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Daniele Muniz Nascimento

DESTINED TO SAVE LIVES:

THE EFFECT OF LEADERSHIP BACKGROUND ON HEALTH

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Dissertação de Mestrado submetida ao Programa de Pós-Graduação em Economia da Indústria e da Tecnologia, Instituto de Economia, Universidade Federal do Rio de Janeiro como requisito parcial à obtenção do título de Mestre em Economia.

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À Miguel, Neli e Gabriel.

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RESUMO

Este estudo investiga a relação entre as características e experiências dos prefeitos brasileiros e seu desempenho na gestão do sistema de saúde pública. Utilizando um design de Regressão Descontínua em um conjunto de 15 anos de dados em painel, comparamos os resultados do setor de saúde em municípios com prefeitos que possuem antecedentes profissionais relacionados à saúde- com aqueles que não o elegeram por uma margem curta. O estudo constata que municípios com prefeitos com experiência na área da saúde não possuem taxas de mortalidade significativamente mais baixas ou maiores gastos públicos alocados no setor de saúde. Em geral, este estudo verifica que o princípio dos profissionais de saúde em ”salvar vidas” não é um preditor significante do desempenho dos prefeitos no setor da saúde. Sendo assim, os antecedentes profissionais e as crenças dos prefeitos brasileiros podem não ser um fator importante em sua habilidade de gerenciar eficazmente o sistema de saúde pública e melhorar os resultados sociais.

Palavras-chave: Política-Pública; Política; Saúde

ABSTRACT

This study investigates the relationship between the characteristics and experiences of Brazilian mayors and their performance in the management of the public health system. Using a Regression Discontinuity design in a 15-year panel context, we compare health sector outcomes in municipalities with mayors who have prior health-related professional backgrounds to those that did not elect them by a small margin. Our main result suggests that municipal leaders with experience in health services do not have significantly lower mortality rates or a higher allocation of public resources on health expenses. Overall, this study finds that the principle of health professionals in ”saving lives” is not a significant predictor of mayoral performance in the health sector. Therefore, the previous professional background and beliefs of Brazilian mayors may not be an important factor in their ability to manage the public health system and improve social outcomes effectively.

Key-words Public-Policy; Politics; Health

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LIST OF ABBREVIATIONS AND ACRONYMS

CBO	Brazilian Job Classification
CCT	Cattaneo, Idrobo & Titiunik
CPF	Individual Taxpayers' Registry
DATASUS	Department of Informatics of the Unified Health System
ICD	International Statistical Classification of Diseases and Related Health Problems
IPCA	Extended National Consumer Price Index
PSF	*Programa Saúde da Família* (Family Health Strategy)
TSE	Superior Electoral Court
SAPS	Primary Health Care Secretariat
SIAB	Primary Care Information System
SIOPS	Brazilian Information System on Public Health Budgets
SUS	Universal Health System
RDD	Regression Discontinuity Design
RAIS	Annual Report of Social Information

CONTENTS

1 Introduction

The Brazilian public health system has a particular structure that requires substantial action from local leaders. In contrast with several countries, the provision of healthcare services in Brazil counts with a decentralized structure where municipalities are the main responsible to ensure the population's health (Ministério da Saúde, 2009).

In the following years of the 1988 Constitution, the Brazilian Universal Health System (SUS) relied on decentralization as an instrument to optimize the use of resources and guarantee access to all citizens (Arretche, 1999; CNS, 2008; Ministério da Saúde, 2009). This strategy has made municipalities responsible for essential functions such as managing the majority of public units, providing primary care, and implementing health surveillance actions (Ministério da Saúde, 2009; Tasca et al, 2020; Bruce et al, 2022; Rocha, Orellano, & Bugarin, 2018; Brollo & Troiano, 2016).

Policymakers' characteristic appears as an important factor to understand policy choices. Once mayors were recognized as relevant decision-makers, the effectiveness of the health sector started to be influenced by the decisions and policies implemented by them. In contrast with the literature that assumes that the singular objective of political parties is to achieve success in elections (Downs, 1957), political parties may also be concerned with the quality of the policies resulting from the elections (Alesina, 1988). In this sense, various factors such as candidates' preferences, interest group influence, legislators' own ideologies, and their level of political power can be useful to understand how political decisions are made (Grogan, 2015; Wittman, 1977).

Empirical evidence has reinforced the relevance of understanding the relationship between decision-makers' characteristics or interests and the welfare of our society (Dreher et al, 2009; Gerber & Hopkins, 2011). In this sense, researchers have conducted studies to investigate the influence of political ideology on various outcomes. Fiva et al.(2018) explore the fact that Norwegian local governments have relevant responsibilities for providing welfare services and find that an increase in the number of seats held by the left-wing party is associated with increases in childcare and lower elderly care spending. Although, right-wing local governments do not seem to impact spending allocations.

In order to understand political parties' influence on social and economic outcomes, several authors apply close elections procedures. Pettersson-Lidbom (2008) shows that left-wing city governments tend to increase the municipal budget and lower the local unemployment rate compared to the conservative ones in Sweden. Using the same methodology, Ferreira and Gyourko (2016) show no strong partisan impact on USA mayors' allocation of local public spending or crime rates. In contrast, Gerber and Hopkins (2011) find that democrats allocate a smaller portion of their budgets to public safety compared to republicans or independent mayors in the United States. However, they do not observe significant differences in tax policy, social policy, or other areas with significant overlapping authority.

In the Brazilian context, Gouvea and Girard (2021) find a small positive effect of having a left-wing mayor on the social expenditures share. Additionally, applying RD design on mixed-gender races, Bruce et al (2022) find a causal effect between woman's leadership and the reduction of mortality rates and hospitalizations during a pandemic crisis. Brollo and Troiano (2016) show that woman leadership in Brazil tends to achieve better health outcomes, including higher rates of prenatal visits and lower rates of premature births.

According to the idea that the mayor's background influences their recognition of the benefits that the field brings to the community, leaders' education and job-related experience can have a potential impact on their performance and policy choice. Avellaneda (2008) presents evidence that the mayor's qualifications in terms of educational background and job-related experience have a positive influence on school enrollment in Colombia. Bragança and Dahis (2022) applied an RDD approach to show that having a mayor who reported an occupation connected to agriculture can influence economical and environmental outcomes, highlighting evidence of higher CO_2 emissions and deforestation rates by municipalities governed by this group. The authors also provide empirical evidence that farmers can influence economic outcomes when the political leader has the power to generate rents for their group of interest.

Moreover, Jochimsen and Thomasius (2014) use a dynamic panel model to present that finance ministers with previous financial experience achieved lower deficits than others without this specific background in German States. Rocha, Orellano, and Bugarin (2018) conducted an RD study to examine the effects of decentralization on local decision-making. They find that mayors with higher levels of education and experience had better performance in negotiating discretionary transfers, and tended to allocate a smaller portion of the public budget to personal expenditures. Dreher et al (2009) analyse panel data over 32 years to show that the implementation of market liberalizing reforms can be influenced by politicians' professional background since "reforms are more likely to occur if the head of government has been an entrepreneur before entering into politics" (Dreher et al, 2009).

As discussed, mayors in Brazil play an important role in the decision-making process and in the management of the public health system. Then, understanding the relationship between policy-makers previous experience and their outputs becomes a relevant question. In particular, municipalities' substantial participation in the delivery of health services, especially in the areas of basic care and medium complexity, provided us reasonable interest to answer the following questions: Does the principle of health professionals in "saving lives" benefit the community when this mayor is acting in the public health sector? Did municipalities govern by those present lower mortality rates? Is the leaders' previous professional background a relevant characteristic to influence social outcomes and municipalities' performance in terms of public health?

To respond to these questions we implemented a Regression Discontinuity design in a 15 years panel data context that allows us to compare health sector outcomes in municipalities in which mayors who had health backgrounds won by a small margin with municipalities who did not elect them by a small margin. In short, this method permits us to identify if there is a causal effect of electing a mayor with a specific background in health services and health indicators since we are able to avoid biases caused by municipalities' characteristics using a close elections procedure.

Our elections database is constructed based on municipal information from the highest Brazilian electoral body, the Superior Electoral Court (TSE). This data allows us to identify all eligible candidates, such as the number of received votes by round, declared profession, and gender. To compare the mayor's performance from 2005 to 2019 we focus on candidates from the 2004, 2008, 2012, and 2016 municipal elections. Additionally, we combined this database with labor occupation data from the Annual Report of Social Information (RAIS) from 2003 to 2019 to provide a detailed consistent view of the mayors' professional background before entering into politics.

On one hand, contrary to the literature that shows an important relationship between leaders' previous specific experience and their performance during their leadership, our main results do not present a significant impact of having a mayor with a background related to health services on mortality rates and in the allocation of money on public health expenses. On the other hand, our results contribute to studies that do not find strong effects of mayors' characteristics on social expenditure. Additionally, our findings present reliable new knowledge to the emerging literature focused on politics and public policy and leverage further research into what candidates' main skills matter to the well-being of the population.

This thesis is organized as follows. Section 2 discusses the Institutional Background. Section 3 describes the data used in this paper. Section 4 presents our data and empirical strategy. Section 5 reports our main results. Section 6 provides several robustness checks used to validate our study. Finally, Section 7 summarizes our main conclusions.

2 Institutional Background

In Brazil, political power is divided among multiple parties and the country is branched into several administrative units, including the federal government, the states, the federal district, and the municipalities (TSE; Brollo & Troiano, 2016). In this democratic system, municipalities have a relevant degree of autonomy at the local level with elected leaders serving four-year terms (Brollo & Troiano, 2016).

Since the 1988 Brazilian Federal Constitution, mayors have assumed substantial participation in the delivery of public services in areas such as education, health, and infrastructure (Rocha, Orellano & Bugarin (2018); Brollo & Troiano, 2016). Particularly, the Brazilian health care system has changed substantially since this Constitution. In the 1990s, the organizational model of the healthcare system changed from a centralized structure to a model where municipalities became strategic actors (Ugá et al, 2003). The main point of the decentralization was transferring responsibilities and resources to municipalities in order to promote the development of local management capabilities and improve the management of regional and macro-regional care networks (Ministério da Saúde, 2009).

The municipal action in health management was also stimulated by a body of laws and operational rules that regulated the health budget to be transferred, by the federal government, to each city. The Organic Law of Health (Law Number 8080/1990, art. 35) established the rules that define the amount to be transferred to each locality, based on population and a combination of factors such as epidemiological and demographic characteristics, technical performance, and current capacity. Further, law number 8142/1990 established that transfers related to health activities should be regular and automatic (Ugá et al, 2003).

In the following years after the establishment of health care as a right, the Universal Health System (SUS) in Brazil has been counting on the decentralization as a tool to increase access to health care, optimize the use of resources, and maintain the provision of health services for all population (Arretche, 1999; CNS, 2008; Ministério da Saúde, 2009). Thus, municipal action can have several divergences across localities, and once the mayor became a key decision maker it is important to identify which mayor characteristics, such as skills, traits, behavior, and styles, have an impact on performance. (Avellaneda, 2008).

In contrast with most countries, local policy markers in Brazil assume strong responsibilities in the management of the public health system (Tasca et al, 2020; Bruce et al, 2022). Municipalities are responsible for managing the vast majority of public units to provide health services, playing a significant role in the production of health services, particularly in the areas of basic care and medium complexity (Fleury et al, 2010).

Additionally, the municipal government has a range of important functions in the management of health surveillance such as being responsible for notification of compulsory diseases and unusual health problems, monitoring the quality of water for human consumption, coordinating and implementing vaccination campaigns, monitoring infant and maternal mortality and implementing basic health surveillance action (Ministério da Saúde, 2009) [1].

Given the mayors' relevant role in the functioning of the Brazilian public health system, their performance during political mandates might have significant effects on the welfare of the population. In this thesis, we focus on understanding the factors that influence mayors' political decisions on health outputs. In the next section, we describe the data used for this purpose.

[1] complete list of competences are available in Ministério da Saúde, 2009, p. 38

3 Data

3.1 Electoral Results and Mayor's Background

To construct our elections database we use municipal information from the highest Brazilian electoral body Superior Electoral Court (TSE). In Brazil, elections count with an entirely electronic system and TSE is responsible for guaranteeing data collection from regional electoral courts and providing transparent data with free public access. These data allow us to identify all eligible candidates of 5.567 Brazilian municipalities, such as the number of received votes by round, declared profession, and gender. To understand the effect of mayors' backgrounds on expenditures and public health indicators, we collect candidates' data from the 2004, 2008, 2012, and 2016 municipal elections.

