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The achievements of the SUS in tackling the communicable diseases

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Abstract *This article presents the development of the epidemiological situation of some of the major communicable diseases (CD) in Brazil, with emphasis on the interventions by the SUS and other social policies. The data and information were collected from Datasus, epidemiological newsletters from the Brazilian Ministry of Health, and scientific articles on the issue. The universalization, decentralization and expansion of the surveillance, control and prevention of CD has produced an impact on the morbidity and mortality of these diseases, mainly those which are vaccine-preventable. The emergence and re-emergence of three arboviruses, for which there are no effective control instruments, interrupted the downward trend in the morbidity profile of CD in Brazil. Other social and economic programs, which are geared to the needier sectors of the Brazilian population, have also contributed to the improvement of the analyzed health indicators. However, the universalization of access to healthcare services, as well as improvements in the scope of the surveillance of diseases and health risks, has played a key role in improving the health and quality of life of the population, as well as contributing to the process of the democratization of Brazil.*

Key words *Communicable diseases, Emerging diseases, Re-emerging diseases, Unified Health System (SUS), Brazil*

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Introduction

In the period prior to the introduction of the Unified National Health System (SUS), the epidemiological profile of the Brazilian population was characterized by a high incidence and mortality due to communicable diseases (CD), including a high burden of rural endemic diseases, such as Chagas disease and schistosomiasis, although some improvements were already occurring. The surveillance, prevention and control measures developed to these diseases were incipient and relatively limited territorially, considering their magnitude, geographic distribution and severity[1].

With the reorganization and universalization of actions to deal with several CD that are of interest to public health, which was implemented by the SUS, these actions began to be developed in a coordinated way through the integration of the service network that today composes the National System of Health Surveillance (SNVS) with the other areas of the healthcare network. This has provided the system with the following: technical and operational uniformity regarding actions; comparability of the information generated in relation to the list of CD included in the Compulsory Notification List and, above all, a continuous flow of information between the different management spheres within the vast territory of the country, wichwhich has a continental dimension. These elements have also made it possible to have records of notifications of this group of diseases on a regular basis for the country as a whole[1,2].

In addition to this reorganization, other SUS initiatives should be highlighted, such as expanding access to primary health care and providing a wide range of free-of-charge vaccines and treatment for various CD that are universally available to the population. Furthermore, the decentralization of this health system, coupled with the gradual incorporation of a broader range of surveillance, prevention and control measures, has had a great impact in reducing the morbidity and mortality of a group of CD for which effective bio-medical technologies are already available. The information systems of the health sector, especially those of an epidemiological nature, began to be computerized based on information regarding the municipality of residence, instead of the state, which significantly increased the coverage. Efforts are continuously being made to improve the quality of this data.

From the 1980s, the emergence of new diseases produced by unknown agents, changes in the virulence or pathogenicity of diseases that already existed, and the introduction of agents that circulated in geographic spaces previously considered to be non-affected area, generated epidemics, which were often of an unexpected magnitude and severity, and caused changes in the epidemiological profile of CD throughout most of the world[3]. Regardless to these lengeschallenges, the SUS has faced the problems generated by these diseases, defined as either emerging or re-emerging, by introducing special measures to provide rapid surveillance and response to these problems.

This article describes the evolution of the epidemiological status of some of the major CD in Brazil, noting the contribution of the interventions provided by the SUS and other social policies, as well as the strategies that have been adopted to tackle the emergence and re-emergence of some diseases.

Achievements of the SUS regarding the prevention and control of some communicable diseases

Several studies have shown that the epidemiological profile of CD has markedly improved, especially since the 1960s, as a result of demographic and social transformations within Brazil[1]. In order to highlight the effects of the interventions developed within the scope of the SUS, the morbidity and mortality indicators of some of the main compulsory notification diseases in Brazil were compared (starting in the 1980s, when the data began to present a certain regularity) with data from the period after the promulgation of the Organic Health Law in 1990. Together with this information, scientific articles, epidemiological bulletins, official publications, and the websites of Brazilian and international health institutions, were also consulted.

