Journal of the Royal Society of Medicine Open;
5(9) 1–5
DOI: 10.1177/2054270414533327

A survey of birth order status of students studying for medical degree at the University of Sheffield

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Summary

Objective: It is hypothesised that firstborn children and only children are more intelligent with higher intelligence scores having been observed in firstborn or only children. Evidence of the increased intelligence has been suggested by the fact that 21/23 (91%) of US astronauts, 23/43 (53%) of US presidents and between 75 and 80% of students at Harvard are firstborn or only children. It is of interest to investigate, therefore, whether a high achieving career such as medicine has a disproportionate number of firstborn or only children.
Design: A survey of medical students.
Setting: The University of Sheffield Medical School.
Participants: All students studying medicine in the academic year 2011–2012.
Main outcome measures: The proportion of firstborn or only children.
Results: There was a disproportionate number of students who were firstborn or only children: 53% (95% CI 49 to 58%). The expected percentage is 39.8% and therefore we can reject the null hypothesis. The results were consistent across all phases of study.
Conclusions: There is a higher than expected proportion of medical students at the University of Sheffield who are firstborn or only children. The data though highlight the issue of comparing populations. Here we are comparing a population of medical students with a general population. A comparison which may not be appropriate as medical students may be drawn from a subsample of the general population.

Keywords

birth order, medical students, University of Sheffield

Introduction

It is hypothesised that firstborn children and only children are more intelligent with higher intelligence scores having been observed in firstborn or only children.[1,2] However, the possible explanation for this is complex[3] and could be influenced by factors like the gender of siblings.[4] Evidence of the increased intelligence has been suggested by the fact that 21/23 (91%) of US astronauts[4]; 23/43 (53%) of US presidents, including George W Bush and between 75 and 80% of students at Harvard[5] are firstborn or only children. All these figures compare to the 39.8% of children born in England and Wales who are first or only children.[6]

Medicine is a high achieving career that firstborn or only children may pursue. A previous investigation of Intercalated Bachelor of Medical Science degree (BMedSci) for University of Sheffield Medical Students found that in 2008, 2009, 2010 and 2011, 51.5% (17/33), 55.0% (22/40), 60.5% (23/38) and 53.4% (31/58), respectively, were firstborn or only children. Intercalating medical students, however, are only a small subpopulation of the whole medical student population.

It is of interest, therefore, to investigate whether a higher proportion of firstborn or only children is specific to medical students who intercalate or is generally true of the medical school population. The working hypothesis was that as medicine was a high achieving profession firstborn or only children would be over represented.

Methods

The research was undertaken by a short questionnaire in March 2012. This involved three simple questions, which can be seen in Appendix 1. The question asking about birth order status was ‘‘Do you consider yourself firstborn or an only child?’’ For the other questions students were asked their gender and their year of birth. Year of birth was required so the expected proportion of firstborn in the student population could be calculated.

The questionnaire was placed on the Medical School teaching portal of The University of Sheffield, Minerva, for two weeks. The questionnaires were made available to each year of medicine separately. This meant that only the medical students of that exact year could respond.

The survey could only be completed once by each student. A message was put on the Minerva homepage to notify the participants that the survey was available.

A reminder was then sent out after one week through Minerva. After two weeks, the questionnaire was closed. The Minerva system allows students to edit their entries prior to a closing date. However, it only permits one entry per student, which is submitted when the survey closes. The survey was anonymous with no student identifiable questions asked and fully anonymised data provided to the study team.

There is an issue with the survey as highlighted by President Barack Obama. For the purpose of this paper, he was classed as a first or only child (one of the 53% of US Presidents to be so); this is because he is the first or only child of his mother. He in fact has older half siblings through his father and so this classification could be questioned. The definition of taking the firstborn to a mother as firstborn is used by the Office of National Statistics.[6] A person in similar circumstances may respond both yes and no if asked, if they considered themselves the first or only child.

Each phase of the medical degree in Sheffield was surveyed and analysed separately. The primary analysis of overall response was estimated by a standard fixed effects meta-analysis approach for a single binary response with the overall response and phase summarised by a Forest plot.[7]

The null hypothesis was that the intercalated medical students were no different from the overall population and the proportion who were firstborn or only children was 39.8%. This is against the alternative hypothesis that the proportion who are firstborn or only children is different to the overall population.