To verify the previous candidate's occupation, we combine the declared profession available on TSE with labor occupation data from the Annual Report of Social Information (RAIS) from 2003 to 2019. Based on TSE's database, we classify as political candidates with previous experience in health services those who declared occupation in the following medical or related professions: Doctor, Sanitary Agent, Biomedical, Nurse, Pharmacist, Speech Therapist, Nutritionist and related, Dentist, Prosthetic specialist, Psychologist, Nursing technician, and Radiology technician. From RAIS' database, we collected related professions according to the Brazilian Job Classification (CBO). Since there is no available data of candidates' Individual Taxpayers' Registry (CPF) in the RAIS database before 2003, we were not able to investigate candidates' backgrounds from previous years. Meanwhile, combining such data provide us a detailed consistent view of the mayor´s professional background before entering into politics.

3.2 Public expenditures and health indicators

We use several variables from the Brazilian IT department of the Unified Health System (DATASUS), provided by the Ministry of Health, to estimate the effect of mayors' backgrounds on Brazilian mortality rates. First, we collected data from mortality registers by municipal residence by four age groups: 0 to 1; 0 to 4; 15 to 59; and 60 years old or older. Secondly, we collected the estimated population for each group sample. Based on these data, we were able to create our mortality rates per 1,000 and 100,000 inhabitants at a municipal level. Finally, we summarized our variables into the categories: Infant (0 to 1 year), Childhood (0 to 4 years old), Adulthood (15 to 59 years) and Older people (60 years old or older).

Additionally, in order to understand the impact of the mayor's background on mortality rates by related conditions that might be affected by public health policies and SUS primary healthcare, we collected mortality registers by municipal residence and age group according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10).

We also collected data from the Brazilian Information System on Public Health Budgets (SIOPS) to evaluate public expenses. This system allows us to collect reliable information and to monitor the application of health resources, within the scope of the Union, States, Federal District, and Municipalities. Based on the available data, we were able to compute the total health expenditure per inhabitant and the percentage of spending that is allocated to health by the municipal government.

Moreover, we collected data from the Brazilian Family Health Strategy *Programa Saúde da Família* (PSF) based on the available data from Primary Health Care Secretariat (SAPS) and Primary Care Information System (SIAB). Family Health Strategy was developed to reorganize primary care, in accordance with the precepts of the Unified Health System (SUS), and has an important role in the expansion, qualification, and consolidation of primary care joining considerable efforts from the Ministry of Health, municipalities and also from state managers (Ministério da Saúde). Evaluating such data provide us a consistent view of the program coverage by municipality and give us a reliable instrument to estimate mayors' impact on the provision of Brazilian basic healthcare.

In Table 1 we present the means and standardized deviations for all dependent variables without restricting to close elections' bandwidths. Additionally, we present the means for our mortality rates by an aggregation of related conditions that might be affected by public health policies and SUS primary healthcare based on the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). Detailed results are available in Table 11 in the appendix.

Table 1: Descriptive: Health Indicators

		Health Background	No Health Background
Mortality rates by age group			
First Infant	Mean	14.87	14.69
	SD	12.51	11.62
Childhood	Mean	3.09	3.05
	SD	2.31	2.12
Adulhood	Mean	278.8	276.21
	SD	89.72	87.66
Older people	Mean	3145.56	3125.26
	SD	769.54	766.85
Health Expenses			
Total Expenditure	Mean	164.21	167.57
	SD	168.15	163.2
Percentage	Mean	21.28	20.96
	SD	5.02	5.25
Family Health Strategy			
Coverage	Mean	84.73	84.35
	SD	25.08	25.23

Notes: This table presents the means and standard deviations for our main dependents variables without optimal bandwidths restrictions. Variables First Infant and Childhood records the mortality rate of people from 0 to 1 year old and from 0 to 4 years old, respectively, by municipal residence per 1,000 inhabitants. Variables First Infant and Childhood present the mortality rate of people from 15 to 59 years old and from 60 years old or older, respectively, by municipal residence per 1000,000 inhabitants. Health Expenses represent the total health expenditure per inhabitant deflated by IPCA Index. Percentage records the percentage of the municipality's expenditure allocated to Health. Family Health Strategy presents the municipality coverage by the program. Source: Self-elaboration based on DATASUS, TSE, SIOPS, SIAB, and RAIS databases.

4 Empirical Strategy

We implement a regression discontinuity design (RDD) in a panel data context, to measure the causal effect of political leaders' background related to health areas on public health indicators, following the format:

$$y_{mt} = \alpha + \beta HealthMayor_{mt} + f(HealthVoteMargin_{mt}) + \phi_t + \epsilon_{mt} \tag{1}$$

where $HealthMayor_{mt}$ denotes a dummy variable that takes a value equal to 1 when the candidate has experience in the health area and 0 otherwise. Hence, β represents our coefficient of interest in order to capture the effect of having a mayor with health services experience on public health indicators. The term m and t denotes a municipality and the year, respectively. Moreover, ϕ_t denotes fixed effects by year and ϵ_{mt} a stochastic error term. We compute standard errors using clusters at the municipality level to make them robust to autocorrelation.

This procedure allows us to estimate our model based on close elections bandwidths. Therefore, $HealthVoteMargin$ will assume positive values if the winner of the election has had health experience and if the second place doesn't have this characteristic. Analogously, it will assume a negative value for the opposite situation. We apply Calonico et al (2014) optimal bandwidths to construct reliable margins of victory.

Our empirical design (RDD) is useful to eliminate selection bias by selecting municipalities with similar preferences on either side of an observable discontinuity. The use of this method allows us to estimate the average treatment effect for a specific subgroup within the study population (Cunningham, 2021). Therefore, we are able to compare municipalities that elected leaders with health services background with those that almost elected leaders with this specific previous experience by a small margin of difference.

5 Results

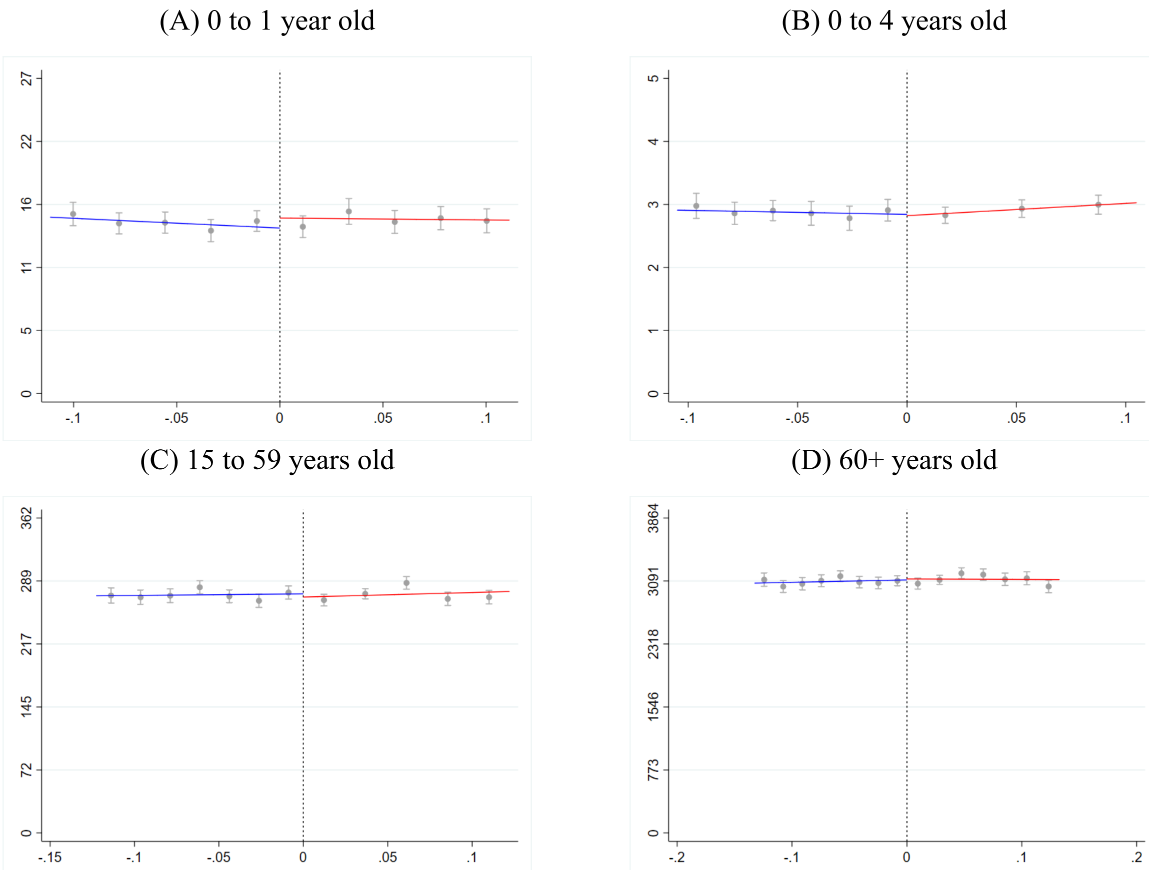
This section is divided into two subsections. In the first subsection, we document graphical evidence of the mayor's background related to health services on health indicators. In the second subsection, we estimate the effect of the mayor's background on mortality rates, allocation of money on public health expenses, and Family Health Strategy coverage.

5.1 Graphical Evidence

We first investigated the effect of mayors' backgrounds on the population's health with a standard RDD plot. We construct our Confidence Intervals using the IMSE-optimal number of bins choice for evenly spaced bins on the support of our running variable Margin of Victory. Our methodology choice provides a number of bins that minimize the integrated quadratic error based on Calonico, Cattaneo, Farrel, and Titiunik (2017). According to Cattaneo, Idrobo & Titiunik (2019), this methodology choice may be useful to assess the overall shape of our regression function.

In Figure 1, we plotted the leaders' health background impact on mortality rates by age group at different values for the margin of victory. Panels A (0 to 1 year old) and B (0 to 4 years old) report mortality rates per 1,000 inhabitants. Panels C (15 to 59 years old) and D (60+ years old) present mortality rates per 100,000 inhabitants. At a margin of victory of zero, we are not able to observe a clear discontinuity applying Calonico, Cattaneo, and Titiunik (CCT) optimal bandwidths. We can observe that there is no significant jump at the threshold based on the bins' confidence intervals of 95%, indicating that the mayor's background related to health services may not have an impact on mortality rates.

Figure 1: Leaders' Health Background Impact on Mortality rates by age group

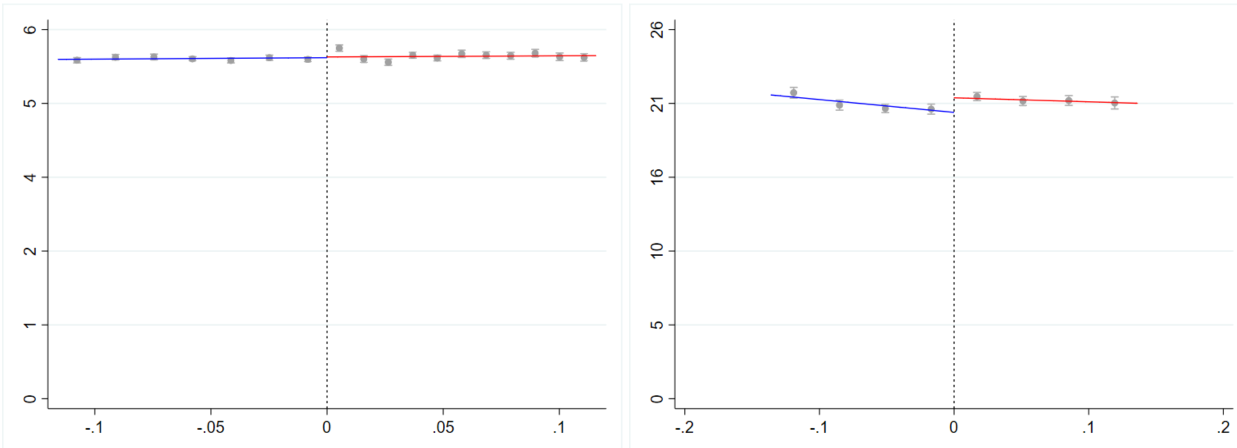


Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by age group. Panels A (0 to 1 years old) and B (0 to 4 years old) present the effect of health mayors on the mortality rates from 2005 to 2019 by age group per 1,000 inhabitants. Panels C (15 to 59 years old) and D (60+ years old) present the effect of health mayors on the mortality rates from 2005 to 2019 by age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

Following the same procedure, we explored the impact of mayors with a background related to health services on public health expenses. In Figure 2, Panel A reports the Total Expenditures per individual by municipality. Panel B presents the percentage of the municipality allocated to the health sector. In this case, we can observe a slight discontinuity at a margin of victory of zero and a small jump at the threshold based on the bins' confidence intervals of 95%, indicating that the mayor's background might have some impact on health expenditures.

