (21·6% of men and 13·1% of women aged 15 years or older) was recorded up to 2009—estimated by the Global Adult Tobacco Survey, a nationally representative survey that included more than 50 000 households across all Brazilian states.⁷² Large variation was noted in this latter study by educational attainment: 25·7% of people with less than 1 year of formal education smoked versus 11·9% with 11 years or more. However, recent data from Vigitel,⁷³ a yearly telephone-based survey adjusted to be representative of residents of Brazilian capital cities (table 1), suggest that smoking prevalence stabilised between 2006 and 2009.

A recent survey of 8th grade children (ie, children aged 14 years) who reside in state capitals,⁷⁶ designed to capture the development of risk factors showed that, in 2009, 6·3% of the children surveyed reported smoking during the previous 30 days, which is more than the mean for the Americas (4·9%), but less than that of Europe (19%).⁷⁷

Despite the major achievements in the control of smoking over the past two decades, an estimated 13·6% of all deaths in adults who reside in 16 Brazilian capitals in 2003 were attributable to smoking, probably related to the effect of higher earlier smoking prevalences.⁷⁸

Although 45% of Brazilian adults abstain from the consumption of alcohol,^{79–81} the proportion of excessive drinking and dependence is high. An estimated 25% of adults reported at least one problem of a social, occupational, familial, legal, or physical nature related to alcohol.⁸¹ Estimates for alcohol dependence vary from 9% to 12% of the entire adult population, the prevalence being three-to-five-times greater in men than women.^{79–81} Alcohol dependence is also higher in young adults and those with intermediate levels of education and income.

Exposure to alcohol begins early: a large survey of 8th grade students (mean age 14 years) in public and private schools of Brazilian state capitals showed that 71% had already experimented with alcohol and 27% had consumed alcohol in the previous 30 days.⁷⁶ Almost 25% of these students said they had been drunk at least once in their lives.

The problem with alcohol seems to be worsening. Table 1 shows that the prevalence of reporting at least one episode of excessive drinking in the past 30 days increased significantly between 2006 and 2009. This increase was more prominent in women (up 27%) than in men (up 13%). Additionally, age-adjusted mortality from mental and behavioural disorders due to use of alcohol (ICD10 code F10) rose 21% in 11 years, from 4·26 per 100 000 people in 1996 to 5·17 per 100 000 in 2007.

Patterns of physical activity have only been studied recently in Brazil and, therefore, secular trends in energy expenditures are unknown. In 1996–97, a nationwide survey showed that only 3·3% of Brazilian adults reported doing the minimum recommended level of 30 min of leisure-time physical activity at least 5 days per week.⁸² Self-reports through Vigitel surveys suggest that levels of physical activity have improved (table 1); but this is probably still not enough to compensate for the decline in occupational energy expenditures. Between 1970 and 2004, the fraction of economically active people who were employed in agriculture declined from 44% to 21%, whereas the fraction employed in services increased from 38% to 58%.¹⁰

Brazil does not have repeated national surveys on dietary patterns at present. Data from four large representative surveys of family food expenditure done in metropolitan areas of Brazil from the mid-1970s to the mid-2000s suggest a decline in the household purchase of basic traditional foods, such as rice, beans, and vegetables, and notable increases (up to 400%) in the purchase of processed foods, such as cookies and biscuits, soft drinks, processed meats, and ready meals. Over the same period, the proportion of energy from fat in total food purchases increased from 25·8% to 30·5% and energy from saturated fats went from 7·5% to

9·6%.⁸³ National estimates on sodium intake show a daily consumption of about 4 g per person, twice the maximum recommended intake.⁸⁴ Added sugar corresponds to 16% of total available energy according to a national household food expenditure survey done in 2003, or to 18% according to food balance data for the same year,⁸⁵ exceeding the maximum recommended intake by 60–80%. Although no estimate exists on the intake of trans fats in Brazil, excessive content of trans fatty acids is present in several processed foods, such as fried potatoes, ice creams, and cream crackers.⁸⁶

Repeated, nationally representative household anthropometric surveys, done since the mid-1970s, show a substantial rise in the frequency of excess weight. The development of this increase differs by age group, sex, socioeconomic status, and period.^{87–91}

From 1975 to 1989 the prevalence of adolescents who were overweight⁹² doubled for boys and girls and, from 1989 to 2003, more than doubled in boys, while increasing very little in girls (table 2). Although the rise in the prevalence of overweight was similar for all income and sex groups between 1975 and 1989,⁸⁷ between 1989 and 2003 family income modified the intensity of changes over time, with the increase shifting towards poor people. Figure 4 shows the relative rise in the number of people who were overweight was much higher for the lower than the upper income quintile in boys. In girls, those from lower income families had an increase whereas those from upper income families actually had a decline. Recent changes in number of people who are overweight has reduced but not eliminated the positive association between family income and being overweight that was initially noted.⁸⁷

Changes in obesity in adults⁹⁴ had similar patterns to those noted in adolescents, except that the shift towards poor people was recorded in both 1989 and 2002–03 (figure 4). As a consequence, the strong protection against obesity noted in the mid-1970s for lower-income groups was reduced across the 28-year period for men and was totally eliminated for women.⁹⁰

Perhaps surprisingly, the prevalence of Brazilian boys and girls younger than 5 years who were overweight⁹³ has remained stable (around 7–8%) from 1989 to 2007 (table 2), with no significant changes in the positive association between family income and being overweight.^{89,91} In the same period, child linear growth improved substantially in Brazil (child stunting was reduced from 19·9% to 7·1%), which could be one of the reasons underlying the absence of an increase in overweight children.⁸⁸

Estimates from Vigitel (table 1) show a continuing increase in obesity in adults from 2006 to 2009—from 11·4% to 13·9%. The increased prevalence in men was similar for all socioeconomic groups, although in women the major socioeconomic gap has widened—obesity increased from 15·2% to 18·2% for those with 8 years or less of schooling, but only from 7·5% to 8·4% in those with 12 years or more.⁷³ A 2008–09 nationally rep-

representative survey with anthropometric measurements confirms these increases, reporting an overall obesity prevalence of 14·8% for those aged 20 years or older.⁹⁵

The specific role of the immediate determinants of obesity—diet and physical activity—in causing the higher obesity increases noted in Brazil in adolescents and adults from lower-income groups is unknown since the country lacks reliable data on socioeconomic-specific secular trends in patterns of food intake and physical activity.

Rapid population ageing

Brazil has one of the fastest ageing populations in the world.^{96,97} Most of today's older Brazilian adults were born in rural areas, but now live in large urban centres; have endured significant socioeconomic adversity throughout their lives; have received little or no formal education; and worked in poorly paid unskilled occupations.⁹⁸ Moreover, changes such as smaller families and more women in the paid workforce have reduced families' ability to provide support and health care for elderly people.

The healthy life expectancy at birth of Brazilians is estimated to be 59·8 years, 12 years shorter than total life expectancy. Of those aged 60 years or older, the prevalence of limited capacity to properly and independently perform basic activities of daily life has been estimated as 15·2% (95% CI 14·6–15·8); however, the frequency is greater for those with lower household income or less schooling.³⁷

Behavioural, neuropsychological, environmental, and economic interventions are needed to respond to progressive population ageing. An important step in this direction, which results mainly from new legislation that altered retirement pension minimums, was the reduction in the proportion of elderly people whose per-head family income was less than half of the minimum wage, from 21·5% in 1993 to 10·1% in 2008. Additionally, Brazil launched its national policy for the health of elderly people in 2003, patterned after WHO's Active Ageing approach.⁹⁹

Successes and failures of prevention policies

Although various initiatives for the prevention and control of NCDs had been adopted over the past two or three decades, after the resolution of the 53rd World Health Assembly¹⁰⁰ Brazil has progressively implemented a comprehensive plan of action and a surveillance system for NCDs and their risk factors (panel 2).

Health promotion and intersectoral action

Brazil has increased its focus on NCDs, and policies implemented³⁹ have widened the scope of action from the traditional concern of medical care to prevention, health promotion, and intersectoral action.

In 2006, after discussion and agreement by representatives at federal, state, and municipal levels, a broad health promotion policy was approved. The policy included a series of actions in intersectoral articulation and policy development, health education, disease and

	1974-75	1989	1996	2002-03	2006-07
0-4 years					
Both sexes	..	8·4% (0·5)	7·4% (0·5)	..	7·3% (0·6)
10-19 years					
Boys	2·4% (0·2)	5·7% (0·5)	..	13·2% (0·5)	..
Girls	6·0% (0·2)	11·8% (0·6)	..	12·5% (0·5)	..
≥20 years					
Men	2·7% (0·2)	5·1% (0·3)	..	8·8% (0·3)	..
Women	7·4% (0·3)	12·4% (0·5)	..	13·0% (0·3)	..

Data are prevalence (SE). Excess weight criteria: for children <5 years was weight-for-height ≥ 2 Z scores of the WHO standards;⁹⁵ for adolescents was BMI-for-age higher than the International Obesity Task Force overweight cutoff;⁹² and for adults was BMI ≥ 30 kg/m².³⁴ Adapted from Conde,⁸⁷ Monteiro,⁹⁰ and Monteiro.⁹¹ BMI=body-mass index.

Table 2: Prevalence of excess weight by sex and age group, 1974-2007

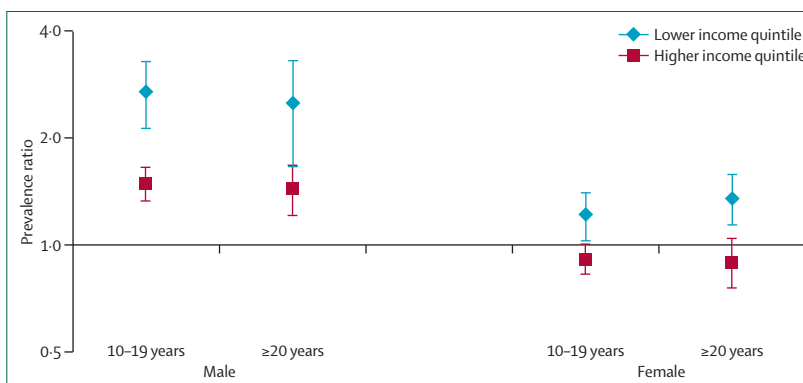


Figure 4: Age-adjusted prevalence ratio of excess weight in 2002-03 compared with 1989 in adolescents and adults by family income

Adapted from Conde⁸⁷ and Monteiro.⁹⁰

risk factor monitoring, and health care provision centred on healthy diets, physical activity, reduction of smoking, and the harmful use of alcohol. To support local health-promotion activities, the Ministry of Health transferred R\$5 million (about US\$2 million) to 27 state capital cities in 2005. By 2009, the allocation had climbed to R\$56 million (about US\$25 million), distributed on a competitive basis to 1277 states and municipalities. This initiative merits expansion, within a framework that stimulates adoption of effective interventions.

Of the Brazilian initiatives to respond to the challenge of chronic diseases, the control of smoking is a prominent success and is probably responsible for much of the decline in NCDs. To legislate and implement tobacco control has been a major challenge, because Brazil is the world's largest tobacco exporter and the second-largest tobacco producer. Yet, Brazil has progressively enacted, since the late 1980s, a broad framework of laws to control tobacco and tobacco use. In 2000, advertising of tobacco products was prohibited, photos alerting consumers to the risks were placed on cigarette packets, and a national committee for the control of tobacco was created involving various sectors. In 2006, Brazil ratified the WHO Framework Convention on Tobacco Control.¹⁰² A free

Panel 2: Health information systems and periodic surveys for chronic diseases

The main health information systems—SIM (mortality), SIAB and SIA (primary care), and SIH (admission to hospital)—are complemented with *Autorização de Procedimentos Ambulatoriais de Alta Complexidade/Custo*, a database for high cost and complex out-patient procedures such as renal dialysis and cancer chemotherapy; *SisHiperDia*, a voluntary registry of patients with diabetes, hypertension, or both; and population-based cancer registries.⁵⁸

Periodic representative surveys capture data on socioeconomic and demographic characteristics, risk factors and behaviour, health-care facilities, and self-reported disease—covering core, expanded, and optional items of step 1 (behavioural), and weight and height of step 2 (physical measurements), of the WHO STEPwise approach to risk factor surveillance.¹⁰¹ Principal of these studies are *Pesquisa de Orçamento Familiar (POF)*,⁹⁵ *Pesquisa Nacional por Amostra de Domicílios (PNAD)*,³⁷ *Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquerito Telefônico (Vigitel)*,⁷³ *Pesquisa Nacional da Saúde do Escolar (PeNSE)*,⁷⁶ and *Pesquisa Nacional de Saúde (PNS)*.

POF is the national household budget survey, profiling nutritional status and spending, including nutrition-related purchases, of Brazilian families along with measured height and weight. It permits the creation of food consumption indexes and time trends in household food availability.

PNAD is the national household survey that includes questions related to health every 3 years, providing individual information on socioeconomic and demographic characteristics, and selected health indicators including risk factors and self reported chronic diseases. In 2008 it included for the first time, data on tobacco consumption, physical activity, and exposure to violence.

Vigitel is the the telephone-based survey of risk factors for chronic disease established in 2006, annually reporting information on key risk factors and self-reported diseases of residents of Brazilian state capital cities.

PeNSE is the national survey of school health, investigating nutritional, smoking, and physical activity health behaviours, and family and school relationships, while measuring weight and height in 8th grade children (14 years) in all Brazilian state capital cities.

PNS is the first Brazilian national health survey. It includes blood pressure and other clinical parameters and laboratory measurements. It is scheduled for 2013.

national hotline, whose number is placed within the cigarette pack warning, offers guidance on smoking cessation. Several new tobacco control bills have been widely debated and approved at the national, state, and municipal levels. In seven states, smoking was prohibited in all public or private indoor collective spaces.¹⁰³

Although declines in smoking in Brazil produced prevalences that are among the lowest in the world outside of Africa,¹⁰⁴ recent declines have tapered (table 1). Additional advances in tobacco control are needed,¹⁰⁴ for example, through raising the price of cigarettes.

National food and nutrition policy from 1999, although directing efforts towards an integrated agenda for nutrition, makes clear the need to promote healthy diets and active lifestyles.¹⁰⁵ In accordance with the recommendations of the Global Strategy for Diet, Physical Activity, and Health,¹⁰⁶ this policy recognises the complex nature of obesity and other nutrition-related NCDs, and defines a set of actions within health and other sectors to ensure environments that favour healthy diets and active lifestyles for all.

The government has made recent advancements in this direction. Programmes offering free professionally supervised physical activity classes were implemented in several cities and have been assessed.¹⁰⁷ In 2009, national legislation was enacted that required at least 30% of the budget of the national school lunch programme be spent on fresh foods from local agricultural production and family farms. In 2010, a resolution regulating the marketing of foods rich in sugar, salt, or unhealthy fats was promulgated by the national surveillance agency.

Yet, the continued rapid rise in obesity, hypertension, and diabetes shows the inadequacy of present strategies, and raises the challenge of implementing additional steps as recommended by the Global Strategy.¹⁰⁶ These steps include fiscal ones that increase population access to healthy foods such as fruits and vegetables and that discourage consumption of highly processed foods, as well as interventions that guide urban design with the aim of promoting regular physical activity. Further actions to reduce the sodium content of foods are especially needed.

Important steps in the control of excessive drinking were taken, culminating in 2007 in the national policy for alcohol.¹⁰⁸ This policy includes educational actions, advertisement and sale regulations, law enforcement for drinking and driving, and provision of care for those with alcohol-related problems.

