Canaries in the Coalmine:

An investigation of the relative age effect within further education

Anne Jacqueline Smith

Oxford Brookes University

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Abstract

The month in which they are born is consequential for some students as they progress through the educational system. Those born later in the academic year cycle, the summer months of May, June, July and August in England, are more likely to experience educational challenges due to their relative age within their year cohort. This study reports on a mixed methods research project, undertaken through a critical realist lens, in which I investigated quantitative patterns of enrolment in a large further education college and subsequently undertook qualitative research with a group of students, who were selected based on the earlier quantitative findings. Drawing on established international research evidence from the field of the relative age effect, this study challenges the unproblematic view that the effect of month of birth virtually disappears beyond the age of sixteen in England. Analysis of the findings shows that students born in the summer months disproportionately enrol onto further education courses in comparison to the underlying monthly birth rate in England, with comparative under-enrolment detectable for those students born in the first four months of the academic year. Study participants were aware of social and physical differences due to their relative age but identified their academic differences as unrelated to their relative age. This study argues that the relative age effect is evident in enrolment patterns in further education, most strongly for enrolments to Level One and Level Two courses. The evidence suggests that this enrolment pattern is due to the systemic generation of lower achievements in General Certificate of Secondary Education (GCSE) examinations, specifically in English Language and Mathematics, for some students born later in the academic year. In contrast, once enrolled in college, summer-born students have higher attendance and achievement rates than those students born in the first four months of the year. GCSE English Language and Mathematics achievement at Grade 4 is still a significant hurdle that many summer-born students are not able to surmount. Consequently, educational choices and thus life trajectories are fundamentally altered due to the relative age effect.

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Glossary of key terms

Absolute age	Exactly how old an individual is in terms of years, months and days.
Age normalised testing	Adjustments made to test results that take account of the absolute age of the individual being tested.
Condition of funding	Any student on a Study Programme who does not already hold a GCSE in English Language or Mathematics at Grade 4 (C) or above is required to resit these qualifications as part of the ESFA contract.
Education and Skills Funding Agency (ESFA)	The Education and Skills Funding Agency is accountable for £58 million of education and training sector funding and regulates academies, sixth form and further education colleges.
Further education (FE)	Part of the tertiary educational sector in England and Wales that specialises in vocational and skills development.
General Certificate of Secondary Education (GCSE)	An academic qualification taken in a variety of subjects by pupils in secondary education in England, Wales and Northern Ireland, usually around age 16.
Grade retention	The practice of holding a child back a year in school so that they repeat an academic year, resulting in a child being older within their peer cohort.
Index of Multiple Deprivation (IMD)	Produced by the Ministry of Housing, Communities and Local Government, the English Indices offer statistics on relative deprivation at a small, local level.
Individual Learner Record (ILR)	The detailed statistical dataset that captures 139 different characteristics for all funded learners in further education colleges.
Office for National Statistics (ONS)	Independent producer of official statistics for the UK related to the economy, population and society at national, regional and local levels.
Relative age effect	The impact of within-cohort age differences, in terms of academic attainment, socio-emotional development and selection in sport.
School delay	The practice of delaying starting school, resulting in a child being older within their peer cohort rather than among the youngest.
Special Educational Needs (SEN)	Designation for learners with physical, learning and developmental disabilities which may include behavioural, communication and learning deficiencies.

1. Introduction

The date on which we are born is beyond our individual control but stays with us as a constant personal point of reference throughout our lives. We share our individual birth date with approximately 1700 other individuals in England and Wales from the day we are born (Office for National Statistics, 2015a). However, our date of birth has implications far beyond simply defining when we celebrate each passing year. When we are born matters, particularly in relation to our subsequent arrival in and passage through the educational system.

Research literature, drawn from schools and universities, suggests that some individuals, who are born later in an academic year, experience negative consequences resulting from their birth date (Crawford, Dearden and Greaves, 2013). In England, the academic year runs from September through to August and those most adversely affected are identified as being born in the summer months, typically taken to be June, July and August (Martin et al., 2004; Lawlor et al., 2006; Navarro, Garcia-Rubio and Olivares, 2015). However, current research suggests that the issue of being younger in an academic year cohort dwindles as a child progresses through primary and secondary settings, but no research relating to age-within-cohort is available for further education. If those affected by being younger in year cluster in further education rather than in school sixth forms, the existing research is simply looking in the wrong place and coming to incorrect conclusions about the extent and impact of being younger for late adolescents. This effect, known as the relative age effect, has been identified in primary and secondary settings in many different countries, where it may indicate disadvantage for those born later in the academic year (McEwan and Shapiro, 2008; Givord, 2020). As educators we need to understand how this adverse effect influences subsequent academic choices, achievement and progression. Our summer-born children are canaries in our educational coalmines. We need to listen to their warning songs.

I am a white, female, British, middle-class, middle-aged, heterosexual and able-bodied person – and I am a late August summer-born. I am a senior leader in an educational group with over 35 years of experience in education, 25 of which have been in further education. My core values centre around social justice, democratic and equitable educational experiences and, as Darling-Hammond proposes, ‘a rich and inalienable right to learn’ (2010, p.328). I believe that education prepares us for our whole lives in the broadest sense rather than just enabling us to achieve qualifications and progress to employment. Frustrated by the negative self-image that some students have on entering further education, which hampers their progress towards a fulfilling life in both personal

and economic terms, I have constantly searched for both explanations and solutions. As an insider to the chosen research setting, I have developed a multi-layered understanding of the various factors that impact on students' trajectories. This rich perspective has led me to appreciate the extent and limitations of my perceptions of social reality, ultimately leading me to embrace a critical realist stance, allowing for the possibility of unseen structures within a power hierarchy. Therefore, this study is based in a critical realist theoretical framework, giving precedence to the ontological dimension (Bhaskar, 1993), in the complex, messy, open and changing nature of the further education sector, within which empirical, observable events are underpinned by actual events, that may or may not be perceived, all of which are then predicated upon hidden but real structures and mechanisms.

The research questions were fourfold. The first question sought to identify the extent to which summer-born students were represented in further education Study Programmes in the college in this study. The second question queried these patterns of enrolment by age, level and individual characteristics, such as gender and ethnicity. The third question explored the events, acknowledged or unacknowledged, that had contributed to further education summer-born students' academic journeys. The final question interrogated the generative mechanisms that might account for the existence of these patterns of representation and events.

There are four major contributions made by this study. Firstly, this research identifies the significant over-representation of those born in the summer months in further education in England for the first time. The relative age effect field of research is thus expanded by the inclusion of the further education sector. Although the month of May had occasionally been included in relative age effect research, this study establishes the importance of including May as a month of interest in this field. Thirdly, this study uniquely applies a critical realist theoretical framework to the research field of relative age through the application of a mixed methods methodology. Finally, by recording and analysing the individual accounts of those who are summer-born, this study contributes individual student perspectives to this research field that have been absent from the typically quantitative literature in this area.

A mixed methods approach was deemed the most appropriate methodological choice for this research. Specifically, an explanatory sequential design was adopted, which enabled the research to be segmented into three consecutive phases: quantitative data collection, qualitative data collection, and deductive and retroductive analysis. The population was

the 20-year birth date data from the for National Statistics for the years 1994-2015 (Office for National Statistics, 2015a). The sample was the cohort of students in one further education college who enrolled in 2018-19. This sample was explicitly chosen because it offered access to a substantial, relevant dataset that would not have been possible for anyone other than a trusted insider, as the data was both commercially and data protection sensitive. Quantitative data was derived from the college's Individualised Learner Record (ILR), a mandatory data return for funding purposes. The qualitative data was obtained through semi-structured interviews with seven participants. Due to the timing of the qualitative phase of the data collection, references to COVID-19 were present throughout.

Following this introduction, this study consists of five further chapters. In the literature review, alternative explanations for differential achievement are reviewed and then the concept of relative age is introduced, initially in the field of professional sport and then applied to education. The following chapter sets out the methodological choices made, based on a critical realist ontological stance, and the mixed methods research design is outlined with due consideration given to the ethical dimensions of this study. The results chapter considers each phase of the research in turn and offer clear evidence from each data collection phase. The analysis chapter also has two sections, which follow a critical realist approach using both deduction and retroduction. The final chapter concludes this study by summarising the findings in relation to the research questions posed. In addition, the contribution that this study has made to knowledge about the relative age effect as it manifests within further education is outlined and further suggestions for research are proposed.

2 Literature Review

2.1 Introduction

The aim for this chapter is to provide a detailed study of the research literature which is relevant to an understanding of the consequences of being born in any given month of the academic year. The chapter begins by considering the historic literature that attempted to identify the causes of difference in academic performance relating to month of birth. The variables are identified in the literature as being the absolute (chronological) age a child starts school, the length of time they are in school prior to being tested, their absolute age at testing and a child's age relative to her peers within a given academic cohort. As relative age appears to be the most satisfactory explanation, attention is turned to evidence of the varying repercussions of month of birth in professional and amateur sports, where studies of relative age are plentiful. Evidence of the relative age effect is then discussed in relation to experiences and achievement in different stages of education, from primary, through secondary and further education to university-level studies. Within this discussion attention is drawn to the apparent inter-relationship with Special Educational Needs referrals and to correlations with gender and ethnicity, which are significant current areas of concern in educational achievement. Evidence relating to the impact on mental health and English Language and Mathematics performance will also be considered, alongside research that suggests that the influence of relative age extends into adult life. This overview of the research literature will show that there is a lack of acknowledgement of the consequences of relative age for those students who progress to further education, rather than staying within the school system post-16, and no evidence of any relative age effect research in the further education sector in England. Therefore, the strategic positioning of this sector within the English education system will be explored and an argument will be made for the importance of better understanding of the impact of relative age in further education.

Notwithstanding the lack of focus on further education, the highly quantitative research into the relative age effect clarifies what is taking place globally and attempts to identify key factors that create such a significant impact, by drawing on extant evidence from a range of large-scale pupil surveys. However, this approach does not probe sufficiently what the underlying mechanisms at play might be. Therefore, this chapter subsequently explores the systemic, teacher- and peer-based influences that may contribute to the relative age effect. In addition, careful analysis is undertaken of the theoretical explanations of how the self is created and influenced, ranging from agency and mirroring to cognitive dissonance.

2.2 Historic evidence and explanations

2.2.1 Seasonality

One of the earliest biological explanations for a difference in performance by those born in the summer months in the northern hemisphere was posited by Orme (1963). He suggested that colder weather would increase maternal exposure to infections, causing foetal damage and resulting in lower intelligence quotients. Subsequent international studies, where those youngest in the school year were born in different seasons, have undermined this hypothesis (Berglund, 1967; Borg and Falzon, 1995, Bedard and Dhuey, 2006). For instance, those born in June, July and August in Australia would be classed as autumn born, with gestation taking place through the warmer summer months, and yet consistently it is the youngest children in the school year who evidence weaker academic performance (Borg and Falzon,1995). This seasonal/biological explanation, although frequently re-investigated, has been consistently rejected in the research literature as unsubstantiated (Bedard and Dhuey, 2006).

Given the lack of empirical evidence to support a biological cause for differential performance, researchers' attention turned to systemic explanations for differences in academic performance by month of birth. Regulations around the age of school entry, frequency of intakes across the year and the timing of significant tests differ across the world. It is difficult to determine the magnitude of individual contributions from each of these operational features. The difficulty arises because certain operational features of school organisation are often in synchrony with each other (Crawford, Dearden and Greaves, 2013). For example, if all children start school and then sit national tests at the same time, it is difficult to extract one effect from another. In the United States, where school delay (delaying a potentially young-in-cohort child from starting school, so that they become one of the oldest when they start the following year) or grade retention (holding an academically weaker child back to repeat a year) are commonplace, it becomes even more difficult to separate out the effects of absolute age, relative age and length of schooling (Martin et al. 2004). Furthermore, Givord's (2020) systematic research review for the Organisation for Economic, Co-operation and Development suggests that those children born in the summer months are more likely to have been required to repeat a year during primary schooling, further confusing the data. Studies such as those by Sykes, Bell and Rodeiro (2009) and Borg and Falzon (1995) attempt to extract these different influences from each other as will be shown.

2.2.2 Length of schooling

School admission policies and their subsequent impact on the length of time a child has spent in school have been cited as explanatory of differential academic performance. Research focus tends to be on the primary years, as the proportional impact of length of

schooling wanes as children spend longer in educational settings. A study by Fogelman and Gorbach (1978), using data from the *National Child Development Study* in England, found that children who started school before their fifth birthday did better on tests of academic ability than those who started after their fifth birthday. Their analysis suggested that the length of time in school was a positive indicator. However, their study only analysed the data for children born in the same week in March, thereby eliminating any possible impact of relative, rather than absolute, age differences within the cohort. Sykes, Bell and Rodeiro (2009) in their review of the literature in this field since 1990 clearly show the impact of different admission policies when a single annual intake results in every child in that year cohort experiencing the same length of schooling, although their chronological ages may be up to twelve months apart. Neither Fogelman and Gorbach (1978) nor Sykes, Bell and Rodeiro (2009) account for the effects of pre-school education on subsequent performance. Dickson (2007), studied the impact of the introduction of free pre-school education for three-year olds in England between 1999 and 2004, using a linear regression model examining the relationship between different Local Education Authorities and years of policy operation. He found that there was a small positive effect on attainment in reading and writing by age seven, particularly for state-maintained rather than private providers, which indicates that calculations for length of time in school should also include consideration of the length of time spent in pre-school education. The importance of high-quality pre-school education on attainment and outcomes throughout schooling and beyond age 16 was demonstrated in the *Effective Pre-school, Primary and Secondary Education Project* (Department for Education, 2015). Although many factors were examined as part of the study, consideration of the precise age by month of birth of the children was absent.

Pre-schooling notwithstanding, where a termly admission system operates, the oldest children entering school in September in England will, by the end of their first year, have experienced two terms more schooling than the youngest who join from April onwards. In this situation a shorter length of schooling is compounded by differences in chronological age and becomes evident in national test results at the end of Key Stage 1. Evidence of the significant disadvantage experienced by those who are summer born is provided by Crawford, Dearden and Meghir (2007, p.30). Through careful statistical modelling within schools to include school-fixed effects for children born in September and August, and through regression modelling to include all children across all birth months, they found highly consistent results. They identified that 53% of August-born girls and 47% of August-born boys achieved expected attainment levels in reading, writing and Mathematics at the end of Key Stage 1, in comparison to 80% and 70% of September-born girls and boys respectively. By the end of primary school this disadvantage had reduced but was still

significant (Sykes, Bell and Rodeiro, 2009). In contrast, Daniels, Shorrocks-Taylor and Redfern (2000), using a multi-level linear model to test for the differences in outcome between summer-born children who had either seven or nine terms of schooling prior to testing, found no statistically significant effects of length of schooling in the National Curriculum Key Stage 1 assessments in reading, writing, number and science. However, Daniels, Shorrocks-Taylor and Redfern's analysis was based on much earlier data (Shorrocks et al., 1992) and only compared the differences between summer-born children depending on their length of schooling, rather than between autumn- and summer-borns, thus inadvertently eliminating the effect of being younger in a particular age cohort.

In Malta a single annual school intake operates across the country. In a cross-sectional study of over 4000 primary school children, the youngest were still significantly underperforming in comparison to the oldest children, even though they had all experienced the same length of schooling (Borg and Falzon, 1995). The authors observed that due to school intake policies positioning January-born pupils as the oldest in their year, December-born pupils, the youngest in their year groups, were the most disadvantaged. Similar disadvantages for the youngest children emerged in Japan, based on large-scale labour-force data, where the annual school intake in April creates an achievement gap between the two extremes of April- and March-born (Kawaguchi, 2006).

2.2.3 Age when starting school

Research attention for age of starting school is focused on primary settings as this is where the differential in age is greatest. The absolute chronological age of an individual child will be greater the later that child starts school. This fact has been posited as a possible explanation for differential academic achievement by month of birth because a child may be older when initial tests are conducted, and she may be older relative to her classmates (McEwan and Shapiro, 2008). Those children who are younger, it is argued, may be not as developmentally ready to deal with the school environment and may be too immature to cope with the designated curriculum. Differences in maturity result in the older children's maturity being mistaken for innate ability, locking them into a 'virtuous cycle of reinforcement' and, consequently having the opposite effect on those children who are less mature (Givord, 2020, p.7). Arguably, having the stimulation and stretch of older, more able peers within the same classroom could mitigate some of the negative consequences of being younger. However, further research evidence suggests that early experience of academic competency and attainment powerfully benefits and reinforces positive self-concepts (Arens, Schmidt and Preckel, 2019; Niepel, Brunner and Preckel, 2014).

Indeed, in Black, Devereux and Salvanes' (2008) longitudinal Norwegian study examining the impact of school starting age on a variety of measures on reaching adulthood and controlling for family background characteristics, they did not find substantial impacts due to age when starting school, but noted that increased age at test was the most definite determiner of positive future outcomes. A more recent study based on a regression discontinuity design, undertaken in Switzerland and drawing on multiple datasets on school performance and subsequent earnings, identified an impact for those starting school later in the academic year in terms of special educational needs diagnoses, behavioural problems and speech impediments (Balestra, Eugster and Liebert, 2020). Being older or younger in a year cohort appears to have consequences beyond educational attainment for individuals too. For example, in a Danish study, being older when starting school was found to reduce the likelihood of criminal behaviour (Landersø, Nielsen and Sanderson, 2013), but the authors determined this was principally due to older-in-cohort children being physically in school and, therefore, less able to engage in criminal behaviour at any given age. However, they do acknowledge that those born at the end of the Danish school year (December) 'are more likely to have been charged with a crime compared to those born in January' (p.12). In addition, these results are complicated by children born around the December/January cut-off date being held back or pushed forwards by parental interventions. One consequence of being in a cohort of students drawn from across a twelve-month span is that some students are going to be younger than others if tests are conducted at a fixed point in the year. Therefore, age at test is a relevant area of research focus.

2.2.4 Age at test

In contrast to length of schooling and age of starting school, age at test research spans both primary and secondary schooling, although it does not reach as far as further education. National assessment tests in England are usually administered at fixed points in a school year. If children vary in age by a matter of months or even years at the point of testing, it is not surprising that those who are youngest perform overall less well than those who are the oldest. Crawford, Dearden and Greaves (2013) highlighted the crucial importance of absolute age at testing, stating that it was a 'key driver of the differences in educational attainment and cognitive test scores between children born at the start and end of the academic year' (p.4), whereas age of starting school and length of schooling were not significant. Carefully controlling for individual and familial background characteristics, Crawford, Dearden and Greaves (2013) showed that for independent tests such as the *British Ability Scale* vocabulary test which were administered close to children's actual birthdays, absolute age at test for both five and seven year olds proved to be the strongest driver. However, they follow through with this conclusion even at age

16, without considering how much smaller the proportion of difference in absolute age is by this point. Crawford, Dearden and Greaves (2013) do not explain why the same effect will still be as strong by the time children take their GCSEs, given the proportion of age difference between the oldest and the youngest within a cohort is one fifth (20%) at age five and only one sixteenth (6.25%) at age 16. Their call for age-adjusting nationally reported scores at Key Stages 1 and 2 is well-founded, but potentially only pushes the problem of differential achievement by relative age down the line to GCSE examinations if age at test is the main driver.

2.2.5 Delayed entry

Holding back entry to primary school for those children deemed too immature to flourish is not unusual. From a teacher's perspective, holding children back a year compounds their difficulties as the age range for them to deal with, in terms of cognitive, socio-emotional and physical maturity, widens. In England, where this study is conducted, more than 95% of children start school at the expected age, although it is slightly more common for boys to have a delayed entry (Givord, 2020). Once a child has started school, there is still the possibility of repeating a year, although this is uncommon in England (Givord, 2020). As indicated in the Danish study by Landersø, Nielsen and Sanderson (2013), there is a practice known as 'redshirting' in the United States of America (USA), a term derived from holding back older athletes for them to gain an extra year of skills development (Oshima and Domaleski, 2006). Martin et al. (2004) undertook a study in Georgia, USA comparing relative age to rates of school year repetition for a sample of children diagnosed with specific learning difficulties. Using a chi-square (goodness-of-fit) test, they found that 25% of children born between June and August were retained (p <.0001). However, their sample only included children from European American parents, as they argued that other ethnicities only represented 18% of the sample and they needed a very large sample size for their research design. This choice potentially over-inflates their results, as European American parents might hold a higher socio-economic status and be more likely to hold their children back to gain an academic advantage.

2.3 Relative age effect

Although the research presented thus far has been focused on educational experiences and outcomes, it is not only in this sphere that differences appear for children born in the later months of a given cohort year. The impact of these differences, in terms of academic attainment, socio-emotional development and selection in sport is known as the relative age effect (Cobley, Abraham and Baker, 2008). In some studies, this is referred to as the birth-date effect (Sykes, Bell and Rodeiro, 2009) or the age-position effect (Sweeney, 1995). For consistency, the term relative age effect will be used in this study. Research in professional sport is an area which provided some of the earliest and most convincing

arguments (Grondin, Deshaies and Nault, 1984) for the persistent and significant negative impact of the relative age effect in terms of skills and behaviours for those who are the youngest in their peer cohort.

2.3.1 Relative age effect in professional sport

As with school entrance and yearly progression, eligibility cut-off dates based on chronological age are widespread throughout most sports, often set by international governing bodies, such as the Fédération Internationale de Football (FIFA) and World Rugby. Their aim is to reduce the competitive advantage of significantly older children and to promote personal safety, particularly in sports involving direct contact, where greater physical maturity could be a risk factor. Some of the earliest interest in the unexpected consequences of grouping children by chronological age for sports participation emerged from a research paper identifying the long-term impact of birth date in professional leagues in Canadian hockey (Grondin, Deshaies and Nault, 1984). The authors compared their findings to the national birth rates for the years 1958-1961 on the assumption that these national rates were an accurate representation for the players in their sample. By comparing the actual and expected pattern of births by quartile, Grondin, Deshaies and Nault (1984) showed a strong relationship in professional league hockey by quartile of birth, with those who had birthdays in the earlier quartiles in relation to cut-off dates being significantly over-represented. This study prompted similar research in other sports. Consequently, numerous international studies show significantly more birth dates close to the beginning of a given permissible date range, and therefore oldest, in a variety of sports: English professional football (Dudink, 1994), European youth football (Helsen, van Winckel and Williams, 2004), American baseball (Thompson, Barnsley and Stebelsky, 1991) and French basketball (Delorme and Raspaud, 2009). In addition, it has been shown that those furthest from the start of a given permissible date range, and therefore youngest, are more likely to drop out of sport entirely or participate at a lower level (Barnsley and Thompson, 1988). In England, Cobley, Abraham and Baker (2008, p.273) found clear evidence that those born in the fourth quartile (June-August) of the year attained less well in Physical Education across Key Stage 3 (Years 7-9) according to teacher assessments. They conducted two-way between-group analyses of variance of quartile of birth and year group on Physical Education attainment and chi-square tests on the relationship between date of birth and school sport representation. They showed that, of the near 20% of pupils who represented their school in either soccer, rugby, netball or rounders, there was a statistically significant over-representation of males born in the first quartile (September-November) for both soccer and rugby. There were observable differences in both netball and rounders (more typically female sports), but the results were not statistically significant. However, in their study, the 621 participant birth dates

were not compared to overall population month of birth data and did not account for the slight increase in births in the first quartile nationally.

A better constructed study was that by Musch and Hay (1999) who isolated the relative age effect in professional soccer from other potential explanatory factors through careful international comparisons. By selecting key variables, they eliminated the seasonality impact of crucial phases of motor learning taking place during warmer weather by comparing the birth dates of all players in the highest professional leagues, excluding all foreign players, against the FIFA recommended cut-off date of 1 August in both Germany and Brazil in the 1995-6 season. Being in different hemispheres, the Brazilian and German players would have experienced opposite environmental conditions in relation to their exact chronological age during their sporting development. In this comparison, Musch and Hay (1999, p. 59) found a 'very strong' Spearman-rank correlation (r = -.73, p< .01) in Germany and a strong correlation in Brazil (r = -.53, p< .05) indicating over-representation in both countries of players born close after the competitive cut-off date. In Japan, where the cut-off date of 1 April does not match the FIFA recommendation, they found an even stronger effect (r = -.87, p< .001) for those born earliest in the cohort year. Finally, in Australia, Musch and Hay (1999, p.5) compared the data from before and after the time when the cut-off date changed from 1 January to 1 August in 1988. They demonstrated that the shifting of the cut-off date created a corresponding movement in the peak of birth dates from just after the old cut-off date to just after the new one over a period of years. In all cases, Musch and Hay (1999) were careful to compare their data with national population monthly birth date distributions, as had Grondin, Deshaies and Nault (1984), and could confirm a strong relative age effect in all countries studied.

2.3.2 Relative age effect in education

In French research literature evidence of the relative age effect in Parisian primary schools was provided by Gilly as early as 1965, showing both that those born earlier in the academic year were more likely to be advanced to the year ahead and be more successful, and that those born in the final quarter of the academic year were more likely to be held back, and even then, be less academically successful overall, although socio-economic status also influenced these likelihoods. Most English language educational research now agrees that age, relative to others within the same cohort, rather than season of birth, length of time in school or school starting age, has the most powerful explanatory force (Martin et al., 2004; Lawlor et al., 2006; Navarro, Garcia-Rubio and Olivares, 2015). Irrespective of school admission policies and chosen academic year start dates, in a school system organised by year groups, there will always be some children who are the youngest in the cohort. In England that cut-off date for annual class grouping is 31 August. Therefore, a child born on this date would usually be in the same class as

one born on 1 September in the previous year, resulting in up to twelve months difference in age, physical maturity and cognitive development. The impact of this age difference appears to be greatest in the early years of schooling (Navarro, Garcia-Rubio and Olivares, 2015) and has been shown to operate independently from factors such as socio-economic deprivation, gender and length of schooling (Sharp and Hutchison, 1997). It is important, therefore, to acknowledge that the relative age effect is an artefact of the school system rather than any intrinsic characteristic of a child born at a specific time in the year. Comprehensive and well-structured studies (for example, Givord, 2020) have shown that the relative age effect is the most substantive and reliable predictor of differences in academic performance and is now considered to be the accepted long-term explanation of difference, in preference to other factors such as age of starting school, length of time in schools and age at testing.