Figure 2: Leaders' Health Background Impact in Health Expenditures

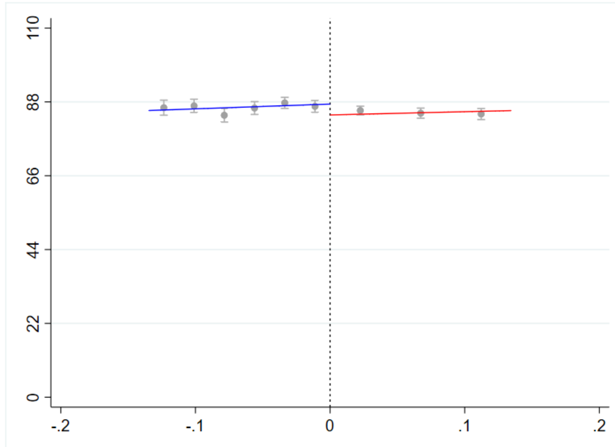
(A) Total Expenditures in Health per individual (B) Percentage of Municipality Expenditure in Health



Notes: Graphic representation of Leaders' Health Background Impact in Health Expenditures. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS, SIOPS and TSE database.

Additionally, we plotted the leaders' health background impact on the outcomes of the Family Health Strategy at different values for the margin of victory. In Figure 3 we reported the percentage of the population covered by this public healthcare program. At a margin of victory of zero, we can also check a slight discontinuity at a margin of victory of zero and a small jump at the threshold based on the bins confidence intervals of 95%, indicating that the mayor's background related to health services may have an impact on the program coverage.

Figure 3: Leaders' Health Background Impact on the Family Health Strategy



Notes: Graphic representation of Leaders' Health Background Impact on the Family Health Strategy. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS, SIAB, SAPS and TSE database.

5.2 Regression results

After our graphical analysis, we investigated the effect of electing a mayor with a background related to health services on mortality rates by age group (Table 2) based on specification 1. Columns (1) to (4) represent the mortality rates per 1,000 inhabitants by two age groups, respectively: infant and child mortality. Columns (5) to (8) present the mortality rates per 100,000 inhabitants by adulthood and older people.

Confirming the evidence exposed by Figure 1, the results from all regressions with optimal bandwidths of our running variable using CCT optimal bandwidths (Columns 1, 3, 5, and 7) and manual bandwidths of 5 p.p. (Columns 2, 4, 6 and 8) indicate that there is no significant reduction in the mortality rates by the presence of a municipal leader with a background related to health services. This result is reinforced by estimating equation 1 for mortality rates by an aggregation of related conditions that might be affected by public health policies and SUS primary healthcare based on the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10).

Table 2: Health Mayor's Impacts on Mortality rates by age group

AGE GROUP	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	0.855	-0.557	-0.0211	-0.220	-3.653	-12.54	11.71	-71.92
	(0.686)	(0.957)	(0.129)	(0.180)	(5.929)	(8.608)	(53.65)	(84.24)
Observations	11,856	11,856	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	0.686	0.957	0.129	0.180	5.929	8.608	53.65	84.24
Conventional p-value	0.212	0.561	0.870	0.221	0.538	0.145	0.827	0.393
Robust p-value	0.286	0.569	0.713	0.398	0.572	0.177	0.882	0.957
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.112	0.0500	0.105	0.0500	0.123	0.0500	0.133	0.0500
BW Bias (b)	0.205	0.0500	0.215	0.0500	0.238	0.0500	0.259	0.0500
Eff. Obs. Left	3133	1521	2986	1521	3374	1521	3545	1521
Eff. Obs. Right	2909	1467	2785	1467	3121	1467	3322	1467

Notes: This table presents the Health Mayor's Impacts Mortality rates by age group from 2005 to 2019. Columns 1 to 4 present the effect of health mayors on the mortality rates per 1,000 inhabitants. Columns 5 to 8 present the effect of health mayors on the mortality rates per 100,000 inhabitants. Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. All estimates include year fixed-effects and cluster by municipality. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Table 3 shows that having a mayor with a background in the health sector does not affect mortality rates for certain Infectious and Parasitic Diseases. Detailed results for ICD-10 Chapters are presented in the Figures 67, 8, 9,10, and Tables 12, 13, 14, and 15 in the appendix.

According to the emerging literature, leaders' previous experience and education can have a potential impact on their performance and policy choice (Jochimsen and Thomasius, 2014; Dreher et al, 2009; Avellaneda, 2008, p. 288; Rocha, Orellano, and Bugarin, 2018). After documenting that municipalities led by mayors with a background related to health services do not present a lower number of mortality rates, we keep our investigation estimating the effects of electing a mayor with

Table 3: Health Mayor's Impacts on Mortality rates by certain Infectious and Parasitic Disease and age group

AGE GROUP	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	-5.385	-15.52	-0.0451	-1.858	-0.505	-0.915	4.051	10.00
	(12.93)	(15.92)	(2.670)	(3.557)	(0.811)	(1.226)	(6.395)	(9.539)
Observations	11,856	11,856	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	12.93	15.92	2.670	3.557	0.811	1.226	6.395	9.539
Conventional p-value	0.677	0.330	0.987	0.601	0.533	0.455	0.526	0.294
Robust p-value	0.584	0.886	0.848	0.846	0.533	0.448	0.587	0.411
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.0996	0.0500	0.101	0.0500	0.136	0.0500	0.107	0.0500
BW Bias (b)	0.204	0.0500	0.207	0.0500	0.269	0.0500	0.198	0.0500
Eff. Obs. Left	2835	1521	2873	1521	3600	1521	3026	1521
Eff. Obs. Right	2666	1467	2710	1467	3367	1467	2813	1467

Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by certain Infectious and Parasitic Disease and age group (CID-10 chapter I). Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. All estimates include year fixed-effects and cluster by municipality. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

this background on public health expenses.

To estimate the effects of electing a mayor with health services' experience on municipality expenditures in health for our 15 years of panel data, we applied the same Regression Discontinuity design (RDD) specified by equation (1) with two main dependent variables: Total Health Expenditure deflated and; the Percentage of Municipality Expenditure in Health.

As expected due to the results of Figure 4, Table 4 also demonstrates only a slight increase (approximately 1%) of the percentage of municipality expenditures in health using CCT optimal bandwidths (Column 3). Although, this result is not robust since there is no significant effect applying a fixed bandwidth of 5 p.p. (Column 4). Furthermore, we have additional evidence to demonstrate that mayors' backgrounds have no significant impact on health expenses since there is no increase in the total expenditure on Health using CCT optimal bandwidths (Column 1) and fixed bandwidths of 5 p.p. (Column 2).

Table 4: Health Mayor's Impacts in Health Expenditures

VARIABLES	(1) Total	(2) Total	(3) Percentage	(4) Percentage
RD_Estimate	0.0117	0.0474	1.024***	0.852
	(0.0349)	(0.0499)	(0.350)	(0.528)
Observations	11,810	11,810	11,857	11,857
Conventional Std. Err.	0.0349	0.0499	0.350	0.528
Conventional p-value	0.736	0.342	0.00343	0.107
Robust p-value	0.792	0.0167	0.00480	0.150
Order Loc.Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
BW Loc. Poly. (h)	0.116	0.0500	0.137	0.0500
BW Bias (b)	0.221	0.0500	0.300	0.0500
Eff. Obs. Left	3197	1509	3604	1521
Eff. Obs. Right	2984	1463	3377	1467

Notes: This table presents the Total Health Expenditure deflated per inhabitant and the Percentage of Municipality Expenditure in Health. Optimal Bandwidths of HealthVoteMargins in Columns 1 and 3 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2 and 4 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIOPS, TSE and RAIS database.

Another way to check if the background of political leaders has any effect on Brazilian health indicators consists of evaluating the impact of these leaders in the coverage of the Family Health Strategy. Table 5 strengthens our argument that there is no impact of electing a mayor with health services' experience on the municipality's health indicators since there is no robust impact of electing leaders with this characteristic in all explored outcomes.

Table 5: Health Mayor's Impacts on the Family Health Strategy

VARIABLES	(1) PSF	(2) PSF
RD_Estimate	-3.239	-2.397
	(1.975)	(3.276)
Observations	11,857	11,857
Conventional Std. Err.	1.975	3.276
Conventional p-value	0.101	0.464
Robust p-value	0.0998	0.974
Order Loc.Poly. (p)	1	1
Order Bias (q)	2	2
BW Loc. Poly. (h)	0.135	0.0500
BW Bias (b)	0.286	0.0500
Eff. Obs. Left	3594	1521
Eff. Obs. Right	3352	1467

Notes: This table presents the Health Mayor's Impacts on the Family Health Strategy. Optimal Bandwidths of HealthVoteMargins in Column 1 was estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Column 2 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIAB, SAPS, TSE and RAIS database.

Our results indicate that while mayors play a significant role in the Brazilian public health system, their prior experience in the health sector may not necessarily predict their performance as politicians. This could be due to political factors and other policymakers' characteristics that could have a greater impact on the decision-making process such as gender (Avellaneda, 2008; Bruce et al, 2022; Brollo & Troiano, 2016). Moreover, political support may also affect a municipality's performance on public health projects (Finan, 2004). Another potential explanation is that a mayor's effectiveness as a public health manager may be more closely tied to their managerial skills

(Akbulut & Toygar, 2013; Avellaneda, 2008). Overall, it suggests that the factors that determine a mayor's performance as a public health manager may be more related to other characteristics rather than their previous experience as Doctors, Sanitary Agents, Nurses, and related professions.

6 Robustness Tests

In this section, we provide robustness exercises to validate our RD design.

