Effects of Maternal Periodontal Diseases on Preterm Births

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This is us

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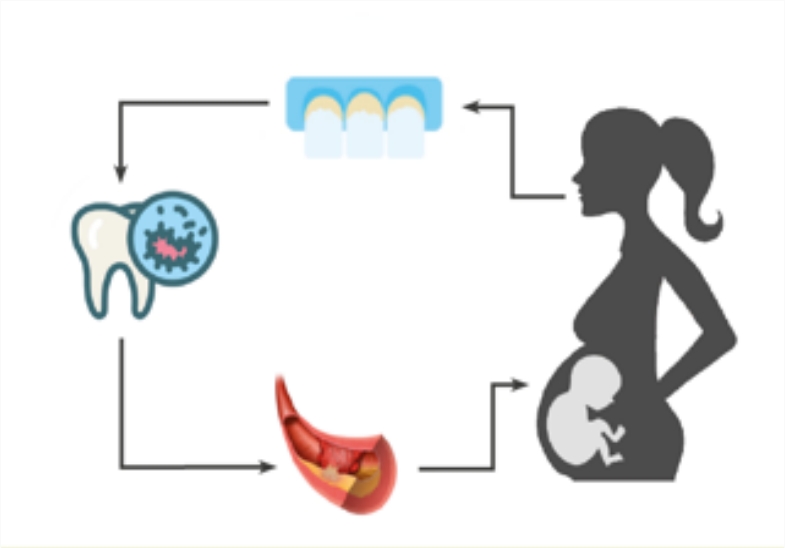
Problem Overview

The Case Study

Several studies on pregnant women have suggested an association between preterm births and low birthweight with respect to periodontal disease.

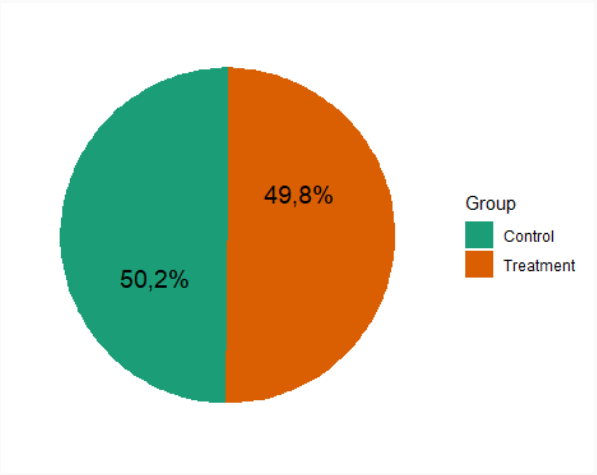


Periodontal disease is an inflammatory condition characterized by the destruction of tissue and/or bone around the teeth.

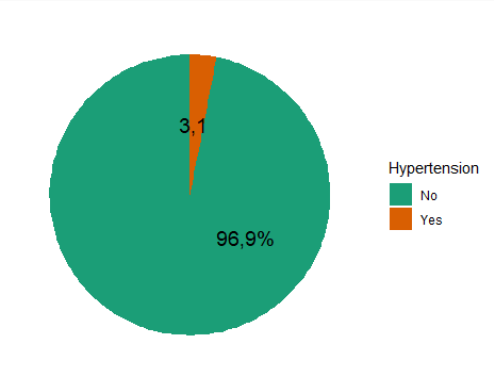
Preterm birth is defined as delivery before 37 weeks of gestation and the *birthweight* is considered too low if it is below 2500g.