2.3.3 Relative age effect across educational sectors

Most studies compare the educational attainment of children born up to a year apart using within-cohort data either in a single year (Martin et al., 2004; Lawlor et al., 2006; Navarro, Garcia-Rubio and Olivares, 2015) or longitudinally (Dunsmuir and Blatchford, 2004). In contrast, Crawford, Dearden and Greaves (2013) in their work for the Institute of Fiscal Studies, compared cross-cohort data from Key Stage 1 to Key Stage 4, ages 5-16, demonstrating the significant differences in the proportion of children achieving the expected level in national achievement tests for children born either side of the annual school cut-off, shown in Figure 2.1 by vertical lines between August and September (data derived by Crawford, Dearden and Greaves (2013) from the *National Pupil Database* for pupils born between 1990-1993). The imposition of a government-determined expected grade per subject at each Key Stage that does not account for the differences in age of the children tested, in and of itself skews the resultant outcomes. The proportion of children achieving the expected levels at the different Key Stages declines across the academic school year, most obviously for the youngest children (Key Stage 1). However, Figure 2.1 shows that the differences were still educationally and statistically significant for those aged 16, thus demonstrating the magnitude of difference in outcomes due to being born just a few days either side of the school year cut-off date.

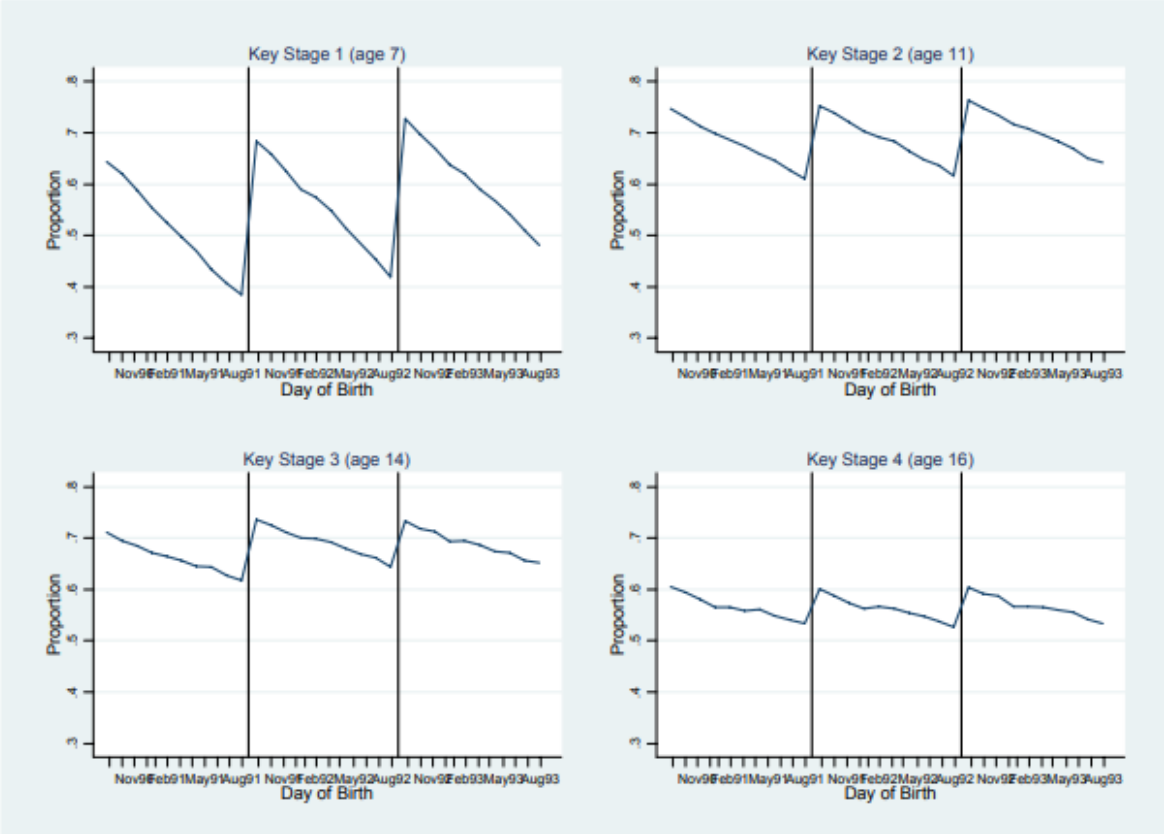

Figure 2.1: Proportion of children achieving at least the expected levels at Key Stages 1, 2, 3 and 4 by day of birth (Crawford, Dearden and Greaves, 2013, p. 20).

2.3.4 Primary education

The impact on test scores for children in England due to month of birth differences is greatest at age seven (Key Stage 1) which Crawford, Dearden and Greaves (2013) have shown to be primarily due to age at test effects. At this age 'August-born children are 26 percentage points less likely to reach the government's expected level than otherwise-identical September born pupils' (p.21). In 2008 the then Secretary of State for Children, Schools and Families, Ed Balls, commissioned an independent review of the curriculum in primary schools requesting that it considered that for summer-born pupils their relative age 'can affect their performance right through school up to the age of 16' (Rose, 2009, p.143). However, Balls' intention was for greater flexibility on school entry dates rather than any adaptation of the curriculum to better suit the younger children. In one extensive study in inner London, Mortimore et al. (1988) found that teacher assessments of their pupils' ability in terms of reading, writing and Mathematics were significantly skewed in favour of those born in the autumn months, with insufficient account taken of in-cohort age differences, resulting in summer-born children being more likely to be placed in lower ability bands, with ongoing disadvantage when transferring to secondary schools. In contrast to Mortimore et al.'s (1988) research, a synthesis of research at a similar time in the United States suggested that the gap between the oldest and the youngest in-year cohort was not very large and that it was a problem that was 'invariably cured by the

passage of time' (Shepard and Smith, 1986, p.78). Uphoff and Gilmore (1986) rightly contradicted this sweeping assertion stating 'the less bright but older and developmentally more mature pupils were able to do more with the ability they had than were the brighter, younger students' (p.13). They evidenced this by showing that not only were older in-year children scoring higher on standardised assessments, but also the younger children were more likely to be referred for learning disability assessments.

2.3.5 Secondary education

Evidence from Crawford, Dearden and Greaves (2013) in Figure 2.1 and from Oshima and Domaleski (2006) demonstrate that the relative age effect, although diminishing, certainly does not disappear in secondary school. McEwan and Shapiro (2008), researching the relative age effect in secondary schools in Chile using consecutive national annual surveys found 'persistent or increasing' (p.25) effects on children born late in the academic year. Bell and Daniels (1990), using a hierarchical linear model, showed that, throughout secondary schooling, summer-born pupils performed worse in science assessments than those who were autumn-born, concluding that relative age within the class was the strongest explanatory factor. Similar findings relating to poorer academic performance for summer-born pupils emerged from Foxman, Ruddock and McCallum's (1990) study into Mathematics performance in secondary schools where, at the point of transfer to secondary school, summer-born pupils were up to a year behind those who were autumn-born. An analysis of GCSE grades undertaken by Wigan Education Authority (cited in Sharp and Benefield, 1995) showed that for every nine subjects taken at GCSE level the oldest students achieved three grades better than those who were youngest in the year cohort. Unfortunately, it is not made clear whether these results were clustered in specific subject areas. Crawford, Dearden and Meghir (2007) compared GCSE results between September- and August-born pupils using a regression discontinuity approach. They identified differences of 6.1 percentage points for males and 5.5 percentage points for females for achievement of five grade A*-C GCSEs, although again there is no indication as to whether particular subjects were more or less likely to be achieved.

A small-scale study in a single secondary school, based on log-linear modelling in three-way contingency tables, found a statistically significant over-representation (p<.01) of both spring and summer-born children with Special Educational Need classifications, although no difference between boys and girls (Wilson, 2000, p.156). Wilson (2000) was able to demonstrate, however, that mean *Cognitive Abilities Test* scores, before any age adjustment, were slightly higher for summer-born children with Special Educational Needs (88.5) in comparison to those who were autumn-born (87.1) suggesting that differences in cognitive abilities cannot explain differential rates of Special Educational Needs diagnosis.

Similarly, in a large study based on the *Mental Health Survey of Children and Adolescents in Great* Britain in 1999, Gledhill, Ford and Goodman (2002) identified that summer-born children were disproportionately more likely to be classed as having Special Educational needs (23.3%), in comparison to spring-born (17.2%) or autumn-born (15.2%). They found that there was no significant difference in Intelligence Quotient (IQ), reading or spelling ability between children born in any month of the year once actual chronological age was considered. Special Educational Needs over-representation for summer-born pupils, alongside equivalence in IQ, suggests that teachers are not making sufficient allowance for the differences in chronological age within their year groups. Crawford, Dearden and Meghir (2007) confirmed this effect at a large scale by interrogating the *National Pupil Database* for pupils born between 1990-1993 for all English state schools for Special Educational Needs identification requiring support through both School Action (internally-sourced/least level of need) and School Action Plus (externally-sourced/greatest level of need).

2.3.6 Tertiary education

In England at age sixteen a student may stay on at school, she may choose to enrol at a college of further education, or in some cases, may drop out of education altogether. After two or three years in this phase a student may choose to enrol at university or enter employment either as an apprentice or as a direct employee.

2.3.6.1 Further education

Within the body of research literature on the impact of month of birth, there is very little mention of further education. However, a series of studies reported by the Institute of Fiscal Studies (Crawford, Dearden and Meghir, 2007; Crawford, Dearden and Greaves, 2011; Crawford, Dearden and Greaves, 2013) acknowledged that the course a 17-year old would be studying varied significantly according to month of birth, highlighting that August-born young people were '7.2 percentage points more likely to be studying for vocational qualifications and 2.4 percentage points less likely to be studying for academic qualifications than those born in September' (Crawford, Dearden and Greaves, 2013, p.32). Unfortunately, in the data presented there is no discussion of level of entry into post-compulsory education (given the data collection was prior to the raising of the participation age to 18), although their analysis shows that an August-born student was marginally less likely to achieve a Level 3 qualification through either an academic or a vocational route based on data from the *National Pupil Database* for pupils born 1985-1988. Their analysis fails to recognise that nearly half of those entering further education do so at a Level 2 (GCSE equivalent) or below, with the focus of their research looking at trajectories to university entrance, rather than at the levels of participation and outcomes for the less academically successful. Indeed, they describe those born later in the

academic year as ‘less likely to meet the standard typically required to continue into post-compulsory education’ (p.31), implying that those without five A*-C grades at GCSE would not find a place in education, revealing a worrying lack of awareness of the structure and capacity of further education to meet the needs of virtually all young people post-16 and a bias to value university education above all other forms of study. Another example of academic rather than vocational focus in research for this age group is Kettley’s (2006) study of educational attainment in colleges, where his focus is on AS and A Level qualifications within further education colleges to the exclusion of all vocational courses. More encouragingly, the recent *Independent Panel Report to the Review of Post-18 Education and Funding* (Augar, 2019) devoted a whole chapter to further education, noting the fall in post-18 participants in further rather than higher education in the past decade and clearly identifying the range of levels of programmes on offer (p.116).

Duckworth and Smith (2019) in their two-phase union-sponsored further education research project, emphasise the transformational power of further education colleges. In a survey sample of 630 students, equally balanced by gender, they found that on starting college significant numbers were concerned about their academic ability, felt that they had been negatively labelled in the past, that they were no good at learning and about a quarter felt that they had learning needs that had not been previously identified. The survey results corroborated the qualitative interview data gathered in the first phase of the project. However, this sample of students was self-selecting, their participation having been triggered by accessing the project’s Transforming Lives and Communities website. This approach compromises the results in two ways. Firstly, the participants could have been unduly influenced by the positive tone and content of the website prior to completing the survey. Secondly, those with positive transformational stories to tell would have been particularly attracted to participate, whereas those with more negative experiences may not have accessed the website in the first place, nor have contributed their narratives. Many of the stories were from Access to HE students, who typically are a rich vein of positive transformative experiences, but only a couple were from 16-18 year-old students who form the largest demographic group in all further education colleges.

Crawford, Dearden and Greaves (2013), applying linear regression models to data extracted from a range of English longitudinal educational studies, claimed that the gap between autumn- and summer-born students remained ‘educationally and statistically significant at the end of compulsory schooling when young people are starting to make choices about further and higher education’ (p.1). Children born in August were found to be 6.4 percentage points less likely to attain grades A*-C at GCSE level, two percentage points less likely to enter university and 2.3 percentage points less likely to enter a Russell

Group (high status) university (p.21). They found the influence of relative month of birth to be continuous throughout the year, meaning those born in September were most advantaged, with an increasing disadvantage for every subsequent month in the academic year. Mühlenweg and Puhani (2010) in their study applying linear regression to administrative data for school years 2002/2003 to 2006/2007 in Hessen in Germany showed that being young-in-cohort (born in June rather than July) was disadvantageous, due to the divergent tracks, or streams, within the school system, where the youngest were 'only two thirds as likely to attend the highest track schools' (p.433) than their older classmates.

In Brazil, where there is no systematic streaming in place, Matta et al. (2015) undertook a regression-discontinuity modelling approach and found that those students who were older-in-year in early primary school, reaped an advantage on leaving high school, as they were more likely to gain admission to a prestigious university than their younger peers. This advantage remained even when those applying to university were the same age, due to the originally older students having repeated a grade. The disadvantage for the originally younger-in-year children was significantly more pronounced at university entry for males from poorer households. Acknowledging the limited validity of their study focused on a single university, Matta et al. (2015), nevertheless, call for the introduction of age-normalised tests in early years of education to ensure every child is tested at the same age. However, even age-normalising tests might not necessarily fully compensate for the individual experiences of younger-in-cohort children.

2.3.6.2 University

In 1986 Russell and Startup conducted a meta-analysis of research over the previous two decades. They found consistent evidence for the relative age effect favouring autumn-born and disadvantaging summer-born university students the most. Taking graduation data from British universities and taking account of the underlying monthly fluctuation in birth rate, they determined that although more autumn-born students graduated, those born in the summer gained higher classes of degree overall. One explanation offered by Russell and Startup (1986) is that those summer-born students who graduate are, by definition, among the most resilient and hard-working of their peers, anyone less so having been filtered out of the system well before this point. Equally, they may simply be among the more academically gifted, but also summer-born. Pellizzari and Billari (2011) replicate Russell and Startup's (1986) findings of grade advantage for the summer-born students. Those younger-in-cohort graduate from university and achieve higher grades overall than those who are up to 11 months older. The authors suggest that two mechanisms account for this outcome. Firstly, Pellizzari and Billari (2011) cite Jones

(2005) in this respect, which they say includes the assertion that cognitive development peaks at age 20 and is at its strongest up to age 25. Secondly, they suggest that the younger-in-cohort have developed socially more slowly and are, therefore, devoting more time to studying. Pellizzari and Billari's (2011) first claim seems highly unlikely to be a valid explanation given the few months difference in age for the cohort in the study in comparison to their citation of Jones' (2005) purported cognitive peak being between ages 20 and 25. Additionally, their quotation of Jones' (2005) research is inaccurate, as Jones clearly states that the mean age for greatest innovative output has increased over the twentieth century and the peak is now in the early thirties. Their second claim of an increased tendency to study among the younger-in-cohort is substantiated through the results derived from cognitive and psychological tests within the university. However, their reasoning for this behaviour is flawed. They suggest that increased time spent studying only emerges at university for this cohort because this is when they have full control of their time, without fully explaining why such a difference should emerge only at this point. Pellizzari and Billari (2012) fail to acknowledge fully the impact of socio-economic backgrounds on their results. The university in their study is a private specialist institution for economics and statistics. Not only might the university attract far more students from the higher echelons of Italian society, but those very students are more likely to have benefitted from private tuition before and during regular schooling. That the relative age effect can effectively be removed for those in the most advantaged groups, should not be a surprise. Interestingly, they do note that in the Italian school system there is no streaming and both primary and secondary school classes are formed 'either completely randomly or with the objective of maintaining a rather uniform distribution of family background, ethnicity, gender and other key characteristics both across and within classes' (p. 5). In England, where there has been considerable emphasis on differentiation and streaming for many years through the inspection process (Ofsted, 2015), early variations in performance due to relative age can be amplified and perpetuated throughout schooling and university studies (Campbell, 2014).

2.4 Multiple disadvantages

Although this study is primarily focused on educational experiences and outcomes, these are not the only measure by which differences appear for children born in the later months of a given cohort year. There is a range of evidence that demonstrates persistent and significant negative impacts for those who are youngest in their peer cohort. These effects have already been discussed in relation to professional sport, however, arguably of far more serious consequence to individuals, are the lifelong impacts on mental health, social

and emotional development, self-esteem and progress in careers beyond education. However, it will be seen that little mention is made of post-16 further education settings.

2.4.1 Special Educational Needs diagnosis

Evidence from the Department for Education's (2017a, p.9) statistical analysis for special educational needs in 2016 reveals that children with SEN were more likely to be entitled to free school meals (26.6% as opposed to 11.8% for non-SEN, and 31.4% for those who held Education, Health and Care plans). In the accompanying statistical tables, 77% of those attending Pupil Referral Units had been identified with SEN, in comparison to 13.5% in state-funded primary schools and 12.4% in state-funded secondary schools in 2017 (Department for Education, 2017b, Table 1). These data evidence the correlations between behavioural issues, special needs identifications and a marker of relative poverty in free school meals. There is no discussion of month of birth or how that might also correlate to these multiple disadvantage indicators.

As noted above in the study by Uphoff and Gilmore (1986), there have been several different studies that suggest increased referrals for those younger-in-year for a variety of learning and behavioural issues (DiPasquale, Moule and Flewelling, 1980; Crawford, Dearden and Greaves, 2013). Figure 2.2 shows the cross-cohort data for School Action and School Action Plus for Key Stages 2 and 4 (schemes to identify and support those with mild to moderate specific learning difficulties).

A similar pattern is revealed to that of national test achievement. Those younger in the year are more likely to be referred to either scheme and there is a significant difference at the 31 August cut-off date. For children born late in the school year, referrals are likely, whereas for those born early in the school year referrals are much less likely. The opposite effect, of inaccurate teacher referrals to gifted programmes for those older in the year, were also identified by Demeis and Stearns (1992) in the United States, suggesting that teachers fail to take account sufficiently of the age differential for in-year cohorts.

Wallingford and Prout (2000) also found a significantly increased likelihood of referral and receipt of Special Educational Needs provision for summer-born children in the United States in the five to seven age group, with the effect disappearing from age eight upwards. As an explanation, they noted that 'teachers' abilities to discern salient factors in the child's in-school performance vary widely in terms of teachers' expertise and knowledge, observations skills, biases and professional motivation' (p. 381). For the less experienced and less-confident teacher, the socio-economic status of the child was the most significant factor for referral, suggesting referral decisions are not made on appropriate professional judgements. However, this does not wholly explain why the youngest age group were so over-referred with no effect detectable by age eight.

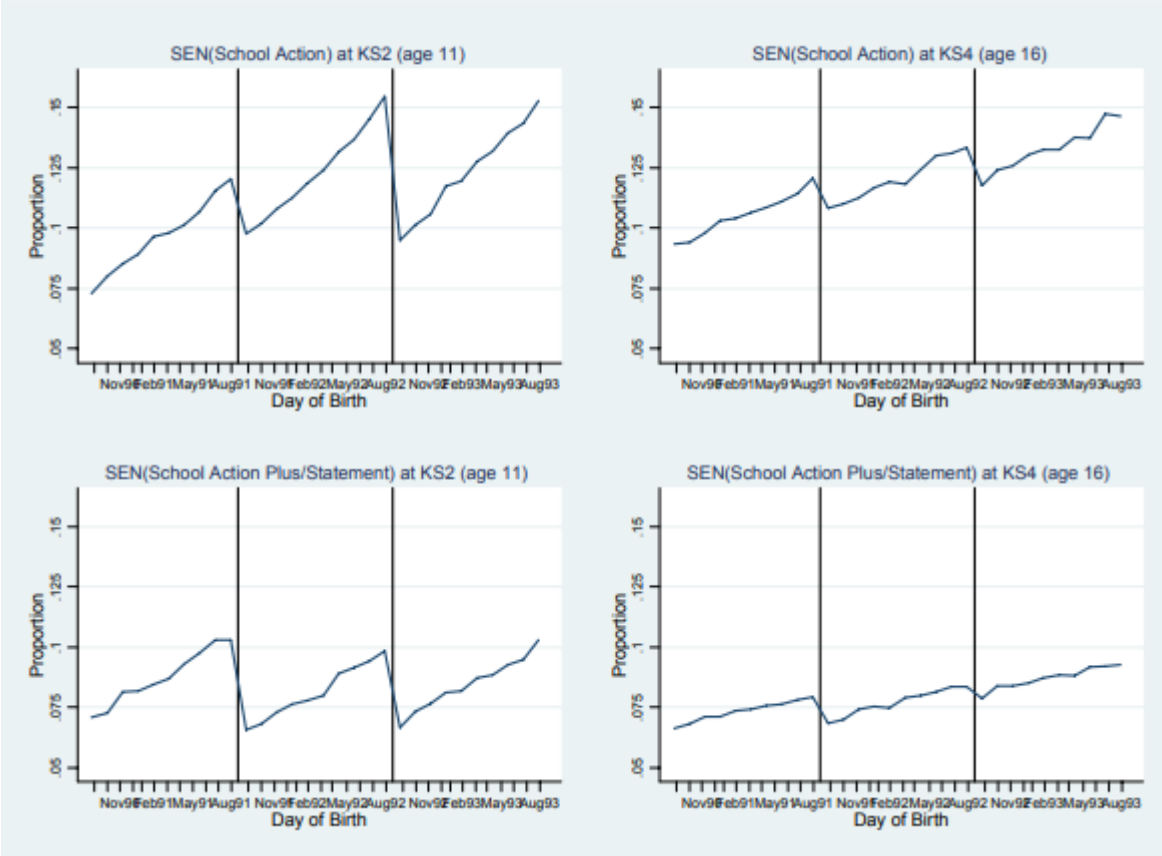

Figure 2.2: Proportion of children with special educational needs identification by day of birth and level of need: School Action top row; School Action Plus bottom row (Crawford, Dearden and Greaves, 2013, p. 25).

Confirmatory evidence from the United States of over-referral and professional over-diagnosis of relatively younger children for special educational needs is provided by Dhuey and Lipscomb (2010), using a mix of linear regression techniques and descriptive statistics. The authors found consistently that, in contrast to other disabilities such as hearing or visual problems for the same cohort, biologically older children within an age cohort were less likely to be referred or diagnosed. They suggest that this may be due to the subjective nature of initially identifying and confirming learning disabilities in contrast to physical conditions. They also found that boys were more likely to be referred for support in the youngest age groups and that White children were more likely to be referred than either Hispanic or Black children. The fact that these over-referrals resulted in over-diagnosis also suggests that tests used were insufficiently discriminatory in screening out younger children referred simply due to relative age differences. In addition, based on longitudinal data from the United States, Elder and Lubotsky (2009) showed that for the youngest children there was an increased probability of 2.9 percentage points of being diagnosed with Attention Deficit/Hyperactivity Disorder. Croll and Moses (2000) analysed both in-cohort and between-cohort data for children with special educational needs as reported by teachers for 1981 and 1998. For both sets of data, they found younger-in-cohort children more likely to be described as having special educational

needs. Due to increases in regulations between these dates, they had expected to see a reduction in frequency and greater consistency within years for special educational needs assessments. However, data from 1998 showed an overall increase in children assessed with special educational needs across all year groups (3-6) in the study. Croll and Moses (2000) do not make the link to the introduction of national league tables for primary schools in 1996, which may well have stimulated teachers to pre-emptively refer children for assessment, a conclusion supported by their interview data where teachers and special educational needs co-ordinators placed Year 3 children on the register 'for safety'. The research detailed above is focused on school-age children up to the age of 16 and does not consider the patterns and consequences for those who leave traditional school settings at this age.

2.4.2 Gender, ethnicity and socio-economic status

There is a similar lack of attention to post-16 vocational students in research of the relative age effect related to gender, ethnicity and socio-economic status. Sharp et al. (2009), in their meta-analysis of the relative age effect on attainment and development, found no consistent evidence that younger children with specific characteristics, such as ethnicity, gender or economic disadvantage, were more impacted due to their relative age. In the United States one study (Langer, Kalk and Searls, 1984), which effectively compensated for socio-economic variables, found that relative age effects lasted longer into secondary schooling for Black students in comparison to students of other ethnicities. They also found that grade retention (holding back for a year) significantly increased for relatively younger-in-cohort students for both Black and Caucasian ethnicities. In another study conducted in the United States, Tarnowski et al. (1990) found significantly more primary school-age children born in the summer months were referred to school psychologists. Additionally, twice as many boys were referred in comparison to girls, leading to the conclusion that teachers may have been influenced not only by academic performance but by other developmental differences such as physical and social skills. In a Chilean study of early adolescents which looked at the inter-relationships between relative age, socio-economic status and type of school attended, Navarro, Garcia-Rubio and Olivares (2015) used a combination of descriptive statistics and structural equation modelling to demonstrate that although the relative age effect diminishes in importance over time as 'the normalising influence of formal schooling increases' (p.16), it consistently magnifies the disadvantage of poor socio-economic status.

2.4.3 Mental health

Mental health research related to relative age does tend to be more longitudinal and thus span a wider age range than some other areas of study. However, there is still a tendency to limit the analysis to age 16, as this is often where the limit of consistent national data

sets lies. For example, using results from both the *Millennium Cohort Study* and the *Avon Longitudinal Study of Parents and Children,* Crawford, Dearden and Greaves (2013) show that August-born children overall have inferior socio-emotional development in comparison to those within peer cohort children born in September. Evidence was generated using a Strengths and Difficulties Questionnaire, completed by both parents and teachers for children aged 3-16. Interestingly, teachers' perceptions using this assessment indicated greater difficulties which persisted longer than those reported by parents, which Crawford, Dearden and Greaves (2013) suggest could indicate teachers perform a more explicit peer-cohort comparison. Parent-reported differences by age nine were no longer of statistical significance, whereas teacher-identified difficulties were still statistically significant up to and beyond age eleven, the limit of their data set. There is no evidence of any of the children being asked their own perceptions of their abilities and difficulties, nor any discussion of whether any identified strengths are consistently represented across the birth months.

