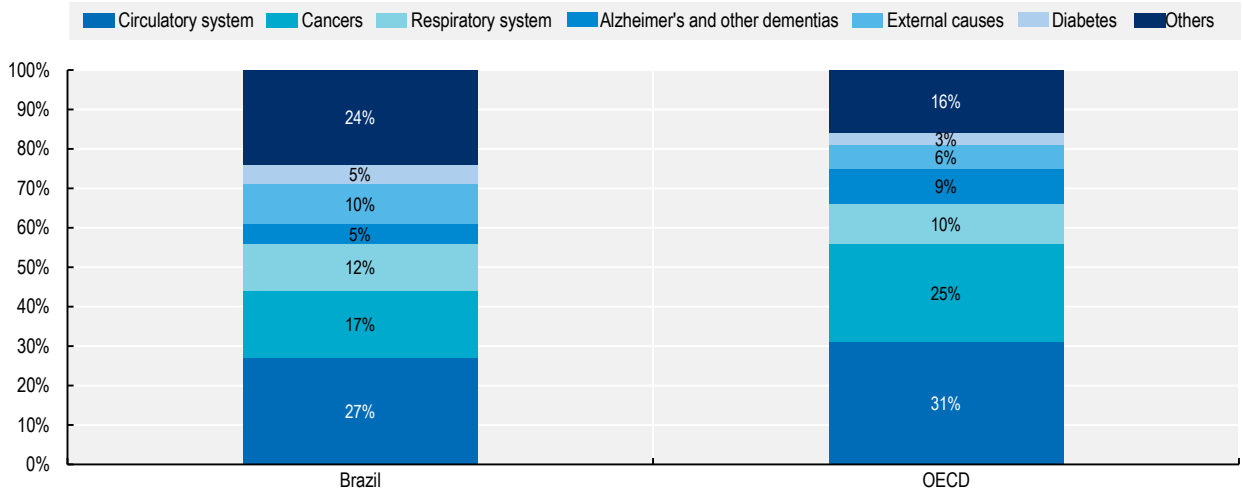
3 Screening in primary health care for the main chronic non-communicable diseases in Brazil

In Brazil, chronic non-communicable diseases such as cancer, diabetes and hypertension are of high public health importance. Brazil has already built mechanisms in the PHC sector to screen for some of the most epidemiologically relevant diseases. Some cancers, hypertension and diabetes have screening and prevention strategies, but more could be done to improve depth and scope of such strategies. Key priorities are to move towards population-based screening programmes for breast and cervical cancer, with a personalised approach and more communication strategies. In the area of diabetes and hypertension, Brazil will need to further develop disease management pathways with a people-centred perspective, integrating all health care providers across different sectors. Family health teams will need to have the right tools, capacities, and incentives to undertake these responsibilities. Last but not least, a more comprehensive information system based on registries, and allowing linking different data sources will also be important.

3.1. Introduction

In Brazil, as in other OECD countries, chronic non-communicable diseases such as cancer and cardiovascular diseases are of high public health importance. Diseases of the circulatory system was the leading cause of death in both Brazil and OECD countries in 2019 representing 27% and 31% of all deaths, respectively, followed by cancer representing 17% and 25% of all deaths. Diabetes in Brazil stands as the fifth cause of mortality with 5% of all deaths, higher than the 3% in OECD countries (Figure 3.1). This reflects the epidemiological transition from communicable to non-communicable diseases, where population ageing largely explains this mortality pattern but the prevalence of different risk factors and the performance of the health system play a relevant role as well.

Figure 3.1. Main causes of mortality in Brazil and the OECD, 2019



Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

In this scenario, Brazil, based on its strong PHC system, has already built mechanisms to screen for some of the most epidemiologically relevant diseases. Some cancers, hypertension and diabetes are on this list, for which screening and prevention strategies have proven to be effective and cost-effective, becoming a very good public health intervention. However, many challenges remain, for instance, related to escalating coverage and expanding to new diseases.

This chapter begins by setting out the current cancer burden in Brazil, while exploring the strengths and weaknesses of Brazil cancer screening system. Next, it analyses the impact of hypertension and diabetes in Brazil's population health and health system, and addresses hypertension and type 2 diabetes screening in PHC as important interventions to control these medical conditions. Throughout the chapter, a series of recommendations on the policy priorities for Brazil when it comes to enhancing screening coverage and promoting early detection of these conditions are provided.

3.2. Cancer in Brazil has been recognised as a major public health challenge but much can be done in terms of prevention in PHC

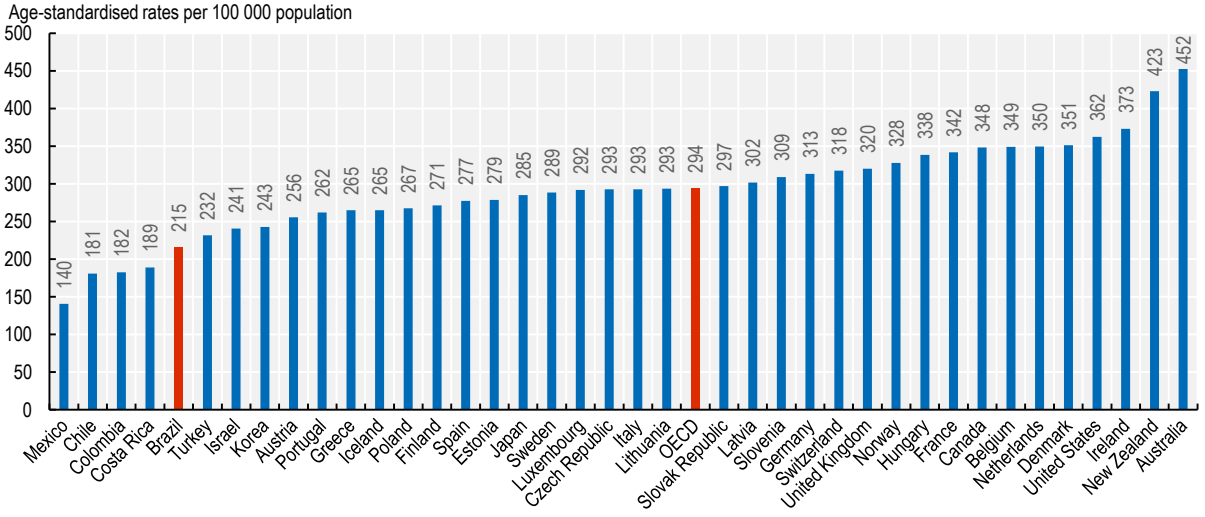
Cancer is the second highest cause of death across OECD countries, but its burden is increasing faster relative to the first cause of death, diseases of the circulatory system. The mortality rate of cardiovascular diseases has declined substantially over recent decades, while cancer mortality has also decreased but at

a slower pace (OECD, 2019[2]). This section summarises the incidence and mortality rates of cancer and their changes over time in Brazil compared to OECD countries to illustrate the relative importance of public health policies in Brazil.

3.2.1. Brazil has a lower cancer incidence than the OECD but mortality has remained stable when it has decreased in the vast majority of OECD countries

Cancer incidence rates vary across OECD countries from over 400 new cases per 100 000 people in Australia and New Zealand, to less than 200 cases in Mexico, Chile, Colombia and Costa Rica. Brazil stands at 215 new cases per 100 000 people, below the OECD average of 294 (Figure 3.2). It is important to notice that cross-country variations in incidence rates reflect differences not only in new cancers occurring each year but also disparities in national cancer screening policies, quality of cancer surveillance and reporting.

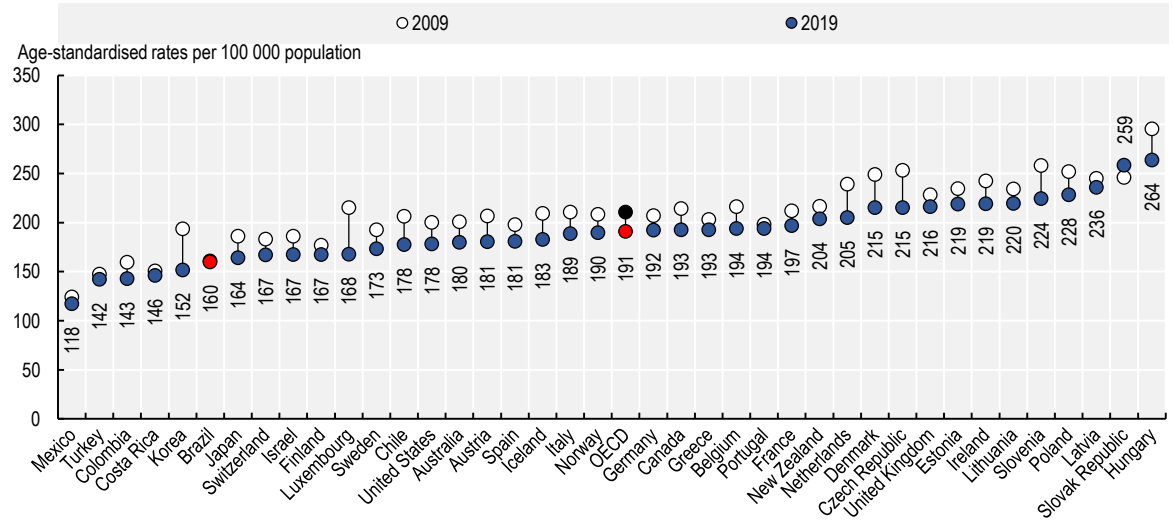
Figure 3.2. All cancer incidence in Brazil and OECD countries, 2020 (estimated)



Source: GLOBOCAN, (2020[3]), International Agency for Research on Cancer (IARC), https://gco.iarc.fr/.

Despite having a relatively low rate of cancer incidence, cancer mortality in Brazil has not been reduced in recent years. Between 2009 and 2019, Brazil´s cancer mortality passed from 161 to 162 deaths per 100 000 people, while the OECD average was reduced from 211 to 196. This decline was observed in most OECD countries, except in Chile and Turkey (Figure 3.3). The decrease of cancer mortality relates to early diagnosis, which puts a strong argument in favour of building effective screening schemes.

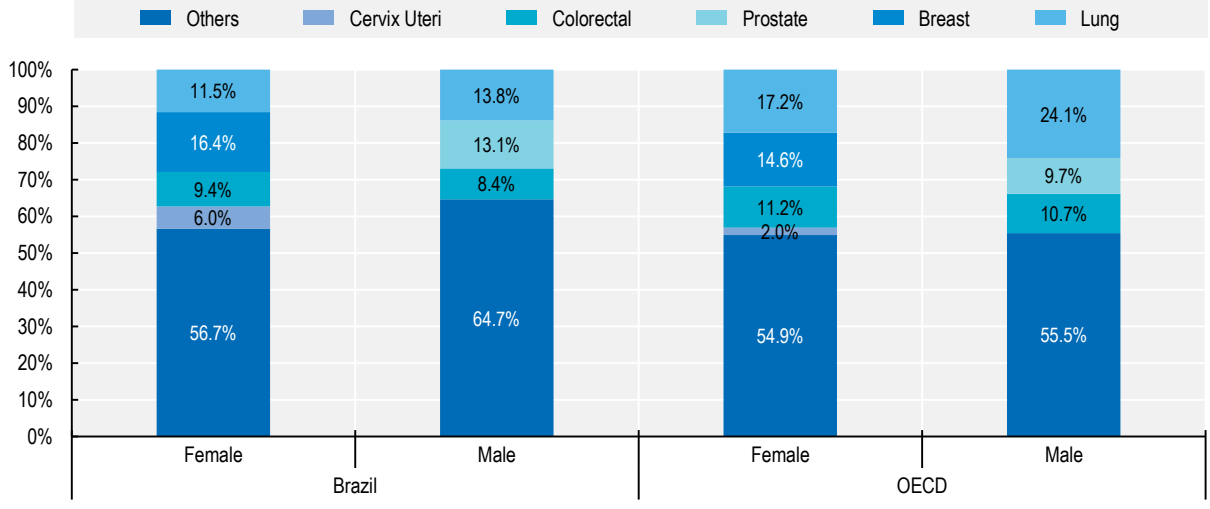
Figure 3.3. Cancer mortality in Brazil and OECD, 2009 and 2019 (or latest available year)



Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

In Brazil, among women, breast cancer takes the largest toll among Brazilian women with 20.6 deaths per 100 000 females, representing 16.4% of all women's cancer deaths in 2019. It is followed by trachea, bronchus and lung cancer with 15.7 deaths per 100 000 females (11.5%); colorectal and anus cancer with 13.1 deaths per 100 000 females (9.4%); and cervical cancer with 7.4 deaths per 100 000 females (6%). In OECD countries, trachea, bronchus and lung cancer are in first place among women and the most relevant difference with Brazil can be found in cervical cancer that only accounts for 2% of all women's cancer deaths. Among men, trachea, bronchus and lung cancer explains the largest number of deaths in both Brazil and the OECD, but the proportion is higher in the latter with 24.1% versus 13.8% in Brazil. Prostate and colorectal and anus cancer are the second and third causes of cancer deaths among Brazil's men, while in the OECD colorectal and anus cancer takes the second place (Figure 3.4).

Figure 3.4. Main causes of cancer mortality by sex in Brazil and OECD countries 2019 (or nearest year)



Note: Colorectal includes colon, rectum and anus cancer. Lung includes trachea, bronchus and lung cancer.
Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

As in OECD countries, age-standardised mortality rates in Brazil due to all cancers are higher among men than among women: 202.8 men's deaths per 100 000 males versus 135.8 women's deaths per 100 000 females. The gender difference in cancer mortality can be explained at least partly by higher prevalence of some risk factors among men.

3.2.2. Breast and cervical cancer have long-standing opportunistic screening programmes delivered mainly through PHC

The control of breast and cervical cancer in Brazil has decades of development, with National Cancer Institute (*Instituto Nacional de Câncer*, INCA) and the Ministry of Health as the main actors in terms of national planning, while PHC in municipalities have had the provision of care role. Importantly, cancer screening in Brazil is opportunistic, meaning that it does not happen within a population-based programme designed and managed at the central level to reach most of the population at risk, but as a result of a recommendation made by a health care provider during a routine medical consultation or by self-referral of individuals. A summary of the main historical developments of breast and cervical cancer screening is presented in Box 3.1.

Box 3.1. Almost 40 years of breast and cervical cancer screening in Brazil

The first actions towards breast and cervical cancer control can be traced back to 1984, when the Program of Integral Assistance to Women's Health (*Programa de Assistência Integral à Saúde da Mulher*), which proposed care beyond the traditional attention to the gravidic-puerperal cycle, included actions for the prevention of these two cancers. In 1986, an Oncology Programme was created and in 1991 was finally hosted in the INCA. In the 1990s and early 2000s, different pilot projects and programmes, mainly for cervical cancer were developed.

In 2005, the Ministry of Health launched the first National Oncology Care Policy (*Política Nacional de Atenção Oncológica*), with emphasis on cervical and breast cancer. The control of these cancers is now a priority on the country's health agenda and it is part of the Strategic Action Plan for Coping with Chronic Non-Communicable Diseases in Brazil, 2011-22 (*Plano de Ações Estratégicas para o Enfrentamento das Doenças Crônicas Não Transmissíveis no Brasil, 2011-22*).