Vaccine-preventable diseases

In the 1980s, the National Immunization Program (PNI) already offered vaccines against pertussis, diphtheria, poliomyelitis, measles and neonatal tetanus; diseases that constituted important health problems for the population, especially children. The average incidence of these diseases from 1981-1990 was 68.2 per 100,000 inhabitants and the majority of cases and deaths occurred in the population aged under five years. In the periods 1991-2000 and 2001-2010 this indicator was 9.9 and 0.6 per 100,000 inhabitants, respectively (Graph 1)[4]. In other words, twenty

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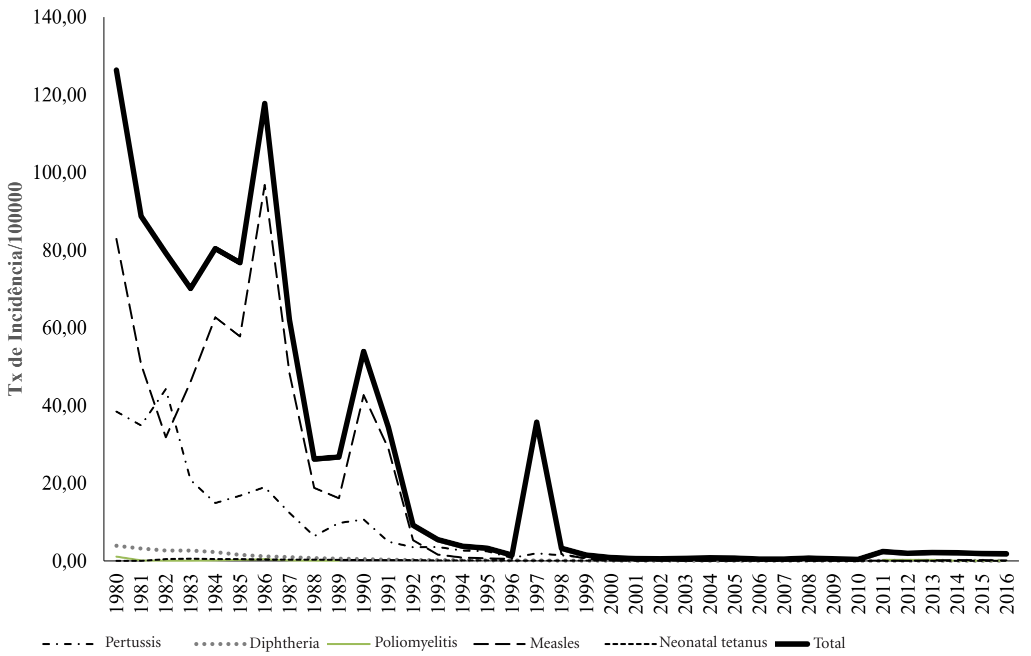
years after the introduction of the SUS the average incidence between the first and third period decreased by 99.1%. Undoubtedly, this impact was due to the high coverage of vaccination programs in Brazil, although the homogeneity of this coverage still needs to be improved. The slight increase in incidence recorded in the period 2010-2016 was due to small outbreaks of pertussis, which were possibly due to the limited efficacy of the pertussis component contained in the triple bacterial vaccine. This limitation did not allow maintain this disease under control for long periods, even with high levels of vaccine coverage. Graph 1 shows the historical series of the incidence of these five diseases.

In 1995, the circulation of wild poliovirus was eradicated in Brazil. To prevent its re-emergence the SUS maintains active surveillance of acute flaccid paralysis syndrome in all Brazilian municipalities, which is monitored continuously in order to provide early detection of the possible re-introduction of wild poliovirus in the country. Neonatal tetanus has been practically eliminated; from 2012-2016 the maximum number of reported cases was three in 2013, while in the 1980s an average of 500 cases were reported each year. Diphtheria is under control; since 2006 less than 15 cases per year have occurred, with an incidence of less than 0.1 per 100,000 inhabitants[4].

The implementation of the National Measles Elimination Plan in 1992 was decisive in reducing vaccine-preventable diseases in Brazil. In the same year, a large national vaccination campaign against this virus was carried out, reaching 96% coverage and targeting the age group from nine months to 14 years[5]. This resulted in a drastic reduction in the endemic-epidemic circulation of the measles virus, a virus of high incidence and mortality in children. Before the implementation of the SUS there were approximately 65,000 cases of measles resulting in 1,465 deaths annually in Brazil, of which more than 90% were children aged under five years, particularly those aged less than one year.

