

FUNDAÇÃO GETULIO VARGAS
ESCOLA DE ADMINISTRAÇÃO DE EMPRESAS DE SÃO PAULO

MARCELA DOS SANTOS CAMARGO

**Electoral impacts of primary healthcare expansion:
Evidence from Rio de Janeiro**

SÃO PAULO

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Dissertação apresentada ao Programa de Mestrado em Administração Pública e Governo da Escola de Administração de Empresas de São Paulo da Fundação Getúlio Vargas, na Linha de Política e Economia do Setor Público.

Supervisor: Prof. Dr. Rudi Rocha de Castro

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“O plano traçado é a absoluta liberdade. Conhecermo-nos e ver o que acontece, deixar o tempo correr e rever. Não há travas. Não há compromissos. Ela é esplêndida.”

(Mario Benedetti, A Trégua)

*“O ano passado não passou,
continua incessantemente.*

Em vão marco novos encontros.

Todos são encontros passados.

*As ruas, sempre do ano passado,
e as pessoas, também as mesmas,
com iguais gestos e falas.*

*O céu tem exatamente
sabidos tons de amanhecer,
de sol pleno, de descambar
como no repetidíssimo ano passado.*

*Embora sepultos, os mortos do ano passado
sepultam-se todos os dias.*

*Escuto os medos, conto as libélulas,
mastigo o pão do ano passado.*

E será sempre assim daqui por diante.

*Não consigo evacuar
o ano passado.”*

(Carlos Drummond de Andrade, O Ano Passado)

Em memória de Katy Lopes e Edson Lopes

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ABSTRACT

CAMARGO, Marcela; ROCHA, Rudi (Advisor). **“Electoral impacts of primary healthcare expansion: Evidence from Rio de Janeiro”**. 2021. 66 f. Dissertação (Mestrado em Administração Pública) – Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas, São Paulo, 2021.

In this paper, we examine whether voters respond to investments in healthcare and access to health services. We focus on the city of Rio de Janeiro, the Brazilian capital with the highest growth in primary healthcare coverage between 2009 and 2012. The newly elected government rapidly expanded the Family Health Program (FHP) in the city, a community healthcare program introduced in Brazil at the municipal level and which is currently the largest in the world. We assess whether the FHP expansion affected the mayor’s vote share in 2012. We exploit fine-grained geocoded variation in access to healthcare and in voting across time and space within the city. The identifying variation comes from changes in the composition of voters (resident or not in a FHP catchment area) at the polling booth level, within polling places fixed effects, triggered by the roll-out of catchment areas over the 2008-2012 period. We find that FHP coverage is positively associated with the mayor’s vote share. Yet, the magnitude of the FHP effect is higher for the last year of government and increases with the proximity between FHP facilities and individuals’ home addresses. Our results also suggest that this impact is accompanied by relatively larger increases in vote share when the services are provided in new health facilities compared to the existing units. The evidence suggests that closer contact with services and the visible side of the service provision may be greatly rewarded by voters. Overall, this paper contributes to a better understanding of voter responsiveness of healthcare policies and possible mechanisms.

Keywords: Retrospective voting; Family Health Program; Public Service delivery; Primary healthcare.

RESUMO

CAMARGO, Marcela; ROCHA, Rudi. **“Electoral impacts of primary healthcare expansion: Evidence from Rio de Janeiro”**. 2021. 66 f. Dissertação (Mestrado em Administração Pública) – Escola de Administração de Empresas de São Paulo da Fundação Getulio Vargas, São Paulo, 2021.

Neste artigo, examinamos se os eleitores respondem a investimentos em saúde e ao acesso aos serviços de saúde. Focamos na cidade do Rio de Janeiro, a capital brasileira com o maior crescimento na cobertura de atenção primária à saúde entre 2009 e 2012. O governo recém-eleito expandiu rapidamente o Programa de Saúde da Família (PSF) na cidade, um programa de saúde comunitária introduzido no Brasil ao nível municipal e que atualmente é a maior do mundo. Avaliamos se a expansão do PSF afetou a votação do prefeito em 2012. Exploramos a variação geocodificada refinada no acesso à saúde e na votação no tempo e no espaço dentro da cidade. A variação identificada vem das mudanças na composição dos eleitores (residentes ou não em uma área de influência do PSF) no nível da seção eleitoral, dentro dos efeitos fixos dos locais de votação, desencadeada pela implantação das áreas de captação no período 2008-2012. Descobrimos que a cobertura do PSF está positivamente associada à votação do prefeito. No entanto, a magnitude do efeito PSF é maior no último ano de governo e aumenta com a proximidade entre as instalações das unidades do PSF e os endereços residenciais dos indivíduos. Nossos resultados também sugerem que esse impacto é acompanhado por aumentos relativamente maiores na parcela de votos quando os serviços são prestados em novas unidades de saúde em comparação com as unidades existentes. A evidência sugere que o contato mais próximo com os serviços e o lado visível da prestação de serviços pode ser muito recompensado pelos eleitores. No geral, este artigo contribui para uma melhor compreensão da capacidade de resposta do eleitor às políticas de saúde e seus possíveis mecanismos.

Palavras-chave: Voto retrospectivo; Programa Saúde da Família; Prestação de serviço público; Atenção primária à saúde

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List of abbreviations and acronyms

CF	Clínica da Família (Family Health Clinics)
CMS	Centro Municipal de Saúde (Municipal Health Centers)
IBGE	Instituto Brasileiro de Geografia e Estatística (Brazilian Census Bureau)
PHC	Primary Health Care
SMS	Secretaria Municipal de Saúde (Municipal Health Secretary)
SUS	Sistema Único de Saúde (Unified Health System)
TSE	Tribunal Superior Eleitoral (Electoral Superior Court)

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1

Introduction

The debate over how public policies affect voters' choices has long been framed by retrospective voting studies, wherein citizens consider past government performance to make forward-looking decisions (BESLEY, 2006). This debate should be particularly relevant for healthcare policies, which absorb a large share of public resources and directly affect human capital accumulation and well-being, but also typically face criticism from public opinion (BLENDON *et al.*, 2006; BLENDON; BENSON; MCMURTRY, 2019). In that sense, whether voters reward or punish politicians for policy interventions in healthcare is a key question and will become increasingly relevant as the needs of populations and countries grow in complexity and financial necessities over time. Yet, evidence on whether healthcare policies affect incumbents' electoral performance remains surprisingly scant and mixed.

In this paper, we examine whether voters respond to investments in healthcare and access to health services. We focus on the city of Rio de Janeiro, the Brazilian capital with the highest growth in primary healthcare coverage between 2009 and 2012. From 2009 on, the newly elected government adapted and rapidly expanded the Family Health Program in the city (FHP, for *Programa Saúde da Família*), a flagship community healthcare program introduced in Brazil at the municipal level in the mid-1990s and which is currently the largest in the world. FHP health professionals work both in basic healthcare facilities, serving patients often through scheduled appointments, and outside these units, by visiting

households in their catchment areas. In doing so, they can monitor health conditions, change habits and detect early symptoms of more complicated health problems.

The population coverage of FHP in Rio increased from 3% in 2008 to 37% in 2012. To rapidly expand coverage, the government improved the infrastructure of the existing health units (CMS, for *Centro Municipal de Saúde*) and increased the number of teams based in these facilities. The most important move, however, came with the construction of new health units, called the Family Health Clinics (CF, for *Clínica da Família*). The CF structure was designed to guarantee the ambiance, comfort, sustainability, and the resolution capacity of services provided in the facility. In particular, these facilities were large constructions, able to host up to 5 FHP teams and that offered an enlarged list of services.

We assess whether the FHP expansion affected the mayor's vote share in 2012, when he was reelected for a second term with 64.6% of the votes in the first round. To achieve this goal, we use administrative data from various sources and exploit fine-grained geocoded variation in access to healthcare and in voting across time and space within the city. In particular, we rely on idiosyncratic variation in FHP coverage across voters led by the design and the roll-out of FHP catchment areas. We use electoral data for different election years at the polling booth level, and connect voting with the roll-out of FHP catchment areas by using geocoded voter registration data from the National Registry for Social Programs, *Cadastro Único*. This system contains administrative data on Brazilian families eligible to social programs and includes the polling booth in which the individual votes and her home address. We then connect voting at the polling booth level with the share of individuals that reside inside FHP catchment areas. For the city of Rio, in 2012 people registered in *Cadastro Único* represented roughly 70% of the total population without private healthcare insurance, mostly users of the public health system.

Our benchmark specification compares the variation in FHP coverage and in the incumbent's vote share across polling booths within polling places, which host about 8 polling booths on average, allowing for pre-trends in electoral performance as well as differential trends in initial electorate characteristics and exposure to other public policies. Polling places fixed effects imply that the identifying variation comes from a residual variation across booths within voting places. More specifically, the variation that we exploit comes from changes in the composition of voters (exposed or not to a FHP catchment

area) at the booth level, within polling places, triggered by the roll-out of catchment areas over the 2008-2012 period.

We find that an increase of one standard deviation in FHP coverage is associated with an increase of 0.6 percentage points in the mayor's vote share. This represents an increase of nearly 2% in the mayor's baseline vote share. In other words, a variation from null to full FHP coverage is associated with an increase of approximately 1.8 percentage points and 6% of the mayor's baseline vote share. To put these estimates into perspective, [Braga \(2020\)](#) found that a 50% increase in annual federal transfers to municipal FHP is associated with an increase of 9 percentage points on average in incumbents' vote share, which is considerably higher than our estimates. We conjecture that our estimates reveal more localized effects of exposure to FHP services, independently of other major benefits that federal transfers may have at the health system level. Our estimates are closer to [Dias e Ferraz \(2019\)](#)'s findings, which shows that the incumbent's vote share increases between 0.4 to 1.9 percentage points with the disclosure of information about school quality in Brazil.

Our results also suggest that the magnitude of the FHP effect is higher for the last year of government and increases with the proximity between health facilities and polling places. We also explore some potential mechanism to explain the relationship between FHP and vote share. First, although both CMS and CF coverage is positively associated with the incumbent's electoral performance, our results suggest that the expansion in CF coverage is accompanied by relatively larger increases in vote share. Also, we document that the number of ambulatory procedures delivered by FHP teams is not statistically related to the mayor's vote share. However, the composition matters and the mayors' electoral performance is associated with a greater share of FHP home visits. Overall, the evidence suggests that closer contact with services and the visible side of the service provision may be greatly rewarded by voters.

Our paper relates to the dense stream of research on how individuals reward political leaders based on their performance in office. We contribute novel evidence by investigating the effects of healthcare policies on voting behavior. Evidence on the relationship between provision of healthcare and electoral outcomes is so far scant and mixed, depends on the type of policy and the socioeconomic context, and the mechanisms are not fully understood. The effects on the incumbent's electoral performance of more specific interventions and technologies are generally positive. This is the case, for instance, of programs that grant

access to clean water (BOBONIS *et al.*, 2017; FRIED; VENKATARAMANI, 2017) and bed nets (CROKE, 2017). On the other hand, evidence on more general health policies is not conclusive. In the US, the literature on the relationship between access to healthcare and electoral outcomes is marked by Medicaid studies (BAICKER; FINKELSTEIN, 2019; CLINTON; SANCES, 2018; HASELSWERDT, 2017). For instance, Baicker e Finkelstein (2019) find a significant effect of Medicaid expansion on voter turnout, with results concentrated in Democratic counties. Yet, for Mexico, Imai, King e Rivera (2020) find that access to a government-subsidized healthcare insurance, *Seguro Popular de Salud* (SPS), does not affect voter support for incumbents, while Braga (2020) provides evidence that FHP investments at the municipal level do affect the mayor’s electoral support across Brazilian municipalities. In this paper we overlap health and electoral systems and rely on fine-grained variation in primary healthcare expansion to provide microevidence on the relationship between health policies and electoral outcomes. We shed light on the allocation of resources within a city to better understand voters’ response to access to services and discuss mechanisms.

The remainder of the paper is organized as follows. The next section provides a conceptual background to guide our exercise and findings. Section 3 describes the institutional background of the public healthcare services in Brazil and in Rio de Janeiro, as well as the political system and the municipal elections in Brazil. Section 4 presents the data. Section 5 describes the empirical strategy. In Section 6 we present and discuss the results. Section 7 concludes.

