

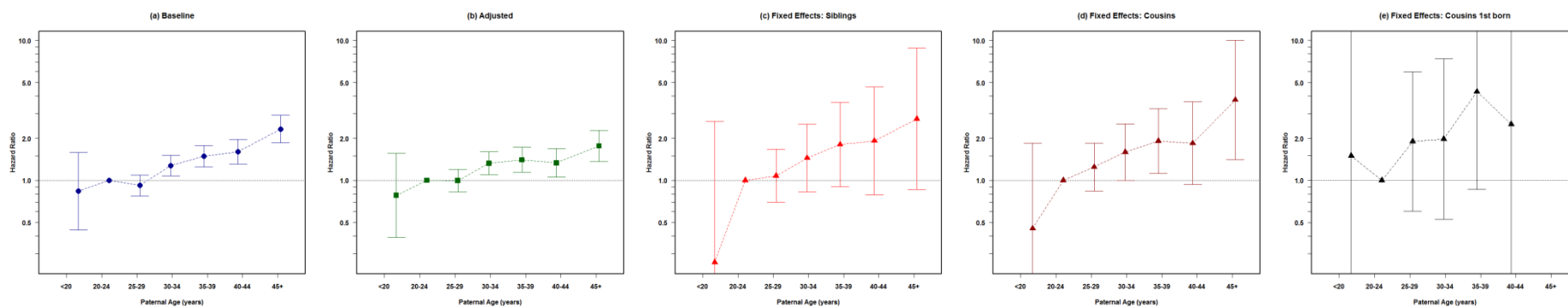
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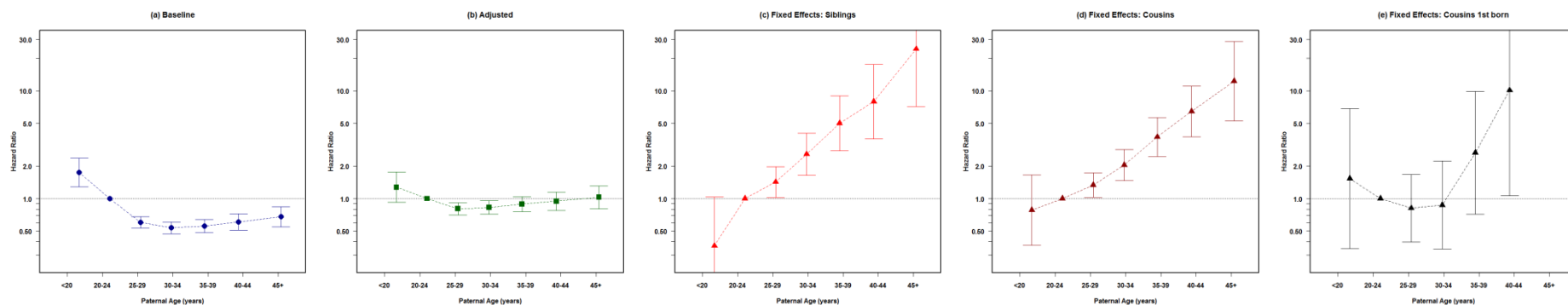
## Appendix A. Model fitting results for Autism and ADHD by 8 years old

The efigures present the Cox regression results when restricting Autism and ADHD diagnosis by age 8. The figures present the association between paternal age at child-bearing (PAC) and each outcome for the (a) baseline, (b) adjusted, (c) sibling-comparison, (d) cousin-comparison, and (e) first-born cousin-comparison models. The results of the ordinal models are presented with the point estimates and 95% confidence intervals as hash tags.

eFigure A.1. The figure presents the model fitting results when predicting Autism by the age of 8.