The last major measles epidemic in Brazil occurred in 1997 (Graph 1), when more than 53,000 cases were reported (33.6 per 100,000 inhabitants). Currently, the endemic transmission of this virus has been interrupted, although the continuation of transmission in other regions of the world has generated some outbreaks in Brazil. However, the early detection of these occurrences and the extensive vaccination that have been performed, together with the high vacci-



Graphic 1. Incidence rates for pertussis, diphtheria, poliomyelitis, measles and neonatal tetanus.

Note: In the period in question, incidence data per 100,000 diphtheria inhabitants ranged from 3.9 to close zero; polio of 1.08 for values close to zero; tetanus of 0.47 to values close to zero.

nation coverage achieved over the last three decades by the PNI, have prevented the spread of this agent, which is highly virulent, transmissible and pathogenic.

Rubella and congenital rubella syndrome (CRS) were eradicated in Brazil after a vaccination campaign of young people aged 20-39 years of both sexes in 2008; coverage reached 95.8%, with a high degree of homogeneity, corresponding to 67.1 million vaccinated people[6]. This initiative, together with the actions over the following years, resulted in the eradication of the endemic transmission of rubella and the eradication of CRS, so that in 2015 Brazil obtained certification of the elimination of this virus from the PAHO/WHO.

In 1999, the immunogen against *Haemophilus influenzae* type B was included in the PNI vaccination calendar, which reduced the invasive diseases produced by this bacterium; a year later, there was a decline of more than 72% in the incidence of pneumonia and meningitis in children aged under five (from 35.4 to 9.7 cases per 100,000 inhabitants). In children aged less than one year this reduction was 90% (from 36.5 to 3.4 cases per 100,000 inhabitants) two years after the introduction of this vaccine[7].

Before 2006, the year in which the vaccine against rotavirus was included in the PNI, approximately 120,000 cases of acute infantile diarrhea (AID) were hospitalized by SUS. From 2008-2009, there was a reduction of approximately 40,000 hospitalizations due to AID in children aged under five due to the protection provided by this immunogen, which has a high effectiveness in the reduction of severe cases of AID in this age group[8,9].

Rabies

Actions in Brazil to control rabies include the vaccination of livestock (rural cycle) and domestic animals (urban cycle), as well as post-exposure treatment for humans. These interventions have led to a marked reduction in human cases of this disease, whose lethality reach 100%. In the period 1981-1990 an average of 76.4 cases were confirmed per year (maximum of 139 and minimum of 39); in the following decade this average was 36.4 (reduction of 52.4%) and from 2001-2010 there were 14 cases (a reduction of 81.7%)[4]. From 2007-2010 the maximum number of cases of human rabies was three, and from 2011-2017 it ranged from 0-6. It should be noted that although in the beginning of this series most of the cases occurred as a result of attacks by domestic or street dogs and cats (urban cycle), in recent years there have been several attacks by bats, which are a wild reservoir of the rabies virus (air cycle) and are difficult to control by health measures.

Leprosy

Taking into account the fact that Brazil is the second most endemic country in the world in terms of leprosy, great efforts have been made to control this disease since the introduction of the SUS. In 1987 there were about 450,000 patients with leprosy actively registered in Brazil, with a rising trend. About 166,000 health professionals were trained and a campaign to publicize the early signs and symptoms of the disease was performed using the mass media. These actions were effective in detecting occult endemicity, so that detection increased from 15,000 to 45,000 new cases in only one year, making it possible to treat patients who had not previously been diagnosed and/or did not have access to health services.