2

Conceptual Background

In principle, voters can reward or punish politicians according to their performance in office, and elections play a crucial role for accountability. According to the Michigan School, voters are not capable of evaluating and acting on their perceptions of the government's performance, as they lack enough knowledge about political and ideological issues (HEALY; MALHOTRA, 2013). However, this idea has been cast on doubt as evidence indicates that voters may react rationally to contextual variations (KRAMER, 1971; FAIR, 1978; FIORINA, 1981). Even upon basic understanding of politics and making mistakes, individuals can implement effective accountability based on simple metrics and using cues and shortcuts (HEALY; MALHOTRA, 2013). For instance, voters react to the incumbent's performance by receiving information about government's transparency. Ferraz e Finan (2008), using a natural experiment on randomly audited municipalities in Brazil, found that voters, when informed before the election, punish incumbents' corrupt practices.

More generally, voters' responsiveness has important implications for politicians' incentives as incumbents may strategically allocate resources to be reelected. Following Persson e Tabellini (2002), we rely on agency models to understand how elections can shape political behavior and voters' attitudes. First, elections act as retribution, where voters retrospectively reward or punish political behavior. Second, elections serve to select the best politicians. Essentially, there are many voters (principals) monitoring few politicians (agents). The fundamental issues in principal-agent models are adverse selection, where voters do not know the politician's type (e.g., corrupt or non-corrupt), and moral hazard, when voters do not observe politician's actions.

In post-election agency models, politicians in office have complete discretion, and voters can reward or punish them at the next elections based on their performance. Assuming that politicians can extract rents while in office, the incumbent has two options: either (i) maximizes his chances of reelection by choosing the optimal level of government spending that satisfy the voters and keeping any remaining rents, or (ii) not satisfying the voters, extracting high levels of rents, and foregoing reelection. Since the sum of moderate current rents plus future rents earned in the second term is greater than extract all rents in the first term, he does not exploit his discretion entirely and seek to be reelected. Thus, elections hold incumbents accountable ex-post.

As originally formulated by [Holmström \(1999\)](#), politicians also have the incentive to perform well in office because they have career concerns. To signal their type, incumbents in pre-electoral periods would avoid rent extraction, act to appear more competent, and perform well. This is known as electoral theory cycles, where incumbents mimic efficient behavior providing public goods or strategically directing resources when elections are imminent. As highlighted by [Healy e Malhotra \(2013\)](#), this practice has been widely documented. In the election year, politicians seem to provide more financial aid (e.g., response to natural disasters, agricultural credit) and increase public spending (e.g., hire more police officers, pay back wages owed to government workers). However, recent evidence suggests that opportunistic political cycles is observed in new democracies and seem not to exist in mature democracy systems because voters punish rather than reward manipulation ([BRENDER; DRAZEN, 2005](#); [AKHMEDOV; ZHURAVSKAYA, 2004](#)).

The literature has extensively produced evidence about voter responsiveness in different contexts. In recent years, studies exploring sources of exogenous variation have overcome major econometric concerns. So far evidence on the relationship between provision of health care and electoral outcomes is scant and still mixed, depend on type of policy and socioeconomic context, and the mechanisms are not fully understood.

In the United States, the literature on the relationship between access to healthcare and electoral outcomes is marked by Medicaid studies ([BAICKER; FINKELSTEIN, 2019](#); [CLINTON; SANCES, 2018](#); [HASELSWERDT, 2017](#)). [Baicker e Finkelstein \(2019\)](#), using a randomized design of a lottery in Oregon, find a significant effect of Medicaid expansion on voter turnout, with results concentrated in men and in Democratic counties. [Clinton e Sances \(2018\)](#) estimate that Medicaid increased voter registration in 2014 and 2016, and a temporary impact on turnout in 2014.

Imai, King e Rivera (2020), using a randomized social experiment, find that the Mexican program *Seguro Popular de Salud* (SPS), government-subsidized healthcare insurance for the population without social security, does not affect voter support for incumbents. Fried e Venkataramani (2017) examine a clean water program in Mexico, *Programa Agua Limpia*, and found that it increased support for the incumbent party, suggesting that the incumbent party's improvement is associated with a decrease in mortality rate due to diarrheal disease. Croke (2017) find a positive relationship between a universal program of bed net distribution in Tanzania and political leaders' support (village chairmen, ward councilors, ward executive officers, and MPs). These effects are more significant in malaria-endemic areas and last up to six months.

In Brazil, studies have found evidence of voter responsiveness in different areas. Firpo, Pieri e Souza (2017) and Dias e Ferraz (2019) both found a positive relationship between school quality and the incumbent's vote share. Bueno, Nunes e Júnior (2018) and Dias e Junior (2015), analyzing one of the largest housing programs in the world, "*Minha Casa Minha Vida*", found negative effects of the program on incumbent's performance. Cavalcante (2015) observed that mayors' fiscal performance increases their reelections chances. The largest CCT program in the world, *Bolsa Família*, has also been the focus of several studies (JR, 2013; JR, 2015; NETO, 2018). A positive relationship between BF and incumbent's performance in presidential elections in 2002 and 2010 has been observed by Jr (2013), regardless of party identification in 2014 (JR, 2015). According to Neto (2018), in presidential elections, BF is positively related to the incumbent's party support, while this relationship seems to be negative in municipal elections.

Regarding specifically healthcare, Mobarak, Rajkumar e Cropper (2011) show that the relationship between services provision and the share of people likely to support healthcare policies in Brazil is more pronounced for clinics and consultation rooms, which are more visible goods, compared to the supply of physicians and nurses. Bobonis *et al.* (2017), using a randomized control trial on construction of residential water cisterns in Northeast Brazil, demonstrate that citizens participate less in clientelist practices after getting access to potable water. The authors show that demanding less private benefits negatively affected incumbent's electoral performance. They also explain that when rainfall decreases and requests increase, the mayor fulfills roughly half of all claims, and politicians are more responsive to water and health care demands. Boas e Hidalgo (2019) show that in Brazil informing individuals about mayor's decision in using federal funds to combat

dengue, Zika and chikungunya do not affect the intention to vote for the mayor's reelection. However, citizens who know someone affected by microcephaly (Zika virus) tend to punish the incumbent. [Braga \(2020\)](#), using a regression discontinuity design, provides evidence that FHP investments affected the mayor's electoral support across municipalities. The author shows that a 50% increase in FHP transfers corresponds to an increment of 9 percentage points on incumbent's vote share.

3

Institutional Background

3.1 Primary Healthcare in Brazil

The Brazilian 1988 Constitution enacted universal and egalitarian access to health care as a constitutional right. The Unified Health System (SUS, for *Sistema Único de Saúde*) was then created to provide free-of-charge services at the point of access for the entire population, and rolled out through the expansion of a network of primary care services, implemented through the Family Health Program (FHP, for *Programa Saúde da Família*). From that moment on, the Brazilian health system has been continuously restructured from a hospital-centered perspective, mostly present in large urban centers and led by federal and state services, to a decentralized arrangement towards municipalities, responsible for the provision of primary care services.

The FHP is currently the largest community health care program in the world, reaching all municipalities of Brazil with health care teams directly interacting with local communities. The program has 43,286 teams and covers about 133 million people, or 63.4% of the Brazilian population.¹ Health teams are usually formed by a family doctor, a nurse, an assistant nurse, and six health community agents. Other health professionals, such as dentists, assistant dentists, dental surgeons, and dental hygiene technicians, may join the teams depending on location needs and funding arrangements. Each FHP team is in charge of a given number of families and is assigned to a specific catchment area. They are responsible for roughly 3,000 to 4,500 individuals and are distributed according

¹ Figures from the e-Gestor website, Ministry of Health, last checked on August 22, 2021.

to population density and the existing network of basic health care facilities (UBS, for *Unidade Básica de Saúde*). FHP health professionals work both in the basic health units, serving patients often through scheduled appointments, and outside health facilities, by visiting households in their catchment areas. In doing so, following public health guidelines and best practices, they can monitor health conditions, change habits and detect early symptoms of more complicated health problems. In these cases, FHP professionals should refer patients to more specialized care within the local health system.

The FHP is a federal-induced program implemented at the municipal level and that relies on the voluntary participation of municipalities, which receive federal funding according to the number of teams and services. Still, municipalities are autonomous administrative entities that can supplement provision by hiring professionals, building health facilities and providing services on their own expenses. This is often the case of larger municipalities, such as state capitals, which are able to raise more funding through tax collection and other sources. Yet, out of 54,105 primary healthcare teams in Brazil, around 80% are funded by FHP.

3.2 Primary Healthcare in Rio de Janeiro

According to the 2010 Census, the city of Rio de Janeiro is the second-most populous municipality in Brazil, with 6.32 million inhabitants. The city has 154 neighbourhoods organized in four major Administrative Regions – North, West, South and Central Zones. It also faces great socioeconomic heterogeneity, both across and within neighborhoods. The city has 763 favelas (slums), where reside roughly 1.39 million people or 22% of the population. This makes Rio the Brazilian city with the largest population living in slums. Poverty rates are nearly twofold in neighborhoods in the North and West Zones in comparison to those in the South Zone. The Gini index ranges from 0.53 in the North Zone to 0.62 in the South Zone, the wealthier region but where the share of inhabitants living in favelas reaches 17%. HDI ranges from 0.970 in the neighborhood of Gávea to 0.732 in the contiguous Rocinha, both in the South Zone, to 0.700 in Complexo do Alemão, where income per capita is only a tenth in comparison to the first (IETS, 2015; IBGE, 2010).

Until 2009, the provision of health services and the sanitary conditions of Rio de Janeiro faced constraints and difficulties due to several factors. The city had the lowest

per capita health expenditure among Brazilian capitals while its budget was extensively allocated to large hospitals; there was an insufficient number of specialists in family medicine, lack of training, low capacity to coordinate the resources available in the health network (e.g. hospitals beds and specialized equipment for diagnosis) as well as a complex burden of diseases, including high rates of tuberculosis, dengue fever, congenital syphilis, infant and maternal mortality (CAMPOS; COHN; BRANDÃO, 2016; NETO; ANTUNES; OLIVEIRA, 2019; LAPÃO *et al.*, 2017; SORANZ; PINTO; PENNA, 2016). Despite the federal efforts to increase primary health care coverage across the country, in December 2008 the city had only 51 FHP teams, covering 3.0% of the population, the lowest coverage of all capitals in the country. At the same time, FHP coverage in the city of São Paulo was 27.38% while in Belo Horizonte it was 71.63% – respectively the most and the third most populous cities of Brazil. Figure A1 shows the FHP coverage in all Brazilian capitals in December 2008 and September 2012.

In 2009, the newly elected municipal government, inspired by national and international successful experiences and pressured by the National Primary Care Policy of 2006 (PNAB, for *Política Nacional de Atenção Básica*), leaned on primary healthcare services in the restructuring of the municipal health system. Within a few years, Rio de Janeiro would host the FIFA World Cup (2014) and the Summer Olympics (2016). After visiting other Olympic cities, such as London, Montreal, Barcelona, and Sidney, the government proposed a new governance and health management model inspired by reforms seen in Portugal and England (CAMPOS; COHN; BRANDÃO, 2016; SORANZ, 2014).

The municipal government implemented the Primary Health Care Reform (RCAPS, for *Reforma dos Cuidados em Atenção Primária em Saúde*), the municipal health secretariat (SMS) gained a horizontal organizational structure and primary healthcare was defined as the vector for the expansion of the healthcare network in the city. The budget was divided between health care levels, which made it possible to plan expenses according to service provision characteristics at each level. Also, the City Council approved an increase in the municipal health budget from 15% to 20%. In order to rapidly expand FHP coverage, the SMS improved the infrastructure of the existing health units and increased the number of teams based in these facilities. The most important move, however, came with the conception and construction of new health units, called the Family Health Clinics (CF, for *Clínica da Família*). The construction of these units started already in 2009, the first year

of the new administration. The municipal goal was not only to increase FHP coverage, but was improve service quality (HARZHEIM; LIMA; HAUSER, 2009).

The CF structure was designed to guarantee the ambiance, comfort, sustainability, and the resolution capacity of the health care units (HARZHEIM; LIMA; HAUSER, 2009; CAMPOS; COHN; BRANDÃO, 2016). Its physical structure was an important requirement that differentiates itself from existing units. The new administration was keen on ensuring that people could differentiate the new units from the existing ones. In 2010, the government published the document “*Guidelines for the Expansion of Family Health Clinics in the City of Rio de Janeiro*” to ensure that CF quality met common standards as well as offered a more comprehensive list of services. The content covered by the document ranged from the hiring of family health professionals to the physical standard established by the SMS for each CF. In particular, the document is extremely extensive and clear in describing the colors, furniture, equipment, and visual programming for each type of existing room (reception, restroom, vaccination, collection, oral health, mother-baby, child’s room). Such guidelines were valid for new units and for the old units that were renovated and transformed into CF. Essentially, the CF units became a policy flagship for the new government.