A Canadian study by Thompson, Barnsley and Dyck (1999), based on death by suicide of those under 20 in Alberta over a 13-year period, suggested a statistically significant relationship between relative age within a school cohort and, sadly, suicide. They acknowledged that due to different school districts within Alberta having different school year start dates they could not be sure that every child had remained within their school district for their entire education up to the point of death, but they concluded that the variance would be mutually offsetting. Thompson, Barnsley and Battle (2010) suggest a potential causal link stemming from differences in achievement in school, to variation in self-esteem, depression and an inability to cope leading to self-harm and ultimately attempted suicide. They state that the relative age effect is only one contributory factor and alone unlikely to be sufficient for causality. Their subsequent analysis was based on either the child or adult form of the *Culture-Free Self-Esteem Inventory*, depending on age, in comparison to family structure, hypothesising that children born later in the school year and from 'broken homes' (p. 316) (i.e., single parent families) would show lower self-esteem. In fact, they found that increased age at entry to school correlated with greater self-esteem irrespective of family structure and therefore that relative age and family structure were independent, with no protective effect by 'intact' (p. 317) family structure for those born later in the year.

In contrast, a Norwegian study (Lien et al., 2005) did not find relative age to be a significant risk factor overall for mental health difficulties in young adolescents, although they found a small positive score for boys having peer problems, based on self-reporting using the *Strengths and Difficulties Questionnaire*. Applying linear probability regression

analysis to the *Progress in International Reading Literacy Survey* (2006) dataset for 17 countries, Mühlenweg (2009) found that younger-in-cohort children were more likely to be victimised at school in terms of bullying, having something stolen or being hurt. Looking at individual countries within the dataset, Mühlenweg (2009, p.15) found that these negative effects were greater in countries which had comprehensive approaches to primary education (England and Canada), in contrast to countries where teaching is more individualised (Norway) or where children are separated early by ability (Slovakia). Mühlenweg (2009) stresses the importance of the impact of such experiences on the development of non-cognitive outcomes. Support for Mühlenweg's findings come from Ballatore, Paccagnella and Tonello's (2020) study in Italian primary schools. They found an increased probability of being bullied at school, particularly for males, depending on their ordinal position within their school cohort and highlighted the contributory impact of the hierarchical character of social relationships in schools based on age distributions (p.11).

Carroll (1992) observed that, having controlled for both gender and family size, attendance rates were lowest for summer-born and highest for autumn-born students, based on a study of more than 500 children in their final year at primary school. Correlation of relative age with poor attendance was also identified in secondary school age children by Cobley et al. (2009), where those born in the second to fourth quartiles of the school year attended school on average six days less than those in the first quartile and were more likely to be in the bottom 20% for attendance (p.520). The authors used a one-way between-groups analysis of covariance initially, followed by logistic regression procedures having categorised pupils' attendance as low (20%), mid-attending (60%) or high (20%). Again, there is no research evidence that considers attendance in post-16 further education settings.

2.4.4 English Language and Mathematics

In a study of a random sample taken from the National Curriculum results in 1991, Sharp, Hutchison and Whetton (1994) found no correlation between month of birth and gender, although overall boys performed less well in both English Language and Mathematics. They did, however, find that summer-born students, in general, performed less well in all three core subject areas (English, Mathematics and science). In a longitudinal study in Flemish primary schools the relative age effect in the first two years of primary school was found to impact negatively on Mathematics achievement (Verachtert et al., 2010). Although this gap narrowed substantially after two years, 'important achievement differences remained at the end of the second grade' (p.301). Additionally, Verachtert et

al. (2010) did not find any mitigation of this effect through more differentiated instruction as self-reported by the teachers in the study. Similarly, Oshima and Domaleski (2006) found relative age to be a significant predictor for test scores, taken from *The Early Childhood Longitudinal Study of the Kindergarten Class of 1998-1999* (n = 21,260), in both Mathematics and reading up to Grade 5, a stronger predictor for reading than gender up to the end of Grade 2 and a stronger predictor than gender for Mathematics up to the end of Grade 5 (p.215-6). However, in all cases, ethnicity was a stronger predictor than either relative age or gender throughout. When gender is considered, Daniels, Shorrocks-Taylor and Redfern (2000) undertook hierarchical linear modelling on data derived from Key Stage 1 assessments and determined, based on a nationally representative sample of children, that summer-born girls (defining summer-born as May–August) outperformed summer-born boys in both reading and writing and that, overall, the older children significantly outperformed the younger children. Although across all birth months girls tend to outperform boys in tests at Key Stage 2 (Department for Education, 2019, p.3), nevertheless, being a summer-born boy is clearly a disadvantage.

Further evidence is provided in an extensive study of 1831 children in pre-school programmes in Queensland, Australia. Thorpe et al. (2004) did not find any correlation between age on entry and socio-emotional behaviours, but they did find that older-in-cohort children scored significantly higher on tests to assess early skills development. Evidence for the continued impact of month of birth on achievement at age sixteen were found when entries into vertically-tiered GCSE English Language and Mathematics examinations were analysed (Massey, Elliott and Ross, 1996; SEB, 1995). Vertical tiers limit possible grades and are usually teacher-determined based on prior performance. In most schools earlier setting or streaming decisions will strongly influence these allocations. Evidence for the duration of the relative age effect through to GCSE also emerged from a study undertaken by Shropshire Local Education Authority (Hedger, 1992) in collaboration with Sheffield University where they analysed the data for a range of sub-groups. Even though the authority was in the top quartile for national GCSE data, they discovered that autumn-born pupils significantly outperformed summer-borns in both English Language and Mathematics GCSE examinations.

More recent evidence, directly relevant to this study, is furnished by the OECD research into the impact of a student's month of birth on school performance undertaken by Givord (2020), who found that among the 15-16-year olds from the United Kingdom, who were oldest in their year cohorts and who took the *Programme for International Student Assessment* (PISA) tests in 2018, there was a statistically significant correlation for increased perceived competence in reading and negative perceived difficulty. In other

words, the older-in-cohort children found reading easier and felt more competent at reading than their younger classmates (Givord, 2020, p. 30). She suggests the reason may be early negative school-based experiences for the younger children and claims that relative difference in maturity at the point of taking the PISA tests may be a causative factor. Differences in maturity cannot be ruled out but are questionable as the root cause, given the proportion of age difference between ages four and five is one fifth (20%) and between 15 and 16 it is one sixteenth (6.25%).

There is no evidence of any research that studies the impact of month of birth on the subsequent success of 16-18 year old students who are required to re-sit GCSE English Language and Mathematics if they have not yet achieved a Grade 4 or above. There is plenty of quantitative data relating to the post-16 cohort who retake GCSE English Language and Mathematics as required by the *Condition of Funding,* but there has been no consideration given to the impact of month of birth (Education and Skills Funding Agency, 2019). This lack of evidence is an omission that this study intends to remediate.

2.4.5 Adult life

Setting aside the clear evidence of the relative age effect on professional sporting achievement (Musch and Hay, 1999), Cascio and Schanzenbach (2007) have shown that the combination of relative age and disadvantage characteristics do combine to reduce attainment and career outcomes. Counter to the argument that the relative age effect does not significantly impact on future career trajectories (Dobkin and Ferreira, 2010), Du, Gao and Levi (2012) found that Chief Executive Officers (CEOs) born in either June or July were disproportionately under-represented in an analysis of CEO birthdates between 1992 and 2009 for Standard and Poor's top 500 companies in the United States. They suggest that the relative age effect has 'a long-lasting impact on career success' (p. 661). When they analysed the data specifically for CEOs born after 1954, to coincide with the introduction of mandated school entry cut-off dates in 1960, they only found 3 out of 43 (6.97%) born in either June or July. This is in stark contrast to the seasonal pattern of 16.91% of the population being born in those two months. They did not find the same pattern for August, which they explained by the common practice of holding an August-born child back by a whole school year, resulting in them being the oldest in their cohort. However, their data does not adequately account for possible variations in school cut-off dates in the United States from 1954 onward.

Advantage due to relative age was also found by Muller and Page (2016) for top politicians in the USA, suggesting that older children benefit throughout their careers from early opportunities to learn and practise leadership skills. The authors suggest that the highly competitive nature of politics, as in professional sports, resulted in increased

significance of relative age. Preference for competitive environments, such as politics and sport, by older-in-cohort children, was also identified by Page, Sarkar and Silva-Goncalves (2017). They found that older-in-cohort adolescent males had a stronger preference for competitions but did not find that these results derived from either self-confidence or attitude to risk, although the task-specific nature of their measurement of these variables might have reduced their overall strength.

In Japan, Kawaguchi (2006), using data from the *Japanese Employment Status Survey* in 2002, found no difference according to the month of birth in either the employment rates or annual incomes, the relative age effect 'washing out' in the labour market (p. 24). In England, Blundell, Dearden and Sianesi (2005) found significant evidence for higher financial return for those completing O-Level (now GCSE), A Level and higher education qualifications, but there was no consideration of vocational qualifications. The dataset used was the *National Child Development Survey* which took a sample cohort all born in the same week in March 1958. This approach excluded any ability to measure the effect of relative ages on any of the outcomes.

2.5 Further education

Evidently, there is a gap in knowledge about the impact and consequences of being born in the summer months for those students who progress to further education in England. This study seeks to fill that gap, so it is appropriate to explore this sector in more detail to better understand why this neglect may have happened.

The research setting for this study is the further education sector, part of the English educational system. Within this system, further education sits at the tertiary and higher education levels, alongside and in competition with local school sixth forms, sixth form colleges and universities. Further education in England is an overarching term that includes a variety of post-14 provision, but will be used in the context of this study to refer to the college sector only (Buchanan, 2020). There were 244 colleges in England in 2020, 168 being General Further Education colleges (i.e., not sixth form colleges or specialist provision). Approximately 738,000 students aged 16-18 were taught in the sector in 2017-18 (Association of Colleges, 2020). The 168 General Further Education colleges are substantially larger, with an average student population of 3982, than state-funded secondary schools, with an average pupil number of 986 (Association of Colleges, 2021; GOV.UK, 2021).

Transferred from direct local authority control in 1993 to direct central government control, through the Further and Higher Education Act of 1992, further education colleges have continued to be the main providers of academic and vocational qualifications for 16-18-year olds, apprentices and adult learners. Employees within the sector may have prior

experience outside education or may have varied experiences within the education system prior to joining a college. Further education colleges derive their student intake from their broad geographic locale, from schools and local adult populations of unemployed, employed and those seeking leisure activities. They can, therefore, be portrayed as specialist within the overall education system. They offer provision for those with profound and multiple learning difficulties (PMLD) through to undergraduate degree level in an extensive range of subject areas. A significant student body within further education colleges are the 16-18 year old students who undertake Study Programmes, consisting of a main qualification aim, such as a vocational qualification or an A Level, GCSE English Language and Mathematics resits where required by funding regulations, work experience, tutorial and enrichment. Study Programmes may be at any level from pre-entry for those students with PMLD to Level 3 (A Level equivalent). Approximately half of all Study Programme students joining a college each year will do so on a programme below Level 3 (Association of Colleges, 2021). Further education colleges can undertake private, unregulated local, national and international projects, from which some generate extra income.

Further education can be conceived as being decentralised in that each institution has independent control of staff and student recruitment, financial decision-making and its internal structure. However, it could equally be argued that further education is highly centralised in that there is little choice of curriculum offer or type (new T Levels being imposed), tight and decreasing funding, a challenging inspection regime and rigorous financial audit. In Archer's (1984) terms, further education is a centralised system because it has a leading part, which is central government, where even small changes originating from government cause subsequent changes across the whole system. Successive governments have sought to control and regulate the sector, driven by neo-liberal market mechanisms to enhance skills formation, based on Human Capital Theory concepts (Esmond, 2019; Mycroft, 2018), whereby the individual, rather than the state or the employer, invests in their own education to increase their own economic productivity (Hall and Soskice, 2001, p.172). This governmental control has been exercised through funding and inspection regimes, review and substantial reduction of approved qualifications, and forced corporate mergers, requiring colleges to perform a 'difficult balancing act' between these competing demands (Thompson and Wolstencroft, 2018, p.217). For example, following years of centrally imposed financial austerity (Lucas and Crowther, 2016) and Post-16 Area-based Reviews (Foster, 2018) between 2015 and 2017, much of further education was restructured, generally by merging smaller, less financially viable colleges with larger, more financially secure institutions. Further education can thus be typified as

relatively lacking in autonomy, impacted by external financial, political and regulatory mechanisms.

Further education spent six years outside the Department for Education, as part of the Department for Business, Innovation and Skills, only being readmitted to the educational fold in 2016. Being marginalised from the educational mainstream is not new. Further education has variously been called 'the disadvantaged middle child' (Foster, 2005, p.5-6), and the 'Cinderella service' (Randle and Brady, 1997, p.121; Lucas and Crowther, 2016, p.586) referencing further education's uncomfortable position between schools and universities, at least in part because further education is 'a world which remains invisible to most politicians, academics and commentators because, with very few exceptions, neither they nor their children have ever passed through it' (Coffield et al., 2007, p.4). Regarded primarily as the vehicle for skills delivery to underpin economic growth (Department for Education, 2021) and separated from the schools' sector by departmental divisions and funding mechanisms, it is hardly surprising that established educational research and practices do not always readily filter across to further education. Thus, the relative age effect is simply not on the agenda of further education colleges, nor is it reported on to any of the agencies that control and monitor the sector.

2.6 Possible mechanisms

The review of research above shows that there is substantial and convincing evidence that being born in certain months of the year can have a long-term impact in relation to academic outcomes, mental health, likelihood of referral for a special educational need and ultimately throughout adult life, including career progression. However, these studies are mostly large-scale, drawing on substantial sets of quantitative data and detailed statistical analyses, but do not thoroughly explore the mechanisms at work which produce these outcomes. Therefore, it is important to investigate in more detail the possible processes by which an apparently innocuous difference in month of birth, for some students at least, results in enduring negative consequences. This section considers both system- and institution-level means by which the relative age effect might be created. It then examines a variety of related theories which purport to explain how an individual student might develop, or indeed fail to develop, key attributes of positive self-concept and self-confidence.

2.6.1 System-level influences

The intrinsic elements of the education system within which an individual finds herself could reasonably explain long-term differences in outcomes for different sub-groups. At its simplest the cut-off date between year entry cohorts has the greatest potential impact,

promoting some pupils to being the oldest in their classes and others to being the youngest. These cut-off dates vary across the world (Borg and Falzon, 1995; Kawaguchi, 2006), allowing confident identification of the impact of relative age on an individual. Another mechanism that could contribute to such variance is the introduction of streaming or academic tracking from early stages in schools. For example, Cascio and Schauzenbach (2007) identified a self-reinforcing advantage of being placed in a higher academic track with access to advanced material, working at a faster pace, which in turn increased motivation and self-confidence. In such cases, the older-in-cohort pupils benefitted at the expense of those who were younger, because they were more likely to be selected for the faster track.

2.6.2 Path dependency

Path dependency arises if 'initial moves in one direction elicit further moves in that same direction' (Kay, 2005, p.1). In other words, the temporal sequence of actions matter, which in turn constrain the options for what happens subsequently. Usually applied in the field of policymaking, path dependency has been criticised for not taking enough account of either speed of change or, alternatively, stability over time (Kay, 2005). Nevertheless, applying the concept to individuals within an educational setting offers a useful perspective.

Cascio and Schauzenbach's (2007) results showing the advantage of being on a higher academic track were reinforced through a mathematical modelling exercise based on age-grouped cohorts by Dawid and Muehlheusser (2012). They identified that, without intervention, training resources would tend to be devoted to those giving the strongest positive indication of skill level at the earliest ages, almost inevitably those who were slightly older in their peer cohort. This systematic favouring at early stages would then be repeated and magnified, as the skill signal became increasingly stronger for those who were in receipt of the additional training. This effect can be argued to be due to path-dependencies 'which arise when the effect of training is sufficiently strong such that old[er] cohort members with low-ability who do receive high-intensity training continue to outperform their younger counterparts with high-ability who do not' (p.2-3). This suggests that simply being older is a far greater advantage than being more able, if the older children are provided with increased training, which is a possible consequence of educational streaming, favouring those oldest in the year cohort.

Dawid and Muehlheusser's (2012) mathematical model was predicated on identifying the optimal allocation of scarce resources to achieve the highest overall skill levels for the entire cohort. In different runs of the model, resources were allocated either to those with the evidently higher skill levels, to those with the weakest skill levels or equally across all skill levels. They found that where the advantage of being older in the cohort was

relatively weak, the best solution was to share resources equitably across the whole cohort and wait for strengths to emerge over time. Conversely, where the relative age advantage was strong, the best long-term results were gained when resources were focused at the early stages on those who had the weakest skills. They insisted that the optimal policy was to avoid both competition and selection early in the cohort's existence.

Although the authors claimed that their model was applicable to both sport and education, their scenarios are more applicable to sport, where individuals are selected for teams and enhanced training. In addition, Dawid and Muehlheusser (2012) failed to distinguish between the differences in each context. Whereas early identification of skill strength in sports might lead to inclusion in an extra-curricular sports team with intensive training and experience of playing a challenging opposition, in a classroom it should be reasonable to expect the same amount of resource to be allocated to every child, extra if specific learning needs are identified. However, in a school, differences may arise in the developing teacher expectations of individuals within the year cohort, children's own perceptions of their abilities and the amount of differentiation that is embedded in sessions. These factors contribute to the creation of the path-dependencies which later lead to children being put into different ability groups and ultimately achieving differently at GCSE and beyond. It is, therefore, important to explore the factors that create and then reify the specific path-dependencies for young-in-cohort learners.

2.6.3 Institution-level influences

2.6.3.1 Teachers

Within a school or college, the key influences on an individual pupil are from teachers and from their peers. Teachers are crucially important to the development of any child within their professional care. A potential example of this interactivity at work can be found in the research undertaken in an elementary school in the United States by Rosenthal and Jacobsen (1968). Now known as the Pygmalion Effect, random students were classified as being likely to bloom academically, based on fictitious, pre-experiment intelligence test results. Even though in later years teachers claimed that they never knew or had no recollection of which student was in which category, those who had been classified positively demonstrated higher levels of achievement and test results. This result suggests that the loop between teacher expectations, their successive interactions and the students' ensuing development was significant. As Burns (1982) points out 'even teachers' ordinary comments are fraught with a hierarchical evaluation and emotional content for children' (p.177). Thus, unguarded and unconscious utterances from the teacher can have a profound and lasting impact on individual students. It is conceivable that moment by moment within the classroom, the younger-in-cohort children's self-perceptions are being framed and reinforced by their teachers, resulting in minor

adjustments of attitude, behaviour and performance, ultimately becoming the pupil that the teacher initially perceives.

Investigating the consequences for in-class ability grouping against those not separated into such groups, Campbell (2014) applied linear probability regression analysis to data taken from the *Millennium Cohort Study* to model the relationship between teacher judgements, season of birth and ability grouping (p. 755). Campbell (2014) found that where in-class grouping by ability was present, teachers were more likely to judge those born earlier in the year as more able, in contrast to those born in the summer months, suggesting that ability grouping practices serve to reify 'assumptions of intrinsic differences in ability and potential' (p. 762), creating a deterministic path dependency effect.

2.6.3.2 Peers

Another explanation for the negative impact of being younger in the year is the significance of peer comparison (Borke, 1972). Within families, siblings are naturally expected to be at different levels of development and competence, whereas the internalised labelling of being part of a particular year group can lead to comparison, competition and, for the younger-in-cohort child, potentially negative self-conceptions. Erikson offers eight stages of psychosocial development from cradle to grave, the fourth of which, industry versus inferiority, relates to school and the social interactions that take place in that environment (Cherry, 2020). Erikson claimed that through positive peer interactions, good grades and encouraging feedback from teachers some pupils develop a sense of industry or confidence in their ability to do well. In contrast, inferiority will develop in those who realise they are not as capable as their peers, not receiving such glowing support from parents or teachers and struggling to gain acceptable grades (Cherry, 2020). It is quite possible that such experiences, once internalised, undermine self-confidence and lower self-concept and correlate with Mead's (1934) conception of self as a process. Being relatively younger-in-year is a disadvantage, as being inferior may simply result from age rather than cognitive difference, leading to diminished performance and achievement over time.

In contrast, based on experimental data from *Tennessee Project STAR*, which removed variation in school start ages, a frequent problem with US data, Cascio and Schauzenbach (2007) claimed that having younger, potentially more disruptive and less academically able peers had a negative impact on the older children in the class, counter to the body of literature that claims that it is the younger children who are most disadvantaged. The relative benefit of being older in a class appeared greatest for boys from a higher income background, whereas the boost from interacting with more mature

peers most benefited girls from lower socio-economic backgrounds. However, their sample was not nationally representative, with nearly half of all participants eligible for Free School Meals, a third were Black (more than double the national average for 1985, the year of the data collection) and based on relative age differences in kindergarten, which generally focuses more on the acquisition of social rather than academic skills.

2.6.4 Individual influences

Although systemic and institutional influences are clearly important, how such effects settle on individuals are crucial for future development and success. Of relevance to this study within further education is Montemayor and Eisen's (1977) assertion that older teenagers have a multi-layered evaluation of their own self-concept. They argue that older teenagers discriminate between their social, physical and academic selves. Unquestionably, those students entering further education are aware of their academic self, as their admission to a course at a given level is dependent on their overall GCSE attainment. Multiple interrelated theories, such as modelling, mirroring and social development, describe how self-concept evolves throughout childhood, adolescence and adulthood. In this study agency, modelling, mirroring, social development and cognitive dissonance will each be considered with respect to the relative age effect.

2.6.4.1 Agency

One possible approach that elucidates the mechanisms at work that influence the self-conceptions of those younger-in-year is that of the development of agency and self-concept. To have agency is to consciously exert control through one's actions over events and the environment through interpersonal influences. Bandura is most associated with theories of human agency. His earlier work in the 1960s was based around understanding aggression in young children (Aubrey and Riley, 2019), but his attention turned towards self-efficacy and human agency in later studies (Bandura, 2006). In a recent article within a management journal, Bandura (2012) identifies three types of environment - imposed, constructed and selected. He suggests that selected and constructed environments are the more usual, but this cannot hold true for young children who in their earliest years at school encounter environments over which they have no personal influence whatsoever. Whilst his explanation of 'continuous reciprocal interaction' (1977, p. vii) describes the adult experience well, the balance of power and agency is very different for a young child.

2.6.4.2 Modelling

Nonetheless, Bandura's (1977) concept of learning behaviour through observation and modelling, which is internalised symbolically, does appear to be sustained in the early primary classroom (Aubrey and Riley, 2019, p.135). In particular, Bandura (1977) highlights how observing models of behaviour, including vicarious reward and punishment, can effectively establish learnt concepts of judgement, language use and

cause and effect, leading to the inhibitory effect of witnessing punishment and consequent self-regulation (Aubrey and Riley, 2019, p.137). Such self-protective behaviour is reinforced and perpetuated to the point that aversive events are avoided well before they occur. This might be one way in which a relatively younger-in-cohort child unconsciously regulates her own behaviour, either striving to do well to avoid upsetting her teacher or withdrawing to avoid making mistakes. Even when circumstances change, as when individuals progress through different stages of education, these behaviours can be so entrenched that they persist and are difficult to counter. As Bandura explains, individuals need 'powerful disconfirming experiences to relinquish fearful expectations, which verbal assurances alone do not provide' (1977, p. 62). Thus, individuals need to experience successful performance to alter their sense of efficacy, but this is risky as failure can further decrease self-efficacy conception. Receiving results from standardised tests at different Key Stages, which take no account of within-cohort relative age, might be one way that experiences are confirmed rather than overturned. Over time, Bandura argues, children learn to self-regulate their own behaviour according to evaluative standards modelled by others and 'judge their own performances relative to those standards and reinforce themselves accordingly' (1977, p. 134). In other words, it is typical of human nature to perceive what is expected and thus even incorrect preconceptions can be falsely perpetuated, which is of significance for those who are younger-in-cohort and who have had more negative incidents throughout their school years. Avoidance of potentially challenging situations ultimately prevent engagement with experiences that could alter such preconceptions, confirming a reason for possible withdrawal from academic challenges for those who are summer-born.

2.6.4.3 Mirroring

In contrast to Bandura's (1977) social learning theory, with its emphasis on modelling and imitation, is self-concept development through assimilation and mirroring. The importance of the significant other in early childhood self-concept development cannot be overstated. Often one of the most important significant others in a child's life is their teacher (Burns, 1982). One key aspect of self-concept is the drive to maintain harmony and consistency between the individual and their environment. Burns (1982), in his detailed study of primary and secondary age children, describes a girl, who, when faced with test scores that suggested she had a better than average IQ, intentionally did less well in subsequent IQ tests to maintain a consistent view of herself, rather than have to change her internal viewpoint and accept her intelligence. Although Burns' (1982) illustration is an isolated example, it is conceivable that those children born in the summer in England may internalise their teachers' perceptions that they are academically weaker compared to others in their cohort, resulting in a long-term negative experience, irrespective of their

true ability. Alongside predetermined curriculum content (Burns, 1982), schools also deliver a responsive affective environment, through which individual pupils assimilate others' judgements and, thereby, determine their rank amongst their peers. Thus, explicit comparative performance within a classroom and implicit expectations from teachers are extremely significant (Borke, 1972), as outlined above in institutional influences. Reasons for misplaced teacher expectations, as evidenced by potential mistaken Special Educational Needs assessment referrals (DiPasquale, Moule and Flewelling, 1980; Crawford, Dearden and Meghir, 2007), can, arguably, be traced back to the symbolic interactionist, Mead (1934), who developed the notion of mirrored self-concept. Mead (1934), described how, for adults, social pressures and individual actions modified each other in an iterative feedback loop of response to self and response to how others in turn treat the self. In his view, self-mirroring evolves by taking perceptions of oneself as reflected by significant others, for example teachers, and then internalising these perceptions, without judging their true accuracy. For Mead (1934), the self was always in a state of process rather than static. He emphasised interactions between the individual and others in society, constantly influencing and changing each other, creating a community in an accumulation of differing perspectives. Relating this to a school setting, a child may internalise the way a teacher interacts with them, albeit potentially erroneously if their within-cohort relative age is not considered, and may then, in turn, display this altered image, eliciting further misperceptions.

