

## The Statistics of Pupil Segregation in England

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## **The statistics of pupil segregation in England**

### **Sean Demack**

#### **Abstract**

In the context of the 2020 exam 'debacle', this paper examines two statistical 'icebergs' that measure aspects of between-school and within-school variance in the English education system; participation in private education and the 'the school effect'. These are 'icebergs' because they both display a superficial appearance of being relatively small but both have hidden, socially divisive, depths. The historical obsession with pupil segregation in England is discussed with reference to the disgraced psychologist Cyril Burt and more recent policy makers enthralled by eugenicist beliefs. In terms of private schools, between 40 and 50% of pupils from families with greatest economic and cultural capital are shown to be privately educated compared with an overall average of 7%. In terms of the school effect, a majority of variance in pupil attainment is shown to reside at the structural level of school and (more importantly) classroom levels. In other words, the English education system is socially engineered so that grades are more determined by structural location than the efforts or agency of pupils or teachers. The analyses lead into a discussion of between-school and within-school pupil segregation. Finally, the paper calls for a new post-Covid 'Spirit' to de-engineer the system to unleash the talent, ability and potential of pupils, students and teachers.

#### **Introduction**

In the summer of 2020, following the arrival of Covid19 and resulting cancellation of pupil examinations, statistical methods were used to generate a 'credible' distribution of educational success in England. This became known as the 2020 exam 'debacle' (Quinn, 2020). Pupil GCSE and A level grades were (initially) based on algorithm and teacher assessments rather than the usual examination ordeal. Following weeks of outcry, the algorithm was scrapped and pupils were regraded based solely on teacher assessment. The PM shirked blame by denouncing the "mutant algorithm" (Coughlan, 2020). The result was grade inflation that the algorithm had purportedly aimed to limit<sup>i</sup>.

When grades stem from an examination, concern from pupils, students and parents for equity are commonly pacified by a belief in examination fairness. This, of course, is a perception that focuses very heavily on a small part (or process) within a larger system that spans many years. Throughout the years in the English system, layers of pupil segregation between and within schools determine the path a pupil takes to examination. This social engineering is commonly eclipsed by an examination hysteria that emphasises individual 'intelligence + effort' to help the successful student to construct a belief that their success was solely merit-based. However, the 'meritocracy' in today's England is more aligned to the dystopia penned by Michael Young (1958) than it is with naïve belief in educational equity and maximising the potential for all. Any guilt glitches in the matrix of the

more liberal elite are patched with certificates of attainment (symbolic capital). Any remaining 'rebel shame' for the decisions of parents to private school are replaced with 'common sense' notions of educational quality and standards and, perhaps most gallingly of all, social duty and responsibility<sup>ii</sup>. The discourse around the 2020 debacle seems to have missed the point - statistical methods merely replicated the usual. The saga certainly provided numerous platforms for leaders to demonstrate how little empathy or common experience they have with the people they rule over. The overbearing superiority of England's leaders is to be expected given how their success and confidence is engineered by the education system. Whether summer 2020 has resulted in a growth in critical awareness of teachers, pupils, students and parents about the confidence trick performed by GCSE and A level examinations each year remains to be seen.

In England, using statistical methods to ensure a credible distribution of grades across the country would always result lead to inequity; because the construction (and justification) of inequity is a key purpose of the English education system. As the functionalists might say, education is to prepare citizens to fit the needs of society (Durkheim, 1898). Businesses require a workforce that is flexible, compliant and shy from the pursuit of organisation or autonomy; and the English education system serves this functional demand very well<sup>iii</sup>. When society discriminates through examination performance, the successful can draw comfort that their rewards are justified and reflect individual intelligence, aptitude and effort. When this performance has been created through a statistical algorithm this (naïve) bubble is burst. Examinations are pragmatic and bring administrative/legitimizing advantages such as greater confidence that what is marked has actually been undertaken by the student, but have always been a very poor way of assessing understanding and application for most school subjects (except perhaps some aspects of maths). The imperfect nature of exams is noted by the RSS Education Policy Advisory Group (EPAG) in one of their communications to Ofqual offering help and advice (RSS EPAG, 2020) in the months leading up to the debacle.

It seems particularly problematic to allow grade inflation in the private sector but algorithmically nobble the public sector given that a good grade from a state school seems to be a stronger indicator of degree success than the same grades obtained through private schools (Smith & Naylor, 2001 & 2005; HEFCE 2003; 2005& 2014; Schwartz, 2004). State school pupils have to work harder and perhaps more independently to get their grades and this seems to make them better prepared for the HE experience ahead. This has led some Universities to offer places to state school pupils at a lower UCAS tariff to places offered to private school pupils<sup>iv</sup> (UCAS, 2018). This is essentially a statistical approach to try to correct for one of many social corruptions of the English education system leading up to HE. If grades from private schools are worth less than equivalent grades in state schools, the decision to protect/inflate the private and nobble the public is statistically topsy-turvy!<sup>v</sup> Amongst graduates at Oxford in 2006, Ogg et al. (2009) found that the weaker relationship between A level attainment and

degree success for privately educated pupils compared with their state educated peers resided within the school rather than the student. When an aptitude test was used to measure prior-attainment, Ogg et al., (ibid) found no difference in degree success and conclude that "teaching effects, associated with private school students, distort secondary school grades as an indicator of academic potential in higher education when compared to state school students" (Ogg et al., 2009 abstract). In other words, private schools are good at getting the grades but seemingly at the expense of the learning (otherwise known as hot-housing).