The CF program indeed changed the concept of primary healthcare delivery in Brazil as the new units are large buildings and that could host 5 or more FHP teams. The list of equipment and services in the CF associated with the incorporation of new technologies enables greater resolution for physicians and, at the same time, greater comfort for patients. CFs provides laboratory tests (clinical analysis), X-ray, electrocardiogram, ultrasound, mother-baby care after discharge from the maternity hospital, screening for cervical cancer (preventive) and breast cancer, among others (HARZHEIM; LIMA; HAUSER, 2009).

In order to understand how the government determined the allocation of the new facilities in the territory, we conducted qualitative interviews with policymakers involved in the process. Official guidelines oriented the construction of the new clinics in areas where health services were under-provided. Yet, the exact CF addresses were defined according to the government’s availability of land. Qualitative evidence indeed indicates that geographical concerns were taken into account during discussions among policymakers (ALLAN, 2014). In particular, transport modes nor accessibility conditions were considered as catchment areas should cover the local population. As mentioned in interviews, the

government prioritized the implementation in places where the building the new clinics could start as soon as possible.

Between 2008 and 2012, Rio de Janeiro was the Brazilian capital that experienced the highest growth of the population covered by the FHP, reaching in 2012 approximately 37% of the population. In September 2012, in the month just before municipal elections, CF covered roughly 1.3 million, which represented 53% of the total FHP coverage.

3.3 Other Policies

It was not only the primary healthcare sector that received investments during the 2009-2012 period. Several other policies were implemented due, in particular, to the 2016 Olympics and the 2014 World Cup. The municipal government chose the Bus Rapid Transit (BRT) system to prepare the city with fast and efficient transport service. The government rearranged the public transportation and carried out works to build bus corridors. In partnership with the State, the local government also revitalized the Port Zone, specially for the Olympics, and prioritized more deprived areas of the city by investing in public parks.

Rio de Janeiro has long suffered from a dispute between criminal gangs and high mortality rates from intentional violent causes and deaths. The issue of public safety has always been central. Therefore, another important public policy launched in the period was the Pacifying Police Units (UPPs, for *Unidade de Polícia Pacificadora*). UPPs is part of a security policy implemented by the state of Rio de Janeiro in 2008, an attempt to permanently remove drug traffickers' rule from the slums (*favelas*).

Finally, the government also expanded other health services. The Urgent Care Centers (UPA, for *Unidades de Pronto Atendimento*) aimed at expanding urgent care and emergency services at the local level. UPA works as an intermediate-level facility within local health systems in Brazil, providing services at a complexity between primary and hospital care and offering urgent and emergency care, with a general physician, paediatrician and nurse, 24 hours a day, seven days a week. The number of UPAs rapidly grew in the city of Rio de Janeiro, reaching 30 units by the end of 2012.²

² For more details see [Bhalotra, Nunes e Rocha \(2020\)](#).

3.4 Political System and Municipal Elections in Brazil

Voting is compulsory in Brazil for all inhabitants between 18 and 70 years old, and literate citizens. Brazil is the world's fourth-largest democracy, with roughly 148 million voters, which represents around 70% of all citizens.³ The city of Rio de Janeiro has the second largest electoral district in Brazil, with about 4.9 million registered voters.⁴

Municipalities are the smallest administrative units in the Brazilian Federative system, where the mayor is the executive chief officer while the City Council is the legislative house. The Brazilian federalism makes the mayor an important person in the political scene since the municipality is also recognized as a federative entity as well as states and the Union. The mayor has high administrative autonomy, receiving large amounts of resources every year from the state and the federal governments to provide basic public services such as health care and primary education. The mayor is the agenda setter, so he or she is responsible for proposing the city's budget to the City Council each year.

In Brazil, citizens vote simultaneously for the municipal mayor and city councillors every 4 years. The elections are held across the country at the end of the year, usually in October, and the new government begins in January of the following year. In municipalities with more than 200,000 voters, such as Rio, mayors must be elected with at least 50% of the votes, or a second round is held. Since 1997 mayors can be reelected once. Thus, if a mayor runs again after two terms, he or she should leave the office for, at least, one term. However, as highlighted by Ferraz e Finan (2011), few mayors return to office after its second term.⁵

³ <http://www.tse.jus.br/imprensa/noticias-tse/2020/Agosto/brasil-tem-147-9-milhoes-de-eleitores-aptos-a-votar-nas-eleicoes-2020>. Last checked on September 21, 2020.

⁴ <http://www.tse.jus.br/eleitor/estatisticas-de-eleitorado/consulta-quantitativo>. Last checked on September 21, 2020

⁵ According to the authors, among the mayors that were in the second term between 2001-2004, only 12% were reelected in 2008, and only 9% ran for higher offices (i.e., state or national congress, senate, or governor).

3.5 Eduardo Paes, the Incumbent

Between 1993 and 1996, Eduardo Paes served as Rio de Janeiro's west zone sub-mayor. In 1996, he was elected city councilor with the highest voting obtained in that election, 83,418 votes. Even before the end of his councilor term, in 1998, he was elected federal deputy with 117,164 votes. In 2002 he was reelected for the National Chamber of Deputies. In 2006, Paes ran for the government of the State of Rio de Janeiro, obtaining 5.5% of the valid votes. Later, Paes served as Rio de Janeiro's Municipal Secretary of Environment and Rio de Janeiro State's Secretary of Tourism, Sport, and Leisure, between 2007 and 2008. In 2008, Eduardo Paes received 31.9% of the votes in the first round and, in the second round, was elected mayor of the city of Rio de Janeiro in a very close race, with 50.8% of votes and a margin of only 60,000 votes for the second-placed candidate.

On the eve of the 2012 elections, Eduardo Paes' administration was approved by 45% of the population (good or very good), and only 15% considered it a bad or very bad administration.⁶ In 2012, Paes was reelected mayor with 64.6% of votes in the first round, with 2.1 million votes, the most expressive vote share for municipal elections in Rio de Janeiro's recent history.

⁶ <http://datafolha.folha.uol.com.br/opiniaopublica/2012/07/1130490-eduardo-paes-pmdb-lidera-disputa-com-54.shtml> Last checked on September 14, 2020.

4

Data

We use administrative data from various sources to assess the effects of the expansion of primary healthcare on electoral outcomes. This section describes datasets, variables and the main descriptive statistics.

4.1 Electoral Data

Electoral data are obtained from the Brazilian Electoral Superior Court (TSE, for *Tribunal Superior Eleitoral*), which is responsible for organizing the elections and collecting electoral statistics in Brazil. TSE defines delimited geographic areas within a state, called polling districts (*Zonas Eleitorais*), which are responsible for centralizing and coordinating the voter registration of citizens living in these regions. Depending on the population size, a municipality may contain one or more polling districts. Until 2012, there were 97 polling districts in the city of Rio de Janeiro.¹ TSE selects polling places (*Locais de votação*) within polling districts to hold elections. Usually, polling places are schools or public service centers. Voting machines (*urna eletrônica*) are located inside of polling places' rooms, called polling booth (*Seção Eleitoral*). In most cases, each polling booth corresponds to one voting machine. Only in extraordinary circumstances there is more than one machine in each room. Electoral data are aggregated at the polling booth level, which is the finest level at which it is possible to conduct the analyses.

¹ For the 2020 elections, the TRE-RJ rearranged the polling districts, reducing them from 97 to 48. <https://www.tse.jus.br/imprensa/noticias-tse/2017/Agosto/tre-do-rio-de-janeiro-realizou-a-maior-adequacao-do-rezoneamento-eleitoral>

Citizens are registered to vote geographically close to their home address. The proof of residence defines the polling place. Inside each polling place, voters are sequentially assigned within polling booths, always keeping the number of voters roughly the same between booths, approximately 400 voters.

We collected from TSE voting data for the 2004, 2008 and 2012 municipal elections, and for the 2006 state election. The data inform the number of eligible voters, absentee, turnout, invalid votes (null and blank), and votes for each candidate at the polling booth level. We use the 2004 data to collect the vote share obtained by Eduardo Paes' political party (PMDB) in the municipal elections of 2004, and 2006 data to identify the vote share of Paes in that state election. As mentioned in Section 3.5, in 2006 Paes ran for governor and obtained 5.5% of the votes. In 2008, Paes received 31.9% and 50.8% of votes in the first and in the second round, respectively. In 2012, Paes was reelected mayor, in the first round. For the analysis, we use data only for the first rounds. The main reason is that we aim to assess voters' preferences and not aversion to the opponent in second rounds.

The second piece of data collected in the TSE's platform covers the characteristics of the electorate at the polling booth level. These consist of age groups, educational level, and gender of voters. We also obtained polling places' addresses to identify their exact location. We cleaned up and georeferenced addresses with Google API. We kept in the sample the polling booths that existed in all elections and removed from those that changed location between elections, despite having the same name and identification code. This trimming represented 4.4% of our sample of polling booths (34 polling places). Our final sample contains 11,116 polling booths located across 1,452 polling places and 97 polling districts.

Figure A2 presents Eduardo Paes' vote share across polling districts in the first round of the 2008 and 2012 municipal elections.² As we observe on the maps, Eduardo Paes' voting pattern is very similar in both elections. Paes had more votes in the North and West regions, except for some neighborhoods, such as Barra da Tijuca, a wealthy neighborhood in the city where he lives. Paes had electoral success in places that concentrate the low-income population and have a smaller number of whites (NICOLAU, 2016).

² Polling district shapefiles were obtained on <http://inloco.mprj.mp.br/>.

4.2 Health Data

4.2.1 *DataRio*

We use Rio de Janeiro’s municipal system of urban information, *DataRio*, to access data on health infrastructure. DataRio contains detailed information of the city and is held by the municipal government. The system covers information on infrastructure related to health, education, urbanism, culture, sports, sanitation, transport, among others. We collected information on all municipal health units, and the data include identification code, name, type of municipal health facility (hospitals, UPA, CMS, CF, and others), opening date, address, latitude and longitude. Since we are interested in the units’ specific location, we double-checked the exact location and the operational status of each facility using official documents, such as the government’s official gazette and other administrative datasets, such as CNES (described in the next section). We geocoded all the CF and CMS units through Google API. We identified 68 CF units and 105 CMS units in operation in the city over the 2008-2012 period.

4.2.2 CNES

We use data from the National Register of Health Establishments in Brazil (CNES, for *Cadastro Nacional de Estabelecimentos de Saúde*), provided by Datasus/Ministry of Health, to characterize health facilities. The CNES platform provides a panel at the month-facility level with a collection of data such as on installed physical capacity and infrastructure, the number of hospital beds, health services, professionals, and health care teams. We use CNES to identify the number of FHP teams by month-facility. We also use this information to double-check whether an active health facility did not have any health care teams registered or, the opposite, whether inactive health units had teams. Using the facility code, we match data from CNES and DataRio. Using the number of FHP teams by month-facility (CNES) and the type of each health unit (DataRio), it was possible to construct the evolution of FHP coverage in the city. Figure A3 shows the number of FHP teams by facility type (CMS or CF) and by year. The right y axis shows the population coverage estimated by the number of health teams multiplied by 3,450, and divided by

the resident population of Rio in the year under consideration. On the left y axis, we show the absolute number of health teams. In 2008, only 3.0% of the population was covered by the FHP. By 2012, the population coverage reached 37%, and the new health facilities represented more than half the coverage.

4.2.3 Catchment Areas

The Municipal Health Secretary (SMS) created a catchment area for each primary health care facility – hospitals, emergency units or other types of establishments do not have catchment areas defined. The catchment areas were designed according to the number of people FHP teams were able to follow. This measure was based on the number of FHP teams based in each health unit multiplied by 3,450, which was the Ministry of Health parameter at that time. The population in a catchment area was under the responsibility of a specific health unit. It is a geographical area around the health facility that includes the covered population that access its services. There is no overlap between catchment areas. Citizens are registered to health units close to their home addresses. There are exceptional cases where people request to be registered at a health unit close to their workplace. Citizens who also do not belong to a specific catchment area can be assisted upon emergency or urgent demands. However, after consultation, they are sent to another unit for treatment (usually to a UPA or a hospital).