From 1990-2016 the prevalence of this disease in Brazil reduced by 94.3%, from 19.5 cases per 100,000 inhabitants to 1.1 cases per 100,000 inhabitants. This corresponded to a reduction from 281,605 cases being treated to 22,631 cases. In that same period the general detection rate decreased by 38.7% (from 19.96 in 1990 to 12.23 cases per 100,000 inhabitants in 2016). Regarding the rate of detection in children under 15 years of age, a decrease of 36.7% was observed in the period from 1994-2016, which corresponded to a detection rate reducing from 5.74 to 3.63 cases per 100,000 inhabitants[4]. The decentralization of leprosy surveillance, control and treatment to the primary care network undeniably contributed to this development. In 2016, 71.1% of new cases (17,935) were notified by primary healthcare services; 19.9% (5,018) were notified by secondary care; and 9.0% (2,265) by tertiary care[10].

The introduction of multidrug therapy (MDT) in 1990, which resulted in a gradual reduction in treatment time, was a determining factor in the fall in prevalence of leprosy. However, despite providing a cure for leprosy, MDT did not interrupt the transmission of the disease, and, consequently, there was no impact on the rate of detection of new cases[11]. This was partially due to a break in the paradigm that leprosy patients do not re-infect, since the decoding of the complete genome of *M. leprae* isolated from patients with a relapse of the disease revealed that the same patient could be infected at different times with different strains of this bacillus[12]. Following the rationale for the treatment of tuberculosis, a new single therapeutic regimen (U-MDT) for leprosy will be adopted in 2018, which includes three drugs, for all patients regardless of clinical classification for a period of only six months[13].

Tuberculosis

There was a 22.7% reduction in Brazil in the number of new cases of tuberculosis reported in 2016 (66,796 cases, 32.4 cases per 100,000 inhabitants) compared to 1981 (86,411, 71.3 cases per 100,000 inhabitants). However, this drop was not linear, which was partially due to the resurgence of this disease in the course of the AIDS epidemic, as well as difficulties in the detection and treatment of all cases, so that in the 1990s the incidence of tuberculosis remained high, varying from 58.4 to 49.3 cases per 100,000 inhabitants (1995 and 1994, respectively). Regarding mortality, whereas in 1998 there were 6,029 deaths (3.7 cases per 100,000 inhabitants), in 2015 there were 4,543 deaths (2.2 cases per 100,000 inhabitants), a reduction of around 40%[4]. The SUS recently adopted a therapeutic regimen for this disease that includes the formulation of four drugs in a single capsule, which has brought enormous advances to the control of tuberculosis, increasing the patients' adherence to the treatment, which results in a rising of the percentage of cure and a reduction of sources of infection.

HIV/AIDS

The emergence of AIDS in 1981 had a huge impact on the history of health worldwide due to its high lethality, rapid spread, and the production of epidemics of increasing magnitude. In Brazil, the first cases were detected soon after the identification of this disease and by 1990 24,514 cases had already been diagnosed, the great majority of whom were individuals living in large urban centers. In the following years the prevalence continued to increase and AIDS expanded into the interior of the country, so that between 1991 to 2000 226,456 new cases were registered. Although the number of cases in the following decade increased, the epidemic stabilized, with an average of 34,807 new cases confirmed each year. From 2007-2016 there was little variation in the number of cases (around 32,321 per year) so that the AIDS detection rate has averaged 20.7 cases per 100,000 inhabitants[4,14].

Universal and free access to antiretroviral therapy (ART) was guaranteed by the SUS in 1996. This was one of the initiatives that had a great impact on the HIV/AIDS epidemic, mainly in terms of increased survival rates, and the reduction of vertical transmission, lethality and mortality rates due to this serious disease[14,15]. From 1997-2003 about 6,000 cases of vertical transmission were avoided[16] and in 2003 there were 150,000 patients undergoing treatment. The Brazilian Ministry of Health estimated that in 2015 there were approximately 827,000 people living with HIV in the country, of whom 82% had performed at least one viral load test or CD4 T lymphocyte count, or had had at least one dispensed antiretroviral prescription; 55% of the total of patients living with HIV (454,850) were using antiretroviral therapy[10]. In addition to treatment, this program is structured to develop the following surveillance and control actions: universal notification of AIDS cases, HIV-positive pregnant women and children exposed to HIV; serological surveillance in sentinel populations (STD and parturient clinics); serological and behavioral surveys in specific populations; and the maintenance of a network of testing and counseling centers (CTA), among others. Due to these achievements the Brazilian STD/AIDS program is recognized as one of the best in the world, receiving an award from the Bill & Melinda Gates Foundation.