In May 2013 occurred the latest update of the national cancer care policy, instituting the National Policy for the Prevention and Control of Cancer in the Health Care Network of People with Chronic Diseases in SUS (*Política Nacional para a Prevenção e Controle do Câncer, PNPCC, na Rede de Atenção à Saúde das Pessoas com Doenças Crônicas no âmbito do SUS*). That same year, the Cancer Information System (SISCAN) was created, a web platform version that integrates the Cervical Cancer Information Systems (SISCOLO) and Breast Cancer (SISMAMA).

More recently, in 2015 the guidelines for early detection of breast cancer, and in 2016 the national guidelines for cervical cancer screening and a manual for quality management of cytopathology laboratories were published.

Source: INCA (2020[4]).

In Brazil's PHC, cervical cancer screening is performed through a cytopathological examination (Pap smear), which is offered to women aged 25 to 64 years and who have already had sexual activity. The recommended routine for screening in Brazil is to repeat the Pap smear every three years, after two consecutive normal examinations performed at an interval of one year. The repetition in one year after the first test aims to reduce the possibility of a false negative result in the first round of screening. The three-year periodicity is based on the WHO recommendation and the guidelines of most countries with an

organised screening programme (INCA, 2016[5]). Table 3.1 summarises the characteristics of cervical cancer programmes in OECD countries.

Table 3.1. Target age and periodicity of cervical cancer screening in OECD countries, 2019

Every year	Every two years	Every three years	Every five years	Other
Czech Republic (15 and over), Greece (20 and over), Luxembourg (15 and over), Mexico (25-64), the Slovak Republic (23-64)	Australia (20-69), Japan (20 and over), Korea (30 and over), Latvia (25-70), Costa Rica (20-64)	Belgium (25-64), Chile (25-64), Denmark (23-50), France (25-65), Hungary (25-65), Iceland (23-65), Ireland (25-44), Israel (25-64), Italy (25-64), Lithuania (25-60), New Zealand (20-69), Slovenia: (20-64), Spain (30-39), Sweden (23-50), Switzerland (no age limit)	Denmark (51-64), Estonia (30-55), Finland (30-60), the Netherlands (30-60), Ireland (45-60), Norway (25-69), Spain (40-69), Turkey (30-65), England (25-64)	Canada: no periodicity (20-69). Germany: no periodicity (20 and over). USA: Every one, two or three years depending on the insurance coverage (21 and over).

Note: Target women's age in brackets.
Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

As for breast cancer, the Brazilian Ministry of Health recommends a biennial mammogram for women aged 50 to 69 years as screening strategy in PHC. In addition, the Ministry of Health recommends against teaching self-examination as a method of screening, and also against screening using ultrasound, thermography, tomosynthesis and magnetic resonance imaging. To assure an early diagnosis of breast cancer, the Ministry of Health endorses that SUS actors develop awareness strategies, suggests urgent referral to diagnostic breast cancer services of patients with specific red-flag signs, and that all the services are to be provided in the same centre (Ministério da Saúde and INCA, 2017[6]). Table 3.2 summarises the target age and characteristics of breast cancer screening programmes in OECD countries.

Table 3.2. Target age in breast cancer screening programmes, 2018/19

Nationwide population-based		Population-based but not nationwide		Non-population-based
Wider age range (20 years+)	Narrower age range	Wider age range (20 years+)	Narrower age range	Wider age range (20 years+)
Australia (50-69), Belgium (50-69), Denmark (50-69), Finland (50-69), France (50-74), Germany (50-69), Hungary (45-65), Iceland (40-69), Israel (51-74), Korea (40+), Latvia (50-69), Lithuania (50-69), Luxembourg (50-69), the Netherlands (50-75), New Zealand (45-69), Norway (50-69), Poland (50-69), Portugal (45-69), Slovenia (50 69),Spain (50-69), Sweden (50-69)	England (53-69), Estonia (50-65), Ireland (50-64 but 50-69 by 2021), Northern Ireland (53-70), Wales (53-70)	Canada (50-69), Czech Republic (45+), Italy (50-69), Japan (40+), Mexico (50-69), Switzerland (50-70), Turkey (40-69)	Chile (50-64)	Greece (40+), the Slovak Republic (40-69) and United States (40 or 50+)

Note: Target women's age in brackets.
Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

The financing of these screening programmes is made through the Ministry of Health, which allocates resources to federated entities (states and municipalities), with these chiefly municipalities responsible for managing and providing the services. In 2020, a new financing model for PHC (the *Previne Brasil* Programme) was instituted combining financial resources from weighted capitation, pay-for-performance and resources for actions in specific contexts (see Chapter 4 of the report). Within the pay-for-performance component (15% of total funding), one of the seven initial target indicators rewards the teams that perform cervical cancer screening.

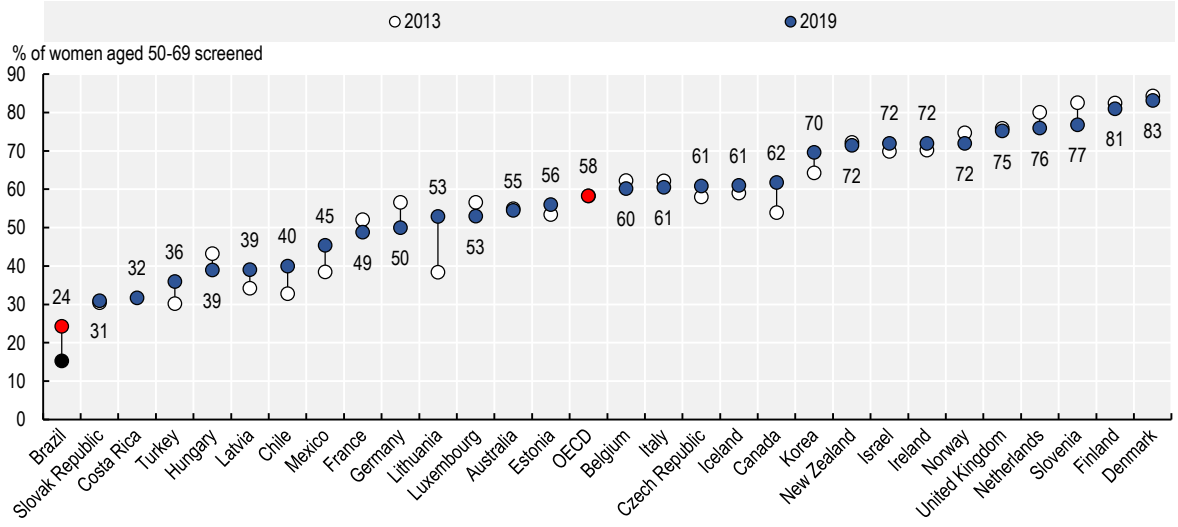
Regarding cancer information system, the PAINEL-Oncology is an instrument developed to monitor Law Nº12.732, of 22 November 2012, which establishes a 60 days maximum waiting time for the start of

treatment for patients with proven malignant neoplasia. The information on PAINEL-oncology refers to the time to start the first oncological treatment calculated from the information of the dates of diagnosis and treatment recorded. It also presents the cases diagnosed through pathological examinations. Cervical and breast cancer diagnosis information has been available since 2013 since the implementation of the Cancer Information System (Sistema de Informação do Câncer, SISCAN). For the other cancers, diagnostic information arising from biopsy or anatomo-pathologic (except for cervical and breast) is available from May 2018, but from other sources it was possible to calculate the time of onset of the first treatment from 2013 as well. The data presented in the PAINEL-oncology refers exclusively to users who have a national health master card (DATASUS, 2021[7]). In addition, a network of 17 Population-Based Cancer Registries, 16 located in capital cities and one of them in a non-capital city, provides crucial information about incidence, trends and survival (INCA, 2013[8]).

3.2.3. Breast and cervical cancer screening needs to drastically increase coverage among target populations

Screening for breast cancer in Brazil has improved in recent years. Between 2014 and 2019, it increased from 15.2% to 24.2% among the target group of women between 50 to 69 years of age. However, breast cancer screening coverage in Brazil is very low when compared to OECD countries, standing below all OECD countries and well below the 58% of average coverage (Figure 3.5).

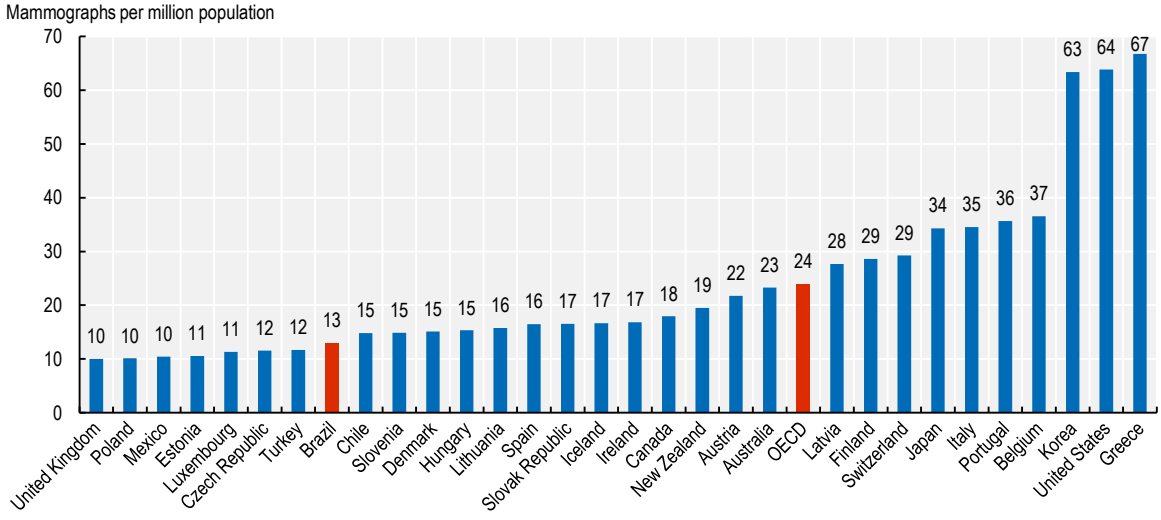
Figure 3.5. Breast cancer screening coverage in Brazil and OECD countries, 2013 and 2019



Note: Programme data is used for all countries. Brazil represent years 2014 and 2019.
Source: Ministry of Health for Brazil; OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

One of the key enablers for conducting breast cancer screening is the availability of mammography machines. In 2020, Brazil had 13 mammography machines per million people, almost half than that of the OECD average of 24 and close to the lowest availability of 10 in Mexico, Poland and the United Kingdom (Figure 3.6). This finding shows that Brazil has space to put more investment into medical technologies aiming to improve equitable access for the population. At the same time, such expansion in access can be accompanied by the development of regulatory frameworks in the areas of registration, assessment and purchasing rules. The existence of updated clinical guidelines for breast cancer screening in Brazil is a step ahead in the necessary task of promoting rational use of diagnostic technologies aiming to reduce the use of unnecessary diagnostic tests and subsequent procedures and treatments.

Figure 3.6. Availability of mammography machines in Brazil and OECD countries, 2019 (or latest year available)



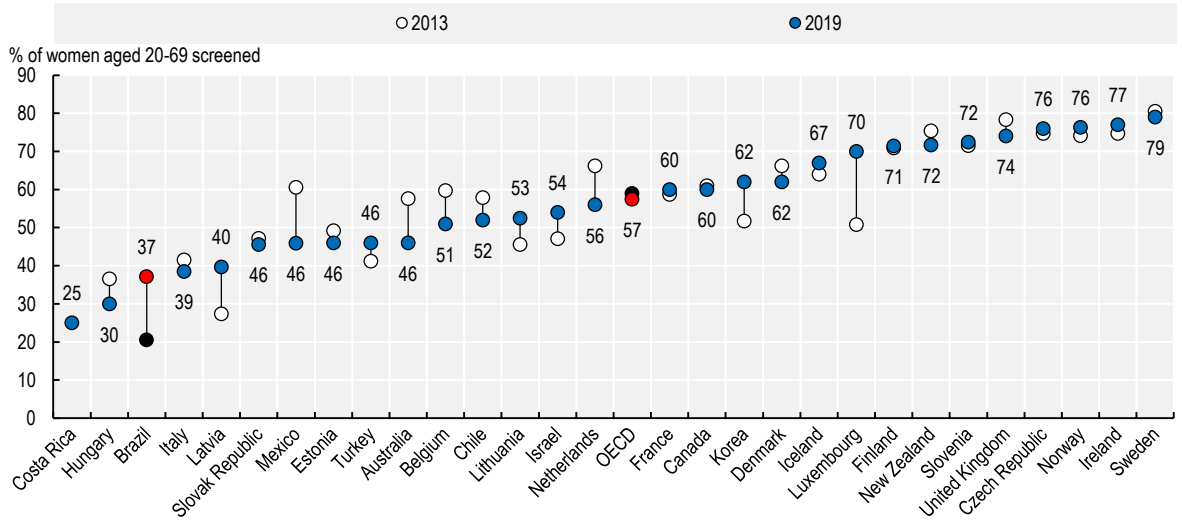
Note: Brazil represents year 2020.
Source: Colégio Brasileiro de Radiologia e Diagnóstico por Imagem; OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

A systematic review including 30 studies identified the main health system factors that led to a late diagnosis of breast cancer in Brazil (Da Costa Vieira, Formenton and Bertolini, 2017[9]). Results highlighted problems related to the distribution of mammography machines, with a higher proportion of unused mammography machines in the North and Northeast of Brazil, and that most mammography occurred in the private sector. Another study analysing the National Health Survey 2013 found that 59.4% of women users of SUS and 83.9% of women with private health insurance declared having a medical request for a mammography. Having private health insurance, higher education level, and being white were positively associated with having this medical request (Silva et al., 2017[10]). These findings highlight some of the problems with the health system organisation and with social inequities found in Brazil.

Cervical cancer screening in Brazil has substantially improved from 20.5% in 2014 to 37% in 2019. Yet, it also remains well below the OECD average coverage of 57% and below all OECD countries, except Costa Rica and Hungary (Figure 3.7).

A study that performed a trend analysis of the cervical cancer screening program's quality indicators in all Brazilian regions and states from 2006 to 2013, found that the estimated target population who underwent Pap testing was lower than that recommended by international guidelines in the North, Northeast and Central-West regions. The trends for this indicator remained stationary over the years in all regions of Brazil. Authors concluded that "the cervical cancer screening programme is still far from efficient" (Costa et al., 2018[11]). Another study using data for 2008 found that rural areas were more likely to have never received a Pap smear screening, while North and Northeast regions showed the highest prevalence of never-screened women. Poorer, less educated, non-white skin colour and younger women were less screened as well, showing the patterns of social inequities (Martínez-Mesa et al., 2013[12]).

