Mater certa est, pater numquam: What can Facebook Advertising Data Tell Us about Male Fertility Rates?

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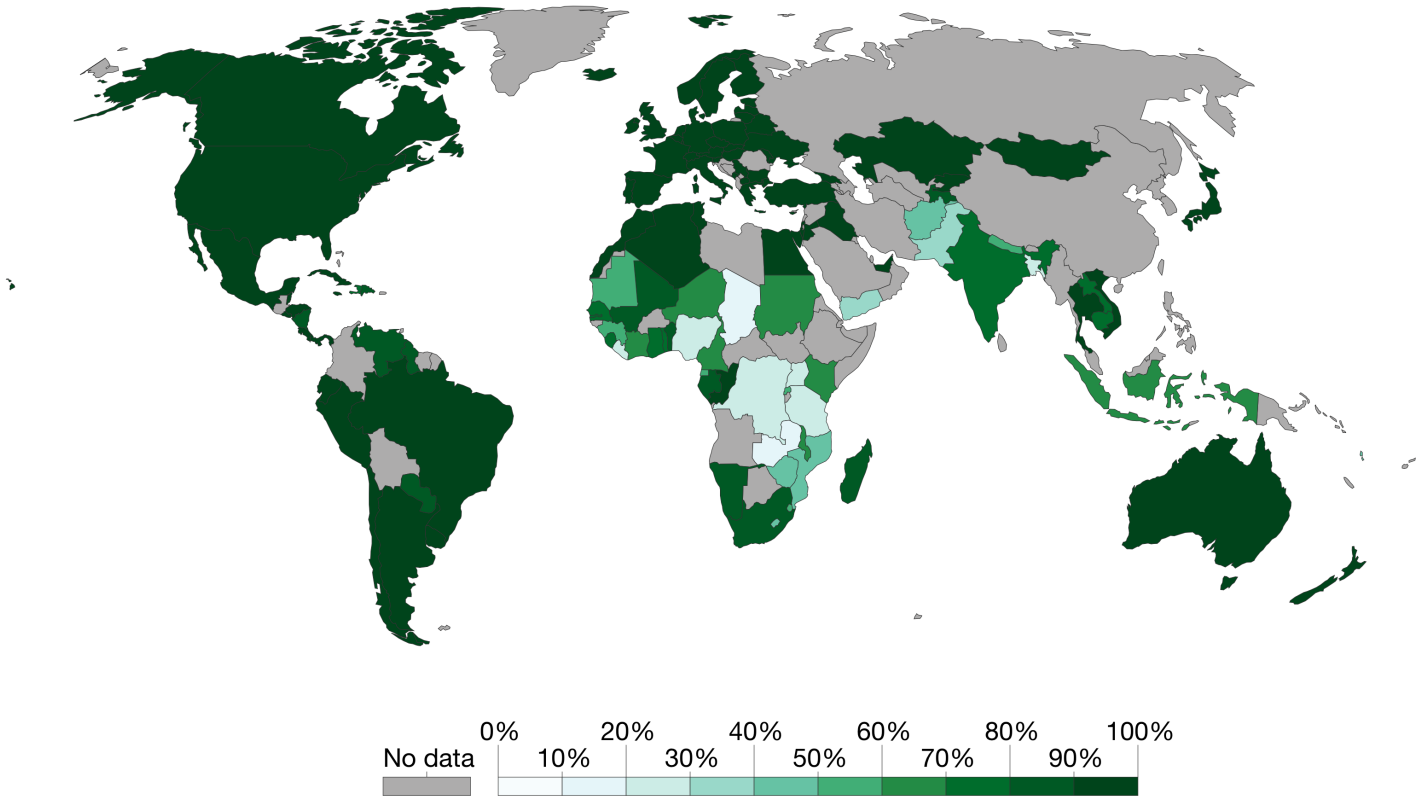
Completeness of birth registration, 2016

Completeness of birth registration is the percentage of children under age 5 whose births were registered at the time of the survey. The numerator of completeness of birth registration includes children whose birth certificate was seen by the interviewer or whose mother or caretaker says the birth has been registered.