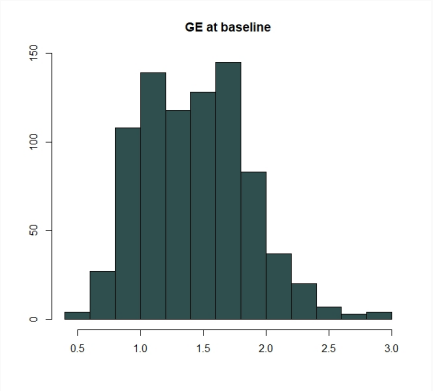
The Dataset

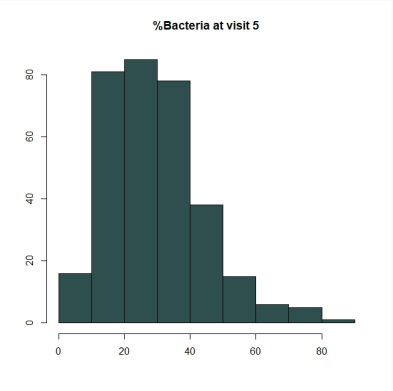
Our dataset is composed by 823 participants affected by periodontal disease subdivided in *treatment* and *control* group with respect to the severity of their oral health:



Moreover we have 171 features covering very different aspects:







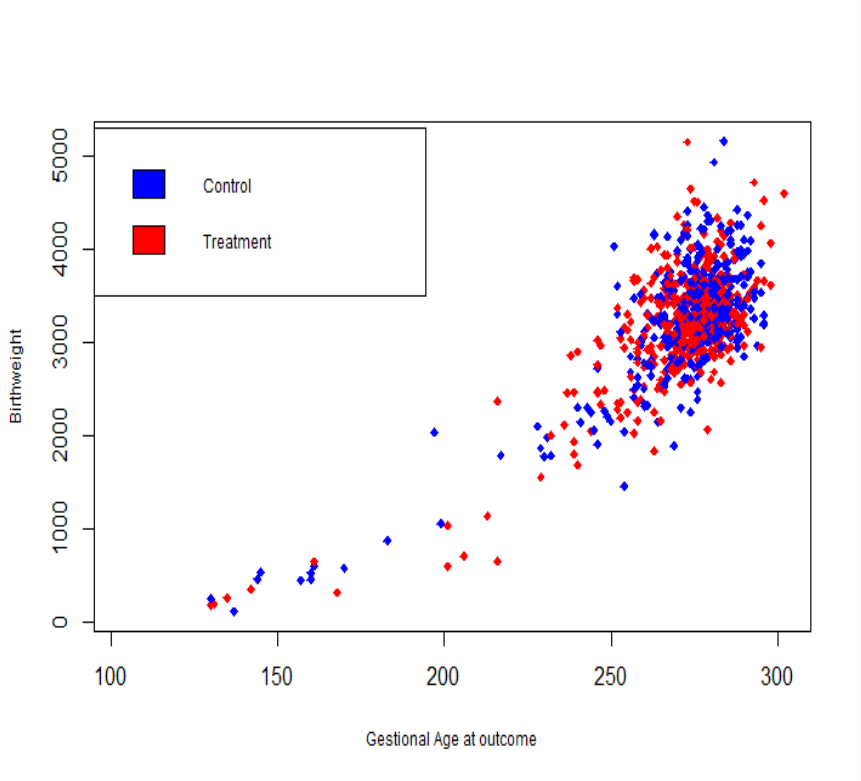
Goal and outline

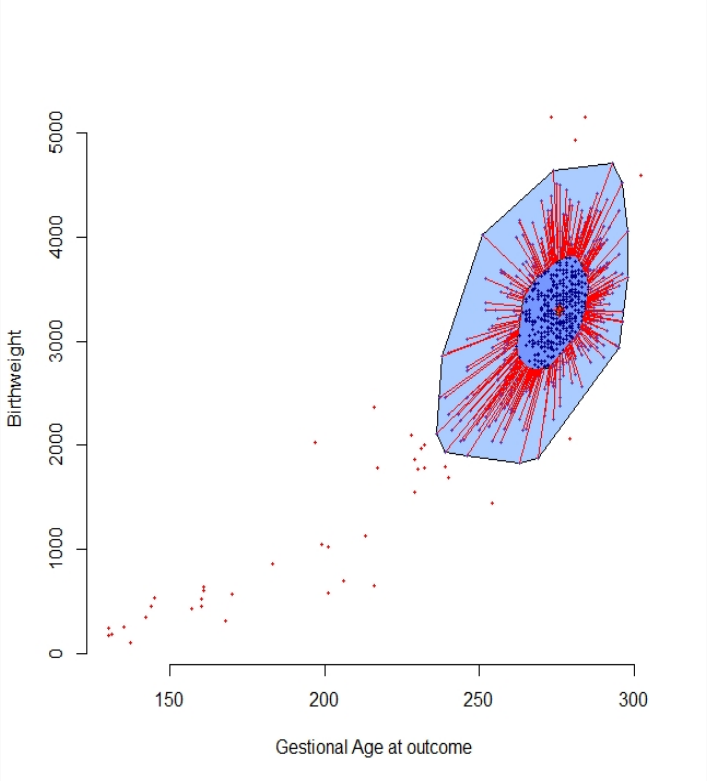
The main *goal* of our project is to determine whether treatment of maternal periodontal disease can reduce risk of preterm birth and low birthweight.