Yet, the implementation of this policy has varied across Brazil, and industry lobbying has exerted negative pressure—eg, to maintain beer advertisements in conjunction with major sports and cultural events. The recent rises in self-reported binge drinking, and the major rise in the age-adjusted mortality from mental and behavioural disorders because of the misuse of alcohol, herald future increases in alcohol-related disease burden and highlight a gap that deserves greater attention.

The most effective public-health actions are usually those that target populations,^{109,110} often legislation or regulations. Health education actions directed at individuals, in the absence of such concomitant upstream actions, have limited effectiveness in altering behaviour, and their effect size is often small in relation to massive industry marketing of unhealthy products. Individual

For more on PNS see
<http://www.pns.icict.fiocruz.br/>

responsibility for a healthy lifestyle must be seen as constrained by the social environment, especially in the presence of such undesirable marketing. An important role of government is to restrain inappropriate industry actions and to frame the environment such that it is easier to make healthy choices.¹¹¹

Brazil's success in legislative and regulatory actions, including fiscal ones, for tobacco control should guide the current challenge of implementing additional actions related to a healthy diet and physical activity. International recommendations relating to risk factor control² and recent recommendations for public actions to prevent cardiovascular disease by the UK's National Institute for Health and Clinical Excellence¹¹² are good examples of what more is needed.

Provision of chronic disease care in the national health system

Brazil's Unified Health System (*Sistema Único de Saúde*; SUS) aims for universal access at all levels of care. Primary care, as discussed elsewhere in this Series,⁹ is increasingly provided by Family Health Programme teams. Progressive expansion of the Family Health Programme has improved access to integral and continuous care, thus providing a platform for the prevention and management of chronic diseases.

The 2001 national reorganisation plan for the care of diabetes and hypertension, a nationwide screening programme, led to the detection and incorporation into the health system of an estimated 320 000 people with diabetes.¹¹³ As a result of this programme, diagnosis and treatment of diabetes were scaled up at the primary care level. Evidence-based norms guiding diabetes care were implemented. Low-cost, generic medications such as aspirin and statins for those with high absolute risk for cardiovascular disease, as suggested for low-income and middle-income countries,¹¹⁴ have been made widely available at no cost. In early 2011, the Ministry of Health expanded its People's Pharmacy programme, which will now offer basic medicines for diabetes and hypertension free of charge, as well as drugs for other chronic disorders such as asthma, rhinitis, Parkinson's disease, osteoporosis, and glaucoma at discounts up to 90%. Within the past few years, a nationally-coordinated smoking cessation programme has been started, based on group sessions and medications.¹¹⁵ Guidelines and materials for the preventive management of other NCDs have also been implemented. Recent ecologic analyses suggest that the Family Health Programme might have produced a decrease of 8% in adult deaths nationally after 8 years of implementation,¹¹⁶ and in Belo Horizonte, a major Brazilian metropolis, a 23% decrease in ambulatory care sensitive hospital admissions for chronic diseases after 4 years of implementation.

Yet major gaps remain in primary care provision, as important aspects of the chronic care model¹¹⁷⁻¹¹⁹ are only now beginning to be incorporated. A major initiative to

increase access via walk-in specialist clinics needs to be well integrated with Family Health Programme chronic care to avoid becoming a step in the wrong direction, leading to a second, competing port of entry into primary care via a model which is inadequate for the management of chronic diseases. Another recent initiative, which permits the support of Family Health Programme teams by other health professionals, including nutritionists, physical educators, psychologists, and psychiatrists,¹²⁰ should be directed primarily toward prevention and management of NCDs.

Although training modules have been developed and implemented for the care of neuropsychiatric disorders in primary care, more interventions for prevalent neuropsychiatric disorders such as depression, dementia, and alcohol dependence need to be implemented and assessed. Much of this mental health care can be designed to be delivered with existing activities such as those of maternal and child care and HIV/AIDS.¹²¹ Similarly, expeditious work-up of cases suggestive of potentially curable cancer, done in collaboration with relevant speciality physicians, must become widely available so as to ensure prompt diagnosis and effective treatment.⁶² Primary care teams also need to have training and support for palliative care of cancer patients with poor prognosis.

Screening for cervical cancer is widely available, and self-reported coverage for the Pap test is adequate overall, but access remains problematic in the poorest areas. A policy for breast cancer screening on the basis of clinical examination after 40 years and biennial mammography between age 50 years and 69 years was started in 2004, but coverage assessed by self report is still less than desirable, and unequal distribution of mammography services across Brazil complicates access. Challenges include ensuring that women at higher risk for cervical cancer are being targeted; implementing screening for breast cancer throughout the country; and providing a complete follow-up of 100% of women screened for both types of cancer, thus allowing prompt and effective treatment for those diagnosed.

Two huge challenges are the elimination of long waiting lists for specialised ambulatory care, diagnostic services and surgeries, and the transfer of treatment of most acute flares of chronic conditions from hospital emergency rooms to outpatient settings. One explanation for the failure to provide adequate access to quality outpatient care and basic surgeries is the competing demands for resources from technology-intensive therapies for advanced NCDs. For example, spending for renal dialysis rose from about R\$600 million (about US\$340 million) in 2000 to R\$1.7 billion (about US\$713 million) in 2009. Additionally, industry and medical societies exert constant pressure for the incorporation of high-cost health technologies of uncertain or questionable cost-effectiveness. Within this scenario, the so-called judicialisation of medicine (*ad hoc*

For more on the People's Pharmacy see <http://www.saude-naotempreco.com/index.php>

judicial rulings mandating the provision of services on the basis of courtroom judgements), addressed elsewhere in this Series,¹²² has aggravated the already questionable distribution of scarce health resources.

Resisting these forces, which lead to inadequate resource allocation, is another major challenge. To rationalise spending, guidelines and protocols have been progressively produced, especially to guide the use of highly complex procedures, and a framework for the assessment and incorporation of health technologies has been created. Major expansion of this effort is ongoing and necessary to assure that cost-effective treatments are offered to all.

The challenge

The fall in age-adjusted NCD mortality of about 2% per year from 1996 to 2007 is a great achievement, even though rates for diabetes and for certain types of cancer are rising. The goal of reducing NCD mortality by 2% per year over and above existing trends, as has been recommended,^{1,123} effectively requires a doubling of Brazil's current rate of decline—an enormous challenge. First, since trends for key diseases and risk factors are not favourable. Second, given the ascending obesity epidemic, these trends are unlikely to be reversed in the near future. Third, potentially avoidable social inequalities in the distribution of NCD risk will continue to act as a large and persistent generator of these conditions for the foreseeable future. Additionally, the challenge faced by Brazil is part of a larger global health challenge that needs concerted worldwide political action—eg, international pressure to remove unfair subsidies on cheap unhealthy foods.¹²⁴

Conclusions and recommendations

NCDs are quickly becoming the main public health priority in Brazil, and policies for their prevention and control have been implemented. Although formal assessment is often lacking, the SUS has made major strides, among them the implementation of very cost-effective interventions such as tobacco control and the widespread delivery of drugs to those at high risk of cardiovascular diseases. However, much more, can be done.^{2,4,125}

The priority and political support for preventing NCDs¹²⁴ needs to be increased through the emphasis of: their control through social, rather than individual, measures; their role in slowing economic growth and perpetuating poverty; and the existence of cost-effective interventions that permit their control.

National goals need to be developed for the reduction of chronic diseases and risk factors,^{1,126} with special emphasis on obesity, and the scaling up of policies and actions to achieve them.^{2,124,127–129}

A concomitant shift of resources, in relative terms, from hospital and high-technology end-stage care to health promotion and prevention is needed to augment

budgetary support and central coordination for chronic disease prevention and care.

Strategies involving augmented intersectoral discussion and planning are needed to implement and scale-up cost-effective interventions that can help to produce an environment conducive to healthy lifestyle choices. Emphasis should be placed on so-called upstream strategies, for example, those reducing the salt content of foods and restricting advertisement of unhealthy foods to children.^{2,114} Partnerships with civil society should be strengthened, and special attention should be given to crucial periods (pregnancy, early childhood, and adolescence).

The Brazilian health system needs to be strengthened for the care of chronic conditions through the development of a chronic-care model^{117,118} on the basis of local experiences; expansion and qualification of the Family Health Programme, amplified access to cost-effective drugs, greater communication between primary and other levels of care; integration of chronic disease programmatic actions with ongoing ones, such as those related to women's health and HIV/AIDS; and a scaling up of prompt detection and treatment of those with curable cancer.

Strategies need to be implemented that concomitantly ameliorate health inequities, in accordance with recommendations of Brazil's National Commission on Social Determinants of Health.¹³

Links with academic institutions need to be expanded, in part via an adequately directed research agenda, engaging them in planning and assessments at all levels and in the training of health professionals working within the SUS.

Health technology assessment needs to be enhanced to provide a sound basis for the proper selection of new public health programmes and actions, and of new drugs, devices and diagnostic tests.

Contributions

All authors contributed to the writing of this paper. BBD, MIS and GAS prepared the NCD burden section; BBD the cardiovascular disease section; AMM the chronic respiratory disease section; GAS the cancer section; MIS the diabetes section; PRM the neuropsychiatric disorders and the harmful use of alcohol sections; CAM the excess weight, unhealthy diet and physical inactivity sections; AMM, GAS and SMB the smoking sections; BBD and GAS the provision of care section; BBD, MIS, CAM and SMB the health promotion section; SMB the ageing section; and DC the inequalities panel. MIS and BBD supervised the organisation of the paper. All authors read and approved the final version.

Conflicts of interest

We declare that we have no conflicts of interest.

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Health in Brazil 5



Violence and injuries in Brazil: the effect, progress made, and challenges ahead

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Although there are signs of decline, homicides and traffic-related injuries and deaths in Brazil account for almost two-thirds of all deaths from external causes. In 2007, the homicide rate was 26·8 per 100 000 people and traffic-related mortality was 23·5 per 100 000. Domestic violence might not lead to as many deaths, but its share of violence-related morbidity is large. These are important public health problems that lead to enormous individual and collective costs. Young, black, and poor men are the main victims and perpetrators of community violence, whereas poor black women and children are the main victims of domestic violence. Regional differentials are also substantial. Besides the sociocultural determinants, much of the violence in Brazil has been associated with the misuse of alcohol and illicit drugs, and the wide availability of firearms. The high traffic-related morbidity and mortality in Brazil have been linked to the chosen model for the transport system that has given priority to roads and private-car use without offering adequate infrastructure. The system is often poorly equipped to deal with violations of traffic rules. In response to the major problems of violence and injuries, Brazil has greatly advanced in terms of legislation and action plans. The main challenge is to assess these advances to identify, extend, integrate, and continue the successful ones.

Introduction

Violence and injuries have been prominent causes of morbidity and mortality in Brazil since the 1980s; by 2007, they accounted for 12·5% of all deaths, mostly in young men (83·5%).¹ The pattern in Brazil differs from other parts of the world in some respects: most deaths are due to homicide or are traffic related (figure 1), by contrast with most WHO member countries where 51% of deaths due to external causes are suicides and 11% are due to wars and civil conflicts.² In 2007, there were 47707 homicides and 38419 traffic-related injuries and deaths in Brazil, which together constituted 67% of the total 131032 deaths from external causes. However, Brazil is not so different when compared with other Latin American countries.³

Domestic violence is another major concern that needs attention. Although not contributing much to mortality from external causes, several studies (reviewed by Krug and colleagues³) suggest that it is a very large problem and leads to serious and lasting consequences for individuals, families, and society.

Insecurity felt by many Brazilians should thus not be unexpected. This feeling stems from a combination of high crime rates—especially interpersonal violence—overseen by an often inefficient and corrupt police, as well as by impunity at large.⁴ In many respects, use of alcohol and illicit drugs, along with a large amount of weapons in circulation, form the backdrop to the violence. Longstanding insufficient and inadequate responses of the public-security forces and the justice system helped to increase the sense of impunity.

After a steady rise over the years, a declining trend in homicides and traffic-related injuries and deaths has been recorded over recent years, albeit not

homogeneously across all regions. Factors that might be influencing this downward trend are still uncertain, but some hypotheses have been proposed. Trends for domestic violence are unknown since there are few studies on this subject.

A renewed commitment of civil society and public agencies to build a national consciousness about violence and injuries has been witnessed over recent years. The

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Key messages

- Violence is an important public health problem in Brazil due to it being the source of a large proportion of morbidity (sixth leading cause of hospital admissions) and a high prevalence of domestic violence) and mortality (third place in mortality). This results in high individual and collective costs.
- Young, black, and poor men are the main victims and perpetrators of community violence, whereas poor black women are the main victims of domestic violence.
- In Brazil, physical violence between intimate partners has a regional pattern, with higher prevalence in the northern regions—less developed, with a strong patriarchal culture and characterised by gender inequality—as opposed to the historically most developed southern regions.
- Despite some successful experiences in recent years, public safety largely operates by confrontation and repression rather than sharing intelligence and prevention.
- The Brazilian transport system gives priority to roads and private-car use without offering an adequate infrastructure, and is poorly equipped to deal with the infringement of traffic rules.
- Widespread corruption and impunity provide a culture of permissiveness that surrounds violence and its consequences.
- Besides the sociocultural determinants, much of the violence in Brazil is associated with the misuse of alcohol and illicit drugs and wide availability of firearms.
- In response to the major problems of violence and injuries, Brazil has advanced greatly in terms of legislation and action plans. The main challenge is to assess these advances to identify, extend, integrate, and continue the successful ones.

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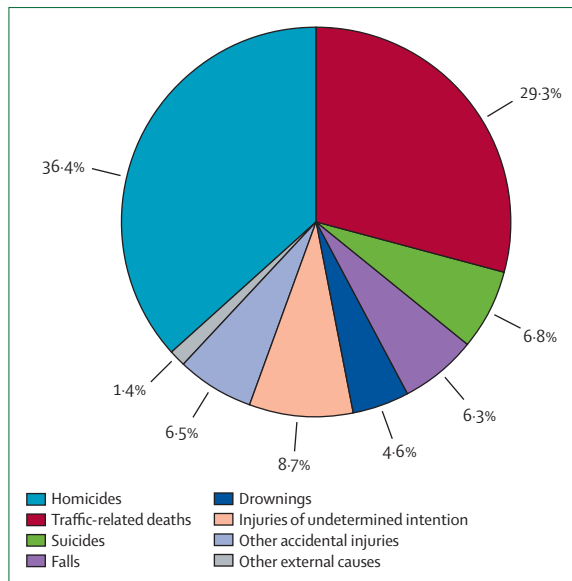


Figure 1: Proportional distribution of deaths by external causes, 2007
Original (ad-hoc) analysis (n=131 032) with the Brazilian Ministry of Health's Mortality Information System database.¹

Panel: Information sources for reviews and data analyses

We include original analyses of secondary data retrieved from the Brazilian Ministry of Health's Mortality Information System,¹ the Information System on Hospital Admissions,⁵ the 2000 Brazilian census obtained from the Brazilian Institute of Geography and Statistics and the Institute of Applied Economic Research. Our analysis of homicides covered 1980–2007, in addition to data from 2008 for Brazilian municipalities (counties) with 100 000 inhabitants or more. We assessed traffic-related deaths for 1996–2007 with data from the Mortality Information System, and for 2007 and 2008 with data from the Information System on Hospital Admissions. We used International Classification of Diseases (10th revision) codes X85–Y09 and Y87.1 for assault involving homicide, Y35 for legal intervention, and V01–V89 for traffic-related deaths.⁶

The original health data on homicides and traffic-related deaths are complemented by a review of published work. Besides police reports, police inquiries, court cases, and other official documents, our review is mainly based on data from the Brazilian National Department of Motor Vehicles, the Mobile Emergency Care Service,⁷ and the System for Surveillance of Accidents and Violence recently created by the Ministry of Health.^{8,9}

As with homicides, the Information System on Hospital Admissions is the best source of data on traffic-related injuries and deaths, since it covers deaths at any time after the event and not only those at the time of the accident. Meanwhile, data from DENATRAN cover only about 70% of all traffic-related deaths,¹⁰ so comparisons need to be viewed with caution when using publications based on different data sources.^{3,11} Records on outpatient morbidity after accidents and violence are usually only partial. The existing data are from admissions to hospital recorded in the Information System on Hospital Admissions database and the Mobile Emergency Care Service.⁷ Both provide better information on accidents (compared with violence), although the Mobile Emergency Care Service is still not organised as a nationwide system. The System for Surveillance of Accidents and Violence, established in 2006, contains reports of cases of violence that reach outpatient clinics and emergency services.^{8,9} Based on the profile of patients admitted to hospital, we have measured morbidity due to traffic-related injuries since 1998.¹²

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urgency about the need for social and institutional changes has been a catalyst for various movements and actions by civil society and government alike. For several health-related problems covered in this Series, violence is certainly one that has strongly affected the health sector, demanding a restructuring and organisational overhaul to respond to its effects: traumas, injuries, and deaths.

