The youngest children in each school cohort are over-represented in referrals to mental health services

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19 November 2013

Abstract

Objective: To investigate whether the youngest children in each school cohort are over-represented as users of specialist mental health services. **Methods:** Dates of birth were obtained for all 9157 children and adolescents referred to specialist mental health services in three London boroughs from 2008 to 2011. The actual frequency of referrals by month of birth is compared to the expected frequency of referrals as determined by birth statistics for the relevant age group. **Results:** August-born children, who are the youngest in their cohorts in England, represent 9.38% of referrals but only 8.59% of the population in the relevant age segment. Hence, August-born children are over-represented in referrals to specialist mental health services (p-value 0.007). September- and October-born children, who are the oldest in their cohorts, are under-represented: September-born children represent 8.62% of the population but 7.99% of referrals to mental health services (p-value 0.032) and October-born children are 8.56% of the population but 7.86% of referrals (p-value 0.016). **Conclusion:** Being among the youngest in a school cohort is associated with a higher risk of referral to mental health services, while being among the oldest is a protective factor.

Keywords: children's mental health; relative age in class; referrals; mental health services

Introduction

It is now well established that the youngest children in a school cohort are worse off in a number of dimensions: They do less well academically than their older class-mates throughout their school careers and are less likely to attend university.[1,2] They have also been found to be less confident in their academic ability and are more likely to report being bullied or unhappy at school,[3] and they are less likely to participate in both youth and professional sports leagues.[4]

Given this, it is perhaps not surprising that children who are among the youngest in their school cohort are also more likely to have mental health problems: they are more likely to be diagnosed with attention disorders, learning disability and dyslexia.[2,5,6,7] One study found that these children scored higher on a psychopathology test and, based on interviews and questionnaires administered to teachers, parents and the children themselves, were diagnosed with psychiatric conditions more often.[8]

It has been suggested that the youngest children in a cohort, rather than having actual mental health problems, might be over-diagnosed with learning disability because the disability assessment does not take actual age, conditional on cohort, into account.[6] However, if it were only a case of over-diagnosis, then the effects should attenuate with age: the difference in mental maturity between a four- and a five-year-old is significant, while that between a 17- and an 18-year-old is less so. Therefore, the fact that relative-age effects are observable right into adulthood[1,4] indicate that that there is a real disadvantage in being among the youngest in class.

Still, little is known about the consequences for health service provision, and in particular the extent to which these children are over-represented as users of specialist mental health services. The contribution of this paper is to investigate whether August-born children, who are the youngest in their class in the English educational system, are over-represented in referrals to specialist Child and Adolescent Mental Health Services (CAMHS Tier 2/3). The threshold for referral to these services is relatively high, since mental health problems can

be dealt with by primary services such as school health workers and general practitioners. Referral to a specialist service is an indicator of significant difficulties.[a]

While most past studies have focused on *average* effects of relative school age along a range of dimensions, the analysis of referrals to CAMHS sheds light on the tail of the distribution: to what extent is being among the youngest in class associated with a greater likelihood of morbidity worrying enough to warrant a referral to CAMHS?

Moreover, since referral is the first step to receiving care, the findings are also informative of the "extra" burden on health services that is being driven by relative-age effects among children. If all children could benefit from protective factors equivalent to those derived from being among the oldest in one's class, the demand for mental health services would be significantly reduced.[8]

We also examine whether the disadvantage of being August-born is gender-neutral or affects boys more than girls, and whether any such effect is stronger or weaker for children of primary-school age compared to those of secondary-school age. Previous work has found that, in Britain, the prevalence of mental disease in 5–16-year-old is higher for boys than for girls, and also higher for children of secondary-school age than those of primary-school age.[11]

In England, children are required by law to start school in the academic year (September–August) in which they turn five. This means, for instance, that a child born on 31 August

[a] Ford et al[9] estimate that 9.5% of British 5–15-year-olds have at least one DSM-IV disorder. Only 20% of these children are referred to specialist mental health services.[10] Assuming that there is at least some tendency to prioritise more severe cases at the referral stage, it is clear that most children referred to specialist services have significant problems.