The elite draw on their educational success to justify high levels of capital. The education system provides symbolic capital to justify economic wealth, power, influence, multiple houses, environmental vandalism and social superiority. In return, the private sector receives around one third of educational funding to hot-house their 7% of pupils (OECD, 2019 p292). Symbiotically engineered for a win-win for them, and to nurture geniuses for all. This justification is embedded in eugenicist thinking that has perennially fascinated the political right. Through rhetoric honed in debating clubs, a belief in the educational superiority of pupils/students who exert no effort while gliding through the 'rigorous' trial by examination is perpetuated<sup>vi</sup>. In England, opinion confidently expressed from some mouths can cloud and undermine empirical evidence. This is perhaps to be expected in the land of the two cultures (Snow, 1959).

This paper discusses two aspects of the English education system from a statistical perspective. Two statistical 'icebergs' are considered; first the 7% of pupils educated privately<sup>vii</sup> and second, 'the school effect' as measured by the proportion of attainment data clustered at the school level (commonly estimated at between 10 and 20%<sup>viii</sup>).

Segregation is socially engineered into the English education system; like Blackpool rock. This is most clearly seen with the public / private school divide where individual / market freedom is seen to be more important than the needs of wider society. Other than individual freedom, the continued acceptance that it is reasonable to allow money to purchase educational advantage is justified by both trivialising and emphasising societal impact. The trivial line of argument points to the very small proportion of pupils located in private schools: 7%. How can such a small proportion undermine the whole educational structure? Whilst being too small to damage society, private schools provide a closeted world in which the precious gene pool of the elite can be preserved for the 'benefit' of society. This draws on eugenicist beliefs in innate intelligence and genetics. Allowing families that have (often over generations) accrued 'quality' genes of intelligence to purchase educational advantage not attainable to others is a creative circumnavigation of any concerns about equity. In response to this, I refer to the words of Sheffield city treasure, Jarvis:

"Did you hear? There's a natural order  
Those most deserving will end up with the most

That the cream cannot help but always rise up to the top  
Well I say, "Shit floats" (Cocker, 2006)

### **Private Education**

So, with such a small proportion of parents able to purchase educational advantage for their children it seems dogmatic to consider binning this system. However, the 7% is an average figure across the whole pupil population regardless of the presence of capital or desire to purchase advantage. When capital is taken into account, a different story emerges; where between 40 and 50% pupils from the 2% of households with the highest concentrations of capital are privately educated.

The relationship between socioeconomic background and education has become less clear in England in recent years because of decline in measurement validity that arrived with an increased reliance upon administrative data. In the last couple of decades of the 20<sup>th</sup> century, social surveys such as the Youth Cohort Study (Croxford, 2004) were the main quantitative data sources used to help explore this. Social surveys are hampered by statistical problems such as non-response and the potential bias this brings and so the arrival of administrative data in the 21<sup>st</sup> century collected directly from schools brought hope of better evidence and (therefore) understanding. The National Pupil Database (NPD) is THE key educational data source for pupils / students aged between the ages of 5 (Reception, Early Years Foundation or Y0) and 18 (Key Stage 5 / A levels) but does not include a valid measure of pupil socioeconomic background. Two 'proxy' measures are found on the data file; Free School Meals (FSM) and geographical deprivation indices (most commonly the Income Deprivation Affecting Children Index; IDACI). A detailed critique of the problems of these measures is beyond the scope of this paper but the problems of using FSM are (superficially) acknowledged in an Educational Select Committee (GREAT BRITAIN, Parliament, House of Commons, 2014) and a more statistical examination is found in Halse and Ledger (2007) and Taylor (2018). In summary, FSM is a binary measure used to statistically examine the educational performance of a problematic educationally vulnerable / disadvantaged group. At the same time, FSM serves to hide the educational performance of the educationally advantaged. Pupils with double-professional parents are grouped with pupils with parents in low paid occupations and/or pupils who qualify for FSM but do not claim it because of issues of social stigma (more common for poor pupils in affluent areas, see Iniesta-Martinez & Evans, 2012).

Alternatives to the binary FSM measure are socio-geographic proxies of socioeconomic background. Unless England was perfectly ghettoised along lines of capital, the use of socio-geographic measures of deprivation like IDACI brings ecological problems. Poor pupils do live in wealthy areas (where they are less likely to claim Free School Meals) and rich pupils do live in poor areas. IDACI along with IMD and POLAR are blind to such realities and assume affluent area = affluent pupil/student (and vice versa).

A seeming lack of interest/concern in methodological validity and statistical accuracy has led to the dominant use of socio-geographic measures in exploring socioeconomics and access/attainment/progression in higher education in England. Then again, perhaps it is of keen concern for some to maintain poor statistical practice to ensure that analyses are persistently plagued with problems that are useful to highlight when findings are politically off message.

An added barrier to the exploration of the relationship between socioeconomic status and educational success arrived in the wake of the General Data Protection Regulation (GDPR) with the notable clampdown on access to public data in England (Harron et al., 2017; Demack, 2019). Access to NPD data is now severely restricted, all tables are assessed by ONS and all interpretations of tables are also assessed in a prolonged two stage process. Additionally, analyses are undertaken in a controlled room and under surveillance. Prior to the enforcement of such draconian working conditions, there was a time with easy access to a seminal educational survey; the first Longitudinal Study of Young People in England (LSYPE<sup>ix</sup>). A second LSYPE is currently being undertaken but access to (key parts of) this data are restricted. The data clampdown impacted on the LSYPE because of the inclusion of NPD data alongside survey data; in order to access this NPD data for the LSYPE respondents, a researcher faces excessive administrative hoops that are clearly easier to navigate for some (e.g. academics with administrative support, the well-resourced) than for others (anyone without such support; the public; the less well-resourced). This inevitably will reduce the quantity of critical analyses undertaken using this data - a shame, GDPR or perhaps a plan coming together. Prior to the clampdown on LSYPE data, I worked on a number of projects that used the LSYPE 1 data (Demack et al., 2010 & 2012). Amongst these was an examination of the relationship between socioeconomic background and participation in private education. Using the accessible parts of LSYPE 2 data, the association between 'capital' and participation in private education can be examined for two pupil cohorts. The LSYPE 1 cohort examines private school participation for a cohort of pupils at the end of key stage 4 (Y11, age 16) pupils in 2006; LSYPE 2 cohort does so for a cohort of pupils at the start of key stage 4 (Y9, age 14) in 2013. Table 1 provides a summary of the percentage of pupils located in private schools in 2006 and 2013.

