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Preliminary evidence from the Millennium Cohort Study

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Summary

This paper lays out a hypothesis that ability grouping in early primary school may be instrumental in creating the heavily evidenced 'month of birth effect', where relatively younger pupils within each school year group are disadvantaged, academically and extra-academically, compared to their relatively older peers.

Using data from the Millennium Cohort Study (MCS), analysis examines the prevalence of ability grouping practices among 5,481 English sample children, who were aged seven and in year two in 2008. It investigates the extent to which reported grouping practices co-occur and demonstrates associations between placement levels where pupils are grouped according to more than one practice. It illustrates the proportions of sample children born in each month placed at each ability grouping level, and explores whether between-month differences are more pronounced according to certain grouping practices.

Main findings include indications that:

- 17.8 per cent of sample children are streamed within their year[1]
- 31.2 per cent are literacy set within their year
- 37.5 per cent are numeracy set within their year
- 78.8 per cent are ability grouped in class for most or all teaching
- 87.2 per cent are grouped in class for literacy teaching
- 85.5 per cent are grouped in class for numeracy teaching
- Many children are subject to at least two co-occurring ability grouping practices. For example, 83.9 per cent of those who are streamed are also ability grouped in class, and 34.9 per cent of those who are ability grouped in class are also set within their year for numeracy.
- There is a high level of correspondence between ability group levels when a pupil is subject to more than one practice. For example, 92.6 per cent of pupils who are in the highest stream are also in the highest literacy set, when also literacy set; 88.6 per cent of pupils who are in the lowest stream are also in the lowest literacy set, when also literacy set.
- Across all practices, there is a pronounced and consistent tendency for relatively older pupils in a school year to be placed in the highest stream, set, or group. The inverse is the case for placement at the middle and lowest levels. For example, children born in September are more than twice as likely to be in the highest stream as those born in August. August-born pupils are more than twice as likely to be in the lowest in-class group as September-borns.
- This pattern is most pronounced according to the practice of streaming, and least pronounced (though still very apparent) according to the practice of in-class grouping for numeracy.

The paper also briefly reviews the literature on in-school ability grouping and pupil attainment. It proposes a theoretical model where the evidenced disproportionalities in group

[1] All statistics reported in this summary use unweighted data. The main paper illustrates and discusses, for comparison, some figures weighted for initial sample design; these weighted figures vary only minimally from unweighted analyses.

placement according to birth month may play out in eventual attainment variation through channels such as:

- ability group-dependent pupil perceptions and behaviours;
- ability group-dependent teacher perceptions and behaviours;
- educational opportunities differentiated according to ability group placement level.

The 5,481 Millennium Cohort sample pupils are compared to the English schools population in 2008, and sufficient similarity is found to justify generalisability. The paper therefore argues that early ability grouping is key to the month of birth effect, and describes planned future analyses which will continue to test the proposal.

In-school ability grouping: definitions

The working definitions of the ability grouping practices explored in this paper – **streaming, setting** and **in-class ability grouping** – reflect those used in the MCS age seven survey teacher questionnaire, and in the work of academics investigating their use (see *Child of the New Century Age 7 Survey Teacher Questionnaire – England,* and e.g. Kutnick et al, 2005).

Streaming refers to division of all pupils in a year group into classes hierarchically structured according to a measure or judgement of 'overall' academic ability.

Setting refers to division of pupils within a year group into ability-based classes specifically for the teaching of a given subject, based on measured or judged ability in that subject (e.g. numeracy setting).

In-class ability grouping refers to division of a class into sub-groups, based on measured or perceived ability, for the purposes of general teaching or of teaching of a specific subject.

Section A: Background and rationale

In England, as in many other countries, the vast majority of pupils are educated within class groups formed according to age relative to the structure of the school academic year. Annually, pupils born over the period beginning in September and ending in August will, with very few exceptions, comprise a distinct year group. Most English children enter primary school in the year following their fourth birthday (see, for example, Riggall and Sharp, 2008). Therefore, as their education commences, many summer-born pupils are considerably younger than their autumn-born counterparts, both in time lived, and in development and maturity.

There is a solid body of evidence for a pervasive and enduring month of birth gradient across a wide variety of outcomes – academic and extra-academic – where children relatively younger in each school year group are disadvantaged compared to their older peers. Based on a hypothesis that early in-school ability grouping may play a part in creating month of birth variation in academic achievement, this paper lays the foundations for an exploration of the relationships between birth month, ability grouping practices, and pupil attainment.

The 'month of birth effect'

There is a vast amount of international research on the 'month of birth effect.' It uniformly indicates that a pupil's age positioning within their year group has a statistically and educationally significant relationship with a variety of outcomes and experiences, throughout compulsory schooling and beyond. They include:

- **academic attainment** (e.g. Bedard et al, 2006; Boardman, 2006; Crawford et al, 2007; Crawford et al, 2011; Daniels et al, 2000; Department for Education, 2010a; Lawlor et al, 2006; Martin et al, 2004; McEwan et al, 2008; Menet et al, 2000; Oshima et al, 2006; Sprietsma, 2007; Strom, 2004; Sykes et al, 2009)
- **propensity to be diagnosed with special educational needs** (e.g. Crawford et al, 2007; Department for Children, Schools and Families, 2009a; Department for Education, 2010a; Gledhill et al, 2002; Martin et al, 2004; Polizzi et al, 2007; Sykes et al, 2009; Wallingford et al, 2000; Wilson et al, 2000)
- **participation in post-compulsory education, and choice of type of post-compulsory education** (e.g. Bedard et al, 2006; Cascio et al, 2007; Crawford et al, 2010; Crawford et al, 2011; HEFCE, 2005; Sykes et al, 2009)
- **diagnosis with psychopathological conditions and referral to psychiatric / psychological services** (e.g. Goodman et al, 2003; Menet et al, 2000)
- **child, parent and teacher perceptions of a child's ability** (e.g. Crawford et al, 2011)
- **propensity to be bullied** (e.g. Crawford et al, 2011; Department for Education, 2010a).

Relatively younger pupils (that is, those born in the summer months in England) tend, on average, to attain inferior academic levels and to score lower on tests of academic performance; disproportionately frequently to be diagnosed with special educational needs;

to be more likely to be held back to repeat a grade; less often to progress into further education; and, potentially, to be more susceptible to psychiatric diagnosis, to rating by others and by themselves as having relatively lower academic ability, and to reported bullying victimhood.

Crawford et al (2007) argue that, 'this cannot be optimal from either an efficiency or an equity perspective' (p. 7). Indeed if, as consistently evidenced, a proportion of children are failing to reach their academic potential while also being penalised at a social level due to the accident of their birth date, this seems inefficient, unjust, and inherently unsatisfactory.

The remainder of this section reviews the literature on possible causes of the 'month of birth effect,' discusses potential interventions and practices which may alleviate or aggravate its impact, and suggests in-school ability grouping as one such practice. Finally it outlines a theoretical model which proposes a number of channels through which ability grouping may prove instrumental in producing birth month variation.

Theories on the cause of the month of birth effect and suggested interventions

A number of theories on the creation and proliferation of the month of birth effect have been proposed, and no single cause or combination of causes has, to date, definitively been established: 'work on remedies is not yet sufficiently advanced' (Sykes et al, 2009; [see also e.g. Sharp et al, 2009; Crawford et al, 2011]). It is feasible still that there are multiple sources of birth-month differentiation – which may each present an option, or options, for intervention and mitigation.

Given the lack of certainty about the existence and importance of (a) specific cause(s), many studies to date have recommended interventions that offer post-hoc solutions and adjustments, such as age-standardisation of academic test results (e.g. Crawford et al, 2007; Sharp et al, 2009). However, as research continues, a more detailed understanding may be constructed of the points at which and routes through which month of birth effects might manifest. It then may become possible to suggest earlier interventions that alleviate, rather than compensate, the current disadvantage of those pupils born later in the school year.

Alleviation is preferable to compensation for a number of reasons. There is emerging evidence for a sliding scale of disadvantage according to in-year group positioning which affects many aspects of a pupil's childhood, in addition to academic performance. For example, studies indicate an increase, for relatively younger pupils, in tendencies to experience bullying both in-school and outside of school, and a decrease in self-perceptions of ability, and in reported happiness at school (e.g. Crawford et al, 2011). These experiences cannot be rectified post-hoc: once bullied, for example, a pupil cannot be 'un-bullied.'

Moreover, accumulating support for a pervasive, multi-faceted month of birth effect suggests that a simple readjustment of one aspect of its manifestation cannot hope to compensate all of its long-run, many-dimensional influence. Even if, for example, age-adjusted versions of a pupil's GCSE results were used by institutions for admittance on to further education courses, this could not address or reimburse any birth month-related differences in academic

self-image and self-confidence, which affect *choices* of post-16 pathway, and applications to study and training. Therefore identification of roots and channels of the month of birth effect, and development of interventions which go some way towards preventing its occurrence, may be preferable and more effective in reducing disparities and inequalities than those that attempt to provide retrospective mitigation.

Biologically-based theories on the month of birth effect

Theories on the essential causes of birth month variation span the biological and social sciences. At a biological level, it has been suggested that pre-natal seasonal variations may influence the development of infants in the womb and subsequent post-natal progress (see e.g. Foster and Roenneberg, 2008; Polizzi et al, 2007; Sharp et al, 2009). However, international evidence from countries whose school entry cut-off points fall in different seasons, but whose relatively youngest pupils are equivalently disadvantaged (Sharp et al, 2009), precludes any possibility that seasonally-related biology can entirely explain the month of birth gradation across each school year group.

It is possible that there is an interaction between the structure of an education system and seasonal biological patterns. However, the work presented in this paper sets aside the potential contribution to the month of birth effect of pre-natal biology, and focuses on social and psychological explanations.