2.6.4.4 Social development

Vygotsky's work on the concept of social development, formulated in the 1920s and 1930s but published in English over 40 years after his death, is related to Mead's concept of mirroring (Cole et al., 1978). Vygotsky places infant and child development centre-stage, although, in one of his later works, he acknowledges a significant shift in thinking and concept formation during adolescence (Vygotsky, 1931). For Vygotsky inter-psychological development takes place initially through interaction with others, which is subsequently internalised at the intra-psychological level (Cole et al., 1978). Thus, in his view, cognitive development, where a child develops the capacity to think for herself, takes place through social processes, with the child being positively influenced by the more knowledgeable other within the zone of proximal development (Aubrey and Riley, 2019). However, this positive view of the role of the more knowledgeable other is not sustained if the teacher's expectations, or perceptions of the child's ability are, in fact, the root cause of the child's negative self-concept, as could be the case for a relatively young-in-cohort child (Wood, 1998, p.98). Teachers' importance as the more knowledgeable other is a powerful influence on individuals and appears to endure well beyond the primary classroom, as was evidenced above in the vertical tiering of GCSE English Language and Mathematics

examination entries which favoured those born earlier in the year in the higher tier entries over those born in the summer months (Massey, Elliott and Ross, 1996; SEB, 1995).

2.6.4.5 Cognitive dissonance

The need for a consistent self-concept also links to more recent literature around cognitive dissonance, which can result from intolerable psychological discomfort. Initially coined by Festinger (McLeod, 2018), the term, based on research into adult cult behaviour, has since become an advanced theory. Not only does cognitive dissonance reinforce already established self-concepts (Elliott and Devine, 1994), but may also result in attitudinal changes to conform to the beliefs of others (Cooper, 2007), echoing the earlier examples of mirroring taking place in response to teacher expectations. However, most research in this area has been undertaken in highly contrived settings with undergraduate students (Cooper, 2007) rather than in schools or colleges, and none investigates differences caused by within-cohort relative age differences. In addition, there is no indication of what might happen if a participant was subjected to repeated iterations of scenarios provoking aversive behaviour as might happen in a classroom for a child who was repeatedly finding herself at the lower end of achievement due to her relative age. However, it can be extrapolated that in an educational setting, objective evidence, such as an unexpectedly high test score, may threaten self-concept and, if discrepancies cannot be assimilated, then dissonance will occur. Behaviours and attitudes may change because dissonance is an uncomfortable cognitive experience, generally avoided by individuals (Elliott and Devine, 1994). For a young child, if there is dissonance, the easiest attitude to change is their own, to align with that of the more powerful significant other - the teacher or the parent. Once formed, the self-concept filters experiences, interpreting them in the light of expectations, reading possible negativity into any situation (Burns, 1982). It is, therefore, possible to trace a mechanism whereby a relatively younger-in-cohort child might unconsciously adapt her actions and beliefs to avoid psychological discomfort.

2.7 Summary

This chapter has shown that a variety of causes have been suggested for the difference in academic and sporting performance for children born at different times across the academic year. The consensus position is that consequences due to differences in age within any given year cohort, the relative age effect, is the most substantiated by research evidence. Season of birth, length of schooling and age of starting school have all been shown to be unlikely causes beyond the first few years of schooling. Relative age within their cohort affects children and can be seen to be unconsciously substantiated by teachers and Special Educational Needs assessment professionals. There is a paucity of research into the relative age effect in further education in England. Beyond education there is evidence of similar relative age impacts in the sporting world and worrying

evidence that mental health can be seriously impacted by being younger-in-cohort. The advantages bestowed on those older-in-year transfer into adulthood and there is some evidence that such favourable early experiences result in preferential career opportunities and outcomes. Underpinning mechanisms have been explored by considering the relevance of several different theories that purport to explain the differential emergence and consolidation of self-concept. These theories all, in some way, describe the interaction between an individual and their environment. Ultimately, the evidence presented confirms that the expression ‘summer-born’ ceases to indicate a summer birthday and instead designates potential systemic and institutional underachievement and disadvantage in school systems and beyond. There is very little mention of how the relative age effect plays out in further education settings. Exploring this neglected sector in relation to the relative age effect is the focus of the research undertaken in this study.

3 Research Methodology

3.1 Introduction

Negative academic consequences such as poorer educational attainment and progression due to an individual's month of birth within a school year, known as the relative age effect, are confirmed in the research literature (Sharp, 1995; Crawford, Deaden and Greaves 2013; Givord, 2020). However, it has been established in the review of literature above that there is a dearth of evidence pertaining to the existence and impact of the relative age effect on the academic achievements of students enrolled in further education colleges in England. This study seeks to address that omission.

This chapter sets out my critical social position at the heart of this study which establishes the grounds for the choice of a methodological approach, combining a critical realist ontological perspective with social constructionism (Elder-Vass, 2012). This combination of perspectives was identified as the most appropriate to answer this study's research questions:

- To what extent are summer-born students over-represented in English further education study programmes?
- In which ways are summer-born students over-represented in English further education study programmes?
- What events, acknowledged or unacknowledged, have contributed to further education summer-born students' academic journeys?
- What generative mechanisms might account for these patterns of representation and events?

For the purposes of this study, it is necessary to define specific terms which are at the heart of the approach taken to respond to the research questions. Realism refers to a cluster of views, including Hammersley's subtle realism (2002), Hacking's entity realism (1983) and Bhaskar's transcendental realism (2008), relating to the extent to which things can be known, whether we consciously perceive them through our senses or can abstractly comprehend them through our thought processes (Pernecky, 2016). Social constructionism can be defined as understanding meaning through the mentally constructed subjective views of individuals (Parker, 1998).

Both critical realist and social constructionist perspectives were carefully combined, by considering what could be taken as real in the social world of further education and choosing how to investigate that reality. This deliberation resulted in the selection of a mixed methods methodological approach grounded in critical realism. The first research

phase was purely quantitative and then, based on these quantitative results, a qualitative phase was undertaken. I will demonstrate how ethical, data privacy, consent and confidentiality considerations were handled. Building from a justified critical realist approach, a rationale is provided for both the quantitative and qualitative methods used, giving details of sample sizes, sampling techniques, procedural activities and any modifications. For the quantitative data collection, the statistical treatments applied are outlined. For the qualitative data, how themes emerged through deductive analysis is defined. Finally, both sets of data are integrated and subjected to a retroductive analysis, from which potential generative mechanisms are identified.

3.2 Key considerations

3.2.1 Ontology

Existing research into the relative age effect, such as that by Crawford, Dearden and Greaves (2013) and Givord (2020) is overwhelmingly based from a positivist stance, which can be said to assume a direct association between objective reality and what can be empirically observed using natural science methodologies (Pernecky, 2016). Reducing reality to only what we can directly perceive results in a 'flat' reality (Danermark et al., 2019, p.113), which does not offer sufficient opportunity to consider the constituent factors that generate new phenomena. In contrast, the ontological viewpoint taken for this research is within the critical realist perspective, itself a diverse field in which there are differing interpretations of what critical realism is and what it can achieve (Danermark et al., 2019). Arriving at this stance, which subsequently determined methodological choices, required a thoughtful exploration of a range of ontological and epistemological considerations, resulting in a justified and defensible position, which was different from that chosen by other researchers in the relative age effect field. Critical realism refutes one-dimensional causative explanations, where empirical evidence may be equivocal or misleading. Instead, at the heart of critical realism is an understanding that there is both a natural and a social reality that exist independently of our perception or even conception of them (Bhaskar, 1989). Crucially, I had privileged access to the research setting as an existing member of staff which allowed me access to data that would not have been shared with an external researcher. As importantly, I brought nearly 30 years of insider sector knowledge to the research that enabled me to perceive readily the complexity and messiness of the field. Thus, the task of this study is to attempt to use a critical realist inspired approach to offer a fuller account of the relative age effect than has been achieved to date, where, arguably, the causative explanations have been one-dimensional. The aim is to reveal the multi-dimensional factors that are at work in FE, however conditional this gained understanding may be.

The extent to which abstract concepts are real has challenged philosophical thinkers over time, as has the concept of reality. In the educational sector such abstract concepts could be year groups and birth dates. A strong constructionist ontological viewpoint regards social phenomena as no more than constructs in thought, discourse and culture (Tao, 2013). Such a standpoint does not deny tangible natural reality, but regards social phenomena, such as education and teachers, differently, as local, relative and co-constructed (Pernecky, 2016, p.18). However, conflating phenomena with the linguistic labels we attach to them ignores the way language 'carves up' and creates categories of knowledge of the world (Sayer, 1992, p.82). Social phenomena and the terminology we use to refer to them in thought or speech are not in a simple binary relationship, nor are they neutral in terms of values or morals, but are best revealed through frameworks of boundaries, distinctions and contrasts, rendering less secure what Collier calls our 'grasp of thought on reality' (1994, p. 5). Therefore, whilst this strong anti-realist branch of social constructionism is rejected, an alternative critical realist position recognises compatibility with more moderate social constructionist perspectives, resulting in a potentially powerful explicit realist constructionism, giving access to unseen structures and causal mechanisms (Bhaskar 1993; Elder-Vass, 2012). From a philosophy of human sciences perspective, Hacking exposes the otherwise unchallenged and 'natural' social constructions within society, which are often mediated through linguistic referencing. Once challenged, alternative constructions become tenable, resulting in scope for changes to be demanded and enacted (Hacking, 2000, p.6-7). More broadly, there is a complex interplay between the work of social science in terms of education and philosophical considerations. Philosophical schools of thought bring frameworks through which society, including education, can be analysed and the specialised field of education offers opportunities to test and understand humanistic issues through a multiplicity of perspectives (National Council for the Social Studies, 1994).

Bhaskar, the principal proponent of critical realism, distinguishes between the intransitive (or ontological and durable) dimension and the transitive (or epistemological and therefore open to change) dimension of the world, giving precedence to ontology (Danermark et al., 2019). Bhaskar describes the world as a complex, open and ever-changing system, in contrast to the closed systems of experimental design, where individual mechanisms can be artificially and temporally isolated (Bhaskar and Hawke, 2017). For critical realists, structures and multiple causal mechanisms underlie the social world (Elder-Vass, 2012). Within the ontological realm, Bhaskar and Hawke (2017), and like-minded critical realists such as Sayer (2000), differentiate between the real, the actual and the empirical, thus delineating a stratified ontology as shown in a simplified form in Figure 3.1. This stratified way of analysing reality is particularly useful for this research study, as it allows for

iterative peeling away of layers to reveal further structures and mechanisms underneath the superficial, empirical surface of further education, aided by my existing access and understanding of the subject area and consistent with the critical realist approach described above.

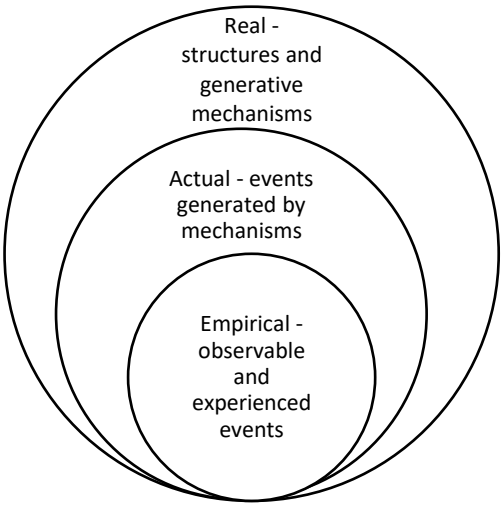

Figure 3.1: Bhaskar's stratified ontology, based on Mingers (2004, p.384).

At the deepest ontological level, the real, including natural objects and social structures, exists irrespective of our comprehension or imagination of it. Within this layer are situated structures with intrinsic 'causal powers and liabilities', which have the potential to generate mechanisms (Zachariadis, Scott and Barrett, 2013). It is this level that Bhaskar regards as the ultimate object of our research enquiry (2017, p.22). Of particular interest to this study at this level are the social structures which may include social relations which, according to Bhaskar, 'pre-exist the individuals who enter into them and whose activity reproduces and/or transforms them' (1989, p.4). Thus, here we find the relationships between teachers and pupils within the relatively durable social structure of a school (Collier, 1994). The powers produced by causal mechanisms that are present in such structures are only tendencies, in that they are contingent and emergent (dependent on the parts being organised in a particular way – in this context an educational institution), not necessarily activated, or if activated, counter-acted or amplified by other mechanisms (Elder-Vass, 2012).

Within the ontological stratification of reality conceived by Bhaskar, there are multiple layers of vertically ordered generative mechanisms, in which each lower level mechanism explains but does not replace that which is higher (Collier,1994, p.48). A mechanism is a facet of a structure, hypothesised or confirmed, which generates a specific power (Collier, 1994, p.62). In the simplified conception of the actual in Figure 3.1, a subgroup of the real,

events occur, experienced or not, that have been triggered by generative mechanisms, of which there may be many. Bhaskar distinguishes between concrete events and mechanisms, wherein mechanisms may include social, political, ideological, physical and economic characteristics (1989). Within education multiple mechanisms are present. To what extent different mechanisms contribute to different events will vary, but this may happen 'horizontally' where events are explained directly by certain mechanisms plus a trigger, or 'vertically' where a given mechanism can be explained by a more fundamental one (Collier, 1994, p.48). Finally, within the stratification the empirical realm consists of those events that are directly observed and experienced. Thus, as can be seen in Figure 3.1, the empirical is a subset of the actual, which in turn is a subset of the real. There is the potential for certain powers and thus generative mechanisms to remain inactivated, meaning that these mechanisms and powers would not translate into actual events and would, therefore, remain invisible to the observer. Nevertheless, the potential for these events to occur is still there (Sayer, 2000).

Bhaskar regards all science as a process of digging deeper into multiple layers of generative mechanisms and events for which he visualises 'no end to this process of the successive discovery and description of ever new and deeper, and explanatorily more basic strata' (2008, p.168-9). Thus, a critical realist starts at the upper layer to identify a mechanism for which an explanation is needed and then works downwards, potentially infinitely, as a higher level mechanism 'is rooted in and emergent from' a more rudimentary one, but not reducible to it (Collier, 1994, p.110). However, for practical research purposes, although several significant layers may be studied and analysed, it is not appropriate in this study to follow the 'turtles' all the way down. Gaining insight into the more immediate underlying structures and mechanisms will be deemed sufficient to establish initial findings and indications for further research.

3.2.2 Epistemology

The criticality underpinning this ontological perspective derives from challenging the concept of a flat reality which collapses ontology into epistemology, otherwise known as the epistemic fallacy (Bhaskar, 2008; Collier, 1994). To answer the ontological 'what is real?' question, critical realists point to structures and mechanisms with inherent powers and liabilities that are not immediately visible. To answer the epistemological 'how do we know?' question, critical realists work back from the empirically directly observable, through the unobserved, but describable, actual towards the underlying structures and their potential mechanisms and powers. Thus, through examining these abstracted objects further, more accurate, concepts can be created (Sayer, 1992).

For this study the empirical, observable phenomenon under scrutiny was the potential relative age effect in further education, for which the task was to identify, describe and explore the basic structures from which were generated the latent, exercised and manifest powers and liabilities. Taking a critical realist perspective in this study therefore required being able to produce a description of the structure of the relative age effect as manifest within further education, including its exercised or unexercised mechanisms. Key questions posed at the outset to direct the investigation of the properties of the relative age effect included:

- What are the preconditions of the relative age effect?
- What must be present for the relative age effect to exist?
- What is it about the relative age effect that enables it to impact on student enrolment patterns, irrespective of other mechanisms at play?
- What would have to cease for the relative age effect to disappear in its present form? (Haigh et al., 2019)

Although answers to these questions were acknowledged as likely to be limited, fallible and situated within social practices, geography and time, recognition of this constraint does not undermine the attempt to gain such answers (Bhaskar and Hawke, 2017). Within the social sciences, and educational research in particular, the complexity and messiness of an open system, by its very nature, brings risks of incorrect assignment of effects to mechanisms and structures, compounded by conducting research within a double hermeneutic, whereby educational theory encroaches into system structures and individual behaviours and is reflected in a 'hall of mirrors' effect (Sayer, 2000, p. 33). Equally, both the researcher's and the participants' understandings may or may not accurately represent underlying mechanisms and neither researcher nor participants may have been able to discern or trace these causal mechanisms accurately. Criticality is not value-neutral and if the research has been undertaken well, there is a strong possibility of producing knowledge that is reasonable, reliable and practically adequate when seen from the perspective of the intended audience, in this case, educational policymakers (Sayer, 2000, p.69).

3.2.3 Research questions

High-quality research demands high-quality research questions. If the right questions are never asked, it is not possible to expand our understanding or generate new concepts. If the conception of a relative age effect being present in further education does not exist, then, consequently, the effect cannot be seen even when the phenomenon is present (Sayer, 1992). In contrast, extensive data is collected and published relating to gender, level of achievement, declared difficulties/disabilities and ethnicity within the further education sector (GOV.UK, 2019b). College leadership teams actively seek to reduce

achievement gaps, which for 2018-19 nationally ranged from 1% difference in achievement for gender (Females 84%; Males 83%) to 2.1% difference in achievement for declared disability or difficulty (No disability/difficulty declared 84.1%; disability/difficulty declared 82%) and to a 5.1% difference in achievement between Mixed ethnicity (80.1%) and Arab and Asian ethnicities (85.2%) (GOV.UK, 2019b). Asking questions about summer-born students in further education is, therefore, important for two reasons. Firstly, there is a paucity of evidence from previous research for this age group in the vocational, rather than academic, pathway and, secondly, given this lack of evidence, the extent of the consequences of being summer-born are not visible to the sector and might be at least, if not more significant than the current demographic characteristics in focus.

As the literature review has shown, there is plenty of evidence of the negative impact of being born later in any given year cohort in the sporting world (Grondin, Deshaies and Nault, 1984; Stebelsky, 1991; Dudink, 1994; Helsen, van Winckel and Williams, 2004; Thompson, Barnsley and, Delorme and Raspaud, 2009). Research into relative age effects within education has tended to focus on primary or secondary schools up to the age of 16, when GCSEs are taken (Hedger, 1992; Wilson, 2000; Oshima and Domaleski, 2006). Further education as a sector has been relatively unexamined in educational research literature, despite its size, not being on the conventional route through school sixth forms to undergraduate courses and therefore, not a transmission route for the dominant culture. Nevertheless, a small group of researchers led by Claire Crawford when she was based at the Institute of Fiscal Studies in London (Crawford, Dearden and Meghir, 2007; Crawford, Dearden and Greaves, 2011 and 2013) have clearly shown the statistically and educationally significant achievement gap at age 16 due to month of birth, drawing attention to the increasingly negative impact for every birth month from October to August. Their work was derived from national data sets (for example: *The National Pupil Database*) and was wholly quantitative in design, an approach typical of this research interest community. To contribute to, and have resonance within, this community, a quantitative approach was highly desirable. However, any links to actual mechanisms that underpin these outcomes in the research literature are mostly speculative, as detailed qualitative research involving summer-born participants is absent. Without a thorough understanding of the possible mechanisms at work, interventions to remediate these issues may be less effective (Sayer, 1992, p.52).

The first research question explored the extent of summer-born students' enrolments in a further education rather than a school or sixth form setting following GCSE examinations. The second research question investigated in greater detail the patterns of enrolment against key indicators such as gender, ethnicity, declared difficulties, GCSE English

Language and Mathematics, and attendance. The intent of these research questions was to describe the evidence, sitting at the surface, empirical layer in a critical realist stratified ontology, as shown in Table 3.1, and as a result, establish with clarity the extent and the patterns of summer-born students' presence within the further education system in England, focusing on those students aged 16-18 who undertake Study Programmes.

Table 3.1: Links between research questions and critical realist ontology layers.

Critical Realist Layer	Research Question
Empirical	To what extent are summer-born students over-represented in English further education study programmes? In what ways are summer-born students over-represented in English further education study programmes?
Actual	What events, acknowledged or unacknowledged, have contributed to further education summer-born students' academic journeys?
Real	What generative mechanisms might account for these patterns of representation and events?

The purpose of the third research question was to attempt to understand what events were relevant for a summer-born student progressing through the English education system, whether the student was conscious of these events or not. The fourth research question focused on possible causation, in terms of structures and mechanisms although explicitly not expecting to uncover simplistic, causal relationships. This question was intended to explain the patterns of enrolment and critically evaluate the student narratives to identify the underlying structures and their powers, which trigger generative mechanisms. Through this structured analysis, more authentic knowledge of the concrete phenomenon of the relative age effect could potentially be gained (Sayer, 1992).

3.2.4 Research setting

To answer the research questions effectively required access to both data and students within the sector. The level of detail required in the data was substantial and of a sensitive nature at a student and organisational level, for example, identifying months of birth and achievement outcomes. Such access was only possible through my own institution as a trusted member of staff. This opportunity was acceptable as the institution could offer a dataset for over 5000 students and could be described as a conventional, albeit quite large, General Further Education college, which offered a representative range of courses for all stakeholders. Typically for the sector, the institution had merged with another college in 2018 as a result of the Area-based Reviews and now has four sites spread

across 70 miles. Although these four sites are branded externally as separate colleges within their individual towns or cities, structurally the college, and the staff and student populations therein, constitute a single combined entity and thus dataset for financial, organisational and quality monitoring purposes.

3.2.4.1 The research setting though a critical realist lens

Analysing the structure of the research setting through conceptual abstraction is an important element of a critical realist approach (Danermark et al., 2019) or as Sayer reminds us '[s]o much depends in social research on the initial definition of our field of study and how we conceptualise key objects' (1992, p.2). Generative mechanisms may be proposed, and internal and external relations suggested only by thorough explanations of both the objects and their relations within a setting (Skinningsrud, 2019, p.454).

Further education's attributes include Study Programmes that are frameworks within which different educational elements exist, relationships between students, the provider's staff, employers, parents or carers and external agencies or institutions such as schools, social services etc. and regulatory and procedural components. Figure 3.2 shows that there are substantial structures and potential generative mechanisms within further education.

The importance of this approach is underpinned by Bhaskar's concept of natural kinds, which involves figuring out the real structure of an object and then identifying its more enduring powers and tendencies that result from these structures (Bhaskar, 2008), which Groff (2013) translates to social kinds for social phenomena. There are tenable associations between these natural or social kinds and Hacking's description of the labyrinthine societal interconnectedness of 'human kinds', where responses to classifications are conscious or not, (1983, p.351, and 2000). Therefore, one of the critical realist tasks for this study is to identify and explain the research setting based on the way that internal structures and generative mechanisms function (Skinningsrud, 2019). Figure 3.2, based on the researcher's insider knowledge of the sector, proposes a structural conception of further education within the English educational system. The diagram shows the considerable forces at play for the further education sector. Regulation and policy are heavily driven by national bodies from Government policies (such as Area Reviews and Condition of Funding rules) to quality inspection by Ofsted. Around this central element are the key stakeholders, ranging from students, to employers, parents and employees. The complex interactions between these stakeholders may both push and pull an individual in terms of their interaction with the sector. For example, the pressure to gain

paid work may pull an individual away from engaging in further education in the short term, even though the paid work has little prospect for career advancement in the longer term. Equally, a teacher entering the sector may be pulled towards giving back to and helping others, based on their own positive experiences in a college setting or even their own negative experiences at school.

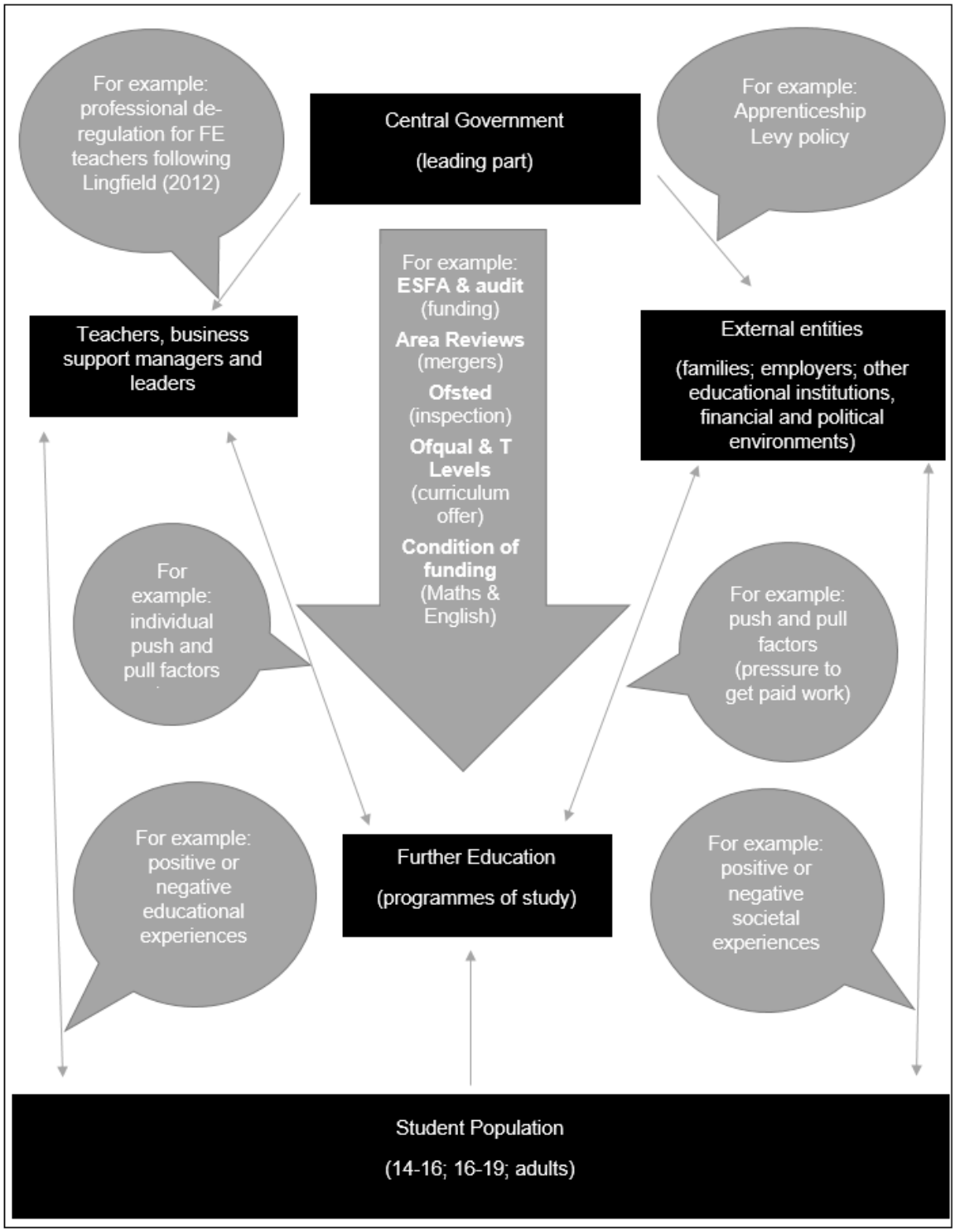

Figure 3.2: *Centralised further education sector in English education system, based on Archer (1984) and Skinningsrud (2019).*

3.3 Realist social constructionism

Feyerabend (1993) rightly warns against making research evidence fit existing theories. In this instance, however, there are no explicit theories or identified mechanisms which directly link the relative age effect to poorer academic outcomes at age 16, but plenty of potential concepts within a social constructionist approach. Combining this approach with a critical realist perspective on causality:

> enables us to recognise that both social structures and individual agents have emergent causal powers, and that social events…. are the product of multiple interacting causal powers, including the powers of both individual agents and social structures (Elder-Vass, 2012, p.12).