To estimate the population response, we asked each student their year of birth. The proportion of children for that year was then taken from the Office of National Statistics. The overall proportion was estimated by taking the proportion of students reporting as born in each year and by multiplying the proportion from the Office of National Statistics as being a firstborn or only child for that year. This gave us the average figure of 39.8%.[8,9]

Please note that these methods were not 100% accurate as to maintain anonymity we could not ask if born in 1989 or before for Phase Ia students (or 1986 or before for final year Phase 4 students). To be more specific for the year of birth could potentially identify mature medical students. The statistical assessment is made through the calculation of a 95% confidence interval (CI) to see if it includes 39.8% (in which case the null hypothesis will be accepted).

Results

The overall results are given in Table 1 and Figure 1. The full results are given in Appendix 2.

Table 1. Results of analysis of proportion of medical students, first or only children.

	Proportion	95% CI
Male	0.48	0.42 to 0.55
Female	0.56	0.51 to 0.52
Overall	0.53	0.49 to 0.58

The proportion of students who responded varied both by year and gender.

For every phase, the 95% CI excluded 39.8% with an overall response of 53% (95% CI 49 to 58%). From the CI, the lowest plausible value for the proportion who were first or only born is 49% which excludes 39.8% and therefore we can reject the null hypothesis.

There is an issue as to whether we are comparing like with like. The estimation of birth order for the Office of National Statistics is not routine – asked only of married women – while for the medical students, the question is if they perceive themselves to be first or only children.[9] Nevertheless the overall response of 53% is quite high.

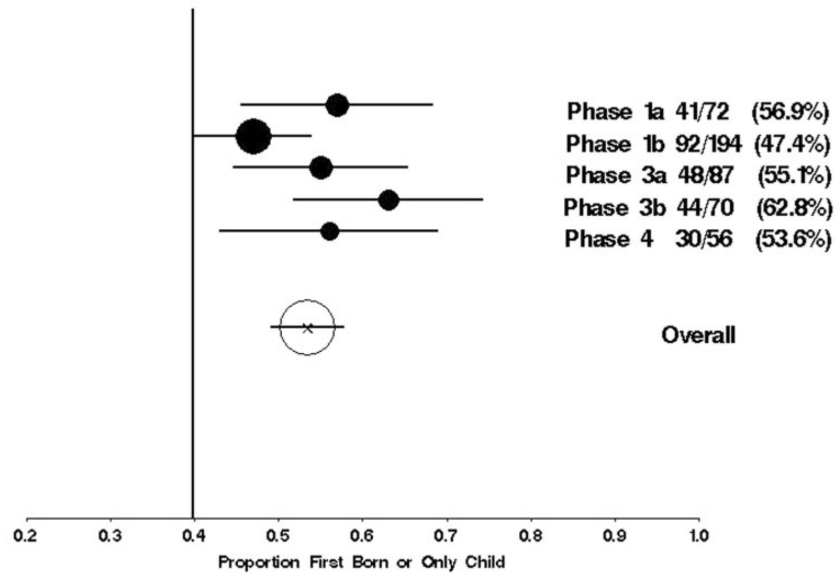
There is some evidence of a difference between genders; however, this was not statistically significant – the overall estimate from a meta-analysis was 7% (more women than men were firstborn) with 95% CI from −2 to 16%.

Conclusions

This paper showed a higher than expected proportion of medical students at the University of Sheffield were firstborn or only children. No data were collected on whether this extends to the whole medical student population in the UK. If the data can be generalised, could it suggest that children who are not firstborn or only children are at a disadvantage? Does it raise the question of whether medical school admission criteria take into account birth order when offering grades for entry into the school? Are non-firstborn or only children at a disadvantage?

An explanation for what we have observed is that firstborn and only children for a period in their lives do not share their parents who assist them in their language development. Greater language ability has been observed in a number of studies.[10–12] However, other research has shown some effect but not in all aspects of language development,[13] while other research again conjectured that younger children have an advantage through observing the interaction between the elder sibling and adults.[14]

Figure 1. Analysis of birth order by phase of medicine.



The greater parental attention firstborn and only children have may also impact on academic achievement,[15] with IQ scores also reportedly related to birth order.[16,17] However, the studies usually have many confounding factors which could also influence the results[18] with other research also showing no effect.[18,19] These studies can also have the same criticisms with respect to confounding.[20] In truth, though as all studies are observation – you cannot do a prospective randomised trial of birth order status – there are going to be methodological issues with any observational study.