Socio-structural theories on the month of birth effect

Much current UK research focuses on exploring and isolating the potential contributions to birth-month attainment variation of drivers related to the high-level structure and administration of the education system, such as:

- absolute age differentials (given that having a system based around annual year groups means that August-born pupils are up to a year younger than September-borns on sitting national tests)
- length of schooling (given that local authorities differ in their policies on exact point of admission after a child's fourth birthday, which means that some relatively younger children receive fewer terms of formal education than their older counterparts) (e.g. Crawford et al, 2011).

Findings from these studies may indicate opportunities for specific national-level interventions that could begin, to some extent, to lessen differences in test results according to month of birth. However, additional causes of the effect may still remain.

Psycho-social theories on the month of birth effect

At the level of the child and the school environment, psycho-social research has proposed that the relative juvenility and immaturity of summer-born pupils at the point of entry to primary school is fundamental in establishing a foundation for subsequent birth month variation, due to a lack of parity in social, emotional, and/or cognitive school-readiness (see e.g. Boardman et al, 2006; Sharp et al, 2009). Evidence that younger pupils may disproportionately be diagnosed with special educational needs on the basis of relative

developmental immaturity (rather than a stable psychological pathology / cognitive deficiency) supports this hypothesis (see e.g. Gledhill et al, 2002; Wallingford et al, 2000). Research indicates that summer-borns are sometimes labelled as manifesting a psychological condition or trait, when in fact they are merely younger and relatively less able to adapt to the demands of early schooling than autumn-borns.

If this relative immaturity due to absolute age differences in early primary school is indeed key to establishing the groundwork for subsequent birth month inequalities, a possible solution would be to reduce in-year group disparities by narrowing the ages each grouping spans. Rather than a school year group, a school 'half-year group' might be constructed, so that children of a more homogenous age and at a more similar stage of development would be educated together. However, the massive resources required for a restructure of this magnitude almost certainly consign it to wishful theorising rather than practical policy recommendation. It is therefore more useful to investigate practices and decisions within the existing structure that, like special needs assessment, may be influenced by relative age in-year.

Analysis of international evidence by Sprietsma (2007) indicates that in-class ability grouping – where pupil groupings are constructed by schools / teachers on the basis of performance relative to peers in the same year group – may be gradated by birth month and may channel and/or create some of the effects of relative age. This suggests a practice, within the established annual cohort system, that may be shaped by the inherent systematic differences in pupil maturity and school readiness that the system necessitates: a practice which, if it occurs at an early stage of schooling, may be implicated as a creator of the month of birth effect.

If, early in their educational career, relatively younger pupils are placed by their teachers in lower in-year groupings, and relatively older pupils in higher groupings, this hasty (and potentially premature) sorting and classification may play a significant part in subsequent differentials in attainment (and experience). Correspondingly, if a contribution of early ability grouping to month of birth variation is evidenced, this will suggest a clear and timely point for intervention and alleviation which has the potential to impede the development – and thwart the existence – of these differentials.

Previous evidence on in-school ability grouping and month of birth

Until very recently, a dearth of large-scale national-level data on in-school ability grouping practices has meant that investigation of their potential contribution to the month of birth effect in England has been constrained. The National Pupil Database does not contain information on whether a pupil is ability grouped, and no representative surveys have collected information on these practices. Likewise, with the exception of Sprietsma's (2007) work, there is scant international evidence in the area (Sharp et al's 2009 international literature review presents no studies specifically examining this issue, nor does Sykes et al's [2009] *English-evidence-based birthdate effects: A review of the literature from 1990-on*). Some very dated studies exist (for example, Jinks' 1964 analysis of a single borough's 11-year-olds suggested that pupils relatively younger in the school year tended to be found in lower streams) - but whether in-school ability grouping may contribute to current birth month attainment differentials, in England, has only lately begun to be explored.

The teacher questionnaire for the MCS age seven survey includes detailed questions on whether each pupil was streamed, set, and/or in-class grouped at the time. The MCS also includes a plethora of background information for each child, gained across four waves of data collection at ages nine months, three years, five years and seven years. It can therefore be used to investigate each of the grouping practices in the context of their relationship(s) with month of birth in English schools. Hallam and Parsons (2012) begin to analyse patterns within the UK-wide MCS sample and find that, after controlling for a range of pupil and family characteristics, month of birth remains a significant predictor of stream placement.

Hallam and Parsons' study models relationships between a multitude of factors and stream placement level across the four UK countries – therefore providing a necessarily inexact estimate of the extent of country-specific stream placement disparities (given, particularly, that educational practices, including school year cut-off points, vary across the devolved administrations). In order to provide a foundation for future work explicitly examining mechanisms through which month of birth effects may be created, the current paper more precisely examines and quantifies relationships among English MCS pupils, along with associations between birth month and placement levels according to: literacy set, numeracy set, in-class ability group, in-class literacy group, and in-class numeracy group.

How might (disparities in) ability grouping affect pupil attainment?

Theory and research on in-school ability grouping generally suggest that grouping entrenches variation between pupils, and has a detrimental effect on pupils placed at lower levels: '[Grouping practices] appear to have replicated the achievement spectrum they were designed to reduce;' '[grouping is] disadvantageous for those in lower sets and increases the overall attainment gap' (Kutnick et al, 2005; Dunne et al, 2007; see also Blatchford et al, 2008). Studies also suggest a number of mechanisms through which grouping may create, embed, or enlarge between-pupil differences in academic performance. In their (2005) review, *The effects of pupil grouping,* Kutnick et al contend that:

> Organisational-based grouping practices can…be seen to mediate both the summative and formative assessment that can be provided in schools for pupils – affecting teacher and pupil behaviour, pupil self-efficacy and the range of educational opportunities offered in the classroom… (pp. 28-9).

Pupil self-perceptions and behaviours

There is a quantity of educational and social-psychological research which supports the notion that labelling an individual as being of a certain 'type,' or priming an aspect of an individual's sense of self, will affect their perceptions and behaviour (see e.g. Croizet and Claire, 1998; Kutnick et al, 2005; Raey, 2006; Shih et al, 1999; Steele and Aronson, 1995; Yopyk et al, 2005). This evidence suggests that if a pupil is informed (explicitly or implicitly) through their academic placement that they are more or less able, this will influence their subsequent behaviours, and they will enact, to some extent, the role assigned, performing at a relatively higher or relatively lower level.

Kutnick et al's review also suggests that the slower progress of pupils in lower 'ability' groups may in part be engendered by a demotivation resulting from their placement, and associated development of 'anti-school attitudes.' Correspondingly, the disproportionately speedy progression of pupils placed in higher groups is argued to stem from pupils' positive expectations and attitudes, which are in part produced by being situated in a group that is assumed to perform well. Some of the relationships between ability grouping and academic attainment may therefore be channelled, in various ways, through children's perceptions of themselves and of school.

Educational opportunities

Kutnick et al's review suggests a number of additional mechanisms through which differentiation between the achievement of pupils in low and high groupings may play out. There is some evidence that teachers of lower groups may themselves be less able, experienced or qualified. The review also reports consistent evidence that pupils are offered different educational and curriculum opportunities according to their ability group placement.

Moreover, research suggests that, once placed, pupils' positions within in-school hierarchies have tended largely to be stable over time (see e.g. Hallam and Parsons, 2012). Having been consigned to their place in a hierarchical structure at an early age, there is, therefore, evidence that the quality and scope of education offered to each pupil will depend on their position within the structure – and that this position is unlikely to be revised.

Teacher perceptions and behaviours

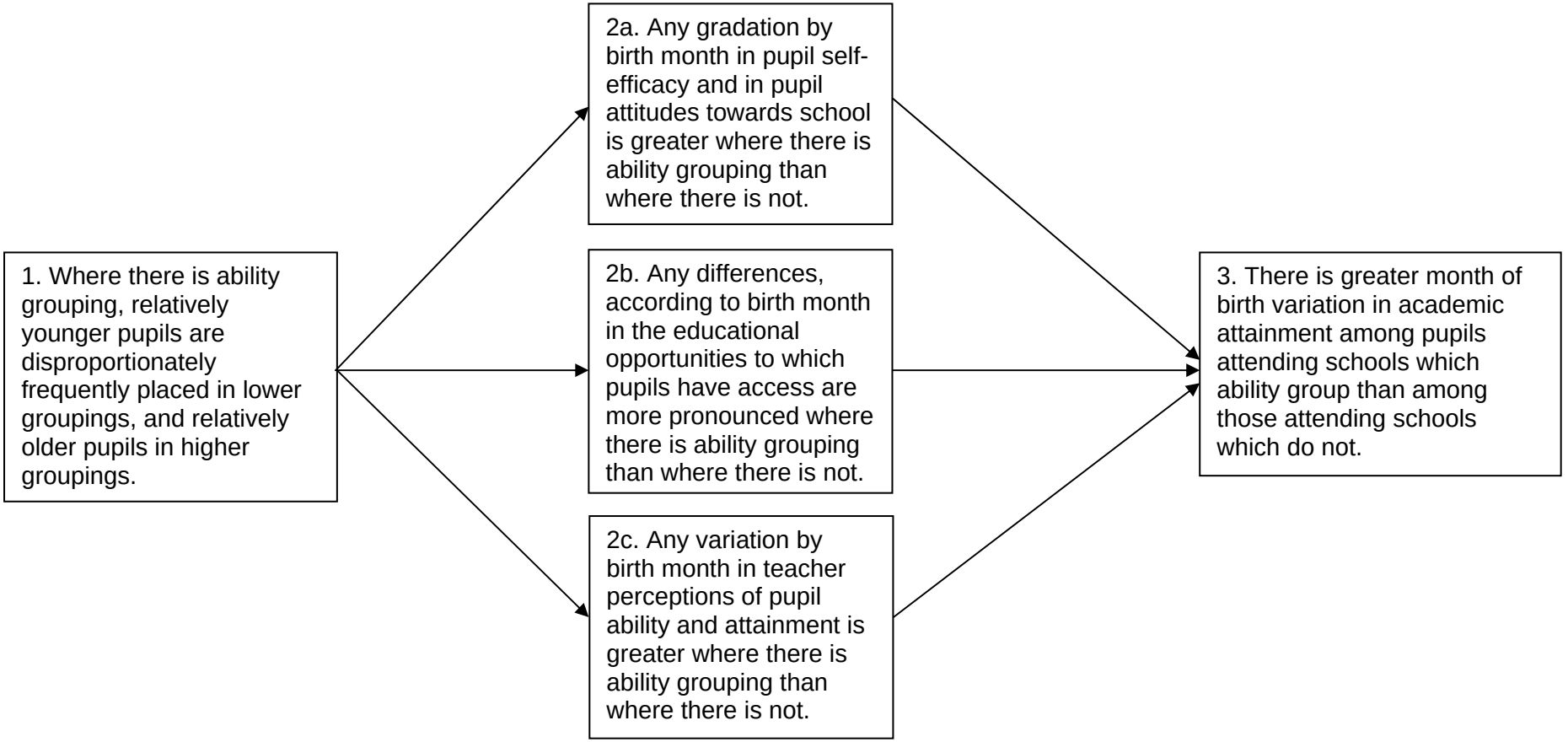
Furthermore, teachers' perceptions of and subsequent behaviours or interactions with pupils may vary according to the pupils' grouping positions. Research suggests that teachers (consciously or unconsciously) label and stereotype pupils based on a variety of characteristics (see e.g. Burgess and Greaves, 2009; Hansen and Jones, 2011; Reaves et al, 2001; Thomas et al, 1998). Studies also indicate that teachers formulate and act upon expectations of pupils according to the level of their academic group (Rubie-Davies, 2010). Ability group membership may therefore affect teacher perceptions, which may result in different encouragements and demands according to group placement.