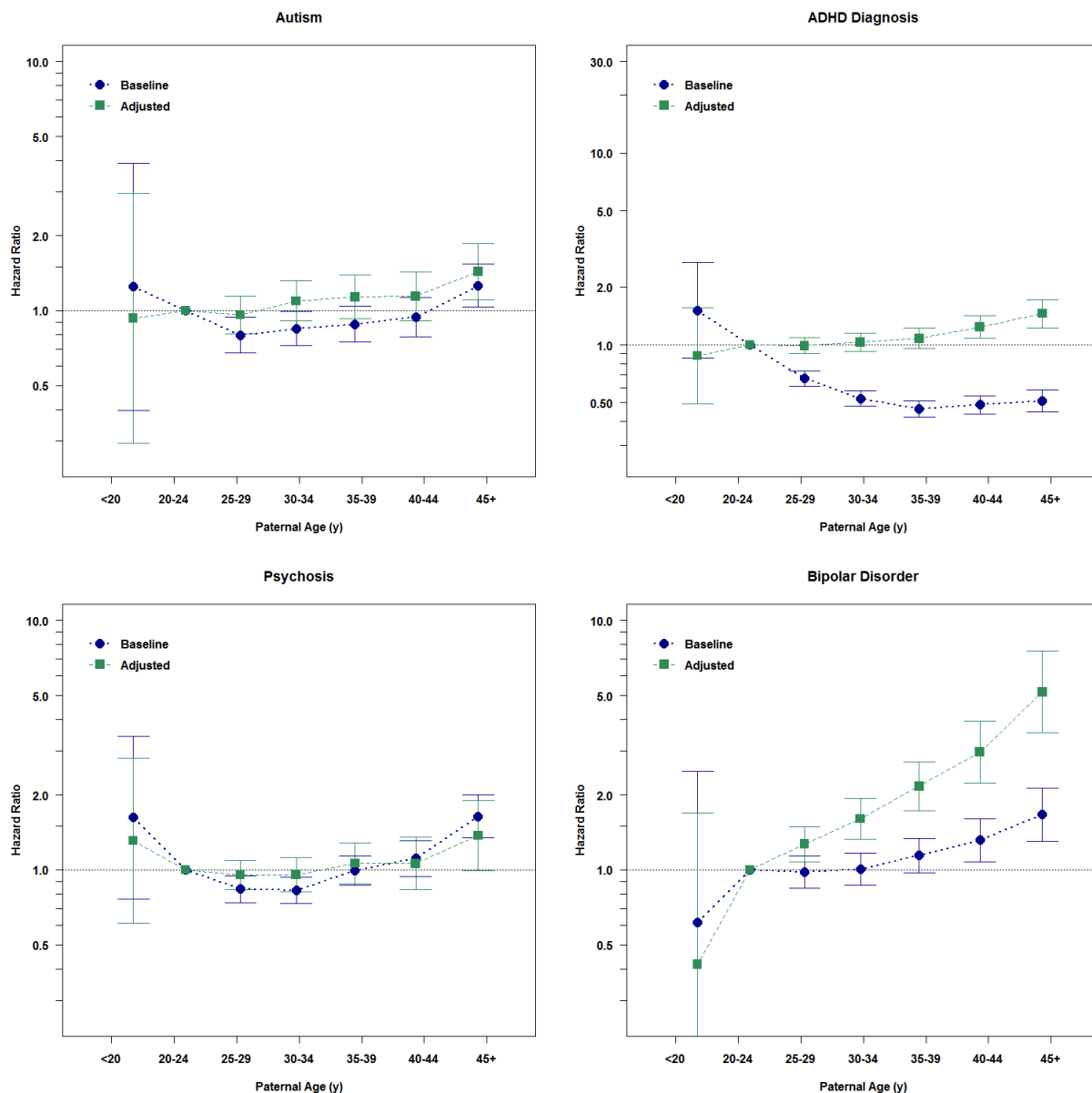
eFigure A.2. The figure presents the model fitting results when predicting ADHD by the age of 8.