Figure 3.7. Cervical cancer screening in Brazil and OECD, 2013 and 2019



Note: Programme data is used. Brazil represent years 2014 and 2019.
Source: Ministry of Health for Brazil; OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

3.2.4. Brazilian society is quite active and key stakeholders are regularly involved in decision making around cancer control issues

Brazil has good examples of stakeholder involvement for cancer policies. Voices of local and regional stakeholders such as municipal and state administrations and health care providers are represented in institutional spaces such as the National Health Council, CONASS and CONASEMS. In addition, representatives of the civil society and users of SUS apply the so-called democratic social control by participating in the National Health Conference, the Councils of Rights and the Councils of Health. The last two have expression at the federal, state and municipal levels (Ministério da Saúde, 2013[13]). Among the topics included, cancer regularly takes part of the agenda.

INCA develops several initiatives to engage civil society. The institution has a Consultative Council (Conselho Consultivo, CONSINCA) with representatives from technical-scientific entities related to cancer prevention and control; SUS service providers; SUS management councils; and SUS users. In recent years, INCA has organised conferences in different parts of the country with women's movements aiming to introduce the issue of cancer control into their working plans. Moreover, INCA has convened meetings with journalists with the objective of discussing the best ways to communicate information related to cancer control, including special meetings with radio managers of the North of Brazil, since in this region radios have a large audience in the population.

"All Together Against Cancer" (*Todos Juntos Contra o Câncer*) (TJCC, 2021[14]) is a civil society movement that brings together representatives of different sectors, such as health managers, medical entities, hospitals, professional associations, researchers, media professionals, patient organisations, and others, committed to guaranteeing the patient's right to universal and equal access to health care. The movement develops several initiatives to assure the implementation of the National Policy for Cancer Prevention and Control, including the areas related to prevention and screening.

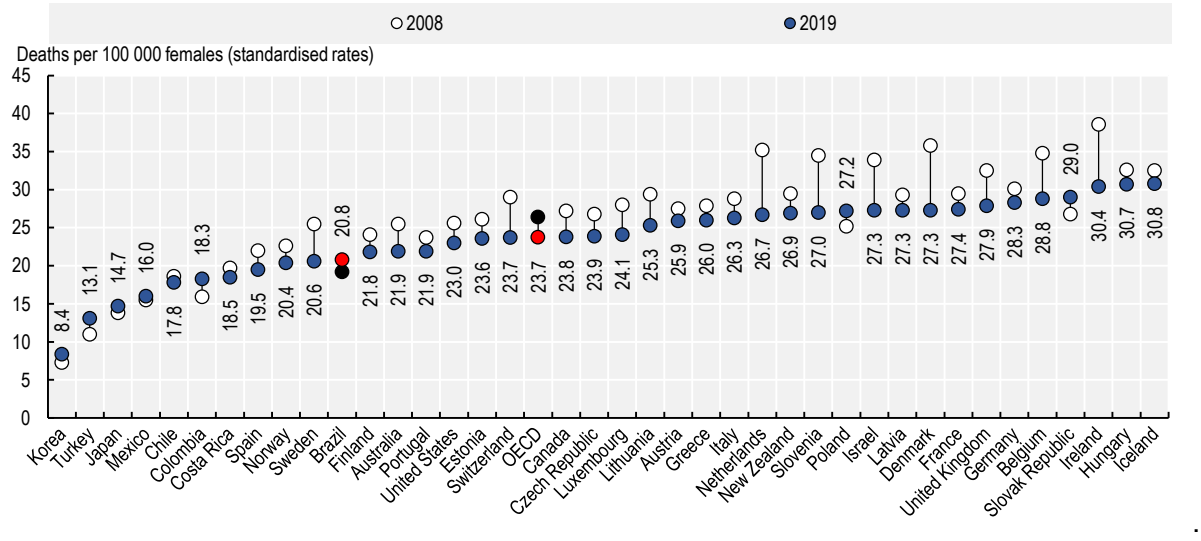
From the private sector, the "System S" carries out actions aimed at supporting promotion, prevention and treatment of cancer. The "System S" refers to nine institutions that are independently managed by business federations and confederations of the main sectors of the economy. Although they provide services of

public interest (e.g. education, social services, transport, etc.), these entities are not linked to any sphere of government, providing them a different space of action.

3.2.5. Despite prevention initiatives, breast and cervical cancer outcomes remain relatively poor with mortality increasing and survival decreasing in recent years

Between 2008 and 2019, breast cancer mortality increased from 19.2 to 20.8 deaths per 100 000 women in Brazil (+8.3%), which is the opposite of what happened as an average amongst OECD countries: a decrease from 26.4 to 23.7 (-10%). Only eight out of the 37 OECD countries experienced a growth in breast cancer mortality, with Turkey, Colombia and Korea having an increase of 15% or more in the period (see Figure 3.8). Despite Brazil's breast cancer mortality is lower than the OECD average, the increasing trend is worrisome.

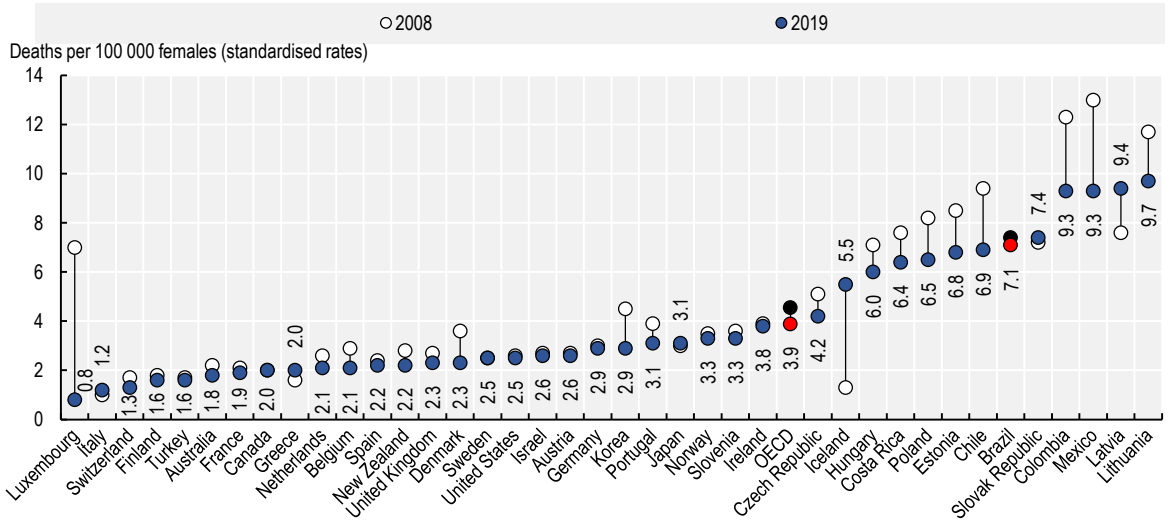
Figure 3.8. Breast cancer mortality in Brazil and OECD countries, 2008 and 2019



Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

The picture for cervical cancer mortality in Brazil seems more problematic. Between 2008 and 2019, mortality remained stable around 7.1 and 7.4 deaths per 100 000 women, compared to a decrease in OECD countries from 4.6 to 3.9 (-14.7%). Only seven out of 37 OECD countries experienced an increase, with Iceland, Greece, Italy and Latvia increasing by 15% or more (see Figure 3.9). In this case, Brazil's cervical cancer mortality is substantially higher than the OECD average.

Figure 3.9. Cervical cancer mortality in Brazil and OECD countries, 2008 and 2019



Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

These worrying trends are also observed in terms of 5-year net cancer survival. In all the selected cancer sites, Brazil has lower survival rates compared to OECD averages. Comparing the 2005-09 and 2010-14 periods, breast cancer survival dropped by more than two years in Brazil, while in the OECD it increased by one year. Colon cancer survival also decreased by more than two years, when in the OECD it increased by almost two years. Cervical cancer survival decreased by 11.3% and lung cancer survival declined by 11% in Brazil between 2000-04 and 2010-14, while in the OECD they both increased by 1.5% and 24.8%, respectively (Table 3.3).

Table 3.3. Trends in survival for breast, cervical, colon and lung cancer in Brazil and the OECD

Five-year net survival, population aged 15 and over

	2000-04	2005-09	2010-14
Brazil Breast	73.4	77.1	74.9
OECD Breast	81.0	83.3	84.3
Brazil Cervical	67.5	62.6	59.9
OECD Cervical	64.5	65.3	65.5
Brazil Colon	44.5	50.6	48.3
OECD Colon	56.1	59.4	61.2
Brazil Lung	9.1	8.5	8.1
OECD Lung	13.7	15.3	17.1

Note: Data for breast cancer considers only female population.
Source: CONCORD programme, London School of Hygiene and Tropical Medicine.

3.2.6. HPV vaccination has been very positive but it can be enhanced

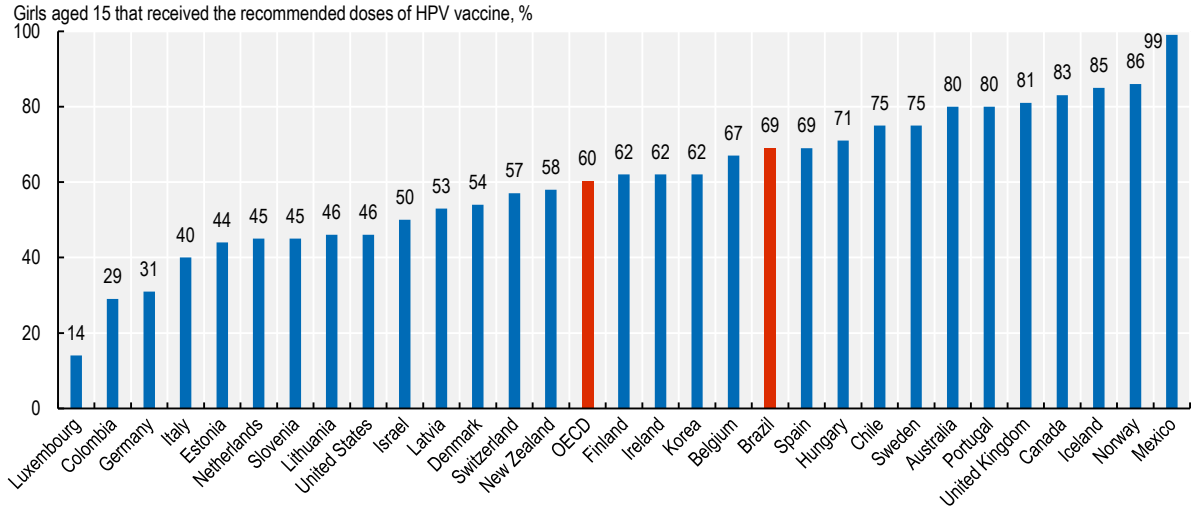
In 2014, the Ministry of Health, through the National Immunization Program, started the vaccination campaign for girls between 9 and 13 years against the Human Papilloma Virus (HPV). In 2017, girls aged 14 and boys between 11 and 14 years old were included as well. The vaccine is quadrivalent, which offers protection against HPV subtypes 6, 11, 16 and 18, preventing diseases such as precancerous lesions, cancer of the cervix, vulva and vagina, anus and genital warts. The vaccine is offered by SUS in

Basic Health Units and in vaccination campaigns in schools. The Practical Guide on HPV – Questions and Answers was launched by the National Immunisation Programme, in collaboration with INCA, seeking to clarify the main doubts on the subject (INCA, 2020[15]).

In 2018, coverage of HPV vaccine in Brazil was 69%, above the OECD average of 60% (see Figure 3.10). However, it is below the target coverage of 80% that was defined by Brazilian authorities (INCA, 2020[15]).

Figure 3.10. Human papilloma virus vaccine coverage in Brazil and OECD countries, 2018

Girls aged 15 that received the recommended doses of HPV vaccine, percentage



Source: Global Health Observatory: Explore a world of health data. (WHO, 2021[16]), https://www.who.int/data/gho.

Although not yet available to be applied, ANVISA has already approved a new vaccine against HPV, which protects against nine types of virus. It is offered for girls from 9 to 14 years old and boys from 11 to 14 years old, for people with HIV – AIDS in the age group of 9 to 26 years old. The vaccination schedule is three doses (interval of 0, 2 and 6 months). Other age groups may have vaccines available at private services, if indicated by their doctors.

3.2.7. A national strategy for cancer prevention and screening in PHC would synergise efforts to improve cancer outcomes in Brazil

Brazil can develop a single national strategy addressing cancer prevention and screening in PHC. Scientific evidence and social participation can be two key guiding principles in order to move towards population-based screening programmes. This strategy can consider the renewal of existing screening programmes for cervical and breast cancer; the expansion to new cancer sites such as colon and lung; the introduction of systematic personalised screening invitation letters and reminders; the redesign of cancer information systems; and the use of information and communication technologies to improve public awareness and health literacy.

Brazil can move towards a population-based cervical cancer screening programme, while introducing HPV-DNA primary testing in PHC settings

In the area of cervical cancer screening, especially after the introduction of the HPV vaccine, Brazil could consider instituting primary testing for the DNA of oncogenic HPV types as novel method for screening.

This would ideally require moving towards a population-based screening programme, further analysing the current epidemiology in the country and conducting a complete health technology assessment to understand the different factors that will determine the efficacy and cost-effectiveness of implementing such an organised programme. It would be important to use reliable, validated HPV tests in qualified laboratories, accredited by authorised accreditation bodies (e.g. ANVISA) and in compliance with international standards. Training for health workers would be another crucial component, along with communication strategies for women in target population.

A recent systematic review focusing in low- and middle-income countries found that cytology-based screening was the least effective and most costly screening method, while self-collected HPV testing was cost-effective when it yielded population coverage gains over other screening methods. The cost of the HPV test and loss to follow-up were also important factors (Mezei et al., 2017[17]). The European guidelines recommend the use of HPV primary testing within an organised, population-based programme for cervical cancer screening, avoiding co-testing (HPV and cytology primary testing) at any given age (von Karsa et al., 2015[18]). The American Cancer Society 2020 guidelines also recommends HPV primary testing as the preferred screening method (Fontham et al., 2020[19]).

Such a national strategy should include quality assurance in monitoring cervical cancer screening performance. The European guidelines define such a performance through achieving: (1) an invitation coverage of at least 95% of the target women; (2) an examination coverage of at least 70% (85% is desirable); and (3) a participation rate of at least 70% (85% is desirable) (von Karsa et al., 2015[18]). Box 3.2 summarises the experience of Finland and Italy with implementing HPV testing.

Box 3.2. HPV primary screening test programme in Finland and Italy

In Finland, women of 30-60 years of age are invited to take part in cervical cancer screening every five years. Some municipalities also invite women aged 25 and/or 65 for screening. About 70% of those invited participate in the screening for cervical cancer. The conventional cervical screening test used in Finland has been the Pap test, while the HPV test is applicable to cervical cancer screening for women over the age of 35. Samples for HPV and Pap are taken from participants in the HPV screening. Following a positive HPV test, the Pap sample is also analysed, after which any further management required is decided. The screening HPV test must meet the requirements of the IARC and WHO. Before being implemented, the validity of new HPV tests must always be verified by comparing them with the most studied HC2 or PCR GP5+/6+ tests. A referral to colposcopy is given to about 1% of the participants. Additionally, about 5% are invited for a follow-up test before the next screening invitation. An annual review provides a comprehensive overview of the Finnish cervical cancer screening programme, presenting information about attendance, outcomes, time series and costs of screening. The history of cervical cancer screening in Finland and its impact on cancer burden is also discussed.

