Appendix 1:
Complex analysis on the effects of PMC on specific outcomes of interest

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Impact of PMC on older people's use of outpatient health services

In Brazil as in other countries, research on health service use by older people is strongly focussed on inpatient hospital provision (Melo Silva et al, 2018). There is evidence that outpatient service use in Brazil is strongly associated with older age (Szwarcwald, Souza-Júnior and Damacena, 2010). Although older people account for a large and growing share of primary health provider caseloads in all countries, there has been almost no research about patterns of service use, such as planned versus unplanned visits (Surate Solaligue, Hederman and Martin, 2014). Unplanned visits represent a greater drain on primary health budgets and are more likely to result in hospital admissions. As such, to there is an urgent need for new interventions which are better tailored to the needs of this population and which improve interface with health services.

Our analysis examines two hypothetical effects. First, that participating in PMC is associated with higher frequency of planned versus unplanned health visits. Second, that participating in PMC is associated with a lower frequency of visits for hypertension control.

Data and methods

Data

The project evaluation team were granted ethical approval and access to anonymised patient record data for the local health department of Belo Horizonte municipal government. These data refer to visits made by people aged 60 and over to the city's 76 SUS health posts from the start of April 2018 to the end of June 2018. These records include users' addresses, as well as their age and sex, and an individual patient number. We also include distance from household to health centre and UTM household coordinates in the matching and analysis.

National data sets have some limitations. Sample sizes do not allow for local level analysis required to study the effects of specific municipal interventions. Spatially disaggregated analysis is of particular importance in countries such as Brazil because local socio-economic disparities within cities are very marked. For example, a study of 275 micro-districts of Belo Horizonte found life expectancy at birth ranged from 69.8 to 82.0 years in 2010 (Costa and Oliveira Marguti, 2015).

In recent years, the city government of Belo Horizonte has started to collect and process administrative data on outpatient health service use in a form that lends itself to analysis. These data include visits made by people aged 60 and over to the city's 76 SUS health posts from since April 2018. These records include users' addresses, as well as their age and sex, and an individual patient number. The project team were granted ethical approval and access to anonymised patient data for the period April to June 2018. These data included individual patient numbers, which it was possible to match with those of older people enrolled in PMC.

Due to the targeted nature of PMC and its focus on poorer neighbourhood, characteristics of older people enrolled in the scheme of relevance to our analysis were likely to differ from the city's older population in general, even when controlling for age and sex. Consequently, simple comparisons between older people enrolled in PMC and other older people were not possible without including mediating effects. The local health department data set does not include additional personal data, such as socio-economic or health status. It was, however, possible to use patient addresses to construct a proxy indicator of socio-economic status based on a separate data set for 275 micro-districts with average populations of 8,546 (standard deviation 9752) (Costa and Oliveira Marguti, 2015). A limitation of this approach is it assumes there is not a significant degree of socio-economic heterogeneity within each micro-district. Nonetheless, key informants from the city validated this assumption and a similar level of spatial socio-economic sorting have been observed for other cities in Brazil (Glebbeek and Koonings, 2016).

Methods

The objective of our analytical model is estimating causal treatment effects of being enrolled in PMC on two relevant health outcomes, namely access to planned attentions and hypertension attentions in primary health care. Therefore, this study falls under a causal counterfactual framework (Rubin, 1983), where we focus on the estimation of two different treatment effects of PMC on access to rehabilitation services and to the planned medical attentions. The effects are the average treatment effect on the treated (ATT).

In this case, due to the nonrandomised nature of our data, we use a Propensity Score Matching (PSM) technique which allows for an unbiased estimation of the effects of the treatment assignment on the outcomes of interest (Rosembaum and Rubin, 1983). The procedure consists in mimicking a randomization process by subsampling a group of potentially comparable units on all observed characteristics to the treatment group. By doing that, PSM attempts to reduce confounding variables and selection bias through the construction of a balanced sample of the treatment and pseudo control groups, either through pairing certain observations or computing weights for the universe of units.

We started by examining differences between PMC and non-PMC by using Independent t-tests with two tails for continuous variables and binomial tests for dichotomous variables in individual characteristics such as sex, age and also in socioeconomic factors such as in the household dependency on elderly, the social vulnerability index and life expectancy. Additionally, we used household geographical coordinates in the analysis.

Considering the observational nature of our study, were only is possible to observe either Y_1 or Y_0, the estimation of an unbiased ATT is conditional on the observed treatment group, which is noted as $\widehat{\mathrm{ATT}} = \mathrm{E}(\mathrm{Y}_1 - \mathrm{Y}_0|\mathrm{Z} = 1)$. Operationally, the first step of PSM consists in the estimation of the probabilities of receiving the treatment given some observed variables PMC for each patient. This is achieved through a logistic model, which is noted as follows:

$$P(PM\mathrm{C} = 1) = \beta_0 + \beta_1 PMC + \beta_2 X + \epsilon$$

Where $\mathrm{P}\ (\mathrm{PMC} = 1)$ represents the predicted probability of belonging to PMC and X are the vector of observed characteristics that are considered to be appropriate confounders associated with the treatment condition and the outcomes.

The individual propensity scores are used in a second step towards matching similar observations using the nearest neighbour matching technique, with a ratio of 1:1 treatment to the comparison group, a maximum calliper of 0.1 standard deviation of propensity scores between groups. We allowed the possibility of comparison units be matched to more than one treated unit. As a robustness analysis, we replicate the matching process and inferential models using different matching parameters, such a different calliper (.001), not allowing to match to more than one treated unit, and using full matching in terms of minimizing a weighted average of the estimated distance measure between each treated subject and each control subject within each subclass. In all cases, observations that are outside the range of common support are discarded from the matching. Common support region analysis is found in the Appendix.

In order to estimate the ATT effects of PMC on our variables of interest, we estimate multivariate logistic regressions adjusting for the same confounding factors used on the PSM to further eliminate residual imbalance. In both cases, we use regression weights estimated during the matching process in order to balance observations, such as in:

$$\hat{y} = \beta_0 + \beta_1 PMC + \beta_2 X + \epsilon$$

Where β_1 represents the log odds associated to belonging to PMC on the outcome variable $\hat{y}$, and β_2 are the set of coefficients to the vector of X observed characteristics that are considered to be appropriate confounders associated with the treatment condition and the outcomes. We present results as odd ratios. Alpha levels are set at .05.

We test estimate possible bias from unobserved factors that may affect inferences about treatment effects using Rosenbaum bounds sensitivity analysis (Rosenbaum, 1991). Under this context, $\Gamma = 1$ mimics a randomized experiment where matched subjects have equal chances of belonging to the treatment group, while larger values of Γ without changes on the p-values suggest matched pairs are less susceptible to bias.

We used ARCGIS PRO v.2.4.1 for computing spatial variables and R core team (2013) with the following packages: MatchIt (Ho, King and Stuart, 2011), logistf (Heinze et al, 2016), SensitivityR5 (Ngendahimana, 2017), ggplot2 (Wickham et al, 2016) and survey (Lumley, 2019).