Based on several primary and secondary sources (panel), as well as specific reviews of published work, we provide an overview of violence and traffic-related events affecting the health of Brazilians. We focus on the most relevant aspects and describe strategies used by federal, state, and municipal governments and Brazilian society in general to confront the problems of homicides, domestic violence, and traffic-related injuries and deaths.

Homicides

Scale of the problem

Homicides, since the 1980s, have been largely responsible for the rise in violence-related mortality in Brazil. Mortality rose from 26.8 per 100 000 people in 1991 to 31.8 per 100 000 in 2001; however, since 2003, there has been a downturn (figure 2). By 2007, levels had returned to what they were in 1991 (26.8 per 100 000). Homicide-related mortality is still greater than that reported in China (1.2 per 100 000 in 2007) and Argentina (5.2 per 100 000 in 2007), yet is below that of other countries such as South Africa (36.5 per 100 000 in 2008) and Colombia (38.8 per 100 000 in 2007).²⁰

In Brazil, men are at ten-times greater risk of dying from homicides than women (figure 2); the differences by age group are equally striking. In the 1980s the increase in mortality was mainly in children (0–9 years) and adolescents (10–14 years), whereas in the next decade homicides also reached young adults aged between 15 and 29 years. In the 2000s, mortality dropped in nearly all age groups, except those aged 50 years and older.²¹

Epidemiological profile, determinants, and risk factors

The north, northeast, and centre-west regions (the areas of agricultural frontiers and serious conflicts over land) had the highest mortality due to homicide, whereas the southeast and south (the most heavily populated and developed regions) had the lowest (table 1). Over the period assessed there has been a general reduction in mortality in the southeast, north, and centre-west regions, but it has increased in the northeast and the south.

Although the most populous regions are those with the lowest homicide rates, the highest rates are in the larger cities. Some studies have given the intense urbanisation beginning in the 1990s as an explanation,²² although others point to social disorganisation and decreased law enforcement capacity.²³ A strong association between homicide, drug trafficking, and the possession of illegal weapons has also been surmised.^{22,24}

Several factors have been implicated in the increase of homicides in Brazil. Many of these factors are common

to Latin American countries and other parts of the world, but some are particular to Brazil, such as the blending of different cultural aspects of Brazilian society. As in many countries, young brown and black men and poorly educated people are the main victims.²¹ In 2007, for instance, men accounted for 43 890 (92%) of 47 707 homicides and 36 124 (81.7%) of 44 216 admissions to hospital involving violence at large. The most heavily affected age-group was 20–29 years, both for deaths (19 226 [40.3%] of 47 707) and admission to hospital (13 928 [31.5%] of 44 216). Of the 47 707 victims of homicides, 26 287 (55.1%) were mixed race (42.5% of the total Brazilian population is mixed race; 79 571 900 of 187 228 000) and 3912 (8.2%) were black (7.5% of the population; 14 042 100 of 187 228 000).²⁵ Of the 30 107 homicides (63.1%) for which information on the victims was available, 13 458 (44.7%) had 4–7 years of schooling whereas only 1174 (3.9%) had schooling for more than 12 years.

High consumption of alcohol and the use of illicit drugs are also common in Brazil. For example, in the state capital in southern Brazil 99 (76.2%) of the 130 victims or the perpetrators tried between 1990 and 1995 were intoxicated at the time of the crime.²⁶ Similarly, a toxicological analysis at the Institute of Forensic Medicine in a city of São Paulo State found cocaine in six of the blood samples taken in relation to 42 violent deaths.²⁷

Brazil has high homicide rates involving firearms (19.5 per 100 000 people in 2002), compared with both high-income countries like Canada, France, and the USA (from fewer than one per 100 000 to three per 100 000), and other low-to-middle income Latin American countries such as Argentina and Mexico (from three per 100 000 to seven per 100 000).²⁸ The proportion of homicides committed with firearms increased from 50% to 70% between 1991 and 2000, an increase mostly due to the use of smuggled weapons in organised crime. During this period, while homicides increased by 27.5% overall, those involving firearms increased by 72.5%.²⁹ According to data from 2007, firearms were used in 71.5% of homicide deaths and 24.4% of admissions to hospital due to assaults.

From a macrostructural standpoint, Brazilian researchers have underscored the severe economic stagnation that took hold of the country in the 1980s and aggravated a historical and enduring concentration of wealth. This stagnation was in the wake of a process of accelerated urbanisation that had already begun in previous decades, a process that led a large portion of the population to move into the peripheries of towns and cities without matching provisions of infrastructure and services. Unprecedented growth of the young population due to the baby boom of the 1960s and the ensuing high rates of unemployment and informal employment of these young people, especially in those with lower levels of formal education, might have also added to the escalating homicide rates.

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All rates are standardised according to the WHO standard population in 2000.¹³ Data corrected for under-reporting according to region of the country, sex, and age strata. The webappendix accompanying the Series paper by Victora and colleagues has details of the mortality calculation.¹⁴

It is difficult to obtain reliable data on child abuse and neglect, intimate partner violence, and domestic violence against the elderly. Mortality data are problematic, since they assume deaths from external causes as a proxy for the problem. Mortality and morbidity databases from law enforcement agencies have many missing data, especially regarding the aggressor, thus hindering interpretation of the data. Surveillance data from reports to health services or Tutelary Councils have limited coverage in different regions of Brazil and tend to emphasise certain aspects of violence more than others.¹⁵ Primary morbidity data are more specific and provide a more detailed picture. We thus chose to prioritise primary sources for our review of published work and as the underlying data for the original analyses. There are few such studies with a nationwide scope in Brazil. So far, only three population-based surveys were identified that specifically assessed domestic and intimate-partner violence and covered states from all regions of the country.^{16–19}

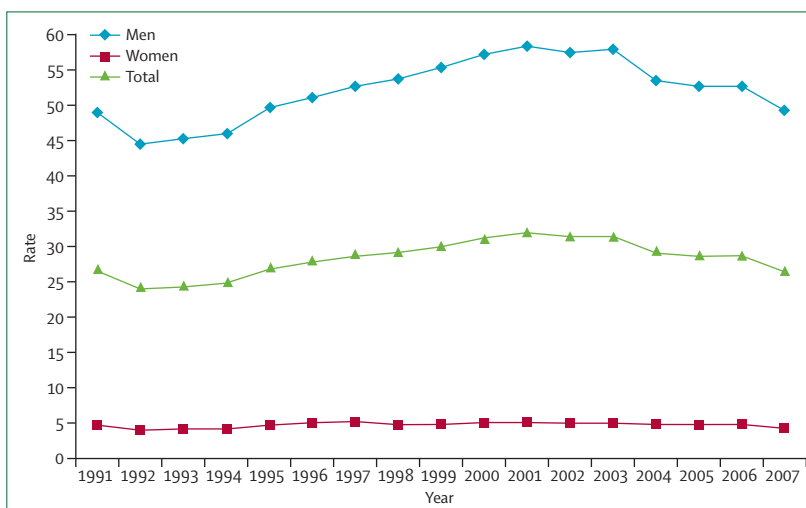


Figure 2: Total homicide mortality (per 100 000 inhabitants) and by sex, 1991–2007

Original (ad-hoc) analysis with Brazilian Ministry of Health's Mortality Information System database.³ Rates are standardised according to the WHO standard population in 2000.¹³ Data corrected for under-reporting according to region of the country, sex, and age strata.

Contextual factors also made a great contribution to the increase in homicides in the 1980s and 1990s. Notable factors are the intensification of the trade in illicit drugs, smuggling and trafficking of firearms and other merchandise, urban turf wars between criminal gangs, police violence, conflicts in rural towns with agricultural frontiers, and land disputes.^{23,30–32}

Consequences

The high homicide rate has major emotional and social costs. Homicide leads to the breakdown of families and affects friends and acquaintances of victims, causing suffering, revolt, fear, and despair, in addition to various psychiatric disorders.³³ Even a non-fatal assault almost always leaves temporary or permanent sequelae.

For more on data from the Brazilian Institute of Geography and Statistics see <http://www.ibge.gov.br/home/>

For more on data from the Institute of Applied Economic Research see <http://www.ipeadata.gov.br/ipeaweb/dll/ipeadata>

For more on data from the Brazilian National Department of Motor Vehicles see <http://www.denatran.gov.br/>

For more on DENATLAN see <http://www.denatran.gov.br/>

	1991	1995	2000	2007	Difference
North	39.0	32.0	31.1	34.1	-12.6%
Northeast	30.8	31.6	32.0	36.8	19.5%
Centre-west	32.6	29.9	34.6	29.6	-9.2%
Southeast	26.9	28.5	34.6	22.9	-14.9%
South	16.5	13.8	16.0	18.2	10.3%

Original (ad-hoc) analysis with Brazilian Ministry of Health's Mortality Information System database.¹ Rates are standardised according to the WHO standard population in 2000.³¹ Data corrected for under-reporting according to region of the country, sex, and age strata.

Table 1: Homicide mortality per 100 000 inhabitants by macro-regions of Brazil, 1991–2007

According to the Institute of Applied Economic Research, violence cost Brazil almost US\$30 billion (more than R\$87 billion) in 2004. Of this, the cost to the public sector was \$9.6 billion (almost R\$28 billion).³⁴ The Unified National Health System (SUS) spent an estimated \$39 million (almost R\$114 million) in 2004 on admissions to hospital due to assaults, a large share of which related to attempted homicides.⁹

Studies have shown that homicides interfered in the urban layout and negatively affected the real-estate sector. These changes led to the closing off of public spaces and sparked the construction of private gated communities for those purporting to shield themselves from violence.³⁵ According to simulations for certain neighbourhoods in Belo Horizonte (capital of the State of Minas Gerais), a 50% drop in the homicide rate would increase rental values by 12–16.6%.³⁶ Perversely, homicides also led to increases in the economy and generated income for the security industry—because of the demand for electric fences and gratings, armoured passenger cars, and alarm systems—and the weapons industry. Homicides also helped the private security industry, which showed an increase of 73.9% in the number of companies from 1997 to 2007; this represented 45.5% of the security services system³⁷ and automobile insurance industry.³⁸

Domestic violence Scale of the problem

Another major public health problem in Brazil is child and adolescent maltreatment by parents, intimate-partner violence, and domestic violence against elderly people. Although sexual abuse is a serious public health problem in Brazil, it is discussed separately in the webappendix (p 1) since it is not necessarily a domestic form of violence and involves specific determinants and consequences compared with other forms of intimate violence.

The webappendix (p 3) summarises the population-based and services-based studies on domestic violence in Brazil between 1995 and 2010. Most studies are from the southeast, especially from the metropolitan areas of São Paulo and Rio de Janeiro.

According to the 11 studies on child abuse and neglect that we have reviewed, the number of cases of

psychological and physical violence against children and adolescents are conspicuously high.^{39,40} Regarding physical abuse, for instance, the average period prevalence according to studies published over the past 15 years was 15.7%. Although lower than in some countries such as India (36%), Egypt (26%), and the Philippines (37%), it is far higher than in other countries in the continent such as Chile (4%) and the USA (4.9%).² Although national studies highlight the importance of child neglect as part of child and adolescent maltreatment,^{41,42} there are no population-based studies accounting for its extent.

Mortality statistics suggest that one woman is killed every 2 h in Brazil, which places the country in 12th position in the world's rankings for the homicide of women.⁴ Morbidity data underlines this startling picture. The first large-scale Brazilian survey in 16 major cities, focusing on how couples resolved disputes arising day-to-day, showed that the overall prevalence of psychological aggression in couples was 78.3%, for so-called minor physical abuse was 21.5%, and for severe physical abuse was 12.9%; roughly in agreement with the out-of-pregnancy average prevalence (63.5% of psychological aggression and 22.8% of any type of physical abuse; webappendix p 3).¹⁷ On narrowing down to violence perpetrated against women by their partners, the study showed 67.5% psychological aggression and 7.1% severe physical abuse. The 12-month prevalence of any type of physical abuse was 14.3%, about average if compared with all studies reviewed by Heise and colleagues,⁴³ Jewkes and colleagues,⁴⁴ and Taft and colleagues.⁴⁵ Prevalence was far greater than the mean estimates in North America (2%), moderately greater than those in Europe (8%) and sub-Saharan Africa (9%), and close to the levels reported from Asia and Oceania (12%). Yet, the aggregate rate (16 cities) was well below the mean reported from North Africa and the Middle East (33%). The overall prevalence was also lower than Latin America's average of 21%, but closer to the rates in Mexico (15%) and Uruguay (10%).

Brazilian estimates were higher when assessing lifetime intimate-partner violence. The *WHO Multi-Country Study on Women's Health and Domestic Violence* reported prevalence of about 27% for São Paulo (city) and 34% for the State of Pernambuco's coastal region.⁴⁶ Intimate-partner violence is also common against pregnant women. A study in Rio de Janeiro showed a 9-month period prevalence of 18.2% for physical assault,⁴⁷ which is at the upper limits reported by other investigators.⁴⁸

Research on domestic abuse of elderly people is still scarce in Brazil. Two population-based studies show prevalence rates of about 10% for physical abuse by family members or caregivers (webappendix p 3),^{49,50} which is substantially higher than those reported in the USA (2%),⁵¹ England (2%),⁵² and the Netherlands (1.2%).⁵³

Epidemiological profile, determinants, and risk factors

Table 2 shows the profile of conflict-resolution related intimate-partner violence.¹⁷ Focusing on women as victims, there are some regional differences in prevalence,

as well as women's age and schooling. In all regions, about three-quarters to two-thirds of the women reported that they were the recipients of at least one act of psychological aggression in the 12 months before they were questioned. About one in five (north and northeast) to one in eight (centre-west, southeast, and south) women reported an episode of physical force during the same period. There is a clear regional gradient with regard to the form of severe physical abuse such as punching, beating, choking, or even brandishing or actually using a knife or firearm. The findings are also consistent with higher levels of intimate-partner violence in lower-income strata, a profile similar to that found in other studies.^{2,47,56} The pattern with regard to women's age is less regular: in the south, adolescents are the more common victims of intimate-partner violence; whereas in the north, the victims are older women.