In 2013, based on a health technology assessment report, the Italian Ministry of Health included HPV test every five years as an option for screening programmes for women of over 30 years of age. Stand-alone HPV was defined as primary test, with cytology only to be used as triage test in HPV+ women. Women with negative findings in the cytology analysis are invited for repeat HPV testing after 12 months and referred to colposcopy if still positive. The National Prevention Plan 2014-18 put as an objective the full implementation of HPV-based screening by 2018.

Source: Finnish Cancer Registry (2020[20]), Cervical cancer screening – Syöpärekisteri, https://cancerregistry.fi/screening/cervical-cancer-screening; Ronco (2020[21]), Core elements of the new HPV-based cervical cancer screening programme in Italy, https://www.hpvworld.com/articles/core-elements-of-the-new-hpv-based-cervical-cancer-screening-programme-in-italy.

Self-sampling with HPV testing has been explored as a novel strategy to increase screening coverage and could be considered in Brazil, for instance, within pilot studies. A systematic review including 34 studies, mostly from high-income countries, found greater screening uptake among HPV self-sampling participants compared with standard of care (e.g. Pap smear, visual inspection with acetic acid, clinician-collected HPV testing) (RR: 2.13, 95% CI 1.89 to 2.40). Uptake was higher when HPV self-sampling kits were sent directly to women's homes (RR: 2.27, 95% CI 1.89 to 2.71) or offered door-to-door by a health worker (RR: 2.37, 95% CI 1.12 to 5.03). However, meta-analysis showed no statistically significant difference in linkage to clinical assessment/treatment between arms (RR: 1.12, 95% CI 0.80 to 1.57) (Yeh et al., 2019[22]). The European guidelines state that the clinical accuracy of HPV primary testing on self-collected samples is sufficient to conduct pilot programmes (von Karsa et al., 2015[18]), while the American Cancer Society did not include a recommendation about it because the Food and Drug Administration has not yet approved self-sampling (Fontham et al., 2020[19]).

Brazil already has practical experiences with using HPV-DNA testing for screening. For instance, a study evaluated HPV-DNA screening in São Paulo, including 16 102 women, finding that high-risk HPV-DNA prevalence was 14.9%, whereas cytology abnormalities were found in 7.2% of the women. HPV DNA detected a significant number of patients with premalignant lesions missed by cytology and all 16 cervical intraepithelial neoplasia positive cases were HPV-DNA+. Authors concluded that HPV genotyping may reduce the burden of colposcopic referral and that HPV-DNA testing was shown to be feasible and advantageous over current cytologic screening in the public health system (Levi et al., 2019[23]). Another study conducted in three Brazilian cities found that the most relevant barriers for a more comprehensive screening programme relates to excessive travel required to access clinics, inconvenient service hours, and lack of public education. In addition, cytology had many unsatisfactory results and low positivity, follow-up was incomplete at all steps and laboratories provided delayed cytology and biopsy results (3+ months). Finally, screening clinics did not arrange or track colposcopy referrals; colposcopy clinics received no information from referring clinics, and electronic medical records have not yet replaced paper recordkeeping, leading to errors and loss of medical records (Ribeiro et al., 2018[24]). The identification of these and other barriers would be very important for policy design and an eventual implementation phase.

Breast cancer screening can evolve to a population-based organised programme and more tools can be provided in PHC

As in the vast majority of OECD countries (see Table 3.2), Brazil can develop a population-based breast cancer screening programme. In practice, this would require an effective call-recall structure, device a screening registry and safeguard robust quality assurance at all levels. The current process for population's registration in Brazil's PHC goes in the direction of individually identifying the eligible target population in each area served (e.g. municipalities), so it represents an opportunity for developing organised screening programmes.

The European guidelines on breast cancer screening and diagnosis describes seven characteristics of an organised screening programme (ECIBC, 2020[25]): 1. a policy specifying target population; 2. screening method and interval; 3. an active invitation of the entire target population; 4. a team responsible for overseeing screening centres; 5. a decision structure and responsibility for health care management; 6. a quality assurance system utilising relevant data; and 7. monitoring of cancer occurrence in the target population.

Building capacity in PHC teams would be crucial. As stated by WHO guidelines (WHO, 2017[26]), early diagnosis capacities requires guidelines or protocols and sensitise providers to cancer signs and symptoms to improve diagnostic accuracy; give sufficient time to evaluate patients and train practitioners in how to diagnose cancer including use of medical devices; promote a clear communication between the provider and the patient; and develop reliable referral mechanisms. In addition, mammography machines

distribution across the country should be also revised to achieve a balanced supply according to the population's need.

Brazil could build up from local experiences that have made progress towards an organised screening programme. For instance, a breast cancer organised screening programme in the community of the Andaraí in Rio de Janeiro targeting asymptomatic women aged between 50-69 years from SUS presented a mammographic coverage rate of 70%, suggesting that a population-based screening is feasible (Gioia et al., 2018[27]).

Systematic personalised invitations and reminders from PHC teams could improve cancer screening coverage

As part of population-based organised screening programmes, Brazil could adopt a more systematic and personalised approach in inviting target populations, as has been implemented in many OECD countries. An increasing number of OECD countries send a personal invitation letter for cancer screening to each individual in the target group, issued through a registry in a systematic manner. In Brazil, however, there is no national initiative regarding such invitations, which in practice are only implemented in some local levels depending on the initiative of particular municipalities or PHC teams.

In the majority of OECD countries, the invitation letter includes information on the benefits and potential harms of cancer screening such as false-positive screening results, over-diagnosis and over-treatment, and asks for either signed or verbal informed consent for screening (IARC, 2017[28]). This practice is in accordance with international recommendations as the WHO recommends organised population-based mammography screening programmes to provide information on both benefits and risks of mammography screening so that target women are able to make an informed decision before undergoing mammography (WHO, 2014[29]). In many OECD countries, additional efforts are also made to invite people with positive screening results in the past for follow-up assessment, and in some countries such as Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom, appointment date is fixed for mammography in the letter to further facilitate access to cancer screening (IARC, 2017[28]; ECIBC, 2020[30]).

A systematic review identified the most effective interventions to increase participation in organised screening programmes. Interventions such as postal reminders, telephone reminders, PHC physician's signature on invitation letter, and giving scheduled appointment instead of open appointment were all effective to increase uptake of breast, cervical and colon cancer screening. Mailing a kit for self-sampling cervical specimens increased participation in non-responders as well (Camilloni et al., 2013[31]). Another systematic review found that text messaging (short message service, SMS) appear to moderately increase screening rates for breast and cervical cancer and may have a small effect on colorectal cancer screening (Uy et al., 2017[32]). Future studies would also need to examine the cost associated with each of the invitation options and its impact in order to identify the most appropriate cost-effective strategies that may be different across regions in Brazil.

Screening in Brazil's PHC could explore expanding to sites such as colon and lung cancer

As colorectal and lung cancer are among the most important cancers in the country (see Figure 3.4), Brazil could explore the possibility of creating national screening programmes for these cancer sites.

For colorectal cancer, which represents the third major cause of cancer mortality in Brazil for men and women, opportunistic screening is available. The recommendation in SUS is to prioritise early diagnosis actions and personalised approach for high-risk groups. Recognising Brazil's different epidemiological and health care network realities, further studies are still needed to support the analysis of the feasibility of introducing screening in these different contexts (INCA, 2019[33]).

As reference, an increasing number of OECD countries have introduced population-based colorectal cancer screening programme for free to target population in recent years, and in many of these countries target population is the population of 50s and 60s years of age often with an upper age limit ranging between 64 and 74 (OECD, 2013[34]). The European guidelines recommend "only organised screening programmes should be implemented, as opposed to case-finding or opportunistic screening as only organised programmes can be properly quality assured". It also states that several issues should be considered: the legal framework, the availability and accuracy of epidemiological and demographic data, the availability of quality-assured services for diagnosis and treatment, promotional efforts, a working relationship with the local cancer registry, and follow-up for causes of death at individual level (Malila, Senore and Armaroli, 2012[35]). The United States recommends that adults age 50 to 75 be screened for colorectal cancer, either with stool tests, flexible sigmoidoscopy, colonoscopy, and CT colonography (virtual colonoscopy) (USPSTF, 2021[36]), varying depending on the patient's history and health system availability (Bibbins-Domingo et al., 2016[37]).

In relation to lung cancer, which represent the second cause of cancer deaths in Brazil (see Figure 3.4), general population screening is not currently recommended in the country and any examination should be discussed between the patient and the doctor (INCA, 2020[38]). Lung cancer screening is not common in OECD countries, but it exists in Canada, Japan and the United States. The Canadian Task Force on Preventive Health Care recommends screening for lung cancer with three consecutive annual low-dose computed tomography (LDCT) scans in high-risk individuals adults aged 55-74 years who currently smoke or quit less than 15 years ago, with a smoking history of at least 30 pack-years (CTFPHC, 2016[39]). In Japan, annual chest X-ray is recommended for people aged 40 and over, and sputum cytology is also recommended for smokers aged 50 and over who have smoked more than 600 cigarettes over their lifetime (OECD, 2019[40]). In the United States, the USPSTF released an updated recommendation in March 2021. Lung cancer screening is recommended as an annual screening with LDCT in adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years. Screening should be discontinued once a person has not smoked for 15 years or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery (USPSTF, 2021[36]).

Brazil could develop a thorough evidence-based analysis, including cost-effectiveness studies, to identify the potential harms and benefits of implementing colorectal and/or lung cancer screening in the country, along with appropriate definitions in areas such as eligibility criteria, screening intervals, existing local initiatives, monitoring schemes and quality improvement, infrastructure and equipment, and payment mechanism.

A redesign of cancer information systems can help manage screening programmes more effectively

Brazil has developed a monitoring system for cancer screening (SISCAN), cancer care (PAINEL-Oncologia) and population-level cancer epidemiology (Population-based cancer registry), which provides a good information infrastructure base. In addition, population-based surveys (Vigitel) regularly collect screening coverage and barriers to screening in view of seeking ways to increase screening coverage.

The main challenges for the cancer information infrastructure in Brazil, including screening information, relates to coverage, interconnectedness and feedback. Coverage aims to reach the full extent of the target population for each screening programme (including actions in the private sector). Interconnection challenges relate to linking existing information systems, for which an expansion of the national health card would be fundamental. Feedback to different actors in the health system, importantly to all PHC teams, is crucial to ensure that decisions and actions are informed by regular and updated information.

A comprehensive information system based on registries, capable of following each patient individually, is essential for efficient management of screening programmes and cancer care delivery. It can identify target

population who have and have not participated in the screening programmes, those who are monitored outside of the programme due to their previous diagnosis of cancer and/or genetic predisposition to specific cancer and those who do not consent to do screening. Using such a system, personalised invitations and reminders for cancer screening, which are important for increasing screening coverage, can be sent systematically to target population.

Integrated information systems generate data that need to be analysed periodically to assess the effectiveness of existing cancer screening protocols such as target group, screening frequency and/or methods and across population with different background. Brazil has started producing this data, which is also publicly available on line through DATASUS. Several OECD countries use information around cancer screening to improve quality of screening programmes as well. They provide feedback to individual providers and benchmarking is also possible. A systematic literature review supports these additional efforts as it found that provider assessment and feedback contribute to increased coverage for cervical, breast and colorectal cancer screening (Sabatino et al., 2012[41]).

Better information and communication technologies could improve public awareness and health literacy

Alongside more personalised invitation to cancer screening, Brazil could develop further communication and information-sharing strategies to improve public awareness on cancer prevention and screening and health literacy of the population. Since 2002, the Ministry of Health of Brazil has been investing annually in actions to raise awareness of cancer prevention measures, for instance, through the October Pink Campaign. The campaign consists of lighting buildings and monuments conveying the message "Prevention is necessary", while also promoting healthy lifestyle among women, encouraging HPV vaccination, overcome fear or stigma associated with cancer, among other topics.

Box 3.3. Sundhed.dk, the Danish e-health portal to support transparency and patient empowerment

Sundhed.dk, the Danish e-health portal launched in 2003, is the official website for the public Danish health care services and enables patients and health care professionals to find information and communicate. It is a public internet-based 24/7 portal that collects and distributes health care information among citizens and health care professionals. In a secure part of the portal the patient has access to:

- Personal health data on treatments and notes from hospital records, information about medication, laboratory test results, vaccination data and visits to the general practitioner (GP);
- Various e-services including making appointments with GP's, prescription renewals and electronic communication with the GP;
- Information on waiting times at all public hospitals and ratings of hospitals in terms of patient experienced quality;
- Patient networks and the sundhed.dk handbook for patients.

This portal brings the entire Danish health care sector together and provides an accessible setting for citizens and health care professionals to meet and efficiently exchange information. By serving both the citizens and the health professionals, the portals aim is to enable the two to achieve co-operation based on the same data. This empowers the citizen and gives the health professionals better tools to improve quality in care (OECD, 2013[34]; European Observatory on Health Systems and Policies and Petersen, 2019[42]).

Municipalities, with support from the State and the Federal Government, works to promote screening tests, through campaigns using printed media, social networks and local media. During determined periods in the year, some municipalities implement mobile units, which go to communities in the most distant parts of the country as a mean of increasing screening access, diagnosis and treatment. In addition, INCA has developed manuals or flyers that are sent to PHC teams every year for informing the public in the community and at work about healthy lifestyles to prevent cancer and the importance of early detection for cancer. INCA also develops videos and written material that is publicly disseminated in websites and social media.

As systematic sharing of information related to cancer is limited, particularly for cancer without screening programmes, Brazil could also better develop information-sharing strategies to help patients to seek care, including cancer diagnostic services, at the right place at the right time. In this context, an increasing number of OECD countries have developed information-sharing platforms to better involve and enable patients in taking care of their own health and navigating through health care systems for their conditions. For example, some OECD countries including Denmark (see Box 3.3), England and Estonia have developed a platform such as a website or e-Health account to share evidence-based information on health care for different diseases including cancer throughout patient pathway with a view to promoting health literacy of the population and to support them to seek health care including cancer screening, diagnosis and treatment appropriately in a timely manner.

