Consistent Population Estimates
An Application to Brazil

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Motivation

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- Need for better (probabilistic) methods to estimate and reconcile inconsistent demographic parameters

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  - census data (residence 5-years prior to the census date)

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- Inconsistent probability distributions are reconciled by using an extension of the *bayesian melding* approach $\Rightarrow$ postmodel posterior distributions

Modeling population counts

$$K_c^{obs} \sim Poisson(\lambda_c \cdot \kappa_c)$$

$$\lambda_c \sim Uniform(0, \infty)$$

$$\kappa_c \sim Beta(a_c^K, b_c^K)$$

Modeling fertility and birth counts

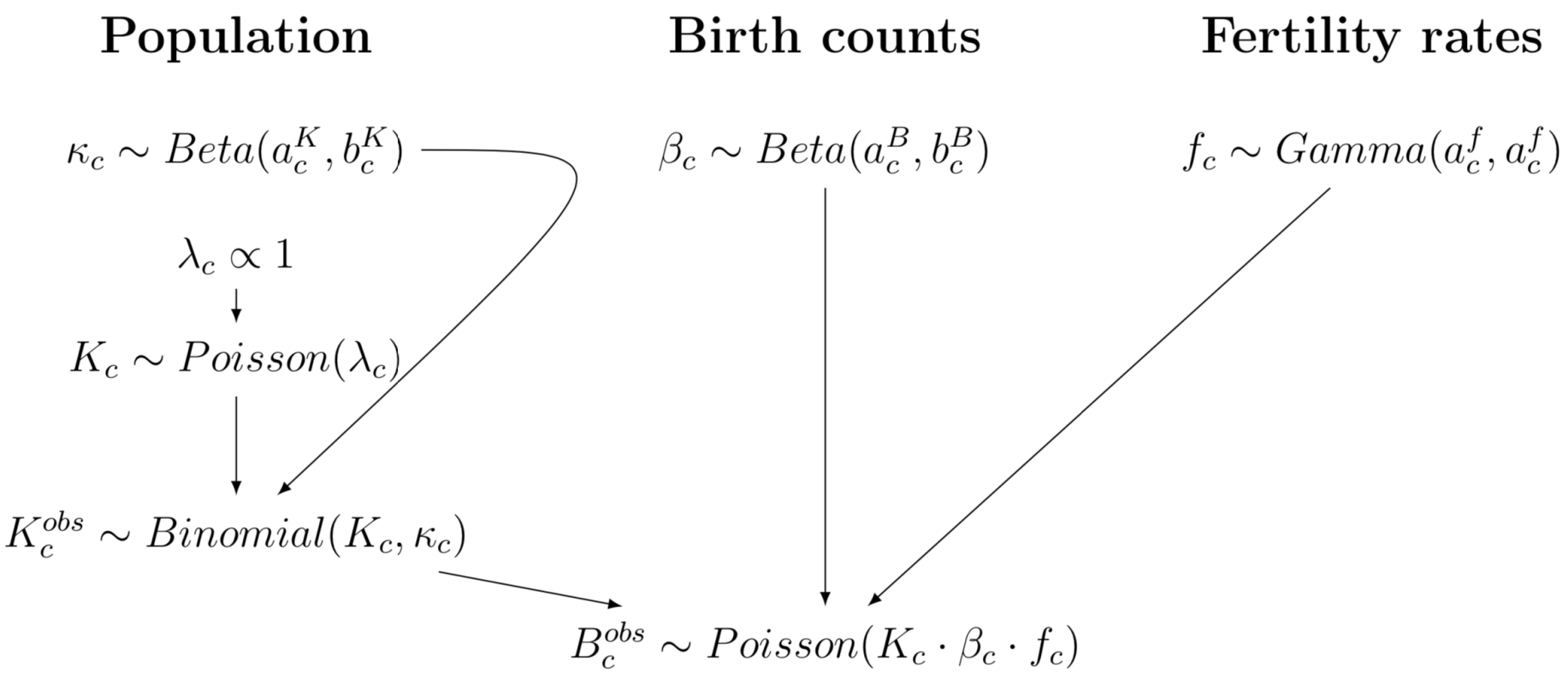
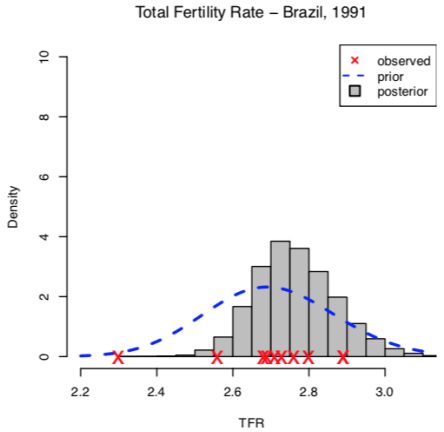
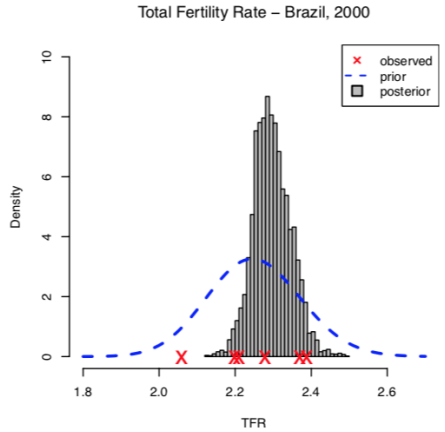
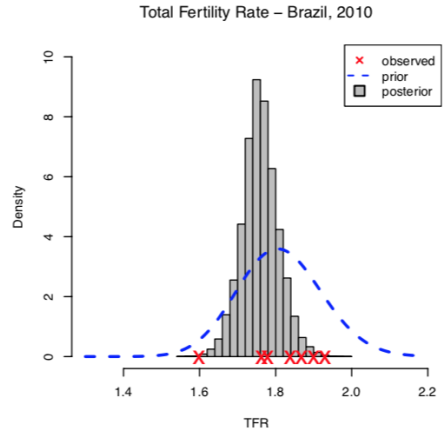