Although table 2 centres on women as victims, additional findings depict a more intricate pattern. Defining a positive case of intimate-partner violence as one act perpetrated within the 12-month recall period, women were shown to be at the same level as men for committing violent acts.^{17,47} However, and most importantly, male perpetrators consistently committed more such acts, and consequences to women victims were more severe. A document prepared by the Institute of Public Security of Rio de Janeiro⁵⁷ shows that women accounted for 27 149 (88%) of 30 851 cases of grievous bodily harm registered at police stations in 2008, and that the perpetrators were the present or former partners of the victims in more than half of these cases. This is clearly a very asymmetrical situation that relates to power structures within couples that might lead to a greater potential for one partner to hurt and severely injure the other.

Many Brazilian studies have identified sociocultural risk factors for domestic violence such as sex inequality,⁵⁸ permissiveness towards violence in childhood education,⁵⁹ devaluation of elderly people,^{49,60} precarious socioeconomic conditions,¹⁷ a weak network of support, and social isolation.⁶¹ A history of violence in the family⁶² and use of alcohol and illicit drugs also plays an important part.^{58,61} Physical violence against children is more common in boys, children with health problems, and in families with concomitant intimate-partner violence.^{63,64} This violence against children tends to happen in younger couples, but also in those couples with more children and household crowding.^{17,58,65} As in other countries, intimate-partner violence in Brazil also seems related to a history of childhood sexual abuse, multiparity, lack of financial autonomy for the woman, informal partnership, and if consent was given at first sexual intercourse.⁵⁸ Women married to men who do not practise any religion or women who are housewives are also at higher risk.⁶⁶

Consequences

Research in Brazil shows that the health consequences of violence in childhood can happen in different aspects of

	North (n=828)	Northeast (n=1920)	Centre- west (n=772)	Southeast (n=2008)	South (n=1246)	Aggregate (n=6797)
Psychological aggression						
Age of women (years)						
<20	79.8%*	69.2%	65.6%	75.3%	76.2%†	73.9%†
≥20	73.3%	66.6%	62.2%	66.7%	66.2%	66.8%
Duration of schooling (years)						
≤7	75.7%	70.7%*	64.6%	67.0%	68.5%	68.4%
>7	73.6%	64.6%	62.2%	68.2%	67.3%	67.5%
Total	74.1%	66.8%	62.7%	67.4%	67.2%	..*
Physical abuse (any)						
Age of women (years)						
<20	21.0%	16.0%	10.8%	13.1%	20.9%‡	14.9%
≥20	24.2%	19.3%	13.0%	12.8%	11.1%	14.5%
Duration of schooling (years)						
≤7	29.6%†	27.8%†	14.1%	19.2%†	16.6%†	21.2%‡
>7	20.1%	12.4%	11.9%	9.9%	10.5%	11.2%
Total	23.8%	18.9%	12.8%	12.4%	12.0%	..‡
Physical abuse (severe)						
Age of women (years)						
<20	6.1%†	7.8%	3.7%	4.3%	9.4%†	5.5%
≥20	12.6%	11.7%	7.5%	5.9%	4.9%	7.4%
Duration of schooling (years)						
≤7	16.9%‡	18.6%‡	7.6%	10.4%‡	9.6%‡	12.3%‡
>7	8.4%	5.7%	6.9%	3.6%	3.7%	4.5%
Total	11.8%	11.3%	7.1%	5.6%	5.4%	..‡

Original (ad-hoc) analysis with data from the Household Survey on Risk Behaviours and Reported Morbidity from Non-Communicable Diseases.⁵⁵ Portuguese (Brazilian) version of the Conflict Tactics Scales used to measure intimate-partner violence.^{53,54} Point-estimates and p values were calculated with Stata 10 svy allowing for design effect (stratified, multi-stage sampling with unequal sampling fractions). *p <0.05. †p <0.01. ‡p <0.001.

Table 2: Period-prevalence (12 months) of psychological and physical abuse against women by region

growth and development, and extend into adulthood. Physical traumatic effects tend to leave visible marks, mainly on the skin and in the musculoskeletal system. Less tangibly, studies have shown associations between child abuse and psychiatric disorders in general,⁶⁷ drug use,⁶⁸ depression and low self-esteem in adolescence,^{39,69} conduct disorders,⁷⁰ post-traumatic stress disorder,⁷¹ and transgressive behaviour in adulthood.⁶²

Intimate-partner violence also has serious consequences.⁷² Brazilian studies have reported many health problems, ranging from scratches to death. The consequences on women's mental health are substantial.^{73,74} Intimate-partner violence during pregnancy threatens not only the mother's health but also that of the infant;⁷⁵⁻⁷⁸ it has also indirect effects, as in other contexts, children who witness violence between their parents also suffer serious repercussions.^{62,79,80}

There is little evidence in Brazilian published work on the consequences of domestic violence against elderly people, so international work has been relied upon to raise the awareness of government agencies and civil society of the relevance of domestic violence and the importance of implementing measures to deal with it.

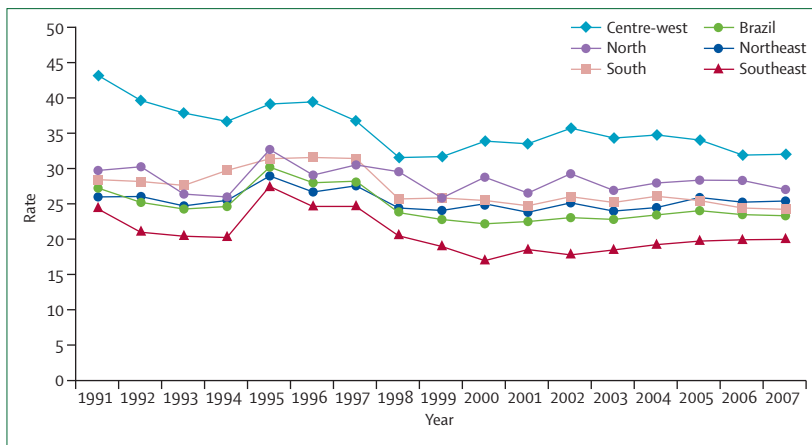


Figure 3: National traffic-related mortality (per 100 000 inhabitants) and by macroregions, 1991–2007
Original (ad-hoc) analysis with Brazilian Ministry of Health's Mortality Information System database.¹ Rates are standardised according to the WHO standard population in 2000.¹³ Data corrected for under-reporting according to region of the country, sex, and age strata.

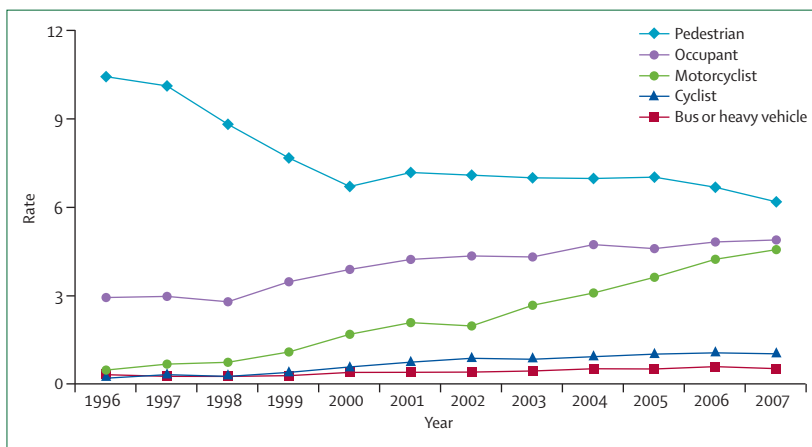


Figure 4: Traffic-related mortality (per 100 000 inhabitants) by type of victim, 1996–2007
Original (ad-hoc) analysis with Brazilian Ministry of Health's Mortality Information System database.¹ Rates are standardised according to the WHO standard population in 2000.¹³ Data corrected for under-reporting according to region of the country, sex, and age strata.

Traffic-related injuries and deaths

Scale of the problem

The first epidemiological studies on traffic-related deaths in Brazil date to the 1970s and already showed high and rising mortality.^{81,82} Based on the profile of patients admitted to hospital, it has been possible to measure morbidity from traffic-related injuries since 1998.¹² The VIVA System,⁸ established in 2006, has allowed the characteristics of patients treated in emergency services to be identified (panel).

In 2007, traffic-related deaths represented almost 30% of all deaths from external causes in Brazil (figure 1). Figure 3 shows the mortality trend from 1991 to 2007. Mortality peaked by 1996 and 1997 (28.1 per 100 000 inhabitants per year). This rate was still greater than the world's average (19.0 per 100 000) and all low-to-middle-income countries put together (20.2 per 100 000),

and far greater than in high-income countries (12.6 per 100 000). The decline happened by 1998 and rates stayed at about 23 per 100 000 thereafter. Brazil's position remained close to the Latin America and Caribbean average (26.1 per 100 000), yet still above some countries such as Argentina (9.9 per 100 000) and Chile (10.7 per 100 000), although below others such as El Salvador (41.7 per 100 000).⁸³ The decline—about 14%—might be attributable in part to the new Brazilian Traffic Code, enacted in 1998, which includes, not only strict enforcement of seatbelt use and drinking-and-driving laws, but also provides severe sanctions for offending drivers.⁸⁴ The sharpest fall was in the centre-west region, although it remained with the highest rate at the end of the 16-year series (figure 3). There was also a small decline in the southern regions (south and southeast), similar to the aggregate Brazilian trend. Rates in the northeast were stable at about 28 per 100 000.

Pedestrians are the largest category of traffic-related deaths (34.6%; figure 4), even with the decrease of 40.4% over the study period. In 2007, mortality of pedestrians was 6.2 per 100 000; however, the worst problem today concerns motorcyclists. Motorcycle deaths as a proportion of total traffic-related deaths rose from 4.1% in 1996 to 28.4% in 2007; the risk increased at an alarming pace (820%), with rates rising from 0.5 to 4.2 per 100 000 inhabitants. Contributing to this increase was the huge expansion in the country's motorcycle fleet, which almost doubled from 2001 to 2005.¹⁰ Until the 1980s, motorcycles were still seen as pleasure vehicles in Brazil, but their low cost and agility in heavy traffic has, since the 1990s, turned them into work vehicles, initially to transport merchandise and to act as couriers (motor-boys) and more recently to transport passengers (motor-taxis).⁸⁵

Epidemiological profile, determinants, and risk factors

Traffic-related deaths mostly involve men (81.2% of deaths in 2007); the male-to-female ratio depends on the type of accident. This ratio is greater for cyclists (9.8 men killed for every woman), motorcyclists (8.1 men killed), and occupants of heavy vehicles and buses (6.8 men killed). The sex ratios are lower for the occupants of cars (3.5:1) and pedestrians (3.1:1). The elderly population (≥ 60 years) has the highest death rates as pedestrians, although individuals aged 40–59 years also make up a large share (table 3). Motorcycle-related and car-related deaths are more common in young adults (aged 20–39 years).

Several studies have attempted to clarify the risk factors for traffic-related injury and death.⁸⁶ Human factors include drinking and driving, stress, fatigue, and drowsiness. The latter is particularly common in taxi, lorry, bus, and ambulance drivers because of their long and exhausting work hours.^{87–89}

Drinking is an important factor beginning at early ages.⁹⁰ Galduróz and Caetano⁹¹ refer to two important studies. One study, done in 1997 in three State capitals (Curitiba,

Recife, and Salvador) and the Federal District (Brasília), showed that in 865 victims, 27.2% had blood alcohol content greater than 0.6 g/L, the amount allowed before the law changed in 2008. The other study, done in 1995 by the Centre for Studies on Drug Abuse (Centro de Estudos e Terapia do Abuso de Drogas) in the city of Salvador showed that 37.7% of drivers involved in traffic-related injuries had been drinking. Injuries as a consequence of heavy drinking were most common at night and on weekends; most of the intoxicated drivers were young single men.⁹² To these factors one must add speeding, sleepiness, and inexperienced young drivers, clearly a very dangerous and sometimes fatal combination.

Roadway-related factors include deficient traffic signs and poor road maintenance, bad or non-existent lighting, poor maintenance of the road surface, lack of highway shoulders, and inadequate inclines, embankments, and curves—all common in Brazil. Vehicle-related factors include inadequate maintenance of engines, brakes, and tyres, lack of airbags in economy vehicles, and hazardous car design.⁸⁶ Surprisingly, figures suggest that the increase in the number of cars in Brazil did not have a corresponding effect on mortality. From 1998 to 2007, motor vehicles increased by 104% (cars 75% and motorcycles 270%); however, according to our original ad-hoc analysis with a database provided by the National Traffic Department death rates decreased between 1998 and 2007 from 23.9% to 23.5%, and from 27.3 to 23.5 from 1991 onwards. This decrease suggests that other factors are involved such as speeding, driving under the influence of alcohol, and the lack of use of safety equipment (seatbelts, airbags, harnesses for children, and helmets for motorcyclists).⁸⁶

Consequences

Brazilian traffic accidents have a high personal and social cost: at the individual level, there is not only high mortality, but also major physical and psychological sequelae in injured survivors, especially in young victims. In 2005, for example, 500 patients were discharged from Brazilian hospitals with spinal-cord injuries related to traffic accidents.⁹³ Data from the Hospital Information System for 2007 show that there were 17265 admissions to hospitals because of traffic-related injuries.⁵

In 2006, the Brazilian Government's Institute of Applied Economic Research estimated the economic costs of traffic-related injuries in urban regions.⁹⁴ The total annual cost was about \$9.9 billion (almost R\$22 billion), or the equivalent of 1.2% of Brazil's gross domestic product that year. This total included \$2.9 billion (R\$6.4 billion) on federal highways (45% from lost productivity and 25% on patient treatment), \$6.4 billion (more than R\$14 billion) on State highways, and about \$632 million (almost R\$1.4 billion) on municipal roadways. Although the mean duration of hospital stay for injuries resulting from traffic-related injuries and death is shorter than that for other external causes,

	Pedestrian (n=6·2)	Cyclist (n=1·0)	Motorcyclist (n=4·6)	Car occupant (n=4·9)	Occupant of heavy vehicles and buses (n=0·5)
<10 years	2·7	0·2	0·1	1·3	0·1
10–19 years	2·5	0·7	3·4	2·4	0·2
20–39 years	5·1	1·1	9·4	7·0	0·8
40–59 years	8·5	1·6	4·1	6·6	0·8
≥60 years	15·0	1·5	1·5	5·2	0·4

Original (ad-hoc) analysis with Brazilian Ministry of Health's Mortality Information System database.¹ Rates are standardised according to the WHO standard population in 2000.¹³ Data corrected for under-reporting according to region of the country, sex, and age strata.