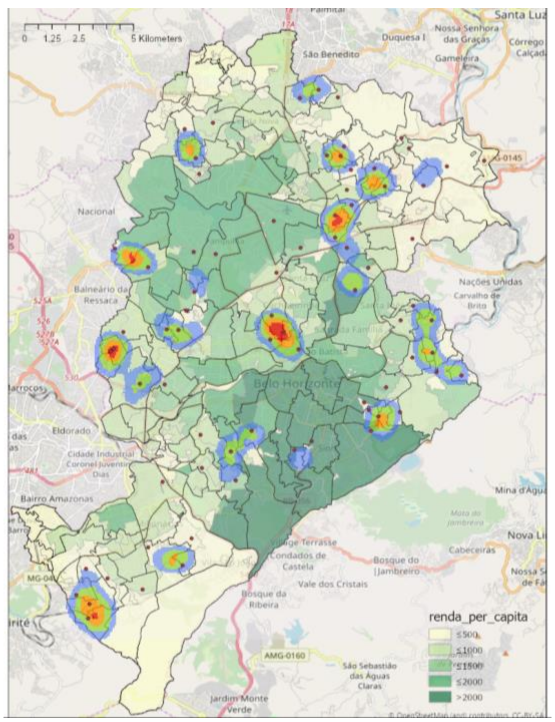
Results

Descriptive findings

From the start of April 2018 to the end of June 2018 the average total number of visits by older people to each of the 76 health posts was 1,150.7 (standard deviation of 920.61). Across all 76 posts, there were 87,455 visits by older people, involving 24,554 different individuals. As such, each of these older individuals made a personal average of 3.52 visits over the three-month period (standard deviation of 3.25). Conversely, the data indicate that the large majority (8.1 %) of people aged 60 or more living in the municipality made no visits to a SUS health post over this time period (Belo Horizonte has 300,000 people over 60). Of those older people who made at least one visit to a health post over this period, 366 were enrolled in PMC, representing 19% of its membership.

The descriptive finding that a large percentage of older people in Belo Horizonte made no visit to a SUS health post is in itself of interest, indicating that older people's engagement with the city's supposedly universal public primary health care system was limited. Spatial analysis of the access to primary public health services reveals a high level of socioeconomic segregation. Figure 1 shows a kernel density map of households which made use of SUS health posts during the study period. It shows that both the location of these health posts and household utilisation were heavily concentrated in low-income neighbourhoods, which are represented by the light green polygons in the map (less than 1000 reais of income per capita). The low number of visits from more affluent neighbourhoods is likely to reflect a higher rate of private health service utilisation by older people in those areas, supporting evidence from other studies that rich older people go to private health (Szwarcwald, Souza-Júnior and Damacena, 2010). It suggests that socio-economic differentials between the PMC and non-PMC SUS users are likely to be smaller than they would be if utilisation was more evenly spread across different neighbourhoods.

Figure 1: Kernel density map of Belo Horizonte – use of health services by people over 60 in months April to June 2018.



Matching and inferential analysis

Based on that, we built 4 different datasets for each outcome variable according to specific parameters for the matching process showing summary statistics of the demographic characteristics of respondents and neighborhood areas (SEAs) differentiating between PMC and non-PMC patients. We focus onwards on the matched data with caliper 1. For instance, Tables 1 and 2 show summary statistics for unmatched (columns 2 and 3) and matched data with caliper .01 SD (columns 5 and 6). After matching, PMC recipients and non-recipients on the estimated propensity score, covariate differences were substantially reduced to non-significant differences.

We observe, in the case of hypertension attentions, a total of 26,348 observations where 510 belong to PMC (1.9%), while the dataset to study planned attentions displays 61,129 units where 1.317 observations are identified as belonging to PMC (2.2%). Visits to control hypertension and planned visits represent 48% and 45% of total visits in the period for non PMC beneficiaries. Descriptive statistics for all additional models can be found in the Appendix.

Table 1: Descriptive statistics – pre and post matching (hypertension visits)

	Sample (Outcome = hypertension)			Matched pairs (Outcome = hypertension) – caliper .01		
Characteristic	0, N = 26,138[1]	1, N = 510[1]	p-value[2]	Non PMC, N = 428[1]	PMC, N = 470[1]	p-value[2]
Sex	8,355 (32%)	133 (26%)	0.005	112 (26%)	122 (26%)	>0.9
Age	68 (64, 75)	78 (70, 84)	<0.001	75 (69, 82)	76 (70, 82)	0.2
Month			>0.9			0.7
April	9,462 (36%)	186 (36%)		166 (39%)	170 (36%)	
June	7,384 (28%)	141 (28%)		112 (26%)	132 (28%)	
May	9,292 (36%)	183 (36%)		150 (35%)	168 (36%)	
UTM Easting	609,445 (604,527, 612,848)	609,803 (605,519, 612,902)	0.4	609,772 (605,340, 612,640)	609,621 (605,390, 612,703)	0.7
UTM Northing	7,798,942 (7,795,095, 7,802,850)	7,799,000 (7,794,381, 7,805,355)	0.7	7,798,889 (7,794,288, 7,803,574)	7,799,000 (7,794,475, 7,804,121)	0.4
Social vulnerability index	0.43 (0.39, 0.49)	0.44 (0.40, 0.49)	<0.001	0.44 (0.40, 0.49)	0.44 (0.40, 0.49)	>0.9
Economic dependency on elderly	1.46 (0.88, 1.85)	1.62 (1.16, 1.93)	<0.001	1.62 (1.14, 1.87)	1.62 (1.07, 1.92)	0.9
Life expectancy	71.38 (69.20, 73.42)	70.79 (68.50, 72.76)	<0.001	71.01 (68.58, 72.76)	71.01 (68.50, 72.80)	>0.9
Income per capita	419 (318, 556)	373 (292, 504)	<0.001	402 (305, 504)	402 (305, 510)	>0.9
Distance Health Center	419 (279, 578)	408 (275, 567)	0.3	406 (264, 583)	435 (292, 581)	0.4
Hypertension visit	12,543 (48%)	183 (36%)	<0.001	200 (47%)	171 (36%)	0.002

[1]Statistics presented: n (%); median (IQR)
[2]Statistical tests performed: chi-square test of independence; Wilcoxon rank-sum test

Table 2: Descriptive statistics – pre and post matching (planned visits)