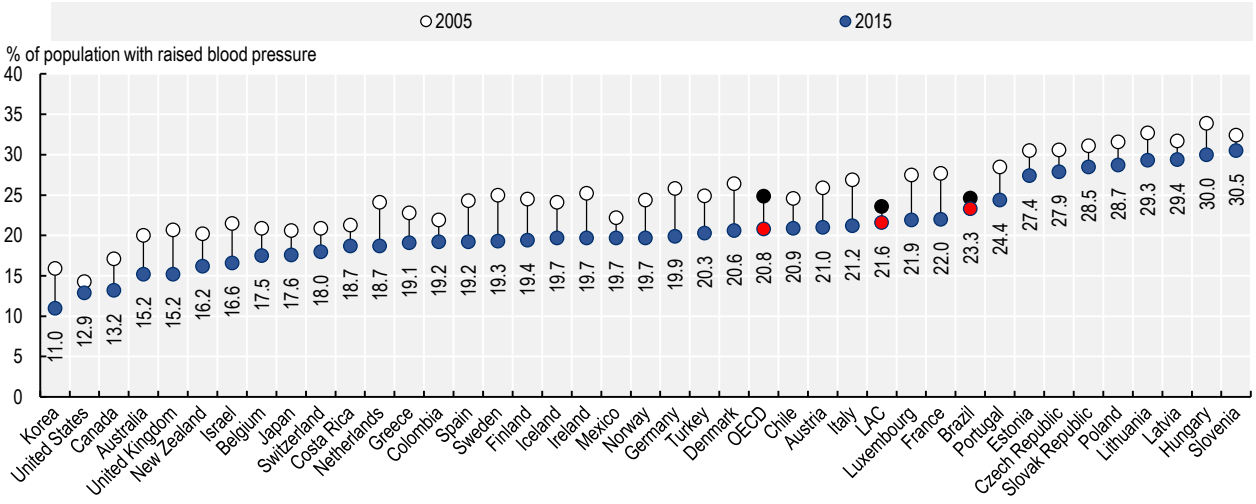
3.3. Screening for hypertension and diabetes can be further strengthened at the PHC level

3.3.1. Hypertension is one of the major health risk factors in Brazil

Hypertension or high blood pressure manifests by causing headaches, nosebleeds or difficulty breathing. If left untreated, hypertension can contribute to the development of more serious cardiovascular problems such as kidney disease, stroke and myocardial infarction. The absence of hypertension is a result of promotion efforts such as physical activity and healthy diets. When hypertension develops, it can be controlled with medication as well as with life style adjustments. This indicator is thus a proxy for both health promotion and medical services, usually delivered in PHC (WHO, 2019[43]).

In 2015, the average prevalence of raised blood pressure in Brazil was 23.3%, higher than the OECD average of 20.8% and the LAC average of 21.6%. Between 2005 and 2015, all OECD countries reduced the prevalence of raised blood pressure with an average of -16.4% reduction. Brazil also reduced this prevalence but only by -5.3%, a decrease lower than all OECD countries (Figure 3.11). Changes in risk factors and improvements in detection and treatment of raised blood pressure have, at least partly, contributed to these general reductions, but other factors such as improvements in early childhood nutrition and year-round availability of fruits and vegetables, might explain it as well (Zhou et al., 2017[44]).

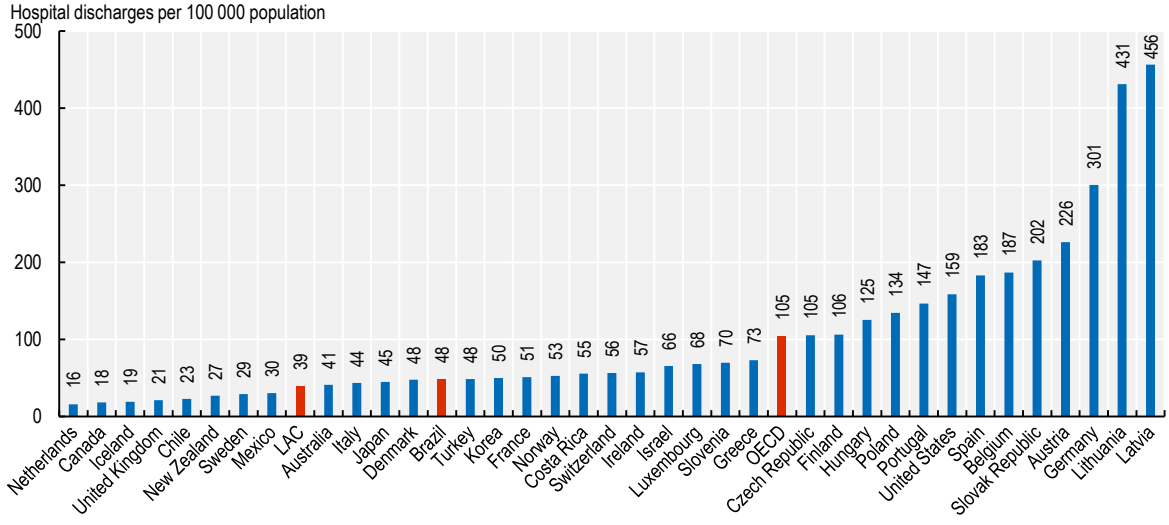
Figure 3.11. Raised blood pressure among adults in Brazil and OECD countries, 2005 and 2015



Note: Raised blood pressure (BP) defined as systolic BP >=140 or diastolic BP >=90. Age-standardised estimate.
Source: Global Health Observatory: Explore a world of health data. (WHO, 2021[16]), https://www.who.int/data/gho.

PHC is expected to keep people well by providing a consistent point of care over the longer term, treating the most common conditions, tailoring and co-ordinating care for those with multiple health care needs and supporting the patient in self-education and self-management. In this way, a good PHC performance can reduce the rates of hospital admissions of several diseases, including hypertension and diabetes. In Brazil, the rate hospital admission due to hypertension was of 48 per 100 000 people in 2019, which is less than half the OECD average of 105 but higher than the LAC average of 39 (Figure 3.12).

Figure 3.12. Hospital admission due to hypertension in Brazil and OECD countries, 2019 (or latest available)



Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm; Ministry of Health of Brazil.

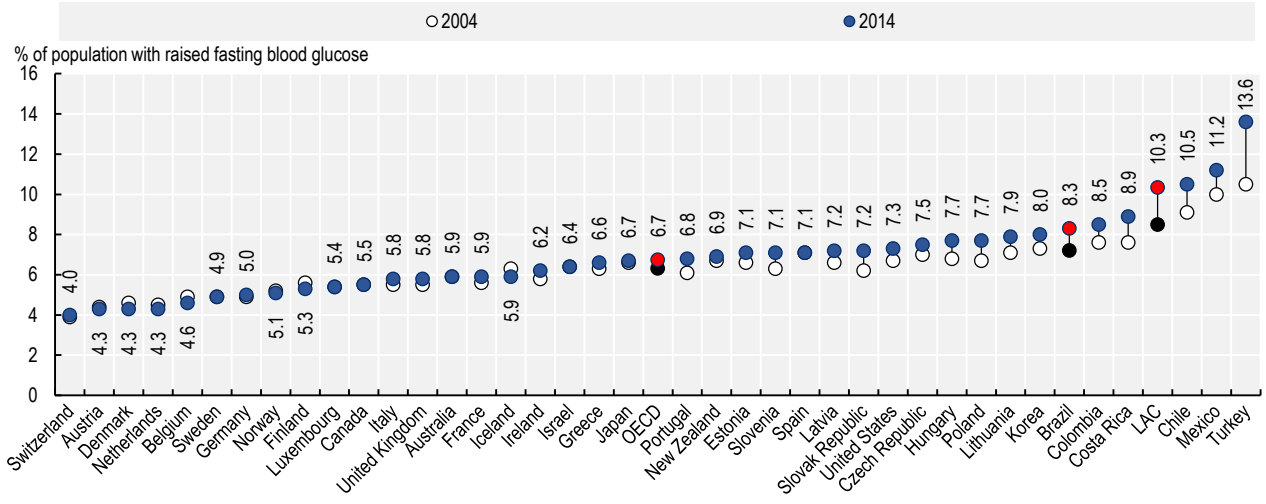
According to a recent study analysing high systolic blood pressure (HSBP) in Brazil, the prevalence of HSBP in 2017 was 18.9%, with an annual 0.4% increase rate, while age-standardised death rates attributable to HSBP decreased from 189.2 (95%UI 168.5-209.2) to 104.8 (95%UI 94.9-114.4) deaths per 100 000 from 1990 to 2017. However, the total number of deaths attributable to HSBP increased by 53.4% and HSBP raised from third to first position, as the leading risk factor for deaths during the period. Regarding total disability-adjusted life-years (DALYs), HSBP raised from fourth in 1990 to second cause in 2017 (Nascimento et al., 2020[45]).

3.3.2. When compared to OECD countries, diabetes represents a higher burden of disease in Brazil

Raised levels of blood sugar can lead to the development of diabetes. Fasting blood glucose (FBG) contributes to diagnose and monitor diabetes, and can be under control because of effective treatment with glucose-lowering medication and as a result of health promotion activities. PHC has a central role in accomplishing these actions (WHO, 2019[43]).

In Brazil, 8.4% of the population had raised FBG in 2014, above the 6.7% average in OECD countries. Importantly, between 2004 and 2014, Brazil recorded one of the largest increases in its population with raised FBG, increasing by 15.3% (Figure 3.13). Only Turkey, Costa Rica, the Slovak Republic and Chile had larger increases amongst OECD countries, evidencing a worrying trend in Brazil.

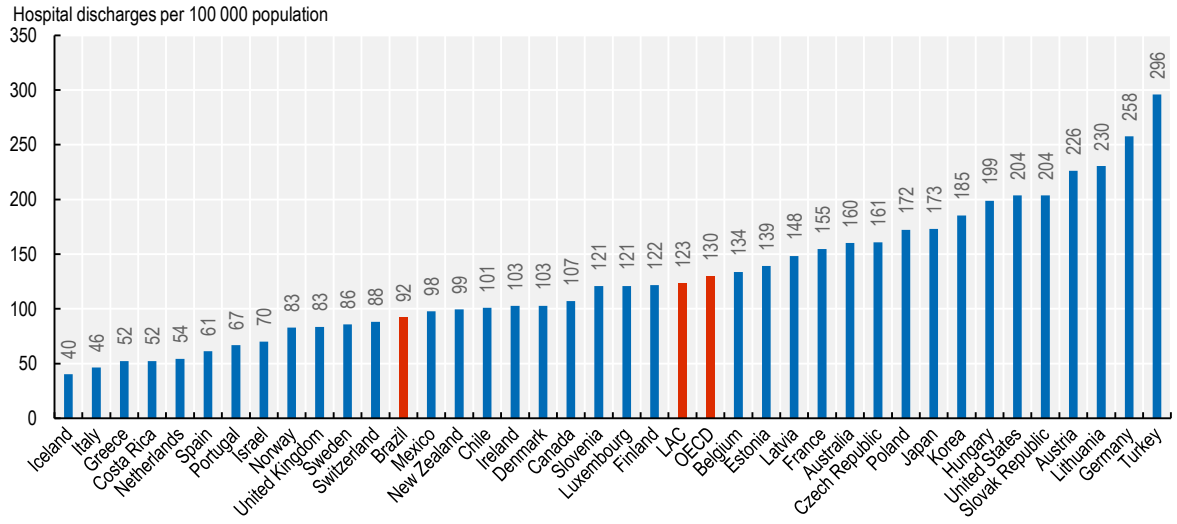
Figure 3.13. Raised fasting blood glucose among adults in Brazil and OECD, 2004 and 2014



Source: Global Health Observatory: Explore a world of health data. (WHO, 2021[16]), https://www.who.int/data/gho.

As stated previously, a well performing PHC can control and reduce the number of hospital admissions due to diabetes. In Brazil, the rate of diabetes hospital admission in 2019 was of 92 admissions per 100 000 people, below the OECD average of 130 and the LAC average of 123 (Figure 3.14). The differences between Brazil and OECD countries in terms of access to hospital care and the profiles of chronic non-communicable disease burden remain as some of factors to be studied more in depth aiming to understand these differences (OECD/The World Bank, 2020[46]).

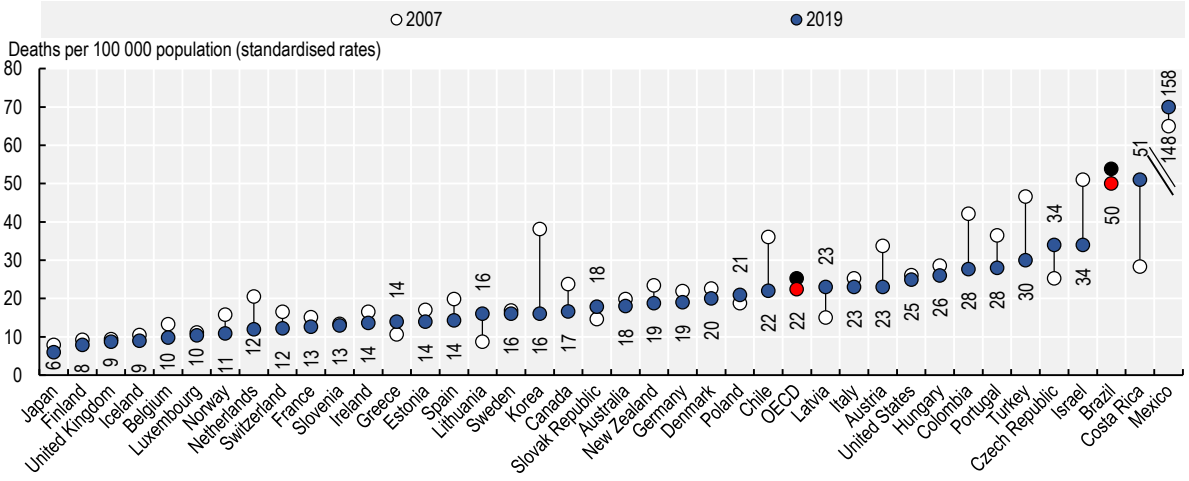
Figure 3.14. Diabetes hospital admission in adults in Brazil and OECD, 2019 (or nearest year)



Source OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

Diabetes mortality in Brazil reached 50 deaths per 100 000 people in 2019, higher than the OECD average of 22 and only lower than Costa Rica and Mexico. Between 2007 and 2019, diabetes mortality was reduced by 9.8%, higher than the average reduction of 7.8% amongst OECD countries (Figure 3.15).

Figure 3.15. Diabetes mortality in Brazil and OECD countries, 2007 and 2019



Source: OECD (2021[1]), Health Statistics Database, https://www.oecd.org/health/health-data.htm.

The impact of diabetes on the Brazilian heath system was further studied by (Quarti Machado Rosa et al., 2018[47]). They found that in 2014, 313 273 hospitalisations were due to diabetes in adults (4.6% of total adult hospitalisation), representing USD 264.9 million. The average cost of an adult hospitalisation due to diabetes was USD 845, 19% higher than hospitalisation without diabetes. Hospitalisations due to cardiovascular diseases related to diabetes accounted for the higher proportion of costs (47.9%), followed by microvascular complications (25.4%) and diabetes per se (18.1%). Another study analysing the burden of diabetes in Brazil, found that the overall estimated prevalence of diabetes in 2017 was 4.4% (95%UI

4.0-4.9%). While the crude prevalence of type 1 diabetes has remained relatively stable from 1990, type 2 prevalence has increased by 30% for males and 26% for females. In 2017, approximately 3.3% of all DALYs were due to diabetes and 5.9% to hyperglycaemia. Diabetes prevalence and mortality were highest in the Northeast region and growing fastest in the North, Northeast, and Central-West regions. Future projections suggested that the diabetes mortality burden will increase by 144% by 2040, more than twice the expected increase in crude disease burden overall (54%). By 2040, diabetes is projected to be Brazil's third leading cause of death and hyperglycaemia its third leading risk factor, in terms of deaths (Duncan et al., 2020[48]).