To accomplish this task, we attack our problem from different points of view:

- Nonparametric test to assess the differences between *control* and *treatment* groups
- Nonparametric test to understand which are the main risk factor for *preterm birth* and *low birthweight*
- Bootstrap procedure to assess quantitatively the differences founded
- Next steps

Outcomes and depth measures





- Looking at severe cases, we notice a prevalence of controlled patients.
- The outliers correspond to the points of interest since they represents premature and underweight newborns.

Nonparametric tests

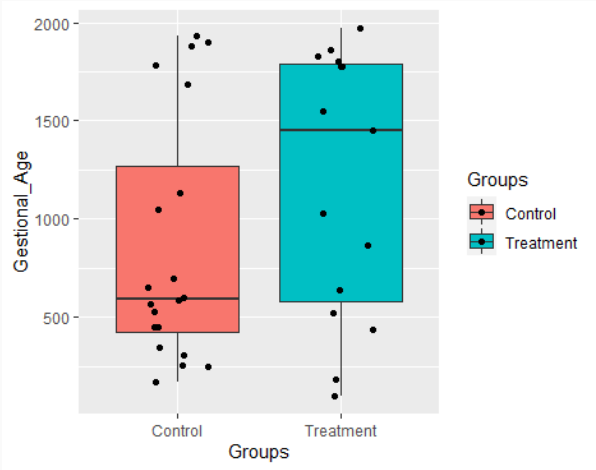
Nonparametric Tests

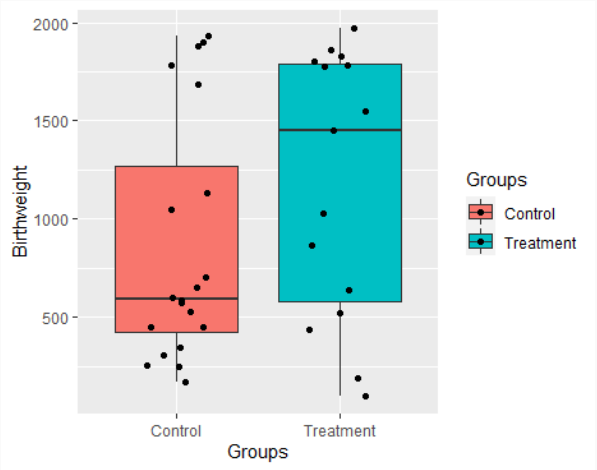
We perform two-populations nonparametric test to assess the differences in treatment and control groups

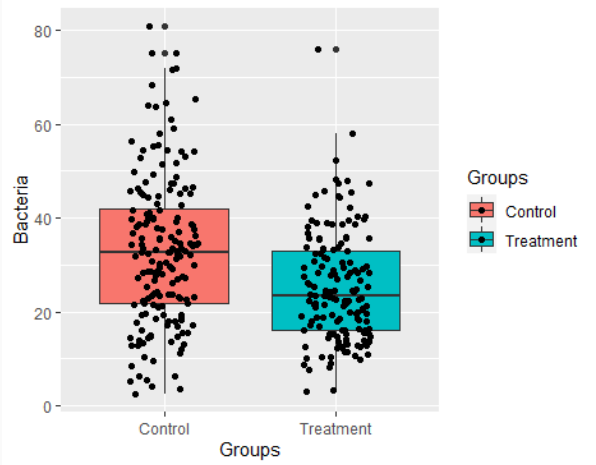
Variables	Group	Test	P-value
Gestational age	C/T	T-test median	0.061
Birthweigth	C/T	T-test median	0.07
%Bacteria at 5th visit	C/T	T-test median	0
GE at 5th visit	C/T	T-test median	0