Thus, integrating a critical realist ontology into social constructionism allows for both an agential and structural analysis, searching for potential causal mechanisms observed in the evidence derived from the quantitative data and from listening to the students' accounts.

3.3.1 Individual agents and social structures

The student population entering FE does not originate from neutral spaces, either politically, educationally or economically. Before arriving in college, some individuals have experienced academic failure, distress and demotivation in schools, whereas others have had far more positive experiences. Their academic identity has thus been formed prior to their arrival, although it would be wrong to make an unchallenged assumption that mechanisms implicit in the relative age effect in an individual's early years remained unchanged over ten years later. Theories relating to academic identity formation originating in self-concept development tend to focus on young children (Vygotsky, 1931) or adults (Cooper, 2007). These theoretical descriptions of self-concept development have a substantial common basis, upon which the individual theories are built. Social construction models do not always explicitly recognise a stratified ontology or use the language of generative mechanisms and powers, but, nevertheless, can be read through a critical realist lens. At their heart, social structures and their emergent generative mechanisms, shape the individual and, thus moulded, the individual, consciously or unconsciously, shapes the structures within which they are present. The extent to which one set of shaping is more powerful than the other depends on context. At a social and cultural level, there are overarching theoretical models that trace how such shaping takes place.

The concept of social construction can be either liberating or constraining but, according to Hacking (2000), its primary use is to raise consciousness primarily of something disliked, criticised and to be eliminated. Social construction is manifest in classifications. Hacking (2000) provides the example of the classification of groups of individuals as

'women refugees'. The classification of 'women refugees' can be seen as a construction of legislation, government workers, the legal system, newspaper reporting, immigration rules and practices, social events, dependent on the interest of the categorisers, including, at times, those women so classified. Such complex interactions are designated as a matrix and have a material effect on the environment and the actors within it. Hacking states:

> In consequence of being so classified, individual women and their experience of themselves are changed.....this contingent classification and the matrix within which it is embedded, changes how some women refugees feel about themselves, their experiences and their actions (2000, p.11).

Thus, in the context of relative age through a realist perspective, younger-in-year pupils operate within an educational social structure within which there are generative mechanisms of school terms, year groups, teachers, parents, peers and local authority rules. Experiences generated at the level of the actual, change how the younger-in-cohort pupils come to perceive themselves and, in turn, their changed behaviour feeds into how others perceive, treat and classify them.

Underpinning such socially constructed classifications is the taken-for-grantedness of a matrix within a culture. Hacking further suggests that by stepping outside, by objectifying such concepts, their socially constructed nature can be unmasked. In effect, he is advocating drilling down to deeper ontological layers to identify the structures and mechanisms to better understand what is taking place. In the context of this study, the educational system is a social structure that generates multiple interactive mechanisms and the classification of being summer-born is a structural conception. The intertwining of mechanisms, where the 'ways of classifying human beings interact with the human beings who are classified' generates not just discourse-derived identities as Hacking (2000) proposes but also renders the individual, an 'agentic subject…. capable of reflection and choice' (Elder-Vass, 2012, p.16) liable to the impact of other structures and mechanisms. Arguably, as Jameson (2002) suggests 'there is nothing that is not social and historical – indeed, that everything is 'in the last analysis' political' (p. 5). Thus, although Hacking emphasises the social, further drilling down may bring us to a political imperative. In an earlier work, Hacking (1995) identifies the 'looping effects of human kinds' (p.351) which he later describes as a 'labyrinth of interlocking alleys' (2000, p.116) due to the dynamic nature of interactive classifications. Although he is not a critical realist, it can be argued that Hacking is describing a multiplicity of generative mechanisms, which can modify what is thought to be known about classes of people, as a direct result of what they have come to believe about themselves through passively accepting what others, historically, socially and politically, say about them. Therefore, it could be argued that summer-born pupils

have become, on average, less successful in the school environment due to this loop effect.

Urrieta reinforces the importance of concepts such as self and identity within the 'figured world' of education (2007, p.107). Identifying one's place in the complex world of education occurs through socially-determined activity and significant relationships, mediated by artefacts and underpinned by powerful hierarchies. New students arriving in college for the start of the academic year will have just left the familiar figured world that is their secondary school and will be entering the unfamiliar territory presented in this next phase of their education. The mechanisms that have engendered self-applied labels such as 'smart' or 'unsuccessful' will have been derived from the intricate balance between self-generation and the acceptance, negotiation or rejection of identities on offer from those in positions of power and influence (Urrieta, 2007, p. 110-111).

One possible example of such mechanisms in practice can be drawn from the work of Lee and Stankov (2018) who analysed levels of self-belief and confidence in both the *Programme for International Student Assessment* (OECD, 2015) and *Trends in International Mathematics and Science* (IEA, 2015) datasets. They suggested that positive, projective judgments by individual students about their ability in mathematics predicted high levels of achievement in the tests. However, without considering deeper ontological levels and the potential mechanisms inherent in the educational structures, they argued that future predictions for performance correlated only with current high performance, missing the crucial impact of previous experiences and self-perceived performance. An alternative explanation for deeply held beliefs about the self, through the process of interpellation, is posited by Althusser (Crossley, 2005; Elder-Vass, 2012). Through interpellation, individuals encounter and then internalise values from the culture within which they live. How individuals come to see themselves and what they believe to be their own values is based on how others, depending on their level of influence, conceive of them and how ideas are presented to them for their consensual acceptance (Althusser, 1970). Thus, individuals can be interpellated into varying roles through their experiences at school, accepting their place as successful or less successful academic subjects. A more political and discursively constructed individual is described by Foucault (1979) who suggests that mechanisms of power operate daily at the micro level, but ultimately come to form 'the dominant system of social control in modern Western society' as individuals come to regulate and subjugate themselves through their self-disciplinary practices (Pylypa, 1998, p.21). Although Elder-Vass (2012) rejects this ideological and political interpretation, believing that the individual would be aware of their domination, Foucault's argument for complicity in such unwitting subjugation seems appropriate,

precisely because the individual believes that they have freedom of choice when, in fact, this apparent freedom is a politically and discursively-generated illusion. Such unconscious consent is manufactured and reproduced within civil society, where those oppressed take on the values of the oppressors (Gramsci, 1971). Accordingly, within schools, powerful and socially constructed mechanisms shape individuals daily, often manifesting differently due to unequal power relationships. Ultimately, students arrive in further education fiercely holding on to their pre-established academic self-concepts, whether positive or negative.

3.4 Mixed Methods

Confidently choosing to work within a critical realist and social constructionist worldview required navigating the complexities of conflicting paradigm definitions and their associated perspectives (Sommer-Harrits, 2011). The term paradigm, synonymous with worldview in some texts (Cresswell and Plano Clark, 2011) and fluid in its use over time (Guba and Lincoln, 2005; Shannon-Baker, 2016), is seen by some as a meaningless cultural cliché (Gorard and Taylor, 2004). Establishing clarity of semantic use of such terms in part resolves these difficulties. For some researchers, critical realism, social constructionism and mixed methods are each considered separate paradigms. For others there are multiple paradigms within mixed methods (Sommer-Harrits, 2011). However, there is a growing argument that methodology should be conceptualised as a single multidimensional model consisting of numerous continua (Niglas, 2010; Johnson and Gray, 2010) rather than as dichotomous and competing paradigms. Niglas (2010) rightly argues that, in contrast to textbook categorisations of distinct philosophical stances, real world researchers have ‘complex and multifaceted individual mental model[s]’ formed by a wide variety of experiences (p.219). She contests that it is no longer correct to identify distinct paradigms, rather we should accept that there are diverse and overlapping schools of thought. Taking such a multi-faceted approach to methodological choices felt appropriate for this study where realism and constructionism both resonated. Indeed, integrating both quantitative and qualitative methods to interrogate phenomena in the day-to-day management of further education is routine. Transferring this practice, albeit at a more sophisticated level for this study, enabled the strength of both approaches to be captured, and through this combination an even stronger ultimate outcome can be achieved (Gorard and Taylor, 2004, p.1).

Ultimately, research undertaken from critical realist and social constructionist perspectives requires consideration of the entirety of observed or unobserved structures, their relations and mechanisms in the messy, open and tangled social world. A mixed methods approach is seen as a natural fit for such a worldview, as within mixed methods there is

an ability to use a range of empirical evidence to infer deeper causality (Zachariadis, Scott and Barrett, 2013). Such an approach increases the rigour of the research by drawing on the strengths of at least two different research methods, using both qualitative and quantitative tools, and thereby compensating for the limitations of each. The question of how much weight or priority to give to each dataset in mixed methods research is controversial (Ivankova, Cresswell and Stick, 2006). Greene and Hall's (2010) insistence that equal weight should be given to both sets of data was rejected, not due to the significant disparity in numbers between each set of data, but because the purpose was to generate sufficient evidence to be able to combine the findings and explain why the data appeared as it did (Olsen, 2007, p.1).

3.4.1 Explanatory sequential design

A mixed methods approach requires consideration of how the research will be implemented, rigorous data collection and integration of the datasets at a predetermined point (Ivankova, Cresswell and Stick, 2006; Shannon-Baker, 2016). In mixed methods studies strands of research are undertaken either concurrently or consecutively (Morgan, 1998). For this study it was decided to adopt an Explanatory Sequential design, taking the outcomes of the quantitative phase to identify purposively the participants for the qualitative phase to offer tentative answers to the research questions (Ivankova, Cresswell and Stick, 2006; Cresswell and Plano Clark, 2011; Cresswell and Cresswell, 2018).

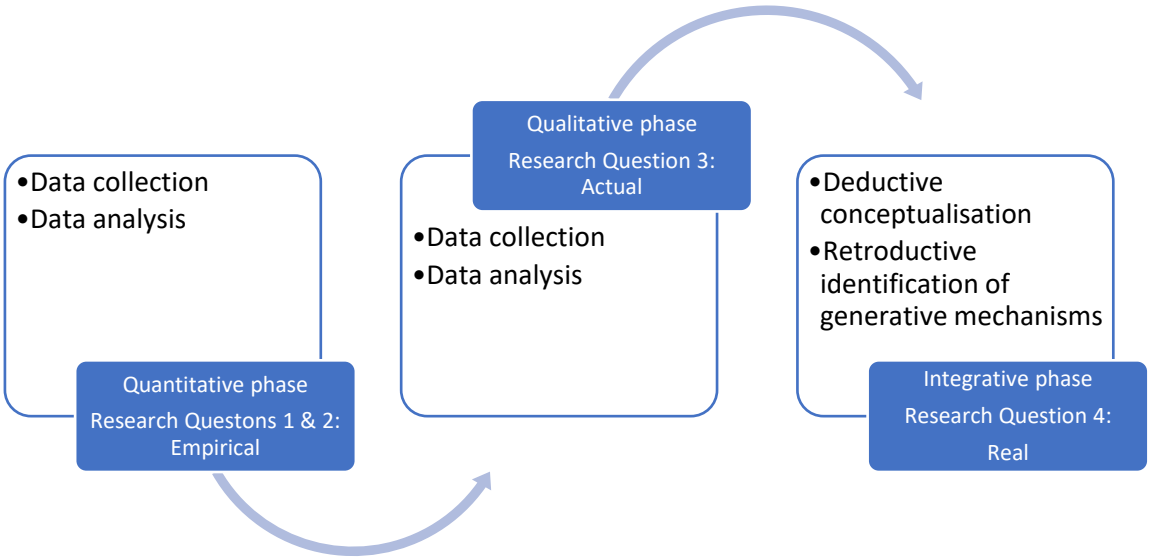

Figure 3.3: *The Explanatory Sequential approach undertaken in this study.*

This approach fitted well with a critical realist retroductive approach (discussed below) and was also advantageous to a single researcher as it enabled data to be collected in phases

over an extended period. The three phases of the Explanatory Sequential approach to the study are shown in Figure 3.3. The initial quantitative phase informs the purposive selection of participants in the qualitative phase. Subsequently, data and analysis from both phases are integrated through a retroductive approach that identifies possible generative mechanisms.

3.4.2 Retroduction

Retroduction is a process of reasoning, favoured by critical realists, that requires the researcher to immerse themselves into the field of study, but simultaneously keep their assumptions about that field weak. It entails asking penetrating questions about the object of research, in this case the existence of the relative age effect in further education, such as: what must be true for the relative age effect to be possible?; why do the data suggest that the relative age effect exists?; how can I adjust my assumptions about the relative age effect in a manner which remains consistent with the mechanisms emerging and personal experience?; why does the relative age effect affect only some students and not others? (Bhaskar, 2008; Olsen, 2007, Zachariadis, Scott and Barrett, 2013). Considering this last question, critical realists (Lawson, 1997; Bache, 2003) point to the importance of demi-regularities which are defined as partial event regularities due to the 'occasional but less than universal, actualisation of a mechanism or a tendency, over a definite region of time-space' (Lawson, 1997, p. 204). Given the research evidence in the field of the relative age effect, it would not be expected that every summer-born student would be equally affected by their month of birth even though the quantitative evidence indicates there is an effect present in further education. It would be expected to find that there was a middle ground between a completely linear correlation between month of birth and academic outcome on the one hand and an entirely random distribution on the other. This effect is produced by context-dependent countervailing mechanisms, whilst still showing some evidence of a relatively enduring event (Lawson, 1997). Therefore, it would be normal to see both patterns and fluctuations in the data that are present at a given time and in a particular context, which are generated by underlying structures and mechanisms (Jagosh, 2019). Rather than a disadvantage of the design, any discrepancies were regarded as part of an appropriate critical realist challenge to explore more deeply the underpinning structures and mechanisms, thereby bringing together the underlying philosophical ideas and refuting Biesta's (2009) criticism of this sequential approach. It is accepted that neither quantitative nor qualitative methods are without issues, which will inevitably still be present in a mixed methods approach. For example, quantitative methods are wholly dependent on the integrity of the original dataset as there will always be errors and omissions. Researcher choices around what to measure, and crucially what is left unmeasured, are also significant. In this study the quantitative dataset was relatively

large, and the analysis is potentially repeatable in other colleges, which gives tentative reliability to the findings. At the same time, the classifications within the college dataset from the Individualised Learner Record (ILR) such as gender, ethnicity, and disability were all pre-determined and concept-dependent assumptions.

3.5 Ethics

In this study ethics are taken to include the way individual participants and their data are treated, and the quality and purpose of the research undertaken in terms of design, collection, analysis and final dissemination (Brooks, te Riele and Maguire, 2014, p.5). Approval to conduct the research was given by the Head of Higher Education within the research site. With supervisory support, full ethics approval was sought and obtained from the university's Research Ethics Committee.

The ethical approach taken was situated, in that every action and decision in the ongoing research process was made based on moral judgements of right and wrong rather than a rule-based approach (Simons and Usher, 2000; Heath et al., 2009). This section outlines how this situated ethical approach was undertaken ensuring ethical considerations were present and reviewed throughout the duration of the study. The careful and informed handling of participants and their data is outlined below, but attention is initially focused on the research quality and purpose.

3.5.1 Research quality and purpose

All research happens in a cultural, societal, historic and philosophical context. These elements frame how research is conducted and determine what emerges (Clark et al., 2014, p. 11). Choosing critical realism as the theoretical framework for this study was situated in a desire to achieve high quality responses to the research questions through focusing attention on the underlying causes and mechanisms that manifest in real life for further education students, rather than only reporting data, albeit through the lens of month of birth. As critical realism embraces both perceptual and theoretical knowledge, it was an appropriate philosophical tradition from which to undertake a mixed methods approach, enabling both a quantitative phase that would be of interest to policy makers and a qualitative phase that enabled the lived experience of summer-born students within further education to be highlighted (Mingers, Mutch and Willcocks, 2013). Combining a critical realist approach with social constructionism increased the ethical validity of the approach by acknowledging the joint construction of meaning in our social worlds and the extent to which these worlds are shaped and reshaped through contextualised actions (Galanes and Leeds-Hurwitz, 2009).

As an insider, I had the advantage of being granted access to the research setting and the detailed dataset that would not have been so readily available to an outsider. Although detailed and regular analysis of data is part of my daily workload within this further education college, such privileged access for research entailed very careful consideration of ethical and data protection issues. Thus, this study was subject to a rigorous process for both ethical approval and compliance with General Data Protection Regulations (GDPR).

Having access to both the research setting, the participants and their data increased the validity and reliability of the research, as the research questions posed were derived from considerable personal experience in the sector and knowledge of what data was potentially available for scrutiny. However, care had to be taken to avoid a loss of objectivity or the introduction of bias through over-familiarity with the setting. The purpose behind the research questions was the desire to raise the level of knowledge and understanding of FE as an important sector when considering the impact of relative age in educational settings. The intended audience for this study and its recommendations extends beyond those involved in the doctoral process, and includes fellow educational researchers, other professionals in the field and potentially national policy makers. Thus, the research can be ethically justified beyond a purely utilitarian rationale, where the end justifies the means. There is an agential ethical principle within this research because the unique contribution of this research, in terms of its focus on an under-studied educational sector, directly relates to an area of educational experience that impacts on the life chances of many young people (Brooks, te Riele and Maguire, 2014, p.25).

3.5.2 Quantitative data ethics

The quantitative dataset requested for this study was a highly limited extract from the extensive data held by the college. The data was thus sufficient for the purpose of the enquiry and did not hold any unnecessary information (Jones, 2000). Participant consent for the quantitative data was derived from the student privacy notice that included reference to data being used for research purposes, which was approved as sufficient for this study by the college's Data Protection Officer. Indeed, such a generalised consent is a sensible and balanced approach for a large, extant dataset that is already being used for statistical analysis and to determine funding claims. (Elliot et al., 2016). The resultant ethical issues for data gathering and protection included choosing appropriate methods for recording, processing, storing and transferring data and, subsequently, ensuring that no participant could be identified in the written or graphical reporting. The aim was to render the data 'functionally anonymous' (Elliot, et al., 2016, p.15), making the risk of re-

identification negligible within the environment in which it was released. As detailed in Appendix A, a Data Protection Impact Assessment was written and approved by the college's Data Protection Officer, setting out the steps in the process and the protective measures put in place, including data de-identification, data transfer and storage protocols. The quantitative data from the Individualised Learner Record were de-identified by the Management Information Systems team within the college group prior to its release for research purposes. De-identification involved the removal of the direct identifiers: all names, student code and address. However, each student's date of birth remained as an identifier as this was crucial to the study's purpose. De-identification is only one step towards anonymisation (Elliot et al. 2016), so to further anonymise the data five percent of the original dataset were randomly removed using a random integer set generator identifying 257 (5%) row code numbers between two and 5155 (Random, 2020). The remaining 95% of students (n= 4897) formed the basis for this study. Nevertheless, as the data were drawn from the Individualised Learner Record and this original dataset remains intact, potential reversal of the data was theoretically possible internally, but not in the external data environment into which the findings would be released (Elliot et al., 2016, p. 16).

Due to the nature of the statistical analysis planned, further consideration had to be given to the possibility of identification through the recombination of multiple variables derived from a small number of participants per variable, known as *k*-anonymity (Samarati and Sweeney, 1998). For example, the combination of remaining indirect identifiers such as year of study, month of birth, course level, gender, ethnicity and specific learning difficulty might enable the potential identification of an individual if only one participant met given criteria. Therefore, a minimum value of five was chosen for all reported data, and certain parameters had to be combined to reach this minimum value. For example, the ten Indices of Multiple Deprivation categories were aggregated to five to ensure this minimum level of anonymity was met without distorting the results more than necessary (Samarati and Sweeney, 1998, p.1). Data suppression was used to retain *k*-anonymity in reporting the incidence of dyscalculia by month and for Entry Level by age group, as category aggregation would have disrupted the analysis of other categories. As the data involved was non-hierarchical, consisting of discrete individuals rather than households for example, and a snapshot in time, identification risk was further reduced.

3.5.3 Qualitative data ethics

Participants in this research were aged 16-18 and, therefore, deemed to have sufficient capacity to understand the nature of the activity and be able to make their own fully

informed and freely-chosen decisions about taking part (Woodhead and Faulkner, 2008). Participants were given a full overview of the research purpose and reminded throughout that they had the right to withdraw without giving a reason up to the point the data was analysed. Permission, thus granted, is, nevertheless, a westernised, liberal concept of an individual's capacity and right to give informed permission (Hammersley and Traianou, 2012). As such, there was an implicit expectation that the participants would present their accounts in a linear, reflexive way and 'narrate themselves earnestly through a confessional, self-conscious account' (Alldred and Gillies, 2012, p. 148), conforming to the tacit power differential between the researcher and the researched, by trying to give the perceived correct answer (Flewitt, 2014, p.146). The experiences recounted must be acknowledged as a modified and selective version of school experiences, brought forward within the context of the participant having progressed to further education college rather than staying on at school (Freeman and Mathison, 2009). In addition, those who volunteered to take part were likely to be those most 'articulate, confident and interested' among the accessible population, and, therefore, the responses can only be taken as representative of that subset of all potential participants (Clark et al., 2014, p.79). Recording and sharing the subsequent analysis cannot be taken as 'giving voice' to participants, as this is a complex notion in a situation in which individuals are likely to respond to meet the interviewer's expectations. Indeed, the authenticity of any accounts cannot be confirmed. At best, the stories told were historic accounts, contextualised and co-constructed to the extent that the interviewer and participant engaged in a reciprocal dialogue throughout (Freeman and Mathison, 2009, p.92).

A key consideration was the possibility of causing actual harm by asking probing questions about the participants' school experiences. Concern for the wellbeing of the participants had to be balanced against my personal scholastic gain and the possibility of finding evidence that contributed to knowledge about the impact of being summer-born, which, in turn, could contribute to beneficial alterations in approaches and policy at both a local and national level (Flewitt, 2014). The chances of exploitation of the participants were minimised due to the explicit nature of the consent obtained using a detailed participant information sheet and consent form as shown in Appendix A and checking verbally that the participants were comfortable to proceed. However, there was still the risk that by focusing attention on the concept of being summer-born, I was creating or reinforcing the 'small, glass cage' for the objectified victim, that had not previously existed or been consciously to the fore (Anderson, 2014, p.93). Although the actual questions asked in the interview were as open-ended as possible, and participants had the choice whether to answer them or not, nevertheless, when offering opportunities to participate in

the research, the focus on being summer-born was explicit and framed the subsequent interactions. Interviews were conducted in a positive and appreciative manner, actively seeking opportunities to affirm contributions and validate experiences. The immediate sharing of a thank you leaflet after the interview also presented the opportunity to identify successful people who shared the same summer birthday as the participant.

The post-interview analysis was inevitably undertaken through the lens of my own adult life experiences and value system as a summer-born (Flewitt, 2014; Hammersley, 2014), requiring constant reflexivity from my perspective (Simons and Usher, 2000). Following the interviews, participants were followed up by email three times over a period of three weeks. Each participant received a £20 Amazon voucher to thank them for their participation. Due to COVID restrictions all participants were recruited via a short online presentation in one of their normal classes and all interviews were also conducted online with audio-only recording. Each participant immediately received a single page leaflet that highlighted successful and famous people who shared their specific birthday but also included my contact details and those of the college counsellor should they wish to talk further. Recordings were transcribed within one week of the initial interview and sent to the participant for checking, deletions and amendments. Once the transcription was confirmed, the audio recording was deleted, ensuring that the privacy and the anonymity of each participant was given primacy. Each participant was re-contacted two weeks after having approved the transcription to check that they were not experiencing any negative repercussions following the interview. All participants were happy to have participated and none reported any ill effects of having revisited their school days. Although such reciprocity in no way compensates for the power inequality of the relationship, nevertheless, the actions taken were an attempt to undertake the research in an ethical and responsible manner (Freeman and Mathison, 2009). Bearing all these considerations in mind, seven interviews were conducted as at that point no significantly new data were emerging and there was sufficient evidence to carry out the analysis.

3.6 Phase One: Quantitative

3.6.1 Rationale

Within the initial, quantitative phase of the Explanatory Sequential approach, and working within a critical realist perspective, research questions one and two initially required a descriptive response looking for indicative configurations in the data that could then be further investigated in the later qualitative and integrative phases (Zachariadis, Scott and Barrett, 2013). Examples of such a descriptive approach are found in the research literature (Wilson, 2000; Dhuey and Lipscomb, 2010; Navarro, Garcia-Rubio and Olivares,

2015). The population, sample and procedure undertaken in relation to each research question are described below. None of the studies in Chapter Two had access to such an extensive dataset for a post-16 setting, so appropriate, comparative statistical procedures were identified from across the full range of the available literature. Very few studies (Russell and Startup, 1986; Musch and Hay, 1999) considered the underlying pattern of births across different months of the year as points of comparison for the datasets they analysed. However, in those studies that did take the underlying birth pattern into consideration, far greater confidence could be given that the patterns found were truly those of the relative age effect and not simply a typical seasonal variation. Therefore, comparison to national population birth pattern data was central to the initial phase of this analysis. Following the statistical methods chosen by the stronger studies in the literature review (Musch and Hay, 1999; Wilson, 2000; Martin et al., 2004; Cobley, Abraham and Baker, 2009), tests for difference and tests for strength of association between data in the sample and months of the year in academic order were also undertaken.