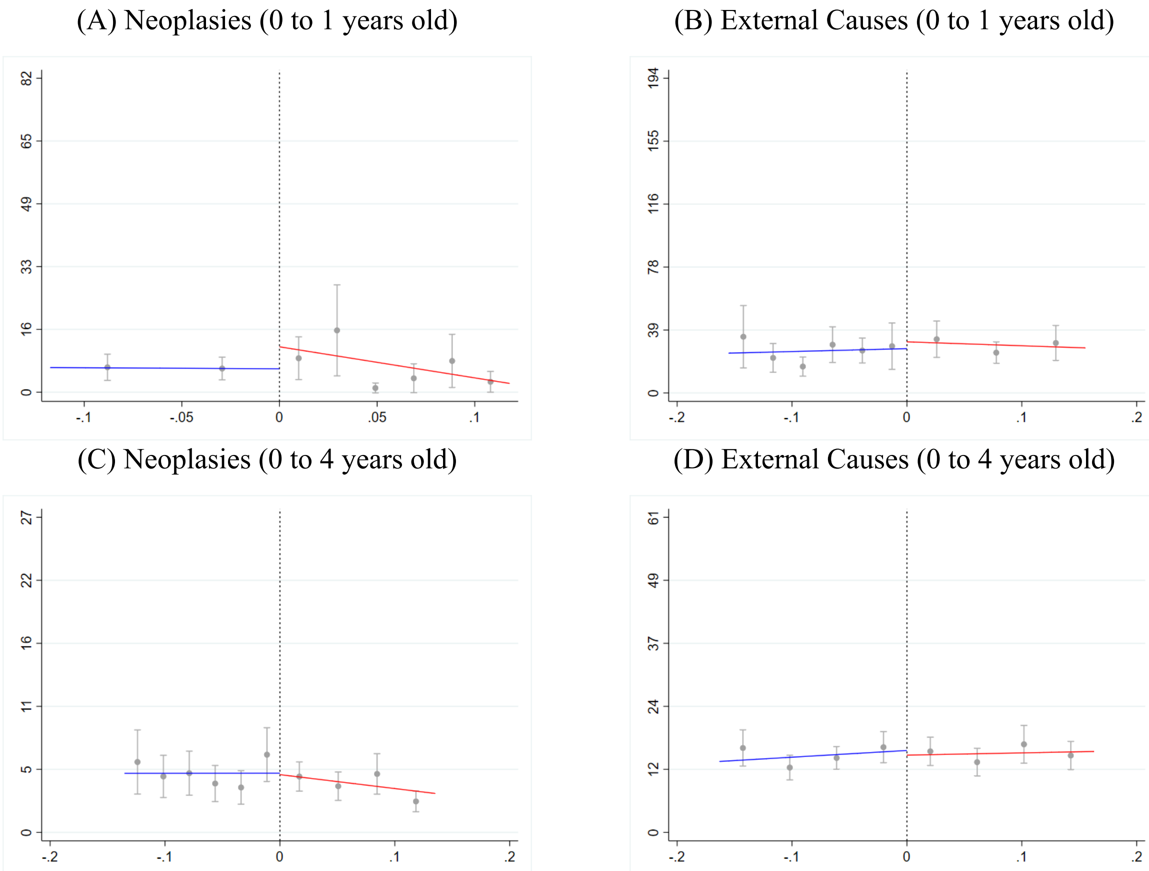
6.1 Validity's Tests

We first re-estimated our RD model with an alternative outcome to evaluate whether our main results are robust to the measure used. In this sense, we evaluated the impact on mortality rates by ICD-10 conditions that might not be affected by SUS primary healthcare in the Infant and Childhood.

We plotted the leaders' health background impact on these mortality rates at different values for the margin of victory to provide graphical evidence and we re-estimate equation 1 as well. As expected, we can observe in Figure 4 that there is no significant jump at the threshold based on the bins' confidence intervals of 95% and there is no significant impact on these mortality rates according to Table 6.

Additionally, we estimated our main specification 1 using municipal characteristics as dependent variables. Based on the estimated population available on DATASUS, we created a variable of the log transformation of the total population. Using the Brazilian Census we were able to construct the percentage of women, literacy rate, and the proportion of older people by municipality. As expected, there is no significant impact on municipal characteristics according to Table 7.

Figure 4: Leaders' Health Background Impact on Mortality rates by Neoplasies (Tumors) and External Causes in the First Infant and Childhood



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by Neoplasies (ICD-10 Chapters II) and External Causes (ICD-10 Chapter XX), and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

Table 6: Health Mayor's Impacts on Mortality rates by Neoplasies (Tumors) and External Causes in the First Infant and Childhood

VARIABLES	(1) Neoplasies 0 to 1	(2) Neoplasies 0 to 1	(3) Neoplasies 0 to 4	(4) Neoplasies 0 to 4	(5) External 0 to 1	(6) External 0 to 1	(7) External 0 to 4	(8) External 0 to 4
RD_Estimate	5.730	7.509	-0.130	-1.509	4.171	6.837	-0.906	-1.579
	(3.917)	(4.899)	(1.064)	(1.701)	(8.226)	(13.36)	(2.140)	(3.956)
Observations	11,856	11,856	11,857	11,857	11,856	11,856	11,857	11,857
Conv. Std. Err.	3.917	4.899	1.064	1.701	8.226	13.36	2.140	3.956
Conv. p-value	0.143	0.125	0.903	0.375	0.612	0.609	0.672	0.690
Robust p-value	0.108	0.939	0.990	0.105	0.730	0.272	0.629	0.853
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.118	0.0500	0.136	0.0500	0.156	0.0500	0.163	0.0500
BW Bias (b)	0.292	0.0500	0.266	0.0500	0.290	0.0500	0.323	0.0500
Eff. Obs. Left	3267	1521	3600	1521	3966	1521	4074	1521
Eff. Obs. Right	3039	1467	3363	1467	3729	1467	3828	1467

Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by Neoplasies (ICD-10 Chapter II) and External Causes (ICD-10 chapter II). Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6, and 8 use the same design but with the input of manual bandwidths of 5%. All estimates include year fixed-effects and cluster by municipality. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Table 7: Health Mayor’s Impacts on Municipal Characteristics

VARIABLES	(1) ln pop	(2) ln pop	(3) % women	(4) % women	(5) literacy	(6) literacy	(7) %Older People	(8) %Older People
RD_Estimate	0.143	0.137	1,841	3,156	2,890	5,275	444.2	712.9
	(0.0974)	(0.142)	(2,095)	(2,323)	(3,482)	(3,853)	(395.8)	(481.2)
Observations	11,857	11,857	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	0.0974	0.142	2095	2323	3482	3853	395.8	481.2
Conventional p-value	0.143	0.335	0.380	0.174	0.407	0.171	0.262	0.139
Robust p-value	0.160	0.956	0.417	0.991	0.453	0.929	0.303	0.729
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.112	0.0500	0.0697	0.0500	0.0697	0.0500	0.0766	0.0500
BW Bias (b)	0.215	0.0500	0.169	0.0500	0.169	0.0500	0.172	0.0500
Eff. Obs. Left	3134	1521	2112	1521	2112	1521	2256	1521
Eff. Obs. Right	2909	1467	1968	1467	1968	1467	2118	1467

Notes: This table presents the Health Mayor’s Impacts on Municipal Characteristics based on the most recent available Brazilian Demographic Census 2010. Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. All estimates include year fixed-effects and cluster by municipality. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on IBGE, TSE, RAIS database.

We also applied placebo checks to provide additional evidence that there is no causal relationship between electing a mayor with a background related to health services and public health expenditures. For this purpose, we re-estimated equation 1 using alternative RD cutoffs around -30 p.p and 30 p.p. Confirming our previous conclusion, Table 8 shows that there is no impact of leaders' health background on total expenditure and the percentage of municipality expenditure directed to the health sector.

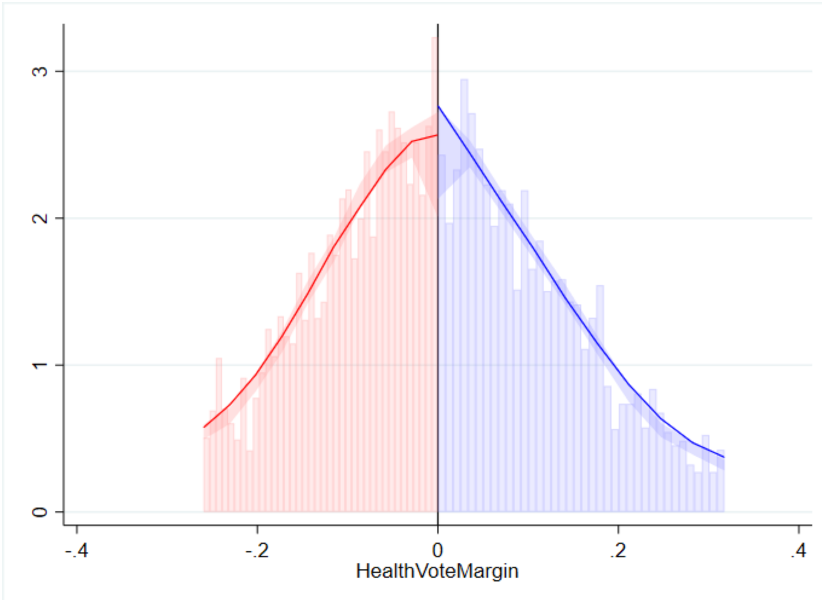
Table 8: Placebo Test: Health Mayor's Impacts in Health Expenditures

VARIABLES	(1) Total c (-0.3)	(2) Total c (0.3)	(3) Percentage c (-0.3)	(4) Percentage c (0.3)
RD_Estimate	-0.0125	0.0354	1.587	-0.183
	(0.0803)	(0.0919)	(0.968)	(0.851)
Observations	11,810	11,810	11,857	11,857
Conventional Std. Err.	0.0803	0.0919	0.968	0.851
Conventional p-value	0.877	0.700	0.101	0.830
Robust p-value	0.778	0.801	0.153	0.849
Order Loc.Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
BW Loc. Poly. (h)	0.113	0.156	0.131	0.184
BW Bias (b)	0.213	0.290	0.224	0.340
Eff. Obs. Left	337	1481	376	2008
Eff. Obs. Right	838	445	1117	498

Notes: This table presents Placebo checks for variables Total Health Expenditure deflated per inhabitant and Percentage of Municipality Expenditure in Health applying alternative RD cutoffs around -30 p.p and 30 p.p. Optimal Bandwidths of HealthVoteMargins in Columns 1 and 3 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Standard errors are reported in parenthesis. Stars indicate the significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIOPS, TSE and RAIS database.

Finally, to validate that there is no statistical manipulation of our running variable we realize the McCrary's Density Test. According to Figure 5 our running variable $HealthVoteMargin$ does not present bunching near the threshold since our test reports a p-value of 0.74 and, therefore, fails to reject the null hypothesis of no manipulation in our running variable (McCrary, 2008).

Figure 5: McCrary Test



Notes: Graphic representation of rddensity plot based on the McCrary density test for the running variable around the cutoff (McCrary, 2008).

6.2 Heterogeneity Exercises

We explored whether the estimated results on health differ from alternative samples. We begin our heterogeneity exercises by re-estimating specification 1 with a reduced sample including only candidates with occupations related to the following professions: Doctors, Sanitary Agents, Nurses, and Nursing technicians. Table 9 shows our result with this new sample on the Family Health Strategy using CCT optimal bandwidths (Column 1) and fixed bandwidths of 5 p.p. (Column 2). Confirming our main evidence, there is no robust impact of electing a mayor with a health background on Family Health Strategy, mortality rates, and public expenses. Detailed results are presented in the Figures 14, 15 and Tables 18, 19 and 9 in the appendix.

Table 9: Heterogeneity: Health Mayor's Impacts on the Family Health Strategy

VARIABLES	(1) PSF	(2) PSF
RD_Estimate	0.359	1.106
	(2.363)	(3.755)
Observations	10,266	10,266
Conventional Std. Err.	2.363	3.755
Conventional p-value	0.879	0.768
Robust p-value	0.751	0.944
Order Loc.Poly. (p)	1	1
Order Bias (q)	2	2
BW Loc. Poly. (h)	0.125	0.0500
BW Bias (b)	0.246	0.0500
Eff. Obs. Left	2951	1319
Eff. Obs. Right	2750	1292

Notes: This table presents the Health Mayor's Impacts on the Family Health Strategy. Optimal Bandwidths of HealthVoteMargins in Column 1 was estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Column 2 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIAB, SAPS, TSE and RAIS database.

After that, we also re-estimate our RD model with a sample composed only by doctors from different medical specialties. Figures 16, 17, 18 and Tables 10, 20 and 21 at the appendix file describes our findings. Table 10 presents our main results for mortality rates by age group according to CCT optimal bandwidths (Columns 1, 3, 5 and 7) and fixed bandwidths of 5 p.p. (Column 2, 4, 6 and 8). In short, our heterogeneity exercises provided us stronger evidences to our argument that professional health background does not seem to be a relevant characteristic to influence mayors' performance.