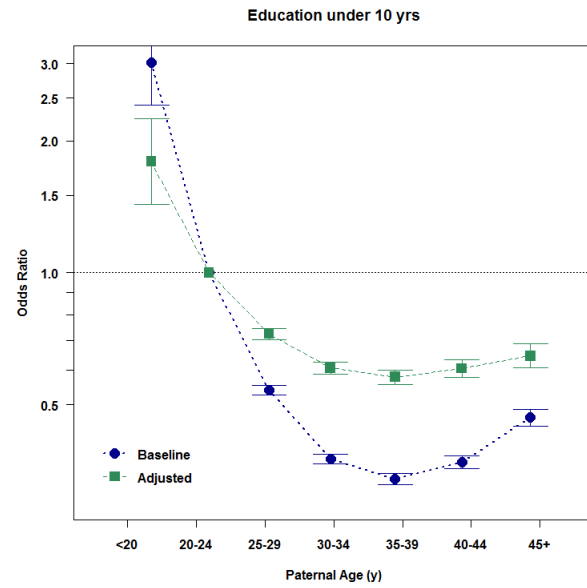
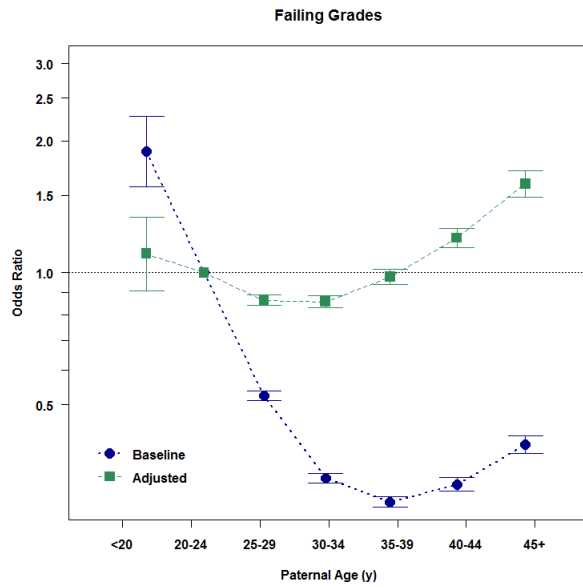
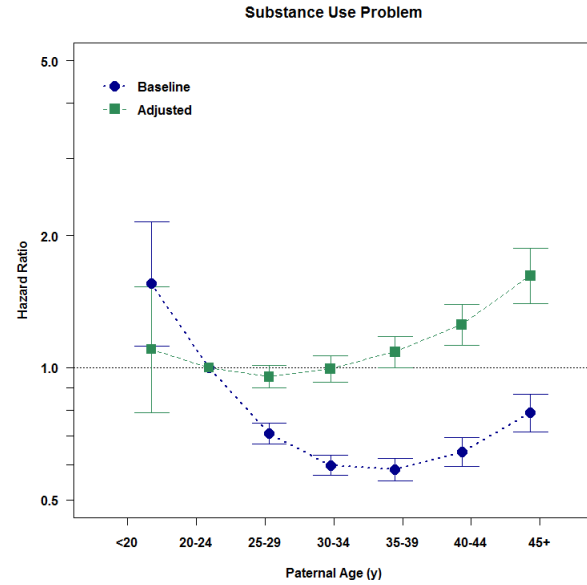
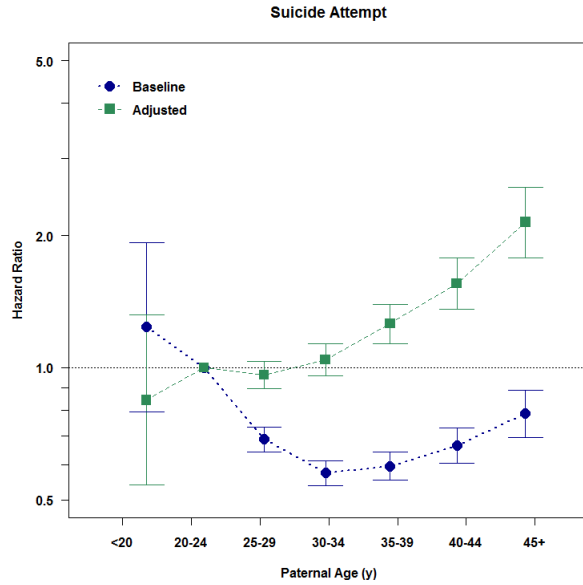


## Appendix B. Results for models controlling for paternal age at first childbearing while estimating associations with focal age at childbearing for all later-born offspring.

