

Supplement to:

Rauf, Tamkinat. 2026. "The Happiness Paradox of Birth Order" Sociological Science 13: 1329-1353.

Online Supplement

The Happiness Paradox of Birth Order

Table of Contents

<i>S1. Documentation of data & measures</i>	3
<i>S2. Results of models estimating birth order effects</i>	5
<i>S3. Results of models estimating wellbeing-income association</i>	7
<i>S4. Non-pecuniary processes</i>	10
<i>References</i>	12

S1. Documentation of data & measures

Sibling data

NLSY79

Data about siblings was collected at two time points. In 1979, respondents reported the total number of living siblings (no distinction was made between biological and non-biological siblings). Respondents were then asked how many of those siblings were older. The household roster included data about living coresidential siblings and their ages, but did not ask about deceased siblings. In 1993, a sibling supplement was administered, which recorded information for up to 13 living and deceased *biological* siblings, including whether the sibling was older, younger, or the same age as the respondent. There is a high correlation between the number of siblings reported in 1979 and 1993 ($r=.9$). However, the 1993 supplement provides more accurate information about birth order since it includes deceased siblings.

To identify birth order and number of biological siblings, I primarily use data from the 1993 supplement. For respondents who did not participate in the 1993 interview ($N=953$) or did not provide complete sibling data in 1993 ($N=28$), the number of siblings and birth order is imputed from the 1979 survey where possible. I cannot establish birth order for respondents who did not participate in the 1993 survey and also reported no older siblings in 1979 (since they could have had deceased older siblings); these cases are excluded ($N=194$).

NLSY97

Data about siblings was collected in Wave 1 via household and non-household rosters. Rosters included information about sibling relation (biological or non-biological) and age. The non-household roster also included deceased siblings. I use the respondents' and siblings' ages to identify birth order. Where age is missing, I compare years of education completed to approximate birth order. Birth order cannot be established for cases that had non-zero siblings and were missing data on age and education of one or more sibling; these cases are excluded ($N=535$).

Subjective wellbeing

- *Life satisfaction*: In NLSY79, life satisfaction is consistently measured between 2014-2022 (age 49+) on a 7-item scale ranging from 1= not at all satisfied, 7= completely satisfied. In the NLSY97, life satisfaction was only measured in 2008 (age 23-29), on a scale of 1 (extremely dissatisfied) to 10 (extremely satisfied).
- *Positive affect*: In NLSY79, I use an item from the 1992 survey (ages 27-35) which measures the frequency of "being a happy person" in the week prior to interview on a 4-category scale ranging from 1 = none of the time to 4 = all of the time. In NLSY97, I use a question about frequency of being a happy person in the past month. This was also recorded on a similar 4-category scale and was administered consistently from 2000-2019 (ages 15-40). Only measures recorded after age 25 are used in the analysis.

- *Mental health:* I use a 7-item version of the Center of Epidemiological Studies Depression (CES-D) scale as an indicator of negative psychological experience (Radloff 1977). The items pertain to frequency of the following experiences during the week prior to the interview: appetite, trouble focusing, feeling depressed, feeling that everything was an effort, restless sleep, sadness, and inability to get going. CES-D items were administered for the NLS1979 cohort in 1992, 1994, 2020, and 2022 (age 27+), and for the NLS1997 cohort in 2019-2023 (age 35+).

Imputation

Missing data for measures about parents, wellbeing, and non-pecuniary processes were imputed. Imputation increases precision without generating bias as long as the cases are conditionally missing at random (Brownstone and Valletta 2001; Zha and Harel 2021). Imputation models included all covariates that were used in the main models, as well as both measures of income, years of education, region, birth year, household size in Wave 1, and NLSY cohort fixed effect. Models are weighted, with survey weights normalized within dataset. Multiple imputation is conducted on the combined dataset using chained imputation models with 50 imputations. The number of imputations was decided using the *how many imputations* package in Stata (von Hippel 2018, 2020). Standard errors are pooled using Rubin's rule.