### **Table 1 about here**

Overall, 7% of respondents were located in private schools in both 2006 and 2013 but, as might be anticipated, there is notable socioeconomic variation in participation and this can only be viewed when using variables other than FSM<sup>x</sup>.

In addition to different pupil year groups (Y11 & Y9), there are a few differences between socioeconomic variables for LSYPE 1 and 2. In terms of cultural capital, both have detail on whether one or more parent of a respondent had an undergraduate degree but LSYPE 1 has additional detail

on HE experience of grandparents and whether a parent held a postgraduate degree. In terms of economic capital, both have a comparable household occupational NS-SEC measure but estimated income differs. LSYPE 1 has a categorised household income estimates; LSYPE 2 has categorised income estimates for individual parent(s).

In terms of cultural capital, having a parent with an undergraduate degree is associated with higher participation in private education in 2006 (22%) and 2013 (17%). The additional detail in 2006 shows participation to be higher still when a parent had a postgraduate degree (27%) and an association with having one or more grandparent with HE experience (20%).

In terms of economic capital, having a parent who is employed in an occupation classed as NS-SEC high professional / managerial is associated with higher participation in private education in 2006 (21%) and 2013 (18%). In 2006, having a household income in the highest band (£52K+) was associated with higher participation in private education (26%). In 2013, a similar pattern is seen when one or more parent had an income of £50K+ (30%); an income of £40K+ (24%) or an income of £30K+ (15%).

These dimensions of capital do not exist in isolation of each other. For example, in 2006, of the 14% of respondents with 1+ parent in a high professional/managerial occupation, over half also had a parent with a degree and/or a household income of £52K+. In 2013, of the 16% of respondents with 1+ parent in a high professional/managerial occupation, two thirds also had a parent with a degree.

If the dimensions are intersected, Table 1 shows that, in 2006, the private school participation rate was 31% for pupils in households with a parent with a degree or higher and a grandparent with HE experience and 50% for pupils in households with a parent with a degree or higher; a parent in a high prof/managerial occupation; a grandparent with HE experience and an estimated household income of £52K or higher. In 2013, Table 1 shows that the private school participation rate was 38% for pupils in households with 1+ parent in a high prof/managerial occupation and 1+ parent with an income of £50K+.

In summary, the 7% iceberg figure hides a reality where 40-50% of pupils with the greatest (top 2%) economic and cultural capital are educated in private schools. This is a statistical illustration of how socially privileged parents appreciate the educational advantage purchased through private education. 4-5 of every 10 pupils from the most socioeconomically advantaged households are systematically segregated from 93% of their peers. By definition, this is divisive, but a liberal view might highlight examples of great artists, scientists, engineers or architects that have emerged from the segregated system. The distraction of individual greatness helps to white-wash structural realities. Superhuman myths are key part of the meritocratic lie and inherently drenched with racism and chauvinism (Dorling, 2015). In other words, 'great' white male artists,

scientists, engineers and architects have been munching at a 'genius' cherry systemically placed out of reach for most men and all women for most of modern history. As racism and sexism were key in the construction of past genii, it is perhaps unsurprising when an anointed genius expresses views within these frameworks. For example, James Watson (hoped that everyone was equal, but "people who have to deal with black employees find this not true") and Francis Crick (positive eugenics) (both and others in Dorling, 2015). In addition to providing white male genii, the system must produce people (again, mainly white men) with a thirst for a form of office who will flow towards Westminster and help to politically ensure that the win-win (majority lose) system of privilege is defended and maintained.

As touched on earlier, this statistical evidence has limitations because the data stems from two social surveys with associated issues of response and sample size. However, the lack of a valid socioeconomic measure in the NPD and general reticence of the Independent school sector to subject itself to statistical scrutiny mean that this is a rare look at this pattern. All state schools have a legal obligation to submit details on pupil attainment, gender, ethnicity, FSM etc. but private schools have a more limited obligation and tend to submit the bare minimum (just gender and attainment). The FSM measure is likely to have little/no meaning in private schools but the lack of ethnicity detail makes examination of experiences of ethnic differences in the private sector impossible; an example where commercial sensitivity seems to be prioritised over concern about protected characteristics. I understand that a separate data set is collected by independent schools and this does include ethnicity data but for some reason, this is not included in their submission to the NPD.

The remaining 93% of secondary pupils are educated in mainstream state schools, special schools, pupil referral units or at home. Within mainstream state schools (often confusingly called 'comprehensive' schools), segregation remains nearly universal. This current reality is a product of the history of the English education system from the introduction of universal secondary education in the post-WW2 social settlement; the spirit of 1945. Education for all was provided following four centuries of Britain / England enjoying international economic dominance from the brutality and theft of Empire. This echoed a post-war expansion of mass education across the global north. In England, the initial post-45 years focused on constructing a system based on segregation between schools with the incorporation of some ancient Grammar schools into the state system. A small sample of pupils were selected into Grammars based on performance in the 11-plus examination and the 'failed' majority were sent to secondary modern schools. This political process was justified through the work of the first psychologist to become a Knight of the British Empire; Sir Cyril Burt. This reward was in acknowledgement of the influence of Burt in shaping the education system, particularly following the Second World War (for example, Burt, 1909; 1920; 1943; 1958; 1959). Burt's perspective was saturated with the eugenicist beliefs / theories that were held in high regard by the regime that Britain had helped to defeat in that war. The immediate post



war years saw political consensus in constructing an education system around these perspectives but voices of dissent began to surface (Floud et al., 1956; Halsey, 1958). Confronted by critical sociologists with empirical evidence that Sir Cyril seemed unable to empirically challenge, he retreated into ideology and scandal. After the death of Sir Cyril, it became apparent that he had made up his data and fabricated analyses, participants, and co-authors (Tucker, 1997).