Table 3: Traffic-related mortality per 100 000 inhabitants by type of victim and by age group, 2007

admission to hospital as the result of traffic-related injury are far more costly than others.⁹⁵

Social responses to violence and traffic-related deaths and injuries

Past and present policies and measures

Several measures have been undertaken to reduce the number of homicides. Macrostructural measures implemented by the Brazilian Government feature initiatives for young people like the First Job Programme and Family Grant Programme (*Programa Bolsa Família*) that aim to keep children and young people in school. In 2004, the government created the National Public Security Force (*Força Nacional de Segurança Pública*) to address urban violence and reinforce the State's presence in regions with high-crime rates. More recently, in 2008, Brazil launched the National Public Security Programme with Citizenship (*Programa Nacional de Segurança Pública com Cidadania*) to link strict security policies with preventive social measures in projects for women at risk and young people in trouble with the law.⁹⁶

In 2003, the National Congress passed Law 10826—known as the Disarmament Statute—ruling on the registration, possession, and commercialisation of firearms and establishing the National Weapons System (*Sistema Nacional de Armas*). In 2004, a major campaign for voluntary disarmament, led predominantly by non-governmental organisations, resulted in more than 450 000 guns being turned in. However, a subsequent national referendum in 2005 did not enforce the control of the possession of illegal firearms, since 67% of the population voted against a ban on the sale of guns and ammunition. Regional governmental and non-governmental initiatives have however implemented comprehensive programmes of gun control.^{97–101}

We do not know whether the noted decline in recent years is consistent and widespread. In the absence of specific studies, one cannot pinpoint what the effects of such initiatives really are. However, the downturn in mortality since 2003 might be the result of a combination of socioeconomic, demographic, and specific measures. For one, there is the influence of recent improvements in

the quality of life, such as rising education levels, income, and purchasing power.¹⁰² The drop in the proportion of young in the population might also play a part.¹⁰³ At a more specific level, besides the stricter enforcement of the purchase and possession of firearms and the country's disarmament campaign,¹⁰⁴ there is the growing

incarceration rate,¹⁰⁵ preventive social projects, investment in public security actions, and use of intelligence for planning interventions.⁹⁶

Table 4 provides a brief history of the key actions taken in the past 30 years to deal with domestic violence. As the Brazilian women's movement grew in the late 1970s,

	Name or number	Details
Intimate-partner violence		
1980	Convention on the elimination of all forms of discrimination against women (I)	Brazil joins the international movement for sex equality and signs the bill passed 3 years previously by the UN General Assembly
1985	National council for women's rights Women's defence precinct	Founding of the council Created in the State of São Paulo; first in country
1986	Special precinct for women	Created in the State of Rio de Janeiro; first in country
1988	Convention on the elimination of all forms of discrimination against women (II)	Brazilian Government ratifies the UN Convention in full
1995	Inter-American convention on the prevention, punishment, and eradication of violence against women	Brazil also signs the Convention in a meeting that came to be known as the Convention of Belém do Pará
2003	Law number 10778 Executive order 103	Providing for nationwide mandatory reporting of violence against women by public and private health services Creation of the Special Secretariat for Women's Policies
2004	National policy for comprehensive women's health care Law number 10886 1st National Conference on Women's Policies, Brasilia	Aimed at developing policies for women's health in liaison with other technical areas of the Ministry of Health Its role is to develop technical standards, technical manuals, publications on topics related to women's health and provide technical support to states and municipalities in developing and implementing policies Adding paragraphs to Article 129 of Decree Law number 2848 of the 1940 penal code, and specifically defining domestic violence Ministry of Health formally acknowledges intimate-partner violence as a health problem, according to the National Policy for the Reduction of Morbidity and Mortality from Accidents and Violence and the National Plan for the Prevention of Violence
2005	Women's hotline (180)	Implemented as a free 24 h, 7 days a week telephone service with nationwide coverage
2006	Law number 11340	The so-called Maria da Penha law
2007	2nd National Conference on Women's Policies	Follow-up of the 1st National Conference in 2004
2008	Publication of the 2nd National Plan for Women's Policies	Strengthens the political will of the federal government to reverse the pattern of inequality between men and women, guided by the principles of equality and respect for diversity, equity, Brazilian women's autonomy, secularity of the state, universality of policies, social justice, transparency of public acts, participation, and social control
Children and adolescent maltreatment		
1988	Article 227 of the Brazilian Constitution	Aims to ensure protection of children by the family, society, and state
1990	Law number 99710 Law number 8069	Brazil adopts in full the text of the International Convention on the Rights of Children, passed by the UN General Assembly in 1989 Passage of the Statute of Children and Adolescents creating the so-called Tutelary Councils (for minors)
1991	Bill of Law number 8242	Creation of the National Council for the Rights of Children and Adolescents
1998	Implementation of the Information System on Childhood and Adolescence	In support of the work by the Tutelary Councils and the Councils for the Rights of Children at the municipal, state, and federal levels
1999	Ruling number 1354 by the Rio de Janeiro State Health Secretariat	The first major step towards mandatory reporting of child abuse
2001	Ministry of Health Ruling number 737 Ministry of Health Ruling number 1968	Institutes the National Policy for the Reduction of Morbidity and Mortality from Accidents and Violence Makes it mandatory for health services nationwide to report confirmed and suspected cases of child and adolescent abuse
2002	National Programme to Combat Sexual Violence against Children and Adolescents	Created in response to demands by the National Plan to Combat Violence Against Children and Adolescents
2003	Programme for the Protection of Children and Adolescents Threatened with Death (I)	Aim at providing accommodation to threatened children and adolescents; social programmes aimed at full protection; legal, psychological, pedagogical and financial support and assistance; and support in case of civil and administrative obligations that require their attendance
2004	Ministry of Health Ruling number 2406	Establishes the reporting service, reporting forms, and referral flows
2007	Decree number 6231	Officially establishes the Programme for the Protection of Children and Adolescents Threatened with Death started in 2003 The Programme launched a social agenda for children and adolescents, especially with regards to violence related deaths in children and juveniles
2010	Law project ruling out corporal punishment and degrading and cruel treatment against children and adolescents	Submitted to the National Congress on July 14, 2010, in commemoration of the 20 year anniversary of the Statute of Children and Adolescents

(Continues on next page)

Name or number		Details
(Continued from previous page)		
Domestic violence against elderly people		
1994	National Policy for the Elderly (law 8842)	Launched by government creating the National Council for the Elderly
1999	Ruling 1395/99	Enacts the National Policy for the Health of the Elderly
2003	Law 10 741 Law 10 741, and Articles 19 and 57	Establishes the Statute of the Elderly, after the International Action Plan for Aging approved by the 2nd UN World Assembly on Aging in 2002 Makes it the responsibility of health professionals and institutions to report abuses against the elderly to the Council for the Elderly (Municipal, State, or Federal)
2005	Action Plan to Combat Violence against Senior Citizens (I)	Presentation of the plan by the National Under-Secretariat for Human Rights, Office of the President Scheduled for implementation in 2005 and 2006
2006	Ruling number 2528	Updates the National Policy for the Health of the Elderly of 1994
2007	1st National Conference on the Rights of the Elderly	The initial step in establishing the National Network for the Protection and Defence of the Elderly

Table 4: Important benchmarks in tackling domestic violence in Brazil, by year

intimate-partner violence was the first form of domestic violence to become a priority. The initial measures were small, but have since gained impetus, establishing specialised and multidisciplinary care in police precincts and mandatory reporting of suspected and confirmed cases of intimate-partner violence. The process led to passage of the so-called Maria da Penha Law, which defined domestic violence as a human-rights violation and led to changes in the penal code. The law provides for measures to protect women whose lives are endangered, such as restraining orders or the arrest of aggressors.¹⁰⁶

Advances in legislation have been accompanied by accomplishments aimed at expanding services to women in situations of violence. There has been an increase of Offices of Public Defenders, specialised courts, dedicated police precincts for women, shelters for handling emergency situations, and referral centres. However, this work is unfinished since the coverage of services is still concentrated in the south and southeast regions, especially in big cities.¹⁰⁷

Another important step was the enactment of the Statute of Children and Adolescents (*Estatuto da Criança e do Adolescente*) in 1990, when it became mandatory to report suspected or confirmed cases of domestic violence to the authorities. The health sector was also made responsible for reporting and preventing cases, in addition to providing psychosocial and medical care for confirmed cases.⁷²

Prevention of violence against elderly people is a more recent concern. The Statute of the Elderly, enacted in 2003, was the first specific stance to guarantee the rights of citizens older than 60 years. Civil society and governmental institutions have also been uniting efforts. For instance, as an important strategy arising from the *Action Plan for Combating Violence against the Elderly*,¹⁰⁸ precincts for their care (*Centros Integrados de Atenção e Prevenção à Violência contra a Pessoa Idosa*) have been set up by the Special Secretariat for Human Rights. At present, 16 states in Brazil have such centres in operation.

The 20 years of mobilisation seems to be paying off. The mandatory reporting of suspected or confirmed

cases of violence is a reality in most Brazilian cities.¹⁰⁹ So too are the calls to complaints free-phone services (*disque-denúncia*).¹¹⁰ Registrations in specialised precincts have grown steadily, as well as the number of institutions focused on equality of the sexes and in reducing violence against children and elderly people.^{60,107,109,111} Fruitful initiatives for assessing the effectiveness of programmes and policies such as those developed by some non-governmental institutions are still isolated and sparse (eg, the Institute PROMUNDO and NOOS).

Several Brazilian institutions have taken measures to deal with the problem of traffic-related injuries and deaths (table 5). The important role of driving under the influence of alcohol in traffic-related injuries and deaths, for example, led to the setting of maximum permissible blood alcohol concentrations. In 1998, the Brazilian Traffic Code specified the legal limit at 0.6 g/L.⁸⁴ In 2008, Law 11705 was passed, widely known as the Dry Law, which revised the legal blood alcohol limit to zero.¹¹² Although it is still too early to assess the Law's effects, some studies have shown a reduction in morbidity and mortality from traffic-related injuries and deaths since it was enacted.^{95,113}

The growing demand for emergency services, hospital admission, and rehabilitation led the Ministry of Health to launch, in 2001, the Project for the Reduction of Traffic Accidents in several cities. The aim was to integrate the efforts by health services with that of the transport sector;¹¹⁴ another initiative was the Policy for Emergency Care. The guidelines have been used to finance and organise the prehospital-care system through the Mobile Emergency Care System, a crucial service for survival of victims and the reduction of sequelae.¹¹⁵ Non-governmental sectors in Brazil have also responded to the problem of traffic-related injuries and deaths, organising social movements of parents and relatives of victims to lobby for heavy punishment for drunk drivers that have caused injuries and deaths.

Although several of the initiatives might contribute to the reduction of traffic-related injuries and deaths, the Brazilian rates are still high when compared with many Latin American countries, and still little is known about

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For more on **NOOS** see <http://www.noos.org.br/>

	Name or number	Details
1966	Law 5108	Establishes the Brazilian National Traffic Code
1974	Law 6194	Rules on compulsory insurance for personal damages caused by automotive vehicles, or by their cargo, to third parties, both occupants and non-occupants
1997	Law 9053	Enacts the new National Traffic Code, which regulates Brazilian traffic along with complementary rulings; The States and municipalities also complement this legislation with their own rulings and ordinances and are free to enforce specific details concerning their own traffic The law includes the mandatory use of seatbelts by drivers and passengers on all roadways in Brazil
2001	Law 10350	Amends the National Traffic Code by making periodic psychological tests mandatory for professional drivers
2006	Law 11275 Law 11334	Alters articles 165 277, and 302 of the National Traffic Code in relation to driving under the influence of alcohol Amends article 218 of the National Traffic Code, altering the speed limits for purposes of defining violations and penalties
2007	..	The Senate Committee on the Constitution and Justice issues a positive review on a bill to ban the sale and consumption of alcoholic beverages in service stations and convenience stores within city limits and on Federal highways Some States, like Pernambuco, Rio de Janeiro, and Espirito Santo enacted this bill into law
2008	Executive Decree number 415 Ruling 277 of the National Traffic Council Law 11705	Places a nationwide ban on the sale of alcoholic beverages along Federal highways Rules on the transportation of children younger than 10 years and the use of restraining devices for children in motor vehicles Better known as the so-called Dry Law Sets a zero limit on blood alcohol content and places strict penalties on driving under the influence of alcohol
2009	Law 12006 Law 11910	Adds an article to the National Traffic Code to establish mechanisms for displaying and broadcasting traffic awareness messages, like advertising and campaigns Amends article 105 of Law number 9503, establishing mandatory use of complementary restraining device (airbag)

Table 5: Measures related to traffic-related injuries and deaths in Brazil, by year

their effectiveness since there are very few studies assessing these interventions. Although not comprehensive, there are suggestions of some improvements (figure 3).

Brazil has always been a violent country: national development began with the enslavement of Indians and Black Africans, and the scars of the country's colonial past persist to this day. This unfavourable legacy of exclusion, inequality, poverty, impunity, and corruption, often led by the state itself, has for centuries failed to fully guarantee basic social and human rights like safety and security, health, education, housing, work, and recreation.^{116,117} Aggravating such violations are deeply rooted cultural values that are often used to justify various expressions of violence in subjective and interpersonal relationships, like machismo, patriarchy,¹¹⁸⁻¹²⁰ and prejudice and discrimination against blacks, poor, women, elderly people, and homosexuals.^{109,121}

Yet, despite this legacy, in the past 15 years there has been a shift at the macro-level. This change ranges from improved quality of life, reduction of poverty and inequality (social protection schemes etc), reduction of unemployment, increased and more universal access to schooling, social mobility, and promotion of social inclusion with recognition of rights of the individual.¹⁰² There has been widespread mobilisation by society and government to respond to the challenges raised by the scale of violence; this is shown in the large and diverse board of nationwide debate forums, new policies, and enactment of specific laws.

However, there is still an enormous task ahead. Beyond a well established legal framework now available, the

challenge now rests in implementing and assessing specific action plans. The difficulties in monitoring and enforcing laws and policies are huge, because of the size of Brazil and its cultural diversity. From the perspective of management there are also barriers, such as corruption and the lack of prioritisation of resources to upgrade infrastructure. An example, one of the most contentious issues in Brazil today, is that despite the sanctioning of the drink-and-drive law across the country, some cities still lack breathalysers needed to enforce it.

However, supported by the emerging legislation and policies, various National Plans with well established guidelines and priorities were developed, providing for financial, operational, and technical support. However, there are still no comprehensive large-scale studies to assess the effect of actions to reduce homicides, domestic violence, and traffic-related injuries and deaths. What one finds are localised process assessments done for the sole purpose of guiding actions. These assessments have consistently raised concerns and emphasise an urgent need for intrasectoral and intersectoral integration. It has become clear that there is discontinuity and lack of communication between programmes and actions, both within the same sector of government, and across different sectors such as health, justice, welfare, and education.

Specific measures are also needed. In the case of homicides, the law enforcement sector is still dominated by ineffective policies based primarily on repression. Widespread impunity for crimes committed by common criminals, as well as by businessmen and politicians, fuels the perception that crime pays. It is thus important

to reinforce and redefine actions for fighting drug trafficking and crime in general, drawing on experiences that respect and promote human rights.^{97,98} This involves strict control of smuggling and illegal possession of firearms, improving police investigation methods, and providing a swifter judicial system to speed up potential convictions and thus curb impunity. Along with structural changes aimed at broadening opportunities for teenagers and young adults—many of whom do not attend school, are unemployed, and are away from their families, and thus at risk of involvement in crime. Attention must also be paid to the implementation of socioeducational schemes for convicted young people; this, in turn, needs a complete restructuring and overhaul of the institutions aiming at reintegrating offenders, which could be extended to the substandard prison system as a whole.

Brazilian society should strive for equitable and respectful interaction between partners and family members that promotes sex equality and the rights of children, adolescents, and elderly people. Replacing the common punishment-based and aggression-based disciplining of children, communication between partners, and caring for elderly people, with strategies that foster dialogue and affection should be encouraged. To this end, the involvement of media campaigns that promote peace and condemn violence are crucial to enhance cultural change. Introduction of these issues in the curricula of elementary and secondary schools could lead to positive results in the future.