We fitted baseline and adjusted models for second born or later offspring only. In this analysis, the adjusted model controlled for paternal age at first childbearing. The sample for this analysis included  $n=1,206,412$  offspring (46.13% of the original 1973-2001 cohort) born to 897,340 fathers.

The figures present the association between paternal age at childbearing and psychiatric and academic morbidity in the subsample of second- or later-born children. The baseline model (in blue) presents the association in this subsample of the population, which replicates the findings from the complete sample. The adjusted model included a quantitative covariate for paternal age at first childbearing. The results are consistent with the fixed effects model results for each of the outcomes, although the associations between advancing PAC and Autism and ADHD are not as large as the estimates from the main analyses. The results, however, provide converging evidence that advancing paternal age is associated with increased risk of psychiatric and academic morbidity when accounting for factors associated with a father's age at first childbearing.





## Appendix C. Results for models predicting continuous indices of offspring grades and IQ (in males)

The results in eTable C.1 provide the point estimates (in standard deviation units) of the association between PAC and offspring IQ (in males) and grades (in both males and females). The results illustrate that the advancing PAC is associated with higher IQ and grades in the population (the baseline model). For IQ, the estimates are attenuated in the adjusted model, and the association is largely attenuated in the fixed effects models that compare differentially exposed siblings.

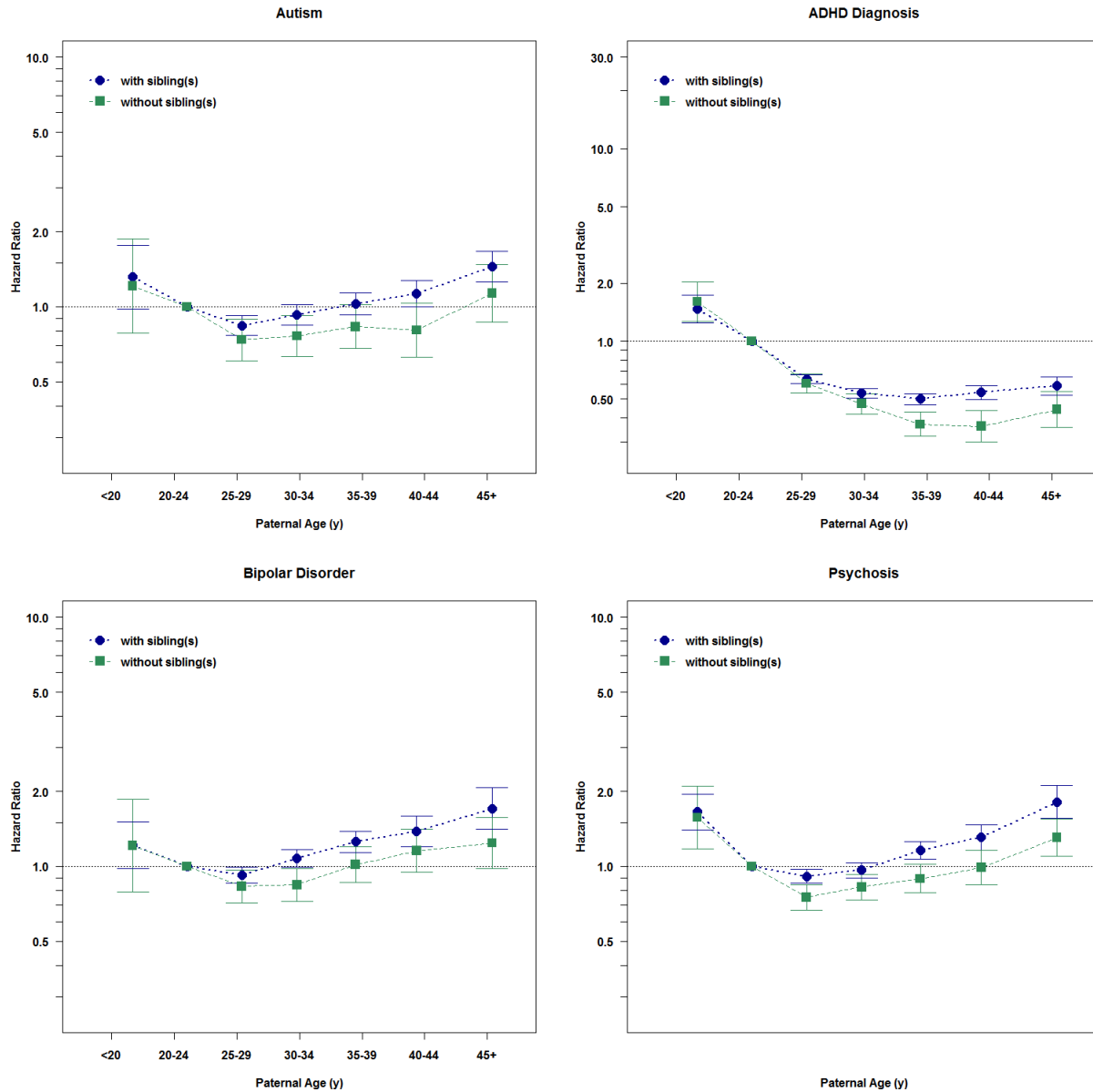
eTable C.1. Point estimates for continuous indices of offspring grades and IQ