The corruption of Sir Cyril may have helped to push the theories of educational eugenicists to the periphery of overt influence on educational policy but a more covert 'IQism' remains (Dorling, 2015). Hidden for a while, glimpses have been caught from the US in *Bell Curve* in the 1990s (Hermstein & Murray, 1994) and more recently in the UK with the 2017 UCL eugenics conference<sup>xi</sup> and Michael Gove / Dominic Cummings attraction to the work of Robert Plomin<sup>xii</sup> and official 'weirdo' super forecaster, Andrew Sabisky<sup>xiii</sup>. In the immediate post-war years, eugenicist beliefs were widespread and used to justify segregating most poor pupils from their intellectual superiors (Hanson, 2013). Some poor pupils did get into the Grammar system and some of these went on to university and onto socioeconomic comfort. At the individual level, upward social mobility was experienced, and these individual experiences provided tokenistic evidence of success for the educational system in helping to slay Beveridge's giants (Beveridge 1942).

Of course, using individual data as evidence of success/failure at a system/structural level is an example of a failure of reasoning known as the atomistic fallacy or fallacy of composition (Vogt & Johnson, 2011). This fallacy is the complement to the ecological fallacy of assuming group level patterns are true at the individual level (see IDACI above). Following growing pressure from parents, circular 10/65 issued by Anthony Crossland was the starting point in a failed attempt to "destroy every fucking grammar school in England" (Crossland, 1982, p148). The circular 'requested' Local Education Authorities to submit plans to replace the two tiered system with a single tiered 'comprehensive' system. The fear of a truly comprehensive system brought numerous academic and political attacks from eugenicists and the political right (Cox & Dyson, 1971) based on confident opinion and anecdote rather than robust evidence (unless you count that made up by Sir Cyril). Even with these desperate measures from the right, the move away from Grammar/secondary modern and towards comprehensive schools gathered pace in the 1970s with the number of Grammar schools falling from over 1,000 in 1970 to 566 in 1975 and to just over 200 by the time Margaret Thatcher became prime minister in 1979. Thatcher halted the move from the grammar/secondary modern to comprehensive schools leaving a mixed education system with some LEAs with comprehensive state schools, others maintaining the older grammar/secondary modern system and others with a mixture of the two (which is effectively a rebooting of the older system).

Alongside this, of course, is the continued existence of private schools. Through many helpful political interventions (e.g. assisted places), private education has gone from strength to strength. In LEAs where pupils still suffer Sir Cyril's eugenicist system (like Kent and Trafford), the private sector acts as a safety net should the 11+ not be surmounted. Parents with capital invest (via tuition) to try to access 'free' socially segregated state education with private school as the more expensive plan b. This is parents doing what parents will always do; what they perceive to be 'best' for their child(ren). The problem is that what is best for the offspring of the elite tends to run counter to what is best for society. The system markets itself to the individualistic/family desires of the elite because it was socially engineered and re-engineered for them. A system engineered for the elite shines brightly for the aspirational middle class who may need to 'do without' in their 'struggles' to purchase educational advantage. Those with capital are encouraged to use it to best ensure this capital remains in their lineage; and the Grammar / private school systems are engineered to meet this demand.

A comprehensive system is only realised when all LEAs operate non-selective entry policies for all schools in their control and which apply to all pupils. Given such things as catchment areas and housing, such a system could only be envisaged as an aim in England. When financial or academic selection is brought into an education system it ceases to be comprehensive. The greater the influence of selective schools, the weaker the comprehensive ideal. In England, there are many schools with comprehensive labels - and perhaps historical ideals - that appear rather hypocritical today. An individual school might be given a 'comprehensive' name to highlight that no policies of academic selection are used to determine whether a pupil attends. But once a pupil crosses the secondary school gates, they usually enter a covert Grammar / secondary modern system under a comprehensive badge. The difference being a lack of transparency.

### **The School Effect**

The rise of multi-level modelling through the 1980s and 1990s provided new software and statistical tools to help explore the structural nature of the education system (Goldstein 1987). The clustering of variance for indicators of educational success (e.g. attainment) at the school level could be measured and any changes over time could be observed. In the School Effect (Smith & Tomlinson, 1989), the proportion of variance in attainment data found to cluster at the school level was between 10 and 20 percent. This meant that at least 80% of variance was within schools and commonly assumed to be between pupils. This 'school effect' figure of 20% or lower has been found on many occasions since (e.g. Allen et al, 2018). The relatively small proportion of variance found between schools (20% or less) serves to suggest that the role of schools in helping to dismantle or disrupt long standing educational inequities is limited. One fifth or less of attainment difference was between schools; so the influence of pupil-compositions and other factors on attainment is one fifth or less. However, this is a conveniently naïve understanding of the English education system.

Pupils are not taught in a single block within each school; they are taught within classes within year groups. Pupils are not usually randomly assigned to their classes; this is commonly done through within-school academic selection and policies of setting and/or streaming.

