Family Networks versus Genetics in Social Outcomes, England 1750-2019

Gregory Clark, UC Davis and LSE

Family Networks and Social Outcomes

- Substantial literature in anthropology and sociology on how family other than parents affect child social outcomes (*alloparents*).
- These relatives are grandparents, uncles/aunts, and cousins.
- Controlling for characteristics of parents, the status of these other relatives is predictive of child status.

Example - Recent Papers

- Chan, T. W., and Boliver, V. 2013. The grandparents effect in social mobility: Evidence from British birth cohort studies. *American Sociological Review, 78,* 662–678.

- Knigge, Antonie, 2016. "Beyond the Parental Generation: The Influence of Grandfathers and Great-grandfathers on Status Attainment." *Demography*, 53.

- Song, Xi, Robert D. Mare. 2019. "Shared Lifetimes, Multigenerational Exposure, and Educational Mobility." *Demography*, 56(3): 891-916.

Predictive Effect of Collateral Relatives Significant

	Outcome:		
	Ln Wealth	Occupational Rank	Education
	(1)	(2)	(3)
Father	.264***	.366***	.185***
	(.004)	(.004)	(.002)
Grandfather	.136***	.153***	.081***
	(.004)	(.004)	(.003)
Uncle	.078***	.162***	.105***
	(.004)	(.004)	(.003)
Observations	46,940	63,472	106,565
R^2	.323	.469	.166

Predictive Effect of Collateral Relatives Significant

	Outcome:		
	Ln Wealth	Occupational Rank	Education
	(1)	(2)	(3)
Father	.272***	.399***	.231***
	(.006)	(.005)	(.003)
Grandfather	.164***	.168***	.089***
	(.005)	(.005)	(.003)
Cousin	.096***	.162***	.133***
	(.006)	(.004)	(.004)
Observations	27,182	44,094	66,682
R^2	.362	.483	.190

Reasons for collateral relatives being predictive

- **CAUSAL** - Social transmission of status – relatives contribute resources, connections, models

- **NON CAUSAL** - Genetic transmission – relatives give information on the underlying genotype of parents. Parents alone determine child outcomes.

Additive Genetic Transmission

$$y_{it} = x_t + u_{it}$$
$$x_t = bx_{t-1} + e_t$$

- *yi* status phenotypes
- *x* status genotype

- Phenotype values of relatives give information on relative values of x_{t-1} and u_{it-1} for father in determining y_t for child

- That information is stronger the more closely genetically related the relative is.

Predicted Correlation of Relatives

Relative to Child	Matching on: Genotype	Phenotype
Parent-Parent	$h^2 m$	r
Mid-parent	h^2	h^2
Single parent	$h^2 \frac{1+m}{2}$	$h^2 \frac{1+r}{2}$
Siblings	$h^2 \frac{1+m}{2}$	$h^2 \frac{1+m}{2}$
Avuncular	$h^2 (\frac{1+m}{2})^2$	$h^2 (\frac{1+m}{2}) \frac{1+r}{2}$
Grandparent	$h^2 (\frac{1+m}{2})^2$	$h^2 (\frac{1+m}{2}) \frac{1+r}{2}$
Cousins	$h^2 (\frac{1+m}{2})^3$	$h^2 (\frac{1+m}{2})^2 \frac{1+r}{2}$
Gt Grandparent	$h^2 (\frac{1+m}{2})^3$	$h^2 (\frac{1+m}{2})^2 \frac{1+r}{2}$
Second Cousins	$h^2 (\frac{1+m}{2})^5$	$h^2 (\frac{1+m}{2})^4 \frac{1+r}{2}$