	Sample (Outcome = planned visits)			Matched pairs (Outcome = planned visits) – caliper .01		
Characteristic	0, N = 59,812[1]	1, N = 1,317[1]	p-value[2]	Non PMC, N = 1,185[1]	PMC, N = 1,261[1]	p-value[2]
Sex	19,487 (33%)	373 (28%)	0.001	325 (27%)	367 (29%)	0.4
Age	68 (64, 75)	79 (71, 85)	<0.001	78 (70, 84)	78 (71, 84)	0.2
Month			0.4			0.4
April	21,498 (36%)	489 (37%)		428 (36%)	461 (37%)	
June	17,134 (29%)	355 (27%)		351 (30%)	345 (27%)	
May	21,180 (35%)	473 (36%)		406 (34%)	455 (36%)	
UTM Easting	609,455 (604,703, 612,913)	609,813 (605,439, 612,932)	0.4	609,972 (605,394, 612,748)	609,793 (605,411, 612,813)	0.8
UTM Northing	7,799,066 (7,795,080, 7,803,396)	7,798,510 (7,794,117, 7,803,848)	0.001	7,798,277 (7,793,720, 7,803,541)	7,798,489 (7,794,117, 7,803,678)	0.4
Social vulnerability index	0.44 (0.38, 0.49)	0.45 (0.42, 0.49)	<0.001	0.45 (0.42, 0.49)	0.45 (0.42, 0.49)	0.11
Economic dependency on elderly	1.54 (0.89, 1.85)	1.62 (1.17, 1.86)	<0.001	1.62 (1.00, 1.86)	1.62 (1.17, 1.86)	0.7
Life expectancy	71.38 (69.20, 73.42)	70.79 (68.50, 72.76)	<0.001	70.53 (68.50, 72.76)	70.79 (68.50, 72.76)	0.3
Income per capita	419 (318, 556)	373 (305, 504)	<0.001	359 (299, 504)	373 (305, 504)	0.2
Distance Health Center	420 (280, 578)	408 (267, 567)	0.056	416 (276, 572)	408 (272, 572)	0.8
Planned visit	26,786 (45%)	695 (53%)	<0.001	516 (44%)	664 (53%)	<0.001

[1]Statistics presented: n (%); median (IQR)

[2]Statistical tests performed: chi-square test of independence; Wilcoxon rank-sum test

Focusing on the estimation of ATT, the matching process retrieved 898 observations (470 treatment and 428 for potential comparisons) and 2,446 observations (1,185 treatment and 1,261 for potential comparisons) for the Hypertension and Planned samples, respectively. In all cases, it is possible to observe that all differences between covariates become non-significant in the matched sample. Turning to Table 3, we observe across all models that a significant negative association of belonging to PMC and having a hypertension attention in comparison to other type of attentions, holding all other variables constant. Odds ratios range from 0.37 (CI 95% 0.26, 0.51) to 0.47 (CI 95% 0.35, 0.63). Conversely, Table 4 shows a significant positive association of belonging to PMC and increase odds of having a planned attention in comparison to unplanned attentions across all models, ranging from 1.41 (CI 95% 1.24, 1.61) to 1.67 (CI 95% 1.38, 2.02) and receiving a rehabilitation medical attention in comparison to other reasons for attendance, holding all other variables constant.

Sensitivity tests became significant in a range of $\Gamma = 1.4$ and 1.7 for hypertension visits and $\Gamma = 1.2$ and 1.3 for planned attentions, suggesting a higher insensitivity to hidden bias specially in the case of matched for the hypertension attention analysis.

Table 3: Odds ratios of Hypertension visits after propensity score matching

	Caliper = .01, replace			Caliper = .001, replace			Caliper = .001, without replace			Full matching		
Characteristic	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value
PMC	0.47	0.35, 0.63	<0.001	0.37	0.26, 0.51	<0.001	0.44	0.31, 0.61	<0.001	0.52	0.43, 0.64	<0.001
Sex	0.87	0.62, 1.21	0.4	1.23	0.85, 1.79	0.3	0.98	0.67, 1.42	>0.9	1.38	1.30, 1.47	<0.001
Age	1.03	1.01, 1.05	0.004	1.03	1.01, 1.06	0.008	1.06	1.03, 1.08	<0.001	1.01	1.01, 1.02	<0.001
Social vulnerability index	0.00	0.00, 13.1	0.2	0.02	0.00, 267	0.4	0.01	0.00, 124	0.3	30.3	3.69, 250	0.002
Economic dependency on elderly	0.80	0.43, 1.47	0.5	1.00	0.51, 1.92	>0.9	0.91	0.47, 1.73	0.8	0.62	0.52, 0.75	<0.001
Income per capita	1.00	1.00, 1.00	0.5	1.00	1.00, 1.00	0.7	1.00	1.00, 1.00	0.6	1.00	1.00, 1.00	0.009
Life expectancy	0.74	0.61, 0.89	0.002	0.96	0.77, 1.21	0.7	0.87	0.70, 1.09	0.2	1.09	1.05, 1.13	<0.001
UTM Easting	1.00	1.00, 1.00	0.5	1.00	1.00, 1.00	0.7	1.00	1.00, 1.00	0.2	1.00	1.00, 1.00	0.3
UTM Northing	1.00	1.00, 1.00	0.7	1.00	1.00, 1.00	>0.9	1.00	1.00, 1.00	0.14	1.00	1.00, 1.00	0.2
Month												
April	—	—		—	—		—	—		—	—	
June	1.15	0.79, 1.68	0.5	1.07	0.70, 1.65	0.7	0.90	0.60, 1.36	0.6	1.11	1.03, 1.19	0.004
May	0.88	0.62, 1.25	0.5	0.99	0.66, 1.49	>0.9	0.72	0.48, 1.08	0.11	0.86	0.81, 0.92	<0.001
Fixed effects (GP)	*Yes*			*Yes*			*Yes*			*Yes*		

[1]OR = Odds Ratio, CI = Confidence Interval

Table 4: Odds ratios of Planned visits after propensity score matching

	Caliper = .01, replace			Caliper = .001, replace			Caliper = .001, without replace			Full matching		
Characteristic	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value
PMC	1.53	1.29, 1.82	<0.001	1.64	1.35, 1.98	<0.001	1.67	1.38, 2.02	<0.001	1.41	1.24, 1.61	<0.001
Sex	0.77	0.63, 0.94	0.010	0.84	0.68, 1.04	0.10	0.88	0.71, 1.09	0.2	0.87	0.83, 0.91	<0.001
Age	1.00	0.99, 1.02	0.4	1.00	0.99, 1.01	>0.9	1.01	1.00, 1.02	0.15	1.00	.99, 1.00	0.14
Social vulnerability index	0.00	0.00, 0.06	0.002	0.00	0.00, 0.03	0.002	0.00	0.00, 0.07	0.004	0.00	0.00, 0.07	<0.001
Economic dependency on elderly	2.77	1.89, 4.12	<0.001	2.41	1.57, 3.72	<0.001	2.02	1.36, 3.04	<0.001	5.13	4.49, 5.86	<0.001
Income per capita	1.00	1.00, 1.00	0.8	1.00	1.00, 1.00	0.8	1.00	1.00, 1.00	0.5	1.00	1.00, 1.00	<0.001
Life expectancy	0.90	0.80, 1.01	0.063	0.89	0.78, 1.00	0.057	0.84	0.74, 0.95	0.005	0.80	0.79, 0.83	0.005
UTM Easting	1.00	1.00, 1.00	>0.9	1.00	1.00, 1.00	0.5	1.00	1.00, 1.00	0.2	1.00	1.00, 1.00	<0.001
UTM Northing	1.00	1.00, 1.00	0.3	1.00	1.00, 1.00	0.011	1.00	1.00, 1.00	0.11	1.00	1.00, 1.00	0.99
Month												
April	—	—		—	—		—	—		—	—	
June	1.12	0.90, 1.39	0.3	1.13	0.89, 1.43	0.3	1.10	0.87, 1.40	0.4	.94	0.89, 0.98	0.04
May	1.04	0.85, 1.27	0.7	1.00	0.80, 1.26	>0.9	0.99	0.79, 1.24	>0.9	0.89	0.85, 0.94	<0.001
Fixed effects (GP)	*Yes*			*Yes*			*Yes*			*Yes*		

[1]OR = Odds Ratio, CI = Confidence Interval

Discussion and conclusion

Our multivariate analysis, which controls for potential confounding effects, shows that there was a statistically significant association for being included in the PMC programme and making use of health visits related associated with a higher proportion of health visits that were planned, as opposed to unplanned, when compared to a matched set of older people in Belo Horizonte who were not included in PMC. Applying the same analytical method, we find that being included in PMC was significantly associated with a lower proportion of health visits for hypertension control, as opposed to other motives for visits.