Essentially, most secondary schools with 'comprehensive' policies for access operate an internal grammar *and* secondary modern school system across all subjects (streaming) or, more commonly multiple systems across specific subject areas (setting). The excessive use of within-school segregation policies have been highlighted as key barriers to social mobility in England (Causa & Johansson, 2010). In terms of attainment, little to no positive evidence for the use of setting/streaming has been found but growing evidence on the harmful impact of such policies is emerging<sup>xiv</sup>. Essentially, there is no educational justification for a school moving from all/mixed ability classes to a policy of segregating pupils through setting/streaming. The problem is that in England nearly all secondary schools already segregate and have done so for decades with others more recently being forced into doing so through the cosh of special measures and the OFSTED inspection<sup>xv</sup>. The segregation is maintained by confident argument (bluster) and fear of middle class parents (Taylor et al., 2017). The system is now awash with people with no other experience than that of segregating. The training, practice, curriculum planning and examination are within the segregated structure and culture.

Within-school statistical detail on the English education system is difficult to access; and things have not got easier since GDPR. However, involvement in designing and undertaking Randomised Controlled Trials has enabled access to this detail for a number of projects<sup>xvi</sup>. If it is assumed that 20% of variance in attainment lies between schools, this clustering of variance at the school level is known as the school level intra-class correlation coefficient (ICC). This suggests that 80% of the variance is within schools. Ignoring year groups, classes, teachers, setting/streaming policies results in the structurally naïve conclusion that the 80% is all about individual difference. Given the complexity, it is perhaps understandable that multilevel analyses would first focus at the school and perhaps LEA level. Once these are figured, the next step might be to look into the school. Indeed, in the early analyses, the importance of the classroom level was noted (Goldstein, 1997).

After designing a number of 2-level clustered RCTs, I decided to try and incorporate the teacher into the research design. The lack of a 'teacher level' in most educational RCTs seemed like a glaring omission. My initial concern was practical rather than statistical. Across evaluations, it was the teacher that usually directly experienced the 'intervention' being evaluated and commonly this was two or more teachers in a school. Alongside an educational RCT, a mixed methods 'Implementation and Process Evaluation' (IPE) is usually undertaken that collects data from teachers on a variety of things such as engagement with the intervention and any classroom tasks. Administrative data on teacher attendance of training events is also

commonly drawn on. This IPE data is used to explore 'fidelity' to an intervention. Fidelity relates to whether a teacher did all that was (theorised to be) needed to best ensure that an intervention was delivered as it was intended. The inability to link teacher-level IPE data to the school / pupil level impact evaluation was frustrating and my key motivation to include a within-school level in future RCT designs. The trial where I first undertook a 3-level design was funded by the DfE (Boylan et al. 2015). Whilst the trial itself had issues related predominantly to the limited time resource the DfE specified (less than a year), the resulting data set proved to be fascinating.

In designing a clustered RCT, the partitioning of variance is an important consideration. The proportion of variance found between clusters is estimated using the Intra-Cluster Correlation coefficient (ICC). For a fixed/specified number of schools, an increase in between-school variance (as measured by the ICC) leads to a drop in statistical sensitivity. Statistical sensitivity is usually estimated using a power analysis to calculate something called a Minimum Detectable Effect Size (MDES). This is the smallest difference (often measured as an effect size such as Cohens  $d$  or Hedges  $g$  in units of standard deviations) between the groups (control & intervention samples) that could be detected with a specified level of statistical error (e.g.  $p < 0.05$ ; statistical power  $> 80\%$ ). In addition to the clustering of attainment data, the sensitivity of a trial can be increased by covariate explanatory power and/or by increasing sample size. In terms of sample size, greater gains in sensitivity are brought by increasing the number of clusters at the higher level (e.g. schools & classrooms) rather than at lower ones (e.g. number of pupils per class or school).

The DfE-funded 3-level trial was used to evaluate a Key Stage 3 maths programme that focused on improving multiplicative reasoning for secondary school pupils aged between 11 and 14. Data was collected for pupils in the first three years of secondary education (Y7 to Y9) across 62 schools in England. The pre-randomisation design made some assumptions that seem rather naïve with hindsight. MDES estimates prior to randomisation ranged between 0.24 sds (in Y7) and 0.26 sds (Y9). This means that for the Y7 sample, the design was estimated to detect a difference of 0.24 sds in the outcome (a maths test) as statistically significant ( $p < 0.05$ ) with a statistical power of 80% or higher. A class rather than teacher level was included into the design. This was done to reflect practical complexities such as dual or shared classes and specialist teachers; a pupil is always located in their maths class but sometimes their maths teachers changed. Details on classes and teachers were collected but the design focused on the class level. It was (naively) assumed that around 5% of the variation in the outcome would be clustered at the class level (class level ICC assumed to be 0.05). The reality was rather different and the impact of this on the trial sensitivity was striking (the actual MDES resulted in being between 0.41 and 0.49 sds). In reality, class level ICC values of between 0.42 and 0.70 were observed. It is somewhat illogical to consider variation at the class level (i.e. within schools) separately from the variation between schools in which the classes vary; but the clustering does

suggest that the classroom is more important than the school, but both combine to account for between 63% and 74% of variance in attainment. In other words, only between 26% and 37% of variance is at the pupil level; differences between-pupils within-classes. The school (and most strikingly, the classroom) seem to be statistically more important than was previously thought from 2-level analyses. The potential for the school, classroom and teacher to help to disrupt and dismantle long standing educational inequalities is therefore greater than previously thought.

Of course - the clustering is driven by pupil segregation - the near universal use of setting/streaming of pupils in secondary maths in England. The findings illustrate how the education structure serves to smother the potential impact teachers can have on the attainment of pupils; because the majority of difference is structurally engineered (or determined). Of course, a teacher may create an educational revolution in their classrooms. Such experiences will go unmeasured through the various examinations but may well encourage pupils to develop self-belief; confidence; creativity; respect for others, an understanding of society and a love of learning (amongst many other things). This is a plight of the secondary school teacher in the English education system; drawing professional solace in the classroom and pupil agency whilst being complicit in enforcing pupil segregation which results in limiting the academic 'impact' of their profession. Although, even the professional autonomy of teachers within their classrooms is moot in the performativity panopticon of schools today.