The channels through which placement level influences attainment may also be interrelated: decisions by teachers about the curriculum and assessment opportunities to which pupils have access may be related to perceptions engendered by their 'ability' group situation, and access to opportunities may, in turn, affect children's self-perceptions (see e.g. Ireson and Hallam, 2005; Kutnick et al, 2005).

Ability grouping as instrumental in the month of birth effect

Figure 1 therefore draws upon previous research and theory to describe some of the potential pathways of influence through which any disproportionate ability group placements of pupils according to birth month may lead to month of birth variation in academic attainment.

Figure 1: Premises for potential channels through which in-school ability grouping may lead to month of birth attainment variation



Policy background: in-school ability grouping

Under the previous Labour government (1997-2010), in-school ability grouping was encouraged. The 2005 White Paper, *Higher Standards, Better Schools For All,* categorised pupils into three groups: the 'gifted and talented,' the 'struggling,' and the 'just average' (p 20). The Paper bemoaned a comprehensive system which had replaced the old grammar / secondary modern institutions with 'all-ability classes, which made setting by subject ability too rare' (p. 1). It also called for 'more grouping and setting by subject ability' (p. 10), proposing that:

> Grouping students can help to build motivation, social skills and independence; and most importantly can raise standards because pupils are better engaged in their own learning (p. 58).

Labour's support for in-school grouping continued until the end of their term in 2010: the consultation paper for the 2009 *21st Century Schools* White Paper continued to endorse 'carefully planned pupil groupings' (Department for Children, Schools and Families, 2008, para 3.5).

The Coalition Government has been fairly circumspect regarding its policies on grouping. On election, the 2010(a) White Paper *The Importance of Teaching* made no reference to the subject, but given that prior to the election the Conservatives were strongly pro-ability grouping (their 2007 green paper, *Raising the Bar, Closing the Gap,* avowed a belief in '[delivering] more teaching by ability which stretches the strongest and nurtures the weakest' [p. 9]), it seems unlikely that reticence can be read as any kind of reversal of ideology. Indeed, in response to a (2012) OECD review which argued that 'student selection – and in particular early tracking (setting and streaming) – exacerbates differences in learning between students,' the Department for Education issued a response stating:

> It is for schools to decide how and when to group and set pupils by ability as they are best placed to know and meet the learning needs of their pupils.
>
> Research shows that when setting is done well it can be an effective way to personalise teaching and learning to the different needs of groups of pupils. (Quoted in e.g. Guardian report on OECD study.)

Overall, then, recent governments have sought to endorse and encourage in-school ability grouping, and no indications of policy change on this matter are apparent. This paper begins to explore the potential contribution of this policy, and of related practices, to the development of month of birth attainment differentials.

Section B: The data and its suitability

Data from the MCS age seven survey teacher questionnaire is used throughout this paper (along with data from the wave four survey of families). This section describes the data and discusses its suitability for investigation of relationships between month of birth and in-school ability grouping in England.

Overview of the Millennium Cohort Study

The initial MCS population for England is defined as:

> All children born between 1 September 2000 and 31 August 2001…alive…at age nine months (when the first wave of MCS interviews was intended to take place), and eligible to receive Child Benefit at that age; and, after nine months: for as long as they remain living in the UK at the time of sampling' (Plewis et al, 2007).

Four surveys of the MCS have taken place to date, at ages nine months (2001), three years (2004), five years (2006) and seven years (2008). The age 11 survey is taking place in 2012-13. At age 9 months, 11,695 individual babies were included in the final achieved sample in England. At age seven, 8,887 interviews took place in England, of which 5,627 (63 per cent) also generated responses to a teacher-completed questionnaire (Johnson et al, 2011). Therefore just under half of the original English sample remain for analysis using the teacher survey data.

All analyses in this paper are for children surveyed in England only, in line with the assumption that relationships within the structure of a school system are key to creating associations between month of birth and child outcomes. The majority of included cases are therefore for children in English schools, and within the same educational framework with the same school year cut-off points at the time of interview[2].

In the English dataset, there are 164 cases recorded as being part of multi-cohort member households at age nine months (i.e. twins, triplets, or siblings very close in age). Because there might be a particular relationship between being a twin or triplet and ability grouping (teachers might keep these children together or separate them for social reasons, or make assumptions about parity of ability, for example) all of these cases were removed from the analysis. This leaves a base total of 5,481 seven-year-old English singleton cases.

Weighting

Most results presented in this paper are unweighted, except where explicitly stated. The teacher survey sample of 5,481 cases is implicitly derived from two populations: that of children in England aged seven in 2008, and that of schools in England in 2008. The MCS was sampled by means of a 'disproportionately stratified cluster sample' of births during the first year of the millennium (see Plewis et al, 2007, p. 15). The MCS age seven teacher

[2] It is possible that a minority of children (e.g. those who live on country borders) might attend school in a different country to that in which they live. This should lead to underestimation rather than overestimation during analysis.

questionnaire therefore represents teachers in schools eventually attended by the cohort children selected through this initial sampling procedure, rather than being sampled from and directly representing all schools in England. As well as being conditional upon the eventual distribution of MCS children across schools seven years after sampling, the teacher sample is dependent upon school- and teacher-level response.

Survey weights are available to compensate for the differing probabilities of sample selection and for patterns of responses at each wave at the child / family level (see Plewis, 2007), but these weights are not applicable to adjust for patterns of teacher response. Given then that the exact relationship of the teacher survey sub-sample to the school / teacher population is unknown, and as an exploration of the ostensible 'representativeness' of the teacher responses, the 2008 teacher sub-sample is compared to the English schools population in 2008.

Sample make-up

The 5,481 survey children attend 2,700 schools in 154 local authorities. Table 1 compares key characteristics in the sample and the national pupil population as presented in (then) Department for Children, Schools and Families statistics (Department for Children, Schools and Families 2009b; Department for Children, Schools and Families 2009c).

Table 1: Pupil characteristics in the English MCS age seven (2008) sample with completed teacher questionnaires, and in the English school population in 2008-09

Characteristic	Measure / definition Proportions in age 7 MCS teacher sample (unweighted)	Measure / definition Proportions in state school population according to Department for Children, Schools and Families statistics for pupils in 2008-09
Gender	Parent-report in survey **50.2%** male	Statistics for pupils who were age 7 in January 2009 **51.2%** male
Ethnicity	Parent report in survey / derived variable **80.7%** White 3.3% Indian 6.9% Pakistani / Bangladeshi 3.9% Black 1.7% 'Other' 3.4% Mixed ethnicity	Statistics for all state primary pupils **79.2%** White 2.5 % Indian 5.5% Pakistani / Bangladeshi 4.9 % Black 3.8% 'Other' 4.1% Mixed ethnicity
English as an additional language	Parent report in survey: response to question on, "language spoken in household" **86.3%** "English only"	"First language is known or believed to be English" – statistic for all state primary pupils **84.6%** English first language

Characteristic	Measure / definition Proportions in age 7 MCS teacher sample (unweighted)	Measure / definition Proportions in state school population according to Department for Children, Schools and Families statistics for pupils in 2008-09
Diagnosed / recognised with special educational needs (SEN)	Teacher report in survey: response to question, "Has this child EVER been recognised as having SEN?" **22.6%** "yes"	Pupils in year two in 2008-09 **21.8%** with any SEN recorded
	Teacher report in survey: response to question, "Does this child have a full statement of SEN?" **2.6%**	Pupils in year two in 2008-09 **1.3%** with statement of SEN

Based on these comparisons, the unweighted age seven survey teacher questionnaire sample does not appear alarmingly dissimilar to the national population of pupils aged seven in 2008-09 (though of course there may be differences according to unobserved characteristics). Save for the discrepancy between proportions with a statement of SEN, which may be due to official statistics lagging behind local diagnoses, variation is minimal.

Potentially more worryingly, the teacher sample is unevenly distributed across birth months, though a reasonable sample size remains for each (see Table 2). However, survey documentation indicates that this uneven distribution is due to variation in response windows allowed by sequential multi-stage fieldwork roll-out, rather than to pupil / family-level response bias (see Chaplin Grey et al, 2010; Huang and Gatenby, 2010).

Table 2: Percentage proportion of MCS age 7 survey teacher sample born in each month

Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
9.4	8.7	9.2	9.0	8.7	7.4	8.4	7.9	8.0	8.5	7.5	7.2

(n = 5481)

The assumption that there is not a bias in response according to birth month, high levels of individual teacher item response to questions on streaming, setting, and grouping (see Table 3, Section C), and compatibility on key characteristics of the sample statistics and statistics for the English schools population, allow a sufficient dataset to explore relationships between month of birth and ability groupings, and to suggest that patterns in the sample provide some representation of the national situation in England.