2010 will be in the same cohort as a child born on 1 September 2009, even though there is a difference in age of practically one year between them. The September-born child, who starts school around his fifth birthday, has had a 25% longer life experience than the August-born child, who starts school around his fourth birthday. Most countries have a similar system, although the point in the calendar year which defines the cut-off varies. It may be noted that in most countries children start school at a later age than in the UK.

It is, in principle, possible to defer school start to the term (there are three terms per year) in which the child turns five. However, this is rarely practiced, because the child would still join the same class they would have been in had entry not been deferred. Deferring entry may therefore imply falling behind in academic and social development even before starting school.

In the independent (private) education sector, deferral is in some cases easier. Our data do not capture whether children have deferred school start. However, we are confident that month of birth is a very robust predictor of relative age in a school cohort. Deferral is rare, even in the private sector. Moreover, only 7% of British children attend independent schools, and the proportion of independent-school pupils is even lower in referrals to mental health services.

Method

We obtained the gender and date of birth of all children aged 0–17 who were referred to Child and Adolescent Mental Health Services (CAMHS) in three London boroughs (Hammersmith and Fulham, Ealing and Hounslow) over a four-year period (2008–2011). The data were obtained from a central data collection unit in the West London Mental Health

Trust, which serves these three boroughs. The West London Mental Health Trust is part of the National Health Service (NHS). Ethical approval was given by the Research Governance Officer, R&D Office, West London Mental Health Trust. Where the same child was referred more than once, only the first referral was considered. There were 9157 children in the data set.

The number of live births per month in England and Wales between 1992 and 2010 were obtained from the Office of National Statistics. If children born in all months were equally likely to be referred, then the proportion of referred patients born in a given month should reflect the frequency of that month of birth in the population.[b]

Formally, the null hypothesis is that the number of referrals by month of birth over the period of observation is Poisson-distributed with expectation proportional to the month-of-birth frequencies in the population. Then, conditional on the total number of referrals, the referrals by month are multinomially distributed. Using the normal approximation to the binomial distribution, which should be quite accurate given the sample size, it is straight-forward to construct 95% confidence intervals and test whether each birth-month is over- or under-represented in the referrals data.

[b] Inspecting the referrals data, it was clear that children born on 1 January are over-represented—more than twice as many referrals are recorded as being born on 1 January compared to the average for the remaining days of January. This is likely to be because children whose real birth dates are not known are sometimes recorded as being born on 1 January. If not taken into account, this would lead to an apparent over-representation of January-born children compared to the other months in the referrals. For this reason, all referrals with 1 January birth dates were deleted, and the birth statistics were adjusted to take account of this censoring: the number of children born in January over the period 1992–2010 was adjusted by multiplying it by 30/31 since there are now only 30 observed days in January. Then the expected referral rate for each month was obtained by dividing the number of births in that month over the period 1992–2010 by the total number of births in the same period.

Results

The main results are presented in Table 1. In the full sample, August-born children are significantly over-represented in CAMHS referrals. While 8.59% of the relevant population were born in August, 9.38% of children referred to CAMHS were born in August. The difference is significant with a p-value of .007. September- and October-born children, who are the oldest in each school cohort, are significantly under-represented with p-values of .032 and .016. No other birth-months are significantly over- or under-represented at the 5% significance level.

This is also illustrated in Figure 1 which shows the birth months of referred patients along with 95% confidence intervals.

Figure 1 about here.

When children of primary-school and secondary-school age are considered separately, the August-born remain over-represented in both sub-samples (Figure 2). October-born children are under-represented in the primary-school sub-sample. No other birth-months are significantly over- or under-represented in either sub-sample.

Figure 2 about here.

When boys and girls are studied separately, August- as well as December-born boys are over-represented, as are January- and February-born girls (not reported). October-born girls are significantly under-represented. All other gender–month-of-birth combinations fall within the confidence intervals. This indicates that young relative age is a more serious risk factor for boys than for girls, and that being relatively old is more protective for girls than for boys.