From the health-service perspective, integrating professionals so that they become the backbone for the formation and strengthening of intersectoral networks for care and protection of victims is crucial. There is a need for expanding programmes concerned with mapping local vulnerabilities, such as unwanted pregnancy in adolescents, alcohol and drug misuse, and family history of violence. These programmes need to be based on multidisciplinary and geographically well distributed teams, including health-care workers drawn from the communities as many thousands already operating within the Brazilian primary health care strategy the Family Health Programme (widely known as *Programa Saúde da Família*).¹²²

Only focusing on prevention or early detection of cases is clearly not enough. So far, the Brazilian health system is poorly prepared to deal with cases of domestic violence. Properly trained personnel must be able to decide whether the situation should be handled locally or be referred. Liaison with other sectors is vital. The expansion and coordination of a safety net of specialist care for victims of violence should include welcoming police precincts, specialised courts, guardianship councils, shelters, rights councils, and health services directed at the care of victims and perpetrators.

Brazil's traffic problem needs the strong implementation of laws derived from the Brazilian Traffic

Code and others related to traffic safety. There needs to be stricter enforcement and prosecution of traffic violations. Better, honest, and credible policing is indispensable; as is improving the quality and integration of several information systems concerning traffic-related deaths and injuries used by police and the health sector. There is also an urgent need to intensify measures to tackle drinking and driving, as provided by the so-called Dry Law; although this law has received strong public support in many parts of the country, its implementation is far from complete. A solid infrastructure remains to be made universally available. Restrictions on alcoholic beverage sales along intercity highways and roads might be considered, as are campaigns to discourage drinking and driving. The cooperation of mass media would be crucial, not just to promote proactive educational campaigns of the need of defensive and responsible driving, but also to avoid advertisements and entertainment programmes that encourage speeding and reckless driving.

Efforts should be geared towards improving the automotive fleet and the transport network as a whole. Stricter annual licensing procedures would ease the withdrawal from circulation of unroadworthy vehicles. The introduction of modern safety features to all new vehicles sold would also help. Renewing and improving the mass transport systems and restoring the partly dilapidated extant road networks are also of utmost importance; this involves improving the quality of asphalt and extending the number of highway and road tracks across the country, adequately signposting roads, and providing walkways for pedestrians. Because of the great increase in motorcycle crashes, it is now essential to regulate motorcycle use for work purposes, create exclusive traffic lanes for motorcycles, and enforce the use of protective equipment by motorcyclists. From the perspective of health care, there is still room for development, such as in expanding the coverage and quality of hospital emergency care—before and during admission—and by the upscale of rehabilitation services for the survivors of traffic-related incidents.

Advances have been made in the study of violence and injuries. Growing investment by national research agencies led to an increase in the number of dedicated research groups (seven in 2000 to 80 in 2009).¹²³ Yet, research efforts have mostly concentrated on the size, determinants, causes, and consequences of violence. It is time to go further and also focus on assessing the ever increasing number of public policies and related plans. More and better placed investment should go to studies on monitoring methods, systematic and in-built process assessments, and studies on effect that should be sufficiently comprehensive to guide actions.

Finally, to reduce violence, Brazil must take a proactive stance and complete its full democratisation process,¹²⁴ especially with regards to strengthening and organising

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the state, providing education for all, and fostering dialogue between law enforcement and the poorer segments of society, without which the legal efforts to tackle this serious social problem will be insufficient to deal with its enormous complexity.

Contributors

MER, ERS, MHPMJ, and CMFPS participated in the original data analysis. All authors participated in the search of published work and the writing of sections of the report. All authors revised subsequent drafts of the article and approved its final version.

Conflicts of interest

We declare that we have no conflicts of interest.

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Health in Brazil 6



Health conditions and health-policy innovations in Brazil: the way forward

Cesar G Victora, Mauricio L Barreto, Maria do Carmo Leal, Carlos A Monteiro, Maria Ines Schmidt, Jairnilson Paim, Francisco I Bastos, Celia Almeida, Ligia Bahia, Claudia Travassos, Michael Reichenheim, Fernando C Barros, and the Lancet Brazil Series Working Group*

Brazil is a large complex country that is undergoing rapid economic, social, and environmental change. In this Series of six articles, we have reported important improvements in health status and life expectancy, which can be ascribed largely to progress in social determinants of health and to implementation of a comprehensive national health system with strong social participation. Many challenges remain, however. Socioeconomic and regional disparities are still unacceptably large, reflecting the fact that much progress is still needed to improve basic living conditions for a large proportion of the population. New health problems arise as a result of urbanisation and social and environmental change, and some old health issues remain unabated. Administration of a complex, decentralised public-health system, in which a large share of services is contracted out to the private sector, together with many private insurance providers, inevitably causes conflict and contradiction. The challenge is ultimately political, and we conclude with a call for action that requires continuous engagement by Brazilian society as a whole in securing the right to health for all Brazilian people.

Introduction

“Brazil is not for beginners”, said Tom Jobim, one of the world’s greatest popular composers of the 20th century. Throughout this Series of articles,^{1–5} we have shown that this statement indeed seems to be the case. We have reported remarkable progress in some aspects of health and health care, in sharp contrast with stagnation or even deterioration in other indicators. One of the ten largest economies globally, Brazil still has a long way to go before reaching current levels of health in the world’s most affluent nations.

Large countries tend to be complex and difficult to administrate. With nearly 200 million inhabitants, striking regional differences exist in Brazil, from the rich southeast and south (where life expectancy approaches that of rich countries),¹ to the poorer north and northeast, and to the rapidly expanding frontier of the centre-west. In this Series of articles we have shown that, despite these deep divisions, the health of Brazilian people is improving.^{1–5} Over the past four decades, life expectancy at birth increased by more than 6 months per calendar year.¹ Likewise, good progress is being made towards most of the Millennium Development Goals (MDGs; table 1). Indicators for MDG 1 (poverty and child undernutrition) and MDG 4 (child survival) will most probably be met.² Maternal mortality trends (MDG 5) have proven difficult to measure with precision because of enhanced reporting; modelled estimates show an annual rate of decline of around 4%,^{7,8} which will be insufficient to reach the goal.² With respect to infectious diseases (MDG 6), Brazil excels in control of vaccine-preventable diseases and HIV/AIDS, but other diseases—particularly dengue fever—have been unaffected by control efforts.³

Neither chronic diseases nor violence and injuries are part of the MDGs, although some researchers argue they

should have been included.^{9,10} Brazil is making some progress in these areas. Mortality rates of non-communicable diseases declined 20% between 1996 and 2007, mainly due to reductions in cardiovascular and chronic respiratory diseases, in parallel with falling smoking rates. By contrast, hypertension, obesity, and diabetes have risen, and neuropsychiatric disorders are currently the major contributor to disease burden.⁴ Both homicide and traffic-related death rates started to fall slowly after reaching peak levels in the 1990s, but much still needs to be done to control these two epidemics;⁵ for example, homicide rates in Brazil remain several fold higher than in neighbouring countries such as Argentina, Chile, or Uruguay.¹¹

Social, ethnic, and regional inequalities have plagued Brazilian society for centuries, which is not surprising since Brazil is one of the world’s leaders in terms of income inequalities. Nevertheless, in this Series we have provided evidence that socioeconomic and regional gaps in several health indicators are being narrowed progressively.

To place Brazil in perspective, table 2 shows time trends in key socioeconomic and health indicators in the seven Latin American countries with a population greater than 15 million inhabitants. In 1960, Brazil was ranked first or second in terms of poverty, income concentration, rural population, illiteracy, and mortality. Income concentration in Brazil is especially high, with the Gini coefficient reaching a peak of 0·64 in the late 1980s, when Brazil was the world’s most unequal country. Unlike any other country in table 2, Brazil has a huge land area and a major tropical disease burden at baseline. All countries showed progress in all indicators. Absolute and relative gaps between Brazil and the average value of the other six countries were reduced for all indicators, and for some of these (fertility and urbanisation) reversals took place. Gaps

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	Progress in terms of MDG indicators	Forecast
Eradicate extreme poverty and hunger (reduce extreme poverty and underweight by half; MDG 1)	Extreme poverty reduced from 8.8% (1990) to 4.2% (2005); underweight prevalence in children younger than 5 years reduced from 5.6% (1989) to 2.2% (2006–07)	Extreme poverty reduction goal reached; underweight reduction goal achieved
Achieve universal primary education (MDG 2)	95% of children and adolescents aged 7–17 years enrolled in school (2008)	On track
Promote gender equality and empower women (MDG 3)	More girls than boys are enrolled in primary, secondary, and higher education; discrimination against women in terms of employment, income, and political representation persists	Gender equality in education goal reached; other types of discrimination against women remain
Reduce under-5 mortality by two-thirds (MDG 4)	Under-5 mortality falling by 4.8% a year since 1990 (MDG requires annual rate of decline of 4.2%)	On track: goal likely to be met in 2011
Reduce maternal mortality by three-quarters (MDG 5)	Improved reporting of maternal deaths makes trends difficult to estimate but reduction unlikely to meet the goal; modelled estimates suggest annual reductions of 4%, lower than the rate of 5.4% required to meet the goal	Insufficient progress
Combat HIV, AIDS, malaria, tuberculosis, and other diseases (MDG 6)	Low prevalence (<0.5%) of HIV, which has been stable since 2000; almost complete eradication of some vaccine-preventable diseases (polio, measles, and diphtheria), diarrhoea, and Chagas' disease; partial success in control of malaria, hepatitis A and B, tuberculosis, and schistosomiasis; failure to control dengue and visceral leishmaniasis	Striking or partial progress against most infectious diseases

MDG=Millennium Development Goal. Data taken from United Nations Development Programme (UNDP) Brazil, the World Bank,⁶ and previous articles in this Series.^{1–5}

Table 1: Progress in MDGs achieved by Brazil

	Population (millions)		GDP per head (US\$)		Gini coefficient for income concentration		Urbanisation (%)		Adult literacy (%)		Total fertility rate (children/woman)		Life expectancy at birth (years)		Under-5 mortality rate (per 1000)	
	1960	2008	1960	2008	1984–87	2005–07	1960	2008	1980–82	2007	1960	2009	1960	2009	1960	2009
Brazil	71.7	191.9	1448	4448	0.58	0.55	45	86	75	90	6.2	1.8	54.5	72.7	178	21
Argentina	20.6	40.7	5237	9894	0.45	0.50	74	92	94	98	3.1	2.2	65.2	75.5	72	14
Chile	7.6	16.4	1842	6212	0.56	0.52	68	88	91	97	5.6	1.9	57.0	78.7	139	9
Colombia	16.0	44.9	1130	2986	..	0.58	45	75	..	93	6.8	2.4	56.7	73.2	144	19
Mexico	38.6	110.0	2554	6591	0.46	0.48	51	77	83	93	6.8	2.2	57.1	76.5	137	17
Peru	9.9	29.0	1647	2921	0.46	0.50	47	71	82	90	6.9	2.5	47.7	73.5	233	21
Venezuela	7.6	26.4	5425	5964	0.54	0.43	62	93	85	95	6.6	2.5	59.5	74.0	83	18
Mean*	..	..	2973	5761	0.493	0.503	57.6	82.8	86.9	94.1	6.0	2.3	57.2	75.2	134.5	16.2
Difference†	..	..	-1524	-1314	0.088	0.047	-12.7	2.8	-12.3	-4.1	0.2	-0.5	-2.7	-2.5	43.2	4.4
Ratio‡	..	..	0.49	0.77	1.18	1.09	0.78	1.03	0.86	0.96	1.04	0.80	0.95	0.97	1.32	1.27

GDP=gross domestic product. *Mean value of the indicator in the six countries (Brazil not included). †Difference between Brazil and the mean value of the other six countries. ‡Ratio between Brazil and the mean value of the other six countries. Data taken from Gapminder.

Table 2: Evolution of selected demographic, socioeconomic, and health indicators in the seven largest countries in Latin America, 1960–2009

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For more on UNDP Brazil see
<http://www.pnud.org.br/odm>

For the Gapminder data see
<http://www.gapminder.org/data>

in terms of life expectancy and under-5 mortality were small, except for a large reduction in the absolute gap in under-5 mortality, from 43.2 to 4.4 deaths per 1000 livebirths between 1960 and 2009.

Trends in the health status of the Brazilian population over the past 50 years must be interpreted in terms of social determinants of health. Military dictatorship from 1964 to the late 1980s was characterised by rapid economic growth and increased income concentration, inadequate social protection with a fragmented health system, and little social participation in all sectors, including health. This situation did not preclude growth of a strong social movement advocating for reform of the health sector in the 1970s and 1980s. The return to democracy allowed creation of the Unified Health System (SUS) in the new 1988 constitution, with strong popular participation at all levels.¹ Throughout this period, changes were seen in other determinants of health,

including urbanisation (more than four in every five Brazilian people now live in cities), fertility (which dropped from more than six to fewer than two children per woman in 40 years), and education (primary education now being nearly universal).

From the mid-1990s, other major changes started to happen. Hyperinflation was controlled and economic stability—followed by moderate economic growth—was established. The Family Health Strategy (formerly called the Family Health Programme) expanded primary health care and used geographic targeting to reach the poorest areas of the country, particularly the rural northeast and north, small cities, and periurban neighbourhoods in metropolitan areas. Conditional cash transfer programmes evolved into the current social protection system (the *Bolsa Familia*), which now benefits a quarter of the population. The minimum wage increased from US\$50 (about R\$83 at the 1990

exchange rate) a month in the 1980s to \$300 at present (almost R\$500), and after a long period of income concentration, the Gini coefficient started to decline from around the year 2000.

In addition to positive changes in social determinants of health, Brazil has also profited from a strong and committed health-sector reform movement, including not only academics, policy makers, and managers but also health workers from all levels (eg, auxiliary staff, nurses, and doctors), trade unionists, and the general population. This social movement was at the forefront of resistance to the post-welfare neoliberal agenda that swept through the world in the 1980s and 1990s.¹ Even when national governments included coalitions led by centrist or right-centrist parties, progressive health policies continued to be pursued. A comprehensive tax-based universal health system was created at the same time that basic packages and user fees were implemented in the public sector in most low-income and middle-income countries.

Internationally, Brazil adopted an independent and outspoken stance in forums such as the World Trade Organization, at which unfair drug patent laws were challenged.¹² At WHO, Brazil expressed strong opposition to the year 2000 *World Health Report* on health systems performance. Some people might argue that Brazil's reaction was attributable to its poor ranking among the world's countries, but the critique to that report was scientifically based, published in a high-impact journal,¹³ and later endorsed by the World Health Assembly.¹⁴

Nevertheless, progress has been uneven. Here, we address some of the main achievements and remaining challenges for the health of Brazilian people.

What is special about health in Brazil?