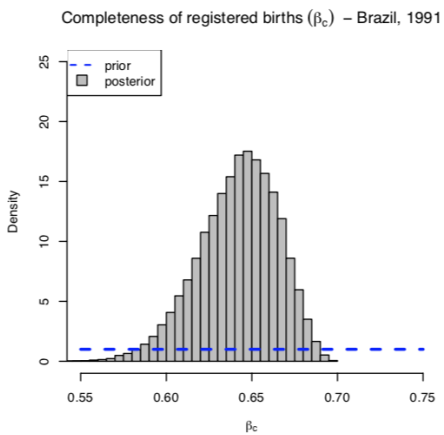
Figure 1: Diagram of the the relationship between priors and fertility models

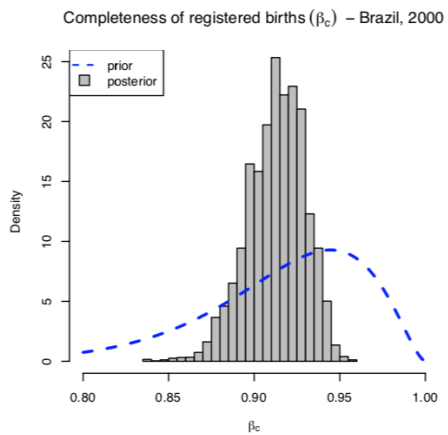
Modeling fertility and birth counts - illustration