Predicted Correlation of Relatives

Relative to Child	Matching on: Genotype	Phenotype
Parent-Parent	$h^2 m$	r
Mid-parent	h^2	h^2
Single parent	$h^2 \frac{1+m}{2}$	$h^2 \frac{1+r}{2}$
Siblings	$h^2 \frac{1+m}{2}$	$h^2 \frac{1+m}{2}$
Avuncular	$h^2 (\frac{1+m}{2})^2$	$h^2 (\frac{1+m}{2}) \frac{1+r}{2}$
Grandparent	$h^2 (\frac{1+m}{2})^2$	$h^2 (\frac{1+m}{2}) \frac{1+r}{2}$
Cousins	$h^2 (\frac{1+m}{2})^3$	$h^2 (\frac{1+m}{2})^2 \frac{1+r}{2}$
Gt Grandparent	$h^2 (\frac{1+m}{2})^3$	$h^2 (\frac{1+m}{2})^2 \frac{1+r}{2}$
Second Cousins	$h^2 (\frac{1+m}{2})^5$	$h^2 (\frac{1+m}{2})^4 \frac{1+r}{2}$

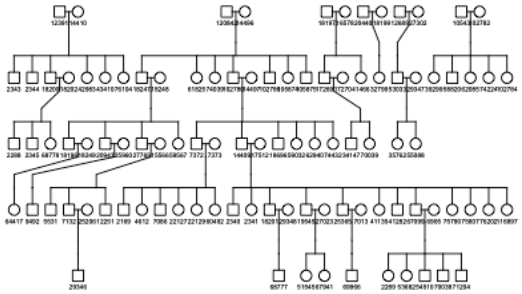
Predicted Correlation of Relatives

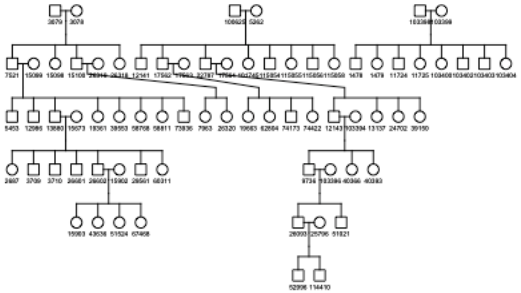
Relative to Child	Matching on: Genotype	Phenotype
Parent-Parent	$h^2 m$	r
Mid-parent	h^2	h^2
Single parent	$h^2 \frac{1+m}{2}$	$h^2 \frac{1+r}{2}$
Siblings	$h^2 \frac{1+m}{2}$	$h^2 \frac{1+m}{2}$
Avuncular	$h^2 (\frac{1+m}{2})^2$	$h^2 (\frac{1+m}{2}) \frac{1+r}{2}$
Grandparent	$h^2 (\frac{1+m}{2})^2$	$h^2 (\frac{1+m}{2}) \frac{1+r}{2}$
Cousins	$h^2 (\frac{1+m}{2})^3$	$h^2 (\frac{1+m}{2})^2 \frac{1+r}{2}$
Gt Grandparent	$h^2 (\frac{1+m}{2})^3$	$h^2 (\frac{1+m}{2})^2 \frac{1+r}{2}$
Second Cousins	$h^2 (\frac{1+m}{2})^5$	$h^2 (\frac{1+m}{2})^4 \frac{1+r}{2}$

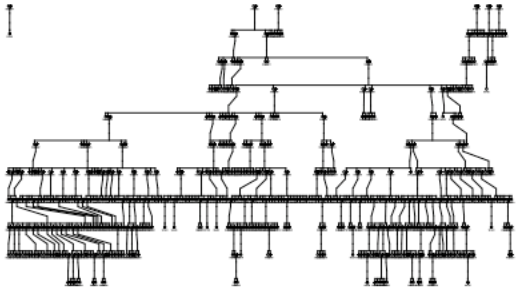
Dataset under construction to test this

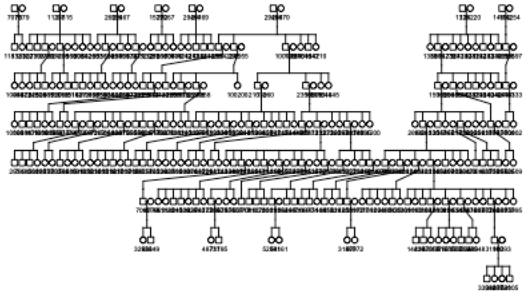
- Lineage of 366,450 people with rare surnames England 1700-2019.
- Using variety of public data sources we link parents-children across 4-8 generations