3.3.3. Hypertension and diabetes screening in Brazil is embedded in a broader PHC check-up programme

Overall, basic health checks and risk screening for chronic diseases in Brazil relies on PHC family health teams, and predominantly on opportunistic screenings. Blood pressure and blood glucose are usually checked during PHC basic check-ups for chronic diseases. These check-ups also include other measures such as cholesterol, screen for cardiovascular disease based on age, family history and risk factors such as body mass index (BMI) that can help diagnose persons at-risk of chronic diseases, or diagnose chronic diseases in their earlier stages when they can be managed with fewer complications.

An official Ministry of Health screening guideline for chronic non-communicable diseases was published in 2010 and it is valid until today (Ministério da Saúde, 2010[49]). For both hypertension and diabetes, screening target populations are quite wide. Screening for hypertension is recommended for adults (over 18 years of age) without the knowledge that they are hypertensive. It suggests screening every two years for people with blood pressure below 120/80 mmHg and annual screening if systolic blood pressure is between 120 and 139 mmHg or diastolic blood pressure between 80 and 90 mmHg. For diabetes, the guideline recommends screening in asymptomatic adults with sustained BP greater than 135/80 mmHg and does not apply to other screening criteria such as obesity, family history or age range. In addition, there are specific booklets (*Cadernos de atenção básica*) for the management of hypertension (Ministério da Saúde, 2013[50]) and a recent protocol for diabetes (CONITEC, 2020[51]), which also consider a screening component. For both diseases, the family health model proposes that trained health professionals work in an interdisciplinary manner, link with service users, and take on responsibility for ensuring the provision of comprehensive health care. For instance, for diabetes this includes from screening, classification, and diagnosis, along with an initial assessment, healthy lifestyle guidance and follow-up medical appointments. It also considers blood glucose control and treatment with or without medication, prevention and management of acute and chronic complications, care of feet and oral health care (Ministério da Saúde, 2013[52]).

A study assessed hypertension care continuum in Brazil's PHC, finding that over one-third of the Brazilian adult population had measured hypertension or prior diagnosis. Nearly 90% of these had recent contact with the health system, but only 65% were aware of their condition. Only 62% of these regularly sought care for hypertension, but of these 92% received treatment. Hypertension control was 33% overall, but increased to 57% among those who passed through all stages of the care continuum, showing the importance of high-performing PHC teams (Macinko, Leventhal and Lima-Costa, 2018[55]).

Regarding health information infrastructure, Brazil developed a specific registration and monitoring system for hypertensive and diabetic patients: HIPERDIA. It is managed by the Ministry of Health, through the Secretariat of Health Care Services, in conjunction with the the State and Municipal Health Secretariats. Municipalities that are members of the National Pharmaceutical Assistance Programme for Hypertension and Diabetes Mellitus send, through the HIPERDIA system, information on the registration and monitoring of patients with these diseases. All this information is processed and made available by DATASUS of the Ministry of Health (Ministério da Saúde, 2021[56]).

Box 3.4. People with pre-existing chronic conditions risk more severe COVID-19 health outcomes

Across OECD countries, people with existing chronic conditions (including cancer, chronic kidney disease, chronic obstructive pulmonary disease, heart conditions, immunocompromised state, diabetes type 2, sickle cell disease and obesity) are the most hard-hit patient population in the COVID-19 pandemic. People with chronic conditions are facing a 'double threat': they are more vulnerable to complications and death from COVID-19, and they experience indirect health effects from disruptions in essential care:

- First, people living with certain chronic conditions are at higher risk of severe COVID-19 symptoms. Early in the pandemic, it was shown in China that older patients and those with chronic conditions were more likely to have a severe to critical COVID-19 condition, to show deterioration of their health condition and to die from COVID-19 (Zhang and et, 2020[53]). Researches in the United States, Italy and the United Kingdom, confirm more severe COVID-19 outcomes and higher risk of hospitalisation among patients having underlying health conditions (OECD, 2021[54]);
- Second, people living with chronic conditions, also face indirect impacts of the pandemic due to disruptions in continuity of care or foregoing care. The lock-down and fears of contamination in waiting rooms have led many patients to forego care, including those who require regular follow-up for chronic diseases, such as cancer (OECD, 2021[54]). For example, in England, urgent referrals from PHC for people with suspected cancers decreased by nearly 80% in comparison with levels before the COVID-19 crisis. In France, the number of cancer diagnoses decreased by 35% to 50% in April 2020, as compared to April 2019. Preventive cancer screenings in the United States for breast cancer, colon cancer, and cervical cancer have also dropped between 86% and 94% in March 2020 compared to average volumes in 2017-19. In Australia, there were around 145°000 fewer screening mammograms conducted by BreastScreen Australia in January to June 2020 compared with January to June 2018.

Strong PHC has the capacity to mitigate these indirect effects during the pandemic, but also to reduce the pressure on the entire health system by providing comprehensive and preventive care.

Source: (OECD, 2021[54]). Strengthening the frontline: How primary health care helps health systems adapt during the COVID-19 pandemic. OECD Policy Responses to Coronavirus (COVID-19).

In the context of the COVID-19 pandemic, and recognising that people with NCDs are at higher risk, the Ministry of Health issued specific guidelines for supporting this group of the population through PHC. The aim was to follow-up of this population with adequate regularity, aiming at clinical stability, reducing the chances of unfavourable outcomes during the pandemic period. Amongst other components, the strategy included the identification, registration and risk stratification of people with obesity, diabetes and/or systemic arterial hypertension through surveillance actions and timely diagnosis of the adherent population. In addition, the early identification and prioritisation of follow-up and monitoring of these individuals with influenza syndrome or with suspected or confirmed COVID-19. The response included multi-professional therapeutic assistance, the prevention of coronavirus transmission in individuals with obesity, diabetes and/or hypertension, and the implementation of intersectorial and community actions for promotion of health, considering the epidemiological situation of COVID-19 in each territory (Ministério da Saúde, 2020[57]). These are all welcome strategies given that people with chronic non-communicable diseases are facing a 'double threat': they are more vulnerable to complications and death from COVID-19, and they experience indirect health effects from disruptions in essential care (Box 3.4).

3.3.4. Quality improvement and pay-for-performance schemes in Brazil's PHC have included hypertension and diabetes management

Checkup activities are part of the PHC Service Portfolio (*Carteira de Serviços da Atenção Primária à Saúde*), which receives financing from the Federal Government transferred to States and Municipalities, with these entities responsible for managing the provision of services. In 2011, the Ministry of Health created the Programme to Improve PHC Access and Quality (PMAQ), aiming at scaling up access and quality of care offered by means of financial incentives directed toward municipal health management, conditioned on formal agreements of commitments and indicator evaluation agreed between PHC teams, municipal health service managers, and the Ministry of Health (see Chapter 4). As part of PMAQ, the evaluation of FHTs included topics such as early detection of hypertension, laboratory exams for diabetes, and prescription refills for users on continued care/programs such as hypertension and diabetes without the need for marking medical appointments.

More recently, the new *Previne Brasil* Programme, implemented in 2020, includes a pay-for-performance component, which rewards performance linked to seven indicators (see Chapter 4). Two of them relates to hypertension and diabetes (Ministério da Saúde, 2020[58]):

- Indicator 6: Percentage of people with hypertension having blood pressure checked in each semester.
- Indicator 7: Percentage of people with diabetes with a request for glycated haemoglobin.

Even though these indicators are not directly related to screening but to the follow-up of patients who already have the disease, it is important to highlight that patients who are diagnosed may benefit from this incentive. However, it would be important to monitor how this programme could influence screening activities for hypertension and diabetes in PHC.

3.3.5. Hypertension and diabetes secondary prevention in Brazil should be revised to improve the efficacy and efficiency of its screening activities

Brazil could develop population-based hypertension and type 2 diabetes screening targeting high-risk population groups

Several OECD countries have health check-ups for chronic conditions, usually targeted at particular groups of the population, undertaken periodically for example every five years, and sometimes provided by health care professionals other than doctors. In Estonia, health check-ups and guidance are provided by family nurses for people aged between 40 and 60 with hypertension or diabetes (Habicht et al., 2018[59]), and in 2007, Korea introduced the National Screening Programme for Transitional Ages, targeting people at age 40 and 66 (Kim et al., 2012[60]). In England, the NHS Health Check was introduced for people aged between 40 and 74 in 2009 and an invitation letter is sent every five years to those who do not already have diabetes, heart disease, or kidney disease or have not had a stroke, in order to screen them for the risk of developing chronic conditions including heart disease, stroke, kidney disease, type 2 diabetes, or dementia (available only for those above 65 and above). This check-up is often undertaken by a nurse or health care assistant (Gmeinder, Morgan and Mueller, 2017[61]; NHS, 2018[62]). Table 3.4 shows the recommendations for hypertension screening from selected evidence-based guidelines along with the latest recommendations in Brazil.

However, a recent review commissioned by WHO Europe found that the available evidence does not support the recommendation on systematic population-level screening for hypertension (Eriksen et al., 2021[66]). Instead of recommending systematic screening, the preferred alternative would be targeting those in PHC who may be at a higher risk owing to age or the presence of a risk factor (i.e. case-finding). In Brazil, a study identifying the main risk factors for developing hypertension found that the prevalence increased with age, low educational level, increased body mass index and abdominal waist, and urinary

sodium excretion (Cipullo et al., 2010[67]). This type of studies in the Brazilian population could help to define the target group in order to guide future hypertension screening recommendations.

Table 3.4. Selected recommendations for high blood pressure screening

	Population group	Screening interval	Persons at increased risk of high BP
Brazil (Ministério da Saúde, 2010[49])	18 years and over, without known hypertension	• Every two years if BP below 120/80 mm Hg. • Every year if systolic BP 120-139 mm Hg or diastolic BP 80-90 mm Hg	None mentioned.
European Society of Cardiology and of Hypertension (Williams et al., 2018[63])	18 years and over	• Every 1-5 years or when opportunity arise if BP below 120/80 mm Hg • Every 3 years if BP 120-129/80-84 mm Hg • Every year if BP 130-139/85-89 mmHg	In older patients (>50 years), more frequent screening should be considered for each BP category.
United States (USPSTF, 2016[64])	18 years and over, without known hypertension	• Annual for adults aged ≥ 40 years and persons at increased risk for high BP. • Adults 18-39 years with BP < 130/85 mm Hg who do not have other risk factors, every 3-5 years.	Have high-normal blood pressure (130-139/85-89 mm Hg); those who are overweight or obese, and African Americans.
WHO HEART guidelines (WHO, 2018[65])	18 years and over, during routine visits to PHC	• Every 1 to 5 years if normal • No mention of other interval	Have had a prior heart attack or stroke; have diabetes; have chronic kidney disease; are obese; use tobacco; have a family history of heart attack or stroke.

Note: BP: Blood pressure.

Table 3.5. Selected recommendations for type 2 diabetes screening

	Population and screening interval	Persons at increased risk of DM2
Brazil (CONITEC, 2020[51])	• All adults over 45 years of age. • Adult overweight (BMI >25 kg/m2) and with one risk factor or moderate CVD risk. • If normal, screen every 3 years. • If pre-diabetes, screen every year.	Sedentary lifestyle; first-degree relative with DM; women with previous pregnancy with a fetus weighing ≥ 4 kg or with a diagnosis of gestational DM; hypertension or antihypertensive use; HDL cholesterol ≤ 35 mg/dL and/or triglycerides ≥ 250 mg/dL; women with polycystic ovarian syndrome; other clinical conditions associated with insulin resistance (e.g. obesity III, acanthosis nigricans); history of CVD.
Canada (Diabetes Canada, 2018[69])	• Screen every 3 years in individuals ≥40 years of age • Screen every 3 years in individuals at high risk according to a risk calculator • Screen earlier and/or more frequently (every 6 to 12 months) in people with additional risk factors for diabetes	First-degree relative with DM2; Member of high-risk population (e.g. African, Arab, Asian, Hispanic, Indigenous or South Asian descent, low socio-economic status); History of prediabetes; History of gestational diabetes; History of delivery of a macrosomic infant; presence of end organ damage associated with diabetes; and presence of vascular risk factors (e.g. smoking), associated diseases (e.g. HIV), and use of drugs associated with diabetes (e.g. statins).
United States (USPSTF, 2015[70])	• Adults aged 40 to 70 years who are overweight or obese. • Every 3 years for adults with normal blood glucose levels.	Family history of diabetes; history of gestational diabetes or polycystic ovarian syndrome; members of certain racial/ethnic groups (e.g. African Americans, American Indians or Alaskan Natives, Asian Americans, Hispanics or Latinos, or Native Hawaiians or Pacific Islanders) may be at increased risk for DM2 at a younger age or at a lower BMI.
WHO HEART guidelines (WHO, 2018[65])	• Adults who are 40+ years old and who are overweight (BMI >25) or obese (BMI >30) • No screening interval mentioned.	Have had a prior heart attack or stroke; have diabetes; have chronic kidney disease; are obese; use tobacco; have a family history of heart attack or stroke.

Note: DM2: diabetes mellitus type 2. BMI: body mass index. CVD: cardiovascular disease.

Similarly as with hypertension, diabetes screening in OECD countries is normally embedded in more general health check-ups. In Australia, for example, PHC physicians can provide health assessment for people who are at risk of developing a chronic disease. This assessment is provided to people aged between 45 and 49 once if they have at least one risk factor (lifestyle habits or a family history) for developing a chronic disease such as type 2 diabetes or heart disease. The assessment is also provided to people aged 75 and over with an interval of 12 months or longer (Department of Health, 2014[68]). In view of reducing the prevalence of lifestyle-related diseases including cancer, cardiovascular diseases and diabetes, Japan introduced the specific health check-up (Tokutei kenshin) to the population aged between 40 and 74 in 2008. All insurers in the Japanese health system are obliged to provide a specific health check-up to people in this age group every year as they are considered to have higher risks of developing lifestyle-related diseases. Insurers need to provide a nationwide standard set of health check-up items (OECD, 2019[40]). Table 3.5 shows the recommendations for diabetes mellitus type 2 screening from selected evidence-based guidelines along with the latest recommendation in Brazil.

According to the most recent scientific evidence, too much screening (e.g. by having a too wide target population) probably will not improve population health outcomes and can be an inefficient use of resources. Therefore, Brazil can aim for well-targeted hypertension and type 2 diabetes screening population-based programmes, based on its national epidemiology, health system characteristics and cost-effectiveness analysis, as an effective way to identify and manage chronic disease.