Key survey questions

The MCS age seven teacher questionnaire was, in the vast majority (97.3 per cent) of cases, completed by an individual identifying themselves as the cohort pupil's class teacher. It asked a number of questions about whether each child was subject to streaming, setting and/or in-class grouping. These practices are described and defined in the survey as follows:

> Some schools group children in the same year by general ability and they are taught in these groups for most or all lessons. We refer to this as streaming.
>
> Some schools group children from different classes by ability for certain subjects only and they may be taught in different ability groups for different subjects. We refer to this as setting.
>
> Other schools do not group children by ability between classes. Sometimes this may be because there are not multiple classes in the year.
>
> Some schools group children within the same class by general ability and they are taught in these ability groups for most or all lessons. We refer to this as within-class ability grouping.
>
> Some schools group children within the same class by ability for certain subjects only and they may be taught in different ability groups for different subjects. We refer to this as within-class subject grouping.
>
> Other schools do not group children by ability within-classes. Some schools may use within-class groupings in addition to between class streaming and setting and others may use within-class groupings instead of between class streaming and setting.
>
> Some schools may not use any general or subject specific ability groupings either within or between classes.

Teachers were asked to indicate whether any of the following practices took place in the MCS child's year:

- streaming
- literacy setting
- numeracy setting
- in-class ability grouping
- in-class grouping for literacy
- in-class grouping for numeracy

Once they had provided a yes / no response to each practice, an affirmative answer prompted a follow-up asking whether the pupil was in the: 'highest,' 'middle' or 'lowest' grouping according to each. (For exact wordings and original documentation see *Child of the New Century Age 7 Survey Teacher Questionnaire – England)*.

Section C: In-school ability grouping: Prevalence and co-occurrences

This section describes the proportions in the MCS age seven sample with teacher response described as being subject to each of the six ability grouping practices identified in the questionnaire. It also examines co-occurrences of practices and of placement levels.

Numbers in sample who were streamed, set, grouped

Percentages of sample pupils who are reported as being subject to streaming, setting and grouping, along with (very similar) estimates weighted for initial survey design[3], are reported in Table 3, below.

Table 3: Percentages within the English MCS age seven sample with teacher response who are reported as being streamed, set for literacy / numeracy, grouped by overall ability in-class, grouped in-class for literacy / numeracy teaching

Grouping practice	Number of pupils with data available	Percentage of pupils reported as being subject to practice (unweighted)	Percentage of pupils reported as being subject to practice (weighted, with 95% confidence intervals for weighted estimate)[4]
Streaming	5288	17.8	17.1 (15.4 – 18.9)
Literacy-setting	5196	31.2	28.6 (26.2 – 31.1)
Numeracy-setting	5137	37.5	36.0 (33.1 – 39)
In-class overall ability grouping	5374	78.8	78.8 (76.8 – 80.7)
In-class grouping for literacy	5366	87.2	88.4 (87 - 89.7)
In-class grouping for numeracy	5353	85.5	86.4 (84.6 - 88.0)

At age seven, a large majority of sample pupils are reported as being grouped in class. Nearly 80 per cent are stratified according to an overriding in-class hierarchy, and even more are categorised in-class specifically for maths or English teaching. A significant minority are reported as being set or streamed within their year group: nearly 40 per cent are set for

[3] This weighting corrects for unequal selection probabilities when the survey was sampled at age nine months - for example, taking account of the higher probabilities of pupils living in more deprived areas to be included in the initial sample (see Plewis et al, 2007).

[4] Weighted for initial sample design, single-country analysis, and finite population, using *weight1, pttype2, sptn00, nh2* (as per Plewis et al, 2007).

numeracy, while almost 18 per cent are subject to an overall stream placement for all teaching.

The large percentage of sample children grouped at an early stage of schooling provides a basis for the hypothesis that there is potential for these practices to be instrumental in creating long-term birth month differentials in experience and attainment, should ability grouping placement display a consistent association with month of birth.

Co-occurrence of grouping practices

Ability grouping of pupils may not be confined to one practice per pupil. Children may concurrently be streamed, set, and/or in-class grouped, according to a number of combinations. Table 4 begins to examine this by presenting a basic cross-tabulation of pair-wise co-occurrence.

Table 4: Percentage of cases in which each given pair of grouping practices are reported to occur together

	Percentage within those who **are** grouped according to the practice denoted on the **left** (by row), who are **also** grouped according to the practice below (column):					
	Streamed	***Set: Literacy***	***Set: Numeracy***	***Ability grouped in-class***	***Literacy grouped in-class***	***Numeracy grouped in-class***
Streamed		66.1	74.6	83.9	84.4	79.6
Set: Literacy	38.5		90.4	72.1	75.3	76.2
Set: Numeracy	36.6	76.2		73.6	79.1	71.4
Ability grouped in-class	18.9	28.4	34.9		92.0	89.7
Literacy grouped in-class	16.9	26.5	33.7	83.3		95.5
Numeracy grouped in-class	16.2	27.4	31.0	83.0	97.5	

(n for sample from which each cross-tabulation is derived = 5,481, but exact sample size varies slightly according to each pairing)

Table 3 indicates that many of the MCS seven-year-olds are subject to at least two co-occurring practices.[5] For example, most pupils who are subject to an overriding in-class

[5] Only 2.6% of sample pupils are reported as being subject to no ability grouping at all, and 2.8% to just one practice. 13.2% are grouped according to two practices, 51.5% according to three, 12.2% according to four, 10.8% according to five, and 6.9% according to six co-occuring practices.

ability grouping (the third most commonly occurring practice, at 78.8 per cent of the sample) are also grouped in class for literacy and numeracy, and some are set or streamed as well as in-class grouped. This co-occurrence invites the question: do children tend to be placed at the same level within each of the grouping practices to which they are subject?

Co-occurrence of placement level across groupings

Streaming precedes all other grouping practices in the sense that, when it occurs, it provides an overriding framework structure for a child's placement within their school year group. Table 4 indicates that the majority of children who are streamed are also set, or grouped within their class.

A priori, this should not necessitate an association between stream placement level and set or in-class placement level. It is possible that a child might, for example, be in the bottom stream, but a top set. Whether there is in fact a correspondence between levels for children in the data is presented in Table 5, for those pupils who are reported as being streamed (17.8 per cent of the sample) and as being subject to each of the other practices.

Table 5: Correspondence between stream placement and set or in-class group placement

		Stream level at which child is situated (below), and proportion within this stream situated at each level of the grouping practice in the left column, where the two co-occur		
		Highest	**Middle**	**Lowest**
Literacy set	**Highest**	92.6	4.7	0.7
	Middle	7.0	84.2	10.7
	Lowest	0.4	11.1	88.6
	Cramer's V statistic for association between stream / literacy set placement			.83 ($p < .001$)
Numeracy set	**Highest**	91.6	12.6	2.4
	Middle	7.1	78.3	8.3
	Lowest	1.3	9.2	89.3
	Cramer's V statistic for association between stream / numeracy set placement			.80 ($p < .001$)
In-class ability group	**Highest**	82.7	3.2	3.3
	Middle	16.4	90.9	16.8
	Lowest	0.9	5.9	79.9

		Stream level at which child is situated (below), and proportion within this stream situated at each level of the grouping practice in the left column, where the two co-occur		
		Highest	**Middle**	**Lowest**
	Cramer's V statistic for association between stream / in-class ability group placement			.78 (p < .001)
Literacy group in class	**Highest**	81.8	4.1	5.2
	Middle	16.3	84.9	21.1
	Lowest	1.9	11.0	73.7
	Cramer's V statistic for association between stream / literacy group placement			.71 (p < .001)
Numeracy group in class	**Highest**	77.7	12.4	7.7
	Middle	18.7	78.7	20.8
	Lowest	3.6	8.9	71.6
	Cramer's V statistic for association between stream / numeracy group placement			.65 (p < .001)

Table 5 suggests a strong correspondence between stream and set placement, with around 90 per cent of these who are in the highest (lowest) stream also in the highest (lowest) literacy / numeracy set. There is a little more variation in the relationship with in-class grouping: around 80 per cent of those in the highest (lowest) stream are also in the highest (lowest) in-class group. The lowest correspondence is between streaming and numeracy grouping in-class (71.6 per cent are in the lowest stream and the lowest numeracy group). This is still a significant majority, however (as supported by a Cramer's V of .65), indicating a consistency in the placement level of pupils who are streamed according to each of the grouping practices to which they are subject.

In order to check whether this consistency is also apparent when a different, more prevalent practice is taken as the basis for comparisons, Table 6 describes associations in placement levels for all pupils reported as being in-class ability grouped (78.8 per cent of the sample).

Table 6: Correspondence between in-class ability group placement and stream, set, or in-class literacy or numeracy group placement

		In-class ability group level at which child is situated (below), and proportion within this group situated at each level of the grouping practice in the left column, where the two co-occur		
		Highest	**Middle**	**Lowest**
Stream	**Highest**	95.4	18.7	1.8
	Middle	2.5	70.4	8.0
	Lowest	2.1	10.9	90.2
	Cramer's V statistic for association between in-class group / stream placement			.78 ($p < .001$)
Literacy set	**Highest**	93.6	14.4	1.3
	Middle	5.9	74.3	7.9
	Lowest	0.5	11.4	90.8
	Cramer's V statistic for association between in-class group / literacy set placement			.79 ($p < .001$)
Numeracy set	**Highest**	90.4	24.7	1.8
	Middle	9.0	60.3	15.0
	Lowest	0.6	15.0	83.2
	Cramer's V statistic for association between in-class group / numeracy set placement			.70 ($p < .001$)
Literacy group in-class	**Highest**	93.7	5.7	0.1
	Middle	6.1	88.0	4.3
	Lowest	0.2	6.4	95.6
	Cramer's V statistic for association between in-class group / literacy group placement			.88 ($p < .001$)
Numeracy group in-class	**Highest**	88.7	12.6	1.4
	Middle	10.8	79.3	18.0
	Lowest	0.5	8.1	80.6
	Cramer's V statistic for association between in-class group / numeracy group placement			.75 ($p < .001$)

Associations here remain high: the vast majority of pupils who are in-class ability grouped are placed at the same level according to each of the practices to which they are subject (Cramer's V is significant at .70 as at minimum). This indicates a level of cross-sectional immobility and rigidity among practices. For example, the pupil classed as high in the ability hierarchy for stream placement is likely to be classified similarly for in-class numeracy teaching. The pupil categorised as low ability for overall in-class grouping is highly likely also to be placed in the lowest streams, the lowest sets, and the lowest groups for subject teaching.