Sample Pedigrees from the Database

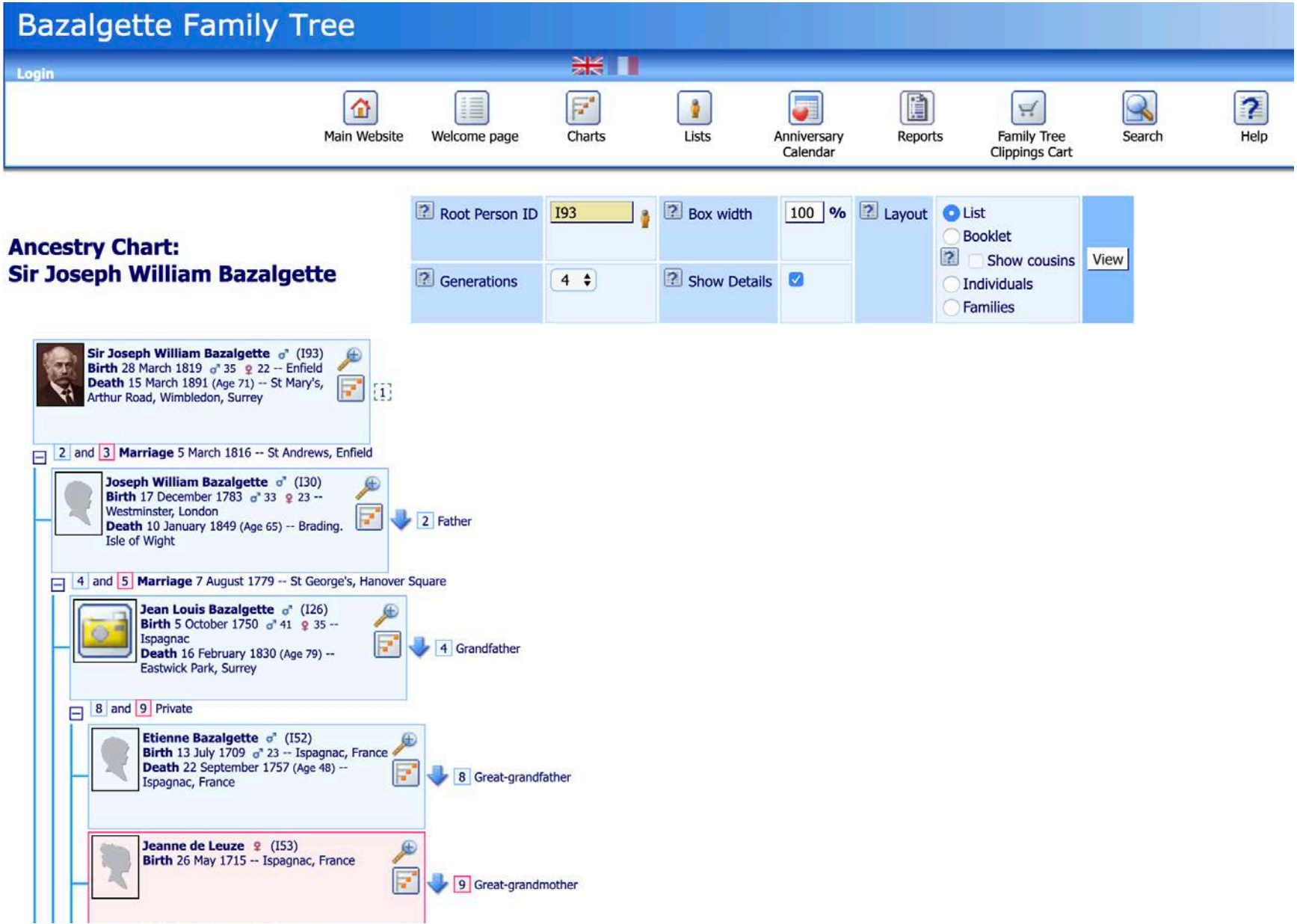








Crowd Sourcing – Family Trees



Guild of One-Name Studies

Search the site | Search

Home | Studies | News | Forums | Events | Resources | Help | Log In

Guild of One-Name Studies

Start your surname search here

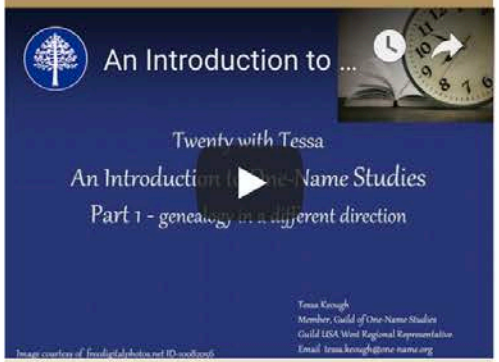
Surname search... Search

2,703 members
2,380 studies
8,429 surnames

Guild News

- Persons of Interest - Part 2, Sir Charles Umpherston AITCHISON
- Persons of Interest - Part 1, Sir Charles Umpherston AITCHISON
- Persons of Interest - Luke Sidney Morcom
- Persons of Interest - Frederic Moseley Sackett
- Maritime Aspects of Yorkshire and the Humber Seminar
- Persons of Interest - Charles Hiley
- Will You Meet the Guild in St. Charles?

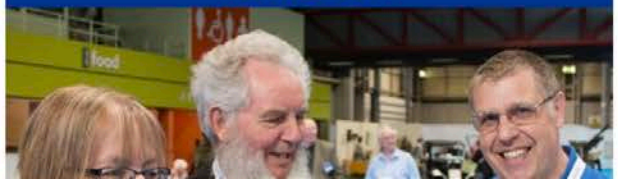
Welcome Videos



We invite you to explore the context of One-

About the Guild

How to Join



Social Outcomes

- **Wealth at Death –** everyone, 1858-2016. Richer families 1799-1857.
- **Adult Occupation –** 1841-1911, 1939
- **Schooling 11-20 –** 1851-1911, 1939
- **Education –** Professional Qualifications 1750-1940
- **Adult Life Span –** born 1750-1920
- **Attaining age 21 –** born 1750-1920

Data so Far

Outcome	Number
People	366,453
Wealth at Death	48,912
Higher Education (males)	49,926