There are no published studies for Brazil or any other countries which specifically analyse patterns and determinants of unplanned or emergency visits of older people to non-hospital based providers. Consequently, the finding of this analysis provides a unique insight into patterns of service use by older people. With reference to the UK, Surate Solaligue et al (2014) observe:

"there has been little attention to acuity of presentation to GPs during the working week, and in particular, multi-morbid community-dwelling older person's utilization of planned and unplanned GP care."

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Appendix

Hypertension visits

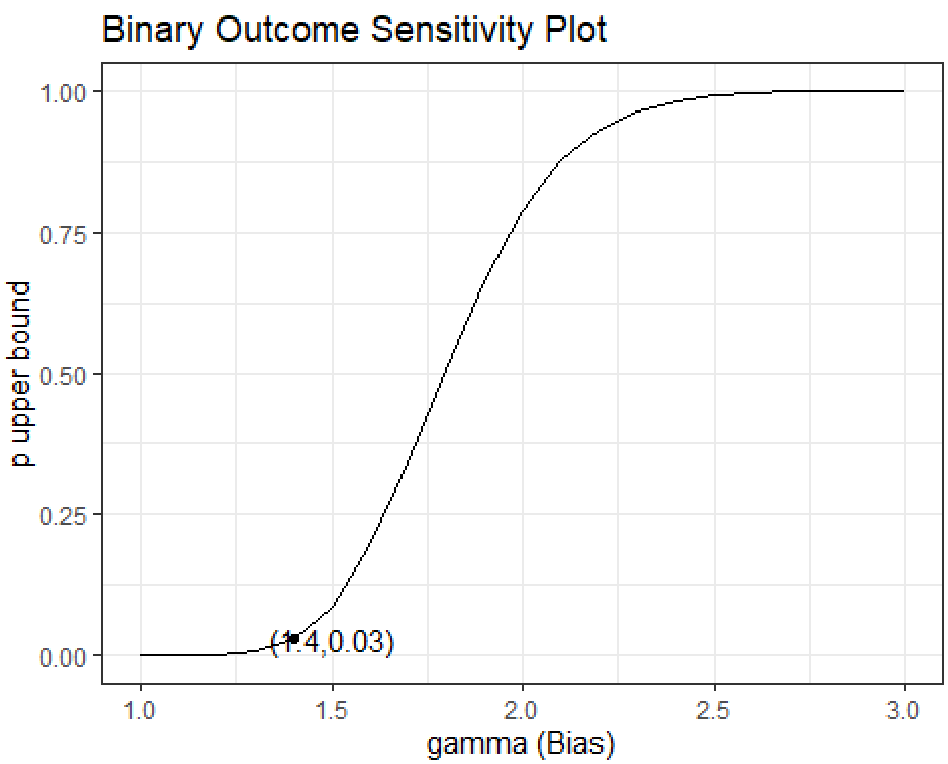
	Table 1			Table 2			Table 3		
Characteristic	0, N = 366[1]	1, N = 402[1]	p-value[2]	0, N = 386[1]	1, N = 386[1]	p-value[2]	0, N = 23,266[1]	1, N = 510[1]	p-value[2]
Sex	99 (27%)	111 (28%)	>0.9	100 (26%)	108 (28%)	0.6	7,407 (32%)	133 (26%)	0.007
Age	74 (68, 81)	73 (68, 81)	0.7	75 (68, 81)	73 (68, 80)	0.3	69 (64, 75)	78 (70, 84)	<0.001
M_SATEND			0.4			0.4			>0.9
Abril	117 (32%)	146 (36%)		134 (35%)	143 (37%)		8,374 (36%)	186 (36%)	
Junho	114 (31%)	112 (28%)		129 (33%)	111 (29%)		6,631 (29%)	141 (28%)	
Maio	135 (37%)	144 (36%)		123 (32%)	132 (34%)		8,261 (36%)	183 (36%)	
XGEO	609,608 (605,191, 612,644)	609,818 (605,411, 612,902)	0.5	609,754 (605,168, 612,648)	609,818 (605,411, 612,813)	0.7	609,469 (604,541, 612,739)	609,803 (605,519, 612,902)	0.4
YGEO	7,798,720 (7,794,395, 7,803,544)	7,798,887 (7,794,489, 7,803,367)	0.5	7,799,009 (7,794,442, 7,803,560)	7,798,768 (7,794,558, 7,802,958)	>0.9	7,798,787 (7,794,878, 7,802,750)	7,799,000 (7,794,381, 7,805,355)	0.2
SVI	0.45 (0.40, 0.49)	0.44 (0.40, 0.49)	0.8	0.45 (0.40, 0.49)	0.44 (0.39, 0.49)	>0.9	0.44 (0.38, 0.49)	0.44 (0.40, 0.49)	<0.001
Economic_depend_elderly	1.66 (1.17, 1.86)	1.54 (0.89, 1.86)	0.2	1.62 (1.03, 1.85)	1.54 (0.89, 1.86)	0.6	1.54 (0.88, 1.86)	1.62 (1.16, 1.93)	<0.001
Life_expectancy	71.01 (68.50, 72.76)	71.01 (68.50, 73.28)	0.8	71.08 (68.58, 73.28)	71.01 (68.50, 73.33)	0.7	71.38 (69.20, 73.34)	70.79 (68.50, 72.76)	<0.001

	Table 1			Table 2			Table 3		
Characteristic	0, N = 366[1]	1, N = 402[1]	p-value[2]	0, N = 386[1]	1, N = 386[1]	p-value[2]	0, N = 23,266[1]	1, N = 510[1]	p-value[2]
Income_per_capita	402 (305, 504)	402 (305, 549)	0.8	406 (305, 549)	402 (305, 553)	0.7	419 (318, 555)	373 (292, 504)	<0.001
Distance_Health_C	425 (267, 600)	447 (292, 580)	0.9	437 (284, 600)	449 (296, 580)	0.6	419 (276, 583)	408 (275, 567)	0.3
hiper	204 (56%)	145 (36%)	<0.001	201 (52%)	139 (36%)	<0.001	11,281 (48%)	183 (36%)	<0.001
subclass							225 (163, 237)	256 (128, 371)	<0.001

[1]Statistics presented: n (%); median (IQR)
[2]Statistical tests performed: chi-square test of independence; Wilcoxon rank-sum test