Strengthen disease management pathways with a people-centred perspective

Hypertension and diabetes screening should be just the first step in a clear disease management pathway in Brazil. Chronic disease management pathways (also called integrated care pathways), which can be embedded on clinical guidelines, should be available for all high prevalence chronic diseases, to give guidance to health care providers and patients over expectations of the care that should be delivered and received. The two existing clinical guidelines in Brazil (Ministério da Saúde, 2013[50]; CONITEC, 2020[51]) represent a very positive step towards developing best practice guidelines with explicit pathways of care. For the moment these pathways are focused on information for health professionals in PHC, but could be expanded to integrate other care providers (for example specialists, or patient-support groups), and be produced in a patient-friendly format.

Pathways of chronic disease care, produced in both patient-facing and clinician-facing formats, should clearly establish the professional responsibilities of health professionals at different stages of disease. These pathways can be used to set quality expectations for chronic diseases such as diabetes and cardiovascular disease, and standardise quality of care across Brazil. The pathways can also be used to clarify expected roles for different care providers. In the area of diabetes, clinical pathways can help by: (1) assisting to systemically evaluate the patient's clinical presentation and risk factors; (2) choosing the most appropriate behavioural and medication interventions; and (3) providing a timeline for patient follow-up and monitoring. In short, clinical pathways will assist in the co-ordination of care and follow-up (Wong, 2017[71]).

Figure 3.16. NHS England RightCare Pathway: Diabetes, summary table

Source: NHS England (2018[72]), NHS RightCare, Diabetes pathway, https://www.england.nhs.uk/rightcare/products/pathways/diabetes-pathway

England has developed more complex pathways, which include expectations at different stages of the disease, the roles for different care providers, key interventions and target outcomes (NHS England, 2018[72]). England's 'NHS RightCare Pathway: Diabetes' includes, for example, an expectation that care planning and an annual review take place for patients with both Type 1 and Type 2 diabetes, and the Pathway includes links to supportive documentation to help with care planning. In England, the expectation is that a lot of diabetes care is provided by multidisciplinary teams in community care settings, and the Pathway includes details of the services that the team would usually provide (patient education, pregnancy advice, foot protection team) (see Figure 3.16).

Alongside establishing clear chronic disease management pathways, there is a need to ensure that other levers within the system are effectively aligned with the pathway. This includes line up payment and reimbursement incentives, as well as ensuring that health professionals have the tools and capacities they need to undertake the responsibilities expected of them.

Create more capacity in PHC for screening and management of hypertension and diabetes through expanding the role of health workers

To strengthen prevention capacity and impact, Brazil should look to increase capacity in PHC. One way that several OECD countries have found to increase capacity relates to task shifting or expanding the role of other health workers (Box 3.5). Exploring whether there are ways for other health workers – for instance nurses, nutritionists or pharmacists – to play a role in delivering some of these key prevention activities is certainly a possibility for Brazil.

Box 3.5. Advanced nurse practitioners and community pharmacists in France

As in other OECD countries, France has extended the role of nurses and pharmacists, which is seen as a key policy lever to improve access in underserved areas where the number of PHC physicians is decreasing. The new decree establishing the profession of Advanced Nurse Practitioner (Infirmière en Pratique Avancée) was issued in June 2018. The Advanced Nurse Practitioner will work within a PHC team to manage patients having chronic conditions and take the lead in prevention and co-ordination.

In parallel, the role of community pharmacists is gradually increasing. Community pharmacists are allowed to perform three rapid diagnostic orientation tests: the capillary blood glucose test for diabetes screening; the oropharyngeal tests for influenza; and the group A streptococcal tonsillitis test. The objective is to determine if antibiotic treatment is necessary and if a visit to the doctor is required for a prescription. The community pharmacist can also participate in punctual screening programmes for chronic obstructive pulmonary disease (COPD). Lastly, pharmacists in France are now allowed to perform flu vaccination.

Source: OECD (2020[78]), Realising the potential of PHC, https://dx.doi.org/10.1787/a92adee4-en.

For example, when it comes to diabetes, nurses could have the capacity and training to conduct an initial assessment of the patient, including ensuring the capacity to do blood sugar testing in all practices and working together with doctors and other team members in follow-up activities. In general terms, nurse-provided care has shown equivalent or better quality of care across a large range of clinical outcome measures for chronic conditions, including diabetes (Maier, Aiken and Busse, 2017[73]). A systematic review found that nurse-led care was at least as effective as physician-led care in providing secondary prevention to patients with chronic conditions, where 84% of outcome parameters showed no statistically significant differences, and for the remaining 16%, secondary prevention outcomes improved in the nurse-group, primarily among patients with diabetes. In this patient group, nurse-led care was superior in preventing the onset of heart disease and it lowered cardiovascular risk (Martínez-González et al., 2015[74]).

Community pharmacists can also be considered for task shifting policies, and in most OECD countries its role has evolved substantially in recent years. Pharmacists can play a key part in giving advice to patients and supporting them to navigate their health needs and manage their care. Recent systematic reviews have shown that pharmacist involvement in care may improve health outcomes for chronic conditions such as diabetes and hypertension (Pousinho et al., 2016[75]), while it can turn to be cost-effective for health systems (Wang, Yeo and Ko, 2016[76]). In Brazil, pharmacists do not seem to have a large presence in PHC teams, even stating that pharmacists' isolation in PHC prevails (Barberato, Scherer and Lacourt, 2019[77]). Therefore, such a policy would require a thorough analysis and planning to define the best way to invest on further introducing community pharmacists in Brazil's PHC teams.

The health information system needs to be developed further to support targeted population-based screening for better monitoring and evaluation

Screening and other health care activities for hypertension and diabetes have the potential of generating a wealth of valuable health information, which could be used both for better managing population health, designing and targeting more effective public health interventions, and for research. However, HIPERDIA, Brazil's health information system for hypertension and diabetes in PHC, does not collect information about screening and it is not capable of capturing the pathway of care for each patient either (e.g. referrals, waiting times, consultations with specialists, laboratory tests, medications, etc.). It is also hard for PHC teams to review and act on this information as they do not receive regular feedback, and patients cannot

have access to his personal health data. It is also difficult for the system to link with other databases such as hospitalisations, death registries, etc.

Many OECD countries have nationally standardised digital medical records and they are able to use up-to-date data for monitoring and evaluation of the health system by automatically extracting data from electronic clinical records. For example, 13 countries including Canada, the Czech Republic, Denmark, Finland, Israel, Korea, New Zealand, Norway, Singapore, Sweden and the United Kingdom (England, Scotland and Wales) regularly link data from different national datasets such as hospital and mental hospital in-patient data, cancer registry data and mortality data. Using these linked data, these countries are able to actively monitor health care quality and health system performance.

In order to monitor and further develop secondary prevention strategies, Brazil needs to develop a health information system, which allows linking different data sources. Experiences of other OECD countries in developing a strong health information system within a data governance framework that protects patients' health information privacy, which is laid out in OECD (2019[79]), would be useful for Brazil in following such paths.

A stronger health information system could also facilitate streamlining the efforts to invite target population for hypertension and diabetes screening. Currently, these screenings are largely opportunistic and there is no information about who is receiving them. Moreover, it is not possible for municipalities or PHC teams to identify whom to send the invitations. The current process for population's registration in Brazil's PHC represents an opportunity for developing organised screening programmes. Brazil could send personalised invitation letters, without duplication, only to those who are in the target population, and not currently undergoing treatment, and to those who have not followed up on worrying results from a previous check-up. These targeted personalised approaches are considered more effective in recruiting people in need of health check-ups (Bunten et al., 2020[80]).

In the future, Brazil could consider bundled payments as a mechanism to improve management of chronic conditions in PHC

Brazil has recently innovated on its payment scheme in PHC with the *Previne Brasil* programme. For the future, another alternative to explore are bundled payments, in particular, for chronic conditions. These consist of one payment per patient with a chronic illness to cover the cost of all health care services provided by the full range of providers during a specific time period. It has been introduced in OECD countries to incentivise co-ordination of care between providers, or provide a broader set of care (e.g. education, regular checks, occasional specific checks). Bundled payments can encourage collaboration within and across care settings, contribute to greater standardisation of care for example by requiring adherence to quality criteria, and can strengthen data availability by requiring the collection of monitoring indicators or integration of data systems across care settings, and control overall costs (OECD, 2016[81]).

Although the design and characteristics of bundled payments differ between OECD countries, the models developed in Australia and Canada could be of particular interest to Brazil and others. In these countries, the bundled payment accounts for patient complexity, which is an important prerequisite to encourage the participation of PHC providers (OECD, 2020[78]).

3.4. Conclusion

In Brazil, all-cancer mortality has not been reduced in the past decade, while breast and cervical cancer have reduced its odds for a longer survival after being diagnosed. This finding goes in the opposite direction from the outcomes obtained in OECD countries, calling for an urgent action to reverse these trends. Although breast and cervical cancer screening have increased in recent years, its coverage remain well

below the recommended standards, limiting its potential to contribute to better cancer outcomes. In order to tackle the burden of cancer, Brazil has strengthened cancer care governance and delivery, however, more still needs to be done, with an emphasis in promotion and prevention of cancer. There is scope to expand the coverage of screening – notably by developing population-based programmes, introducing more systematic personalised invitation for cancer screening, and developing better communication and education strategies by using new technologies. Brazil could also look to expand efforts to new cancer sites such as lung and colorectal, as they represent a high burden of disease, deserving further analysis of the potential benefits of investing in national screening programmes. Meanwhile, developing a more comprehensive monitoring system for cancer screening, with information at the individual level of each patient, would help Brazil in both the administration of the cancer screening programmes (e.g. assuring effective target population coverage) and be a rich source of data to periodically assess the effectiveness of existing cancer screening protocols.

On the other hand, hypertension and diabetes also represent a burden for Brazil's population health and health system. For example, the prevalence of both raised blood pressure and of raised fasting blood glucose is higher than the average of OECD countries. For diabetes, mortality has not been reduced in past years in Brazil, on the contrary to what has been observed in OECD countries. Therefore, Brazil could strengthen its PHC check-up activities by moving towards population-based hypertension and type 2 diabetes screening programmes, targeting well-defined high-risk population groups. This goes in hand with further developing clear disease management pathways, where PHC teams and each individual patient can take appropriate actions to manage its disease. The current clinical guidelines and the registration of patients in PHC are good starting points to continue in this direction. There is also a clear scope for PHC nurses to play a more active role in patient education, screening promotion and disease management, while community pharmacists might be further introduced in targeted actions to manage these chronic conditions. Health information systems needs to be further developed in order to provide more and better information to both PHC teams and patients, which would allow improving clinical management decisions in PHC and will empower patients to take a leading role in its own prevention and control actions.

References

Barberato, L., M. Scherer and R. Lacourt (2019), *The pharmacist in the Brazilian primary health care: Insertion under construction*, Associacao Brasileira de Pos – Graduacao em Saude Coletiva, http://dx.doi.org/10.1590/1413-812320182410.30772017. [77]

Bibbins-Domingo, K. et al. (2016), "Screening for colorectal cancer: US preventive services task force recommendation statement", *JAMA – Journal of the American Medical Association*, Vol. 315/23, pp. 2564-2575, http://dx.doi.org/10.1001/jama.2016.5989. [37]

Bunten, A. et al. (2020), "A systematic review of factors influencing nhs health check uptake: Invitation methods, patient characteristics, and the impact of interventions", *BMC Public Health*, Vol. 20/1, pp. 1-16, http://dx.doi.org/10.1186/s12889-019-7889-4. [80]

Camilloni, L. et al. (2013), *Methods to increase participation in organised screening programs: A systematic review*, BioMed Central, http://dx.doi.org/10.1186/1471-2458-13-464. [31]

Cipullo, J. et al. (2010), "Hypertension prevalence and risk factors in a Brazilian urban population", *Arquivos Brasileiros de Cardiologia*, Vol. 94/4, pp. 488-494, http://dx.doi.org/10.1590/S0066-782X2010005000014. [67]

CONITEC (2020), *Protocolo Clínico e Diretrises Terapêuticas do Diabete Melito Tipo 2*, Comissão Nacional de Incorporação de Tecnologias no Sistema Único de Saúde, Brasilia, http://conitec.gov.br/ (accessed on 7 March 2021). [51]

Coordenação de Prevenção e Vigilância. Divisão de Detecção Precoce e Apoio à Organização de Rede (ed.) (2016), *Diretrises brasileiras para o rastreamento do câncer do colo do útero*, / Instituto Nacional de Câncer José Alencar Gomes da Silva, Rio de Janeiro, http://www.inca.gov.br (accessed on 16 February 2021). [5]

Costa, R. et al. (2018), "Trend analysis of the quality indicators for the Brazilian cervical cancer screening programme by region and state from 2006 to 2013", *BMC Cancer*, Vol. 18/1, pp. 1-9, http://dx.doi.org/10.1186/s12885-018-4047-9. [11]

CTFPHC (2016), "Recommendations on screening for lung cancer – Canadian Task Force on Preventive Health Care", *CMAJ*, Vol. 188/6, pp. 425-432, http://dx.doi.org/10.1503/cmaj.151421. [39]

Da Costa Vieira, R., A. Formenton and S. Bertolini (2017), *Breast cancer screening in Brazil. Barriers related to the health system*, Associacao Medica Brasileira, http://dx.doi.org/10.1590/1806-9282.63.05.466. [9]

DATASUS (2021), *Painel-Oncologia – Notas Técnicas*, DATASUS, Brasil, http://tabnet.datasus.gov.br/cgi/dhdat.exe?PAINEL_ONCO/PAINEL_ONCOLOGIABR.def (accessed on 2 March 2021). [7]

Department of Health (2014), *Medicare Benefits Schedule (MBS) – Health assessment for people aged 45 to 49 years who are at risk of developing a chronic disease*, Department of Health, Australian Government. [68]

Diabetes Canada (2018), "Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada", *Can J Diabetes*, Vol. 42/Suppl 1, pp. S1-S325. [69]

Duncan, B. et al. (2020), "The burden of diabetes and hyperglycemia in Brazil: A global burden of disease study 2017", *Population Health Metrics*, Vol. 18/S1, p. 9, http://dx.doi.org/10.1186/s12963-020-00209-0. [48]

ECIBC (2020), *European guidelines on breast cancer screening and diagnosis*, European Commission Initiative on Breast Cancer, https://health care-quality.jrc.ec.europa.eu/european-breast-cancer-guidelines (accessed on 2 March 2021). [25]

ECIBC (2020), *Inviting women to subsequent rounds of screening: Letters with fixed appointment to screening*, European Commission Initiative on Breast Cancer, https://health care-quality.jrc.ec.europa.eu/european-breast-cancer-guidelines/Invitation-to-screening-and-decision-aid/subsequent-invitations/fixed-date (accessed on 2 March 2021). [30]

Eriksen, C. et al. (2021), *What is the effectiveness of systematic population-level screening programmes for reducing the burden of cardiovascular diseases?*, WHO Regional Office for Europe. WHO Health Evidence Network (HEN), Copenhagen. [66]