The 26 to 37% estimate for the proportion of variance in maths attainment that lies between pupils, once school and class clustering is accounted for, is based on a limited data set. Similar strengths of clustering have been found elsewhere (Demack, 2019) but studies are scarce. At the time of writing, I am awaiting access to NPD data for a trial involving 120 secondary schools for an evaluation of a different KS3 maths programme (Realistic Maths<sup>xvii</sup>). In addition to measuring the clustering of attainment data at the school and class levels, this trial collected data to track pupils during the first three years of secondary school (Y7 to Y9 again) to capture movement between classes (e.g. moving up/down sets or introduction of setting). However, with the arrival of Covid19, NPD access has become a more drawn out affair!

The focus here has been on secondary maths, segregation is found in other subject areas and is also once more a common feature of primary schools<sup>xviii</sup>. Data from lessons observed by OFSTED in 2010 found segregation to be most common in maths. From the final two years of primary, maths sets become increasingly common in Y5 (26%) and Y6 (34%) and increase sharply in secondary from 62% in the first year (Y7) to 74% in the final year. Setting was also evident for English from 12% (Y5) to 19% (Y6) in primary school and 49% to 65% in secondary. Finally, setting was also popular in Science but seems more common later on from 2% to 3% in primary school and from 45% to 65% in secondary. This data was obtained to respond to a question in Parliament in 2011 (Dracup, 2014). In 2019 I submitted a

freedom of information (FOI) request to OFSTED to seek more up to date data on setting/streaming in schools they inspected the response illustrates how unproblematic pupil segregation is perceived to be.

"... I can confirm that we do not hold any such analysis that meets the description of your request. As the explanation in Hansard sets out, in response to the Parliamentary Question, Ofsted provided summary data for the period 2009-10. The data was based on lessons observed during inspections that had taken place in this period; however, the data was not an indicator at a national level. The analysis undertaken to respond to the question was a one-off piece of work and not something carried out routinely." Ofsted, 2019 via email

### **Discussion**

The construction and justification of inequity is a key purpose of the English education system. This is done with a smile and pretence of an alternate reality of educational success brought by effort and aptitude (intelligence too but this is less shouted about). Private schools segregate a privileged group of pupils from 93% of their peers and 40-50% of the 2% of with greatest economic and cultural capital choose this. It seems clear that buying academic advantage in the form of 'grades' through private education works. However, this is counter-balanced by a limited / narrow social education and a relatively lower depth of learning<sup>xix</sup> when compared with their state educated peers. This becomes of critical concern for society when individuals with such limited common experience, empathy and learning rule over the rest (as demonstrated in 'the debacle').

Meanwhile in the state sector, the 11+ realised (and still does for some) naïve meritocratic (and eugenicist) beliefs and gave many an early experience of failure to draw on in helping to explain their future social struggles. The remnants of this system conspire to energise the market for education; private schools used to catch the children of the elite who do not make the 11+ hurdle. Other than the problems brought by private education, pupils saved from the 11+ do not suffer such overt discrimination. Instead, their segregation takes place within schools commonly known as comprehensives. Pupils are tested and sorted according to measured and/or perceived ability. As with the 11+ experience, setting/streaming in 'comprehensive' schools communicates educational success and failure. Streaming is more closely aligned to the older system when pupil cohorts are divided into Grammar and Secondary Modern streams for all subjects (although these may be labelled more neutrally as part of the obfuscation). Setting does allow for some fluctuations (a pupil might be in a high maths set and low English set for example) but essentially is built on the same beliefs in measurable innate intelligence held by Sir Cyril et al. Pupils bounce off the buffers of success and failure in finding their path through and beyond secondary school. Traditional academic paths will lead to the school 6<sup>th</sup> form, A levels and HE. Less traditional paths will lead to FE college and vocational qualifications and possibly HE. Finally, paths will lead the least successful away from

education into an increasingly precarious workplace with little autonomy. The English education system does well in lowering the sights and confidence of pupils on this last pathway through years of signalled failure culminating in pointing to the door following Y11. Much time and effort is spent placating or distracting pupils from their structural position within the (pre-sixth) school; attitudes to learning are dwelled on and critical understanding of structural barriers obscured by a cloying positivity. Once shed of around 60% of their pupils, comprehensive schools with sixth forms return to the older Grammar school overtly selective system with disproportionately socially advantaged pupils.

England is a funny old place with a cranky education system not fit for a progressive 21<sup>st</sup> century. The masses finally got 'free' education 75 years ago but that was socially engineered to limit success for most and maximise it for the few. Corrupt academics were used to prop up beliefs in innate intelligence, eugenics and faith in the effortless superiority of the elite. Whilst horribly flawed, 'free' education was a seismic step for England and one that the Labour party built on in the 1960s with the Crossland circular, Open University and school public health programmes. Things came to a grinding halt in the 1970s most clearly signalled by Callaghan's Ruskin speech and the arrival of Prime Minister Thatcher. The autonomy of the teaching and education profession has been falling since then. In sum, evidence of progress in the first 30 years of free education followed by 40 years of stagnation. In this 40 year period, further obfuscation arrived in the name of a common examination system (the GCSE) to replace a 'divisive' two tiered O level / CSE system. The GCSE is common in name only because a number of (high status) subjects use tiered entry; meaning that the same two-tiered system remained - but was less overt/transparent. This period also saw the school become ever more iconised and blamed for systemically engineered failures (see 'school led system<sup>xx</sup>'). League tables of simplistic statistics were published to misinform parents about their local schools and remain a regular embarrassing feature in England (although the more enlightened systems in Scotland and Wales have moved on). Local accountability of schools was undermined by persistent attacks on Local Education Authorities' ability to properly manage a local education system from Grant Maintained Schools through the illusory Parental Choice to the Academy chains of today. Schools are encouraged to diversify and specialise; parents then to choose the school most suited for their child(ren). This marketization would be laughable if it wasn't so pernicious and has more than an aroma of the socially and culturally narrow world of the elite; what do we expect given that around half of them choose to use their capital to purchase educational advantage (along with the sheltered segregation bolt on) for their children.