Our World in Data



Source: World Bank – WDI

OurWorldInData.org/world-population-growth/ • CC BY-SA

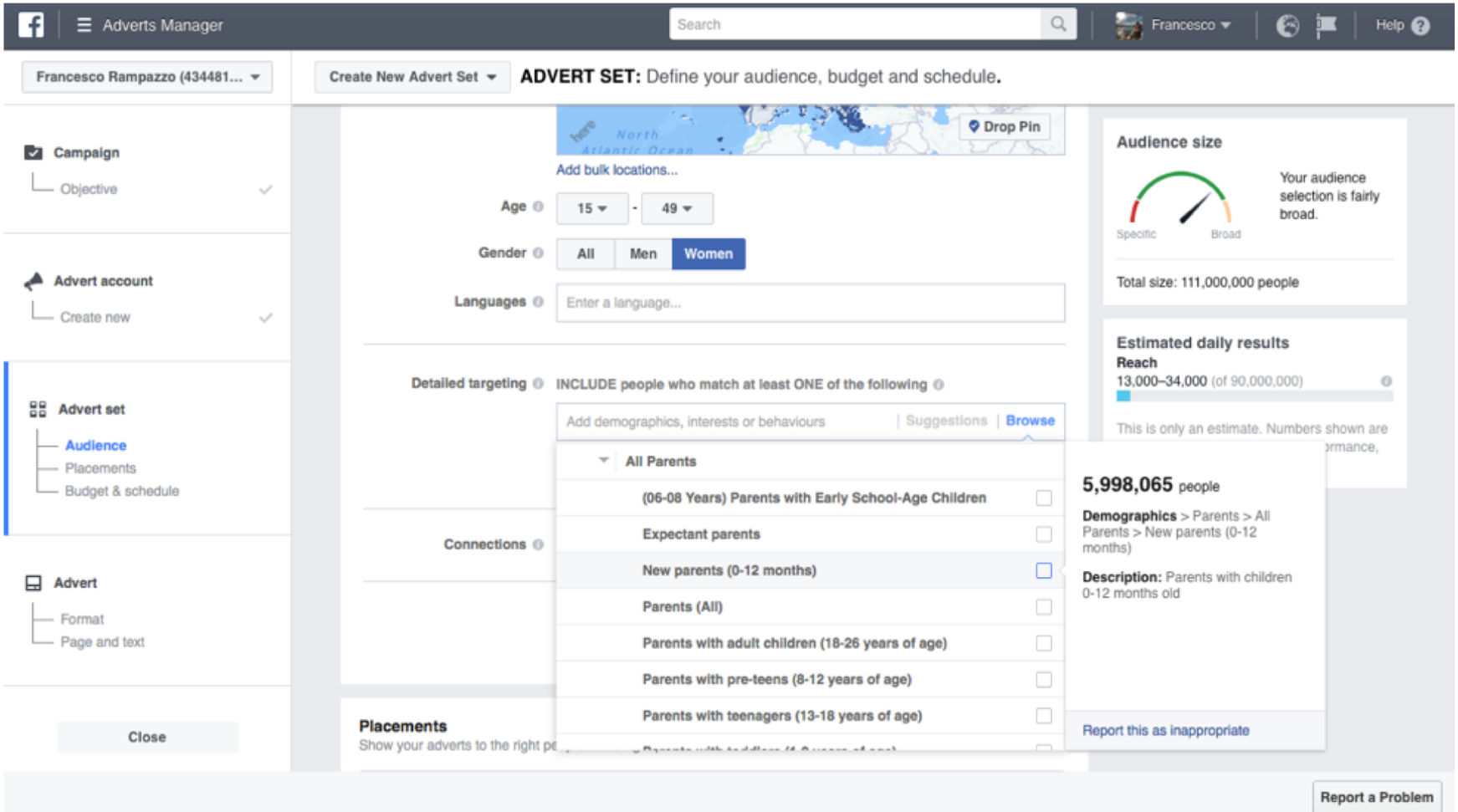
Objective

We investigate the extent to which the Female and Male Mean Age at Childbearing (MAC) produced using the Facebook Advertising Platform data are congruent with figures from the United Nations (UN).

After a Cross Validation, we predict the Male MAC for those countries the UN does not provide the data.

Facebook Data

Facebook Advertising Data



Digital Demography

Fertility research through Internet data has manifested itself into studies of fertility:

- Billari, D'Amuri, and Marcucci 'Forecasting Birth using Google' (PAA 2013)
- Hitsch, Hortaçsu, and Ariely (2010), Bellou (2015), and Billari and Sironi (2016) focus on the impact of the diffusion of internet on the postponement in timing of marriages and births
- by age and location in the US (Ojala et al. 2017),
- in seasonality of mating-related Web searchers and consequential fertility (Markey and Markey 2013)
- fertility desires and intentions have also been explored through Twitter (Adair et al. 2014)

Dataset to compare

Facebook:
Aggregated and anonymised data for Females and Males between 15-49 years old, who had a child in the last 12 months, and the the total of Females and Males in each age group.