3.6.2 Population and sample

The review of literature showed that the relative age effect, defined as the impact of month of birth on educational achievement and progression, with those born later in any given academic year as the most negatively impacted (Cobley, Abraham and Baker, 2009) is identifiable in several different countries around the world (for example: Borg and Falzon, 1995; Martin et al., 2004). This study focused on England only. The target population for this study (Gaciu, 2021) was all those who had progressed through the English age-stratified education system. For this study the target population was derived from the Office for National Statistics dataset for all births in England and Wales between 1994 and 2015 (Office for National Statistics, 2015a). This target population included all those who had been formally educated in England following the raising of the participation age in 2015 (Department for Education, 2016). Of relevance to this study, the target population data included young people born from 1 September 1998 – 31 August 2001. These young people were in school sixth forms or sixth form colleges, in apprenticeships, in employment with substantial training, in FE colleges or not in employment, education or training (NEET) in 2018-19. If there were no difference between the England and Wales' target population pattern of births by month and those observed amongst the 16-18 year old students enrolled to Study Programmes in the college, then there would be no evidence for the existence of the relative age effect within further education.

Differences in enrolment, outcome and progression are routinely monitored for different characteristics in further education colleges, including gender, ethnicity, specific learning difficulty and socio-economic group, but not relative age. Even small differences of

between one to five percent by characteristic are identified and action planned for reduction through detailed improvement planning that is monitored for impact throughout the year. As a result, larger differences are unusual, but always identified. Therefore, in further education terms, any identifiable difference above one percent is significant because it represents a large number of individuals (1% = 49 students in this dataset).

The accessible population for this study were students enrolled in the college (Gaciu, 2021). The college is a General Further Education college and can therefore be deemed to be representative of the sector, at least in the south of England. The sample chosen from within these colleges were the 16-18 year old Study Programme students (n=5155) for the single academic year 2018-19. The date parameter was chosen because 2018-19 was the last year for which verified data was available, as data for 2019-20 was affected by COVID-19. The choice of this sample was driven by the desire to access a substantial and complete as possible dataset of students who had recently left the school system. These students were, therefore, relatively similar in age and academic experience, and provided an opportunity for detailed data interrogation.

3.6.3 Data analysis procedure

In accordance with ethical permissions given through the university's Research Ethics Committee, a specific dataset was requested from the organisation's Management and Information Systems team in a de-identified format against twelve key variables. The data requested was from the statistical return that must be provided by each further education institution to the national funding body, the Education and Skills Funding Agency (ESFA). The statistical return, known as the Individualised Learner Record (ILR), is required for all government-funded programmes including all Study Programmes. The ILR identifies the learning provider, details of the individual learner, their programme of learning, their destination and progression. In total, there are 139 different variables which are updated and submitted monthly for fourteen consecutive months starting in the September of enrolment and concluded in a final return in the following December. This closing return is the most accurate as it determines the amount of funding an institution will receive for the following academic year, known as lag funding. Restricting the quantitative data to the final 2018-19 return, to only Study Programme students and to twelve key variables from the ILR was an attempt to set boundaries on the openness of the research and move towards a somewhat more closed system, although this was inevitably only a partial shift. The variables of date of birth, gender, disability, ethnicity and socio-economic status were chosen to reflect the most likely areas where the relative age effect might be detected, based on the existing literature in this field. Additionally, variables specific to the English further education system were included to deepen the analysis, including level of main

programme enrolment, completion status and English Language and Mathematics qualifications on entry. English Language and Mathematics GCSE outcomes and attendance were also requested, although these did not form part of the ILR return. These extra variables enabled a more nuanced and insightful analysis to be undertaken. Data supplied was from the final return for the 2018-19 cohort.

Indices of Multiple Deprivation were only available for 2950 out of the remaining 4897 entries (60.2%) in the ILR. Gaps were due to newer postcodes not being included in the indices which were issued in September 2015, based on tax records from 2012-2013 which had been applied prior to the data being provided for this research project. Updated Indices of Multiple Deprivation were released later in 2020, but I was unable to apply them to this dataset because, for reasons of data protection, the original dataset supplied did not include postcodes. The indices are generated from a set of related deprivation indicators from small geographic areas, designated lower-layer super-output layers from the second half of postcodes, created by the Office for National Statistics (2015b) for England. To arrive at the final score seven areas of deprivation are combined in a weighted algorithm based on deprivations factors including income, employment, health and living environment, and crime reports. Scores are given in a range 1-10, with 1 being low.

Specific learning difficulties (dyslexia and dyscalculia) and mental health difficulty were chosen as the categories that were arguably environmentally influenced or contingent, as opposed to others that were pre-existing physiological conditions such as hearing impairment, autistic spectrum disorder or severe learning disability. Dyslexia is specifically mentioned as over-identified in primary settings for those younger-in-year and dyscalculia identification, although not mentioned in the research evidence, could be extrapolated to be similarly impacted (Crawford, Dearden and Meghir, 2007). Equally, mental health difficulties have been shown to co-exist with relative age effects for younger-in-cohort children (Thompson, Barnsley and Dyck, 1999; Thompson, Barnsley and Battle, 2004).

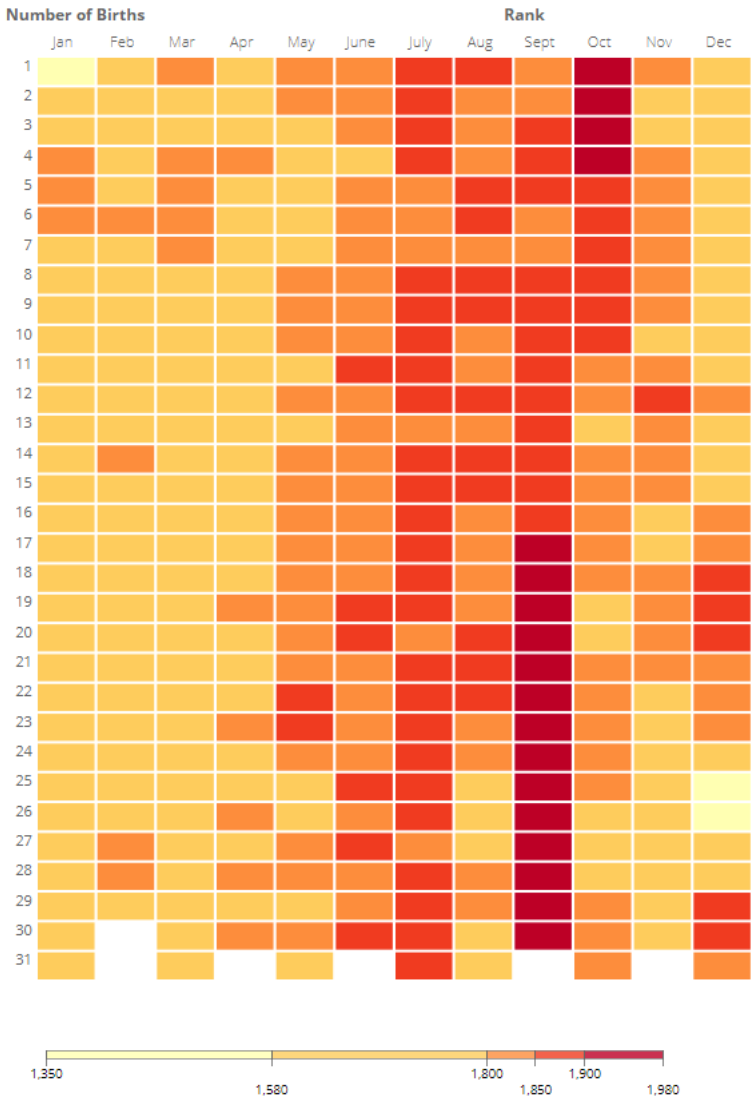

Figure 3.4: *Average daily births derived from birth registrations in England and Wales 1995-2014 (ONS, 2015a).*

National trends in births across different months were derived from the Office for National Statistics database of all births in England and Wales between 1995 and 2014 (2015a). This longitudinal national data reveals that there were relatively more births between May and early November, indicated by the dark orange to dark red colours, in comparison to late November through to the end of April indicated by pale to mid-yellow colours, as shown in Figure 3.4.

It was important, therefore, to be sure that any variation in the frequencies of birth by month in the ILR data was not simply a reflection of an underlying frequency fluctuation in the overall population but the typical distribution. Table 3.2 shows the distribution of births by months of the year based on the ONS data (2015b). If every month were of equal length in terms of days and an equal number of births occurred in each month, the distribution of births by month would be uniform at 8.33%. Instead, months vary in length

by as many as three days (10%). Therefore, to allow for a more accurate comparison to the ILR data, the expected frequency of births per month was calculated and adjusted for leap years. From this calculation the deviation from the actual births for each month was computed.

Table 3.2: Actual and probable frequency of births by normalised months derived from the ONS (2015a) dataset for births in England and Wales 1995-2014.

Month of birth	*Number of days in month*	*Probable relative frequency of births based on actual days in month*	*Actual frequency of births*	*Probable frequency of births based on actual days in month*
September	30	8.2%	57035	54397
October	31	8.5%	56972	56211
November	30	8.2%	54054	54397
December	31	8.5%	54754	56211
January	31	8.5%	54951	56211
February	28.25	7.7%	50485	51224
March	31	8.5%	55150	56211
April	30	8.2%	53264	54397
May	31	8.5%	56071	56211
June	30	8.2%	55027	54397
July	31	8.5%	57754	56211
August	31	8.5%	56773	56211
Total	**365.25**	**100%**	**662289**	**662289**

A limitation to note, however, was that not all students in the 2018-19 ILR dataset would have been born in either England or Wales. The country of birth is not recorded in the ILR, so it is not possible to quantify the number of students who were born outside England and Wales. The assumption made by using the national dataset was that birth trends are uniform across the years and across different regions and that the ILR data was equally uniform. This assumption, although reasonable given the size of the datasets, could not be confirmed with the data available.

3.6.4 Statistical treatment and how data represented

3.6.4.1 Research question one

The first research question asked to what extent summer-born students are over-represented in further education Study Programmes. Therefore, inferential statistical tests were undertaken to detect any underlying differences in the relative frequency of students born in the summer months in comparison to that predicted from the national data (Office for National Statistics, 2015a). In other words, if the relative age effect was present within the sample then it would not match the population data which could have no relative age

effect within it. The first stage was to describe with precision the relative frequency of birth month for all Study Programme students in the Individualised Learner Record (ILR) dataset for 2018-19 and then compare this distribution with the relative frequency of births by month derived from the Office for National Statistics data (2015a), as shown in Table 3.2. The frequency of births in each month was calculated and then expressed as a percentage by dividing the frequency by the total number of students (n=4897). Both sets of data are interval and were checked for normality and variance (homogeneity) and found to be normally distributed based on the results of QQ plots as shown in Appendix B.

This finding from the QQ plots was confirmed by the results of a Shapiro-Wilk normality test. Therefore, a t-test was chosen as the most suitable inferential test, as it compares the sample and population means and the sample size was under 30 (Gaciu, 2021, p. 185).

3.6.4.2 Research question two

The second research question took into consideration the variables of student age and level of the main programme of study, calculated in the same way as for the overall ILR data and expressed as a percentage of frequency for each month. All student ages were calculated as on 1 September 2018 and the level of the main programme of study was given as part of the ILR dataset. Student ages are interval data and were found to be normally distributed, so a t-test was chosen as the most suitable inferential test. Levels of study are based on the nine qualification levels ranging from Entry to Level 8 for England, Wales and Northern Ireland. Entry level is further subdivided into three levels from Entry 1 to Entry 3, Level 1 includes GCSE Grades 1-3 (D-G), Level 2 includes GCSEs Grades 9-4 (A*-C), and Level 3 includes A Levels. Vocational main programmes are offered between Entry 1 and Level 3, but as these levels are not equally spaced, a nonparametric test was most appropriate as there could be no assumption of normal distribution. A Wilcoxon signed-rank test was chosen as the most appropriate inferential test. For other variables that were nominal (declared difficulty, gender and ethnicity), a nonparametric test, the Pearson chi-squared test, was chosen as the most suitable inferential test. For the remaining ordinal variables (GCSE incoming and outcome grades, socio-economic rank), the nonparametric Wilcoxon signed-rank test was chosen as the most suitable inferential test, as it is suitable for testing the difference between two independent samples (Gaciu, 2021, p. 220). An alpha level of 0.05 was chosen as a reasonable threshold level for all tests. These decisions are summarised in Table 3.3.

Evidence within the ILR dataset was then examined to measure any association between month of birth in academic year sequence and the other variables including age, level of programme, gender, ethnicity, socio-economic rank and declared difficulties. In

accordance with a critical realist approach to causality, there was no expectation of direct cause and effect between gender, ethnicity, socio-economic rank, declared difficulties and month of birth.

Table 3.3: Tests used to determine differences between groups where month of birth is the independent variable.

Variables	**Scale of measure-ment**	**Dependent/ independent**	**Test for normality of distribution**	**Test for homogeneity of variance**	**Test for difference**	
			QQ Plot	**ANOVA**	**Parametric /nonparametric**	**Test**
Age	Interval	Independent	Normal	Not fulfilled	Parametric	t-test
Level	Ordinal	Independent	Normal	Not fulfilled	Nonparametric	Wilcoxon signed rank test
Attendance	Interval	Independent	Normal	Not fulfilled	Parametric	t-test
Declared difficulty	Nominal	Independent	Normal	Fulfilled	Nonparametric	Pearson's chi-squared test
GCSE incoming grade	Ordinal	Independent (unpaired)	Normal	Fulfilled	Nonparametric	Wilcoxon signed rank test
GCSE outcomes	Ordinal	Independent (unpaired)	Normal	Fulfilled	Nonparametric	Wilcoxon signed rank test
Socio-economic rank	Ordinal	Independent (unpaired)	Normal	Fulfilled	Nonparametric	Wilcoxon signed rank test
Gender	Nominal	Independent	Normal	Fulfilled	Nonparametric	Pearson's chi-squared test
Ethnicity	Nominal	Independent	Normal	Not fulfilled	Nonparametric	Pearson's chi-squared test
Completion	Interval	Independent	Normal	Fulfilled	Parametric	t-test

However, these variables could all be considered social structures within the context of the English educational system, generating their own causal mechanisms with emergent powers that influence and are influenced by the mechanisms generated by the social structure of the month of birth. Gender, ethnicity, and socio-economic rank are, arguably, all at the same level of social stratification as month of birth. Declared difficulties may also be considered at the same stratum, based on a biological difference, or, alternatively, at a higher stratum if the difficulties have been generated by educational experiences. These variables were chosen because they are the key indicators of diversity against which FE data is measured and are, therefore, actively targeted for reduction in inequality, unlike month of birth.

Pearson's product moment correlation coefficient was chosen as the parametric test for investigating correlations between month of birth in academic year sequence, age, attendance and completion, as all are interval scales of measurement, normally distributed and independent of each other (Gaciu, 2021, p. 303). For the variables of

gender, ethnicity and declared difficulties, tests for normality and equality of variance were undertaken as shown in Appendix B. For gender, ethnicity and declared difficulties, although the distribution was normal, the variance was unequal. For the variables that were either ordinal or nominal, i.e. level of programme, declared difficulty, GCSE incoming and outcome grades, socio-economic rank, gender and ethnicity, a non-parametric test, the Spearman's correlation coefficient, was computed to determine their correlation with month of birth in academic year sequence (Salkind and Shaw, 2020, p. 150). Tests for strength of association are summarised in Table 3.4 below.

Table 3.4: Tests used to determine strength of association with month of birth in academic year sequence.

Variables	**Scale of measure-ment**	**Dependent/ independent**	**Testing for normality**	**Testing for variance**	**Testing for strength of association**	
			QQ Plot	**ANOVA**	**Parametric/ nonparametric**	**Test**
Age	Interval	Independent	Normal	Not fulfilled	Parametric	Pearson's product moment correlation
Level	Ordinal	Independent	Normal	Not fulfilled	Nonparametric	Spearman's rank correlation coefficient
Attendance	Interval	Independent	Normal	Not fulfilled	Parametric	Pearson's product moment correlation
Declared difficulty	Nominal	Independent	Normal	Fulfilled	Nonparametric	Spearman's rank correlation coefficient
GCSE incoming grade	Ordinal	Independent	Normal	Fulfilled	Nonparametric	Spearman's rank correlation coefficient
GCSE outcomes	Ordinal	Independent	Normal	Fulfilled	Nonparametric	Spearman's rank correlation coefficient
Socio-economic	Ordinal	Independent	Normal	Fulfilled	Nonparametric	Spearman's rank correlation coefficient
Gender	Nominal	Independent	Normal	Fulfilled	Nonparametric	Spearman's rank correlation coefficient
Ethnicity	Nominal	Independent	Normal	Not fulfilled	Nonparametric	Spearman's rank correlation coefficient
Completion	Interval	Independent	Normal	Fulfilled	Parametric	Pearson's product moment correlation

In accordance with the ethical data protection agreement both the ethnicity and socio-economic rank data were aggregated to eliminate any potential small, and therefore identifiable, results. For ethnicity the nineteen possible categories were reduced to six as

shown in Table 3.5. The socio-economic ranks were ordinal, ranked from 1-10 in the original dataset, where one represented the most deprived and ten represented the least deprived. These ten levels were aggregated to five levels, to remove the possibility of individual identification through small numbers in the results. In contrast, mean attendance was a continuous, normally distributed variable with an insignificant skew. Following the work of Cobley et al. (2009), which compared attendance rates by low, middle and high categorisations with relative age within a year cohort, a similar analysis was undertaken for the college-derived data, breaking attendance patterns into the lowest 20%, the mid 60% and the highest 20%.

Table 3.5: Aggregation of Individualised Learner Record ethnicity categories.

Overarching ethnic group	**Included:**
White	English; Welsh; Scottish; Northern Irish; Irish; Gypsy or Irish traveller; any other White background
Mixed/multiple ethnic background	White and Black Caribbean; White and Black African; White and Asian; any other mixed/multiple ethnic background
Asian and Arab	Indian; Pakistani; Bangladeshi; Chinese; any other Asian background; Arab
Black	African; Caribbean; any other Black/ African/ Caribbean background
Any other ethnic group	Any other ethnic group

3.7 Phase Two: Qualitative

3.7.1 Rationale

The second, qualitative phase of the Explanatory Sequential approach was designed to answer the third research question which asked how summer-born students on further education study programmes described the events and actions that contributed to their academic journeys. The pre-existing research literature revealed no evidence of a similar narrative approach, consisting only of quantitative enquiries based on pre-existing organisational, sector and survey data, that were re-purposed for the requirements of the research. By interviewing individuals through a conversational approach, I intended to enable individuals to describe their personal experiences through the stories they told. By listening to these stories, the intention was to identify the events and actions that they reported and thereby offer an interpretation based on their contributions (Riessman, 1993). Such qualitative methods are considered highly epistemologically valid in a critical realist approach (Tsoukas, 1989, p.556). The entities which form the social structures are both contingent (subject to context) and depend on concepts. Actors in such social worlds use concepts which they then, in turn, go on to shape (Sayer, 1992). A qualitative

approach was used to explore the participants' concepts of their school experiences, the development of their academic self-concept and any possible link to the relative age effect. The sample and procedure undertaken are outlined below.

3.7.2 Sample

A purposive sample of participants for the second phase of research was recruited based on the patterns of evidence of the relative age effect found in the first phase of the study. As a result of these findings, of particular interest were students born in May, students who were on Level One and Level Two courses, students who had progressed to a Level Three course having already spent at least a year at college and those who were retaking English Language and/or Mathematics. A mix of genders and ethnicities was desired, plus one or two students who had gone straight into a Level Three course for comparison. Students who might meet these criteria were sent a digital flyer as a banner on their main student dashboard for a period of two weeks to gather possible responses. Further opportunities to take part were offered by me giving a short overview of the project by joining four different online classes where potential participants were likely to be found. When potential participants responded, their eligibility in terms of birth month was checked and the research participation protocols, including the right to withdraw and confidentiality, were introduced. Originally, it had been hoped to recruit participants who were also represented in the dataset from the 2018-19 academic year, but this proved impossible due to having to delay the recruitment of participants due to COVID-19. This second phase sample consisted of seven individuals, as upon analysis this was the number at which saturation of responses in the data was identified. Participant characteristics are summarised in Table 3.6.

Table 3.6: Qualitative phase participant demographics

Gender	**Ethnicity**	**Age**	**Course Level**	**Retaking GCSE English Language and/or Mathematics**
4 male students 3 female students	1 Asian British - Chinese student 1 Asian student 5 White British students	5 students aged 16 2 students aged 17	2 at Level 1 1 at Level 2 4 at Level 3 (2 having taken a lower level course last year)	3 English Language 2 Mathematics

3.7.3 Interview procedure

To prompt conversation about school events and experiences a selection of thirty images was displayed through screen-sharing at the outset of the interview. Images have frequently been used as triggers to stimulate discussion in research interviews (Van Leeuwen and Jewitt, 2001; Croghan et al., 2008; Keats, 2009) because they can

conceivably allow participants to gain access to obscure aspects of experience or identity (Rose, 2012). Connections between an image and personal experience is not dependent on the image itself but in the collaborative articulation of its significance between the participant and the researcher (Croghan et al., 2008; Evans and Hall, 1999). Maps, drawings and historical photographs have all been used in visual research methods along with pre-existing images taken from popular media (Torre and Murphy, 2015). Any image can have both connotative and denotative meanings for study participants. The usefulness of an image in an interview is not necessarily based on who created the image, but the way a participant defines and interprets it. By providing pre-existing images as triggers, connotations brought by the participants could be layered onto literal meanings denoted by the images (Van Leeuwen and Jewitt, 2001).

Although considered as an approach, asking participants to take their own photographs to represent their prior experiences and bring to the interview was considered too problematic as they had left their previous school settings and the interviews took place during lockdown. It would also have been difficult in ethical and legal terms to ensure that no recognisable images of people were included without their explicit permission. Instead, a selection of visual and textual images drawn from the work of designer Alan Fletcher was used that were accessible and colourful (Fletcher, 2001; Fletcher, Gibbs and Myerson, 2004). These images were chosen as I had already successfully used them in a variety of different learning activities with students aged 16-18. Using pre-existing images was intended to make it easier for participants to surface opinions and school memories rather than relying on direct questioning alone (Radley and Taylor, 2007). The chosen set of images was extensive and offered a range that could be interpreted in a variety of ways, intending to offer neither overtly positive nor negative connotations. A sample of the images used is shown in Appendix C. Image choice was important so as not to suggest earlier difficulties in school and thereby unintentionally trigger negative memories for the participants. Openness of the images to interpretation (Lynn and Slea, 2005) was a strength, and no different from the ambiguity of written or spoken words, contrary to Frith et al.'s (2005) claim that visual data is more polysemic than text. There were no people represented in any of the images used but this was not seen as a disadvantage. In similar photo-elicitation research using participants' own images that had explicitly excluded people, people still got 'into the study' by being referenced anyway (Radley and Taylor, 2007, p. 82). The choice of the images meant treading a fine line between stretching the connotative thread too far at one extreme and imposing my own value-laden choices at the other, although choosing the set of thirty images inevitably meant imposing my own choices to some extent. Nevertheless, the approach was pursued because using visual

stimuli is claimed to be a better approach for those participant groups who are harder to reach, who may have low levels of literacy or who might have regarded school as an unsafe space, as Rose suggested for a variety of urban environments (2012, p. 299). Reflecting on the use of the images as triggers after the interview phase was complete, I concluded that they were only helpful in a minority of cases. By using random, non-school specific images participants were required to make mental associations back to school experiences through the trigger of the images, which was potentially harder than if the images had been of school settings. However, it is possible that for those few participants where they worked best, the process was worthwhile, as they needed to work from the images to extract their experiences, as opposed to the more confident contributors who already knew the stories they wanted to tell.

The individual semi structured interviews were conducted online rather than in person due to social distancing restrictions. As some participants found it difficult to provide actual signatures for their consent forms due to being in lockdown, printed names were sent back by participants in place of signatures. Initially, I explained my interest in the participant's time at school. To confirm consent each participant's information sheet details and each of the points on the consent form were thoroughly reviewed prior to the start of the interview. Careful checks were made on the participant's willingness to continue and for the interview to be audio-recorded. The participants' ability to withdraw at any point until the data was processed was reiterated.

Questions were asked in a specific sequence:

1. Take your time to look at the images on the shared screen. Please choose one that reminds you of a story or an event when you were at primary school.
2. Tell me about your image?
3. Would you like to choose another image for primary school?
4. Tell me about this image?
5. There are still lots of images to choose from. Please choose one that reminds you of a story or an event when you were at secondary school.
6. Tell me about your image?
7. Would you like to choose another image for secondary school?
8. Tell me about this image?

Depending on the responses, further questions were posed including:

1. Is there anything else you want to add?
1. Can you tell me more about how you got on with English and maths at school?
2. How did you feel about your teachers/your classmates?

3. Did you get involved with school sports or clubs?
4. Were you aware of being young in your class?

Finally, further probing was undertaken to elicit more consideration of why certain responses had been given. Specific questions based on earlier responses included attitudes to English Language and Mathematics, teacher relationships, peer relationships and progression through the educational system. Each interview was recorded via a secure online conferencing platform with the researcher visible, but the participant's camera turned off throughout. This recording was private. The interview was transcribed and within one week a draft transcription of the interview was sent to each participant for checking. No amendments or alterations from the participants were requested so the audio recordings were deleted.

The initial analysis of the transcripts followed a classificatory approach, working out from the observations derived from the interviews to identify categories and sub-categories that might be relevant (Coffey and Atkinson, 1996). By considering each transcript individually and then as a piece of a whole, the aim of this phase was to keep as broad a perspective as possible, whilst accepting that in a small qualitative sample only hints and traces might appear to inform new concepts or understandings (Sage, 2019). All analysis was done by hand and every step was acknowledged as a choice, albeit a principled one (Coffey and Atkinson, 1996). Initially, each transcript was thoroughly annotated for possible categories and sub-categories. On review of these categories, the key ones were then transferred to separate sticky notes, sorted, combined and recombined until a satisfactory analytical structure was established. The transcripts were then printed in different colours and relevant parts of each transcript plus the associated annotations were grouped by sub-category onto large sheets of paper. Once this grouping was completed, further consideration was given to the evidence from the different interviews, enabling newly-combined perspectives due to the related parts of different responses being presented in one space. From this point I was then able to conduct my interpretation of the evidence, illustrating it with pertinent quotations. This stage of the analysis allowed for a more deductive approach as interpretations were contextualised within the overall field of the relative age effect as evidenced in the literature. Key relationships were identified through methodical scrutiny of the transcripts (Coffey and Atkinson, 1996). Photographs of the process undertaken can be seen in Appendix D.