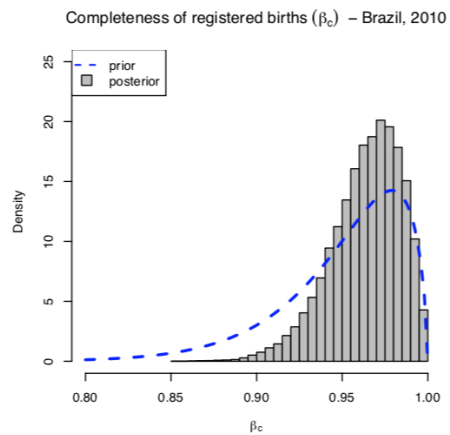


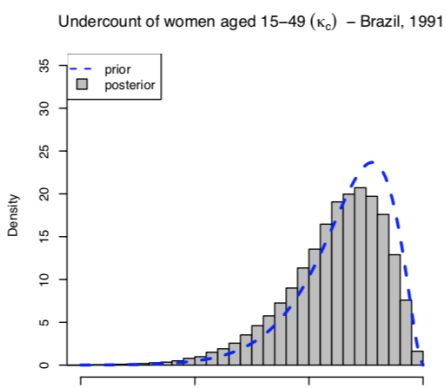


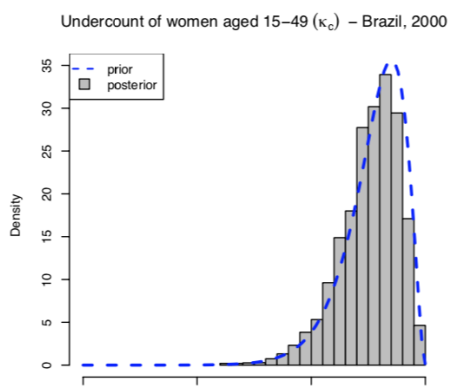


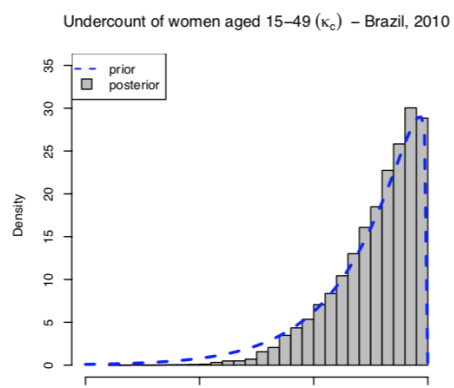












Results - Brazil