Amidst the regressive mire of education in England in the last 40 years, one notable step forward is clear: the (legal) removal of systemic violence in schools. Prior to 1982, all pupils in English schools (primary and secondary, state and private) witnessed or personally experienced the deliberate infliction of physical pain and psychological humiliation from their teachers

(along with parents, police, shopkeepers and any adult who felt the desire). Today, such ritualised violent practices are considered brutal and perverse but discipline in England's schools was ensured through routine threats and violent realities; an approach famously exported in the days of Empire. 1982 saw a ruling by the European Court of Human Rights that gave parents the right to protect their children from school beatings and four years later corporal punishment in English state schools was outlawed by the UK Parliament. So, for the last 34 years, pupils in English state schools have not had a legally sanctioned fear of violence embedded into their school day. However, pupils in private schools had to wait a while longer before the threat of the cane, slipper or hand was removed. Pupil walloping was finally outlawed in all schools between 1999 and 2005. The protracted time was due to religious private schools failed attempts to maintain their 'Whack-O!' spanking habits via the legal system. This is perhaps a very rare example of state pupils being advantaged when compared with their privately educated peers. This injustice has now been removed from the whole system; a step forward and future hope for progress. Of course, 'harm' to children can manifest in many ways including physical, social and psychological. In terms of Bourdieu's symbolic capital, being placed in a low maths set (like failing the 11+) is a 'negative consecration' of educational ability/potential. This 'consecration' has scientific rather than religious roots (a pseudo-science that has faith in measurable innate intelligence). This serves as an example of the symbolic violence of pupil segregation. This may have 'helped' numerous generations to explain their future poverty and struggle. Individualising what is caused by a socially engineered system has been in vogue through the 40 years of educational stagnation in England, keep on smiling and don't play the victim card. The result is a widespread belief in a naïve meritocratic lie (Reay, 2020; Mijs & Savage, 2020).

The rigidity of the English education system reflects the social engineering of its construction that best ensures success for pupils from the right social background (and ethnicity) whilst building barriers to success for most. Segregation ensures social reproduction and is why the rich and powerful have not and will not permit a move away from it. Justifications for the extent of covert/overt pupil segregation draw on age old and widely discredited beliefs in eugenics, innate intelligence and natural order. Rigidity and segregation also ensure mediocrity because of the socially engineered "disconnect" between the genuine holistic pupil ability and educational success. The result is hot-housing and mental health problems at the top and restricted access to curricula and grades and mental health problems for the rest (Boaler, 1997a; 1997b; Boaler et al., 2000).

Currently, capital is an obvious spanner in the wheel of naïve meritocratic belief in England; short circuiting any chance of realising the economic, cultural and social potential of all in order to ensure the same old few can hold onto comforts, power and effortless superiority. The system enables parents with capital to seek to maximise return through their children but



at the expense of societal cohesion. It is as illogical and unreasonable to expect progressive change to come from parents as it would be to expect the consumer to resolve the climate crisis through purchasing power alone. This would require parents to prioritise society over what they believe to be best for their children; a level of civic trust difficult to believe possible (perhaps particularly in England).

Evidence of progress in the 40 years since Ruskin are limited to the legal removal of violence, HE expansion (offset now by mass privatisation of HE via £9K/year student fees/debt) and the (now historic) Education Maintenance Allowance. The balance of power has shifted from teachers and other educationalists to politicians, with the school taking the blame (and the glory). In a similar way to deciding whether to beat a child, the decision to segregate pupils comes from a world away from education; it is political. A political ideology with embedded beliefs in the genetic supremacy of 'the haves' over the 'have nots'.

Teachers, educationalists, unions, pupils, students, and parents need to prise power back from Westminster. A focus on cooperation over competition and on education over segregation is urgently needed. Generations of young people have been harmed by the systemic violence of segregation, whether they are educationally 'successful' or not. Teachers and educationalists have a professional duty to engage, encourage and enthral but not damage, abuse or segregate. Some hope is seen with the National Education Union independent review of GCSE and A level examinations in England<sup>xxi</sup> but this is muted by the lack of Government interest. This, of course, is to be expected. Any moves away from segregation would undermine social reproduction and this is not nor ever would be in the interests of a Tory government. This, however, conflicts with the educational and economic interests of society which would be best served by the removal of barriers of access at all educational levels. A true comprehensive system from primary to tertiary would provide strength through diversity. Teachers and headteachers will need to adapt to a non-segregated system; to free up their profession. The post-Covid world needs a similar courage and 'Spirit' seen in 1945 if England is to realise and release the autonomy, potential and hope of pupils, students and teachers.