It should be noted in general that the sub-sample analyses rely on fewer observations and that this may explain some of the findings. In particular, it is possible that with more data, the August effect would be present also in the girls-only sample, especially since there is a marked drop in referral rates between August- and September-born girls (not reported).

While no policy can make every child the oldest in his or her class, the numbers suggest that if everybody could benefit from protective factors equivalent in power to that of being born in September or October, the aggregate number of referrals to Child and Adolescent Mental Health Services would be reduced by 8%. The number of referrals of August-born children would be reduced by 16%.[c]

Discussion

This study has a number of limitations. Based on data from three London boroughs, the findings may not be valid for England as a whole, or for other countries with different educational systems. The fact that we only have data on date of birth and gender, and not on diagnoses or reasons for referral, means that we are unable to say whether August-born children are over-represented in specific types of mental health problems or whether the issue applies generally across all diagnostic categories. And while a referral is indicative of relatively significant difficulties, we are unable to distinguish degrees of severity with our data.

[c] These numbers were calculated from Table 1 by noting that the proportion of referrals born in September or October is 0.1585, whereas the proportion of the population born in those months is 0.1718. Therefore, if children born in every month were referred to mental health service with the same frequency as those born in September or October, the total number of referrals would be only 92% (0.1585/0.1718) of what it currently is for all months and 84% of what it currently is for August ((0.1585/0.1718) / (0.0938/0.0859)).

It is worth pointing out that a large majority of children born in August are not referred to mental health services. Other factors, including the children's home environment, are likely to be more important determinants of mental health than month of birth. Still, August-born children, being the youngest—physically, emotionally and intellectually—in their class, may be more vulnerable than their older peers.

While there is evidence to suggest that relative age affects actual mental health,[8] some studies have argued that younger children may be over-diagnosed with certain conditions because teachers and clinicians do not take actual age into account.[6] More research is needed on whether over-diagnosis is limited to some conditions, such as learning disability, where a given test score may be low for a child of a certain age but considered normal for a younger child.

Since the rules determining when a child should start school tend to be fixed within a country, being the youngest in class is typically correlated with being born at a particular time of year. It can therefore be difficult, using data from a single country, to disentangle a relative-age effect, as discussed here, from a season-of-birth effect which is not related to being among the youngest in class but rather to being born in a particular season or month of the year. However, the sharp and significant drop in referrals between August- and September-born children in our data points in the direction of a relative-age effect rather than season of birth. This argument is corroborated by several previous studies which compare findings across countries that differ in their school-starting cut-off dates and find that most of the age-related within-cohort heterogeneity among young children is explained by being among the youngest rather than by the actual month of birth.[4,8,12] One study controlled for ambient temperature around the period of gestation and found that

temperature did not matter for measures of childhood intelligence, providing further suggestive evidence that relative age may a more important determining factor than season of birth.[13]

The problem may be more acute in the United Kingdom than in other countries because British children start school at a particularly young age. In Britain, compulsory education begins at the age of five, but many children start school at four. One cross-country study found that relative-age effects were less persistent in Finland, where children enter school only at age seven.[1] This may be because an age difference of one year is more significant the younger the child—one year is 20% of a five-year-old's life. It is ironic that Britain's early school-starting age may exacerbate inequality, since one of the original aims of the policy, dating back to 1870, was to promote equality by reducing the impact of diverse family backgrounds and expose children to a standardised educational setting from a young age.[14]

The fact that the problems persist throughout the school career and beyond may suggest that the educational system is unable to compensate for the priming effect of relative youth in the first years of school. In England, regulations allow the parents of summer-born children to defer school start until the term of the child's fifth birthday. This is not often done in practice, and in any case, expecting the children to catch up with older peers who by then have a social as well as academic head start may be unrealistic. One might argue that parents and schools should be allowed greater flexibility in deferring school start by a full year. Still, the choice is probably not best left to the parents on their own. Other researchers have suggested that the parents who are most likely to take advantage of any flexibility in the school starting age would tend to be resourceful middle-class parents, while children of parents from more disadvantaged background are more likely to need the hours of extra

free childcare that school provides, and are therefore less likely to defer school start.[15] Hence, those parents who are likely to take steps to defer their child's school entry are probably not the ones whose children would benefit the most.

