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Evolution and Human Behavior 31 (2010) 150 – 151

Evolution and Human Behavior

A re-evaluation of the statistical model in Pollet and Nettle 2009☆

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Initial receipt 26 June 2009; final revision received 6 December 2009

Pollet and Nettle (Pollet & Nettle, 2009; henceforth, P&N) used ordinal regression models to investigate the effect of indicators of male quality, height and income, on self-reported female orgasm frequency. The strategy was as follows: in the first step the two key variables, male height and male income, were included. Subsequently, height was removed as it proved not to be a significant predictor at 5% level. Then, using an information theoretic approach, the authors examined whether model fit could be improved by adding control variables and stopped when the model could not be further improved as assessed by the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). P&N concluded that the best-fitting model contained partner income as a predictor.

To obtain the parameter estimates in an ordinal regression model, the data are often pooled into groups according to the values of the covariates, and the likelihood of the grouped data is maximized, instead of the likelihood of the individual data. The pooled data likelihood function includes a multinomial constant (see Supporting Information, Sections 1 and 2), which is not present in the likelihood function for the individual data. This multinomial constant does not alter the parameter estimates, and so the estimates presented in P&N's Table 2 were correct. However, inclusion or exclusion of the multinomial constant affects the calculation of AIC and BIC based on −2 log likelihood, since these criterions are model specific. As a consequence, models with different multinomial constants cannot be compared based on log-likelihood statistics. It turned out that P&N used a software implementation (SPSS 15.0) which by default calculates the log likelihood including the constant. Thus, the AIC and BIC values given were not correct, and the model selection strategy was affected. We reran the analyses in R (R Development Core Team, 2008) the model estimating the likelihood for the individual data and excluding the multinomial constant term. The results are presented in Table 1.

The results confirm that partner income is associated with orgasm frequency (Step 1), and this association is robust to control for female age and education (Steps 2 and 4). However, unlike P&N, the reanalysis shows that the model fit can be improved by adding more variables, until the point where the effect of partner income is not significant anymore. This conclusion is reinforced by using alternative model selection strategies (see Supporting Information, Sections 3 and 4).

Acknowledgments

The authors would like to thank the Population Center at NORC and the University of Chicago for providing public access to these data. Information about the CHFLS, and due acknowledgement of its original funding, can be found at: http://popcenter.uchicago.edu/data/chfls.shtml.

Appendix A. Online appendix

The online appendix contains additional information about the model selection procedure, the likelihood calculation and

☆ EH and TH spotted the mistake, re-analysed the data and wrote the supplementary material. TP and DN provided information on the preparation and interpretation of the data and the strategy of analysis and wrote the commentary.

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doi:10.1016/j.evolhumbehav.2009.12.003

Table 1
Summary of variable selection following the strategy of Pollet and Nettle (2009) using the correctly computed AIC and BIC

	Start	Step 1	Step 2	Step 3	Step 4a	Step 4b	Step 5	Step 6	Step 7
Partner income	0.243****	0.247****	0.151**	0.119*	0.100	0.089	0.070	0.054	0.052
Partner height	0.082	–	–	–	–	–	–	–	–
Education ♀									
No school	–	–	−1.452****	−1.312***	−1.367***	−1.647****	−1.706****	−1.680****	−1.753****
Primary	–	–	−0.496	−0.518	−0.548	−0.787*	−0.815*	−0.875*	−0.927**
Lower middle	–	–	0.051	−0.132	−0.144	−0.312	−0.321	−0.354	−0.412
Upper middle	–	–	0.453	0.364	0.336	0.275	−0.251	0.208	0.171
Junior college	–	–	0.318	0.231	0.204	0.186	0.162	0.144	0.113
University	–	–	0	0	0	0	0	0	0
Age ♀	–	–	–	−0.314****	−0.314****	−0.320****	−0.320****	−0.314****	−0.287****
Happiness ♀									
Very happy	–	–	–	–	1.154	–	1.209	1.209	0.889
Relatively happy	–	–	–	–	0.845	–	0.892	0.891	0.620
Not too unhappy	–	–	–	–	0.253	–	0.315	0.307	0.151
Very unhappy	–	–	–	–	0	–	0	0	0
Education difference	–	–	–	–	–	−0.178**	−0.179**	−0.166**	−0.170**
Region									
Coastal South	–	–	–	–	–	–	–	0.574**	0.578**
Coastal East	–	–	–	–	–	–	–	0.212	0.189
Inland South	–	–	–	–	–	–	–	0.483*	0.489*
North	–	–	–	–	–	–	–	0.181	0.190
North East	–	–	–	–	–	–	–	0.379*	0.397*
Central West	–	–	–	–	–	–	–	0	0
Health ♀									
Excellent	–	–	–	–	–	–	–	–	1.716**
Good	–	–	–	–	–	–	–	–	1.695**
Fair	–	–	–	–	–	–	–	–	1.556*
Not good	–	–	–	–	–	–	–	–	1.224
Poor	–	–	–	–	–	–	–	–	0
AIC	3915.8	3916.7	3837.0	3800.0	3779.4[1]		3764.3	3759.2	3753.9[4]
BIC	3947.8	3943.4	3890.4	3858.7		3848.7[2]	3844.3[3]		

[1] AIC for Step 4a.
[2] BIC for Step 4b.
[3] No reduction of BIC by adding a further variable.
[4] No reduction of AIC by adding a further variable.
* $p<.05$.
** $p<.01$.
*** $p<.001$.
**** $p<.0001$ based on Wald test.

alternative models, and can be found at http://cran.r-project.org/web/packages/multcomp/index.html.

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.evolhumbehav.2009.12.003.

References

Pollet, T. V., & Nettle, D. (2009). Partner wealth predicts self-reported orgasm frequency in a sample of Chinese women. *Evolution and Human Behavior, 30,* 146–151.

R Development Core Team. R: A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing. http://www.R-project.org.