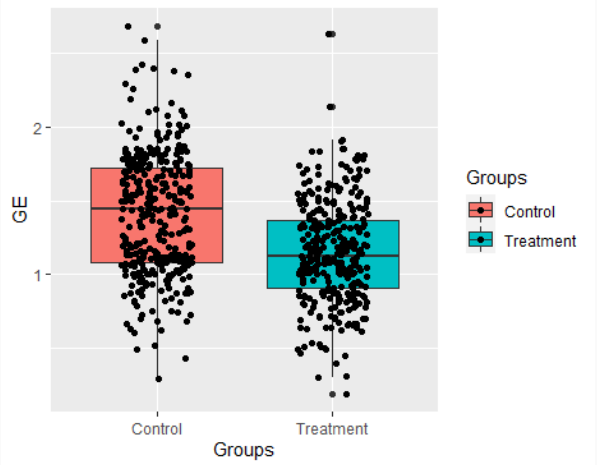
Nonparametric Tests

Graphically we can see that the treatment helps to reduce the risks of preterm birth and low weight; moreover it improves also the oral health









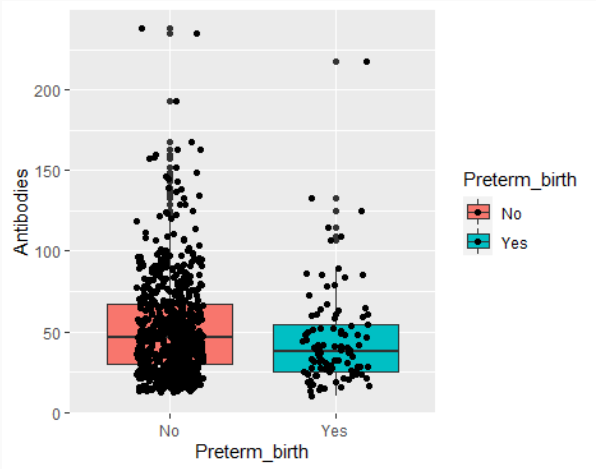
Nonparametric Tests

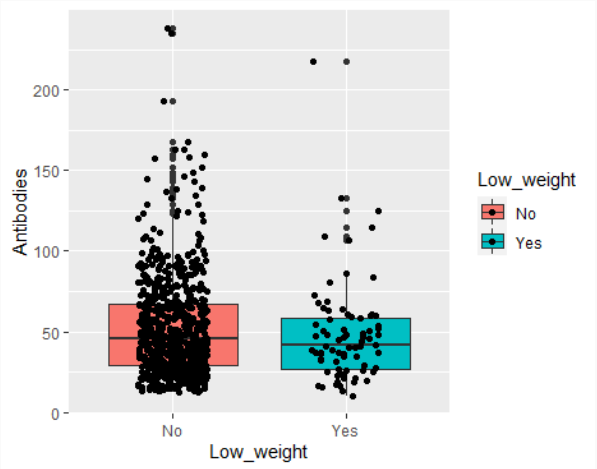
We perform two-populations nonparametric test to find risk factors for preterm birth and low birthweight