As new health teams were also allocated in existing units (CMS), the shapefiles were extended accordingly to reflect outreach capacity. Likewise, as new units were launched (CF), the SMS designed new catchment areas. In both cases, expansion was guided by the city's zip codes' shapefiles. Each zip code in the city contains an approximate number of inhabitants. As a health unit's service capacity increases, it can cover a new zip code, and so on. We plot catchment areas on a map by matching the location and the opening date of health units (from DataRio) and the catchment area shapefile (from SMS). Figure A4 shows catchment areas in 2008 and 2012. In 2008, there were only CMS units. In 2012, we observe the new health facilities (CF), and also empty spaces not covered by any units.

4.2.4 SIA

The National System of Information on Ambulatory Care (SIA, for *Sistema de Informação Ambulatorial*), from Datasus/Ministry of Health, provides detailed administrative information on ambulatory procedures funded by SUS, including consultation, diagnosis, treatment, intervention, medicines, and rehabilitation services offered by health teams by each health facility (hospital, primary health care unit, UPAs). We use the data to measure how individuals were potentially affected and by how much health services were actually reaching the population. More importantly, we examine potential mechanisms by looking at the relationship between services, by type and location, and electoral outcomes. To do so, we use the polling places' addresses and identify if they were inside or outside a catchment area. SIA provides data at the health facility level. We match SIA and *Datario* to compute a proxy for the sum of the procedures performed at the polling place level. Since we are looking at a primary health care policy, we selected procedures from the group of health promotion and prevention actions, in particular home visits. Figure A5 shows the total number of home visits and the number of home visits per thousand inhabitants by health facility type over time.

4.3 *Cadastro Único*

Cadastro Único, the National Registry for Social Programs, contains administrative data on Brazilian families eligible to social programs and typically over-represented in poverty. Several federal programs and social benefits use *Cadastro Único* as a basis for selecting families for public policies, such as *Programa Minha Casa, Minha Vida*, a large-scale housing program, and *Bolsa Família*, one of the largest conditional cash transfer programs in the world.³ *Cadastro Único* includes data on voter registration, such as the polling district and the polling booth in which the individual votes, as well as the home address for each person registered in the system.

The database does not cover the entire population of Rio. We cleaned the dataset, removing observations without voter registration or home address, wrong polling place

³ The dataset is organized by the Ministry for Social Development (MDS, for Ministério de Desenvolvimento Social), which was responsible for national policies for social development, food, and nutrition security, social assistance and citizenship income in the country.

and booth information, and people living outside the city. After this process, we end up with 2,044,451 individuals, which represented 32% of the city population in 2012. Considering that 3,336,426 inhabitants at that time had private healthcare insurance, people registered in *Cadastro Único* represented roughly 70% of the total population without private healthcare insurance, mostly users of SUS. Therefore, it is reasonable to consider that people enrolled in *Cadastro Único* represent the target group of public health policies, including primary care services.

Cadastro Único microdata are only available from 2012 onwards, but cover families registered in previous years. Addresses refer to the date of the latest update in the system and we do not observe migration records from 2008 to 2012. As we use addresses registered in the system to assign individuals to catchment areas, we need to assume that the individual's exposure to services available in a given catchment area takes place from the time when the area starts covering her/his registered address up to 2012. Yet, according to the 2010 Census, the state of Rio de Janeiro had similar migratory flows and negligible population growth between 2000 and 2010 (IBGE, 2011). Although we do not observe migration flows within the city, the period of analysis is short and sorting along political preferences in such a fine-grained level of analysis is not expected – in particular as we get closer to the election year.

Since we have home addresses of the population enrolled in *Cadastro Único*, we match this information with the shapefiles of catchment areas to identify if the individual lives inside or outside a given area. We consider a voter as treated if the individual lives inside a catchment area. We are then able to calculate the share of people treated by the FHP at the polling booth level by dividing the total number of people who vote in that booth and live inside a catchment area by the total number of people who vote in that booth. In our benchmark specifications, both the numerator and the denominator refer to people registered in *Cadastro Único*. More specifically, the treatment variable is defined as follow:

$$FHP_b = \frac{\sum \text{people living inside a catchment area voting in the polling booth } b}{\sum \text{total voters in polling booth } b} \quad (1)$$

4.4 Other Public Policies

Other public policies were implemented in Rio between 2008 and 2012. We use other sources of data to map concurrent policies and create control variables. We use information from Rio de Janeiro State Prosecutor’s Office website (MPRJ, for *Ministério Público Estadual do Rio de Janeiro*) to collect data on Pacifying Police Units (UPPs, for *Unidade de Polícia Pacificadora*). Similarly to health facilities, each UPP also has a specific and delimited catchment area as the units were defined at the favela level. By the end of 2012, there were 28 UPPs in the city of Rio de Janeiro. From MPRJ’s platform, we also collected data on public transportation. By the end of 2012, the municipal government launched 38 BRTs (Bus Rapid Transit) stations, especially in the west zone of the city. From CNES we also collected data on UPAs. In 2012, there were 30 UPAs units in the city.

We create a 1km buffer around each polling place to identify which of them were intersected by any UPP catchment areas, BRT stations or UPA facilities. Figure A6 presents the polling places and their 1km buffers, as well as the mapping of each of these other policies. We therefore use dummy indicators for the presence of other policies in the surroundings of polling places as control variables.

4.5 IBGE

We use the 2010 Brazilian Census, provided by the Brazilian Institute of Geography and Statistics (IBGE), to access detailed information on socioeconomic indicators at the census tract level. There are 10,504 census tracts in the city of Rio, and data available includes population size, the number of households, the percentage of women and men, average income per capita, percentage of households with access to sewer, water supply network and garbage collection, as well as its *shapefile*. Since we are working on data at the very local level, observing the city’s features at a finer scale confers precision and richness to the analysis. We match the census tract information with the health facilities’ catchment area to examine the characteristics of the CF facilities’ location and the determinants of the CF adoption (described in the next section).

4.6 Descriptive Statistics

Table A1 presents the main descriptive statistics at the polling booth level. The variation in FHP coverage between 2012 and 2008 was 33.3%, which is very close to the variation observed for the entire population (35%). We also show the coverage change by year: 1.7%, 9.0%, 16.2% and 6.4% during 2009, 2010, 2011 and 2012, respectively. We present these percentages splitting by health facility type (CMS and CF). Eduardo Paes' vote share variation between 2008 and 2012 was 32.8 percentage points. PMDB vote share in the 2004 elections was 11.1% and the variation between 2004 and 2008 was 20.7 percentage points. When Eduardo Paes ran for governor he had 6.7% of votes, and the variation of his performance between 2006 and 2008 was of 25.1 percentage points.

5

Empirical Strategy

In this paper we examine the extent to which the expansion in primary care services in Rio is associated with changes in the electoral performance of the incumbent mayor. The following equation provides our main regression specification:

$$\Delta votes_{pb} = \alpha_p + \beta \Delta FHP_{pb} + X'_{pb} \gamma + \epsilon_{pb} \quad (2)$$

where the subscript p refers to polling place and b indicate the polling booth. The outcome variable is the incumbent's vote share variation between 2008 and 2012 in each polling booth and polling place pb in the first round. The treatment variable, ΔFHP_{pb} , is the variation in the share of voters covered by the FHP between 2008 and 2012 in each polling booth, where FHP_{pb} is defined in equation 1. The term α_p corresponds to polling place fixed effects, X'_{pb} is a vector of controls at the polling booth level, while ϵ_{pb} is the error term. We cluster standard errors at the polling district level to allow for serial correlation across polling booths and places within the same district.

Polling place fixed effects should absorb the influence of potential confounding variables that are specific to the location and could be considered fixed over time, e.g., polling place infrastructure, block characteristics and access to services that may remain constant. The term X'_{pb} includes a series of controls computed at the baseline year, 2008: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older), educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college

completed) and gender (percentage of women). We also include dummy indicators that control for other policies (UPP, BRT and UPA) and lagged electoral variables in order to absorb pre-trends. The latter include variation in the PMDB vote share between 2004-2008 and Eduardo Paes' vote share between 2006-2008. Our most saturated specification therefore compares the variation in FHP coverage and in the incumbent's vote share across polling booths within polling places, allowing for pre-trends in electoral performance as well as differential trends in initial electorate characteristics and in other public policies.

Polling places fixed effects imply that the identifying variation comes from a residual variation across booths within places. In other words, the variation that we exploit comes from changes in the composition of voters (exposed or not to the FHP) at the booth level, within polling places, triggered by the roll-out of FHP catchment areas over the 2008-2012 period. Although the design controls for time-invariant confounders, several omitted variables are potentially correlated with the outcome and the treatment assignment at the same time. First, the relationship between Eduardo Paes' vote share and the FHP expansion may be endogenous if, for instance, the mayor intentionally allocated new units in areas where he already had increasing (reducing) approval. In this case, the estimates can be biased upward (downward).

To understand the potential sources of bias, in Table A2 we examine characteristics of the location where CF facilities were created. Using the CF catchment areas and data from the 2010 Census at the census tract level, we compare the features of those census tracts intersected by CF catchment areas with those places that did not fall into any areas. Electoral outcomes at the census tract level were computed by intersecting census tracts and Voronoi polygons defined around polling places.¹ Although the magnitude of the differences between the two groups are not substantial, we observe that CF catchment areas were assigned to places with (i) a high proportion of non-white inhabitants, (ii) a high share of households with monthly income up to one minimum wage, (iii) average income below the average and (iv) a high percentage of socioeconomically vulnerable individuals.² We also see that the mayor's vote share in 2008 was slightly greater in the

¹ A given census tract that falls inside a polling place Voronoi polygon received its electoral outcome. In case of being crossed by two or more polygons, the census tract received the electoral outcome of the Voronoi polygon that intersected the largest share of the tract's area.

² The percentage of vulnerable individuals was calculated by summing the number of individuals: with inadequate water supply network (rain or other ways), without bathroom access, with poor sewer network (rudimentary cesspit trench, sea or others) or open sewer, without proper garbage collection, without electricity, adequate pavement or sidewalk.

treatment group, which may lead to the assumption that it was the mayor who rewards his voters and not the opposite.

In order to assess the determinants of the CF adoption and evaluate how its expansion may be associated with the characteristics of the city, we follow [Rocha e Soares \(2010\)](#) and conduct a survival analysis. The dependent variable is a dummy indicating whether the census tract is intersected by any CF catchment area and zero otherwise. We conduct a Cox model to estimate the probability that a CF catchment area crosses a census tract, given that the census tract has survived up (or has not yet been intersected) to a specific time. When the census tract is treated (or, in this case, intersected), it leaves the sample. Cox proportional hazard regression is usually used to describe significant factors, considered simultaneously, to survival time.

Since we are interested in how this probability is associated with fixed characteristics at the local level, we include (i) electoral variable in the baseline (e.g. Eduardo Paes' vote share in the 2008 election), (ii) a set of socioeconomic variables (e.g. percentage of non-white inhabitants, the average number of residents per household, average age, average income per household, dummy indicating whether the census tract is in a *favela*), (iii) housing conditions from the 2010 Census (e.g. percentage of households with access to sewer, water supply network, garbage collection, and access to electricity), and (iv) health outcomes, such as mortality rates at the census tract level in 2008 from the Brazilian National System of Mortality Records (SIM/Datasus).

Table A3 presents the Cox model results. The first three columns show the hazard ratio estimators, and the remaining exhibit the regressions coefficients.³ Columns 1 and 4 consider all the census tract characteristics mentioned above without any fixed effect. Columns 2 and 5 add 154 neighborhood fixed effects. Lastly, columns 3 and 6 consider all regressors and fixed effects. After including neighborhood fixed effects, the results indicate that the probability of a census tract being intersected by any CF catchment area is not significantly associated with baseline housing conditions or health outcomes, except for a positive coefficient for water supply. Yet, we do observe a negative association with slums but also with average income. This suggests that CF were not located inside slums,

³ Probabilities lower than 0 represent negative regression estimates. Since we are running a Cox proportional hazards regression model and the estimators are hazard rates (or probabilities), one should ask why some estimators are not ranging between 0 and 1. There are estimators greater than one because the hazard represents the expected number of events per one unit of time, in this case, per census tract of month-year. As a result, the hazard can exceed 1.

as land availability could be restricted in those places, but close to poorer households. Finally, we do not observe any significant association with Eduardo Paes' vote share in 2008. The point estimate for this variable is negative, suggesting that Eduardo Paes was not rewarding his voters but increasing FHP coverage in places where he had less support. Overall, we do not find evidence that the mayor allocated new units in areas where he had greater or smaller support. In particular, we observe that the effect of his performance in 2008 on CF entry decreases tenfold and becomes statistically insignificant once we add neighborhood fixed-effects, for instance, when we compare columns 1 and 2. In that sense, we expect that CF location becomes relatively more idiosyncratic and less determined by political factors once we consider finer-grained variation within smaller geographical units. Even though we are not able to map polling places or booths onto neighborhoods, we expect variation in FHP areas within places, across booths, to be driven by idiosyncratic variation in the assignment of catchment areas at the very local area.