United Nations:
Aggregated estimates of fertility rates available on the United Nations website both for Females and Males.

We compare the dataset through correlation and Mean Absolute Percentage Error (MAPE).

$$MAPE = \frac{100}{n} \sum \left| \frac{MAC_{UN} - MAC_{FB}}{MAC_{UN}} \right|$$

Results Female MAC

Female MAC Correlation is 0.47 ($p = 4.02e-08$).

Table: Spearman Correlation and MAPE for Females MAC by continent.

Continent	Female MAC Correlation	Female MAC MAPE	N
Africa	-0.27*	6.64%	28
Asia	0.52***	6.80%	33
Europe	0.69***	6.54%	41
North America	0.62***	6.52%	16
Oceania	0.29	4.98%	8
South America	-0.26	6.88%	12

*p<0.1; **p<0.05; ***p<0.01

Results Male Mac

Male MAC Correlation is 0.79 ($p = 2.2e-15$), and Female MAC for the same set of countries is 0.75 ($p = 6.21e-14$).

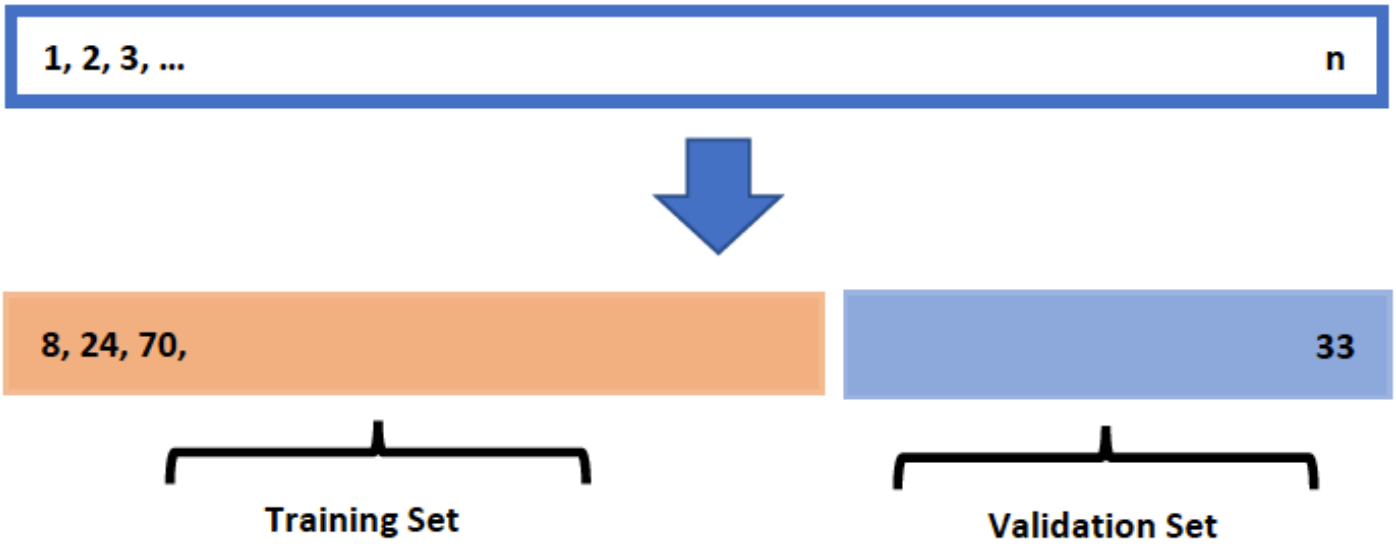
Table: Spearman Correlation and MAPE for Male MAC by continent.

	Male MAC		
Continent	Correlation	MAPE	N
Africa	1.00	6.44%	3
Asia	0.75***	6.88%	17
Europe	0.71***	5.35%	40
North America	0.87***	2.01%	13
Oceania	0.50	4.82%	3
South America	0.08	6.51%	6

*p<0.1; **p<0.05; ***p<0.01

Modeling

Cross Validation between United Nations and Facebook data:



$$MAC_{UN} = \beta_0 + \beta_1 MAC_{FB} + \epsilon$$

We use the model to make predictions for countries for which we do not have the UN data.