The Unified Health System

Since 1989, all Brazilian people have been entitled to free health care at primary, secondary, and tertiary level through a national health system that is unique in Latin America, being funded by taxes and social contributions, such as social security payments.¹ As described in the first report of this Series,¹ implementation of the SUS was accompanied by strong decentralisation and resulted in increased access to primary health care through the Family Health Strategy. This change has led to major increases in coverage,¹² with recorded effects on infant,^{15,16} and possibly adult,¹⁷ mortality, and reductions in unnecessary admissions.¹⁸ Brazil has been investing in a sustainable system based on primary health care at a time when many countries opted for selective primary care and for less equitable forms of funding.¹⁹ A 2008 survey showed that 93% of Brazilian people who sought health care were able to obtain it,¹ and several interventions for maternal and child health are now close to reaching universal coverage, being delivered through the primary health-care structure rather than as independent vertical programmes.²

Social participation

Intense social participation has been a cornerstone of the SUS since the bottom-up movements that resulted in Brazilian health-sector reform in the 1970s and 1980s. Social participation in health was institutionalised by the 1988 constitution and regulated further in 1990 legislation, establishing national health councils and conferences at three levels of government: Brazil has one national, 27 state, and more than 5500 municipal health councils.^{1,20} These are permanent bodies in charge of formulating health strategies, controlling implementation of policies, and analysing health plans and management reports submitted by their respective level of government. Strong interactions exist between councils, managers, and policy makers, forming a complex and innovative decision-making process.¹ All councils are made up of users (50% of members), health workers (25%), and health managers and service providers (25%). Health conferences are held every 4 years at the three levels, which entail many representatives with the same proportionate distribution as the councils. The mandate of these conferences is to assess the health situation and propose directives for health policies, thus contributing to inclusion of themes in the public agenda. Among other democratic mechanisms, the participatory budget adopted by several states and municipalities is quite innovative. A proportion of the health budget for a city (municipality) or state is defined on the basis of popular vote; the population of a given city can vote, for example, on whether a new intensive-care unit or more health posts should be built. Despite these advances, the participatory process needs to be improved continuously.²¹ Social and educational differences between users, professionals, and managers sometimes preclude democratic dialogue on equal terms. Corporate interests (see Dangers of professional interests) frequently play a part, and technobureaucratic dominance could restrict the ability of councils to make substantial changes. As a response to these shortcomings, the National Policy for Strategic and Participatory Management (known as ParticipaSUS) was approved in 2007 with the clear objective to integrate actions related to social participation, ombudsmanship, auditing, monitoring, and evaluation. Despite some difficulties, institutionalisation of social participation at all levels is a unique characteristic of the SUS.²²

Human resources for health

Qualified individuals are needed to run this complex Brazilian health system. In 2007, 1.7 doctors, 0.9 nurses, and 1.2 dentists were available per 1000 population, and these people were mostly located in the southeast and south of the country.¹ Rapid growth has taken place in terms of university enrolments for these professions: in 2008, 90 000 medical, 220 000 nursing, and 50 000 dentistry students were in training.²³ In particular, training of nurses has been promoted to address the chronic imbalance between nurses and doctors. Even in

terms of numbers of doctors, Brazil is outperformed by Argentina (3·2 per 1000) and Mexico (2·9 per 1000).²⁴ The Brazilian ministries of health and education are investing heavily to increase the focus of undergraduate programmes on primary health care. The latest innovation is undergraduate courses devoted to training of public-health (rather than clinical) workers.²⁵ In parallel, large programmes were set up to train auxiliary health personnel, not only for the primary-care system but also for other levels of care. Although health workers already represent about 10% of the Brazilian workforce, several challenges remain: uneven regional distribution of qualified personnel, high turnover, scarcity of structured careers, and major differences in salaries between regions, states, and municipalities, factors which are discussed below (see Human resources challenges).¹

The public-private mix

Brazil has substantial experience to share with respect to public-private partnerships, particularly in terms of provision of health services. The interface between the two sectors has evolved over time, yet it remains a constant source of conflict and contradictions.¹ Many private services (non-profit and for-profit hospitals, diagnostic laboratories, private outpatient clinics, etc) provide services for both the SUS and patients with private insurance. These facilities sometimes offer a dual standard of care according to how much they are being reimbursed per patient. A short visit to most private hospitals will show striking differences between crowded wards occupied by SUS patients and comfortable accommodation for those with private insurance. The public-private mix also leads to distortions in use of procedures, according to how much the government will reimburse private providers for a specific intervention. For example, the sharp rise in number of caesarean sections can be traced to higher payments for operative than for normal deliveries by social security schemes (which predated the SUS) to private providers in the 1970s.²⁶ Currently, private providers systematically complain that the values they receive from the SUS are insufficient to provide an adequate standard of care, but on the other hand they would not be able to survive economically without SUS contributions, which account for more than two-thirds of their clientele. Advocates for the SUS, in turn, argue that increased coverage and funding from the government, coupled with strong regulation and auditing, are essential to confer equal status to SUS and private patients and for effective insertion of the private sector into rationalised regionalised health-care networks. Public-private interactions are complicated further because many patients are entitled to use both systems, and doctors, nurses, and other health workers tend to have more than one job, typically being employed by both sectors. In short, the complex dimensions of the public-private mix in the Brazilian health sector are yet to be addressed.

Private health insurance

Important changes are also happening in the private insurance sector. Although Brazil has more than 1000 health plan providers,²⁷ most of these are small and operate at local level; among the largest companies with national operations, fusions and acquisitions have taken place that are rapidly leading to concentration in this sector.²⁸ The number of Brazilians with private insurance rose by more than 6 million from 2002 to 2008, although the proportion of the population covered has remained at around 20–25%.¹ As many formerly poor families join the middle class, the clientele for new mega-companies is likely to grow.¹ There is concern, however, that the overall price of insurance is increasing well above inflation rates, and that new plans exclude disorders for which treatment is likely to be costly. Because of the universal nature of the SUS, private patients with complex conditions that are not covered by their insurance plans still rely on the public sector, even though their private insurance contributions are largely tax-deductible—a highly regressive policy that undermines funding for the SUS.²⁹ Although progress has been made in regulation of private insurance, a redefinition of the roles of this sector vis-à-vis the SUS is essential, and stronger regulation is vital to define how to minimise competition between public and private sectors and how to reimburse the SUS when patients with private insurance use public services.

Capacity building for health research

Scientific research is growing rapidly in Brazil.³⁰ The National Science and Technology System was launched five decades ago with incentives for scientific training at undergraduate and postgraduate levels. Currently, there are 2718 postgraduate courses in the area of health, including 55 that offer masters and doctoral degrees in public health and related fields.³¹ Special incentives are provided for consolidated programmes, most of which are in the southeast and south of the country, to foster development of emerging groups in the rest of the country. Publications by Brazilian researchers in peer-reviewed science journals have leapt from 14237 in 2003 to 30415 in 2008.³⁰ 2·7% of global scientific publications in all areas of research are from Brazil, and this proportion is advancing faster than comparable countries in public health sciences (figure). This growth is attributable largely to a striking increase in government investment in research, including grants and performance-based funding of individual researchers and academic departments, and to investments that ensure open access to major Brazilian journals and improve their quality. In particular, the ministry of health established, in 2000, its department of science and technology, which uses 1·5% of the large SUS budget to finance health research according to a set of priorities³² delineated after a broad consultative process. From 2003 to 2009, the department financed 3700 projects with a total budget of US\$400

million (more than R\$907 million at 2009 exchange rates).³³ Funding of postgraduate programmes on topics such as surveillance, environmental health, hospital management, and technological assessment, among many others, is also supported. Academic institutions receive funding from the ministry of health to offer these courses regularly to health managers employed by the SUS. A major player in this area since 1979 has been the Brazilian Association of Post-Graduate Programmes in Collective Health (ABRASCO), which had a major role in creation of the SUS and which now represents the academic public health community in several national and international forums.³⁴

Mass media and health promotion

Another positive aspect of Brazilian public health is heavy involvement of the mass media. Televised soap operas are an integral part of Brazilian culture and are a major export item to other countries. Since the 1980s, serials and other television programmes have been used intensively by government and international organisations and by civil society to promote healthy behaviours, including oral rehydration for diarrhoea, breastfeeding, condom use for HIV prevention, and family planning. In parallel to the explicit dissemination of health messages, the lifestyle portrayed in soap operas—eg, small families³⁵ and leisure-time physical activity—has contributed to shaping behavioural norms. Television and soap operas are only one of many media channels used to promote healthy behaviours. Local radio stations, usually operated by community volunteers, have long had a role in health promotion; a good example is the dissemination of materials prepared by the Brazilian ministry of health and UNICEF during vertical campaigns in the 1980s for child-survival interventions. On the negative side, mass media has been used heavily to advertise unhealthy foods and drinks, aggressively market private insurance, and promote high-technology solutions (such as transplants, complex diagnostic procedures, caesarean section, plastic surgery) as equivalent to the best health care.

Regulation and drugs

A complex system such as the SUS requires a strong regulatory body. The National Agency for Health Surveillance (ANVISA; the Brazilian equivalent of the US Food and Drug Administration) was set up in 1999 as an autonomous body to regulate on a broad range of matters: medicines and health technologies, environment, food, health services, and frontiers.³⁶ Efficient action in many different areas is proving to be a major challenge, as exemplified by control of drugs. High treatment coverage for key infections such as HIV/AIDS, tuberculosis, and leprosy has been achieved, with exclusive distribution of free drugs through the SUS on the basis of protocols derived through expert consensus. Although emergence of strains resistant to antimicrobials remains a great concern, levels of primary and secondary

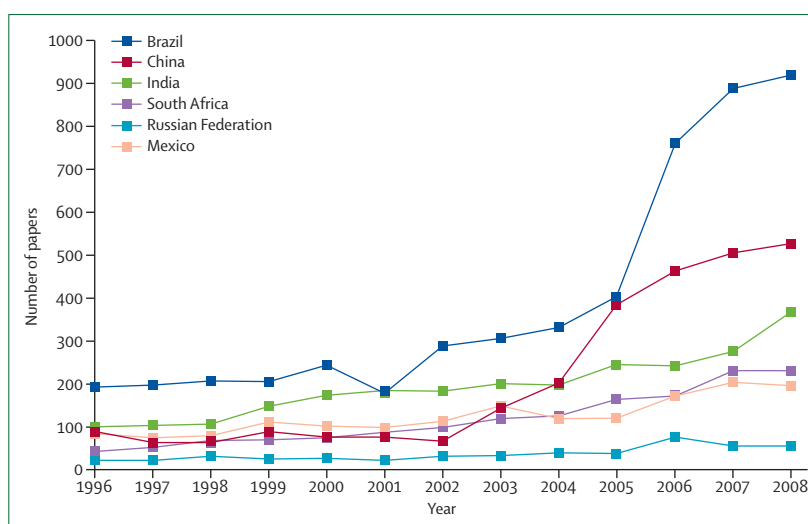


Figure: Number of scientific articles published per year in the area of public health, in selected countries
Data taken from ABRASCO.

resistance have been low and stable, suggesting that regulation has contributed to rational drug use.³ The situation for other antimicrobials is rather different. Despite strong regulatory rulings, most antibiotics have historically been available to anyone who requested them from unlicensed salespersons in private pharmacies;³⁷ such practices undoubtedly contributed to high levels of antimicrobial resistance in patients with community-acquired urinary infections³⁸ and gonorrhoea.³⁹ At the end of 2010, new legislation was passed to prohibit sales of antibiotics without a medical prescription, but whether it will be enforced effectively throughout the country remains to be seen.

For ABRASCO see <http://www.abrasco.org.br>

Commercial advertising

Infant foods, tobacco, alcoholic beverages, and sugared soft drinks are examples of products with potential harmful effects on health that can be controlled through legislation. Brazil has a mixed track record in this area. Experience with breastmilk substitutes is highly positive;² infant formula and bottles cannot be advertised to the general public, and labels of all commercial milk products must mention that they are unsuitable to replace breastmilk. Marketing techniques—such as discounts and gifts—are forbidden in the case of infant formula and bottles. Funding of scientific meetings by infant formula companies is strictly regulated, and grants to health personnel are not allowed. The International Code of Marketing of Breastmilk Substitutes was adopted in 1988 and is enforced strongly by the Brazilian ministry of health, in collaboration with the International Baby Food Action Network. Marketing regulations on tobacco are also comprehensive and strict; since 2000, advertising was prohibited, and photographs alerting about risks are mandatory on cigarette packets.⁴ By contrast, limits on the marketing

For the International Baby Food Action Network see <http://www.ibfan.org.br>

of alcoholic beverages are weak and are restricted to drinks with more than 13% alcohol. This constraint allows large marketing campaigns for beer targeted at young consumers, including sponsorship of major sports and cultural events.⁴ Regulatory attempts by ANVISA have been defeated repeatedly by industry and the media. The situation is even more important for energy-dense, nutrient-poor processed foods, which are not subject to any type of regulation, not even advertisements directed at children and adolescents. The timid pledges voluntarily assumed in Europe and North America by transnational food and beverages companies are not honoured in Brazil, and repeated attempts by ANVISA to regulate such marketing have been blocked by industrial lobbyists.⁴⁰ Unlike the observation for breastmilk substitutes and tobacco, civil society movements have yet to tackle the aggressive commercial promotion of alcoholic beverages and unhealthy processed foods, possibly because the health hazards of moderate alcohol intake and of processed foods are less well documented and publicised than are those of tobacco or infant formula, both nationally and globally. Therefore, unsurprisingly, breastfeeding is on the increase² and smoking is becoming less frequent;⁴ by contrast however, no detectable improvements have been seen in drinking of alcohol or being overweight.⁴

Major challenges remain

In a large and complex country such as Brazil, to lay out a comprehensive list of challenges to population health—and in particular, to provision of health care—would be overambitious. Nevertheless, some of the most important issues that need to be tackled in the near future are discussed below. These challenges are by no means the only ones. A major need exists to improve coordination between the public and private sectors, between different government sectors, and between diverse levels of government—municipal, state, and federal. Furthermore, impact assessment is crucial. Many programmes, projects, policies, and other initiatives have been launched in the past 20 years, the effect of which are unknown because of sparse attention to rigorous evaluation.

Reaching the hardest to reach

Despite high overall coverage and narrowing of regional and social disparities, important health inequities remain. Child mortality rates are still twice as high in the north and northeast of Brazil than in the south or southeast of the country.² Indigenous populations, mostly in the Amazon region, account for less than 1% of the population but still lag well behind the rest of the country in health indicators.⁴¹ Inequalities in ethnic groups persist for many indicators, whether in maternal and child health, chronic diseases, or violence.^{2,4,5,42} Quilombolas—or communities established in the 19th century by runaway slaves—present unacceptable levels of maternal and child health, as do settlements for

landless families (located throughout Brazil).⁴³ Having ensured high levels of access to health services for most of the population,¹ reduction of social exclusion of specific subgroups remains a challenge to the SUS. Further expansion and consolidation of primary care through the Family Health Strategy can help to address this challenge, together with the need to increase access to secondary and tertiary care.

Financing of the SUS

The SUS has been less successful than originally expected with respect to expansion of the share of the public sector relative to total health expenditure, which at 41% in 2007 compares unfavourably to countries with (UK, 82%) or without (Mexico, 47%) a national health service.¹ Expenditure in private insurance and out-of-pocket payments rose steadily over time, but the SUS has been underfunded since its creation, despite specific funding recommendations embedded in the 1988 constitution. The share of the health sector in the federal budget has remained stable, and total health expenditure represents 8.4% of the gross domestic product.⁴⁴ Important constraints exist in infrastructure, supply of specialised services, and human resources within the SUS, which have exacerbated the dependence of the SUS on purchasing services from the private sector, particularly for secondary and tertiary care. For example, only a third of all hospital beds used by SUS patients are in public hospitals. Private providers, on the other hand, are constantly arguing that current levels of reimbursement by the SUS barely allow them to meet costs. The current financing crisis is a major threat to the future of the SUS and a key priority for the future.