6

Results

In this section, we present the results based on estimates from equation 2. We organize the findings into two sections. First, we analyze the main effects of FHP expansion on the incumbent’s electoral performance. Then, we explore heterogeneous effects along different margins and discuss possible mechanisms at play in our context.

6.1 FHP Expansion and Electoral Outcomes

We begin with Table 1, which presents the estimated effects of FHP coverage on Eduardo Paes’ vote share. Column 1 shows our lighter specification, without any controls or fixed effects. The relationship between FHP coverage and vote share is positive and statistically significant. The point estimate drops in the second and third columns, which include baseline controls and neighborhood fixed effects, respectively. In the fourth column we add polling places fixed effects and observe a positive coefficient of 0.024. As mentioned in the previous section, in that specification the identifying variation comes from changes in the composition of voters across polling booths according to exposure to FHP catchment areas at the very local level. Point estimates remain roughly stable in the remaining columns. In Column 5 we add controls for alternative policies and the coefficient remains identical, which suggests that confounding variation from other relevant policy interventions may not be a concern (e.g. proximity to UPA facilities, UPP catchment areas and BRT stations). In columns 6 and 7 we add, respectively, the vote share of Paes (2006) and PMDB (2004) in levels, and in variation up to 2008. In the latter case, we include

the variation in Paes' vote share between 2006-2008 and in PMDB's vote share between 2004-2008.¹ We observe that the coefficient only marginally drops in column 6, which suggests that the result is robust to both reversion to the mean and baseline performance. In column 7 the point estimate drops to 0.018 once we control for pre-trends in electoral performance, but remain robust at 1% and statistically similar to the coefficients from columns 4-6.²

Table 1 – FHP expansion

	<i>Dependent variable:</i>						
	Δ Eduardo Paes' vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ FHP	0.049*** (0.010)	0.026*** (0.006)	0.009** (0.003)	0.024*** (0.006)	0.024*** (0.005)	0.022*** (0.005)	0.018*** (0.004)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood fixed effects	No	No	Yes	No	No	No	No
Polling places fixed effects	No	No	No	Yes	Yes	Yes	Yes
Other public policies	No	No	No	No	Yes	Yes	Yes
Vote share level	No	No	No	No	No	Yes	Yes
Vote share delta	No	No	No	No	No	No	Yes
Observations	10, 116	10, 116	10, 116	10, 116	10, 116	10, 116	10, 116
N clusters	97	97	97	97	97	97	97

Note: The vector of controls, computed at the baseline year 2008, includes: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older); educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college completed) and gender (percentage of women). Other public policies include: UPA facilities, UPP catchment areas and BRT stations. Vote share level includes: PMBD' vote share in the 2004 municipal election and Eduardo Paes' vote share in the 2006 state election. Vote share delta includes: PMDB's vote share variation between 2004 and 2008, and Eduardo Paes' vote share variation between 2006 and 2008. Standard errors clustered at the polling district level in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Both outcome and treatment variables are measured in percentage variation. Column 7 of Table 1 reports our most saturated and conservative specification, which compares variation in FHP coverage and in vote share in polling booths within polling places, taking into account differential trends in baseline characteristics as well as pre-trends in vote

¹ We remove the PMDB's 2004 vote share due to perfect multicollinearity with other electoral variables in levels and in changes.

² In Appendix Table A4 we present estimates for regressions that use an alternative variable of interest, the share of people treated by the FHP at the polling booth level but considering in the denominator the total number of people who voted in that booth, not necessarily enrolled in *Cadastro Único*. The results remain similar.

share. The coefficient of 0.018 means that an increase of one standard deviation in FHP coverage (0.327) is associated with an increase of 0.6 percentage points in the mayor's vote share $[0.327 \times 0.018]$. In other words, this represents an increase of nearly 2% in the mayor's baseline vote share. A variation from null to full FHP coverage would therefore be associated with an increase of approximately 1.8 percentage points and 6% of the mayor's baseline vote share.

To put these estimates into perspective, [Braga \(2020\)](#) found that a 50% increase in annual federal transfers to municipal FHP is associated with an increase of 9 percentage points on average in incumbents' vote share, which is considerably higher than our estimates. We conjecture that our estimates reveal more localized effects of exposure to FHP services, independently of other major benefits that federal transfers may have at the health system level. In that sense, it is interesting to see that our estimates are closer to [Dias e Ferraz \(2019\)](#)'s findings, which shows that the incumbent's vote share increases between 0.4 to 1.9 percentage points with the disclosure of information about school quality.

6.2 Effect Heterogeneity

This subsection explores some heterogeneities on the relationship between FHP coverage and the mayor's electoral performance. First we explore the timing of the FHP roll-out. The literature has pointed out that voters may behave differently according to the timing of the events ([HEALY; MALHOTRA, 2013](#)). For instance, economic conditions in the election year have a larger effect on voting, while circumstances in other years barely have any impacts on electoral outcomes ([KRAMER, 1971](#); [FAIR, 1978](#)). It has been argued that voter myopia can be purely because of cognitive bias or, simply, an easier way to evaluate overall government performance. On the other hand, politicians also seem to respond to this tendency. To increase the chances to be reelected, incumbents tend to provide public goods closer to the elections ([HEALY; MALHOTRA, 2013](#)). Thus, just as there are business cycles, there are also political cycles ([AKHMEDOV; ZHURAVSKAYA, 2004](#); [HEALY; MALHOTRA, 2013](#)).

We take advantage of the program's staggered implementation to understand if voting behavior change according to changes in FHP coverage over time. We split the treatment variable into FHP^{year} for each year between 2009-2012. The variable FHP^{2009} ,

for instance, is the share of people treated by the FHP during the first year of the program expansion. We calculate this rate as the difference between the share of individuals covered by the FHP in December 2009 against December 2008. We analogously compute the variable by years up to 2012, the last year of Paes' term.³

The examine effects by year in Table 2, which follows the same series of specifications of Table 1. The results suggest a positive and statistically significant impact of FHP coverage on the mayor's vote share variation in all years except for the first year, when most of the variation comes from CMS and the construction of CFs was not yet completed. Considering the point estimates of column 7, we find that the magnitude of the coefficient for the last year is 50% higher than the 2010's one and twofold the point estimate for 2011. In the last year, a variation from null to full FHP coverage would be associated with an increase of approximately 3.4 percentage points or 10.6% of the mayor's baseline vote share. Yet, the coefficients are statistically similar and the interpretation that the effects increase with the proximity to the elections remains suggestive.

³ Since the election was held in October 2012, we calculate this variable as the difference between FHP coverage in September 2012 against December 2011.

Table 2 – FHP expansion by year

	<i>Dependent variable:</i>						
	Δ Eduardo Paes' vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FHP - 2009	-0.012 (0.018)	-0.006 (0.010)	-0.022** (0.007)	-0.006 (0.009)	-0.005 (0.010)	-0.006 (0.010)	-0.012 (0.009)
FHP - 2010	0.065** (0.020)	0.031* (0.013)	0.009 (0.006)	0.026* (0.013)	0.024* (0.011)	0.022* (0.011)	0.021* (0.009)
FHP - 2011	0.038*** (0.010)	0.021*** (0.006)	0.011*** (0.003)	0.021*** (0.006)	0.021*** (0.006)	0.020*** (0.005)	0.014** (0.004)
FHP - 2012	0.069*** (0.015)	0.038*** (0.010)	0.014** (0.005)	0.038*** (0.010)	0.038*** (0.011)	0.036*** (0.010)	0.034*** (0.008)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood fixed effects	No	No	Yes	No	No	No	No
Polling places fixed effects	No	No	No	Yes	Yes	Yes	Yes
Other public policies	No	No	No	No	Yes	Yes	Yes
Vote share level	No	No	No	No	No	Yes	Yes
Vote share delta	No	No	No	No	No	No	Yes
Observations	10,116	10,116	10,116	10,116	10,116	10,116	10,116
N clusters	97	97	97	97	97	97	97

Note: The vector of controls, computed at the baseline year 2008, includes: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older); educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college completed) and gender (percentage of women). Other public policies include: UPA facilities, UPP catchment areas and BRT stations. Vote share level includes: PMBD' vote share in the 2004 municipal election and Eduardo Paes' vote share in the 2006 state election. Vote share delta includes: PMDB's vote share variation between 2004 and 2008, and Eduardo Paes' vote share variation between 2006 and 2008. Standard errors clustered at the polling district level in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Since we are working on data at the local level, we explore the distance between each individual based on its home address and the closest health facility. We then group this distance at the pooling booth level, according to the polling booth that each person was assigned to vote. We Appendix Table A5 presents the descriptive statistics of distances computed in a straight line in meters at the polling booth level. In 2008, a individual was, on average, 760 meters away from the closest primary health care facility. In 2012, this measure fell to 324 meters, roughly 60% lower. We divided the distances of each polling booth in 2012 into four groups: (i) up to 100 meters, (ii) from 100 meters to 250 meters, (iii) from 250 meters to 500 meters, and (v) above 500 meters. We then regress the Paes'

vote share variation computed in each polling place on dummies for these groups, omitting above 500 meters.

Table 3 presents the results, which follows the same series of specifications of Table 1.⁴ The results suggest a positive and statistically significant effect of the health facility's distance on the mayor's vote share variation. Yet, we observe that the closer is the facility to the individual's home address, the greater the effect. We also find that the effects becomes smaller and non-significant once the distance increases beyond 250 meters. Considering the coefficients of column 7, we find that the magnitude of the point estimate for individuals closer up to 100m to a health facility is 40% higher than the second closest group and 2.6 times greater the point estimate for the 250m-500m distant group.

⁴ The number of polling booths is slightly smaller than the other tables because there are polling booths where no one registered in the *Cadastro Único* is assigned to vote. In the other specifications, these booths assume zero FHP coverage. Still, in this case, it is not possible to calculate the average distance from the place of residence to the nearest clinic in these booths.

Table 3 – Distance to health facility

	<i>Dependent variable:</i>						
	Δ Eduardo Paes' vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
100m	0.031*	0.022**	0.012***	0.022***	0.022***	0.020**	0.013**
	(0.012)	(0.007)	(0.003)	(0.006)	(0.006)	(0.006)	(0.005)
100m - 250m	0.023**	0.012**	0.007**	0.013**	0.014**	0.013**	0.009*
	(0.007)	(0.005)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
250m - 500m	0.018**	0.008*	0.005***	0.009*	0.009**	0.008*	0.005
	(0.006)	(0.004)	(0.001)	(0.004)	(0.003)	(0.003)	(0.003)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood fixed effects	No	No	Yes	No	No	No	No
Polling places fixed effects	No	No	No	Yes	Yes	Yes	Yes
Other public policies	No	No	No	No	Yes	Yes	Yes
Vote share level	No	No	No	No	No	Yes	Yes
Vote share delta	No	No	No	No	No	No	Yes
Observations	9,963	9,963	9,963	9,963	9,963	9,963	9,963
N clusters	97	97	97	97	97	97	97

Note: The vector of controls, computed at the baseline year 2008, includes: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older); educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college completed) and gender (percentage of women). Other public policies include: UPA facilities, UPP catchment areas and BRT stations. Vote share level includes: PMBD' vote share in the 2004 municipal election and Eduardo Paes' vote share in the 2006 state election. Vote share delta includes: PMDB's vote share variation between 2004 and 2008, and Eduardo Paes' vote share variation between 2006 and 2008. Standard errors clustered at the polling district level in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

6.3 Potential Mechanisms

We follow equation 2 to examine how relationship between FHP and vote share varies depending on the health facility type. CFs differs from the existing units in quality both in physical infrastructure and in services offered (see discussion in Section 3). We are able to separate the FHP coverage into two fractions: CMS, the share of voters covered by a CMS unit; and analogously for CF. Since there is no overlap between the health facilities' catchment areas, each individual is treated just by one type of unit.