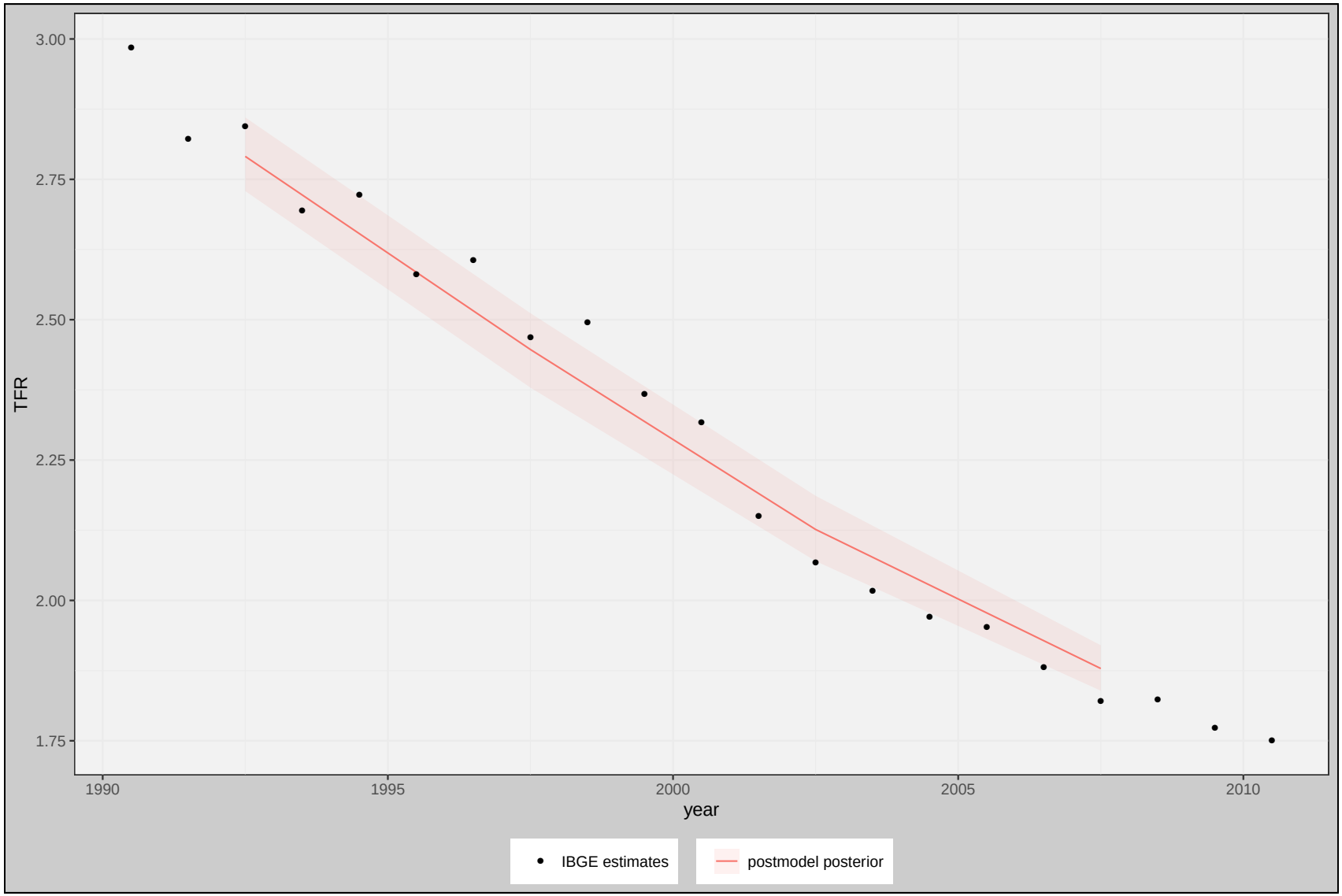


Figure 2: TFR: comparison between postmodel posterior with IBGE estimates, Brazil, 1990, 2000 and 2010

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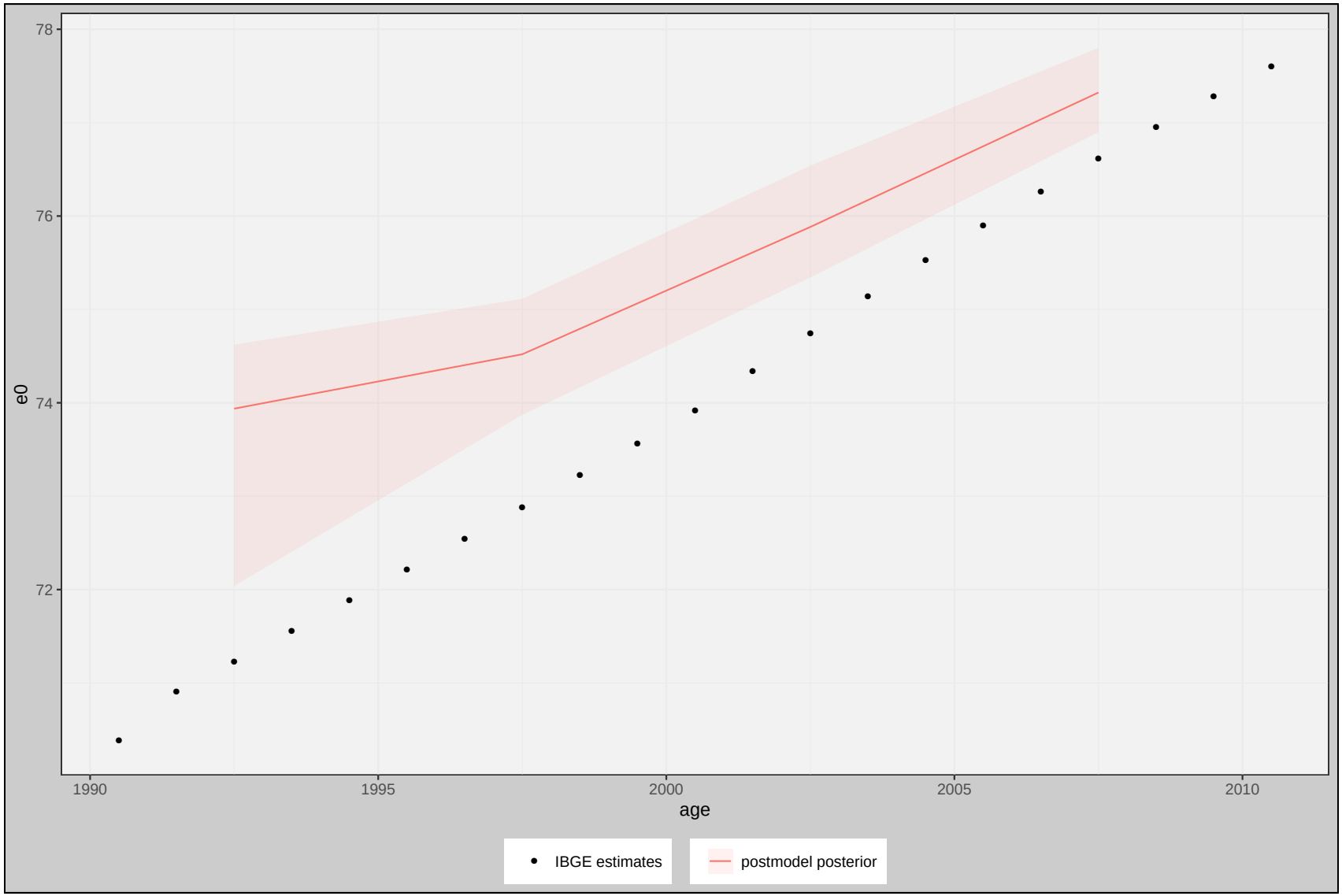