Table 10: Heterogeneity: Doctors' Impacts on Mortality rates by age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	57.25	-114.5	2.423	-33.19*	-3.019	-13.59	-22.64	-128.1
	(67.95)	(109.5)	(12.40)	(19.88)	(6.955)	(9.618)	(65.11)	(99.58)
Observations	8,600	8,600	8,601	8,601	8,601	8,601	8,601	8,601
Conventional Std. Err.	67.95	109.5	12.40	19.88	6.955	9.618	65.11	99.58
Conventional p-value	0.399	0.296	0.845	0.0951	0.664	0.158	0.728	0.198
Robust p-value	0.458	0.378	0.900	0.401	0.652	0.977	0.833	0.863
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.155	0.0500	0.154	0.0500	0.120	0.0500	0.133	0.0500
BW Bias (b)	0.302	0.0500	0.305	0.0500	0.236	0.0500	0.259	0.0500
Eff. Obs. Left	2863	1144	2845	1144	2436	1144	2585	1144
Eff. Obs. Right	2732	1075	2728	1075	2230	1075	2441	1075

Notes: This table presents the Health Mayor's Impacts Mortality rates by age group from 2005 to 2019. Columns 1 to 4 present the effect of health mayors on the mortality rates per 1,000 inhabitants. Columns 5 to 8 present the effect of health mayors on the mortality rates per 100,000 inhabitants. Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. All estimates include year fixed-effects and cluster by municipality. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

7 Conclusion

Our study evaluates the impacts of electing a mayor with experience in health services on several indicators such as mortality rates and public expenses. With this purpose, we use the outcomes of close elections in a Regression Discontinuity in a 15 years panel data context to compare several outcomes in municipalities in which mayors who had health backgrounds won by a small margin against municipalities that did not elect them by a small margin.

The health sector plays a central role in social policy and our study seeks to contribute with an emerging literature that identifies the impacts of mayors' skills on the well-being of the population. In addition, the Brazilian public health system has a particular structure that requires mayors' action in the decision-making process and in the management of the public health system. Therefore, understanding the relationship between policy-makers' previous experience and education, and their outputs become a relevant question.

Opposing the authors that show an important relationship between leaders' previous specific experience and their performance during their leadership, our main results suggest that professional health background does not seem to be a relevant characteristic in the population's health. Our main findings show that municipalities led by these mayors do not present lower mortality rates or higher allocation of public resources on health expenses. Moreover, we provided robust evidence that these leaders do not impact the coverage of the Family Health Strategy.

Besides mayors undertaking a relevant role in the Brazilian public health system, their previous background related to the health sector may not be a predictor of their performance as politicians according to our results. One possible explanation is that political factors such as legislative support and political ideology may have more influence on their decision-making (Avellaneda, 2008). Finan (2004) points out that political support may influence the probability of a municipality receiving a health project. Another explanation may be related to their capability of managing public resources. In this sense, mayors' effectiveness as public health managers may be more related to their possession of managerial skills (Akbulut & Toygar, 2013; Avellaneda, 2008).

Overall, our results bring a relevant contribution to the recent literature since they provide novelty knowledge about which candidates' characteristics should not be emphasized as a strong competence in some areas during voters' choice. Furthermore, this result instigates further research about what matters in different policy choice perspectives, especially in the public health area.

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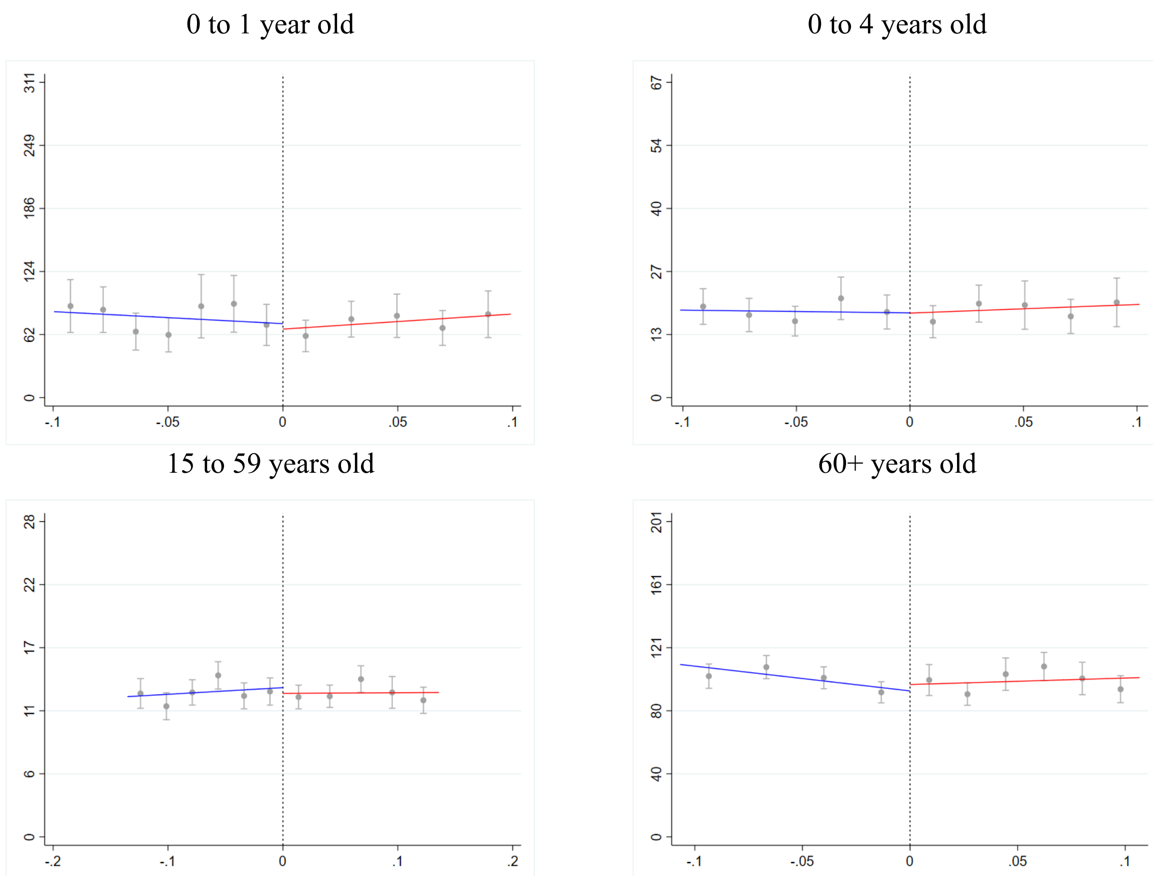
9 APPENDIX

Mortality rates by ICD-10 chapters

Figure 6: Leaders' Health Background Impact on Mortality rates by certain Infectious and Parasitic Disease and age group



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter I and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

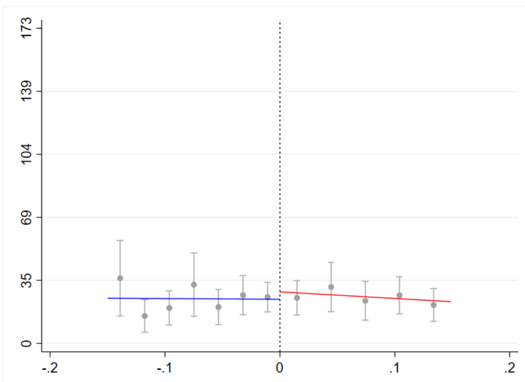
Table 11: Balance Test: Leaders' Health Background Impact on Mortality rates by ICD-10 Chapters

		Health Background	No Health Background
Infectious and Parasitic (0 to 1)	Mean	70.6	74.14
	SD	221.71	229.62
Infectious and Parasitic (0 to 4)	Mean	18.19	17.92
	SD	52.68	44.41
Infectious and Parasitic (15 to 59)	Mean	13.14	13.12
	SD	15.63	14.86
Infectious and Parasitic (60+)	Mean	103.77	102.02
	SD	107.32	101.14
Endocrine, Nutrition and Metabolic (0 to 1)	Mean	24.36	25.15
	SD	149.09	137.89
Endocrine, Nutrition and Metabolic (0 to 4)	Mean	6.15	6.56
	SD	30.08	31.51
Endocrine, Nutrition and Metabolic (15 to 59)	Mean	12.45	12.1
	SD	15.03	14.12
Endocrine, Nutrition and Metabolic (60+)	Mean	254.17	264.04
	SD	179.39	184.35
Circulatory (0 to 1)	Mean	15.53	15.41
	SD	119.26	105.61
Circulatory (0 to 4)	Mean	4.34	4.38
	SD	26.08	23.28
Circulatory (15 to 59)	Mean	53.6	52.6
	SD	33.72	33
Circulatory (60+)	Mean	1153.67	1138.14
	SD	435.1	442.97
Digestive (0 to 1)	Mean	11.57	12.91
	SD	83.69	100.87
Digestive (0 to 4)	Mean	2.93	3.19
	SD	17.16	20.3
Digestive (15 to 59)	Mean	19.5	18.77
	SD	19.58	18.54
Digestive (60+)	Mean	137.93	137.14
	SD	110.82	109.3
Respiratory (0 to 1)	Mean	67.8	72.51
	SD	242.94	237.66
Respiratory (0 to 4)	Mean	18.14	19.16
	SD	47.71	48.06
Respiratory (15 to 59)	Mean	14.13	14.36
	SD	15.82	16
Respiratory (60+)	Mean	415.12	400.81
	SD	247.35	241.7
Perinatal (0 to 1)	Mean	887.53	867.8
	SD	932.93	872.05
Perinatal (0 to 4)	Mean	159.01	154.64
	SD	159.72	149.85
Pregnancy (15 to 59)	Mean	1.55	1.61
	SD	5.07	5.18

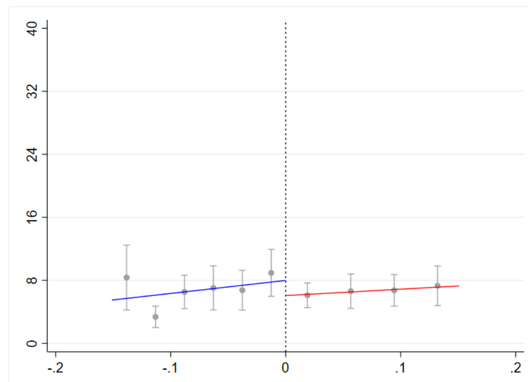
Notes: This table presents the means and standard deviations for dependent variables without optimal bandwidths restrictions. All variables report mortality rates by municipal residence per 100,000 inhabitants based on ICD-10 Chapters. Age groups are presented in parenthesis based on Infant (0 to 1 year old), Childhood (0 to 4 years old), Adulthood (15 to 59 years old) and Older people (60 years old or more). Source: Self-elaboration based on DATASUS, TSE, SIOPS, SIAB, and RAIS databases.

Figure 7: Leaders' Health Background Impact on Mortality rates by Endocrine, Nutritional and Metabolic Diseases and age group

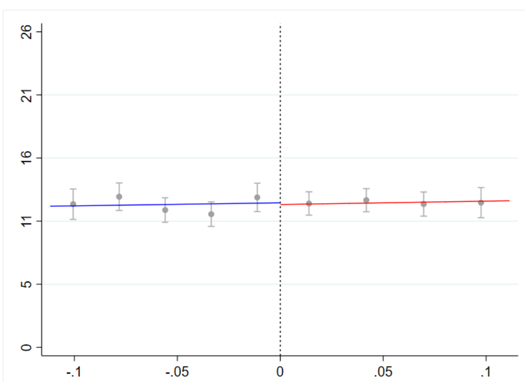
(A) 0 to 1 year old



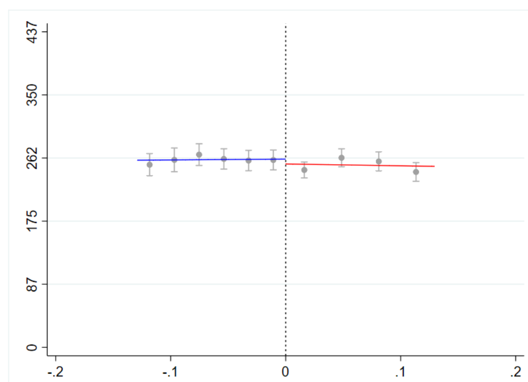
(B) 0 to 4 years old



(C) 15 to 59 years old



(D) 60+ years old



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter IV and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