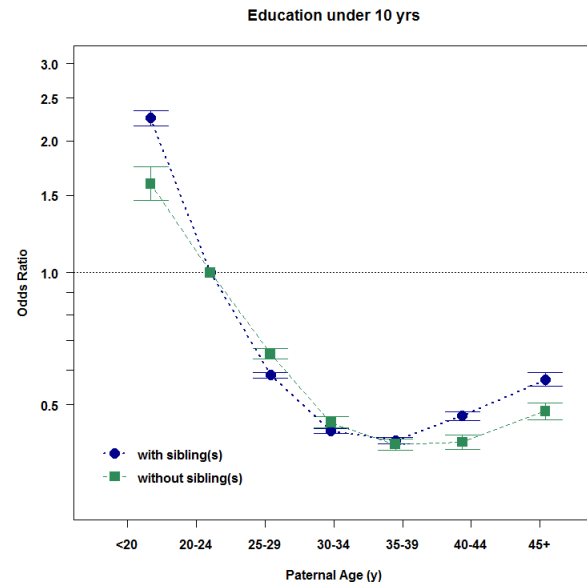
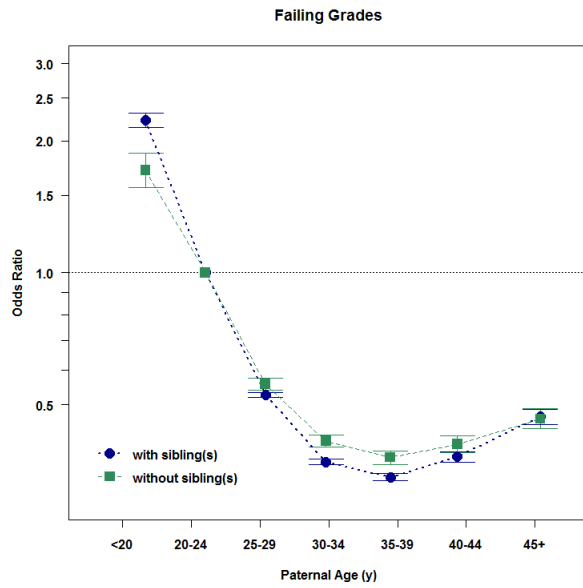
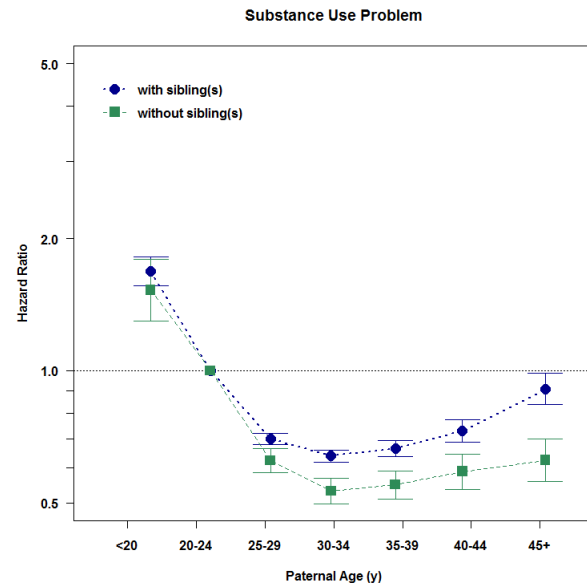
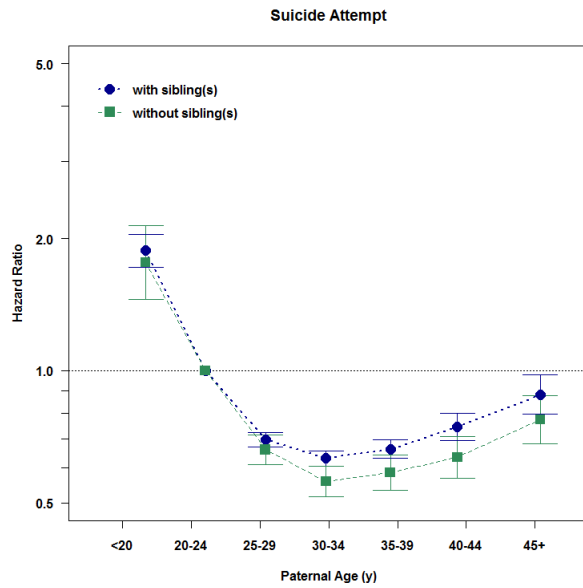
Outcome	Paternal Age (yrs)	Baseline Model				Adjusted Model				Fixed Effects Model			
		b	SE	t Value	Pr >  t	b	SE	t Value	Pr >  t	b	SE	t Value	Pr >  t
IQ (z)													
20-40 (reference)	<20	-0.255	0.013	-19.15	<.0001	-0.056	0.013	-4.40	<.0001	-0.072	0.026	-2.81	0.005
	-	-	-	-	-	-	-	-	-	-	-	-	-
	25-29	0.261	0.004	66.85	<.0001	0.063	0.004	15.86	<.0001	0.006	0.008	0.71	0.476
	30-34	0.390	0.004	94.39	<.0001	0.071	0.005	15.52	<.0001	0.008	0.011	0.74	0.458
	35-39	0.433	0.005	87.64	<.0001	0.078	0.005	14.16	<.0001	0.013	0.015	0.89	0.372
	40-44	0.404	0.007	58.00	<.0001	0.074	0.007	10.00	<.0001	0.013	0.021	0.64	0.519
	45 +	0.378	0.010	38.45	<.0001	0.093	0.010	9.23	<.0001	0.015	0.034	0.44	0.662
Grades (z)													
20-40 (reference)	<20	-0.395	0.008	-51.29	<.0001	-0.134	0.007	-18.34	<.0001	-0.090	0.009	-9.49	<.0001
	-	-	-	-	-	-	-	-	-	-	-	-	-
	25-29	0.324	0.002	143.39	<.0001	0.096	0.002	42.33	<.0001	0.045	0.003	14.97	<.0001
	30-34	0.494	0.002	207.72	<.0001	0.121	0.003	47.18	<.0001	0.092	0.004	22.29	<.0001
	35-39	0.545	0.003	195.16	<.0001	0.116	0.003	37.92	<.0001	0.134	0.005	24.87	<.0001
	40-44	0.514	0.004	134.29	<.0001	0.088	0.004	21.75	<.0001	0.160	0.007	21.85	<.0001
	45 +	0.433	0.005	80.25	<.0001	0.043	0.005	7.81	<.0001	0.178	0.011	15.50	<.0001