3.8 Phase Three: Integrative/Real

The fourth research question asked what generative mechanisms might account for the descriptions given by the analysis of the quantitative and qualitative data and constituted the third and final phase of the Explanatory Sequential approach used for this study. Retroductive reasoning was applied to the entire set of findings, allowing for interactivity between the first two phases and the generation of further insights and understanding. Retroductive reasoning involves moving from descriptive findings, drawn from both the empirical and actual layers, to begin to identify the conditions upon which these phenomena are constructed (Eastwood, Kemp and Jalaludin, 2018). Retroduction considers what causal mechanisms might account for phenomena in a mechanistic rather than a temporal sense (Fleetwood, 2001), and seeks to identify what conditions must fundamentally exist to explain the empirical phenomena observed. Arguably, such an attempt to identify mechanisms is rather inappropriate when human responses are considered but might be of more value given the systemic nature of education. Building out from the structures, powers and relations that constitute a mechanism, key questions were asked to elicit a better understanding of the tendencies in operation. The initial questions asked were:

- What must be present for the relative age effect to exist?
- What is it about the relative age effect that enables it to impact student enrolment patterns?
- What would have to cease for the relative age effect to disappear in its present form?
- Why is the relative age effect only discernible in some cases and not others? (Haigh et al., 2019)

Although any such determinations may be plausible, retroduction does not offer absolute proofs or truths (Thompson, no date). However, retroduction, through conjecturing about the evidence presented, does offer the opportunity to consider new ideas and opens the way to exploring possible avenues that may, in time, lead to firmer conclusions (Glynos and Howarth, 2007). Utilising a retroductive approach, and thus moving beyond conventional deductive or inductive analysis, allowed for the expansion of thought boundaries. Systemic and relational mechanisms were scrutinised, and, for individual students, their identity was explored by considering how different aspects of each participant's account sat in contradiction or ambiguity with each other (Solórzano and Yosso, 2002).

3.9 Summary

In this chapter a critical realist ontological stance was outlined, followed by consequent epistemological considerations, which, based on the stratified ontology, directed key questions relating to the research. The setting for the research in a further education college was detailed, giving evidence of the nature and purpose of such institutions. The case was made for taking a realist and moderate social constructionist approach, explaining how both individual agents and social structures act and interact. The methodological choice of mixed methods, following an Explanatory Sequential approach was proposed, including how a retroductive form of reasoning was identified as the most appropriate analytical approach. For both phases of the research, quantitative and qualitative, population, sample, procedures and data representation were outlined. Finally, how the findings were combined and reviewed was outlined.

4 Findings

4.1 Introduction

In this chapter research findings will be presented that attempt to answer the first three research questions, identifying the scale and scope of the relative age effect and what events contributed to the academic journeys of the interview participants. The relative age effect in this context is defined as the impact of month of birth on educational achievement and progression, with those born later in any given academic year as the most negatively impacted (Cobley, Abraham and Baker, 2008).

Research question one, which constituted the first phase of the Explanatory Sequential approach, asked to what extent summer-born students are over-represented in English further education Study Programmes. An initial answer is achieved by scrutinising the overall dataset for the college in this study for the academic year 2018-19. These data are compared to the Office for National Statistics dataset for all births in England and Wales between 1994 and 2015. Research question two required asking whether there are any associations within the data between being summer-born and other variables including attendance, GCSE attainment in-year, gender, ethnicity, socio-economic background and declaration of specific learning difficulties. Research question three, which constituted the second phase of the Explanatory Sequential approach, queried how summer-born students on further education study programmes described the events, acknowledged or unacknowledged, that contributed to their academic journeys.

For each research question the source of the data is specified and the type of data is identified. The choice of data analysis technique is outlined, and findings are displayed using graphical and tabulated means to offer clarity and intelligibility. Research question four, which constituted the third phase of the Explanatory Sequential approach, asked what generative mechanisms might be present for this effect to be seen in further education and will be discussed in the following chapter.

4.2 Phase One

4.2.1 Research question one

Research question one looks for enrolment patterns for summer-born students within the college's Study Programme sample and compares these patterns to the birth data for England and Wales between 1994 and 2015 (Office for National Statistics, 2015a). The target population is the Office for National Statistics dataset from which can be derived the relative frequency of births per month between 1994 and 2015 (Office for National Statistics, 2015a). This Office for National Statistics dataset is for England and Wales only and shows the mean number of births per day for the period between 1994 and 2015.

This dataset can be configured to show the mean number of births per month for this time in academic year sequence as shown in Appendix E.

The accessible population is all those students on a Study Programme in 2018-19 in the college in this study (Gaciu, 2020, p.143). Study Programmes are the educational framework within which all 16-18 year old students in England are currently funded for a maximum of 540 guided learning hours per year. A Study Programme comprises varying amounts of time allocated to the main qualification, work experience, tutorial and English Language and Mathematics retakes (if a Grade 4 or above has not yet been achieved) and enrichment, based on individual need. The source of data for the identification of month of birth for the Study Programme students in the college in this study is the final Individualised Learner Record (ILR) for 2018-19. This ILR return is robustly internally and externally audited and is, therefore, the most accurate and most complete record of the student population for the academic year 2018-19. An individual student's month of birth is one of 139 variables within this dataset that are collected by the college on enrolment and throughout the course of an academic year.

Based on the data protection requirements for this study, five percent of the accessible college's Study Programme population data were randomly removed, thus minimising possible identification of individuals. This removal of individuals constituted the sampling frame. There was no reason to exclude any other individuals from the dataset. The resulting sample (n= 4897) was, therefore, 95% of the total accessible college's Study Programme population. The college's month of birth data from the sample are independent variables.

The research literature on the relative age effect (Musch and Hay, 1999; McEwan and Shapiro, 2008; Crawford, Dearden and Greaves, 2013) suggests that there might be an underlying monotonic relationship for month of birth for the college's Study Programme sample. A monotonic relationship occurs when the size of one variable increases or decreases in the same direction, but not necessarily at the same rate, as the second variable (McDonald, 2014, p. 209-12). In other words, this study predicts that, as the academic year progresses from September through to August, there will be an increasing number of birth dates from within the college's Study Programme sample across these months. Formally stated:

- Null Hypothesis: There is no difference between the college's Study Programme sample and the target population's relative frequency of month of birth in academic year sequence.

- Alternative Hypothesis: There is a difference between the college's Study Programme sample and target population's relative frequency of month of birth in academic year sequence.

The relative frequency of student births by day aggregated for all students in the Study Programme sample in 2018-19 is shown in Figure 4.1. The two-period moving average, used to even out fluctuations in the data, shows three distinct dips between September and February when the frequency of births per month in the college's sample is below the target population level and three distinct peaks between May and July when the frequency is above the target population. The dips in the target population data are all in February, probably explained by the reduced number of days in that month. Thus, for the college's Study Programme sample data, the frequency of births per month rises from a low point at the start of each of the academic years in September and October and peaks in the summer months, most obviously in May, giving the graph a characteristic sawtooth shape. It is noteworthy that this sawtooth shape is a mirror image of the shape found by Crawford, Dearden and Greaves, (2013) for the proportion of pupils who achieved the expected levels in assessments at Key Stages 1-4, where the proportion of those achieving at expected levels started higher at the beginning of the academic year and decreased throughout the year, albeit less dramatically for the older pupils (see page 13 in Chapter Two). This pattern of relative frequency of birth month suggests that, irrespective of whether a student is in their first, second or third year in any given Study Programme, their month of birth appears to play a role in determining Study Programmes enrolment in colleges, perhaps resulting from summer-born students' lower performance at GCSE, as suggested by the Crawford, Dearden and Greaves' data (2013).

4.2.1.1 Frequency of month of birth distribution

To determine whether evidence of a difference by birth month exists within the college's Study Programme sample, the observed relative frequency of births by month were extracted from the college's dataset and counted in sequence to match the academic year from September through to August. For comparison, the frequency of births in individual months for the 20-year period 1995-2014 derived from the target Office for National Statistics dataset (ONS, 2015a) was calculated. Both sets of data are shown in Table 4.1 by month of birth in academic year sequence. The observed number of births per month for the college's Study Programme sample varies across the academic year with September having the lowest number (n=340) in contrast to May (n=485). The difference between the two months of September and May is 21 times higher for the sample population (9.90-6.94 = 2.96%) than for the target population (8.59-8.45 = 0.14%) and significant in comparison to national demographic differences for further education achievements in 2018-19 (GOV.UK, 2019b).

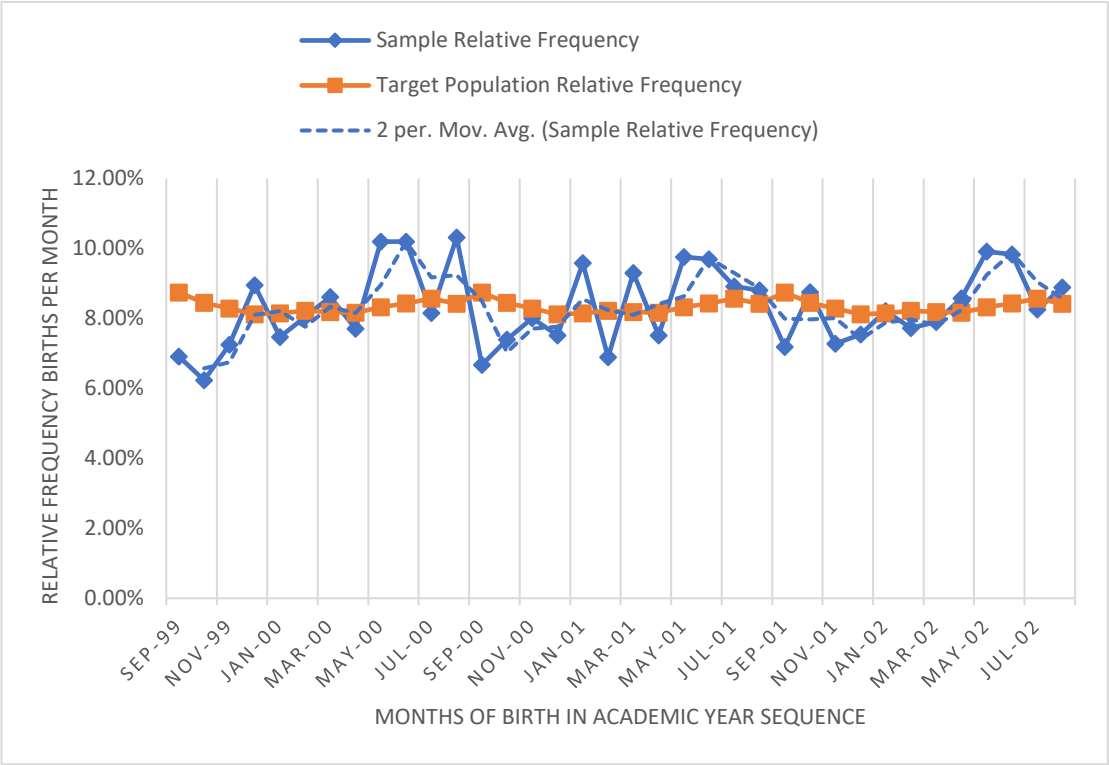

Figure 4.1: Relative frequency of aggregated birth dates in the Study Programme sample compared to target population (Office for National Statistics, 2015a) data.

Table 4.1: Frequency and relative frequency of births by month for the Study Programme sample and target population (Office for National Statistics, 2015a) for all 16-18 year old students in 2018-19.

Month of birth	*Sample frequency per month*	*Sample relative frequency*	*Target population births per month*	*Target population percentage*	*Expected number based on target population frequency*
Sep	340	6.94%	57035	8.59%	421
Oct	382	7.80%	56972	8.58%	420
Nov	369	7.54%	54054	8.15%	399
Dec	381	7.78%	54754	8.25%	404
Jan	420	8.58%	54951	8.28%	405
Feb	366	7.47%	51826	7.81%	382
Mar	418	8.54%	55150	8.31%	407
Apr	393	8.03%	53264	8.03%	393
May	485	9.90%	56071	8.45%	414
Jun	482	9.84%	55027	8.29%	406
Jul	415	8.47%	57754	8.70%	426
Aug	446	9.11%	56773	8.55%	419
Total	**4897**	**100%**	**663630**	**100%**	**4897**

Thus, in the college's Study Programme sample there is a gradual increase in the number of students born from the start of the academic year through to those born towards the summer. This rise is seen most distinctly as percentages of births for each month, rising from 6.94% of the total births (n=340) for September to a peak of 9.9% (n=485) in May. For the target population, there is still variation in terms of relative frequency by month of birth, but no evidence of any pattern or trend. These data suggest that the trend of births by month in academic year sequence found in the college's Study Programme sample does not match that found in the target population for the 20-year average period 1995-2014, as shown by the contrasting lines in Figure 4.2.

In Figure 4.2 observed births by month for the college's Study Programme sample are below the expected level derived from the target population data between September and December but mirror the expected level between January and April. In the summer months, between May and August, the observed number of births for the college's Study Programme sample tracks above the expected level, apart from July where the observed number dips just below the expected (observed=415; expected=427). The data provide initial support for the possible existence of the relative age effect in the college's Study Programme sample and is strongest in both the first and last thirds of the academic year, but with contrasting trends. The relative age effect appears to reduce the number of Study Programme students within the cohorts who have birthdays between September and December and increases the number who have birthdays between May and August. There appears to be no clear trend by relative age for those born in the middle third of the year between January and April, as the observed numbers of birth in these months match the expected numbers as predicted by the target population data (Office for National Statistics, 2015a). Table 4.2 shows the contrast between the college's Study Programme sample and the target population data in the first third of the year in which 30.06% of college student births were recorded (expected = 33.57%; difference = -3.51%) and the final third in which 37.33% of the college's Study Programme sample births were recorded (expected = 33.99%; difference = 3.34%). Contrastingly, the difference between the college's Study Programme sample data and target population data in the middle third of the year, January to April in Table 4.2, was negligible (difference = 0.18%).

A two-sample t-test was conducted to compare the means between the month of birth for the sample (m=408.08333 with a sd=45.408166) and the target population (M=55302.525 with a SD=1728.61374). The difference was statistically significant $p<.001$, indicating a significant difference between the two means.

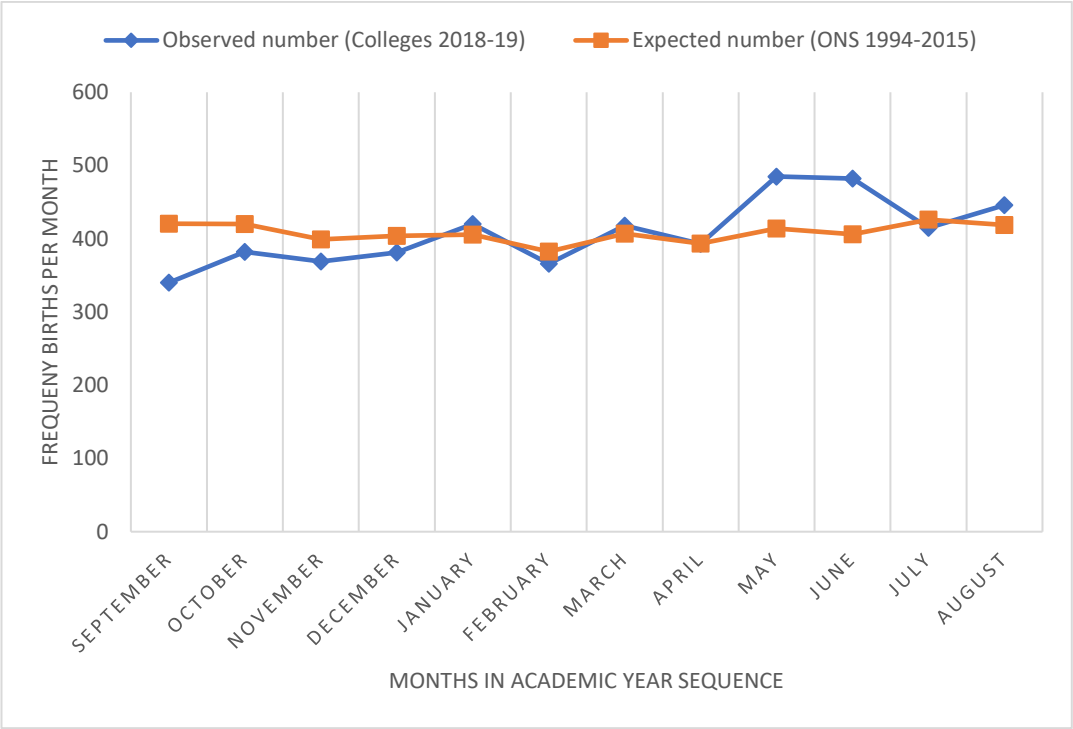

Figure 4.2: Comparison of frequency of Study Programme sample and target population (Office for National Statistics, 2015a) births per month for all 16-18 year old students 2018-19.

Table 4.2: Frequency and relative frequency of the Study Programme sample and the target population (Office for National Statistics, 2015a) by third of the year for 16-18 year old students in 2018-19.

Months of birth	*Observed number*	*Observed percentage*	*Expected number*	*Expected percentage*	*Difference between observed and expected*
September - December	1472	30.06%	1644	33.57%	-3.51%
January - April	1597	32.61%	1588	32.43%	0.18%
May - August	1828	37.33%	1664	33.99%	3.34%
Total	**4897**	**100%**	**4897**	**100%**	**0.00%**

4.2.2 Research question two

Having identified the extent of the relative age effect by enrolments to Study Programmes in the further education college in this study, attention was then given to the patterns of enrolment by age, level of programme, gender, ethnicity, socio-economic rank, declared difficulties, GCSE English Language and Mathematics, attendance and achievement.

4.2.2.1 Month of birth distribution by age

Data were analysed by age on entry to Study Programmes in 2018-19. There are three age cohorts within the Study Programme students in this sample:

- 16 – born 1 September 2001 - 31 August 2002 (n=2229)
- 17 – born 1 September 2000 - 31 August 2001 (n=1785)
- 18 – born 1 September 1999 - 31 August 2000 (n=883)

The youngest, aged 16, are those entering further education for the first time directly from school after GCSE examinations. Those who have already completed one year at college, or a year at school and then transferred to college, are 17 years old. The oldest, aged 18, are in their third year at college, or their second year if they completed one-year post-GCSE at school initially. Overall, nearly half of all students in 2018-19 were in the youngest category (45.51%), having arrived directly from schools in September 2018. These students entered at programme levels ranging from Entry Level through to the first year of a Level Three programme (BTECs or A Levels). Those who were 17 at the start of the academic year (36.45%) were either in their second year at college, typically the second year of a two-year course, or having moved up a level and therefore in the first year of a new course. Not all students make this transition. Some leave during the year and others complete the year and leave to access an apprenticeship or employment with training. The oldest age cohort in this study are those who were aged 18 at the start of the academic year (18.03%). Their trajectory through post-16 education must, therefore, have involved an additional year. Generally, further education students completing three years of post-16 study will have initially repeated a Level Two year (GCSE equivalent), because they do not hold the entry requirements to access a Level Three course directly. After a year repeating this level and gaining the required entry requirements, usually Grade 4 or above in GCSE English Language and Mathematics, some enter a two-year Level Three programme, thus requiring three consecutive years to complete this phase of their education. Other students may use the three years to move between lower levels (Entry to Level One; Level One to Level Two) or may stay at the same level for consecutive years, for example in the case of those students with moderate learning difficulties. Data were initially analysed by the distribution of births by month for each of these three separate age groups and compared to the expected general population distribution.

Table 4.3 displays the same trend for each of the three age cohorts. The observed distribution of months of birth in college students is lower than expected at the start of the academic year and higher than expected towards the end of the academic year at all ages, in comparison to the general population data. For both 16- and 17-year olds the peak proportion of births per month is between May and June. For 18-year olds, apart from a dip in July, the months of May, June and August show a distribution higher than the rest of the year (10.19%, 10.19% and 10.31% respectively), contrasting to the expected

distribution from the national population data (differences: May = 1.7%; June = 1.98%; August = 1.82%).

Table 4.3: Frequency and relative frequency of births by month for the Study Programmes sample and the target population (Office for National Statistics, 2015a) by age on enrolment in 2018-19.

Month	*Observed 16-year olds*	*% observed 16-year olds*	*Observed 17-year olds*	*% observed 17-year olds*	*Observed 18-year olds*	*% observed 18-year olds*	*Expected all ages (ONS-derived)*	*% expected all ages (ONS-derived)*
Sep	160	7.18%	119	6.67%	61	6.91%	421	8.60%
Oct	195	8.75%	132	7.39%	55	6.23%	420	8.58%
Nov	162	7.27%	143	8.01%	64	7.25%	399	8.15%
Dec	168	7.54%	134	7.51%	79	8.95%	404	8.25%
Jan	183	8.21%	171	9.58%	66	7.47%	405	8.27%
Feb	172	7.72%	123	6.89%	71	8.04%	382	7.80%
Mar	176	7.90%	166	9.30%	76	8.61%	407	8.31%
Apr	191	8.57%	134	7.51%	68	7.70%	393	8.03%
May	221	9.91%	174	9.75%	90	10.19%	414	8.46%
Jun	219	9.83%	173	9.69%	90	10.19%	406	8.29%
Jul	184	8.25%	159	8.91%	72	8.15%	426	8.70%
Aug	198	8.88%	157	8.80%	91	10.31%	419	8.56%
	2229	**100%**	**1785**	**100%**	**883**	**100%**	**4896**	**100%**

Figure 4.3 shows the relative frequency of births for 16-year olds, 17-year olds and 18-year olds. Compared to the predicted general population trend, which is virtually flat, there is a clear peak for all three age groups in May and June.

The hypothesis for month of birth distribution by age can be formally stated as:

- Null Hypothesis: There is no difference between the college's Study Programme sample relative frequency of month of birth in academic year sequence by age (16, 17 and 18).
- Alternative Hypothesis: There is a difference between the college's Study Programme sample relative frequency of month of birth in academic year sequence by age (16, 17 and 18).

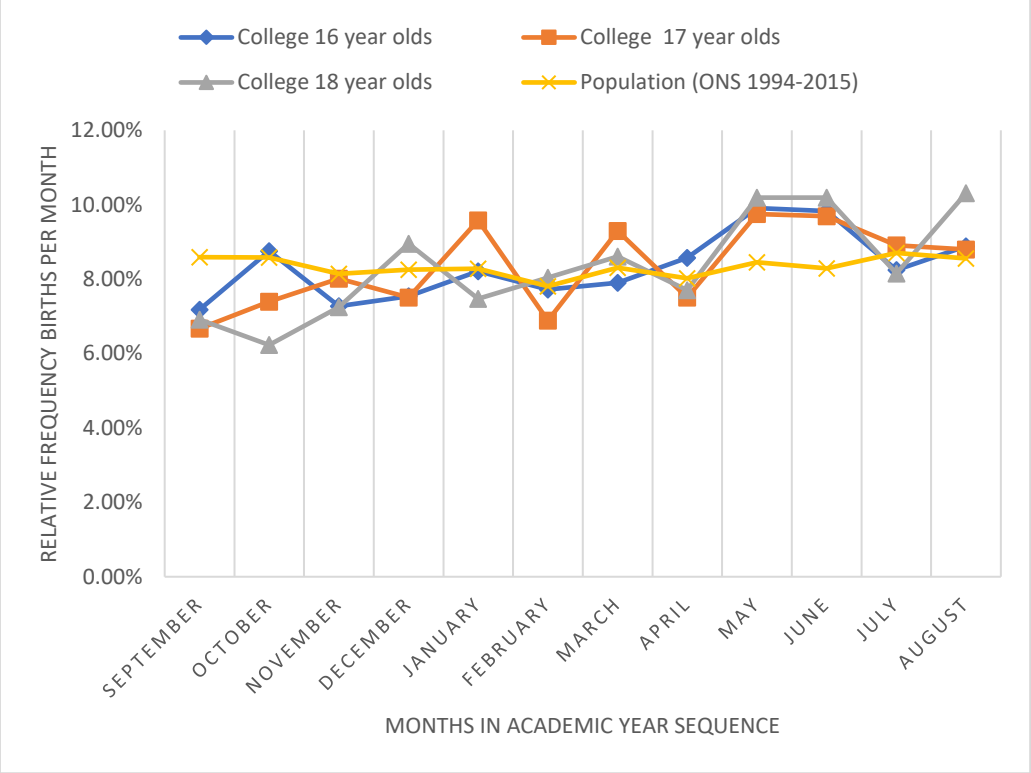

Figure 4.3: Relative frequency of the Study Programme sample and the target population (Office for National Statistics, 2015a) births by month and by age on enrolment in 2018-19.

A two-sample t-test was conducted to compare the means between the three age groups in the college's Study Programme sample. The mean number of students for each age and the full sample was calculated for age 16 (m=185.75, sd=20.10936), for age 17 (m=148.75, sd=20.19957) and for age 18 (m=73.58, sd= 11.95034) and for all ages in the sample (m=408.08, sd=12.64479). For each age $p < .05$ so the null hypothesis was rejected, and it was concluded that there was a statistically significant difference between the age means and the overall sample population. Pearson's product moment correlation was used to test for strength and direction of any association between the three age groups and the months of birth in academic year sequence. Age on programme and month of birth were found to be moderately positively correlated, for age 16 $r(10) = 0.63$, $p=.02$ and for age 17 $r(10) = 0.62$, $p=.02$, and strongly positively correlated for age 18 $r(10) = 0.77$, $p=0.003$. All tests are shown in Appendix G.

4.2.2.2 Month of birth distribution by level of programme

Having established the existence of the typical pattern of the relative age effect within each age cohort, the next area explored was the distribution of month of birth by level of programme. Further education colleges offer courses between Entry Level and Level Seven of the National Qualifications Framework (GOV.UK, no date). Study Programme students aged 16-18 may be enrolled to, and progress between, any level from Entry to

Level Three, depending on their prior qualifications and knowledge of a vocational area. Some students do not progress between levels at all in their time at a college, staying at the same level for multiple years if that is the best fit for their personal and academic development. This approach is in direct contrast to the school system up to age 16, where enrolment to, and progression between years, is automatic based on age, for most pupils. Entry to years 12 and 13 in schools is usually dependent on achieving sufficiently high grades at GCSE to start A level study. Those without suitable entry qualifications must find alternative provision. It is noteworthy that many students who do meet the school sixth form entry criteria, instead choose to study a vocational programme in a single subject area at a college, prior to applying for university entry (n=2510, 51.2% in this cohort - this figure also includes those who have progressed from a lower level at college, rather than direct entry from school). Therefore, analysing enrolments by level of programme offers another perspective from which to view the distribution of birth months.