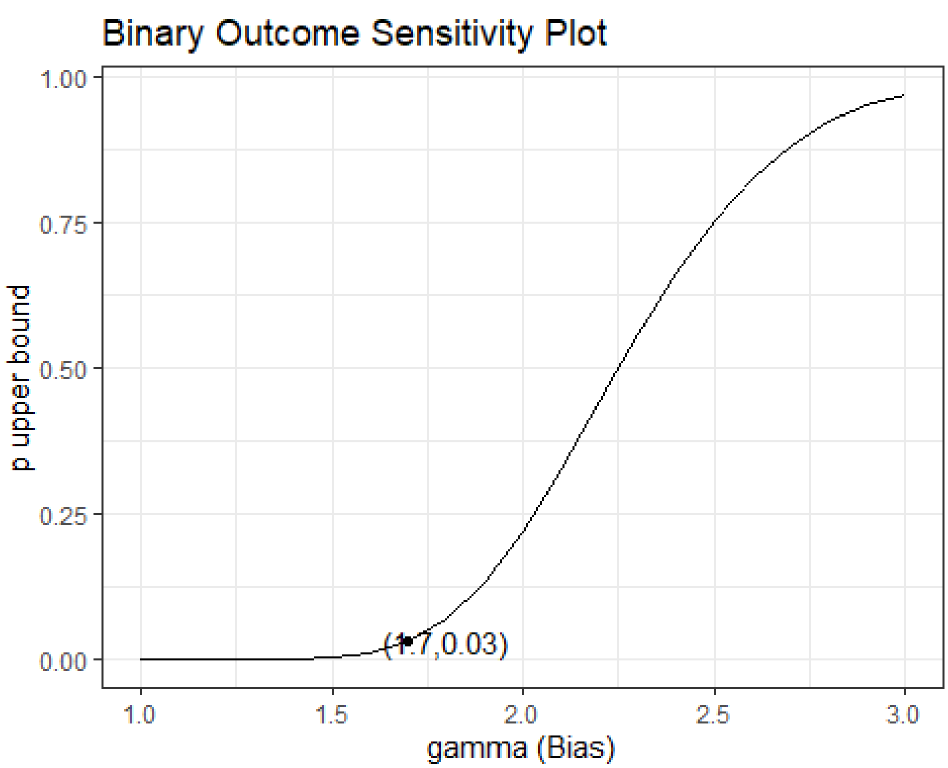
Sensitivy analysis

```
## $Gamma
## [1] 3
##
## $GammaInc
## [1] 0.1
##
## $pval
## [1] 4.005619e-06
##
## $msg
## [1] "Rosenbaum Sensitivity Test \n"
##
## $bounds
##    Gamma Lower bound Upper bound
## 1    1.0           0     0.00000
## 2    1.1           0     0.00010
## 3    1.2           0     0.00111
## 4    1.3           0     0.00723
## 5    1.4           0     0.03007
## 6    1.5           0     0.08761
## 7    1.6           0     0.19278
## 8    1.7           0     0.34028
## 9    1.8           0     0.50637
## 10   1.9           0     0.66218
## 11   2.0           0     0.78762
## 12   2.1           0     0.87646
## 13   2.2           0     0.93297
## 14   2.3           0     0.96579
## 15   2.4           0     0.98344
## 16   2.5           0     0.99235
## 17   2.6           0     0.99660
## 18   2.7           0     0.99854
## 19   2.8           0     0.99939
## 20   2.9           0     0.99975
## 21   3.0           0     0.99990
##
## $note
## [1] "Note: Gamma is Odds of Differential Assignment To\n Treatment Due to Unob
served Factors \n"
##
## $plot
```



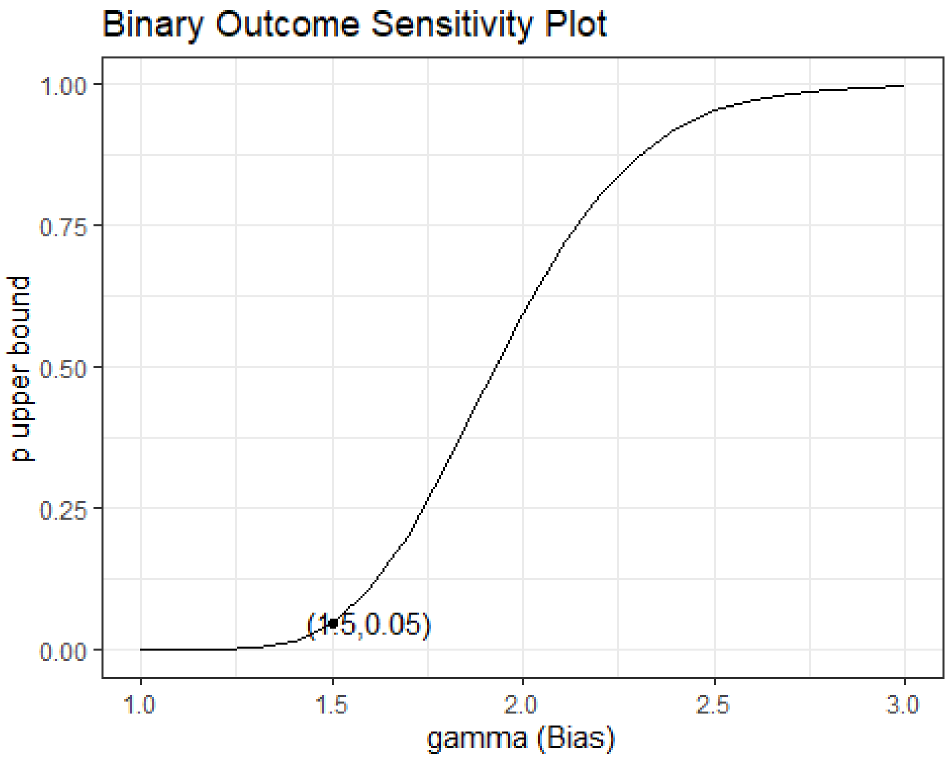

```
## $Gamma
## [1] 3
##
## $GammaInc
## [1] 0.1
##
## $pval
## [1] 1.759079e-08
##
## $msg
## [1] "Rosenbaum Sensitivity Test \n"
##
## $bounds
##    Gamma Lower bound Upper bound
## 1    1.0           0     0.00000
## 2    1.1           0     0.00000
## 3    1.2           0     0.00001
## 4    1.3           0     0.00011
## 5    1.4           0     0.00074
## 6    1.5           0     0.00338
## 7    1.6           0     0.01163
## 8    1.7           0     0.03152
## 9    1.8           0     0.07020
## 10   1.9           0     0.13293
## 11   2.0           0     0.22019
## 12   2.1           0     0.32673
## 13   2.2           0     0.44309
```

```
## 14   2.3           0     0.55860
## 15   2.4           0     0.66423
## 16   2.5           0     0.75423
## 17   2.6           0     0.82638
## 18   2.7           0     0.88124
## 19   2.8           0     0.92110
## 20   2.9           0     0.94892
## 21   3.0           0     0.96768
##
## $note
## [1] "Note: Gamma is Odds of Differential Assignment To\n Treatment Due to Unob
served Factors \n"
##
## $plot
```