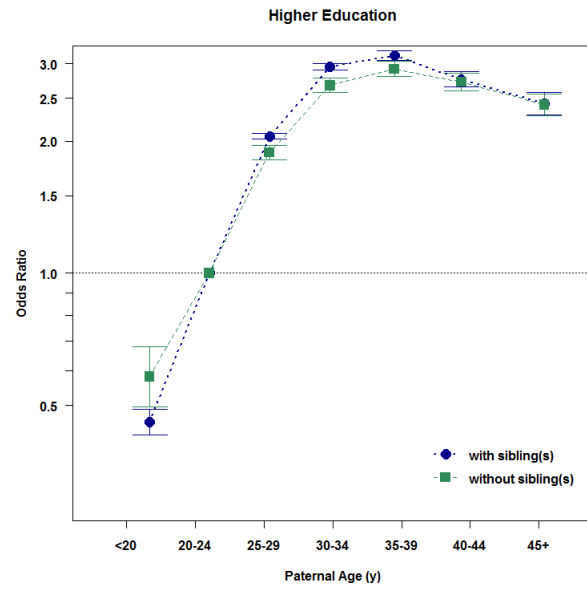
Note. b = the unstandardized parameter estimate (in standard deviations).

## Appendix D. Comparison of population estimates for offspring with siblings to offspring without siblings

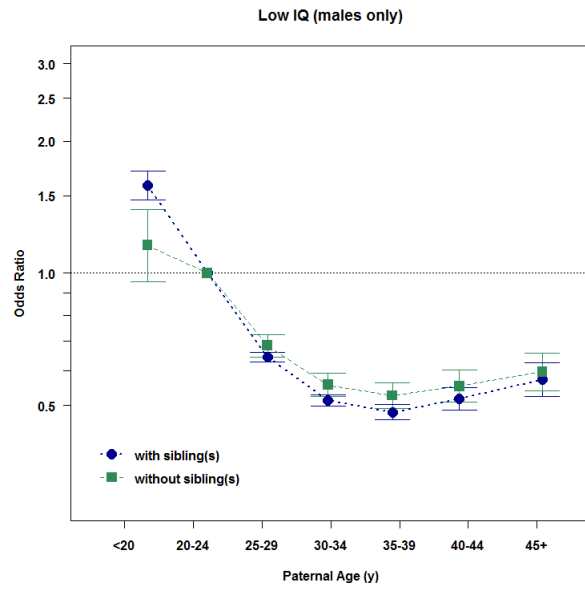
The efigures present the association between paternal age at child-bearing and each outcome for n=2,156,013 (82.4%) offspring in the cohort with one or more siblings (blue) and n=459,068 (17.6%) offspring with no siblings (green). Separate models were run to generate the point estimates for each sub-sample. The hash tag symbols represent 95% Wald confidence intervals.