Schistosomiasis mansoni

Over the last three decades there has been a significant reduction in the prevalence of infection, morbidity and mortality indicators due to schistosomiasis mansoni, in spite of the fact that some endemic municipalities have remained in pockets of poverty in the northeast and southeast of Brazil. Even considering the methodological differences regarding coproscopic surveys conducted in Brazil, it cannot be ignored that in the late 1940s the prevalence of positive tests for schistosomiasis was 9.9%, in the second half of the 1970s it was 6.6%, while in 2011-2015 it was 0.99% (population aged 7-14 years)[17]. A recent Brazilian survey also provided a more accurate estimate of the number of infection carriers nationwide (2 millions), well below previous estimates (over 7 million, in 2006)[18]. This decline in prevalence has resulted in reduced hospital morbidity; from 2.5 cases per 100,000 inhabitants to 0.08 cases per 100,000 inhabitants in 1988 and 2013, respectively, especially for severe digestive cases. Likewise, mortality decreased from 0.5 cases per 100,000 inhabitants in 1987 to 0.2 cases per 100,000 inhabitants in 2012[17].

A more sustainable reduction in the transmission of schistosomiasis is dependent upon improving the sanitation conditions of populations exposed to the risk of being infected, as well as interventions in the health sector. In the field of health, a vaccine against schistosomiasis has been developed by Fiocruz, which is in phase II of clinical studies. Through the auspices of the municipal health system, the SUS develops community education and case detection through coproscopic surveys and the treatment of patients to control this disease. The decentralization of these control activities, which until 1999 were carried out by the National Health Foundation, expanded the scope of this program, which now includes the participation of agents of endemic, community health agents and professionals from the Family Health Strategy/FHS , resulting in a sustainable impact on the morbidity and mortality indicators.

Chagas disease

In 2006, the program to eradicate vector transmission of Chagas disease in Brazil obtained the certificate of elimination of *Triatoma infestans*, the main intra-household vector of this protozoa, which resulted in a drastic reduction of new *Trypanosoma cruzi* infections in humans. In fact, a national serological survey conducted from 1975-1980 revealed that 4.2% of Brazilians living in rural areas that were considered as natural transmission of *Trypanosoma cruzi* were infected by this protozoan[19]. A second national survey, conducted from 2001-2008, found 0.03% seroprevalence among children under five years of age who were also living in rural areas; 0.02% were children of positive mothers, indicating that most infections had been due to congenital transmission. Mortality due to the chronic form of this protozoa has been declining over the last two decades[1]. In Brazil, *Triatoma infestans* is not the only vector of *Trypanosoma cruzi*; consequently, in some areas, especially the Amazônia Legal, there are still cases of natural transmission by extradomiciliary triatomines[20]. Transmission by blood transfusion has also been disrupted; however, there have been sporadic outbreaks of acute Chagas disease as a consequence of transmission by contaminated foods such as cane juice and *açaí*[1].

Malaria

In Brazil, malaria is caused by *Plasmodium vivax*, *Plasmodium falciparum* and *Plasmodium malariae*, the first two of which are of epidemiological importance. This protozoan is endemic in the Amazon region, affecting 808 municipalities where approximately 95% of the country's cases are detected[21].

The available data of this disease for the period until the end of the 1990s refers to the number of positive slides for plasmodium; consequently, it does not correspond to new cases, as they began to be registered in 2000. Thus, it is not possible to make comparisons between these periods. From 2005-2012 the number of detected cases of malaria decreased from 606,069 to 241,806 (a reduction of 60.1%). This decrease was most marked for malaria caused by *P. falciparum* (77.2%), which is responsible for the most severe forms of the disease; there was a consequent decrease in the number of hospitalizations (74.6%) and deaths (54.4%) due to this disease[21]. This positive impact was obtained through the early detection and treatment of carriers of the disease, as well as measures aimed at reducing vector transmission (spraying, insecticide-impregnated screens, community education, etc.). Thus, more effective prevention and control of malaria have been achieved in municipalities that have good coverage levels of primary health care, with integration between the Family Health Strategy and endemic control agents, allowing more timely detection and treatment, which is fundamental to interrupt transmission. The SUS still faces some challenges in achieving the elimination of malaria, as set out in its Sustainable Development Goals.