Table S1. Descriptive Statistics of Analytic Samples

	Full sample	Sibling sample
% First born	0.31	0.26
Number of siblings (mean)	2.84	3.07
% Female	0.50	0.49
% Hispanic	0.10	0.09
% Black	0.14	0.15
% Non-Hispanic, non-Black	0.76	0.76
% Teenage mother	0.15	0.13
Parent years of education, highest (mean)	13.02	13.03
Family income, Wave 1 (mean)	\$ 98,183	\$ 103,193
% Coresidential biological parents Wave 1	0.62	0.69
Family income/year (age 29-40)	\$ 111,489	\$ 114,267
Earned income/year (age 29-40)	\$ 52,906	\$ 53,977
N	15,306	7,056

Note: Estimates are weighted. For comparability, income variables are in 2023 constant dollars. Only biological siblings are included in definitions of birth order, sibship size, and sibling samples.

S2. Results of models estimating birth order effects

Table S2.1 Regressions of permanent income

	(1) Family income	(2) Family income	(3) Personal income	(4) Personal income
First-born	6.01* (2.57)	6.69 (4.53)	2.82** (1.07)	2.29 (1.79)
No. of biological sibs	-2.86*** (0.60)		-1.10*** (0.23)	
Female	2.83 (2.11)	8.80* (4.06)	-27.40*** (0.87)	-29.17*** (1.62)
Hispanic	-18.52*** (2.13)		-7.05*** (1.08)	
Black	-17.28*** (1.95)		-6.14*** (0.96)	
Mother <20yo at birth	-16.78*** (2.26)	-11.56* (5.55)	-7.50*** (1.13)	-4.45 (2.77)
Parental education, years	6.43*** (0.49)		2.60*** (0.19)	
Log family income, Wave 1	6.45*** (1.07)		2.66*** (0.51)	
Co-resided with parents until 18	19.27*** (2.21)		7.78*** (0.94)	
NLSY 1997	-6.47* (2.74)		0.29 (1.06)	
Constant	-41.41*** (12.27)	109.79*** (2.57)	3.05 (5.55)	68.24*** (1.05)
Family FE	No	Yes	No	Yes
N (cases)	15306	7056	15306	7056

Note: Estimates are weighted and based on multiply imputed data (m=50). Standard errors are in parentheses. OLS models report SEs clustered by household. Fixed effects models report robust SEs.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S2.2 Regressions of indicators of subjective wellbeing

	(1) Life sat	(2) Pos affect	(3) Mental health	(4) Life sat	(5) Pos affect	(6) Mental health
First-born	0.02 (0.02)	-0.03 (0.02)	-0.02 (0.02)	0.02 (0.04)	-0.04 (0.04)	0.05 (0.04)
No. of biological sibs	-0.00 (0.01)	-0.01* (0.01)	-0.02*** (0.01)			
Female	0.03 (0.02)	-0.05** (0.02)	-0.33*** (0.02)	0.03 (0.04)	-0.04 (0.03)	-0.37*** (0.03)
Hispanic	0.00 (0.03)	0.03 (0.03)	0.03 (0.03)			
Black	0.09*** (0.03)	-0.03 (0.02)	0.04 (0.02)			
Mother <20yo at birth	-0.05 (0.03)	-0.02 (0.03)	-0.06 (0.03)	-0.04 (0.08)	0.05 (0.07)	-0.08 (0.07)
Parental education, years	-0.01* (0.00)	0.01 (0.00)	0.01*** (0.00)			
Log family income, Wave 1	0.02 (0.01)	-0.00 (0.01)	0.01 (0.01)			
Co-resided with parents until 18	0.19*** (0.02)	0.11*** (0.02)	0.19*** (0.02)			
NLSY 1997	0.08*** (0.02)	-0.11*** (0.02)	-0.06** (0.02)			
Constant	-0.27* (0.11)	0.01 (0.09)	-0.15 (0.10)	-0.00 (0.03)	0.07** (0.02)	0.26*** (0.02)
Family FE	No	No	No	Yes	Yes	Yes
N (cases)	15306	15306	15306	7056	7056	7056

Note: Estimates are weighted and based on multiply imputed data (m=50). Standard errors are in parentheses. OLS models report SEs clustered by household. Fixed effects models report robust SEs.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S3. Results of models estimating wellbeing-income association