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**Table 1: Percentage of KS4 pupils located in private schools by socioeconomic background, 2006 & 2013.**

	<b>LSYPE 1, Wave 3 2006 (End of KS4)</b> Y11 (age 15/16) Weighted N=12,439	<b>LSYPE 2, Wave 1 2013 (Start of KS4)</b> Y9 (age 13/14) Weighted N=13,100
<b>All respondents</b>	7.2% (n=894)	7.0% (919)
<b>HE Grandparent</b>	19.8%	-
<b>Undergrad parent</b>	21.9%	16.5%
<b>Postgrad parent</b>	27.1%	-
<b>NS-SEC high prof/ manag</b>	20.9%	18.4%
<b>HH Income £52K+</b>	25.9%	-
<b>1+ Parent income £50K+</b>	-	29.9%
<b>1+ Parent income £40K+</b>	-	23.5%
<b>1+ Parent income £30K+</b>	-	15.1%
<b>Combined Capital</b>		
<b>HE grandparent &amp; graduate parent</b>	31.0%	-
<b>NS-SEC high prof &amp; HH Income £52K+</b>	30.9%	-
<b>NS-SEC high prof &amp; parent Income £50K+</b>	-	34.9%
<b>HE grandparent &amp; graduate parent &amp; NS-SEC high prof &amp; HH Income £52K+</b>	50.7%	-
<b>Graduate parent &amp; NS-SEC high prof &amp; parent Income £50K+</b>	-	37.8%

**Sources:**

**LSYPE 1** (see [Welcome to Interactive LSYPE \(sda-ltd.com\)](http://www.sda-ltd.com) )

**LSYPE 2** ([Longitudinal Survey of Young People in England: Cohort 2 - CLOSER](#))

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- <sup>i</sup> In terms of attainment 8; the mean score in 2018 was 46.5; in 2019 was 46.7 (+0.2 points) and in 2020 was 50.2 (+3.5 points). In terms of the percentage attaining a grade 5 or higher in Maths and English, 43.3% in 2018; 43.2% in 2019 (-0.1 points) and 49.9% in 2020 (+6.7 points) See <https://explore-education-statistics.service.gov.uk/find-statistics/key-stage-4-performance-revised/2019-20>
- <sup>ii</sup> The social responsibility of private education; by sending their offspring to private school, the state educational resource can be used for others.
- <sup>iii</sup> This educational function is more overt in the US; illustrated by a quote from Dorling (2015) Injustice, p72 "the aim was to turn children into tax paying automata who will never burglarize your home" from a headteacher in a Chicago school.
- <sup>iv</sup> A number of universities operate a contextual offer that results in accepting some students from state schools with a lower tariff compared with that offered to other students. For example, see Bristol here: <http://www.bristol.ac.uk/study/undergraduate/entry-requirements-qualifications/contextual-offers/> and Birmingham here <https://www.birmingham.ac.uk/undergraduate/requirements/Contextual-Offer.aspx>
- <sup>v</sup> Because of their relatively small size, the algorithm did not touch the grades of many private schools, see [Awarding GCSE, AS, A level, advanced extension awards and extended project qualifications in summer 2020: interim report \(publishing.service.gov.uk\)](#) and [Ofqual exam results algorithm - Wikipedia](#)
- <sup>vi</sup> John Harris article that quotes Musa Okwongas' "Visible effort is mocked at my school – the trick is to achieve without seeming to try" from Musa's 'One of Them' memoir of his time at Eton. See [Britain's overgrown Eton schoolboys have turned the country into their playground | John Harris | The Guardian](#)
- <sup>vii</sup> The Independent School Council reports that "The independent sector educates around 6.5% of the total number of school children in the UK (and over 7% of the total number of school children in England)" see <https://www.isc.co.uk/research/>
- <sup>viii</sup> In a review for the EEF, Allen et al. (2018) reported ICC values between 0.07 (KS1 maths or English) and 0.16 (KS4 English).
- <sup>ix</sup> The LSYPE is now known as 'next steps', see <https://cls.ucl.ac.uk/cls-studies/next-steps/>
- <sup>x</sup> FSM data is not submitted to the NPD by private schools and it seems reasonable to assume that the proportion would be relatively small.
- <sup>xi</sup> See <https://www.independent.co.uk/news/education/education-news/university-college-london-eugenics-probe-secret-conference-campus-ucl-white-supremacists-debate-lci-a8153326.html>
- <sup>xii</sup> Robert Plomin practices under the name of 'behavioural genetics' and was consulted by Cummings and Gove in 2013 ahead of seismic changes to assessments at KS2 (age 11, end of primary) and KS4 (age 16, end of secondary) - see <https://www.theguardian.com/politics/2013/oct/12/michael-gove-special-adviser>
- <sup>xiii</sup> See <https://www.theguardian.com/politics/2020/feb/17/andrew-sabisky-boris-johnsons-ex-adviser-in-his-own-words>
- <sup>xiv</sup> See <https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/setting-or-streaming/>
- <sup>xv</sup> Ofsted (2013) The most able students available at <https://www.gov.uk/government/publications/are-the-most-able-students-doing-as-well-as-they-should-in-our-secondary-schools>. Whilst this does not explicitly call for setting / streaming, amongst the "common characteristics" for schools doing well for their most able students included statement "early identification of the most able students so that teaching was adapted, and the curriculum tailored" and "groupings that allowed the students to be stretched from the very start of secondary school".
- <sup>xvi</sup> None of these projects are a representative sample of schools; they were recruited to educational trials before being randomly allocated into control or experiment/intervention groups. Whilst it is not appropriate to infer details from these studies more widely; the rare within-school statistical detail is of sociological interest and raises some notable statistical issues.
- <sup>xvii</sup> See <https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/realistic-maths-education/>
- <sup>xviii</sup> In the post-war years, primary schools became highly segregated in preparation for the 11+ exam to come.
- <sup>xix</sup> See earlier discussion and use of contextual offers by many universities - ii above
- <sup>xx</sup> See <https://nctl.blog.gov.uk/category/school-led-system/>
- <sup>xxi</sup> The National Education Union mention the need for an independent review in a press release in August 2020 ([GCSE Results 2020 | NEU](#)) and more recently in April 2021 ([GCSE and A-Levels | NEU](#))