

# A robust Bayesian Age-Period-Cohort model for the analysis of fertility rates in Puerto Rico

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August 2, 2024



THESIS  
DEPARTMENT OF  
MATHEMATICS

## Abstract

Age-Period-Cohort (APC) models are of special importance in Demography. The decrease of fertility rates in Puerto Rico are concerning, with a Total Fertility Rate of 0.9, way below the replacement level of 2.1. The goal of this project was to develop an Age-Period-Cohort model of Puerto Rican fertility data, following a Bayesian framework, and determine whether fertility decline is mostly attributed to period or cohort effects. The model uses the number of births and the number of women in reproductive age from 1948 to 2022, across different age groups. The model was defined using a Poisson likelihood and autoregressive second-order random walk priors on the age, period and cohort parameters, following a Scale Beta 2 distribution for the variance instead of the more common but inconvenient Inverted Gamma distribution. The analysis showed that fertility decline has been notable since the 1998-2002 period, and since the 1963-1967 birth cohort for women, with births being more common in the 20-24 age group. We concluded that cohort effects have greater importance when describing births. We present novel ways to compare cohort versus period effects. Our finding that cohort effects is more important in PR, differs from other cases heavily studied in the literature like the South Korea and Singapore cases.