Occupational Status (males)	44,554
School 14-20	27,386
Age at Death	144,166
Reaching age 21	294,027

Three tests of social influence

- Dead versus living relatives – grandparents, uncles, cousins
- Magnitude of effects from grandfathers versus uncles, great grandfathers versus cousins
- Geographically close versus distant relatives

Dead versus living grandfathers

	Dependent variable:				
	Wealth	Occupation	Education	School, 14-20	Age, Death
	(1)	(2)	(3)	(4)	(5)
Alive at Birth?	$-.135^{***}$	$-.011^{**}$	$-.007$	.011	.034
	(.038)	(.005)	(.005)	(.018)	(.025)
Grandfather Status	$.100^{***}$	$.164^{***}$	$.064^{***}$	$.180^{***}$	$.066^{***}$
	(.009)	(.011)	(.009)	(.044)	(.015)
Status*Alive	$.021^{**}$	.013	.011	$-.032$	$-.025$
	(.009)	(.012)	(.012)	(.047)	(.021)
Observations	12,669	9,609	13,828	7,897	25,177
R^2	.374	.552	.236	.087	.209

Dead versus living uncles

	Ln Wealth	Occupational Rank	Higher Education	School 14-20	Normed age at death (21+)
Alive at Birth	0.041	-0.007	-0.011	0.000	-0.107
	(.092)	(.007)	(.007)	(.025)	(.062)
Uncle Status	0.015	0.164***	0.085***	0.274***	0.056
	(.022)	(.022)	(.029)	(.079)	(.034)
Status*alive at birth	0.098***	0.013	0.011	0.001	-0.016
	(.022)	(.022)	(0.030)	(.025)	(.035)
N	25,932	27,204	31,983	10,205	29,204
R^2	0.33	0.56	0.30	0.26	0.001