The findings presented here and in earlier work suggest that clinicians should take age relative to classmates into consideration when working with young patients.

Clinical Points

- Children who are the youngest in their school cohort are over-represented in referrals to mental health services.
- The effect is present for boys and girls and for children in both primary and secondary school.
- Clinicians need to take relative age into account in their assessment, formulation and management plan of children and adolescents with mental health problems. This ought to involve close liaison with school.

References

1. Bedard K, Dhuey E. The persistence of early childhood maturity: international evidence of long-run age effects. *Quarterly Journal of Economics*. 2006;121:1437–1472.

2. Zoëga H, Valdimarsdóttir UA, Hernández-Díaz S. Age, academic performance, and stimulant prescribing for ADHD: a nationwide cohort study. *Pediatrics*. 2012;130:1012–1018.

3. Crawford C, Dearden L, Greaves E. Does when you are born matter? The impact of month of birth on children's cognitive and non-cognitive skills in England. *Institute of Fiscal Studies Briefing Notes* 2012; BN122.

4. Musch J, Grondin S. Unequal competition as an impediment to personal development: a review of the relative age effect in sport. *Developmental Review*. 2001;21:147–167.

5. Elder TE, Lubotsky DH. Kindergarten entrance age and children's achievement: impacts of state policies, family background, and peers. *J Hum Resour.* 2009;44:641–683.

6. Dhuey E, Lipscomb S. Disabled or young? Relative age and special education diagnoses in schools. *Economics of Education Review.* 2012;29:857–872.

7. Donfrancesco R, Iozzino R, Caruso B, et al. Is season of birth related to developmental dyslexia? *Annals of Dyslexia.* 2010;60:175–182.

8. Goodman R, Gledhill J, Ford T. Child psychiatric disorder and relative age within school year: cross sectional survey of large population sample. *Br Med J.* 2003;327:472.

9. Ford T, Goodman R, Meltzer H. The British child and adolescent mental health survey 1999: The prevalence of DSM-IV disorders. *J Am Acad Child Adolesc Psychiatry.* 2003;42(10):1203-1211.

10. Richardson G, Wyatt A, Partridge I. Strategies for working with Tier 1. In: Richardson G, Partridge I, Barrett J, eds. *Child and adolescent mental health services: an operational handbook*, 2nd ed. London: RCPsych Publications; 2010:112–126.

11. Office for National Statistics. *Mental health of children and young people in Great Britain, 2004*. Basingstoke: Palgrave Macmillan; 2005.

12. Berglund GW. A note on intelligence and season of birth. *Br J Psychol.* 1967;58:147–151.

13. Lawlor DA, Clark H, Ronalds G, Leon DA. Season of birth and childhood intelligence: findings from the *Aberdeen Children of the 1950s* cohort study. *Br J Educ Psychol.* 2006;76:481–499.

14. Alexander, RJ, ed. *Children, their world, their education: final report and recommendations of the Cambridge Primary Review.* London: Routledge; 2009.

15. Crawford C, Dearden L, Meghir C. When you are born matters: The impact of date of birth on child cognitive outcomes in England. *Institute for Fiscal Studies Working Paper;* 2007.

Table 1: Main Results, Full Sample

Month	Proportion of births	Proportion of referrals	Difference	p-value
January	0.0803	0.0825	0.0021	0.454
February	0.0765	0.0816	0.0050	0.069
March	0.0839	0.0822	-0.0016	0.573
April	0.0812	0.0806	-0.0006	0.826
May	0.0852	0.0814	-0.0038	0.194
June	0.0839	0.0849	0.0010	0.731
July	0.0876	0.0877	0.0001	0.974
August	0.0859	0.0938	0.0079	0.007
September	0.0862	0.0799	-0.0063	0.032
October	0.0856	0.0786	-0.0070	0.016
November	0.0812	0.0820	0.0008	0.775
December	0.0825	0.0849	0.0024	0.411