Table S3.1. Regressions of indicators of subjective wellbeing

	(1) Life sat.	(2) Pos. affect	(3) Mental health	(4) Life sat.	(5) Pos. affect	(6) Mental health
Log family income	0.23*** (0.01)	0.17*** (0.01)	0.29*** (0.01)			
Log personal income				0.08*** (0.01)	0.08*** (0.01)	0.14*** (0.01)
Female	0.02 (0.02)	-0.06** (0.02)	-0.34*** (0.02)	0.09*** (0.02)	0.01 (0.02)	-0.22*** (0.02)
Hispanic	0.11*** (0.03)	0.09*** (0.02)	0.11*** (0.02)	0.00 (0.03)	0.02 (0.02)	0.00 (0.02)
Black	0.18*** (0.02)	0.02 (0.02)	0.10*** (0.02)	0.10*** (0.02)	-0.03 (0.02)	0.01 (0.02)
NLSY97	0.03 (0.02)	-0.11*** (0.02)	-0.07*** (0.02)	0.05* (0.02)	-0.10*** (0.02)	-0.04* (0.02)
Constant	-1.11*** (0.06)	-0.66*** (0.06)	-1.07*** (0.06)	-0.38*** (0.04)	-0.19*** (0.03)	-0.30*** (0.04)
N (cases)	15306	15306	15306	15306	15306	15306

Note: Estimates are weighted and based on multiply imputed data (m=50). Robust standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S3.2. Regressions of selected indicators of subjective wellbeing among first-borns

	(1) Pos. affect	(2) Mental health	(3) Pos. affect	(4) Mental health
Log family income	0.16*** (0.02)	0.31*** (0.02)		
Log personal income			0.08*** (0.01)	0.16*** (0.02)
Female	-0.02 (0.03)	-0.28*** (0.03)	0.05 (0.03)	-0.16*** (0.03)
Hispanic	0.10* (0.04)	0.16*** (0.04)	0.03 (0.04)	0.03 (0.04)
Black	0.07 (0.04)	0.13** (0.04)	0.02 (0.04)	0.05 (0.04)
NLSY97	-0.15*** (0.03)	-0.09** (0.03)	-0.14*** (0.03)	-0.07* (0.03)
Constant	-0.66*** (0.10)	-1.20*** (0.11)	-0.23*** (0.06)	-0.41*** (0.07)
N (cases)	4490	4490	4503	4503

Note: Estimates are weighted and based on multiply imputed data (m=50). Robust standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table S3.3. Regressions of selected indicators of subjective wellbeing among later-borns

	(1) Pos. affect	(2) Mental health	(3) Pos. affect	(4) Mental health
Log family income	0.18*** (0.01)	0.28*** (0.02)		
Log personal income			0.07*** (0.01)	0.13*** (0.01)
Female	-0.08*** (0.02)	-0.37*** (0.02)	-0.01 (0.02)	-0.25*** (0.02)
Hispanic	0.08** (0.03)	0.08** (0.03)	0.01 (0.03)	-0.02 (0.03)
Black	0.00 (0.03)	0.08** (0.03)	-0.06* (0.02)	-0.01 (0.02)
NLSY97	-0.08*** (0.02)	-0.04 (0.02)	-0.07** (0.02)	-0.02 (0.02)
Constant	-0.67*** (0.07)	-1.02*** (0.07)	-0.17*** (0.04)	-0.26*** (0.04)
N (cases)	10795	10795	10829	10829

Note: Estimates are weighted and based on multiply imputed data (m=50). Robust standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

S4. Non-pecuniary processes

Measures

Not all measures are recorded with sufficient frequency to allow nuanced analysis of life course trends. However, to glean some insight into age-related processes, I stratify analysis by measures collected before and after age 25 (“youth” and “midlife”, respectively). Where applicable, repeated measures are averaged over time. As with wellbeing, these measures were collected at different ages across respondents, and are therefore similarly residualized on age. All variables are standardized within datasets and age groups. Definitions of specific measures are as follows:

1. **Self-rated health:** Standard item measuring general health on a scale of 1 = poor to 5 = excellent. In NLSY79, a retrospective measure of childhood health was collected in later waves, and no measure of current self-rated health is available. In NLSY97, this measure was collected in all waves.
2. **Control, internal locus:** This was measured using the locus of control scale (Rosenbaum 1980), and is coded such that higher values indicate internal locus of control. Available only in NLSY79, for two points in time mapping on to youth and midlife.
3. **Self-esteem:** This was measured using the Rosenberg self-esteem scale (Rosenberg 1965). Available only in NLSY79, for two points in time mapping on to youth and midlife.
4. **Grit:** This is measured using the standard grit scale (Duckworth et al. 2007). It is administered in the NLSY97 once per respondent during midlife years.
5. **Parental love:** Indicates whether the respondent felt loved by parent/s as a child (1= quite a lot, or a great deal; 0 = a little, or none at all). Retrospective measure available only in NLSY79.
6. **Parental abuse:** Indicates whether the respondent was abused by parent/s as a child (1= at least once; 0 = never). Retrospective measure available only in NLSY79.
7. **Parental help:** Indicates whether the respondent lists either parent as someone they turn to for help. Available only in NLSY97, and collected during both youth and midlife.
8. **Caregiving:** Indicates whether the respondent was ever a caregiver to a relative or friend during midlife. While the identity of the care recipient is not provided, this is the nearest proxy for whether the respondent has a caregiving role. Available only in NLSY79.
9. **Parent proximity:** Indicates whether R ever co-resided with or lived within 5 miles of one or both parents after age 25. Available only in NLSY97.

Table S4. Regressions of indicators of subjective wellbeing

	(1) Pos affect	(2) Mental health	(3) Pos affect	(4) Mental health
First-born	0.00 (0.03)	-0.01 (0.03)	-0.03 (0.05)	0.07 (0.05)
Parental abuse	-0.22*** (0.04)	-0.50*** (0.04)	-0.17 (0.09)	-0.36*** (0.08)
No. of biological sibs	-0.01 (0.01)	-0.02* (0.01)		
Female	-0.02 (0.02)	-0.34*** (0.02)	-0.02 (0.05)	-0.39*** (0.04)
Hispanic	-0.08* (0.04)	0.03 (0.04)		
Black	-0.19*** (0.03)	-0.07* (0.03)		
Mother <20yo at birth	-0.02 (0.04)	-0.06 (0.04)	0.11 (0.09)	-0.11 (0.09)
Parental education, years	0.02*** (0.00)	0.02*** (0.00)		
Log family income, Wave 1	0.00 (0.01)	0.01 (0.01)		
Co-resided with parents until 18	0.06* (0.03)	0.13*** (0.03)		
Constant	-0.11 (0.13)	-0.14 (0.15)	0.10** (0.03)	0.33*** (0.03)
Family FE	No	No	Yes	Yes
N (cases)	8745	8745	4258	4258

Note: Estimates are weighted and based on multiply imputed data (m=50). Standard errors are in parentheses. OLS models report SEs clustered by household. Fixed effects models report robust SEs. Parental abuse data are only available for NLSY79.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

References

- Brownstone, David, and Robert Valletta. 2001. "The Bootstrap and Multiple Imputations: Harnessing Increased Computing Power for Improved Statistical Tests." *Journal of Economic Perspectives* 15(4):129–41. doi:10.1257/jep.15.4.129.
- Duckworth, Angela L., Christopher Peterson, Michael D. Matthews, and Dennis R. Kelly. 2007. "Grit Scale." American Psychological Association (APA). doi:10.1037/t07051-000.
- von Hippel, Paul T. 2018. *HOW MANY IMPUTATIONS: Stata module to determine required number of imputations*: Version S458452. Department of Economics, Boston College.
- von Hippel, Paul T. 2020. "How Many Imputations Do You Need? A Two-Stage Calculation Using a Quadratic Rule." *Sociological Methods & Research* 49(3):699–718. doi:10.1177/0049124117747303.
- Radloff, Lenore S. 1977. "A Self-Report Depression Scale for Research in the General Population." *Applied Psychological Measurement* 1(3):385–401.
- Rosenbaum, Michael. 1980. "A Schedule for Assessing Self-Control Behaviors: Preliminary Findings." *Behavior Therapy* 11(1):109–21. doi:10.1016/s0005-7894(80)80040-2.
- Rosenberg, M. 1965. "Rosenberg Self-Esteem Scale." American Psychological Association (APA). doi:10.1037/t01038-000.
- Zha, Ruochen, and Ofer Harel. 2021. "Power Calculation in Multiply Imputed Data." *Statistical Papers* 62(1):533–59. doi:10.1007/s00362-019-01098-8.