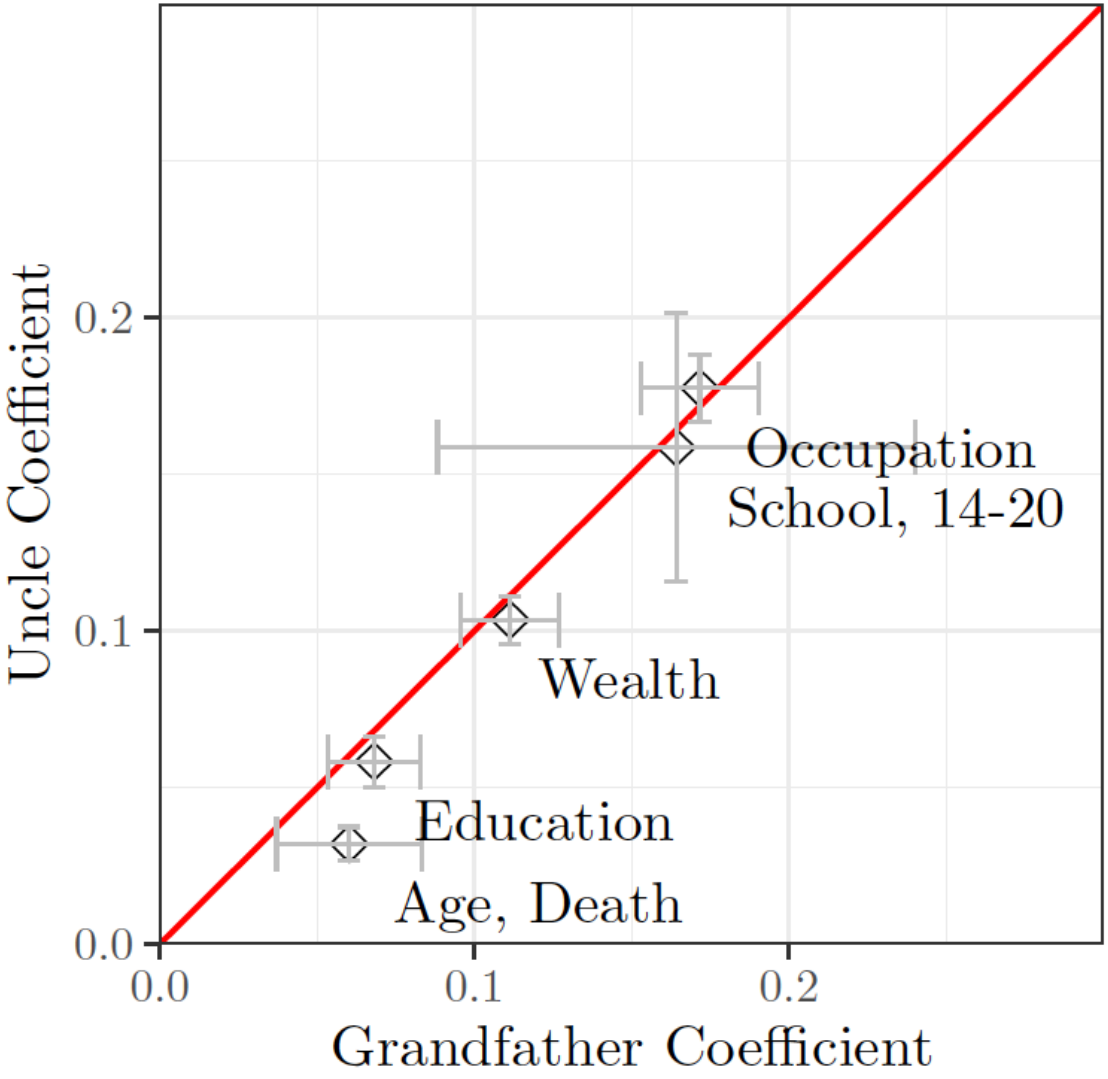
Dead versus living grandmother

	Dependent variable:				
	Wealth	Occupation	Education	School, 14-20	Age, Death
	(1)	(2)	(3)	(4)	(5)
Alive at Birth?	−.014	−.016***	.005	.005	.019
	(.041)	(.005)	(.005)	(.020)	(.027)
Grandfather Status	.089***	.132***	.046***	.140***	.063***
	(.010)	(.013)	(.011)	(.051)	(.019)
Status*Alive	.030***	.064***	.039***	.035	.003
	(.010)	(.013)	(.013)	(.050)	(.022)
Observations	11,548	8,752	12,661	7,247	22,523
R^2	.372	.546	.236	.086	.205