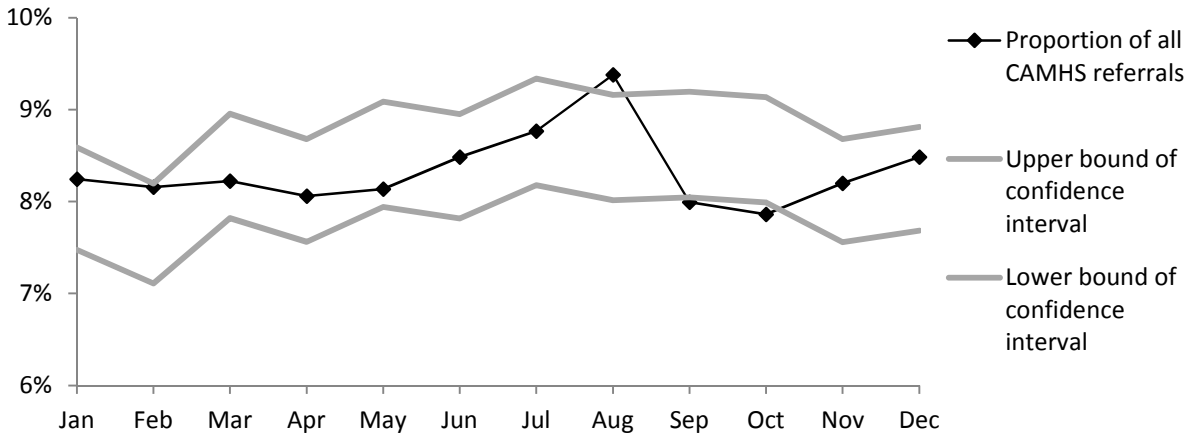

Figure 1: Proportion of referrals by month of birth, with confidence bounds based on monthly birth rates. Full sample.

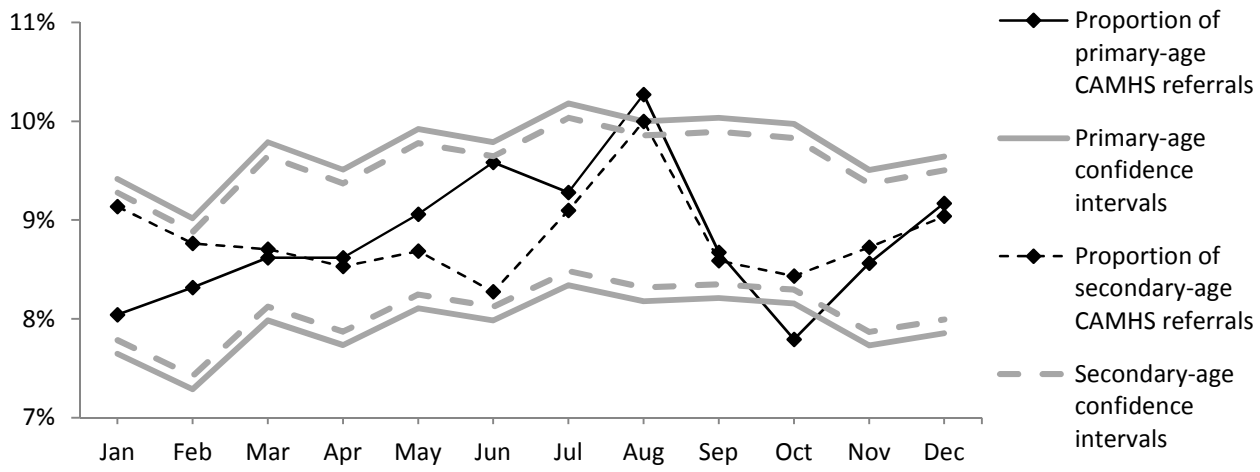

Figure 2: Proportion of referrals by month of birth. Children of primary- and secondary-school age shown separately.