Improving quality of care

In this Series, we have not only reported striking improvements in access to services and in coverage levels for most health interventions but also highlighted that the quality of services provided through the SUS is sometimes below par—eg, in antenatal care.² Poor quality of care is related to institutional issues, such as high turnover of health workers in the Family Health Strategy, and difficulties in attracting skilled doctors to remote areas despite high salaries. Such posts are mostly attractive to young doctors who come out of medical school and choose to postpone their further education, at least for a few years. Greater investment in short training courses in specific areas, such as Integrated Management of Childhood Illnesses (IMCI)⁴⁵ or syndromic management of sexually transmitted diseases,⁴⁶ could contribute to improvement of quality of care, particularly in settings in which laboratory services are limited. Other important threats to quality of care include: health-care-associated acquired infections (a major problem, with hospital infection-control programmes being understaffed and without a focus on surveillance); the undue effect of medical technology on clinical decision making (Brazil has one of the highest rates of caesarean section in the

world);² the reduced proportion of services that have undergone accreditation (despite introduction of this process in the 1990s); and scant continuity of care.⁴⁷

Human resources challenges

Legislation that regulates hiring of civil servants in Brazil is rigid. Workers can only be selected through an open competitive process that takes several months, salary overheads are substantial, and to dismiss under-performers is very difficult. For these reasons, doctors, nurses, and community health workers are employed by the Family Health Strategy through special contracts, which makes them much easier to hire and to dismiss and allows payment in some categories (such as doctors or nurses) of competitive salaries that are well above those received by other similarly qualified health workers. This plan also allows remote municipalities to offer high salaries to attract professionals who would not otherwise be willing to live in such areas. The downside is that family health workers have neither a career structure nor job security or fringe benefits that other civil servants are entitled to. As a result, job satisfaction is typically below par and staff turnover is high,^{48,49} leading to discontinuities in patients' care.

Dangers of professional interests

Corporatism is a challenge to public health in Brazil. Medical societies have lobbied strongly against allowing other health workers—even university-trained nurses, physiotherapists, or audiologists—to prescribe any type of drug, and this action resulted in the *Law of Medical Acts* being passed by congress in 2009. Training of nurses or community health workers in the IMCI programme, which entails prescription of simple antibiotics to children with suspected pneumonia, was interrupted in 2002 because of pressure from medical societies, even though no doctors are working in 455 of Brazil's 5562 municipalities⁵⁰ and despite strong evidence that community case-management can reduce under-5 mortality⁵¹ and that IMCI-trained Brazilian nurses treat common illnesses to the same standard as doctors.⁵² This type of corporatism is especially paradoxical in a country where, until new legislation was passed in late 2010, antibiotics could be purchased easily over the counter. Other examples include pressures exerted by doctors against allowing nurse-midwives to deliver babies and by registered nurses against community health workers precluding them from administering injections.

The judiciary and health

Interference of the judicial system in prescription of drugs is a unique occurrence in Brazil. The 1988 constitution states that "health is the duty of the state"; patients who have been prescribed expensive, sometimes experimental, drugs that are not part of the essential drug lists ask judges to issue court orders obliging municipal health managers to purchase these drugs or to provide elective medical procedures

	Frequency and trends
Health of mothers and children²	
Illegal abortions	Highly prevalent*
Maternal mortality	Slow decline*
Preterm delivery	Increasing
Over-medicalisation of childbirth (caesarean sections, etc)	Increasing
Infectious diseases³	
Dengue fever	Repeated epidemics, out of control
Visceral leishmaniasis	Increasing
Non-communicable diseases⁴	
Overweight/obesity	Rapid increase
Diabetes	Increasing
Hypertension	High prevalence, still increasing
Psychiatric diseases	High prevalence*
Asthma	High prevalence*
Cancers of the breast, lung, prostate, and colon	Increasing
Tobacco use	Declining but still at unacceptable levels
Excessive use of alcohol	High prevalence*
External causes⁵	
Homicides	Slight decline but still at epidemic levels
Traffic-related injuries and deaths	Slight decline but still at epidemic levels
Domestic violence	High prevalence*

*Reliable and representative data for time trends are not available.

Table 3: Diseases and health problems that need special attention

immediately. Managers who do not comply are threatened with imprisonment. In 2008, the State of Rio Grande do Sul spent 22% of its drug budget to comply with 19 000 court orders.⁵³ Analysis of injunctions in São Paulo city shows that most cases were filed through private attorneys, that 47% of prescriptions were by private doctors, and three-quarters of such patients lived in high-income neighbourhoods.⁵⁴ Interference by the judiciary violates the key equity principle of the SUS, by privileging individuals with higher purchasing power and more access to information, boycotting rational prescribing practices, and taking resources away from priority areas. As a reaction to this stalemate, members of parliament are proposing the elaboration of clinical guidelines—similar to those issued by the UK's National Institute for Health and Clinical Excellence—to increase the powers of health managers in ruling which treatments and procedures are cost effective.

Reducing dependency on imported health technologies

Augmented demand for public services, combined with the rapid process of innovation and adoption of such advances in the health system, led to a striking increase in the proportion of the national health budget dedicated to medical equipment and commodities (drugs, diagnostics, vaccines, etc)—from 5.8% in 2003 to 12.3% in 2009. These items are mostly imported and represent a growing share of the country's trade balance. The ministries of health and of science and technology are making renewed

investments towards reduction of such dependency, but greater efforts are needed. Brazil's major investment in scientific training provides a strong basis for public-private partnerships with national entrepreneurs. Mechanisms such as tax exemptions, low-interest loans, and market guarantees for products produced locally are being trialled, and further investments in this area are needed.^{55,56}

Lessening the outcomes of environment and climate change

The effect of global climate change on disease patterns is unquestionable.⁵⁷ Vast areas of Brazil's north (Amazon rainforest) and centre-west (the Pantanal wetlands and savannah) are at especially high risk owing to a combination of overexploitation, deforestation, previous

Panel: Call for action

For a large and complex country undergoing rapid change, a call for action towards improvement of health conditions and provision of health services must be necessarily long. We have divided our recommendations into categories directed at the Brazilian Government and at other actors in the health arena. The state has a central role in the health sector, but other actors must also be involved to achieve the best population health.

The Brazilian Government

We urge the Brazilian Government to reaffirm its commitment to improve the health of all Brazilian people, in particular to the 1988 constitution and SUS, by taking action in the following areas.

Health conditions

- Expand activities aimed at achieving optimum health for all Brazilian people, including health conditions covered by the MDGs (health of children and mothers, undernutrition, selected infectious diseases including HIV, tuberculosis, and malaria) and other major health problems (non-communicable diseases and their risk factors, remaining infectious diseases, violence, traumas and injuries, etc).
- Renew efforts to further reduce diseases and conditions that are still highly prevalent, including traffic-related injuries and deaths, homicides, depression and other psychiatric diseases, and use of tobacco, alcohol, and illicit drugs.
- Prioritise diseases and conditions that are increasing in frequency, including overweight and obesity, diabetes, dengue fever, and prematurity, among others.
- Continue to invest in improvement of public health surveillance, birth and death information systems (particularly for maternal mortality), interpersonal violence, and other currently under-reported conditions.
- Enhance actions to further reduce regional, ethnic group, and socioeconomic inequalities in health, and particularly to reach populations that still have insufficient coverage of health care, including Indigenous groups, landless peasants, and quilombolas (Afro-Brazilian settlements).
- Improve use of health information technology and health information systems.
- Ensure that monitoring and evaluation systems take equity into account, by producing disaggregated results according to socioeconomic status and ethnic origin.

Financing of health care

- Reverse the trend of diminishing participation of public funds in total health expenditure by substantially increasing the public budget for health and reducing public subsidies for the private sector.
- Reduce the dependence of SUS on services purchased from the private sector, particularly in-hospital care and diagnostic services, by expanding public investment in infrastructure.

Primary health care

- Promote and integrate the Family Health Strategy to all levels of care as the means for reaching universal coverage with health interventions.
- Continue to support programmes in which Brazil currently excels, including immunisations, HIV/AIDS, and control of endemic diseases such as Chagas disease.

Regulation, accountability, and quality of care

- Promote initiatives to improve quality of care and patients' safety in health care.
- Monitor quality of care at all levels, including systematic and regular auditing of deaths and near-misses associated with preventable conditions.
- Enforce regulatory measures to avoid distortions and over-medicalisation associated with the need to purchase a large proportion of services from the private sector and with scant performance monitoring of public services.
- Reinforce social participation in the health sector and take proactive actions to ensure that existing health councils remain representative and able to effectively influence policy at all levels.
- Ensure increased accountability of policy makers, managers, and health personnel at all levels by strengthening performance measurement and participatory structures, and by establishing a strong organisational culture orientated around quality and safety.
- Strengthen regulatory bodies to implement effective certification processes for health workers.
- Expand existing regulations on the advertising of infant foods and tobacco, to also cover other potentially unhealthy products such as sugared soft drinks and alcoholic beverages.
- Strengthen regulatory bodies to produce measures that are more effective for protection of the environment and workplaces, and for reduction of potential harmful effects of food and medicines.

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Human resources for health

- Review civil-service regulations to improve the benefits and working conditions for doctors, nurses, and community health workers employed by the Family Health Strategy, to avoid turnover and maintain morale.
- Renew efforts to address health-worker shortages in hard-to-reach areas, by expanding on-the-job training and promoting task-shifting of procedures from doctors to nurses and community health workers.
- Create mechanisms for minimisation of discontinuities in the management of SUS at municipal, state, and federal levels as a result of political party interests.

Health research

- Continue to expand the funding available for health research, with special emphasis on achievement of technological independence and on thorough evaluation of existing technologies, programmes, and services.
- Consider creating a series of research institutes similar to the National Institutes of Health in the USA, or the UK's Medical Research Council.

Intersectoral actions

- Continue to promote conditional cash transfers and real increases in the minimum wage, which have contributed to income redistribution and near-elimination of extreme poverty.
- Enhance social policies and programmes focused on education, housing and social security as a means to reduce inequities.

Health workers

We urge health workers to:

- Fully engage in the continued process of construction and improvement of SUS.
- Participate as key actors in the process of delivering high-coverage quality and comprehensive care to the whole population.
- Avoid allowing narrow corporate interests to prevent essential health interventions from reaching those who need them most.
- Collaborate in augmenting access to high quality of care to those living in remote areas of the country where doctors and nurses are still not accessible.

Private sector

We urge the private sector to:

- Recognise its social role in providing services in coordination with SUS when requested, and to fully engage in the pursuit of high-quality health care for all Brazilian people.
- Harmonise its own financial requirements with the greater goal of achieving the best possible outcome for all, by ensuring equal treatment standards to private and SUS patients.
- Treat all patients with an equal standard of care, irrespective of how services are being reimbursed.

Universities, training institutions, health councils, and researchers

We urge universities, training institutions, health councils, and researchers to:

- Restate their commitment to SUS, specifically, to primary health care as gatekeeper of the system and as a means of achieving comprehensiveness in care and equity.
- Restate their commitment to train professionals to provide high quality of care.
- Review training programmes to ensure a high supply of family doctors and specialists directed at the public sector, by contrast with the current focus towards production of specialists aimed at the private sector.
- Invest further in training of public-health professionals at the undergraduate level.
- Ensure that every graduating doctor and nurse has the basic skills required to provide high quality of care in the Family Health Strategy, independently of whether or not they will become specialists in the future.
- Accelerate production of nurses and mid-level health workers.
- Increase investment in short in-service courses directed at doctors, nurses, and other health workers employed by SUS and the Family Health Strategy.
- Continue to undertake research aimed at improvement of equity in health, including monitoring and evaluation of access and effectiveness of health care, patients' satisfaction, cost-effectiveness of technologies and interventions, development of clinical guidelines, and health information technology.
- Expand research efforts towards achievement of technological self-sufficiency in health products (drugs, vaccines, diagnostics, and equipment) and health-technology assessments.
- Expand research efforts to improve knowledge and political and public awareness about social determinants of health.

Civil society

We urge civil society to:

- Restate its engagement in, and support for, the sanitary reform movement and, in particular, SUS and the Family Health Strategy.
- Continue to participate in health conferences and councils on equal terms with health workers and government representatives.
- Help the public sector to improve availability and quality of services by denouncing ill-treatment, scant access, and under-the-table payment requests.
- Understand that the best health care is not necessarily associated with the most advanced technologies.
- Continue to have a key critical and constructive role in building a unified, effective, and equitable national health system.

SUS=Unified Health System. MDG=Millennium Development Goal.

environmental degradation (eg, mercury poisoning in the major Amazon basins because of rustic open-air mining activities),⁵⁸ a local economy that is heavily dependent on non-renewable sources of energy (eg, forest chopping and burning), and the complex interplay of local and global climate changes.⁵⁹ Progressive environmental degradation at the border of pristine forests, new settlements, and large urban areas undergoing fast and chaotic development has been associated with the urbanisation of malaria.^{60,61} In Brazil's south, repeated severe flooding and tornadoes—unheard of until recent times—caused major material damage and some loss of life together with outbreaks of diarrhoea and leptospirosis, which were rapidly controlled by the health sector. Although attribution of recent increases in dengue fever and leishmaniasis to global warming is tempting, more complex determinants exist, including disordered urbanisation, inadequate sanitation and garbage disposal, and deficiencies in surveillance and control actions.³ The social environment is also affected by change: widespread urbanisation and urban violence⁵ limit opportunities for physical activity in public spaces; increased availability of processed foods contributes to being overweight;⁴⁰ and rapid changes in fertility and family structures might lead to positive and negative changes in physical and mental disease patterns.⁶² Particular attention should be paid to integrated initiatives with several benefits—eg, reduction in deforestation for production of charcoal with a concomitant fall in periurban malaria, or promotion of active commuting, which will increase physical activity and reduce emissions.⁶³

Tackling problems in health that are on the increase

In this Series, we have highlighted several health disorders that are either increasing in prevalence or are stable at unacceptably high levels (table 3).¹⁻⁵ A cross-cutting issue is the sharp growth in the elderly population,¹ who are at high risk of many of these conditions, particularly non-communicable diseases. Health issues related to ageing were discussed by Schmidt and colleagues.⁴ Improving the training of doctors and nurses employed by the Family Health Strategy in chronic conditions is a key challenge.

Concluding remarks

On the basis of present analyses and the preceding articles in this Series,¹⁻⁵ we conclude with a call for action (panel), in which we specify challenges directed to the government, private sector, academics, health workers, and civil society as a whole. We stress, however, that the actions recommended and the respective actors involved are deeply interconnected, and coordinated action is required by all.

Here, we have recorded important improvements in health status. The core message from this Series is that health improvements can be ascribed to favourable changes in social determinants of health, together with a

strong reform movement dating from the 1970s that led Brazil to take the unique approach—as far as Latin America is concerned—of creating a national health service specifically aimed at reduction of inequalities in health. Health-sector reform and the resultant creation of the SUS were part of a broad movement aimed at lowering social exclusion through initiatives in health, education, cash transfers, and other sectorial actions.⁶⁴

Yet, many challenges remain. Despite overall progress, socioeconomic and regional disparities remain unacceptably large, reflecting the fact that much effort is still needed to improve basic living conditions for much of the population. New health issues arise as a result of urbanisation and social and environmental change, and some old health problems remain unabated. Administration of a complex, decentralised public health system—in which a large share of services are contracted to the private sector—inevitably causes conflict and contradiction, as does the presence of a strong private health insurance sector. The challenge is ultimately political,¹ requiring continuous engagement by Brazilian society as a whole to secure the right to health for all Brazilian people.

Contributors

CGV wrote the paper with contributions from all other authors. All authors have seen and approved the final version.

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Conflicts of interest

We declare that we have no conflicts of interest.

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