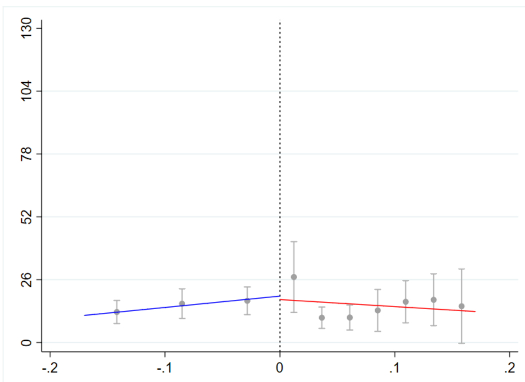
Table 12: Health Mayor's Impacts on Mortality rates by Endocrine, Nutritional and Metabolic Diseases and age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	4.045	-0.584	-1.904	-1.942	-0.144	-1.700	-6.727	-30.83*
	(6.505)	(8.997)	(1.552)	(2.369)	(0.803)	(1.198)	(11.38)	(17.29)
Observations	11,856	11,856	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	6.505	8.997	1.552	2.369	0.803	1.198	11.38	17.29
Conventional p-value	0.534	0.948	0.220	0.412	0.858	0.156	0.555	0.0745
Robust p-value	0.644	0.747	0.192	0.903	0.701	0.529	0.558	0.401
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.150	0.0500	0.151	0.0500	0.112	0.0500	0.130	0.0500
BW Bias (b)	0.292	0.0500	0.309	0.0500	0.225	0.0500	0.252	0.0500
Eff. Obs. Left	3852	1521	3867	1521	3137	1521	3491	1521
Eff. Obs. Right	3626	1467	3648	1467	2909	1467	3281	1467

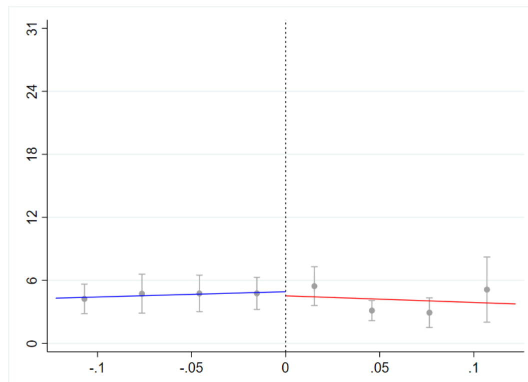
Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by Endocrine, Nutritional, and Metabolic Diseases and age group (CID-10 chapter IV). Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Figure 8: Leaders' Health Background Impact on Mortality rates by Circulatory System Diseases and age group

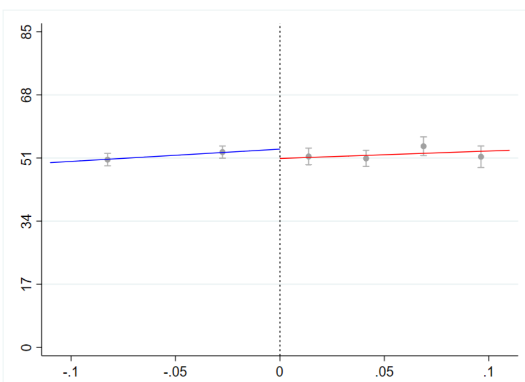
(A) 0 to 1 year old



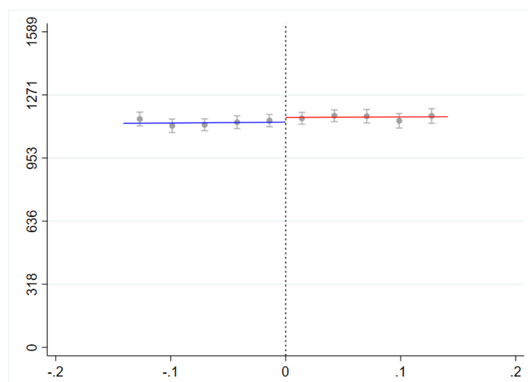
(B) 0 to 4 years old



(C) 15 to 59 years old



(D) 60+ years old



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter IX and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

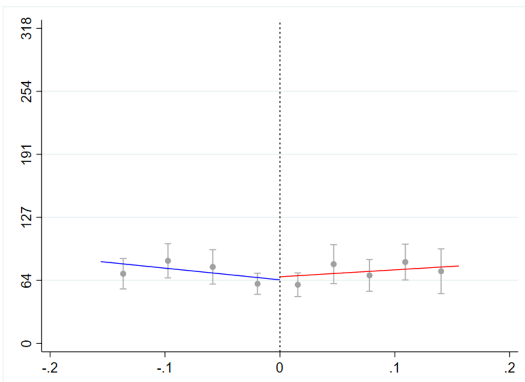
Table 13: Health Mayor's Impacts on Mortality rates by Circulatory System Diseases and age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	-1.435	11.51	-0.400	2.651	-2.516	-1.788	23.65	3.155
	(5.497)	(12.50)	(1.249)	(1.954)	(2.111)	(3.059)	(29.90)	(49.33)
Observations	11,856	11,856	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	5.497	12.50	1.249	1.954	2.111	3.059	29.90	49.33
Conventional p-value	0.794	0.357	0.749	0.175	0.233	0.559	0.429	0.949
Robust p-value	0.865	0.281	0.963	0.293	0.280	0.750	0.648	0.743
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.170	0.0500	0.123	0.0500	0.110	0.0500	0.141	0.0500
BW Bias (b)	0.294	0.0500	0.246	0.0500	0.203	0.0500	0.292	0.0500
Eff. Obs. Left	4174	1521	3371	1521	3104	1521	3699	1521
Eff. Obs. Right	3934	1467	3121	1467	2870	1467	3474	1467

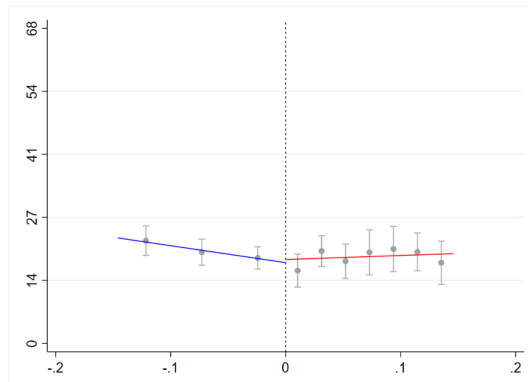
Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by Circulatory System Diseases and age group (CID-10 chapter IX). Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Figure 9: Leaders' Health Background Impact on Mortality rates by Respiratory System Diseases and age group

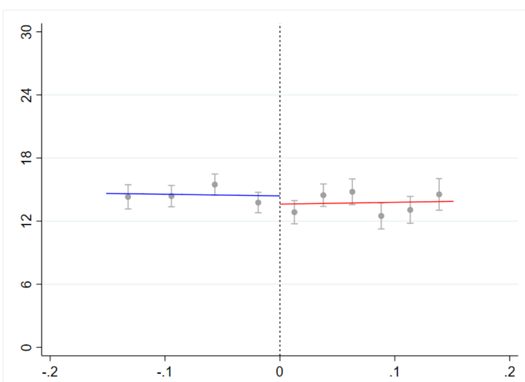
(A) 0 to 1 year old



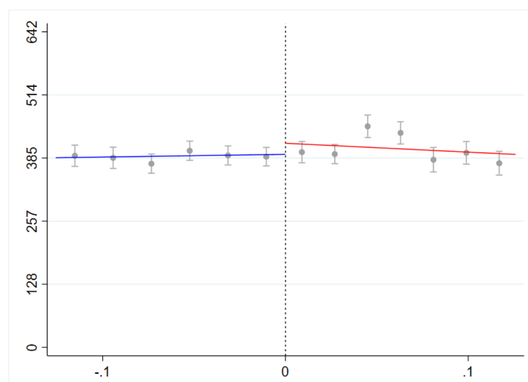
(B) 0 to 4 years old



(C) 15 to 59 years old



(D) 60+ years old



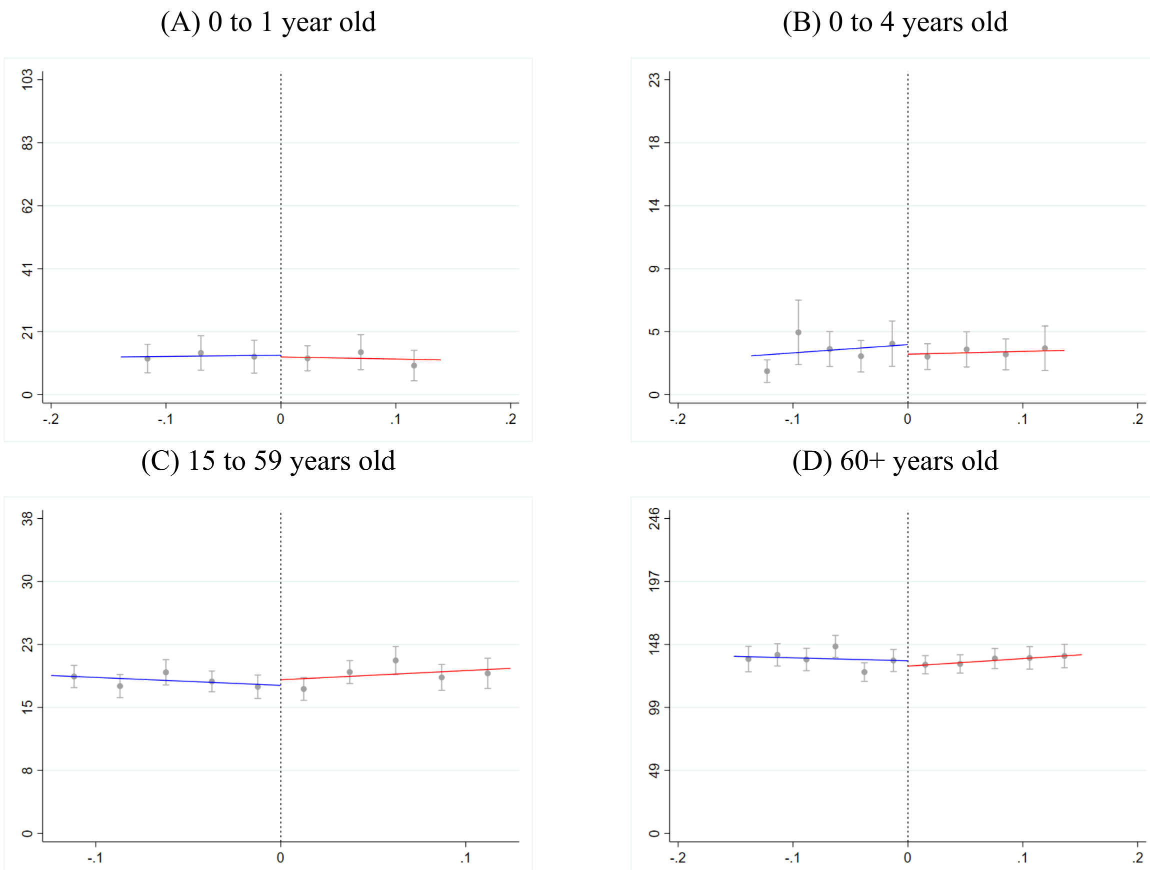
Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter X and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

Table 14: Health Mayor's Impacts on Mortality rates by Respiratory System Diseases and age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	3.054	-9.383	0.670	-1.754	-0.775	-1.440	22.49	-14.23
	(11.31)	(15.91)	(2.180)	(3.370)	(0.764)	(1.243)	(16.52)	(24.81)
Observations	11,856	11,856	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	11.31	15.91	2.180	3.370	0.764	1.243	16.52	24.81
Conventional p-value	0.787	0.555	0.759	0.603	0.310	0.247	0.173	0.566
Robust p-value	0.665	0.703	0.627	0.771	0.336	0.349	0.298	0.433
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.156	0.0500	0.146	0.0500	0.151	0.0500	0.126	0.0500
BW Bias (b)	0.312	0.0500	0.305	0.0500	0.303	0.0500	0.244	0.0500
Eff. Obs. Left	3976	1521	3794	1521	3871	1521	3445	1521
Eff. Obs. Right	3739	1467	3554	1467	3657	1467	3189	1467

Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by Respiratory System Diseases (CID-10 chapter X) and age group. Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Figure 10: Leaders' Health Background Impact on Mortality rates by Digestive System Diseases and age group



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter XI and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