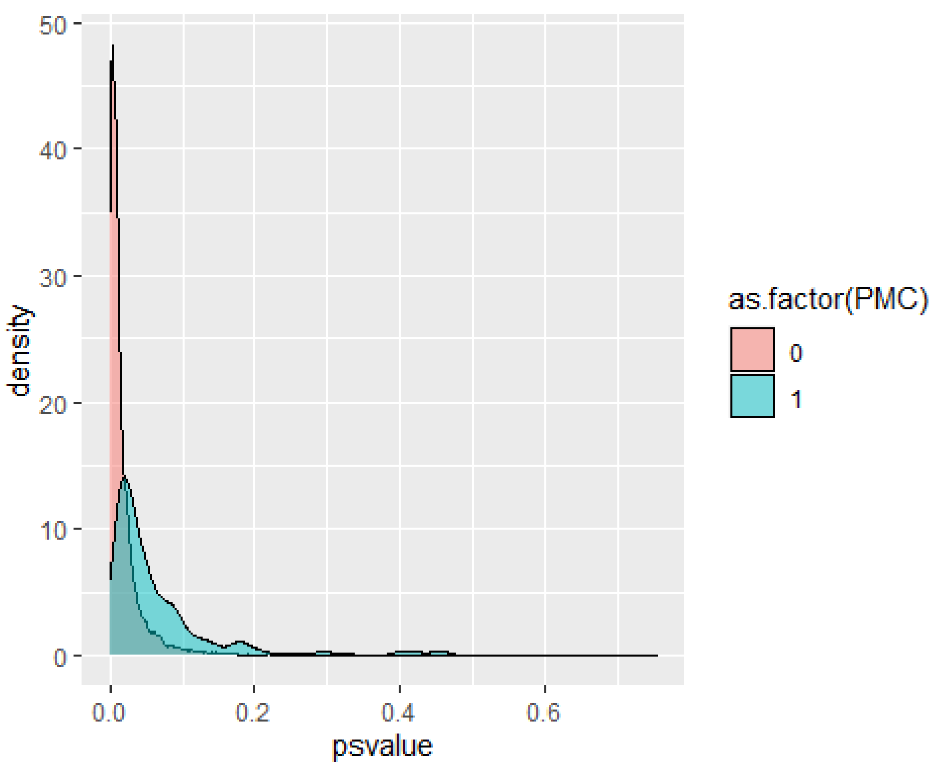



```
## $Gamma
## [1] 3
##
## $GammaInc
## [1] 0.1
##
## $pval
## [1] 4.523815e-06
##
## $msg
## [1] "Rosenbaum Sensitivity Test \n"
##
```

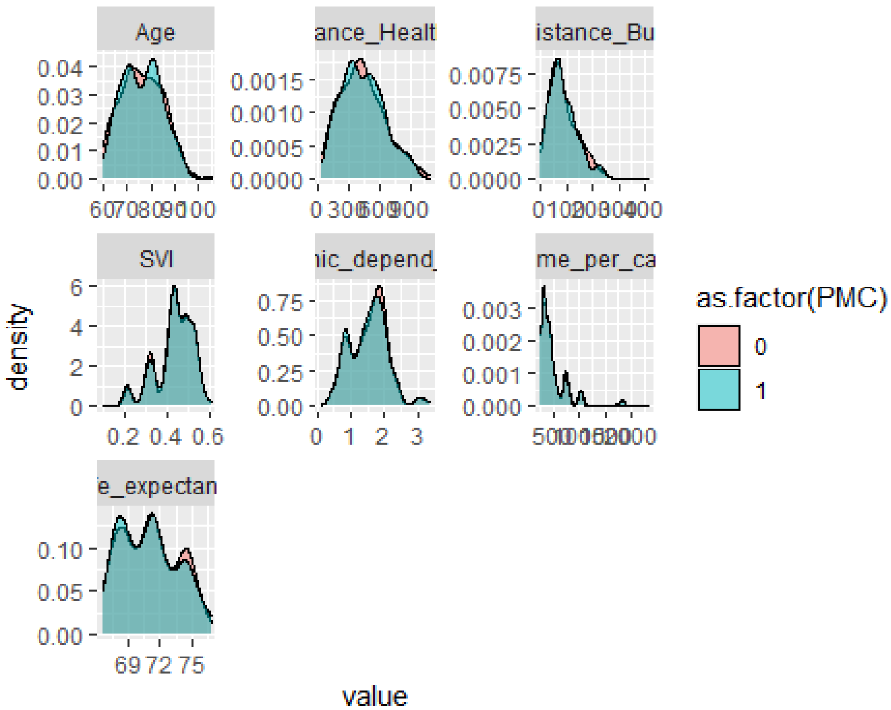
```
## $bounds
##    Gamma Lower bound Upper bound
## 1    1.0           0     0.00000
## 2    1.1           0     0.00008
## 3    1.2           0     0.00071
## 4    1.3           0     0.00410
## 5    1.4           0     0.01615
## 6    1.5           0     0.04697
## 7    1.6           0     0.10720
## 8    1.7           0     0.20142
## 9    1.8           0     0.32392
## 10   1.9           0     0.46037
## 11   2.0           0     0.59391
## 12   2.1           0     0.71107
## 13   2.2           0     0.80481
## 14   2.3           0     0.87417
## 15   2.4           0     0.92220
## 16   2.5           0     0.95364
## 17   2.6           0     0.97324
## 18   2.7           0     0.98498
## 19   2.8           0     0.99177
## 20   2.9           0     0.99559
## 21   3.0           0     0.99767
##
## $note
## [1] "Note: Gamma is Odds of Differential Assignment To\n Treatment Due to Unob
served Factors \n"
##
## $plot
```



Common support area



Covariates balance



Planned visits

Characteristic	Table 1			Table 2			Table 3		
	0, N = 967[1]	1, N = 1,070[1]	p-value[2]	0, N = 1,021[1]	1, N = 1,021[1]	p-value[2]	0, N = 53,625[1]	1, N = 1,317[1]	p-value[2]
Sex	302 (31%)	322 (30%)	0.6	304 (30%)	308 (30%)	0.9	17,484 (33%)	373 (28%)	0.001
Age	75 (69, 81)	76 (70, 82)	0.023	76 (69, 81)	76 (70, 82)	0.4	69 (64, 75)	79 (71, 85)	<0.001
M_SATEND			0.5			0.9			0.4
Abril	336 (35%)	388 (36%)		359 (35%)	366 (36%)		19,312 (36%)	489 (37%)	
Junho	274 (28%)	315 (29%)		300 (29%)	304 (30%)		15,319 (29%)	355 (27%)	
Maio	357 (37%)	367 (34%)		362 (35%)	351 (34%)		18,994 (35%)	473 (36%)	
XGEO	609,671 (604,753, 612,558)	609,723 (605,418, 612,667)	0.2	609,626 (604,861, 612,640)	609,658 (605,439, 612,653)	0.5	609,669 (604,779, 612,843)	609,813 (605,439, 612,932)	0.7
YGEO	7,798,605 (7,794,358, 7,803,638)	7,798,955 (7,794,475, 7,804,153)	0.3	7,798,519 (7,794,290, 7,803,999)	7,798,993 (7,794,475, 7,804,153)	0.15	7,798,971 (7,794,817, 7,803,462)	7,798,510 (7,794,117, 7,803,848)	0.012
SVI	0.45 (0.40, 0.49)	0.44 (0.40, 0.49)	0.7	0.45 (0.40, 0.49)	0.44 (0.40, 0.49)	0.10	0.44 (0.40, 0.49)	0.45 (0.42, 0.49)	<0.001
Economic_depend_elderly	1.62 (1.16, 1.86)	1.61 (1.16, 1.86)	0.4	1.62 (1.16, 1.86)	1.61 (1.16, 1.86)	0.4	1.54 (0.89, 1.86)	1.62 (1.17, 1.86)	<0.001
Life_expectancy	70.94 (68.58, 72.80)	70.94 (68.58, 72.76)	0.8	70.79 (68.47, 72.76)	70.94 (68.58, 72.76)	0.10	71.38 (69.20, 73.34)	70.79 (68.50, 72.76)	<0.001