Table 4 shows the results. Both CMS and CF coverage are positively associated with vote share. However, in our most complete specification, we find that expansion in

CF coverage is accompanied by relatively larger increases in vote share. For an increase of one standard deviation in coverage through CF units, the mayor's vote share increases by roughly 0.6 pp. $[0.020 \times 0.292]$. On the other hand, the CMS coefficient of 0.013 implies that an increase of one standard deviation in in coverage through existing units is accompanied by an increase of 0.2 pp. Although the point estimates remain statistically similar in column 7, the magnitude of CF effects is roughly 2.4 times greater in comparison to CMS. These results suggest that voters may react differently to quality.

Table 4 – Health facility by type

	<i>Dependent variable:</i>						
	Δ Eduardo Paes' vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ CMS	0.041** (0.015)	0.022* (0.009)	0.010* (0.004)	0.020* (0.008)	0.021** (0.008)	0.021** (0.008)	0.013* (0.005)
Δ CF	0.051*** (0.011)	0.027*** (0.007)	0.009** (0.004)	0.025*** (0.007)	0.025*** (0.007)	0.025*** (0.006)	0.020*** (0.005)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood fixed effects	No	No	Yes	No	No	No	No
Polling places fixed effects	No	No	No	Yes	Yes	Yes	Yes
Other public policies	No	No	No	No	Yes	Yes	Yes
Vote share level	No	No	No	No	No	Yes	Yes
Vote share delta	No	No	No	No	No	No	Yes
Observations	10, 116	10, 116	10, 116	10, 116	10, 116	10, 116	10, 116
N clusters	97	97	97	97	97	97	97

Note: The vector of controls, computed at the baseline year 2008, includes: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older); educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college completed) and gender (percentage of women). Other public policies include: UPA facilities, UPP catchment areas and BRT stations. Vote share level includes: PMBD' vote share in the 2004 municipal election and Eduardo Paes' vote share in the 2006 state election. Vote share delta includes: PMDB's vote share variation between 2004 and 2008, and Eduardo Paes' vote share variation between 2006 and 2008. Standard errors clustered at the polling district level in parenthesis. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

As described in Section 3, the CF clinics transformed the existing idea of PHC facilities. Besides their physical structure and appearance, the CF units incorporated new technologies which enable greater resolution. According to the SMS's website, CF facilities can solve 85% of the cases of those seeking care.⁵ While this measure is not available for

⁵ <https://www.rio.rj.gov.br/web/sms/clinicas-da-familia>

CMS units, it is worth highlighting that CF provides some services that CMS do not offer, such as: (i) mother-infant care after discharge, as well as prenatal and postpartum care, (ii) pregnancy test, (iii) newborn screening tests (red reflex, and baby hearing test), (iv) screening for cervical cancer (preventive) and breast cancer, (v) detection, prevention, treatment and monitoring of syphilis and HIV, (vi) detection, prevention, treatment and monitoring of tuberculosis and leprosy, (vii) tobacco control, and (viii) other actions to promote health and social protection to the community. Yet, it is difficult to clearly identify whether voters are reacting to quality in services or simply responding to physical attributes of the new constructions.

In order to further investigate whether variation in services matters, we use information on ambulatory care production delivered by each health facility. We compute the number of procedures over the 2008-2012 period at the health facility level, and assign procedures to polling booth by identifying if they were inside or outside a catchment area. We then estimate the effect of variations in the number of procedures delivered on changes in vote share.

Table 5 presents the results. In Panel A we observe that the total number of ambulatory procedures is not statistically related to the mayor's vote share. However, the way the service is delivered seems to matter. In Panel B we observe that the share of home visits are positive and statistically associated with the mayors' electoral performance. Overall, the evidence suggests that the visible side of the provision of services may be greatly rewarded by voters.

Table 5 – Ambulatory health procedures

	<i>Dependent variable:</i>						
	Δ Eduardo Paes' vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A							
Total procedures	−0.040 (0.027)	−0.006 (0.022)	0.009 (0.017)	−0.004 (0.020)	−0.002 (0.020)	0.001 (0.021)	−0.009 (0.022)
Panel B							
% Home visits	0.076*** (0.015)	0.031** (0.009)	0.022*** (0.006)	0.032*** (0.009)	0.031** (0.009)	0.029** (0.009)	0.021** (0.008)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood fixed effects	No	No	Yes	No	No	No	No
Polling places fixed effects	No	No	No	Yes	Yes	Yes	Yes
Other public policies	No	No	No	No	Yes	Yes	Yes
Vote share level	No	No	No	No	No	Yes	Yes
Vote share delta	No	No	No	No	No	No	Yes
Observations	10,116	10,116	10,116	10,116	10,116	10,116	10,116
N clusters	97	97	97	97	97	97	97

Note: The vector of controls, computed at the baseline year 2008, includes: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older); educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college completed) and gender (percentage of women). Other public policies include: UPA facilities, UPP catchment areas and BRT stations. Vote share level includes: PMBD' vote share in the 2004 municipal election and Eduardo Paes' vote share in the 2006 state election. Vote share delta includes: PMDB's vote share variation between 2004 and 2008, and Eduardo Paes' vote share variation between 2006 and 2008. Standard errors clustered at the polling district level in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

7

Conclusion

In this paper, we examined whether voters reward the incumbent mayor for providing primary healthcare services. More specifically, we focus on the Family Health Program (FHP) in the city of Rio de Janeiro, exploring individual data and information at the very local level. We empirically investigated whether the expansion of FHP is associated with an increase in the mayor's vote share between 2008-2012. We find that FHP coverage is positively associated with Paes' vote share. We evidence that the magnitude of this effect is greater in the election-year and when the polling place is closer to the facility. We also find that CF expansion is accompanied by relatively larger increases in vote share compared to the existing units. Our results also suggest that the visible side of the provision of services may be greatly rewarded by voters.

Our empirical findings reconciles with retrospective voting studies, specially produced evidence in developing countries, showing that healthcare policies can increase the incumbent's vote share. Although our results should be treated carefully when applied to other contexts, these findings shed light on how voting behavior can produce better policy outcomes through elections. This papers is an attempt to better understand voter responsiveness of healthcare policies and possible mechanisms. Yet, there is room for improvements and further research.

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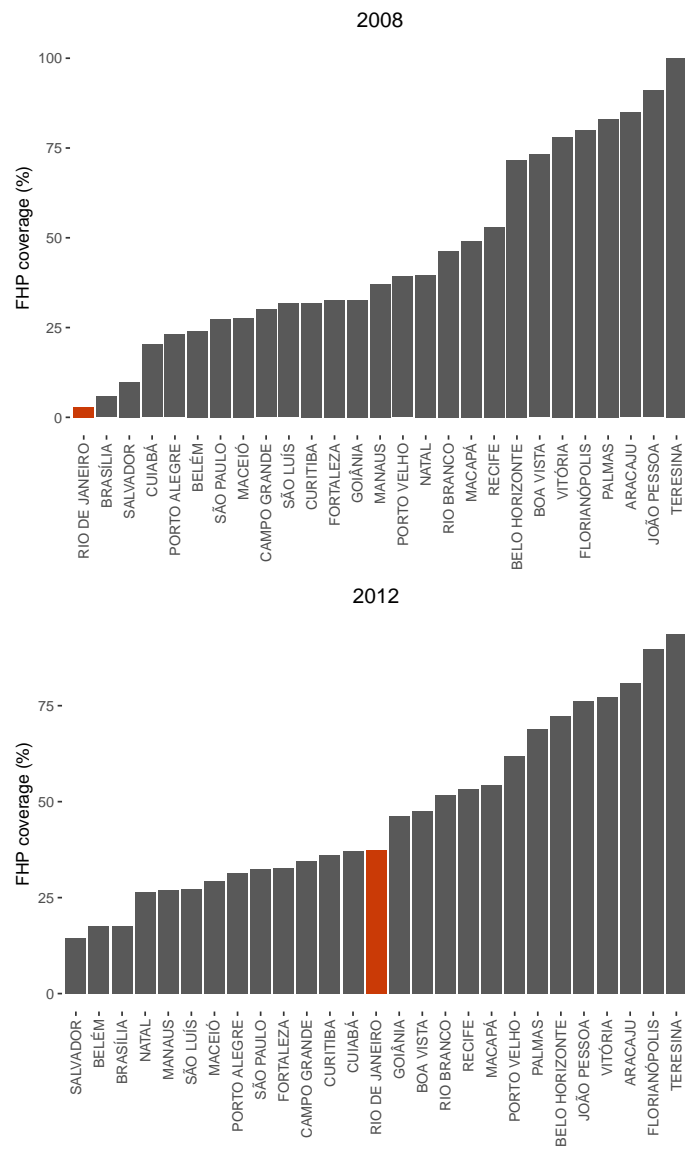
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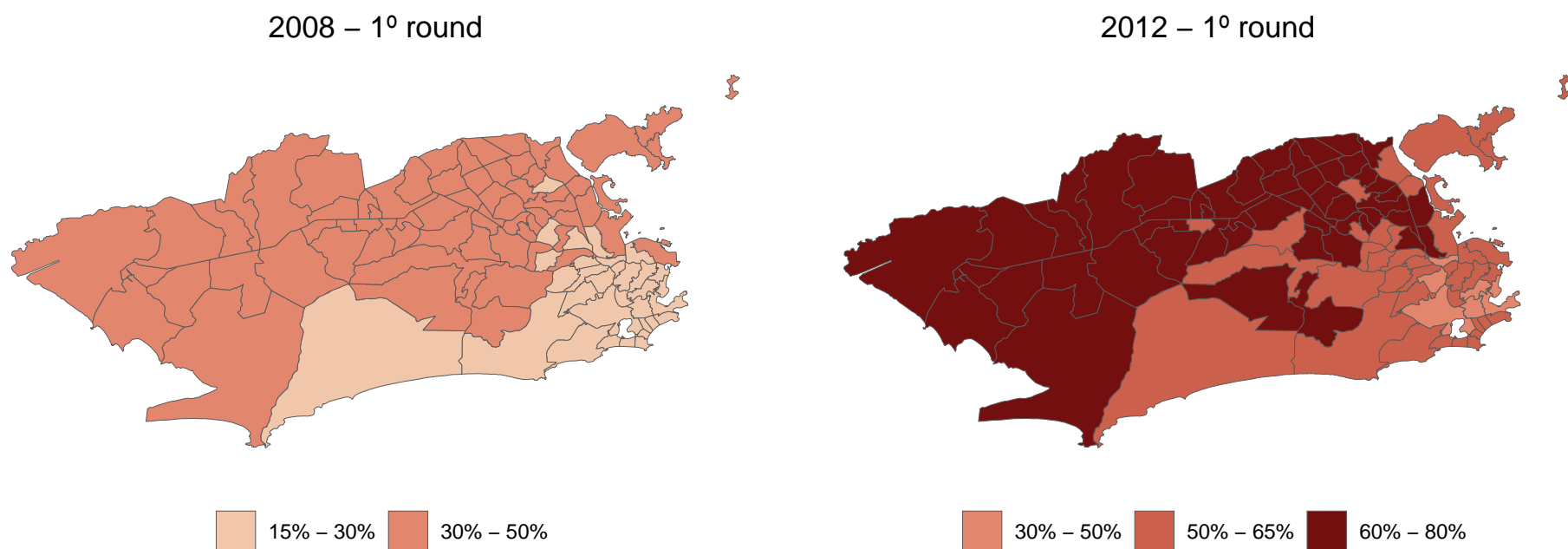
Additional Figures and Tables

Figure A1 – FHP coverage in all Brazilian capitals in December 2008 and September 2012