Figure 3: Life expectancy at birth: comparison between postmodel posterior with IBGE estimates, Brazil, female population, 1990, 2000 and 2010

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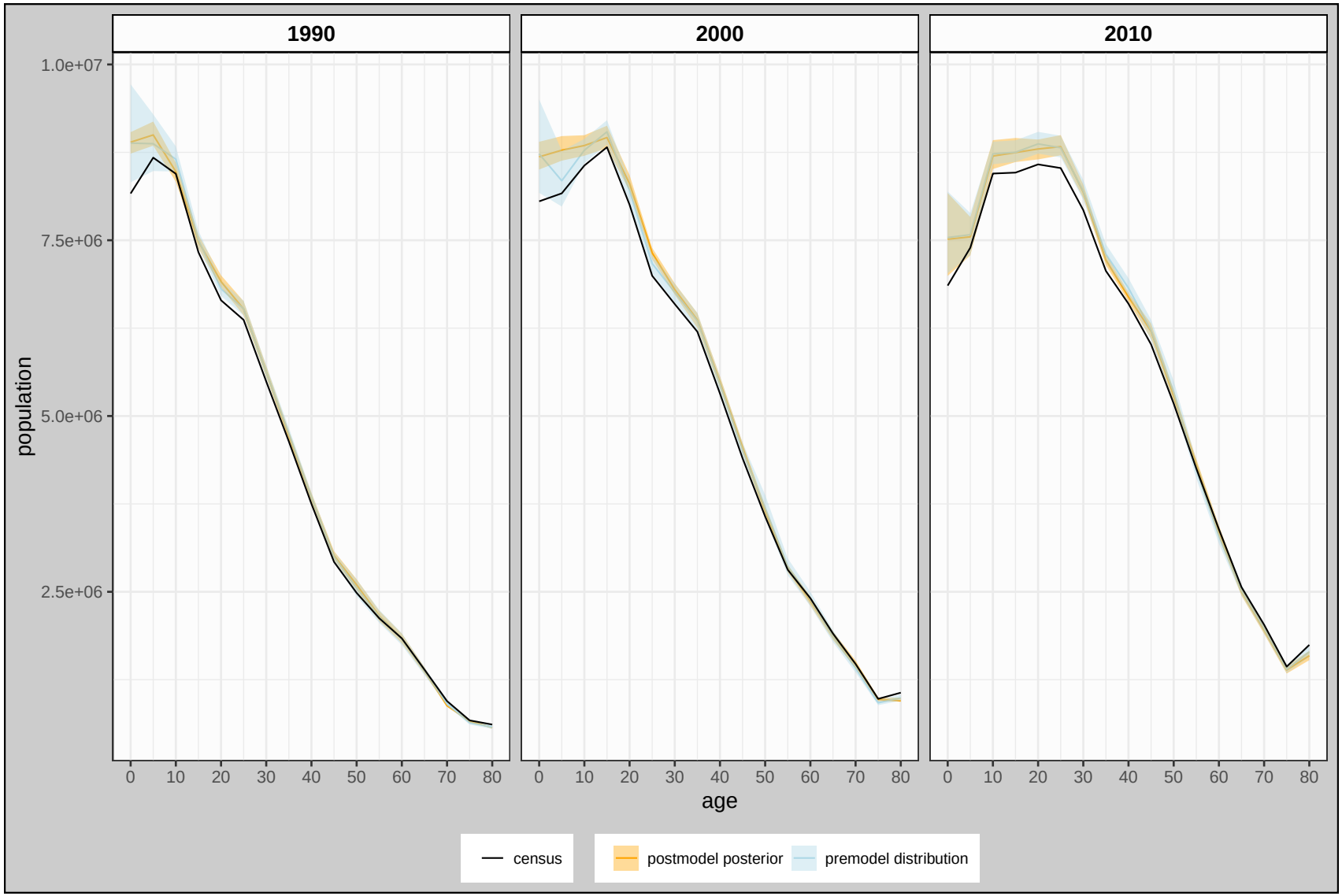