Emerging and re-emerging arboviruses

Among emerging and re-emerging diseases, arboviruses transmitted by mosquitoes of the genus *Aedes* (mainly *Aedes aegypti*) represent important public health problems due to repeated severe epidemics in several regions worldwide. Dengue is one of the most notorious examples of this group of viruses because it reversed the tendency towards decreasing levels of morbidity due to CD. It is estimated that every year the dengue virus (DENV) produces about 390 million infections in 128 countries, and approximately 96 million individuals present clinical manifestations of greater or lesser severity[22].

In Brazil, DENV1 re-emerged in the 1980s and has subsequently been responsible for suc-

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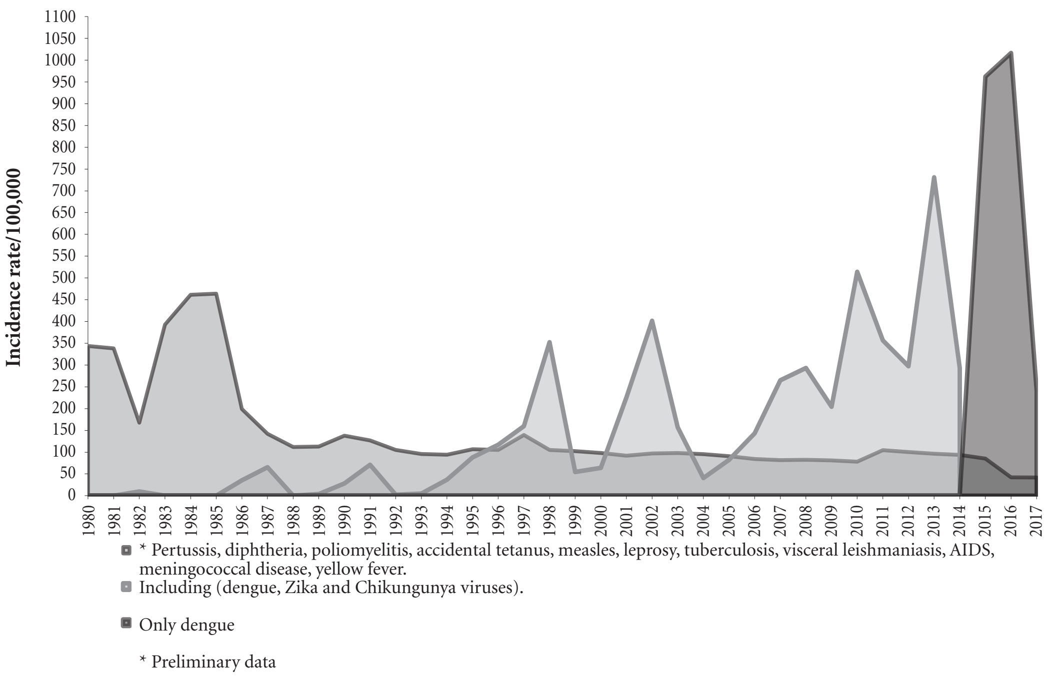
cessive epidemics produced by its four serotypes. Currently, 90% of Brazilian municipalities are infested by *Ae. aegypti*, which favors the intense circulation of DENV and the emergence of the chikungunya (CHIKV) and Zika (ZIKV) viruses. Despite efforts to control this vector this has not been successful, either in Brazil, other Latin American countries, or other regions worldwide[1,23]. A tetravalent vaccine was licensed; however, when used in populations there was an increased risk of hospitalizations due to dengue in individuals who had never previously been infected by wild DENV, which is why the WHO has recommended the use of this vaccine for flavivirus-naive individuals[24]. Thus far, no safe, effective antiviral drugs or vaccines are available for any of these viruses. Surveillance and control have had very limited effectiveness in that they have been restricted to vector control, centered on chemicals and the elimination of potential larval breeding sites. Despite their promise (the new technologies that have been tested reduce *Ae. aegypti*) there is still no evidence that they are effective in preventing the emergence and/or risk of transmission of the aforementioned arboviruses[23].