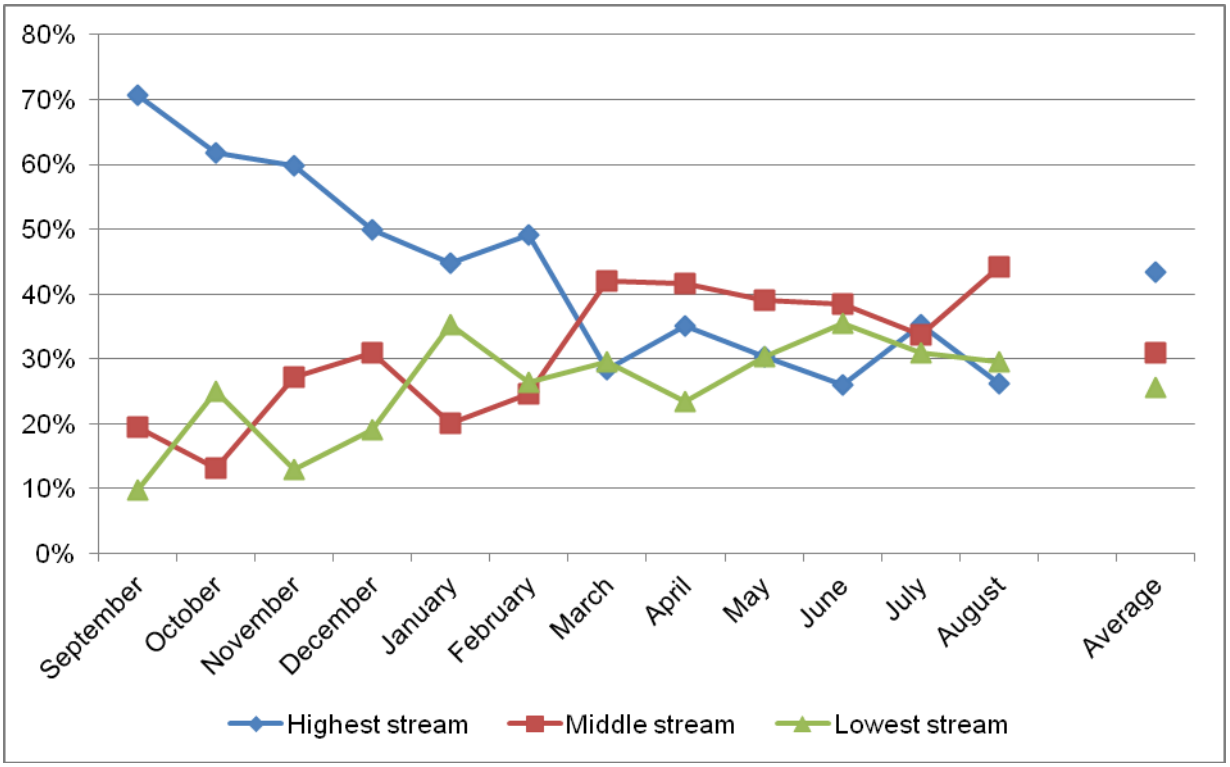
Again, this provides some basis for the possibility that early ability grouping – now indicated to be highly prevalent and to provide a rigorous demarcation between pupils at age seven – may play a part in the formation of the month of birth effect. Whether the consistency in placement levels illustrated here reflects regularity across practices in placement patterns according to month of birth is examined in the next section.

Section D: Month of birth and ability group placement

As discussed earlier, previous research (e.g. Jinks, 1964; Hallam and Parsons, 2012) has indicated that summer-born children may be disproportionately likely to be placed in lower academic groupings, with the inverse being the case for autumn-born children. Analysis of the MCS data presented in this section indicates that this is very much the case for English pupils aged seven in 2008.

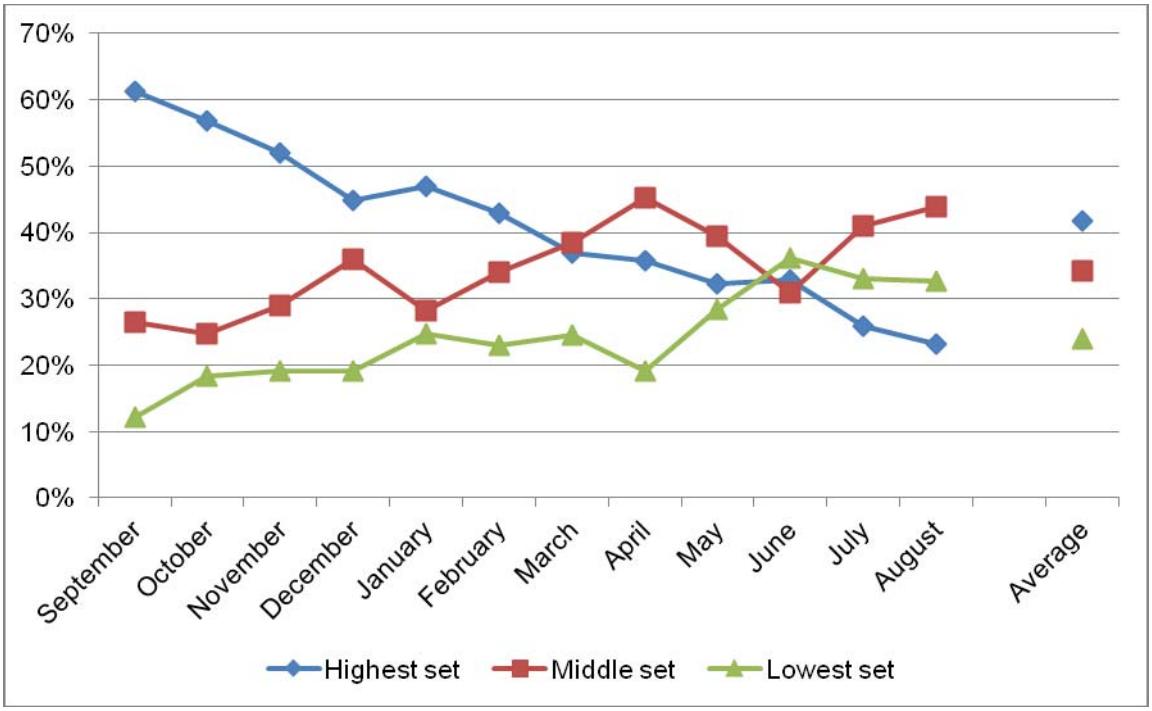
Within-month percentages of pupils placed at each level according to each ability grouping practice (where it takes place) are described in Figures 2 to 7 below. Across practices, there is a consistent, linear incremental tendency for placement in the highest stream, set or group, the relatively older in the school year a pupil – with the inverse being the case for placement in the middle and lowest groupings.

Figure 2: Percentages of pupils born in each month who are reported as being in each stream, among those pupils who are reported as being streamed



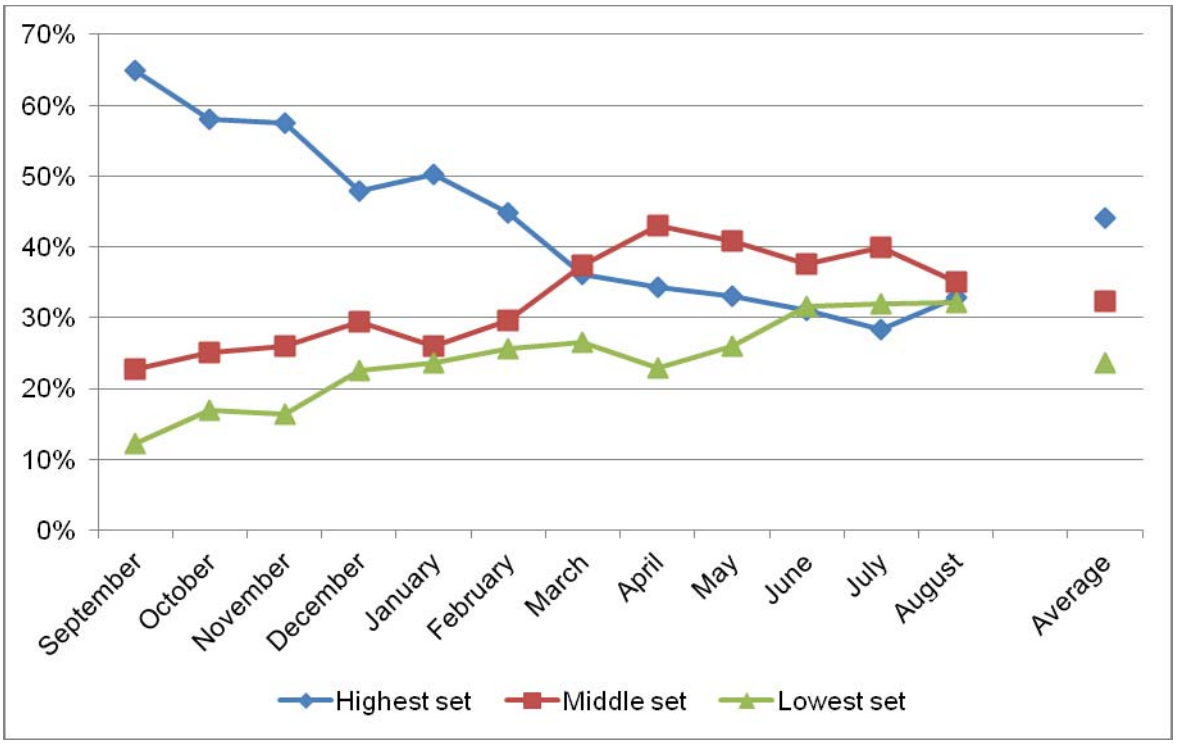
(n = 905)