Figure 4: Population estimates by age group: comparison between the census, the premodel and the postmodel posterior distributions, **Brazil**, female population, 1990, 2000 and 2010

Results - Brazilian states

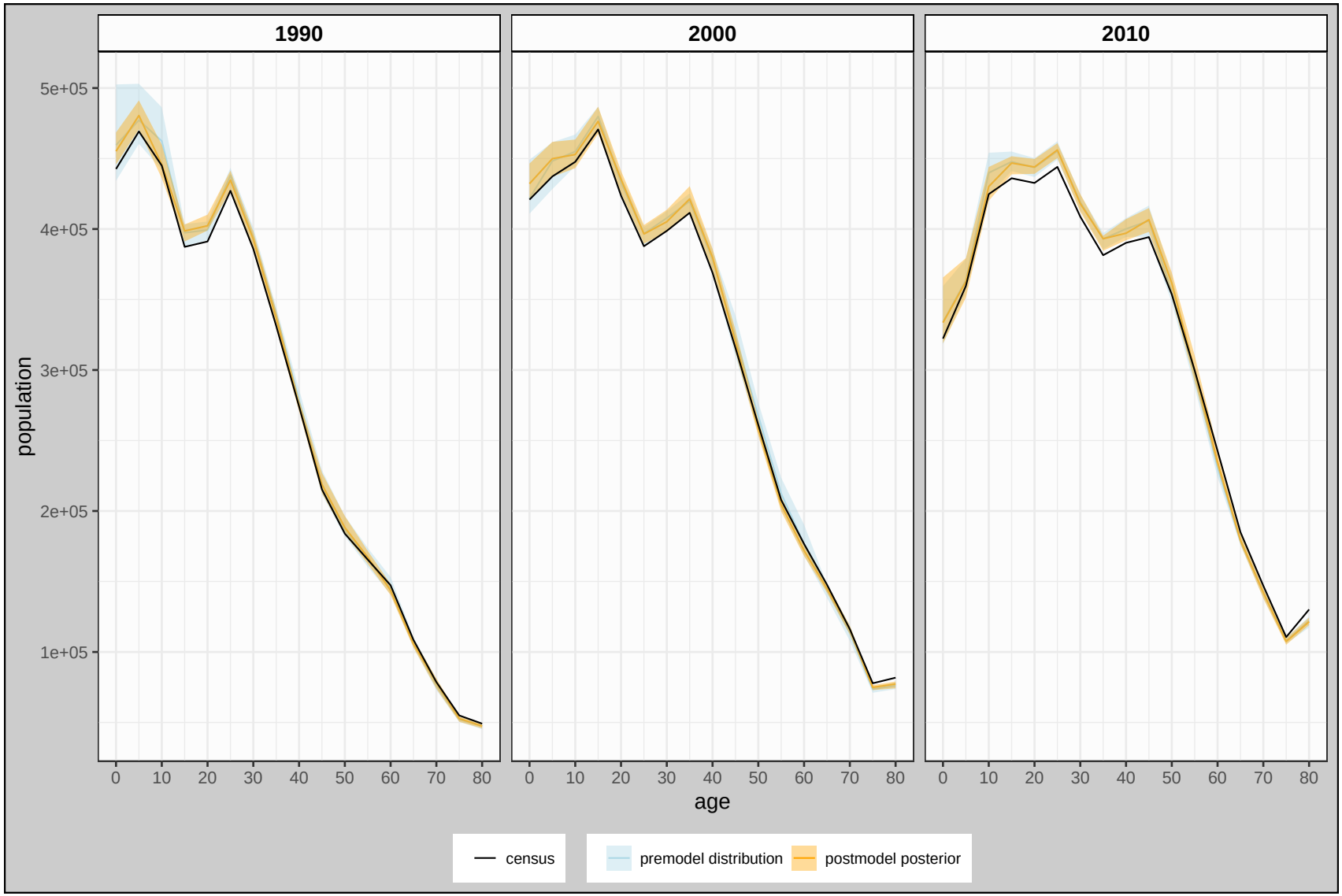

Figure 5: Population estimates by age group: comparison between the census, the premodel and the postmodel posterior distributions, **Rio Grande do Sul**, female population, 1990, 2000 and 2010