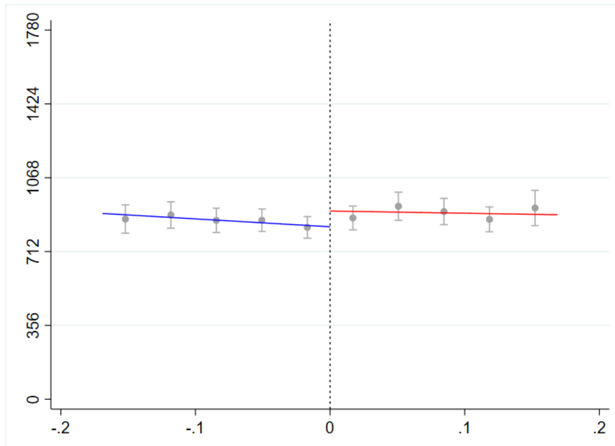
Table 15: Health Mayor's Impacts on Mortality rates by Digestive System Diseases and age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	-0.578	-2.480	-0.685	-0.646	0.675	0.449	-4.175	-5.525
	(3.863)	(5.703)	(0.856)	(1.445)	(1.000)	(1.472)	(5.548)	(9.209)
Observations	11,856	11,856	11,857	11,857	11,857	11,857	11,857	11,857
Conventional Std. Err.	3.863	5.703	0.856	1.445	1	1.472	5.548	9.209
Conventional p-value	0.881	0.664	0.424	0.655	0.500	0.760	0.452	0.549
Robust p-value	0.900	0.805	0.369	0.278	0.652	0.872	0.495	0.965
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.139	0.0500	0.136	0.0500	0.124	0.0500	0.152	0.0500
BW Bias (b)	0.274	0.0500	0.254	0.0500	0.250	0.0500	0.302	0.0500
Eff. Obs. Left	3654	1521	3604	1521	3409	1521	3874	1521
Eff. Obs. Right	3440	1467	3377	1467	3162	1467	3660	1467

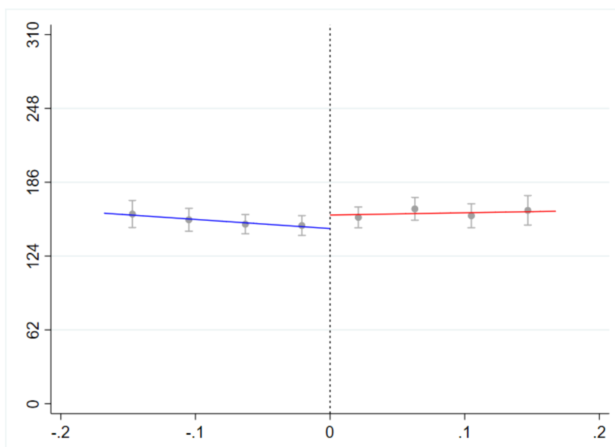
Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by Digestive System Diseases and age group (CID-10 chapter XI). Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Figure 11: Leaders' Health Background Impact on Mortality rate by Illnesses originated in Perinatal Period and age group

(A) 0 to 1 year old



(B) 0 a 4 years old



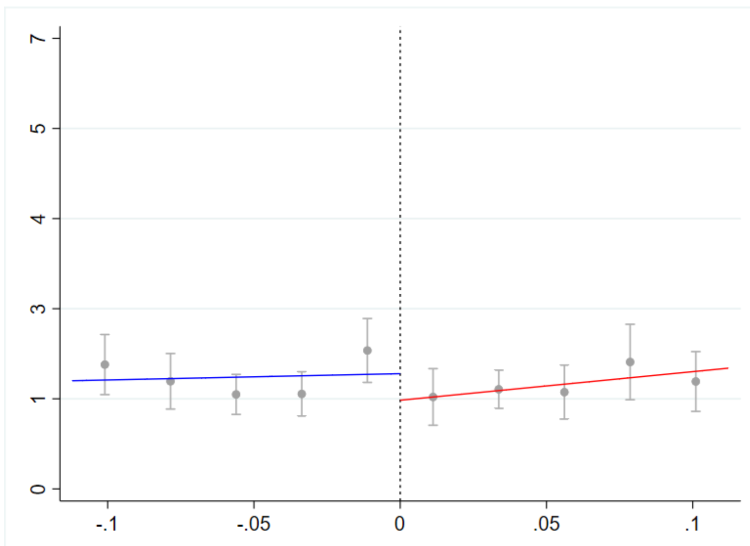
Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter XVI and age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

Table 16: Health Mayor's Impacts on Mortality rates by Illnesses originated in Perinatal Period and age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4
RD_Estimate	75.92*	-3.417	11.37	-1.282
	(40.64)	(68.60)	(6.969)	(11.78)
Observations	11,856	11,856	11,857	11,857
Conventional Std. Err.	40.64	68.60	6.969	11.78
Conventional p-value	0.0617	0.960	0.103	0.913
Robust p-value	0.0594	0.783	0.126	0.871
Order Loc.Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
BW Loc. Poly. (h)	0.169	0.0500	0.168	0.0500
BW Bias (b)	0.417	0.0500	0.384	0.0500
Eff. Obs. Left	4153	1521	4128	1521
Eff. Obs. Right	3914	1467	3890	1467

Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by llnesses originated in Perinatal Period and age group (CID-10 chapter XVI). Optimal Bandwidths of HealthVoteMargins in Columns 1 and 3 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, and 4 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

Figure 12: Leaders' Health Background Impact on Women Mortality rates among 15 and 59 years old by Pregnancy, Childbirth and Puerperium



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by ICD-10 chapter XV per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

Table 17: Health Mayor's Impacts on Women Mortality rates among 15 and 59 years old by Pregnancy, Childbirth and Puerperium and age group

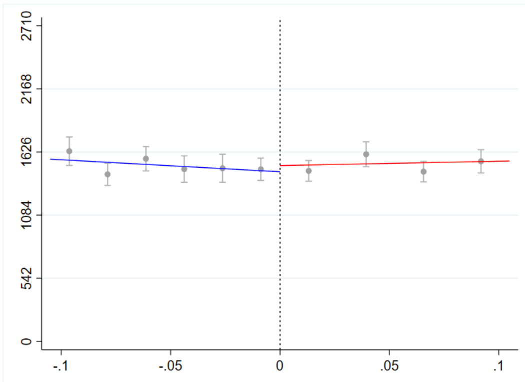
VARIABLES	(1) 15 to 59	(2) 15 to 59
RD_Estimate	-0.393	-0.855**
	(0.272)	(0.400)
Observations	11,857	11,857
Conventional Std. Err.	0.272	0.400
Conventional p-value	0.149	0.0323
Robust p-value	0.128	0.00747
Order Loc.Poly. (p)	1	1
Order Bias (q)	2	2
BW Loc. Poly. (h)	0.112	0.0500
BW Bias (b)	0.234	0.0500
Eff. Obs. Left	3144	1521
Eff. Obs. Right	2924	1467

Notes: This table presents the Health Mayor's Impacts on Mortality rates per 100,000 inhabitants by Women Mortality rates among 15 and 59 years old by Pregnancy, Childbirth and Puerperium (CID-10 chapter XV). Optimal Bandwidths of HealthVoteMargins in Column 1 was estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Column 2 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

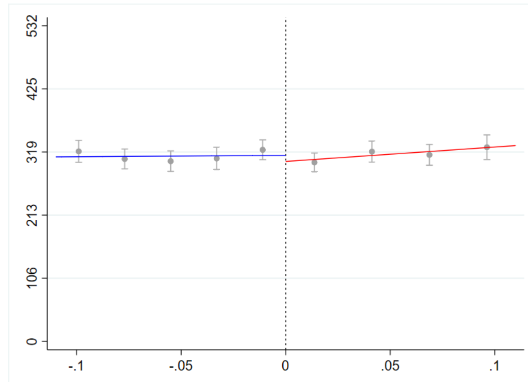
Heterogeneity's results

Figure 13: Heterogeneity: Leaders' Health Background Impact on Mortality rates by age group

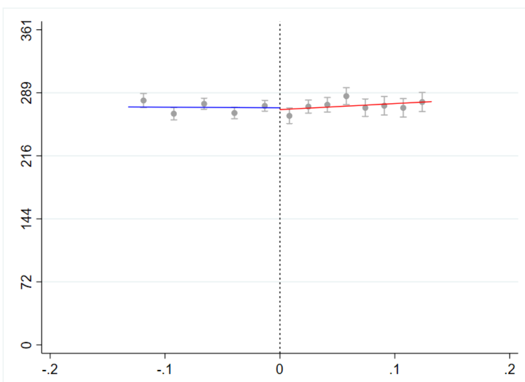
(A) 0 to 1 year old



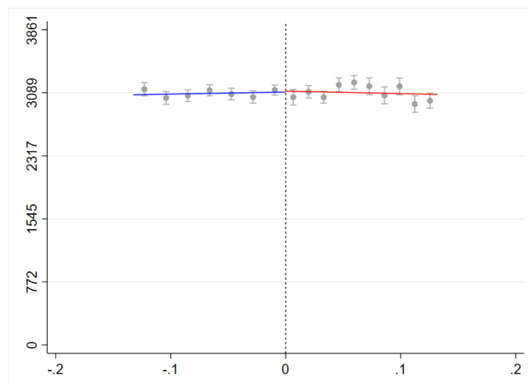
(B) 0 to 4 years old



(C) 15 to 59 years old



(D) 60+ years old



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by age group. Panels A (0 to 1 years old) and B (0 to 4 years old) present the effect of health mayors on the mortality rates from 2005 to 2019 by age group per 1,000 inhabitants. Panels C (15 to 59 years old) and D (60+ years old) present the effect of health mayors on the mortality rates from 2005 to 2019 by age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self elaboration based on RAIS and DATASUS and TSE database.

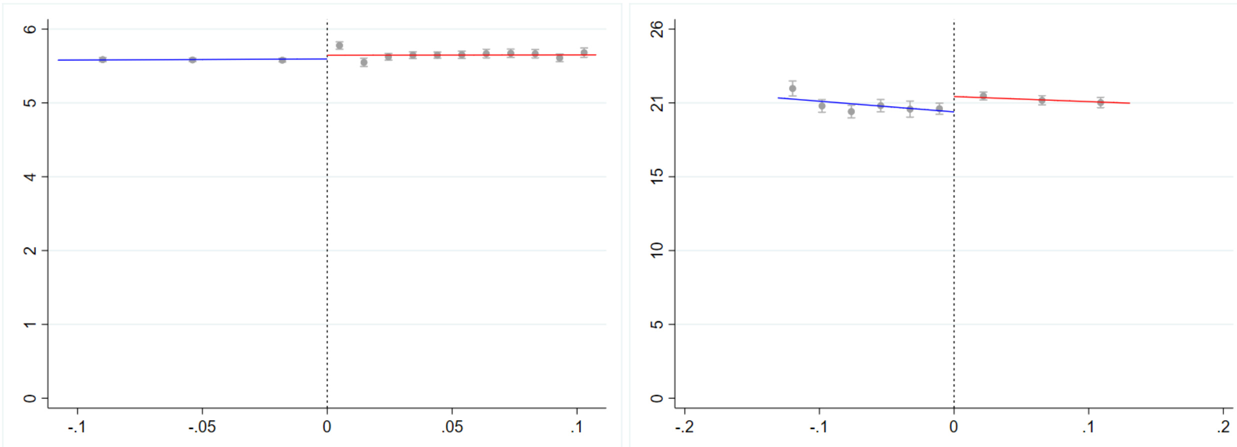
Table 18: Heterogeneity:Health Mayor's Impacts on Mortality rates by age group

VARIABLES	(1) 0 to 1	(2) 0 to 1	(3) 0 to 4	(4) 0 to 4	(5) 15 to 59	(6) 15 to 59	(7) 60+	(8) 60+
RD_Estimate	53.12	-63.09	-10.23	-25.98	-2.116	-16.61*	11.64	-113.9
	(73.01)	(100.2)	(13.39)	(18.68)	(6.460)	(9.176)	(60.75)	(92.33)
Observations	10,265	10,265	10,266	10,266	10,266	10,266	10,266	10,266
Conventional Std. Err.	73.01	100.2	13.39	18.68	6.460	9.176	60.75	92.33
Conventional p-value	0.467	0.529	0.445	0.164	0.743	0.0703	0.848	0.218
Robust p-value	0.595	0.922	0.356	0.578	0.711	0.304	0.863	0.726
Order Loc.Poly. (p)	1	1	1	1	1	1	1	1
Order Bias (q)	2	2	2	2	2	2	2	2
BW Loc. Poly. (h)	0.105	0.0500	0.110	0.0500	0.132	0.0500	0.133	0.0500
BW Bias (b)	0.200	0.0500	0.234	0.0500	0.256	0.0500	0.262	0.0500
Eff. Obs. Left	2577	1319	2686	1319	3042	1319	3049	1319
Eff. Obs. Right	2404	1292	2492	1292	2900	1292	2900	1292

Notes: This table presents the Health Mayor's Impacts Mortality rates by age group from 2005 to 2019. Columns 1 to 4 present the effect of health mayors on the mortality rates per 1,000 inhabitants. Columns 5 to 8 present the effect of health mayors on the mortality rates per 100,000 inhabitants. Optimal Bandwidths of HealthVoteMargins in Columns 1, 3, 5 and 7 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2, 4, 6 and 8 uses the same design but with the input of manual bandwidths of 5%. All estimates include year fixed-effects and cluster by municipality. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on DATASUS, TSE, RAIS database.