Figure 3: Percentage of pupils born in each month who are reported as being in each literacy set, among those pupils who are reported as being set for literacy



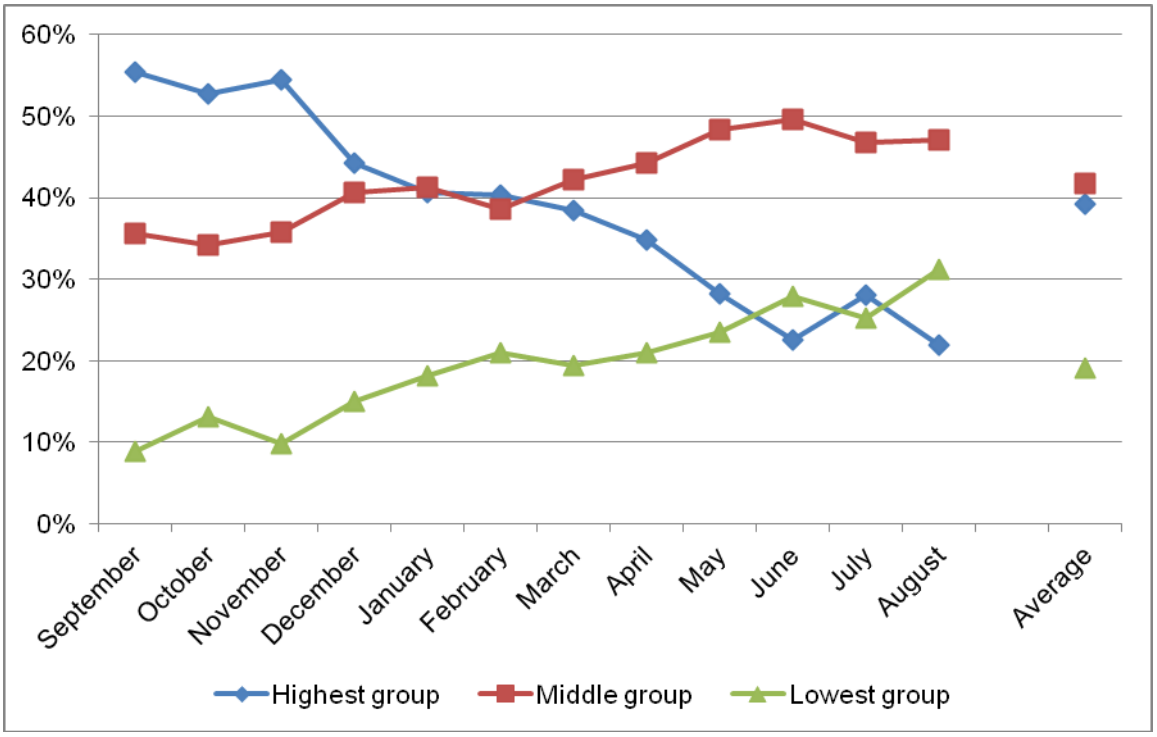
(n = 1599)

Figure 4: Percentage of pupils born in each month who are reported as being in each numeracy set, among those pupils who are reported as being set for numeracy



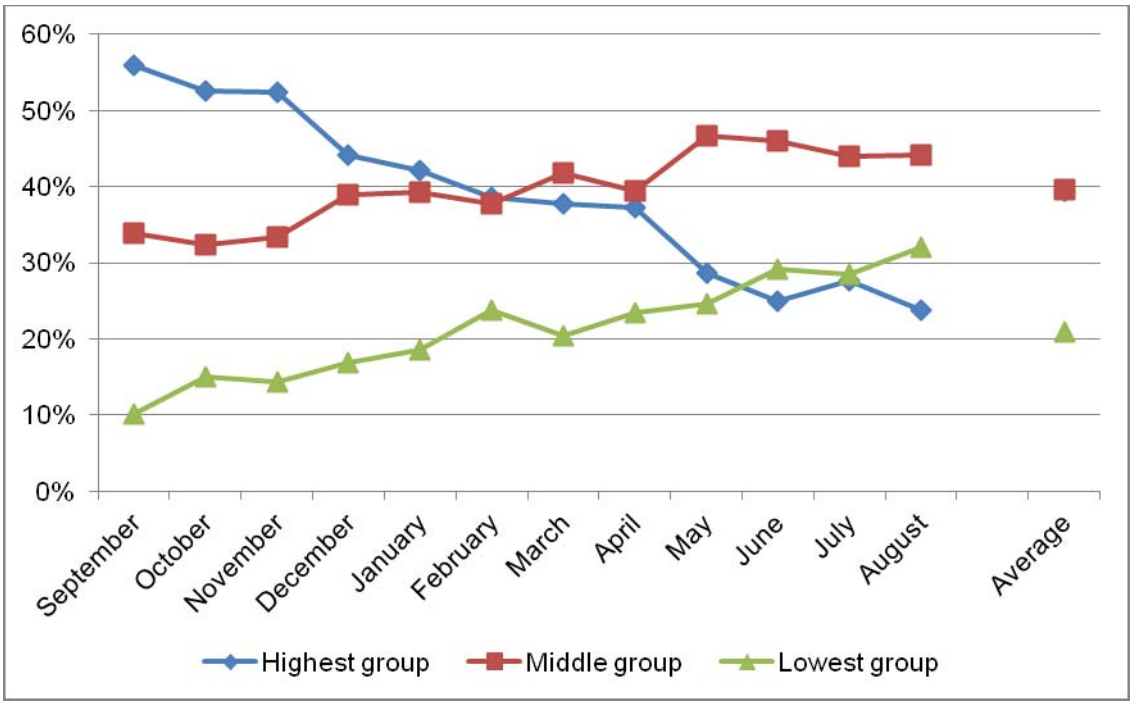
(n = 1903)

Figure 5: Percentage of pupils born in each month who are reported as being in each <u>in-class ability group</u>, among those pupils who are reported as being grouped in class



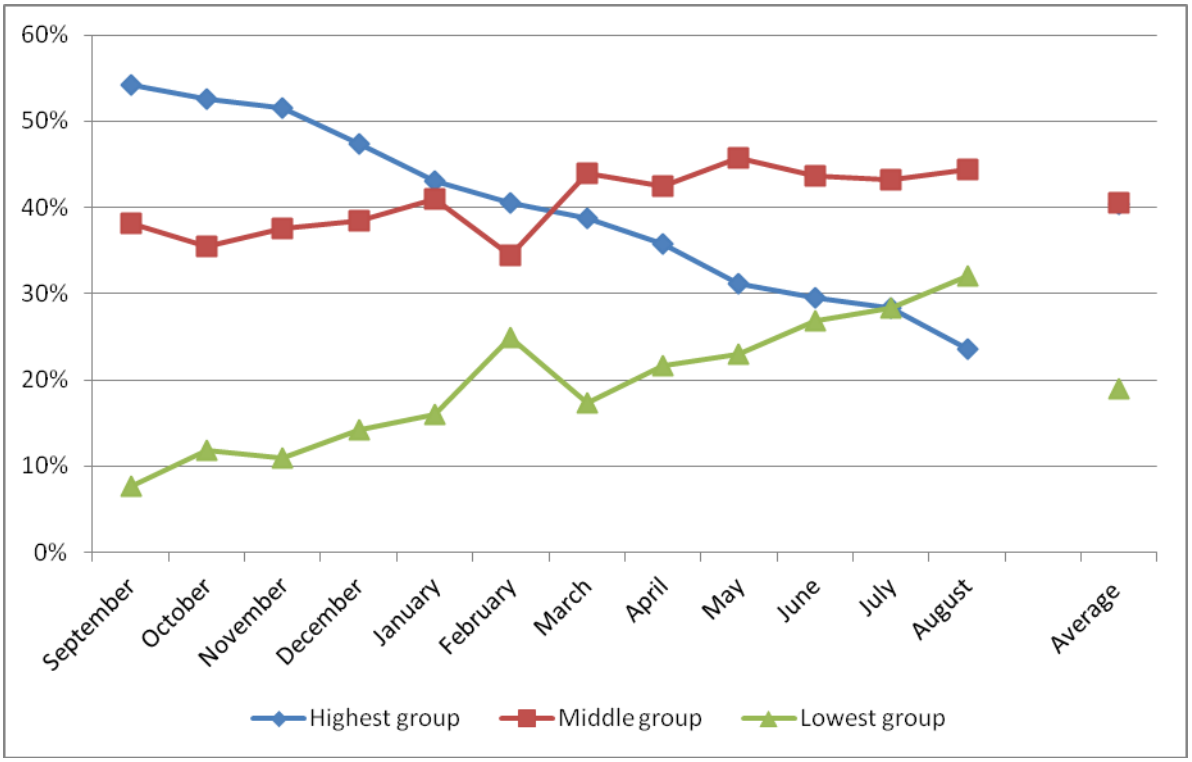
(n = 4140)

Figure 6: Percentage of pupils born in each month who are reported as being in each <u>in-class literacy group</u>, within those pupils who are reported as being grouped for literacy in class



(n = 4641)