Dengue, chikungunya and Zika have influenced the morbidity profile of CD in Brazil, modifying the declining trend of this group of diseases since 1987, as can be seen in Graph 2. DENV1 was first detected in Rio de Janeiro in 1986 and then spread to other metropolitan areas of Brazil. This resulted in 47,370 cases (35.3 cases per 100,000 inhabitants) of this disease, accounting for 15.1% of notifications from a group of twelve, important, compulsorily-notifiable CDs. This proportion reached 46.7% (65.4 cases per 100,000 inhabitants) in the following year. DENV2 emerged in the 1990s, and since 1994 the circulation of this serotype and DENV1 have produced epidemics of great magnitude in many Brazilian urban centers, so that by the end of that decade almost 1.5 million cases of dengue had been recorded. In 1998, the year of the largest epidemic of that period, the number of dengue cases was more than three times higher (352.4 cases per 100,000 inhabitants) than the total of twelve CDs (105.0 cases per 100,000 inhabitants). This situation has worsened throughout the twenty-first century because, in addition to epidemics, hundreds of cases of dengue hemorrhagic fever (DHF) with high lethality occurred soon after the introduction of DENV3. For example, in 2002 the incidence of dengue reached 401.6 cases per 100,000 inhabitants, and 2,608 cases of DHF



Graphic 2. Incidence of some of the major compulsorily notifiable diseases in Brazil, 1980 - 2017*.

and 121 deaths were diagnosed (Graph 2). In 2010, DENV4 also started to circulate intensely, and thus the co-circulation of the four serotypes was established. The incidence has continued at high levels and there have been no periods with decreasing incidence, as was observed in previous decades[4,25].

With the emergence of two more arboviruses transmitted by *Ae. aegypti* (CHIKV in 2014[26] and ZIKV, which was identified in 2015[27] although there is evidence that it was already circulating previously) the epidemiological situation in Brazil worsened[28]. Zika was considered to be a mild, self-limited disease with no associated complications. However, after the intense circulation of ZIKV in cities in northeast Brazil, an unexpected epidemic of microcephaly, which was later identified as a syndrome caused by the vertical transmission of this agent, affected thousands of children. This public health emergency, of national and international interest, was followed by a timely investigation and response which mobilized professionals and managers from the three areas of management of the SUS[29]. Despite the fact that surveillance and vector control measures were readily developed, more than 3,000 cases of congenital Zika syndrome have been subsequently confirmed. Protocols and special attention services for the health of affected children were implemented by the SUS from the beginning of the detection of this epidemic. The first cases of chikungunya were detected simultaneously in the states of Bahia and Amapá and this disease has subsequently spread to many municipalities in the country, especially in the northeast region[10,28]. Although dengue-like symptoms are present in the mild form of the disease, the major importance of this disease is the persistent clinical manifestations that are evident in the chronic phase (which can affect up to half of affected patients), mainly with impairment of the joints, which negatively interferes with the quality of life of those affected. In addition, there are atypical and severe forms that can compromise the nervous system. The atypical manifestations and the presence of concurrent diseases, especially in the elderly, have been related to the higher lethality of chikungunya in Brazil[30].

From 2014 onwards, the epidemiological data registered in Brazil regarding these three arboviruses are difficult to interpret because chikungunya and Zika were not initially included in the universal notification system. Furthermore, because the latter present clinical features in the acute phase that are very similar to dengue, some of the cases were reported as dengue[28]. In view of this, in Graph 2 the incidence was calculated for all the notifications of these three diseases. It should be noted that in 2016 the incidence of all three arboviruses was 1,016.4 cases per 100,000 inhabitants[4], representing 24 times the value of this indicator for all 12 of the other CDs that were analyzed (Graph 2). Thus, it is evident that the low level of effectiveness, or lack of prevention instruments, prevents the control of the CD.