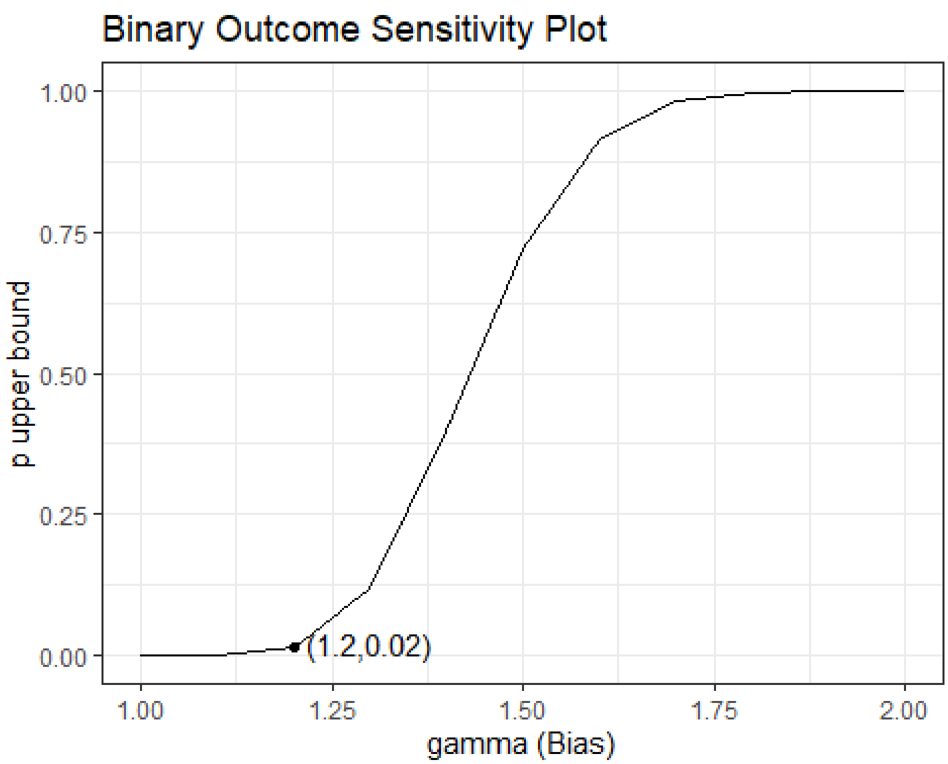
	Table 1			Table 2			Table 3		
Characteristic	0, N = 967[1]	1, N = 1,070[1]	p-value[2]	0, N = 1,021[1]	1, N = 1,021[1]	p-value[2]	0, N = 53,625[1]	1, N = 1,317[1]	p-value[2]
Income_per_capita	398 (305, 510)	398 (309, 504)	0.7	373 (299, 504)	398 (305, 504)	0.11	419 (318, 555)	373 (305, 504)	<0.001
Distance_Health_C	406 (277, 565)	419 (292, 573)	0.5	415 (281, 584)	412 (292, 573)	>0.9	416 (276, 579)	408 (267, 567)	0.12
espon	421 (44%)	580 (54%)	<0.001	440 (43%)	560 (55%)	<0.001	23,928 (45%)	695 (53%)	<0.001
subclass							199 (165, 255)	659 (330, 981)	<0.001

[1]Statistics presented: n (%); median (IQR)

[2]Statistical tests performed: chi-square test of independence; Wilcoxon rank-sum test

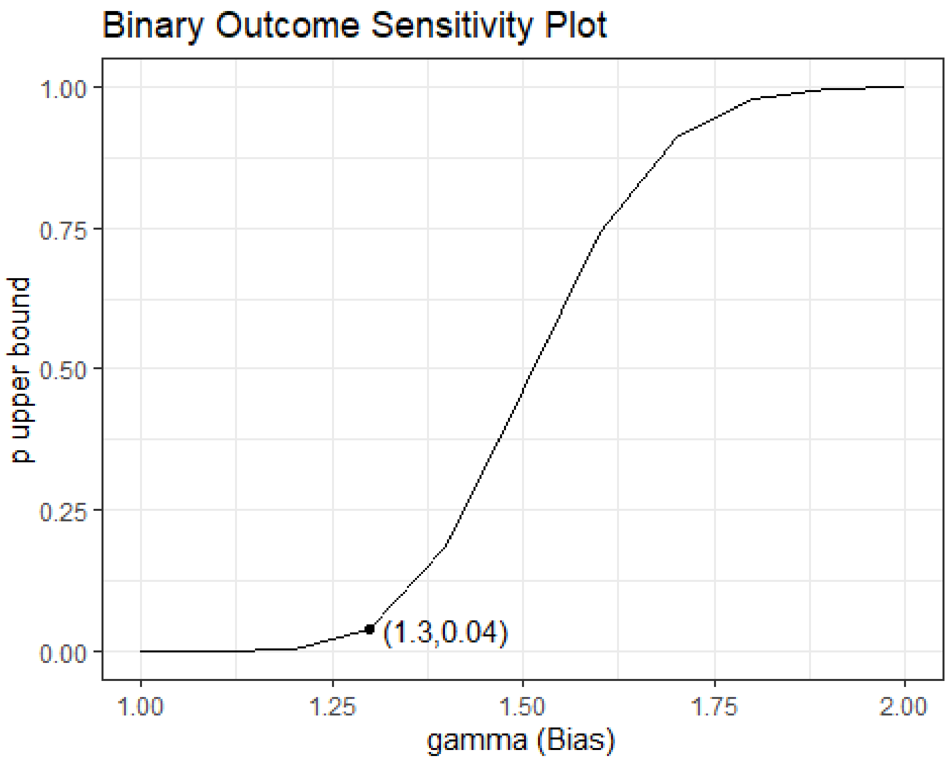
Sensitivity tests

```
## $Gamma
## [1] 2
##
## $GammaInc
## [1] 0.1
##
## $pval
## [1] 4.817128e-06
##
## $msg
## [1] "Rosenbaum Sensitivity Test \n"
##
## $bounds
##    Gamma Lower bound Upper bound
## 1    1.0           0     0.00000
## 2    1.1           0     0.00059
## 3    1.2           0     0.01526
## 4    1.3           0     0.12010
## 5    1.4           0     0.39651
## 6    1.5           0     0.72017
## 7    1.6           0     0.91482
## 8    1.7           0     0.98247
## 9    1.8           0     0.99744
## 10   1.9           0     0.99972
## 11   2.0           0     0.99998
##
## $note
## [1] "Note: Gamma is Odds of Differential Assignment To\n Treatment Due to Unob
served Factors \n"
##
## $plot
```