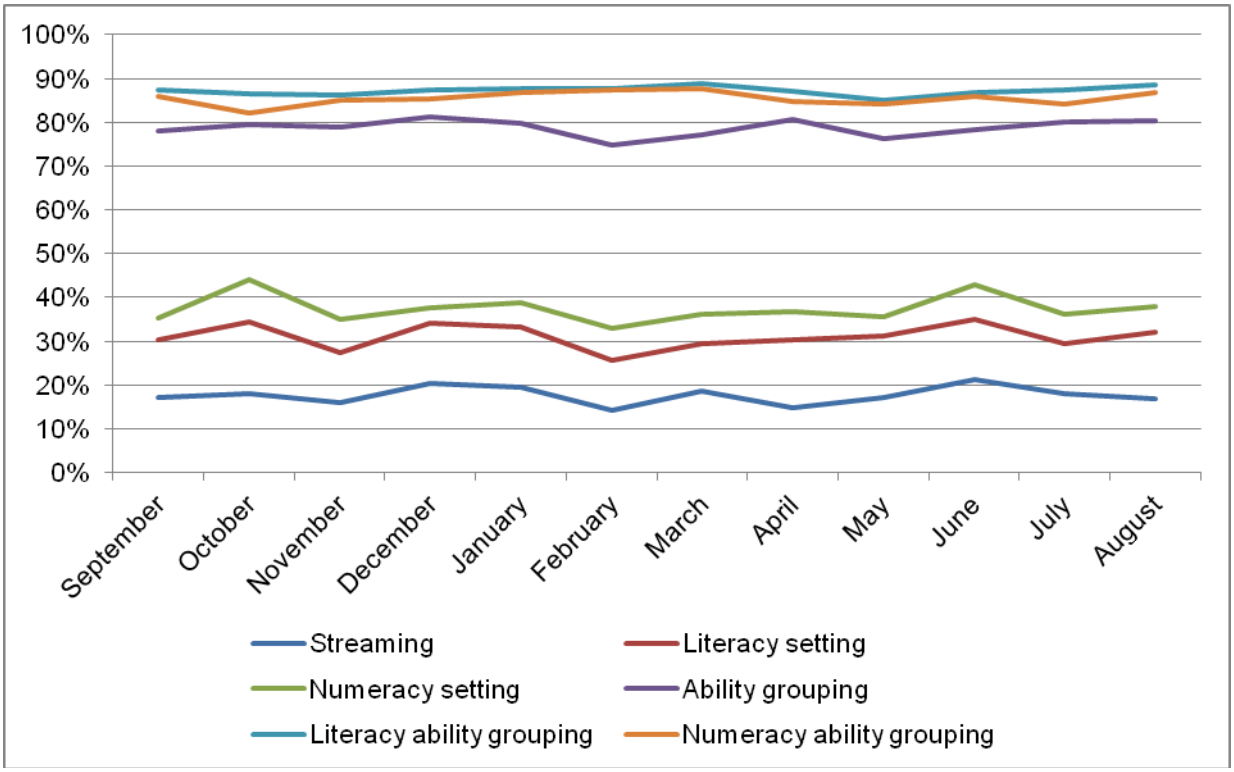
Figure 7: Percentage of pupils born in each month who are reported as being in each in-class numeracy group, among those pupils who are reported as being grouped for numeracy in class



(n = 4532)

In order to check that any variation by birth month in stream, set, or group placement is not driven by section of pupils born in different months into schools employing different practices, Figure 8 presents the percentage of sample pupils reported as subject to each of the six groupings. No differential tendency bearing any relationship to the school year structure is indicated – sample pupils born in each month are roughly equivalently likely to attend schools which sort pupils according to each grouping.

Figure 8: Percentage within each birth month in the MCS age seven sample who are reported as being streamed, set for literacy / numeracy, grouped by ability in class, grouped in class for literacy / numeracy teaching

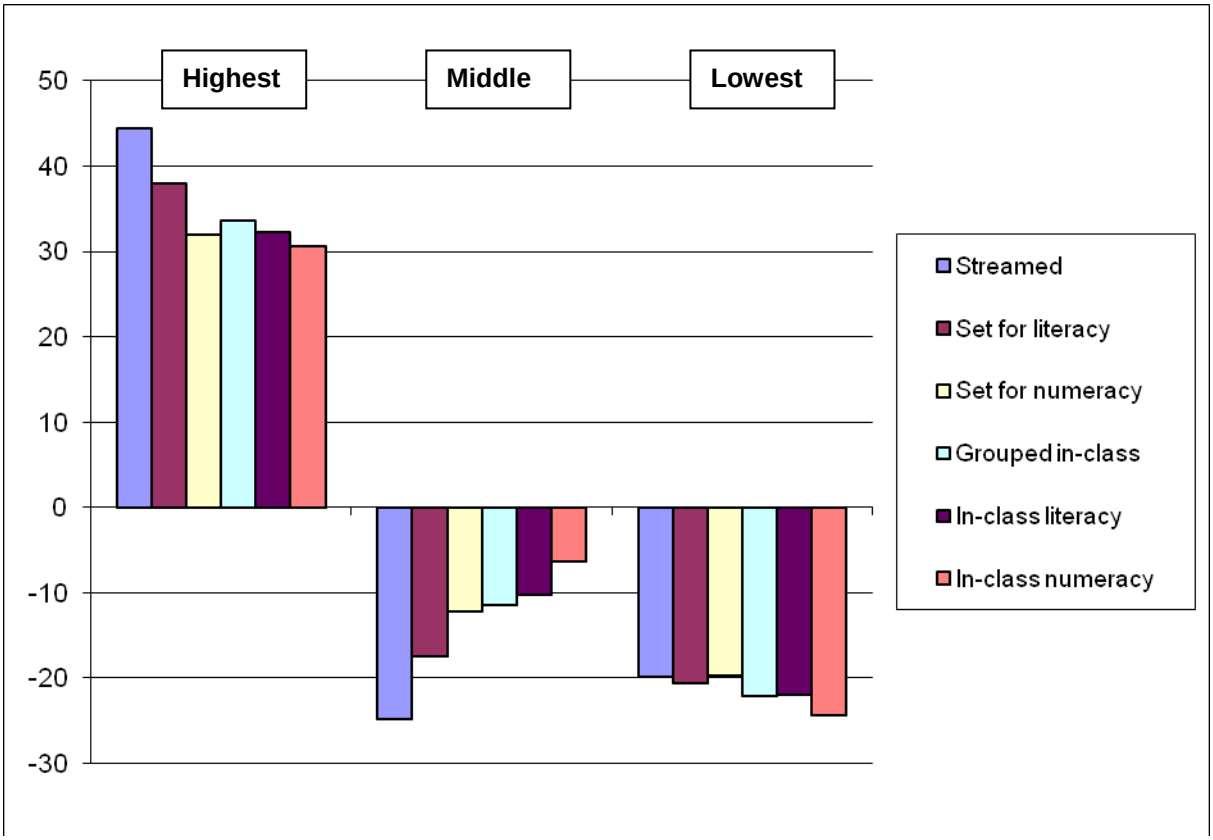


(ns, respectively = 5288, 5196, 5137, 5374, 5366, 5353)

Comparing magnitude of September-August difference across grouping practices

Though the overall cross-birth month pattern is consistent for all grouping practices, there is some variation in magnitude of between-month variation. Figure 9 therefore shows the percentage difference in proportions of pupils born in September and in August found in the highest, middle and lowest streams, according to each practice. Among those children in the sample who are streamed, for example, 70.7 per cent of September-borns are found in the top stream, compared to 26.2 per cent of August-borns. Figure 9 therefore shows that there is a 44.5 percentage point difference between the proportions in this stream within each of these two months, with a much higher proportion of September-borns in the top stream. Similarly, 19.5 per cent of September-borns are found in the middle stream, and 44.3 per cent of August-borns. Figure 9 therefore shows a -28.4 percentage point difference, with a lower proportion of September-borns in the middle stream.

Figure 9: Percentage point difference between proportion of September-borns and proportion of August-borns found in each group, for each grouping practice



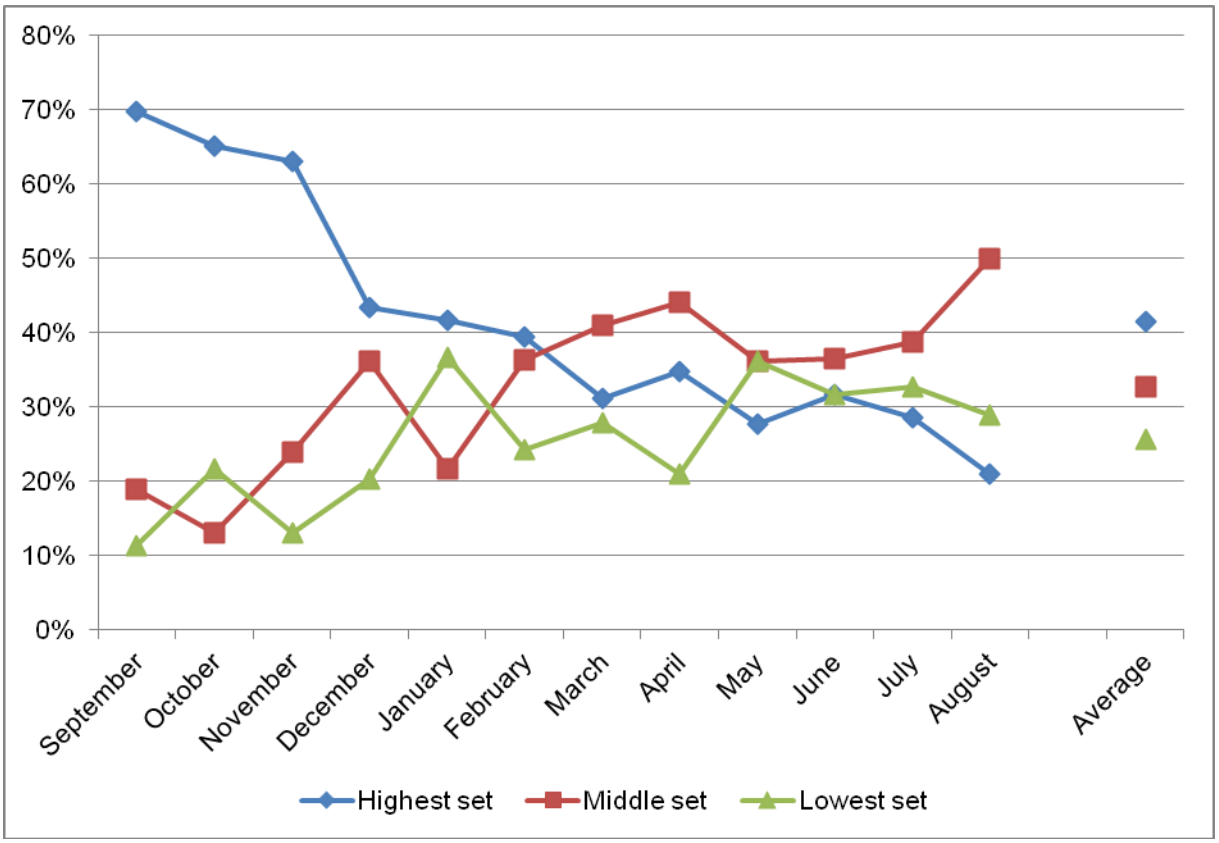
Most disproportionality is indicated for stream placement, followed by set placement for literacy. Proportionately higher (lower) numbers of September (August)- born pupils are to be found in the highest (middle) streams and literacy sets, compared to the differentiation between birth months to be found within the other grouping practices. An overall pattern of increased disproportionality, the higher and more general the level at which categorisation takes place, can therefore be seen across the highest and middle groupings. The least disproportionality within these groups is indicated for in-class numeracy grouping (though the inverse is true, to a lesser degree, within the bottom groupings).