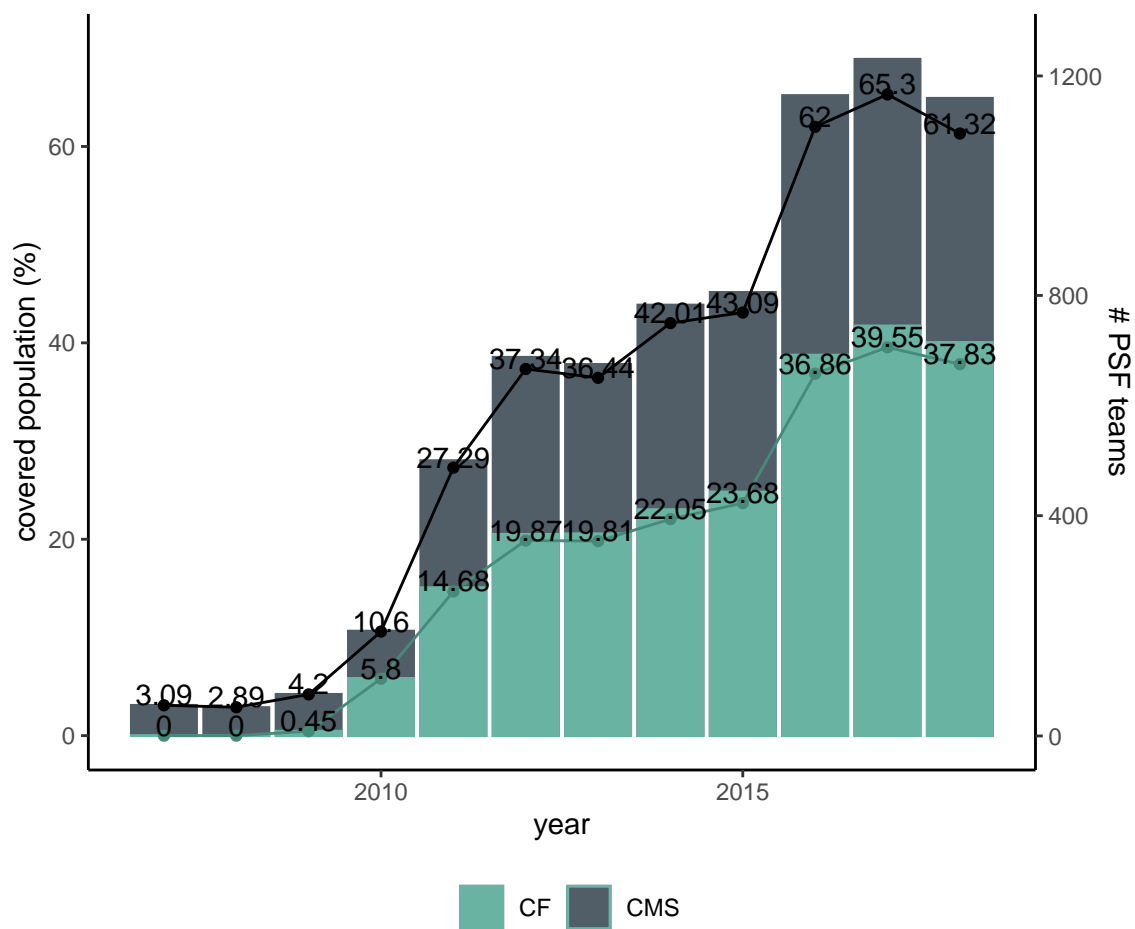
Source: Brazilian Ministry of Health, SAS/Dept de Atenção Básica – DAB

Figure A2 – Eduardo Paes' vote share distribution by polling districts in 2008 and 2012



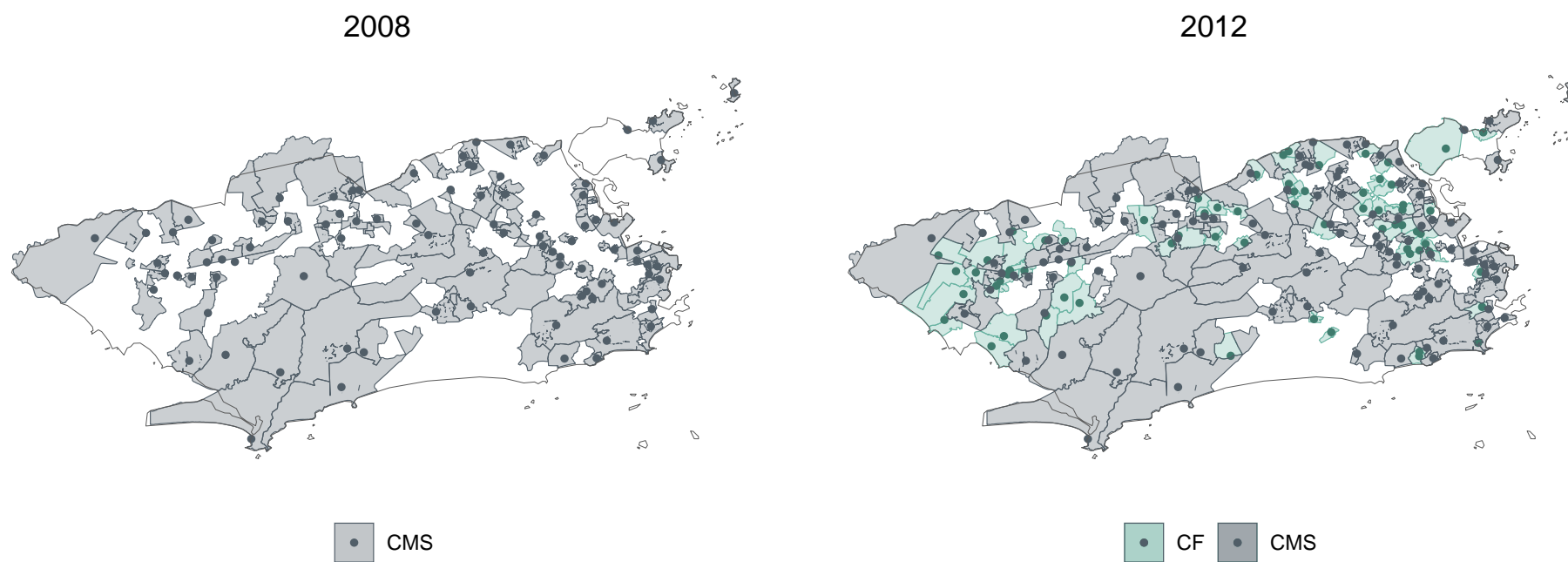
Source: Brazilian Electoral Superior Court - *Tribunal Superior Eleitoral* – TSE

Figure A3 – Number of FHP teams and population coverage segregating by CMS and CF and by year



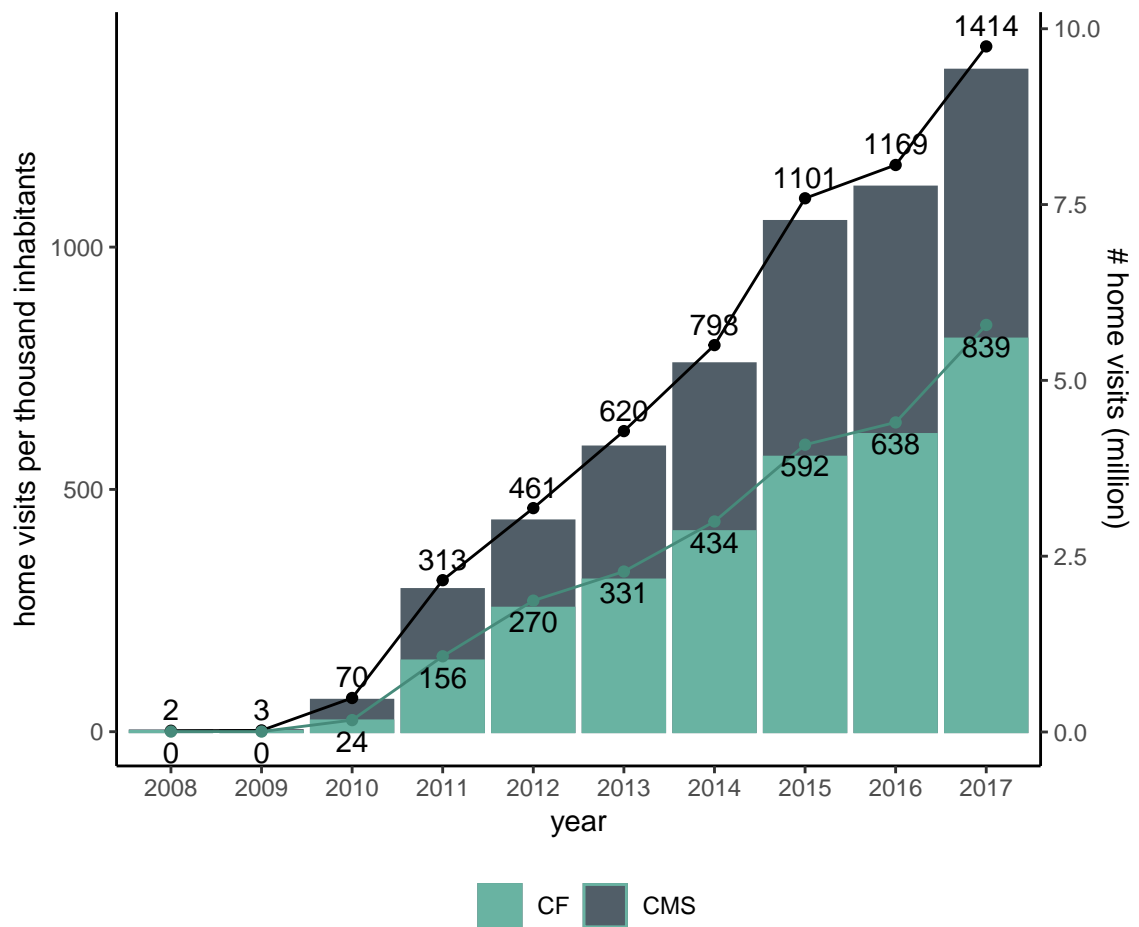
Source: CNES (*Cadastro Nacional de Estabelecimentos de Saúde*) and DataRio

Figure A4 – Health units' catchment areas in 2008 and 2012



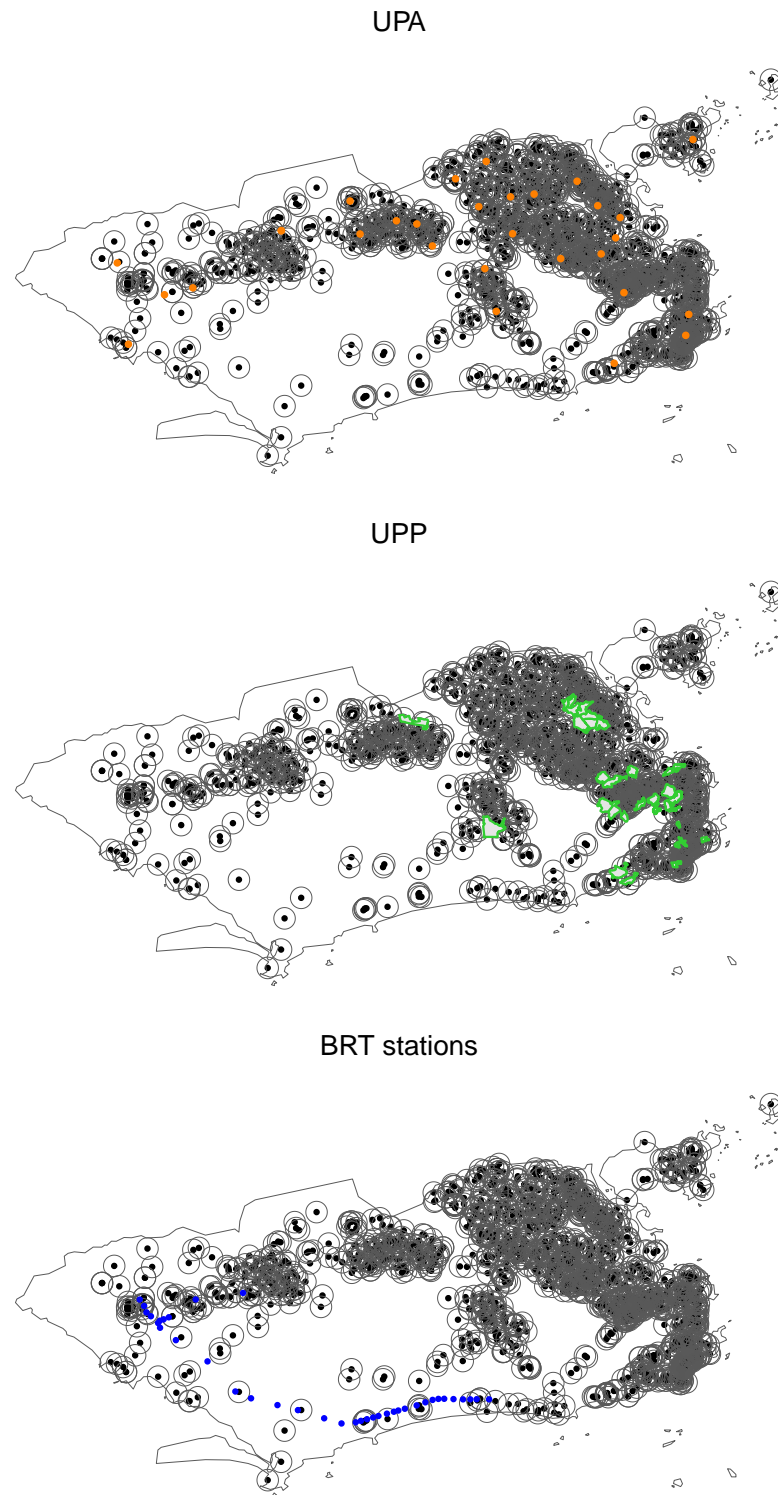
Source: SMS (Municipal Health Secretary) and DataRio