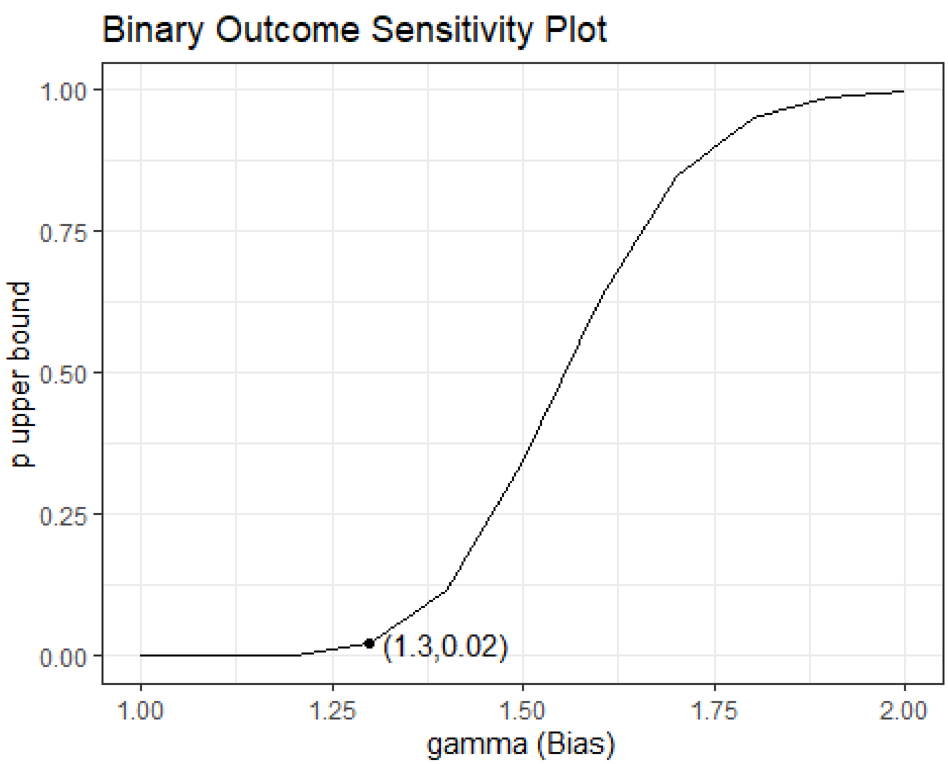

```
## $Gamma
## [1] 2
##
## $GammaInc
## [1] 0.1
##
## $pval
## [1] 8.087619e-07
##
## $msg
## [1] "Rosenbaum Sensitivity Test \n"
##
## $bounds
##    Gamma Lower bound Upper bound
## 1    1.0           0     0.00000
## 2    1.1           0     0.00011
## 3    1.2           0     0.00378
## 4    1.3           0     0.04066
## 5    1.4           0     0.18760
## 6    1.5           0     0.46298
## 7    1.6           0     0.74098
## 8    1.7           0     0.90949
## 9    1.8           0     0.97650
## 10   1.9           0     0.99529
## 11   2.0           0     0.99925
##
## $note
```

```
## [1] "Note: Gamma is Odds of Differential Assignment To\n Treatment Due to Unob
served Factors \n"
##
## $plot
```

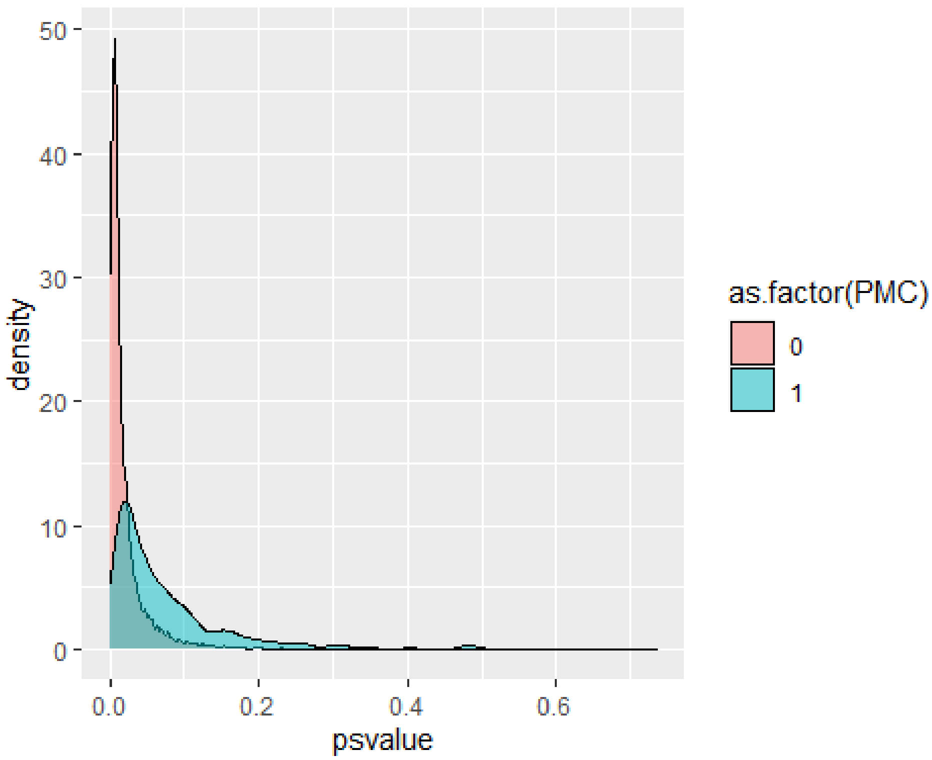



```
## $Gamma
## [1] 2
##
## $GammaInc
## [1] 0.1
##
## $pval
## [1] 1.671854e-07
##
## $msg
## [1] "Rosenbaum Sensitivity Test \n"
##
## $bounds
##    Gamma Lower bound Upper bound
## 1    1.0           0     0.00000
## 2    1.1           0     0.00003
## 3    1.2           0     0.00143
## 4    1.3           0     0.01996
## 5    1.4           0     0.11511
## 6    1.5           0     0.34187
## 7    1.6           0     0.62951
## 8    1.7           0     0.84624
```

```
## 9    1.8           0     0.95232
## 10   1.9           0     0.98861
## 11   2.0           0     0.99783
##
## $note
## [1] "Note: Gamma is Odds of Differential Assignment To\n Treatment Due to Unob
served Factors \n"
##
## $plot
```



Common support region



Covariates balance