# Appendix E. Parameter estimates for maternal age at childbearing in the adjusted model

	Parameter	B	SE(B)	ChiSq	Pr> ChiSq	Point Estimate	95%CI	
							Lower	Upper
Psychiatric Morbidity								
Autism (1992-2001)	<20	-0.337	0.177	3.611	0.057	0.714	0.505	1.011
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	0.015	0.069	0.047	0.828	1.015	0.887	1.162
	30-34	0.117	0.077	2.312	0.128	1.124	0.967	1.307
	35-39	0.329	0.091	13.018	0.000	1.390	1.162	1.662
	40-44	0.560	0.135	17.281	<.0001	1.751	1.344	2.279
	45+	0.964	0.419	5.291	0.021	2.623	1.153	5.965
ADHD Diagnosis (1992-2001)	<20	-0.112	0.111	1.020	0.312	0.894	0.720	1.111
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.051	0.058	0.774	0.379	0.951	0.849	1.064
	30-34	-0.073	0.069	1.139	0.286	0.929	0.812	1.063
	35-39	-0.004	0.087	0.003	0.960	0.996	0.840	1.180
	40-44	0.004	0.146	0.001	0.980	1.004	0.754	1.337
	45+	0.343	0.509	0.455	0.500	1.409	0.520	3.820
Psychosis (1973-1997)	<20	0.095	0.043	4.836	0.028	1.100	1.010	1.197
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.071	0.027	6.962	0.008	0.932	0.884	0.982
	30-34	0.002	0.034	0.003	0.959	1.002	0.938	1.070
	35-39	0.057	0.046	1.545	0.214	1.058	0.968	1.158
	40-44	0.157	0.080	3.858	0.050	1.170	1.000	1.367
	45+	0.030	0.357	0.007	0.934	1.030	0.511	2.075
Bipolar Disorder (1973-1997)	<20	0.068	0.051	1.756	0.185	1.070	0.968	1.184
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.013	0.032	0.167	0.683	0.987	0.927	1.051
	30-34	0.044	0.041	1.154	0.283	1.045	0.965	1.132
	35-39	0.145	0.056	6.744	0.009	1.156	1.036	1.289
	40-44	0.287	0.100	8.258	0.004	1.333	1.096	1.621
	45+	0.790	0.359	4.828	0.028	2.203	1.089	4.457

<i>Suicide Attempt (1973-1997)</i>	<20	0.252	0.024	106.532	<.0001	1.286	1.226	1.350
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.166	0.016	104.182	<.0001	0.847	0.820	0.874
	30-34	-0.256	0.021	143.074	<.0001	0.774	0.742	0.807
	35-39	-0.266	0.030	78.947	<.0001	0.766	0.723	0.813
	40-44	-0.297	0.056	27.820	<.0001	0.743	0.666	0.830
	45+	-0.620	0.291	4.547	0.033	0.538	0.304	0.951
<i>Substance Use Problem (1973-1997)</i>	<20	0.180	0.020	78.076	<.0001	1.197	1.150	1.246
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.148	0.013	123.408	<.0001	0.863	0.840	0.885
	30-34	-0.177	0.017	103.955	<.0001	0.838	0.810	0.867
	35-39	-0.212	0.024	74.655	<.0001	0.809	0.771	0.849
	40-44	-0.175	0.045	14.831	0.000	0.839	0.768	0.918
	45+	-0.384	0.225	2.908	0.088	0.681	0.438	1.059
<i>Academic Achievement</i>								
<i>Failing Grades (1973-1992)</i>	<20	0.421	0.010	1755.693	<.0001	1.524	1.494	1.554
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.325	0.006	2696.438	<.0001	0.722	0.714	0.731
	30-34	-0.500	0.008	3593.649	<.0001	0.607	0.597	0.617
	35-39	-0.611	0.012	2663.863	<.0001	0.543	0.530	0.556
	40-44	-0.660	0.022	898.876	<.0001	0.517	0.495	0.540
	45+	-0.765	0.097	62.766	<.0001	0.466	0.385	0.562
<i>Education under 10 years (1973-1991)</i>	<20	0.516	0.010	2807.547	<.0001	1.676	1.644	1.708
	20-24 (ref)	0.000	-	-	-	1.000	-	-
	25-29	-0.201	0.005	1424.679	<.0001	0.818	0.809	0.827
	30-34	-0.331	0.007	2334.271	<.0001	0.719	0.709	0.728
	35-39	-0.436	0.010	2107.876	<.0001	0.646	0.635	0.659
	40-44	-0.504	0.018	804.402	<.0001	0.604	0.584	0.626
	45+	-0.498	0.081	37.696	<.0001	0.608	0.518	0.712