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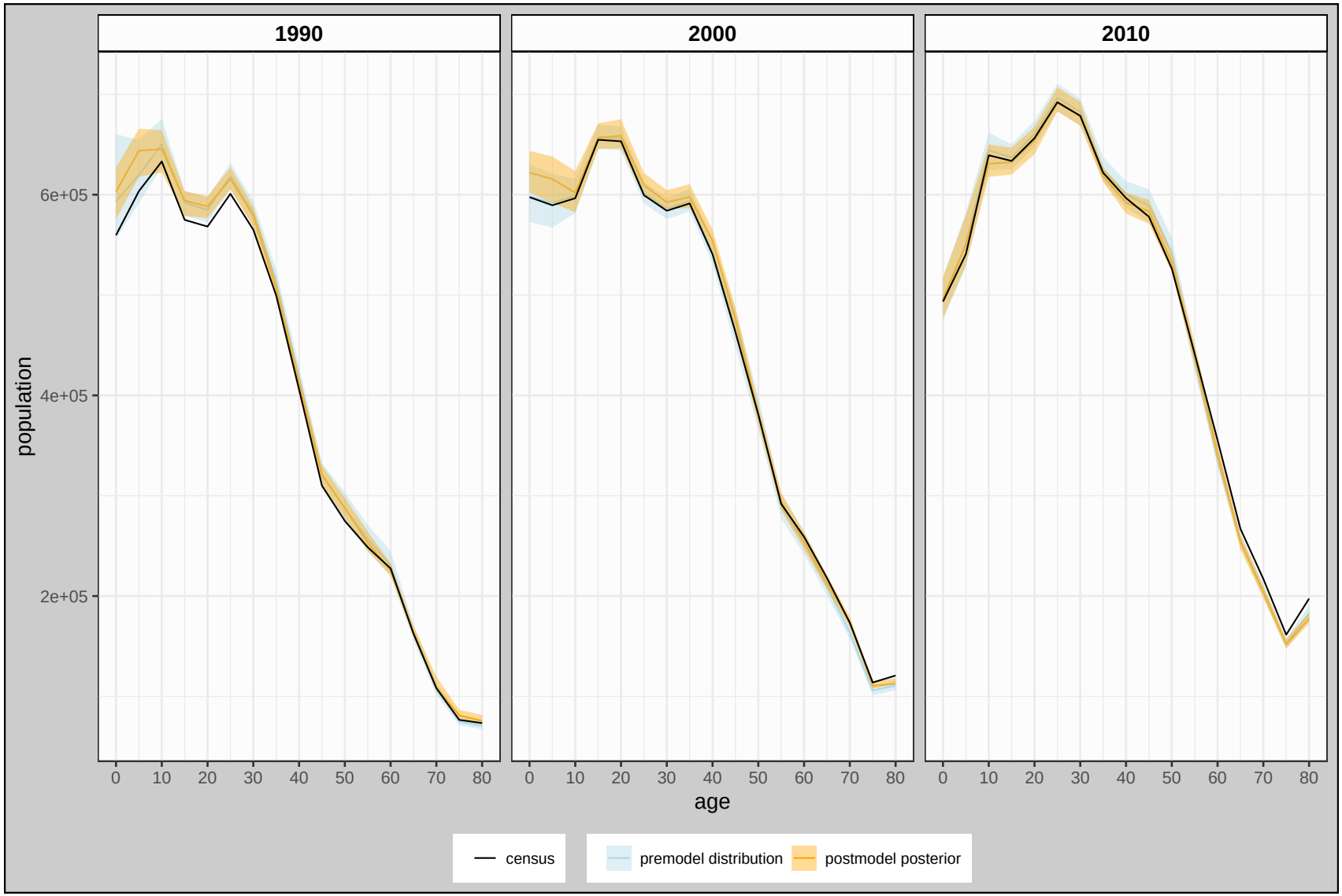

Figure 6: Population estimates by age group: comparison between the census, the premodel and the postmodel posterior distributions, **Rio de Janeiro**, female population, 1990, 2000 and 2010