European Observatory on Health Systems and Policies and M. Petersen (2019), "Achieving better health and well-being via the Danish e-Health portal sundhed.dk", *Eurohealth*, Vol. 25/2, pp. 20-23, https://apps.who.int/iris/handle/10665/332 595 (accessed on 3 March 2021). [42]

Finnish Cancer Registry (2020), *Cervical cancer screening – Syöpärekisteri*, https://cancerregistry.fi/screening/cervical-cancer-screening/ (accessed on 1 March 2021). [20]

Fontham, E. et al. (2020), "Cervical cancer screening for individuals at average risk: 2020 guideline update from the American Cancer Society", *CA: A Cancer Journal for Clinicians*, Vol. 70/5, pp. 321-346, http://dx.doi.org/10.3322/caac.21628. [19]

Gioia, S. et al. (2018), "Brazil Needs Organised Breast Cancer Screening: Pilot Project in Rio De Janeiro", *Journal of Global Oncology*, Vol. 4/Supplement 2, pp. 31s-31s, http://dx.doi.org/10.1200/jgo.18.54900. [27]

GLOBOCAN (2020), *Global Cancer Observatory*, International Agency for Research on Cancer – World Health Organization, https://gco.iarc.fr/ (accessed on 8 March 2021). [3]

Gmeinder, M., D. Morgan and M. Mueller (2017), "How much do OECD countries spend on prevention?", *OECD Health Working Papers*, No. 101, OECD Publishing, Paris, https://dx.doi.org/10.1787/f19e803c-en. [61]

Habicht, T. et al. (2018), "Estonia: Health System Review", *Health Syst Transit*, Vol. 20/1, pp. 1-189, https://pubmed.ncbi.nlm.nih.gov/30277217/ (accessed on 28 January 2021). [59]

IARC (2017), *Cancer Screening in the European Union. Report on the implementation of the Council Recommendation on cancer screening*, International Agency for Research on Cancer; European Commission. [28]

INCA (2020), *Câncer de pulmão*, Instituto Nacional de Câncer, https://www.inca.gov.br/tipos-de-cancer/cancer-de-pulmao (accessed on 2 March 2021). [38]

INCA (2020), *Histórico das ações | INCA – Instituto Nacional de Câncer*, https://www.inca.gov.br/controle-do-cancer-do-colo-do-utero/historico-das-acoes (accessed on 15 February 2021). [4]

INCA (2020), *Prevenção do câncer do colo do útero*, Instituto Nacional de Câncer, https://www.inca.gov.br/controle-do-cancer-do-colo-do-utero/acoes-de-controle/prevencao (accessed on 26 February 2021). [15]

INCA (2019), *Câncer de intestino – versão para Profissionais de Saúde*, Instituto Nacional de Câncer, https://www.inca.gov.br/tipos-de-cancer/cancer-de-intestino/profissional-de-saude (accessed on 2 March 2021). [33]

INCA (2013), *Cancer in Brazil: Data from the Population-Based Registries*, National Cancer Institute José Alencar Gomes da Silva, Rio de Janeiro, http://www.inca.gov.br (accessed on 2 March 2021). [8]

Kim, H. et al. (2012), "National screening programme for transitional ages in Korea: A new screening for strengthening primary prevention and follow-up care", *Journal of Korean Medical Science*, Vol. 27/SUPP, http://dx.doi.org/10.3346/jkms.2012.27.S.S70. [60]

Levi, J. et al. (2019), "High-risk HPV testing in primary screening for cervical cancer in the public health system, São Paulo, Brazil", *Cancer Prevention Research*, Vol. 12/8, pp. 539-546, http://dx.doi.org/10.1158/1940-6207.CAPR-19-0076. [23]

Macinko, J., D. Leventhal and M. Lima-Costa (2018), "Primary Care and the Hypertension Care Continuum in Brazil", *Journal of Ambulatory Care Management*, Vol. 41/1, pp. 34-46, http://dx.doi.org/10.1097/JAC.0000000000000222. [55]

Maier, C., L. Aiken and R. Busse (2017), "Nurses in advanced roles in primary care: Policy levers for implementation", *OECD Health Working Papers*, No. 98, OECD Publishing, Paris, https://dx.doi.org/10.1787/a8756593-en. [73]

Malila, N., C. Senore and P. Armaroli (2012), "European guidelines for quality assurance in colorectal cancer screening and diagnosis. First Edition Organisation", *Endoscopy*, Vol. 44/SUPPL3, pp. SE31-SE48, http://dx.doi.org/10.1055/s-0032-1309783. [35]

Martínez-González, N. et al. (2015), "The impact of physician-nurse task shifting in primary care on the course of disease: A systematic review", *Human Resources for Health*, Vol. 13/1, p. 55, http://dx.doi.org/10.1186/s12960-015-0049-8. [74]

Martínez-Mesa, J. et al. (2013), "Inequalities in Pap smear screening for cervical cancer in Brazil", *Preventive Medicine*, Vol. 57/4, pp. 366-371, http://dx.doi.org/10.1016/j.ypmed.2013.06.026. [12]

Mezei, A. et al. (2017), "Cost-effectiveness of cervical cancer screening methods in low- and middle-income countries: A systematic review", *International Journal of Cancer*, Vol. 141/3, pp. 437-446, http://dx.doi.org/10.1002/ijc.30695. [17]

Ministério da Saúde (2021), *HIPERDIA. Sistema de Cadastramento e Acompanhamento de Hipertensos e Diabéticos- Notas Técnicas*. [56]

Ministério da Saúde (2020), *Indicadores de pagamento por desempenho do Programa Previne*, Ministério da Saúde. Secretaria de Atenção Primária à Saúde, Departamento de Saúde da Família, https://sisab.saude.gov.br/resource/file/nota_tecnica_indicadores_de_desempenho_200210.pdf (accessed on 5 March 2021). [58]

Ministério da Saúde (2020), *Manual – Como organizar o cuidado de pessoas com doenças crônicas na APS no contexto da pandemia*, Ministério da Saúde. Secretaria de Atenção Primária à Saúde, Brasilia, http://aps.saude.gov.br (accessed on 5 March 2021). [57]

Ministério da Saúde (2013), *Conselhos de saúde: a responsabilidade do controle social democrático do SUS*, Ministerio da Saúde, Brasilia, http://www.conselho.saude.gov.br (accessed on 3 March 2021). [13]

Ministério da Saúde (2013), *Estratégias para o cuidado da pessoa com doença crônica: diabetes mellitus*, Ministério da Saúde. Secretaria de Atenção à Saúde, Departamento de Atenção Básica, http://www.dab.saude.gov.br (accessed on 4 March 2021). [52]

Ministério da Saúde (2013), *Estratégias para o cuidado da pessoa com doença crônica: hipertensão arterial sistêmica*, Ministério da Saúde. Secretaria de Atenção à Saúde, Departamento de Atenção Básica, http://aps.saude.gov.br/biblioteca/visualizar/MTIxNA== (accessed on 4 March 2021). [50]

Ministério da Saúde (2010), *Rastreamento*, Secretaria de Atenção à Saúde, Departamento de Atenção Básica, Ministério da Saúde, http://www.saude.gov.br/dab (accessed on 27 January 2021). [49]

Ministério da Saúde and INCA (2017), *Diretrises para a Detecção Precoce do Câncer de Mama no Brasil*, Ministério da Saúde; Instituto Nacional de Câncer José Alencar Gomes da Silva, Rio de Janeiro, http://conitec.gov.br/images/Relatorios/2015/Relatorio_DDT_CancerMama_final.pdf. (accessed on 16 February 2021). [6]

Nascimento, B. et al. (2020), "Trends in prevalence, mortality, and morbidity associated with high systolic blood pressure in Brazil from 1990 to 2017: Estimates from the "global Burden of Disease 2017" (GBD 2017) study", *Population Health Metrics*, Vol. 18/S1, p. 17, http://dx.doi.org/10.1186/s12963-020-00218-z. [45]

NHS (2018), *NHS RightCare » Diabetes pathway*, https://www.england.nhs.uk/rightcare/products/pathways/diabetes-pathway/ (accessed on 28 January 2021). [62]

NHS England (2018), *NHS RightCare » Diabetes pathway*, https://www.england.nhs.uk/rightcare/products/pathways/diabetes-pathway/ (accessed on 7 March 2021). [72]

OECD (2021), *OECD Health Statistics 2021*, https://www.oecd.org/health/health-data.htm (accessed on 15 January 2021). [1]

OECD (2021), *Strengthening the frontline: How primary health care helps health systems adapt during the COVID-19 pandemic*, OECD Publishing, http://dx.doi.org/10.1787/9a5ae6da-en. [54]

OECD (2020), *Realising the Potential of Primary Health Care*, OECD Health Policy Studies, OECD Publishing, Paris, https://dx.doi.org/10.1787/a92adee4-en. [78]

OECD (2019), *OECD Reviews of Public Health: Chile: A Healthier Tomorrow*, OECD Reviews of Public Health, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264309593-en. [2]

OECD (2019), *OECD Reviews of Public Health: Japan: A Healthier Tomorrow*, OECD Reviews of Public Health, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264311602-en. [40]

OECD (2019), *Recommendation of the Council on Health Data Governance*, OECD/LEGAL/0433, http://legalinstruments.oecd.org (accessed on 7 March 2021). [79]

OECD (2016), *Better Ways to Pay for Health Care*, OECD Health Policy Studies, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264258211-en. [81]

OECD (2013), *Cancer Care: Assuring Quality to Improve Survival*, OECD Health Policy Studies, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264181052-en. [34]

OECD/The World Bank (2020), *Health at a Glance: Latin America and the Caribbean 2020*, OECD Publishing, Paris, https://dx.doi.org/10.1787/6089164f-en. [46]

Pousinho, S. et al. (2016), "Pharmacist Interventions in the Management of Type 2 Diabetes Mellitus: A Systematic Review of Randomised Controlled Trials", *Journal of Managed Care & Specialty Pharmacy*, Vol. 22/5, pp. 493-515, http://dx.doi.org/10.18553/jmcp.2016.22.5.493. [75]

Quarti Machado Rosa, M. et al. (2018), "Disease and Economic Burden of Hospitalizations Attributable to Diabetes Mellitus and Its Complications: A Nationwide Study in Brazil", *International Journal of Environmental Research and Public Health*, Vol. 15/2, p. 294, http://dx.doi.org/10.3390/ijerph15020294. [47]

Ribeiro, A. et al. (2018), *hallenges to implementing a comprehensive cervical cancer screening programme in Brazil: lessons from three cities to consider when moving on*, IPVC, Sydney, https://www.arca.fiocruz.br/handle/icict/44737 (accessed on 1 March 2021). [24]

Ronco, G. (2020), *Core elements of the new HPV-based cervical cancer screening programme in Italy*, HPV World, https://www.hpvworld.com/articles/core-elements-of-the-new-hpv-based-cervical-cancer-screening-programme-in-italy/ (accessed on 1 March 2021). [21]

Sabatino, S. et al. (2012), *Effectiveness of interventions to increase screening for breast, cervical, and colorectal cancers: Nine updated systematic reviews for the guide to community preventive services*, Elsevier, http://dx.doi.org/10.1016/j.amepre.2012.04.009. [41]

Silva, G. et al. (2017), "Early detection of breast cancer in Brazil: data from the National Health Survey, 2013", *Revista de Saúde Pública*, Vol. 51/suppl 1, pp. 1S-8S, http://dx.doi.org/10.1590/s1518-8787.2017051000191. [10]

TJCC (2021), *Portal Movimento TJCC – Todos Juntos Contra o Câncer*, https://tjcc.com.br/ (accessed on 4 March 2021). [14]

USPSTF (2021), *FInal Recommendation Statement – Lung Cancer: Screening*, United States Preventive Services Task Force, https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/lung-cancer-screening (accessed on 2 March 2021). [36]

USPSTF (2016), *Screening for High Blood Pressure in Adults: Recommendation Statement*, http://www.uspreventiveservicestaskforce.org/. (accessed on 6 March 2021). [64]

USPSTF (2015), *Abnormal Blood Glucose and Type 2 Diabetes Mellitus: Screening*, United States Preventive Services Taskforce, https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/screening-for-abnormal-blood-glucose-and-type-2-diabetes (accessed on 7 March 2021). [70]

Uy, C. et al. (2017), *Text messaging interventions on cancer screening rates: A systematic review*, JMIR Publications Inc., http://dx.doi.org/10.2196/jmir.7893. [32]

von Karsa, L. et al. (2015), "Executive summary", in Anttila, A. et al. (eds.), *European guidelines for quality assurance in cervical cancer screening*, Office for Official Publications of the European Union, Luxembourg, https://op.europa.eu/en/publication-detail/-/publication/a41a4c40-0626-4556-af5b-2619dd1d5ddc/language-en/format-PDF/source-search (accessed on 17 February 2021). [18]

Wang, Y., Q. Yeo and Y. Ko (2016), "Economic evaluations of pharmacist-managed services in people with diabetes mellitus: a systematic review", *Diabetic Medicine*, Vol. 33/4, pp. 421-427, http://dx.doi.org/10.1111/dme.12976. [76]

WHO (2021), "The Global Health Observatory: Explore a world of health data", https://www.who.int/data/gho. [16]

WHO (2019), *Primary health care on the road to universal health coverage: 2019 monitoring report*. [43]

WHO (2018), *HEARTS Technical package for cardiovascular disease management in primary health care: evidence-based treatment protocols*, World Health Organization, Geneva. [65]

WHO (2017), *Guide to cancer early diagnosis*, World Health Organization, Geneva, https://www.who.int/cancer/publications/cancer_early_diagnosis/en/ (accessed on 2 March 2021). [26]

WHO (2014), *WHO position paper on mammography screening*, World Health Organization, Geneva, https://apps.who.int/iris/handle/10665/137 339 (accessed on 2 March 2021). [29]

Williams, B. et al. (2018), 20*18 ESC/ESH Guidelines for themanagement of arterial hypertension*, Oxford University Press, http://dx.doi.org/10.1093/eurheartj/ehy339. [63]

Wong, W. (2017), "Exploring the Potential of Clinical Pathways for Diabetes", *Journal of Clinical Pathways*, Vol. 2/Suppl 1, pp. S5-S6, https://www.journalofclinicalpathways.com/article/exploring-potential-clinical-pathways-diabetes (accessed on 7 March 2021). [71]

Yeh, P. et al. (2019), *Self-sampling for human papillomavirus (HPV) testing: A systematic review and meta-Analysis*, BMJ Publishing Group, http://dx.doi.org/10.1136/bmjgh-2018-001351. [22]

Zhang, J. and A. et (2020), "Risk factors for disease severity, unimprovement, and mortality in COVID-19 patients in Wuhan, China", *Clinical Microbiology and Infection*, Vol. 26/6, http://dx.doi.org/10.1016/j.cmi.2020.04.012. [53]

Zhou, B. et al. (2017), "Worldwide trends in blood pressure from 1975 to 2015: a pooled analysis of 1 479 population-based measurement studies with 19·1 million participants", *The Lancet*, Vol. 389/10064, pp. 37-55, http://dx.doi.org/10.1016/S0140-6736(16)31919-5. [44]