Yellow fever

Few cases of wild yellow fever (WYF) have been confirmed in Brazil since the 1980s. Every five to seven years there are episodes of epizootic transmission, including 1999-2000 (76 and 85 cases, respectively) and 2008-2009 (46 and 47 cases, respectively). Human cases were confirmed in urban areas, although the transmission cycle was wild. However, in 2017 a major epidemic occurred when 776 human cases were confirmed and there was a large expansion of the transmission area of this virus, with occurrences in several urban areas. In 2018 cases of WYF were confirmed in the same areas[10]. The reasons for this expansion are still unknown, but this event resulted in mass vaccination campaigns against yellow fever in populations of large urban centers such as São Paulo, Rio de Janeiro and Salvador, with the first use in the country of a fractional dose of the vaccine[10].

Responses to pandemics

Between 2002 and 2003 the health surveillance system of every country worldwide was challenged by the occurrence of what became the first pandemic of the twenty-first century, i.e. severe acute respiratory syndrome (SARS). This was caused by a coronavirus that began in China and spread to several continents, including the Americas[31]. In Brazil, a surveillance protocol was rapidly developed and implemented, which was tested from an unconfirmed suspected case. This protocol established measures for issues such as detection, notification, transportation, the clinical management of cases, the control of hospital infection, the definition of hospital reference networks, and laboratory diagnosis in all Brazilian states.

This preparation was refined by plans to deal with an expected influenza pandemic in 2005[32], which was supposed to occur due to outbreaks caused by H5N1. In 2009 another pandemic began (between Mexico and the United States),

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which was caused by (H1N1)pdm09, and in a few weeks the SUS organized a rapid response to this pandemic. In addition to the measures foreseen in the previous protocol, additional mechanisms were used to expand the network of laboratory diagnosis, the acquisition of vaccines and the recommended antiviral drug (Oseltamivir), as well as local production of this drug. In Brazil, as in other Latin American countries, this agent spread in a few weeks and by the end of 2009 50,482 serious cases and 2,060 deaths (lethality of 4.1%) had been confirmed[33], with a higher proportion of cases (71.6%) in the southern region of Brazil, which was possibly due to a more severe winter and the proximity to countries where the virus circulated more intensely. With the availability of an immunogen from 2010, a vaccination strategy was started that was addressed to the most vulnerable groups, reaching coverage above 80%, which quickly reduced the number of cases. In addition, a key strategy used during the pandemic was the mobilization of the Public Health Emergency Alert and Response Network, (the Cievs Network), which was created in 2006 and currently comprises 55 rapid response units in all Brazilian states and municipalities in the state capitals, which has been the basis of the SUS's response to public health emergencies.

Conclusion

The information presented above demonstrates that there has been an important impact on the morbimortality profile due to communicable diseases in Brazil, especially after the introduction of the SUS. Limitations on the prevention and control of communicable diseases have been imposed by the emergence and/or re-emergence of agents for whom scientific knowledge is still insufficient. This indicates the need for greater investments in research, both in Brazil and internationally, in order to overcome the existing gaps in knowledge.

Particular emphasis should be placed on the extraordinary decline in morbidity due to vaccine-preventable diseases and the proportional mortality for communicable diseases, which in 1980 corresponded to 12% of total deaths in Brazil and in 2015 (4%) was three times lower. Among other causes, this decline was strongly influenced by oral rehydration therapy and rotavirus immunization, which reduced infant and child mortality caused by acute infantile diarrhea.

Obviously, other social and economic programs that were targeted at the poorest sectors of the Brazilian population contributed to the improvement of the analyzed health indicators, such as the Bolsa Família Program. Unfortunately, the deep social inequalities that still exist in Brazil, which go beyond the capacity of the health sector, impose limitations on better effectiveness in the prevention and control of communicable diseases.

The current political-institutional situation in Brazil threatens the progress made in recent years. However, the universalization of access to healthcare services, together with the expansion and improvement of the scope of surveillance, prevention and control of diseases and health risks by the SUS, is undoubtedly playing a fundamental role in improving the health conditions and quality of life of the Brazilian population, as well as contributing to the country's democratization process.

Collaborations

MG Teixeira and MCN Costa made the first version of the manuscript; ES Paixão, EH Carmo, FR Barreto and GO Penna added important contributions in this preliminary version; each one of the authors made the writing of the topics related to the diseases on which it has greater expertise. All authors have read and reviewed the final version.

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