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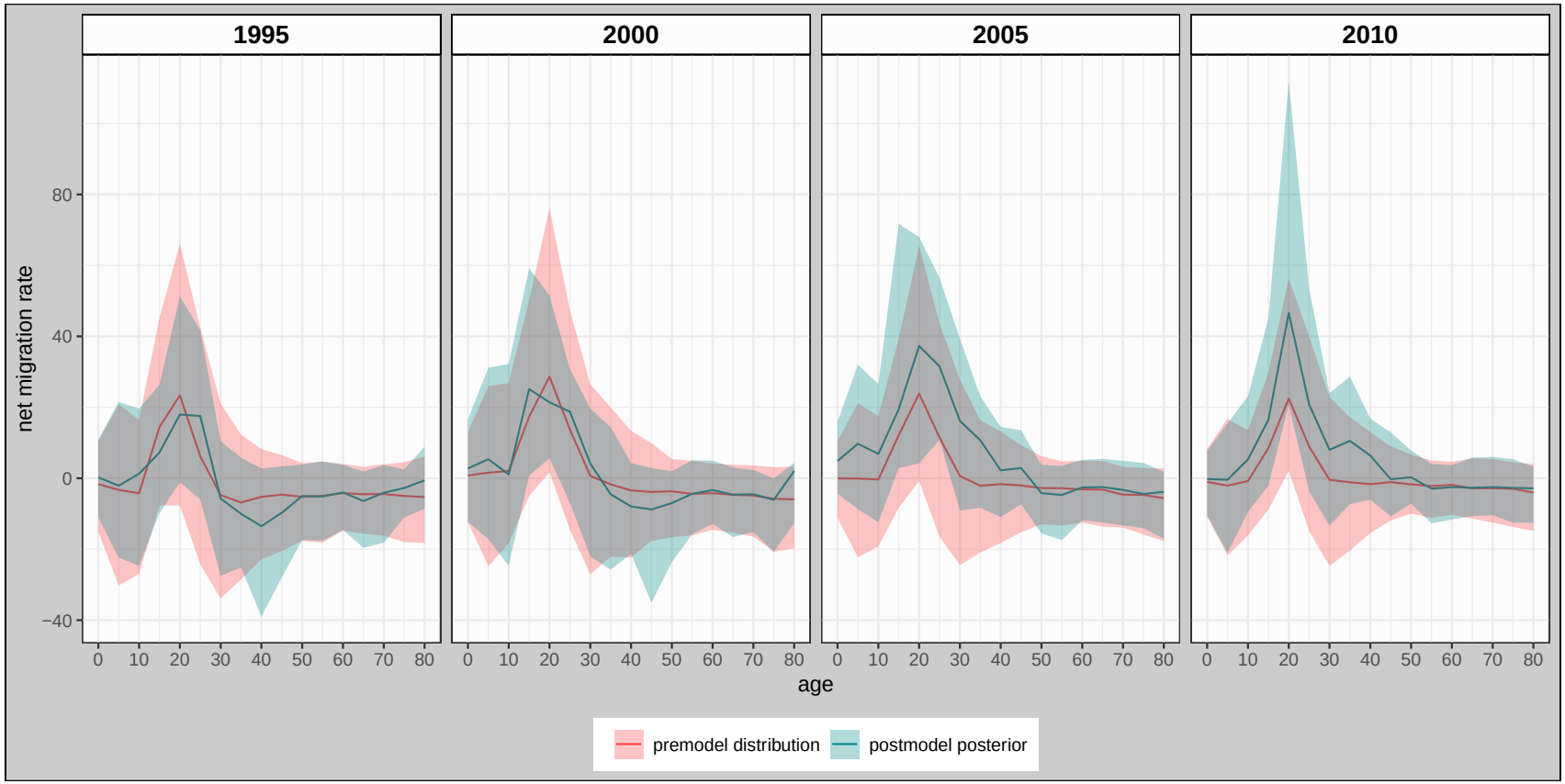

Figure 7: Net migration rates estimates by age group: Comparison between the premodel and postmodel posterior distributions, **Rio de Janeiro**, female population, 1990, 2000 and 2010

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Reference

Borges, G. M. (2018). *Consistent population estimates: an application to Brazil*. Doctoral dissertation, UC Berkeley. Retrieved from https://escholarship.org/uc/item/0z00s2xq