A possible explanation for this is that in-class numeracy grouping may be more easily and more often based upon domain-specific (quasi-)objective attainment tests than some of the other classifications. If grouping for numeracy teaching is according to performance on numeracy tests, and results in relatively less between-birth month variation in group placement, this suggests either that a) there is more month of birth differentiation according to literacy and 'overall' ability, or b) these more general and less concretely-grounded (and auditable) practices of supposed ability grouping may be based on something other than manifest ability and performance. This latter possibility relates to the theories discussed earlier, that relatively younger pupils are less school-ready than their older counterparts, and might, for example, display a behavioural immaturity which results in a lower 'ability' grouping when practices rely on teacher judgements rather than tangible, 'observed' measures of ability.

Differences in month of birth variation where practices co-occur

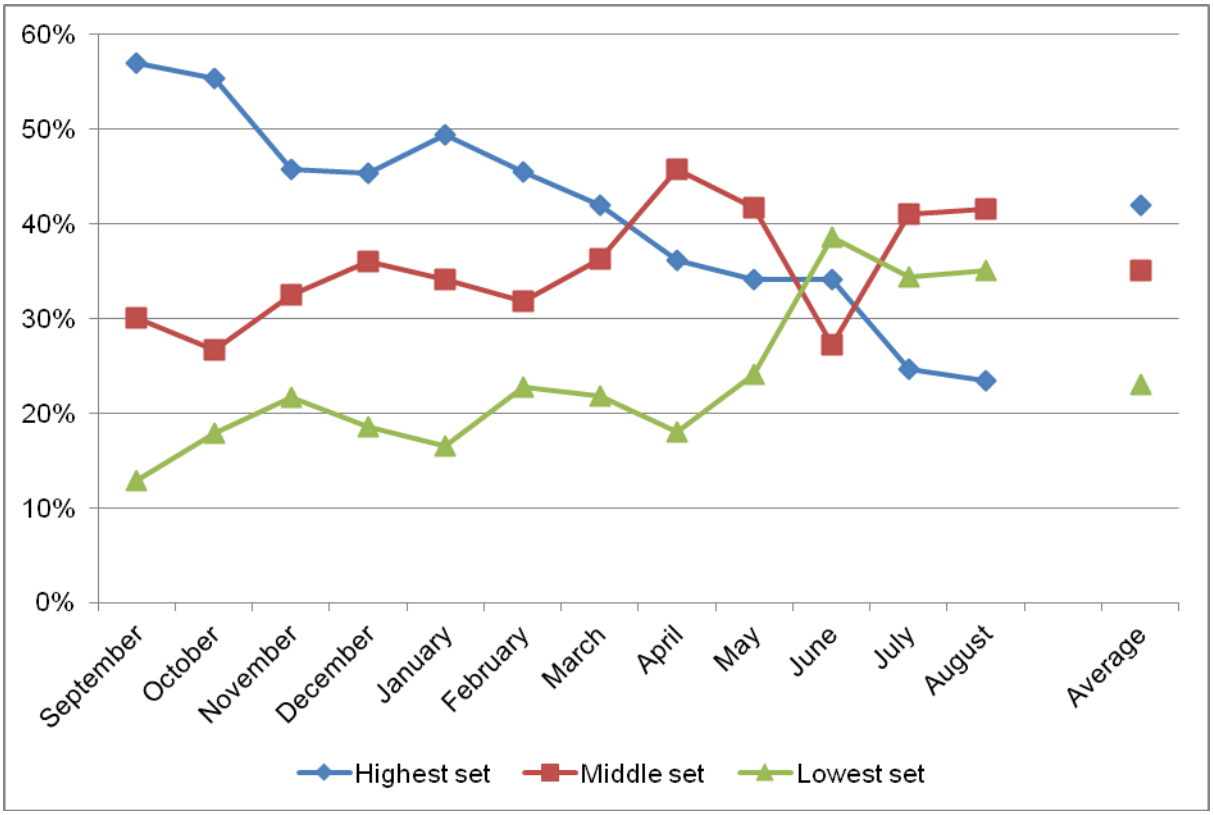
As detailed in the previous section, most sample pupils are grouped according to at least two co-occurring practices. In order to investigate whether more uniformity across birth months is apparent in placement levels when a practice coexists with a higher-level grouping, analysis of proportions born in each month placed at each level is repeated for pupils who are streamed and those who are not streamed, separately. This explores whether, having been classified by stream, more birth month uniformity is present across subsequent categorisations. Figures 10 and 11 illustrate, for example, this pattern for pupils who are set for literacy and who are streamed, or not streamed.

Figure 10: Percentages of pupils born in each month who are reported as being in each literacy set, among those pupils who are reported as being set and streamed



(n = 608)

Figure 11: Percentages of pupils born in each month who are reported as being in each literacy set, among those pupils who are reported as being set but not streamed



(n = 971)

Among pupils who are also streamed, there is a September-August difference of approximately 50 percentage points in in-month proportions placed in the highest literacy set. Among those who are not streamed, this difference is lower, at around 35 percentage points.

A similar pattern is found according to streamed / non-streamed splits for each other practice. As suggested by the strong correspondences shown between placement levels in Section C, where practices co-occur, being subject to one practice does not lead to a lessened birth month disproportionality in another – if anything, disproportionalities are more pronounced.

Summary and conclusion

This section has illustrated a pervasive and consistent disparity in ability group placement according to birth month: relatively younger pupils are disproportionately frequently found in lower groupings, while relatively older pupils are more often placed in the highest groups. The co-occurrence of groupings that is tested here does not mitigate this disproportionality.

If it is assumed that ability groupings are intended to reflect capacity, aptitude and potential, and unless it is assumed that these groupings are in fact entirely 'fair' (i.e. that relatively younger pupils are truly less 'able,' and that this gradation of ability expediently relates to the

structure of the school academic year), then the initial analysis presented here begins strongly to support the contention that early ability grouping may be instrumental in creating the month of birth effect. Given findings that these practices and the resulting inequalities are seemingly widespread and consistent, and given a body of research which suggests that ability grouping establishes the foundations for differentiated trajectories of attainment and experience, the prevalence of and tendencies apparent within in-school ability grouping may go some way towards explaining subsequent birth month achievement differentials.

Section E: Next steps

This paper has provided support for the first premise in the theoretical model illustrated in Figure 1 (page 12). Many pupils are ability grouped at the beginning of primary school, and there is a strong correspondence, in the predicted direction, between birth month and placement level within these groupings – with relatively younger pupils at an apparent disadvantage. Planned further research will develop and explore whether, as hypothesised, these early inequalities will play out in children's educational journey and in their academic achievements.

Because (as illustrated in Section C) there are some pupils in the MCS teacher sample who are grouped and some who are not grouped according to each of the practices, it will be possible to compare, with appropriate controls, those who are grouped according to each practice to those who are not. This will test whether there are associated differences in pupil self-perceptions and attitudes, in teacher perceptions and attitudes, and in formally recorded attainment (propositions 2a and 2c, and 3 in the model; see page 13).[6]

At age seven, the MCS children were asked questions alluding to self-efficacy and self-confidence in the school context[7]. At age 11 they are being asked questions such as 'How do you feel about your school work?' / 'How do you feel about the school you go to?' and to rate their response to statements such as 'I am able to do things as well as most other people.'[8] Whether any month of birth gradation is greater among pupils who are grouped in a given way compared to those who are not grouped will be examined, in work building on the current paper.

Similarly, the age seven teacher questionnaire contains questions on teacher perceptions of each pupil's 'ability and attainment.' Analysis has already indicated month of birth variation in judgements here, with relatively younger children being disadvantaged (Crawford et al, 2011). Again, whether this variation is more pronounced where there is ability grouping will be examined.

Finally, linked data on MCS pupils' Key Stage Two test results should become available in the next year. This will represent the first externally assessed examination of the children's academic attainment – and again, analysis will examine the possibility that expected birth month disparities are more pronounced among pupils who have been ability grouped in each given way than among those who have not been grouped in that way during primary school. Modelling will attempt to unpick the extent to which any findings at this stage can be explained by differences in teacher perceptions and/or in pupil self-perceptions and attitudes, in order further to populate the hypothesised model. It will also establish whether, as theorised, there is evidence for an effect of early ability grouping that implicates it as a creator of the month of birth effect.

[6] Unfortunately proposition 2b may not be testable using current and imminent MCS data, as it does not sufficiently detail the educational opportunities offered to each pupil.
[7] http://www.cls.ioe.ac.uk/shared/get-file.ashx?id=581&itemtype=document
[8] http://www.cls.ioe.ac.uk/shared/get-file.ashx?id=1371&itemtype=document

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