Figure A5 – Number of home visits and home visits per inhabitants segregated by CMS and CF and by year



Source: CNES (*Cadastro Nacional de Estabelecimentos de Saúde*) and SIA (*Sistema de Informação Ambulatorial*)

Figure A6 – Polling places' buffer and other policies



Source: TSE, CNES and MP-RJ

Table A1 – Main Descriptive Statistics

	Obs.	Mean	St. Dev.	Min	Max
FHP					
FHP 2009	10,116	0.017	0.080	0.000	1.000
FHP 2010	10,116	0.090	0.196	0.000	1.000
FHP 2011	10,116	0.162	0.262	0.000	1.000
FHP 2012	10,116	0.064	0.159	0.000	1.000
Δ FHP 2008-2012	10,116	0.333	0.327	0.000	1.000
CMS					
CMS 2009	10,116	0.005	0.031	0.000	1.000
CMS 2010	10,116	0.008	0.054	0.000	1.000
CMS 2011	10,116	0.051	0.176	0.000	1.000
CMS 2012	10,116	0.007	0.053	0.000	1.000
Δ CMS 2008-2012	10,116	0.071	0.190	0.000	1.000
CF					
CF 2009	10,116	0.012	0.074	0.000	1.000
CF 2010	10,116	0.082	0.190	0.000	1.000
CF 2011	10,116	0.111	0.212	0.000	1.000
CF 2012	10,116	0.057	0.151	0.000	1.000
Δ CF 2008-2012	10,116	0.262	0.296	0.000	1.000
Electoral outcomes					
Eduardo Paes' vote share 2008	10,116	0.318	0.066	0.094	0.510
Eduardo Paes' vote share 2012	10,116	0.646	0.100	0.316	0.899
Δ Eduardo Paes' vote share 2008-2012	10,116	0.328	0.074	0.084	0.597
PMDB vote share 2004	10,116	0.111	0.042	0.015	0.445
Eduardo Paes' vote share 2006	10,116	0.067	0.029	0.000	0.237
Δ PMDB vote share 2004-2008	10,116	0.207	0.063	-0.254	0.420
Δ Eduardo Paes' vote share 2006-2008	10,116	0.251	0.076	-0.021	0.464
Ambulatory Care (2012)					
Total procedures (millions)	10,116	0.119	0.134	0.000	0.585
% of home visits	10,116	0.197	0.269	0.000	0.965
Other public policies (2012)					
Dummy for UPP	10,116	0.321	0.467	0.000	1.000
Dummy for UPA	10,116	0.238	0.426	0.000	1.000
Dummy for BRT	10,116	0.032	0.176	0.000	1.000

Note: This table displays descriptive statistics based on data from 2008 and 2012 at the polling booth level. Columns report the number of observations, means, standard deviations, minimum and maximum.

Table A2 – Characteristics of CF location

	Total		Control		Treatment		Difference	
	Mean	Stand Dev	Mean	Stand Dev	Mean	Stand Dev	Diff	p-value
% Eduardo Paes votes 2008	0.32	0.06	0.31	0.06	0.33	0.05	0.02	0.00
% Eduardo Paes votes 2012	0.65	0.10	0.63	0.10	0.70	0.07	0.07	0.00
Inhabitants per households	2.94	0.46	2.87	0.47	3.09	0.39	0.21	0.00
Inhabitants average age	36.00	6.02	36.91	6.19	33.81	4.93	-3.10	0.00
% of non-white habitants	0.47	0.21	0.44	0.22	0.56	0.16	0.12	0.00
% of female habitants	0.53	0.03	0.54	0.03	0.53	0.03	-0.01	0.00
% of male habitants	0.47	0.03	0.46	0.03	0.47	0.03	0.01	0.00
% of literate responsables	0.97	0.04	0.97	0.04	0.96	0.05	-0.01	0.00
% of households income per capita up to 1 MW	0.39	0.25	0.34	0.26	0.49	0.21	0.15	0.00
Average income per household	2137.43	2198.02	2488.31	2416.08	1287.42	1172.16	-1200.89	0.00
% of habitants with water supply network	0.99	0.08	0.99	0.09	0.99	0.06	0.01	0.00
% of habitants with sewer network	0.94	0.18	0.95	0.17	0.92	0.20	-0.02	0.00
% of vulnerable habitants	0.31	0.73	0.26	0.65	0.44	0.89	0.18	0.00
Dummy for favela	0.22	0.41	0.19	0.40	0.28	0.45	0.08	0.00
Central region	0.05	0.23	0.06	0.24	0.04	0.20	-0.02	0.00
North region	0.43	0.49	0.41	0.49	0.47	0.50	0.06	0.00
West region	0.39	0.49	0.37	0.48	0.42	0.49	0.05	0.00
South region	0.13	0.34	0.16	0.37	0.06	0.24	-0.10	0.00

Note: The table presents the characteristics of three groups of census tracts: total sample, never intersected by a health facility catchment area and those intersected until 2012. The percentage of vulnerable inhabitants was calculated by summing the number of individuals: with poor water supply network (rain or other ways), without bathroom access, with poor sewer network (rudimentary cesspit trench, sea or others) or open sewer, without proper garbage collection, without electricity, without proper pavement or sidewalk. Data from the Brazilian National Census 2010, TSE, Datario

Table A3 – Probability of CF catchment area intersection

	Hazard Ratio			Regressions coefficient		
	(1)	(2)	(3)	(4)	(5)	(6)
Electoral variables						
Mayor's vote share (2008)	2.161 (0.818)**	1.531 (0.981)	1.522 (0.975)	0.770 (0.379)**	0.426 (0.641)	0.420 (0.640)
Socioeconomic variables (2010)						
% of non-white inhabitants	0.918 (0.175)	0.770 (0.157)	0.760 (0.156)	-0.0859 (0.191)	-0.262 (0.204)	-0.275 (0.205)
Average inhabitants per household	1.520 (0.0965)***	1.133 (0.0805)*	1.138 (0.0813)*	0.418 (0.0635)***	0.125 (0.0711)*	0.129 (0.0715)*
Inhabitants average age	0.973 (0.00607)***	0.996 (0.00734)	0.996 (0.00734)	-0.0277 (0.00624)***	-0.00430 (0.00738)	-0.00451 (0.00737)
Average income per household	0.833 (0.0228)***	0.956 (0.0172)**	0.955 (0.0172)**	-0.183 (0.0274)***	-0.0449 (0.0179)**	-0.0458 (0.0180)**
Dummy for favela	0.605 (0.0323)***	0.733 (0.0463)***	0.734 (0.0464)***	-0.502 (0.0534)***	-0.311 (0.0632)***	-0.309 (0.0633)***
Health access indicators (2010)						
% of households with water supply network	3.542 (0.926)***	2.845 (0.967)***	2.838 (0.963)***	1.265 (0.261)***	1.046 (0.340)***	1.043 (0.339)***
% of households with exclusive use bathroom	22.60 (85.81)	0.916 (2.118)	1.293 (3.145)	3.118 (3.797)	-0.0879 (2.312)	0.257 (2.433)
% of households with sewer network	0.821 (0.0680)**	1.081 (0.108)	1.079 (0.108)	-0.197 (0.0828)**	0.0777 (0.100)	0.0764 (0.100)
% of households with garbage collection	0.627 (0.236)	0.690 (0.279)	0.712 (0.289)	-0.467 (0.377)	-0.371 (0.404)	-0.340 (0.406)
% of households with electricity	0.00153 (0.0137)	0.00000970 (0.0000715)	0.0000162 (0.000119)	-6.483 (8.992)	-11.54 (7.373)	-11.03 (7.323)
Mortality rates (2008)						
Chronic disease mortality rate	2.473 (4.535)		3.225 (4.075)	0.905 (1.834)		1.171 (1.263)
External causes mortality rate	43.54 (314.9)		187.3 (1042.6)	3.774 (7.232)		5.233 (5.565)
Infectious and parasitic diseases mortality rate	145.7 (1656.1)		6.629 (44.90)	4.982 (11.36)		1.891 (6.774)
Not well defined mortality rate	2.291 (15.61)		0.423 (2.319)	0.829 (6.813)		-0.861 (5.485)
Others mortality rate	0.000100 (0.000888)		0.000459 (0.00288)	-9.205 (8.837)		-7.687 (6.270)
Neighborhood FE?	No	Yes	Yes	No	Yes	Yes
N	678,039	678,039	678,039	678,039	678,039	678,039

Note: *, **, ***: significant at the 10%, 5% and 1% level. Hazard estimation where census tracts leave the sample when they are intersected by one CF catchment area. Independent variables are: the percentage of non-white inhabitants, the average number of residents per household, inhabitants average age, average income per household, dummy indicating whether the census tract is favela, percentage of households with access to sewer, water supply network, garbage collection, and access to electricity, mortality rates by groups of ICD at (chronic disease, external causes, infectious and parasitic diseases not well defined mortality rate and others) the census tract level, and a political variable (mayor's vote share in the 2008 election). Columns (1), (2), (3) report the hazard ratios, while columns (4), (5) and (6) report regression coefficients. Data from SIM, the Brazilian National Census 2010 and TSE.

Table A4 – FHP expansion - Alternative variable of interest

	<i>Dependent variable:</i>						
	Δ Eduardo Paes' vote share						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ FHP	0.074*** (0.010)	0.029*** (0.006)	0.020*** (0.005)	0.029*** (0.006)	0.029*** (0.005)	0.026*** (0.005)	0.019*** (0.004)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Neighborhood fixed effects	No	No	Yes	No	No	No	No
Polling places fixed effects	No	No	No	Yes	Yes	Yes	Yes
Other public policies	No	No	No	No	Yes	Yes	Yes
Vote share level	No	No	No	No	No	Yes	Yes
Vote share delta	No	No	No	No	No	No	Yes
Observations	10, 116	10, 116	10, 116	10, 116	10, 116	10, 116	10, 116
N clusters	97	97	97	97	97	97	97

Note: The variable of interest is the share of people treated by the FHP at the polling booth level but considering in the denominator the total number of people who voted in that booth (from TSE), not necessarily enrolled in *Cadastro Único*. The vector of controls, computed at the baseline year 2008, includes: groups of age (percentage of 16, 17, 18-20, 21-24, 25-34, 35-44, 45-59, 60-69, 70-79 and 79 years of age or older); educational level (percentage of illiterate, knows how to read and write but without formal education, primary incomplete, primary completed, secondary education incomplete, secondary education completed, college incomplete and college completed) and gender (percentage of women). Other public policies include: UPA facilities, UPP catchment areas and BRT stations. Vote share level includes: PMBD' vote share in the 2004 municipal election and Eduardo Paes' vote share in the 2006 state election. Vote share delta includes: PMDB's vote share variation between 2004 and 2008, and Eduardo Paes' vote share variation between 2006 and 2008. Standard errors clustered at the polling district level in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

Table A5 – Distances to health facility: Descriptive Statistics

	Obs.	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Distance 2008	9,963	760.194	613.617	2.595	364.312	957.588	6,226.085
Distance 2009	9,963	596.377	494.356	2.962	299.924	717.208	5,413.858
Distance 2010	9,963	479.312	442.420	1.053	228.946	575.650	5,413.858
Distance 2011	9,963	365.767	261.161	1.053	190.760	477.788	2,800.330
Distance 2012	9,963	323.481	236.335	1.053	171.348	414.390	2,800.330

Note: Distances were computed using individuals' home addresses to the closest health facility in a straight line. We then grouped these distances according to the polling booth that each individual was assigned to vote.