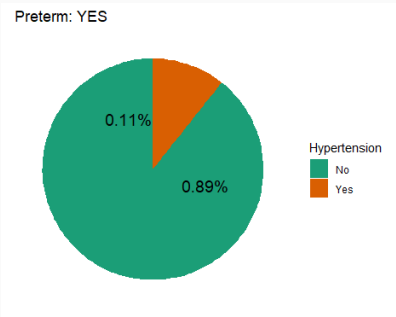
Variables	**Group**	**Test**	**P-value**
Hypertension	Preterm Y/N	T-test prop	0
Hypertension	Low weight Y/N	T-test prop	0.003
Diabetes	Preterm Y/N	T-test prop	0.002
BMI	Preterm Y/N	T-test mean	0.005
Total Bacteria at 5th	Preterm Y/N	T-test median	0.067
Antibodies	Preterm Y/N	T-test median	0.015
Antibodies	Low weight Y/N	T-test mean	0.0302

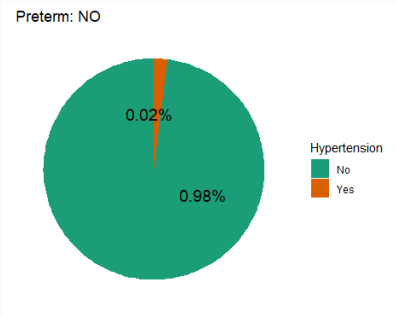
Nonparametric Tests

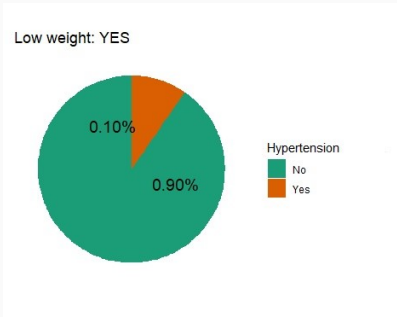
Graphically we can see that the the more antibodies the less the risks of preterm birth and low weight; moreover the hypertension is a risk factor for both preterm birth and low weight