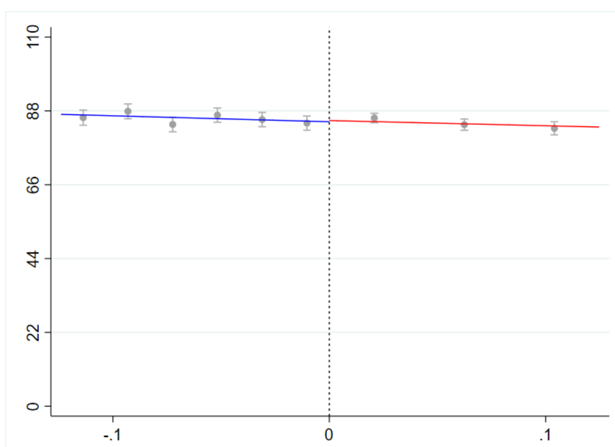
Figure 14: Heterogeneity:Leaders' Health Background Impact in Health Expenditures

(A) Total Expenditures in Health per individual (B) Percentage of Municipality Expenditure in Health



Notes: Graphic representation of Leaders' Health Background Impact in Health Expenditures. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS, SIOPS and TSE database.

Figure 15: Heterogeneity: Leaders' Health Background Impact on the Family Health Strategy



Notes: Graphic representation of Leaders' Health Background Impact on the Family Health Strategy. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS, SIAB, SAPS and TSE database.

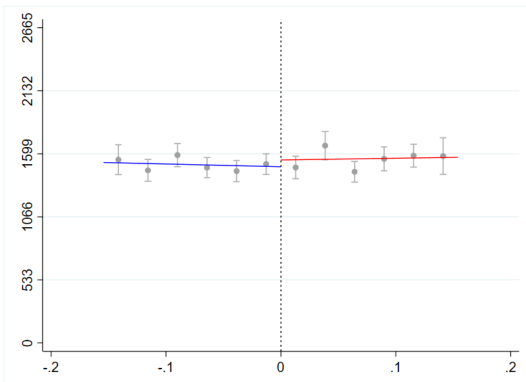
Table 19: Heterogeneity: Health Mayor's Impacts in Health Expenditures

VARIABLES	(1) Total	(2) Total	(3) Percentage	(4) Percentage
RD_Estimate	0.0610	0.0759	1.071***	0.632
	(0.0385)	(0.0549)	(0.391)	(0.571)
Observations	10,222	10,222	10,266	10,266
Conventional Std. Err.	0.0385	0.0549	0.391	0.571
Conventional p-value	0.113	0.167	0.00613	0.268
Robust p-value	0.241	0.0923	0.0206	0.535
Order Loc.Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
BW Loc. Poly. (h)	0.108	0.0500	0.131	0.0500
BW Bias (b)	0.210	0.0500	0.253	0.0500
Eff. Obs. Left	2629	1307	3023	1319
Eff. Obs. Right	2451	1288	2877	1292

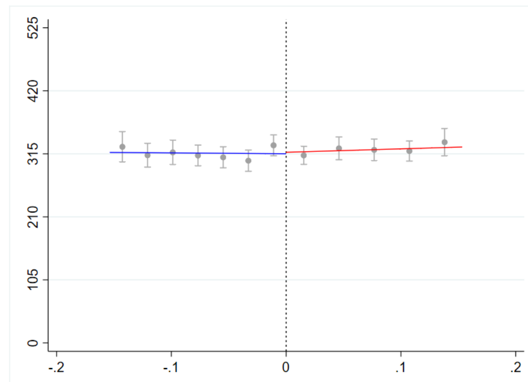
Notes: This table presents the Total Health Expenditure deflated per inhabitant and the Percentage of Municipality Expenditure in Health. Optimal Bandwidths of HealthVoteMargins in Columns 1 and 3 were estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Columns 2 and 4 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIOPS, TSE and RAIS database.

Figure 16: Heterogeneity: Doctors' Impact on Mortality rates by age group

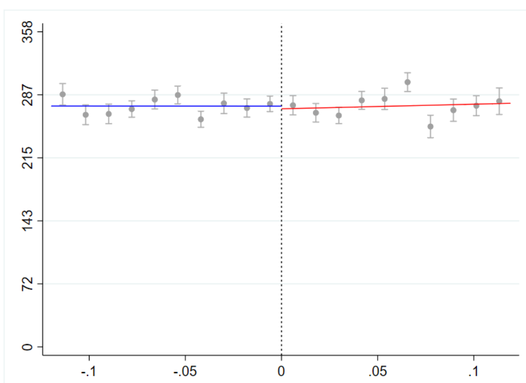
(A) 0 to 1 year old



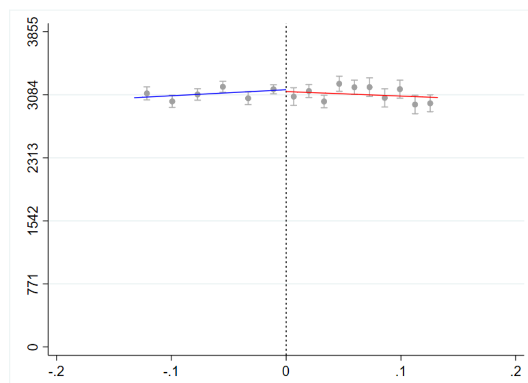
(B) 0 to 4 years old



(C) 15 to 59 years old



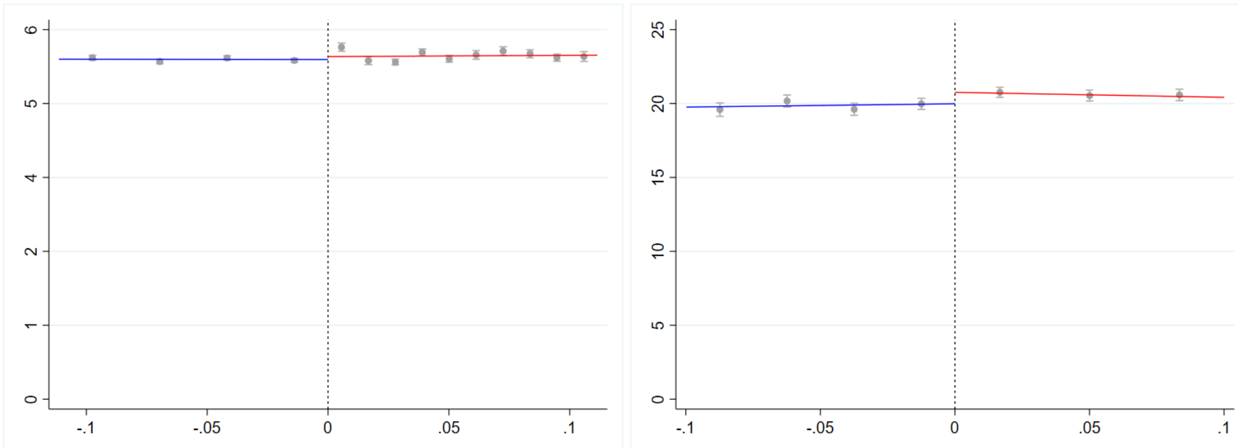
(D) 60+ years old



Notes: Graphic representation of Leaders' Health Background Impact on Mortality rates by age group. Panels A (0 to 1 years old) and B (0 to 4 years old) present the effect of health mayors on the mortality rates from 2005 to 2019 by age group per 1,000 inhabitants. Panels C (15 to 59 years old) and D (60+ years old) present the effect of health mayors on the mortality rates from 2005 to 2019 by age group per 100,000 inhabitants. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS and DATASUS and TSE database.

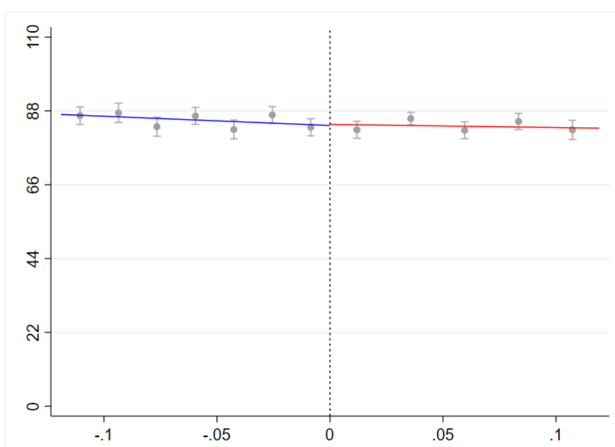
Figure 17: Heterogeneity: Doctors' Impact in Health Expenditures

(A) Total Expenditures in Health per individual (B) Percentage of Municipality Expenditure in Health



Notes: Graphic representation of Leaders' Health Background Impact in Health Expenditures. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS, SIOPS and TSE database.

Figure 18: Heterogeneity: Doctors' Health Background Impact on the Family Health Strategy



Notes: Graphic representation of Leaders' Health Background Impact on the Family Health Strategy. Margins of victory estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. All estimates include year fixed-effects and cluster by municipality. Confidence intervals of 95%. Source: Self-elaboration based on RAIS, SIAB, SAPS and TSE database.

Table 20: Heterogeneity: Doctors' Impacts in in Health Expenditures

VARIABLES	(1) Total	(2) Total	(3) Percentage	(4) Percentage
RD_Estimate	0.0475	0.0654	0.787*	0.765
	(0.0406)	(0.0599)	(0.449)	(0.623)
Observations	8,565	8,565	8,601	8,601
Conventional Std. Err.	0.0406	0.0599	0.449	0.623
Conventional p-value	0.242	0.276	0.0794	0.219
Robust p-value	0.339	0.0762	0.0583	0.503
Order Loc.Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
BW Loc. Poly. (h)	0.112	0.0500	0.100	0.0500
BW Bias (b)	0.210	0.0500	0.224	0.0500
Eff. Obs. Left	2288	1134	2088	1144
Eff. Obs. Right	2110	1071	1960	1075

Notes: This table presents the Health Mayor's Impacts in the *Estratégia Saúde da Família*. Optimal Bandwidths of HealthVoteMargins in Column 1 was estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Column 2 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIAB, SAPS, TSE and RAIS database.

Table 21: Heterogeneity: Doctors' Impacts on the Family Health Strategy

VARIABLES	(1) PSF	(2) PSF
RD_Estimate	0.327	-0.402
	(2.696)	(4.333)
Observations	8,601	8,601
Conventional Std. Err.	2.696	4.333
Conventional p-value	0.903	0.926
Robust p-value	0.745	0.769
Order Loc.Poly. (p)	1	1
Order Bias (q)	2	2
BW Loc. Poly. (h)	0.119	0.0500
BW Bias (b)	0.241	0.0500
Eff. Obs. Left	2428	1144
Eff. Obs. Right	2230	1075

Notes: This table presents the Health Mayor's Impacts on the Family Health Strategy. Optimal Bandwidths of HealthVoteMargins in Column 1 was estimated using local polynomial Regression Discontinuity (RD) point estimators with robust bias-corrected confidence intervals and inference procedures based on Calonico, Cattaneo e Titiunik (2014), Calonico, Cattaneo, Farrell e Titiunik (2019), e Calonico, Cattaneo e Farrell (2020) models. Linear specification and uniform kernel. Column 2 uses the same design but with the input of manual bandwidths of 5%. Standard errors are reported in parenthesis. Stars indicate significance of the estimated difference between control and treatment group: *** p<0.01, ** p<0.05, * p<0.1. Source: Self-elaboration based on SIAB, SAPS, TSE and RAIS database.