There are other explanations for our result. We highlighted earlier how there was an apparent first-born advantage amongst students studying at Harvard. In a discussion of this result, Milner and Calel[21] gave plausible explanations for our finding. For example, they highlight the negative correlation between fertility rates and a woman's education and income – two variables which they conjecture could influence your chances of going to Harvard.[22]

What we have done in our analysis is to compare the birth order status of a population of medical students with the general population to draw conclusions. However, what we should really have done is to compare the population of medical students to a subpopulation from which they were drawn – possibly from better educated and more wealthy families – or adjust for social class in the analysis.

Unfortunately, in the analysis, it was not possible to adjust for confounding variables like social class. This is a weakness of the study as it is likely that family socioeconomic/educational status is associated with family size, and of course family socioeconomic/educational status will be strongly associated with the likelihood of children undertaking a medical degree. Indeed for a marker for social status – whether a parent was a medical doctor – of those who responded on the intercalated medical degree in 2013, 22% (8/22) had one parent who was a doctor. It is thus unclear whether the finding is simply a reflection of the social class of families whose children go to medical school.

The analysis highlights the issue of comparing raw unadjusted rates. In medicine, often the best doctors may often have the worst raw performance data. This is because the best doctors may have the most complex case load. To make any analysis for a fair comparison, there must be a comparison of like with like and where this is not possible any interpretation should be made with caution.

Declarations

Competing interests: None declared

Funding: The University of Sheffield was the sponsor of the study. It is the place of study for five authors and is the employer of SAJ. The sponsor played no part in the study design and the collection, analysis, and interpretation of data and the writing of the article and the decision to submit it for publication.

Ethical approval: The study was approved by the ethics committee of the School of Health and Related Research, Sheffield (ScHARR) at The University of Sheffield. As it was not a trial, there was no trial registration. All the data are presented in the manuscript and can be shared.

Guarantor: SAJ

Contributorship: SEGC, VLB, FRH, AK and EHBA undertook this work under the supervision of SAJ as part of the student selected research component of their degrees in Phase Ib (their second year of medical school). Each student surveyed a year of medicine and undertook a systematic review on a topic related to birth order. SAJ initiated the research and supervised the project. FRH undertook a survey of Phase 1a students. EHBA undertook a survey of Phase 1b students. VLB undertook a survey of Phase 3a students. SEGC undertook a survey of Phase 3b students. AK undertook a survey of Phase 4 students. SAJ drafted the article. All commented.

Acknowledgements: None

Provenance: Not commissioned; peer-reviewed by Fiona Lampe.

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Appendix 1. Questionnaire for use for Phase Ia Medical students (the question what year were you born was adjusted according to year)

1. Do you consider yourself firstborn or an only child?
   (a) Yes
   (b) No
2. Are you?
   (a) Male
   (b) Female
3. What year were you born?
   (a) 1994 or after
   (b) 1993
   (c) 1992
   (d) 1991
   (e) 1990
   (f) 1989 or before

Appendix 2. Complete results from the survey of medical students at The University of Sheffield

		Number of students	Number responded	Response rate	Firstborn	Proportion of firstborn	Lower 95% CI	Upper 95% CI
Phase 1a	Male	112	28	0.25	15	0.54	0.35	0.72
	Female	126	44	0.35	26	0.59	0.45	0.74
	Overall	238	72	0.30	41	0.57	0.46	0.68
Phase 1b	Male	133	84	0.63	40	0.48	0.37	0.58
	Female	140	110	0.79	52	0.47	0.38	0.57
	Overall	273	194	0.71	92	0.47	0.40	0.54
Phase 3a	Male	125	34	0.27	15	0.44	0.27	0.61
	Female	143	53	0.37	33	0.62	0.49	0.75
	Overall	268	87	0.32	48	0.55	0.45	0.66
Phase 3b	Male	106	25	0.24	13	0.52	0.32	0.72
	Female	132	45	0.34	31	0.69	0.55	0.82
	Overall	238	70	0.29	44	0.63	0.52	0.74
Phase 4	Male	78	14	0.18	7	0.50	0.24	0.76
	Female	136	42	0.31	23	0.55	0.40	0.70
	Overall	214	56	0.26	30	0.54	0.41	0.67