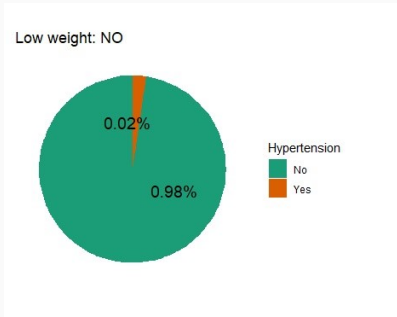






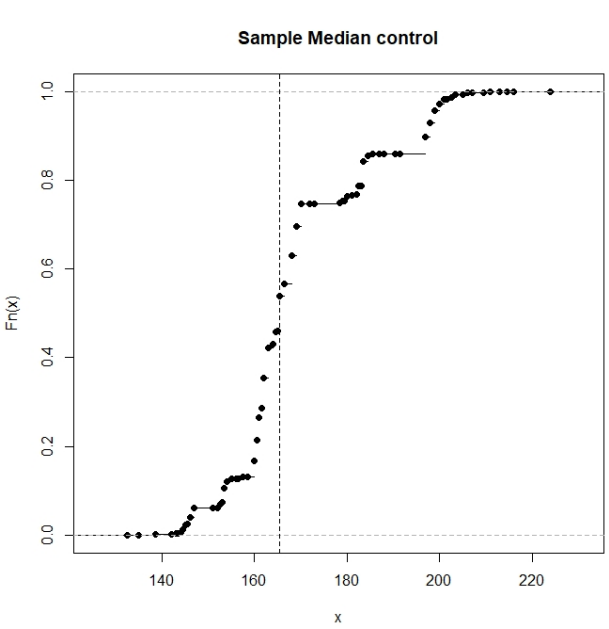


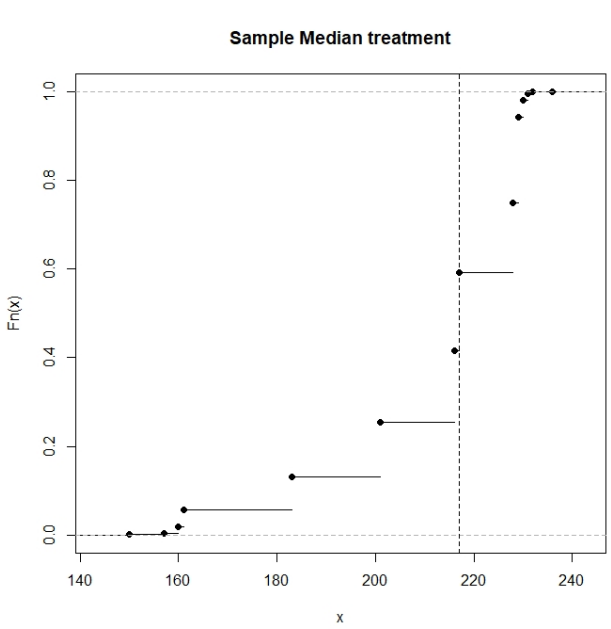




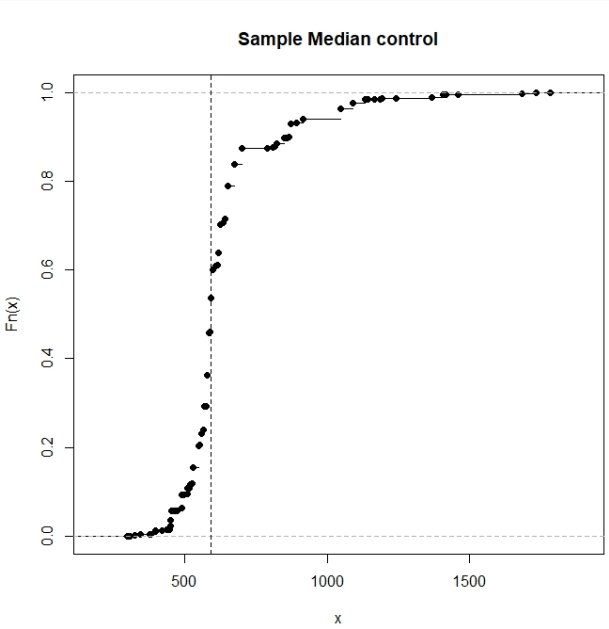
Bootstrap

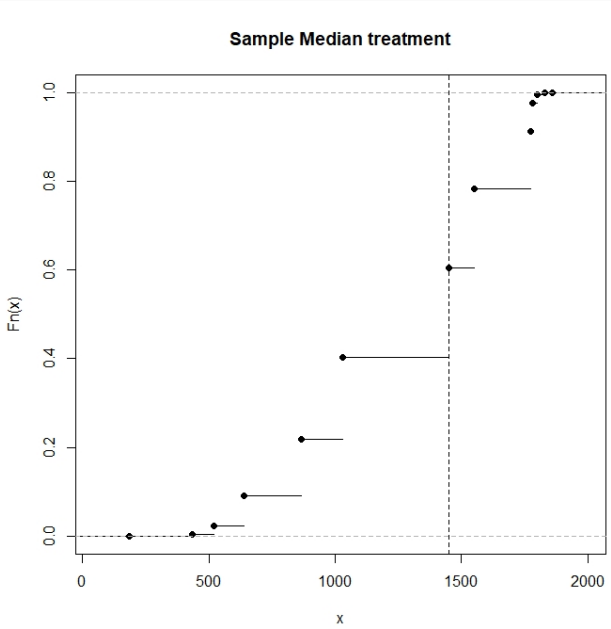
Bootstrap





Sample median distribution of severe gestational age at outcome in Control and Treatment groups





Sample median distribution of severe birthweight in Control and Treatment groups

Next steps

Next steps

The next steps will focus on modeling aspects:

- Nonparametric logistic regression to predict, given different covariates, the occurrence of preterm delivery time or low birthweight
- Model the expected delivery time in the two groups through survival analysis with or without covariates and compare them via log-rank test

References

[1] https://higgi13425.github.io/medicaldata/reference/opt.html

[2] Michalowicz BS, Hodges JS, DiAngelis AJ, Lupo VR, Novak MJ, Ferguson JE, Buchanan W, Bofill J, Papapanou PN, Mitchell DA, Matseoane S, Tschida PA. "Treatment of periodontal disease and the risk of preterm birth." New England Journal of Medicine. 2006 Nov 2. 355 (18): 1885-94.

Thank you for your attention!