Grandfathers versus Uncles

Son Outcome	Predictor	Grandfather	Uncle	Difference
Ln(Wealth) at Death	Ln(Wealth) at Death	0.111*** (.008)	0.104*** (.004)	0.007 (.009)
Higher Education	Higher Education	0.068*** (.007)	0.058*** (.004)	0.010 (.008)
Occupational Status	Occupational Status	0.172*** (.009)	0.178*** (.005)	-0.006 (.010)
Normed adult age at death	Normed adult age at death	0.060** (.012)	0.032*** (.003)	0.028 (.012)
At School 14-20	Occupational Status	0.164*** (.038)	0.159*** (.021)	0.005 (.043)

Grandfathers versus Uncles



Great grandfathers versus cousins

Son Outcome	Predictor	Great Grandfather	Cousin	Difference
Ln(Wealth) at Death	Ln(Wealth) at Death	0.064*** (.014)	0.109*** (.007)	-0.045*** (.016)
Higher Education	Higher Education	0.055*** (.016)	0.063*** (.009)	-0.008 (.018)
Occupational Status	Occupational Status	0.145*** (.017)	0.170*** (.011)	-0.025 (.020)
Normed adult age at death	Normed adult age at death	0.029** (.013)	0.011*** (.004)	0.018 (.014)
At School 14-20	Occupational Status	0.235*** (.070)	0.234*** (.032)	0.001 (.077)
Survival to age 21	Occupational Status	0.037*** (.020)	0.065*** (.015)	-0.028 (.025)

Close versus distant uncles

	Dependent variable:				
	Wealth	Occupation	Education	School, 14-20	Age, Death
	(1)	(2)	(3)	(4)	(5)
Close	−.010	−.003	−.005	−.021	−.022**
	(.039)	(.005)	(.004)	(.021)	(.009)
Uncle Status	.091***	.162***	.059***	.114**	.030***
	(.008)	(.011)	(.008)	(.045)	(.008)
Status*Close	.040***	−.007	.005	.021	−.006
	(.011)	(.016)	(.016)	(.066)	(.010)
Observations	16,015	8,627	15,735	6,838	35,736
R^2	.361	.518	.211	.083	.198

Close versus distant cousins

	Dependent variable:				
	Wealth	Occupation	Education	School, 14-20	Age, Death
	(1)	(2)	(3)	(4)	(5)
Close	$-.106^{*}$	$.011^{*}$	$-.014^{**}$	.006	$-.071^{***}$
	(.060)	(.007)	(.006)	(.031)	(.012)
Cousin Status	$.090^{***}$	$.122^{***}$	$.056^{***}$	$.106^{*}$	$.020^{**}$
	(.012)	(.013)	(.012)	(.060)	(.010)
Status*Close	.004	$-.056^{**}$	$-.033$	$-.022$	$.027^{*}$
	(.020)	(.023)	(.028)	(.110)	(.014)
Observations	8,077	4,701	7,550	4,132	18,484
R^2	.398	.617	.259	.093	.219

Close versus distant grandmothers

	Dependent variable:				
	Wealth	Occupation	Education	School, 14-20	Age, Death
	(1)	(2)	(3)	(4)	(5)
Close	$-.122^{*}$	$-.007$	.004	$-.057$	.010
	(.068)	(.008)	(.009)	(.036)	(.045)
Grandfather Status	$.102^{***}$	$.156^{***}$	$.064^{***}$	.117	.051
	(.016)	(.020)	(.015)	(.087)	(.034)
Status*Close	.009	.006	$.058^{***}$	.108	$-.045$
	(.017)	(.022)	(.022)	(.090)	(.040)
Observations	4,297	2,986	4,486	2,406	7,595
R^2	.363	.517	.196	.082	.177

Conclusions

- Collateral relatives give significant additional information on child outcomes.
- Relatives provide as much information when they had no interaction with a child as when they interact.
- The amount of additional information collateral relatives supply is proportionate to their genetic connection to a child.