Results

$$MAC_{UN} = \beta_0 + \beta_1 MAC_{FB} + \epsilon$$

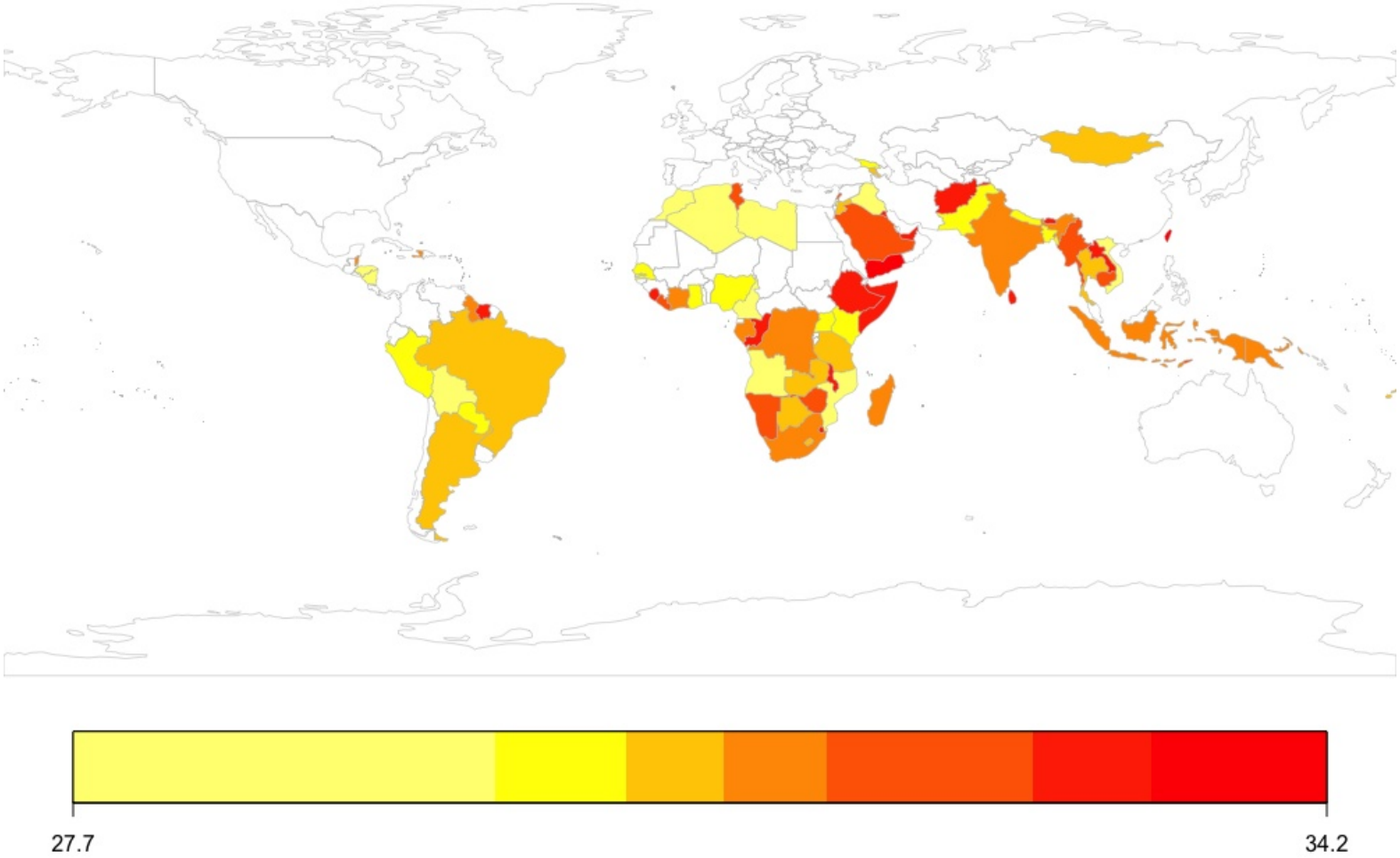
The average value of the MAPE for the predictions on the test set is 2.3%.

Table: Linear Regression for Male MAC.

	Estimate
Intercept	7.451*** (1.936)
Facebook MAC	0.811*** (0.063)
N	81
R^2	0.676
Adjusted R^2	0.671
Residual Std. Error	0.949 (df=79)
F Static	164.4*** (df=1;79)

*p<0.1; **p<0.05; ***p<0.01

Prediction of Male Mean Age at Childbearing



Conclusions

This paper provides the basis for running more detailed (male) fertility analysis through Facebook Advertising Data as it shows the feasibility to estimate Mean Age at Childbearing (MAC).

Advantage:

- Global data availability
- Homogeneous dataset
- Data for under-studied dimensions

Disadvantage:

- No metadata
- No control over the variables
- Bias and non-representative data

Thanks!

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