The four possible levels for Study Programme students are:

- Entry Level – Below GCSE
- Level One – GCSE Grades 1-3 (G-D)
- Level Two – GCSE Grades 4-9 (C-A*)
- Level Three - A Level equivalent

Table 4.4 shows the observed and expected numbers of students by month of birth, split by level of qualification. As the numbers enrolled to each level are different, percentages based on each level are also calculated to show relative differences. As evidenced in Table 4.4, the data show that the relative age effect does not appear to be evident at Entry Level, notwithstanding the peak in June at 11.2% of all enrolments (n=27). There are relatively few students studying at Entry Level (n=241, 4.9%) and factors such as underlying cognitive difficulties or longstanding emotional and behavioural difficulties are likely to be having a far stronger impact than relative age on patterns of enrolment.

However, as can be seen in Table 4.4, from Level One through to Level Three there is evidence of a rise in enrolments as birth dates in the academic year progress. Level One enrolments are all below the expected average from September through to February, with September showing the sharpest negative difference (-2.3%) and July showing the strongest positive difference (1.98%). Level Two enrolments show the same pattern as Level One, below expected enrolments between September and February and above expected enrolments from March through to August. For Level Two the greatest negative difference between observed and expected enrolments is in

November (-1.07%) and the greatest positive difference is in May (2.72%). At Level Three it could have been predicted that the relative age effect would not be evident, due to the influx of students at age 16 who hold typical sixth form entry requirements (5+ GCSEs at Grades 4-9), nevertheless, there is still some evidence of the same pattern as in Levels One and Two. For Level Three, September enrolments show the sharpest negative difference (-1.6%) between the observed and expected enrolments, whereas the enrolments in June show the strongest positive difference (1.79%).

Table 4.4: Frequency of observed (college-derived) and expected (ONS-derived) births by month and by level of programme on enrolment in 2018-19.

Month of birth	*Entry observed*	*Entry observed %*	*Level 1 observed*	*Level 1 observed %*	*Level 2 observed*	*Level 2 observed %*	*Level 3 observed*	*Level 3 observed %*	*Expected (ONS-derived)*	*Expected % (ONS-derived)*
Sep	21	8.71%	45	5.84%	108	7.86%	166	6.61%	421	8.59%
Oct	21	8.71%	59	7.65%	102	7.42%	200	7.97%	420	8.58%
Nov	23	9.54%	58	7.52%	93	6.77%	195	7.77%	399	8.15%
Dec	20	8.30%	54	7.00%	102	7.42%	205	8.17%	404	8.25%
Jan	22	9.13%	61	7.91%	114	8.30%	223	8.88%	405	8.28%
Feb	18	7.47%	51	6.61%	106	7.71%	190	7.57%	382	7.81%
Mar	18	7.47%	73	9.47%	112	8.15%	215	8.57%	407	8.31%
Apr	16	6.64%	71	9.21%	105	7.64%	201	8.01%	393	8.03%
May	20	8.30%	76	9.86%	154	11.21%	235	9.36%	414	8.45%
Jun	27	11.20%	69	8.95%	135	9.83%	251	10.00%	406	8.29%
Jul	16	6.64%	80	10.38%	121	8.81%	198	7.89%	426	8.70%
Aug	19	7.88%	74	9.60%	122	8.88%	231	9.20%	419	8.55%
Total	**241**	**100%**	**771**	**100%**	**1374**	**100%**	**2510**	**100%**	**4897**	**100%**

Although the differences between the lowest and highest observed college enrolments by month compared to those expected based on the general population data are not particularly large for each level, nevertheless differences between 1% (April, Level 1, n=49) and 2.72% (May, Level 2, n=133), as shown in Table 4.5, would be considered significant in a further education college setting. At Levels Two and Three the months of May and June show the strongest evidence of the relative age effect. One possible explanation might be the impact of a delayed start for summer-born students being available for July and August birthdays but not for those born earlier in the summer. For Level One the effect is apparent from March through to August. Figure 4.4 shows the same results for level of main programme graphically, with Entry Level removed as it shows no relevant trend. However, whilst the trend for the target population is relatively flat across the whole year, for those born in the first four months of the academic year (September to December) enrolments to Levels One, Two and Three are below the

target population line, whereas enrolments for those born in May and June show a peak well above the target population line.

Table 4.5: Differences between observed (college-derived) and expected (ONS-derived) births by month on enrolment in 2018-19.

Month of birth	*Level 1 observed*	*Level 1 observed %*	*% difference from expected*	*Level 2 observed*	*Level 2 observed %*	*% difference from expected*	*Level 3 observed*	*Level 3 observed %*	*% difference from expected*
Sep	45	5.84%	-2.37%	108	7.86%	-0.35%	166	6.61%	-1.60%
Oct	59	7.65%	-0.84%	102	7.42%	-1.07%	200	7.97%	-0.52%
Nov	58	7.52%	-0.69%	93	6.77%	-1.44%	195	7.77%	-0.44%
Dec	54	7.00%	-1.49%	102	7.42%	-1.07%	205	8.17%	-0.32%
Jan	61	7.91%	-0.58%	114	8.30%	-0.19%	223	8.88%	0.39%
Feb	51	6.61%	-1.15%	106	7.71%	-0.05%	190	7.57%	-0.19%
Mar	73	9.47%	0.98%	112	8.15%	-0.34%	215	8.57%	0.08%
Apr	71	9.21%	1.00%	105	7.64%	-0.57%	201	8.01%	-0.20%
May	76	9.86%	1.37%	154	11.21%	2.72%	235	9.36%	0.87%
Jun	69	8.95%	0.74%	135	9.83%	1.62%	251	10.00%	1.79%
Jul	80	10.38%	1.89%	121	8.81%	0.32%	198	7.89%	-0.60%
Aug	74	9.60%	1.11%	122	8.88%	0.39%	231	9.20%	0.71%
Total	**771**	**100%**	**0%**	**1374**	**100%**	**0%**	**2510**	**100%**	**0%**

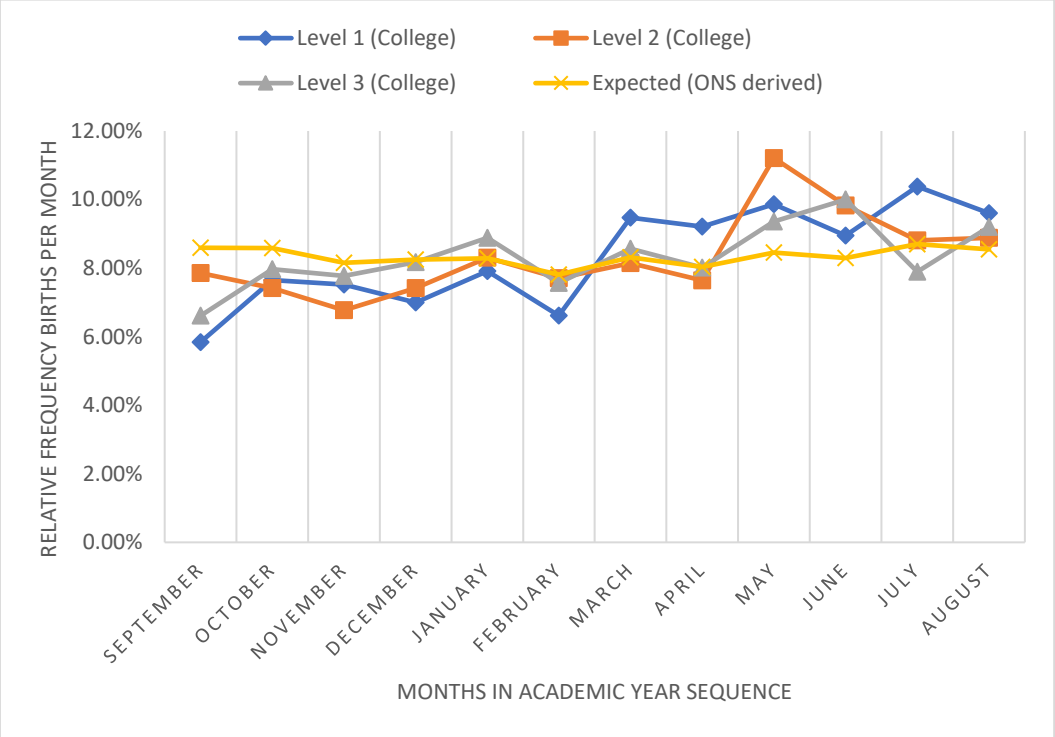

Figure 4.4: Relative frequency of the Study Programme sample and the target population (Office for National Statistics, 2015a) births by month and by level of main programme on enrolment in 2018-19.

The hypothesis for month of birth distribution by level of programme of study can be formally stated as:

- Null Hypothesis: There is no difference between the college's Study Programme sample relative frequency of month of birth in academic year sequence by level (Entry, Level One, Level Two and Level Three).
- Alternative Hypothesis: There is a difference between the college's Study Programme sample relative frequency of month of birth in academic year sequence by level (Entry, Level One, Level Two and Level Three).

Wilcoxon signed-rank tests were conducted which indicated that there were no significant differences between the observed and expected enrolments to the different programme levels. The Spearman's correlation result indicated that the strongest negative and significant correlation between months of birth in academic year sequence and level of programme was for Level One, $rs(10) = -.83$, $p < .05$, and still significant for Level Two, $rs(10) = -.68$, $p < .05$, and Level Three, $rs(10) = -.59$, $p < .05$, but not for Entry Level, which was positive, $rs(10) = .48$, $p < .05$. Thus, the null hypothesis is rejected for Levels One to Three, as there is a correlation between month of birth and level of programme. The negative correlation is understood because as the academic year progresses (months 1-12) enrolments increase, reversing the rank order (12-1).

4.2.2.3 Month of birth distribution by level of programme and age

The results so far have looked at single aspects of the data (age and level) and compared them to month of birth in the academic year. As the age of a student is a good indicator of their rate of progression, if any, through the levels of programme offered by the college system, the data were further analysed by both age and level of programme to identify potential interesting patterns. For example, a sixteen or seventeen year old on a Level Three programme suggests entry directly to this level, whereas an eighteen-year old on a Level Two or Level Three programme suggests a lower level entry point and/or slower progression through the levels. Data for all three ages by level are in Tables 4.6, 4.7 and 4.8. As before, observed numbers are converted to relative frequency percentages to enable comparison across different cohorts. This conversion is a particularly useful approach as the Level Three data contains two-year programmes, and therefore approximately double the number of enrolments, whereas Levels One and Two represent single-year programmes. At all ages there is no evidence for a relative age effect for those enrolling to Entry Level programmes as suggested by the programme level data in Table 4.4. Therefore, Entry Level data is not referred to in the analysis below.

Table 4.6 shows the results of this analysis for those aged 16 during the academic year 2018-19. The trend of an increase in numbers of students born in the summer months is visible for all levels of programme, albeit slight for Levels Two (n=769) and Three

(n=809). However, the most significant increase is for those who are enrolling onto Level One programmes (n=529; GCSE Grades 1-3) rising from 5.29% in September to peaks of 10.4% in May and 10.21% in August. This increasing trend for sixteen year olds might suggest that the relative age effect is at its strongest for those enrolling onto Level One programmes, thereby implying that relative age has suppressed examination performance to such an extent that a disproportionate number only have the entry requirements for these lower level courses.

Table 4.6: Frequency and relative frequency of month of birth distribution by level for 16-year old Study Programme students in sample in 2018-19.

Month of birth	*L1 observed*	*L1 observed %*	*L2 observed*	*L2 observed %*	*L3 observed*	*L3 observed %*	*Total no*	*Total observed %*	*Expected %*
Sep	28	5.29%	65	8.45%	57	7.05%	160	7.18%	8.59%
Oct	48	9.07%	65	8.45%	72	8.90%	195	8.75%	8.58%
Nov	40	7.56%	42	5.46%	66	8.16%	162	7.27%	8.15%
Dec	34	6.43%	63	8.19%	59	7.29%	168	7.54%	8.25%
Jan	38	7.18%	70	9.10%	66	8.16%	183	8.21%	8.28%
Feb	37	6.99%	57	7.41%	74	9.15%	172	7.72%	7.81%
Mar	46	8.70%	63	8.19%	55	6.80%	176	7.90%	8.31%
Apr	48	9.07%	65	8.45%	68	8.41%	191	8.57%	8.03%
May	55	10.40%	78	10.14%	75	9.27%	221	9.91%	8.45%
Jun	50	9.45%	68	8.84%	88	10.88%	219	9.83%	8.29%
Jul	51	9.64%	66	8.58%	60	7.42%	184	8.25%	8.70%
Aug	54	10.21%	67	8.71%	69	8.53%	198	8.88%	8.55%
Total	**529**	**100%**	**769**	**100%**	**809**	**100%**	**2229**	**100%**	**100%**

Seventeen year olds are generally in their second year at college, although a minority arrive directly from schools, having not been sufficiently successful in their first year of A Level study. As seen in Table 4.7, by age 17, Level Three programme enrolments (n=1109) continue to show a very slight increase in births across the months of the academic year, suggesting that at this level those who have arrived with good GCSEs (Grades 4-9) and are in their first or second year of their programme do not show a marked relative age effect. In contrast, both Level One (n=183) and Level Two (n=420) programmes show a sharper rise across the academic year, from 5.46% in October to 13.11% in July for Level One programmes and from 6.19% in October to 12.62% in May and 11.43% in June for Level Two programmes. These data suggest that month of birth plays a much more significant role in enrolment patterns at the lower programme levels, implying that some young people become stuck at these lower levels, rather than being able to progress once they have completed an extra year.

By age 18, the third year of college for students of this age, the pattern changes again, as shown in Table 4.8. Level One students are a much smaller cohort at this age (n=59) and will typically consist of those students with Education and Health Care Plans and therefore significant other difficulties or disabilities, who have the right to stay in college until age 25. There is no longer any impact of month of birth on the enrolment pattern at Level One, with those capable of moving up to Level Two having done so or others having left for employment. The pattern for Level Two programmes (n= 185) shows a similar trend to that for seventeen year olds, rising from 5.95% in October to 10.27% for both June and August. One factor underlying this pattern could be that the Level Two cohort now consists mainly of students who have progressed from Level One programmes where the trend was strong and/or who are repeating a Level Two programme, not having achieved sufficiently high grades to be allowed to join a Level Three programme.

Table 4.7: Frequency and relative frequency of month of birth distribution by level for 17-year old Study Programme students in sample in 2018-19.

Month of birth	*L1 observed*	*L1 %*	*L2 observed*	*L2 %*	*L3 observed*	*L3 %*	*Total observed*	*Total %*	*Expected %*
Sep	11	6.01%	29	6.90%	76	6.85%	119	6.67%	8.59%
Oct	10	5.46%	26	6.19%	88	7.94%	132	7.39%	8.58%
Nov	14	7.65%	35	8.33%	86	7.75%	143	8.01%	8.15%
Dec	13	7.10%	26	6.19%	93	8.39%	134	7.51%	8.25%
Jan	18	9.84%	29	6.90%	115	10.37%	171	9.58%	8.28%
Feb	9	4.92%	34	8.10%	70	6.31%	123	6.89%	7.81%
Mar	19	10.38%	36	8.57%	105	9.47%	166	9.30%	8.31%
Apr	17	9.29%	29	6.90%	85	7.66%	134	7.51%	8.03%
May	18	9.84%	53	12.62%	97	8.75%	174	9.75%	8.45%
Jun	14	7.65%	48	11.43%	105	9.47%	173	9.69%	8.29%
Jul	24	13.11%	39	9.29%	89	8.03%	159	8.91%	8.70%
Aug	16	8.74%	36	8.57%	100	9.02%	157	8.80%	8.55%
Total	**183**	**100%**	**420**	**100%**	**1109**	**100%**	**1785**	**100%**	**100%**

At age 18 the data show for the first time a stronger relative age effect at Level Three (n= 592), mirroring that found at the lower levels at younger ages, as shown in Figure 4.8. In September only 5.57% of births occur for this cohort, whereas by the summer the figure has increased to 10.64% in May and 10.47% in August. Some of these students will be in their second year of a Level Three programme, having made a false start in school sixth forms. However, the vast majority will be in either their first or second year of their programmes at this level having worked their way up from Level One and/or Level Two programmes. It is, therefore, not surprising to see this pattern in

the data because it was there for these same students at the lower levels at younger ages.

The subsequent questions asked of the data were to identify any association between the independent variable of the sample data for birth months for the 2018-19 cohort of Study Programme students and other variables such as gender, ethnicity, social deprivation score and declaration of specific learning difficulties. In addition, the association between the independent variable of the sample data on birth months and in-year performance was investigated in terms of overall attendance and main programme completion and achievement. Finally, any association between the independent variable of the college's data on birth months and whether the students were resitting GCSE English Language or Mathematics was explored. In each analysis, the observed data per variable is compared to the underlying overall college's data. This ensured a more accurate comparison and revealed any underlying patterns that could not simply be accounted for by the already established rising trend throughout the academic year.

*Table 4.8: Frequency and relative frequency of month of birth distribution by level for 18-year old Study Programme students in sample in 2018-19 (*** = data suppressed for anonymity).*

Month of birth	*L1 observed*	*L1 observed %*	*L2 observed*	*L2 observed %*	*L3 observed*	*L3 observed %*	*Total observed*	*Total %*	*Expected %*
Sep	6	10.17%	14	7.57%	33	5.57%	**61**	6.91%	8.59%
Oct	***	1.69%	11	5.95%	40	6.76%	**55**	6.23%	8.58%
Nov	***	6.78%	16	8.65%	43	7.26%	**64**	7.25%	8.15%
Dec	7	11.86%	13	7.03%	53	8.95%	**79**	8.95%	8.25%
Jan	5	8.47%	15	8.11%	42	7.09%	**66**	7.47%	8.28%
Feb	5	8.47%	15	8.11%	46	7.77%	**71**	8.04%	7.81%
Mar	8	13.56%	13	7.03%	55	9.29%	**76**	8.61%	8.31%
Apr	6	10.17%	11	5.95%	48	8.11%	**68**	7.70%	8.03%
May	***	5.08%	23	12.43%	63	10.64%	**90**	10.19%	8.45%
Jun	5	8.47%	19	10.27%	58	9.80%	**90**	10.19%	8.29%
Jul	5	8.47%	16	8.65%	49	8.28%	**72**	8.15%	8.70%
Aug	***	6.78%	19	10.27%	62	10.47%	**91**	10.31%	8.55%
Total	**59**	**100%**	**185**	**100%**	**592**	**100%**	**883**	**100%**	**100%**

4.2.2.4 Month of birth distribution by gender

There are inconsistencies in the research literature around the relative age effect in terms of whether gender, ethnicity and socio-economic status interact either positively or negatively (Sharp et al. 2009; Crawford, Dearden and Greaves, 2013). It is therefore important to review these variables in terms of month of birth in Further Education where there is no extant research.

In the Individualised Learner Record which forms the college's official data return there are only two categories of gender captured – female or male. Therefore, these are the only two variables that can be used in this analysis. Within the Study Programme cohort in 2018 -19 the number of females was 2180 (44.51%) and the number of males was 2717 (55.48%). The relative frequency of month of birth was calculated for each category of gender and converted to a percentage. Both females and males show the same pattern of lower than expected births in the earlier months of the year and higher than expected births in the later months of the year as has already been established as typical of this dataset derived from the colleges' Individualised Learner Record. Females rise from 6.38% in September (n=139) to 10.09% (n=220) in May and 10.05% (n=219) in August. Males rise from 7.40% (n=210) in September to 9.90% (n=269) in June. These data do not suggest that there is any pattern of difference between females and males, other than that found in the college's Study Programme sample data already, confirmed by the tests below.

A chi-square test of independence was performed and showed that there was no significant difference between the genders (Female – X^2 (10, n=2180) = 5.33, p=>.05; Male – X^2 (10, n=2717) = 4.28, p=>.05) for a critical value of 18.31. The Spearman's correlation result indicated that there was an equally strong negative correlation between months of birth in academic year sequence and both genders (Females - *rs*(10) = -.78, p <.05, and Males - *rs*(10) = -.79, p <.05) suggesting that the relative age effect is not gender-specific in this sample.

4.2.2.5 Month of birth distribution by ethnicity

As with gender, there is contrasting evidence surrounding the correlation of ethnicity and the relative age effect from studies in different countries. Langer, Kalk and Searls (1984) found a negative impact associated with relative age for Black students in the United States, whereas Sharp et al. (2009) found no link with relative age in their British study. In the data from the college a small number (n=23, 0.47%) did not provide ethnicity data, so were not included in the analysis. White students are the most common ethnic group within the data (n=3764, 76.86%). Other ethnicities, even when aggregated into overarching ethnic groups, are relatively small, ranging from 9.6% for Asians and Arabs (n=470) to 5.11% (n=250) for Black students. The most obvious increase seen for the category White is from 5.49% (n=269) in September to a peak of 9.83% (n=370) in May. Apart from Whites there are no overtly pronounced relative age effects across the academic year as all ethnicities rise gently from below expected in September to slightly above expected by the summer.

A chi-square test of independence was performed and showed that there was no significant difference between observed and expected ethnicity for the following categories: Black – X^2 (10, n=250) = 6.60, p=>.05; Asian/Arab – X^2 (10, n=495) = 6.49, p=>.05; Mixed – X^2 (10, n=308) = 10.05, p=>.05; White – X^2 (10, n=3764) = 1.13, p=>.05, for a critical value of 18.31. The Spearman's correlation result indicated that there was a strong, significant negative correlation between months of birth in academic year sequence and the White category only ($rs(10) = .80$, $p < .05$) which confirms the descriptive data above in that the relative age effect appears to be more of an issue for White students in comparison to other ethnic categories, which were only weakly or moderately negatively correlated.

4.2.2.6 Month of birth distribution by socio-economic rank

Socio-economic rank was analysed in relation to birth month distribution. Socio-economic rank is derived from English postcodes which are Lower-layer Super Output Areas (LSOA) of approximately 1500 residents produced by the Ministry of Housing, Communities and Local Government (GOV.UK, 2019a). Each LSOA is ranked from the most to the least deprived and then split into ten equal groups, so that the lowest 10% of LSOAs fall into the lowest decile and so on. These ranks and deciles form the Index of Multiple Deprivation. The LSOAs are based on the 2011 census and the most recent update available at the point of analysis was in 2015, so all data refers to this time point. As a result, newer postcodes are not able to be categorised and this has resulted in gaps in the data available. Only 2813 out of 4897 records (57.44%) could be matched to a category in the Index of Multiple Deprivation (IMD). Therefore, as with ethnicity, the ten bands were aggregated to only five to ensure that no individual could be recognised in the data as shown in Appendix F.

On reviewing the data there are clearly some low numbers and percentages earlier in the academic year, for example, 4.99% for IMD 5-6 (n= 28) and 6.15% for IMD 7-8 (n=37) in September. Equally, there are some higher numbers and percentages in the latter part of the academic year, for example 16.27% for IMD 1-2 in May (n=41) and 11.19% in June for IMD 9-10 (n=104). The peak numbers within the whole dataset are in May and June both for the lowest quintile (IMD 1-2, n=69, 27.38%) and for the highest quintile (IMD 9-10, n=202, 21.84%). Although over half of all those within the dataset are recorded here for socio-economic status, the missing 2084 values (42.56%) are not random. The missing values represent newer postcodes, suggesting greater mobility for those who are missing. In addition, as the college in this study is in the south of England and the ranks reflect national differences rather than local ones, those

in the lower quintiles may be particularly deprived relative to their more numerous and prosperous peers.

A Wilcoxon signed-ranks test was performed, which indicated that there was no difference between the observed and expected Indices of Multiple Deprivation. The Spearman's correlation result indicated that all but IMD 1-2 had a moderate, significant negative correlation with month of birth in academic year sequence, the strongest being IMD 9-10, $rs(10) = -.69$, $p < .05$, followed by IMD 5-6, $rs(10) = -.65$, $p < .05$, which suggests that the relative age effect is only moderately correlated for all socio-economic ranks apart from the lowest IMD 1-2.

4.2.2.7 Month of birth distribution by declared difficulty

The Individualised Learner Record (ILR) captures 22 different codes relating to a learner's self-declared disability, learning difficulty and/or health problem. The data is coded in a way that enables alignment with school-based records (GOV.UK, 2018). For this study three codes relating to mental health difficulty, dyslexia and dyscalculia were extracted as the most likely difficulties to be in evidence at age 16 and linked to the relative age effect. Studies concerning mental health difficulties and relative age (see pages 21-23 in Chapter Two) revealed contrasting findings. Canadian studies (Thompson, Barnsley and Dyck, 1999; Thompson, Barnsley and Battle, 2010) indicated a link between low self-esteem and self-harm, in which relative age in the school year could have been a contributory factor, whereas a Norwegian study (Lien et al., 2005) found no correlation. An international study (Mühlenweg, 2009) identified bullying and physical harm for those younger-in-cohort but did not go so far as to relate this to actual mental health difficulties. There is plenty of evidence in the literature that those younger in cohort perform less well in English Language and Mathematics at early primary stages as well as at GCSE level, but nothing that links this specifically to dyslexia or dyscalculia.

Table 4.9 shows a range of frequencies for mental health difficulties (n=269, 5.49% of all students), dyslexia (n=431, 8.8% of all students) and dyscalculia (n=49, 1% of all students) across all months of the year. Although there are some peaks in the summer months (dyscalculia in July, n=8, 16.33%; mental health difficulties in May, n=31, 11.52%) there are equally peaks much earlier in the academic year (dyscalculia in November, n=9, 18.37% and dyslexia in January, n= 46, 10.67%).

A chi-square test of independence was performed to show the relation between observed and expected declared difficulty. Neither the categories of declared mental health difficulty (X^2 (10, n=269) = 13.41, p=>.05) nor dyslexia (X^2 (10, n=431) = 8.76,

p=>.05) were significant, whereas dyscalculia was significant although based on a small number (X^2 (10, n=49) = 20.81, p=<.05) for a critical value of 18.31. The Spearman's correlation result indicated that there was only a very weak negative correlation between month of birth in academic year sequence and declared mental health difficulties and dyscalculia and only a weak negative correlation with dyslexia (*rs*(10) = -.29, *p* <.05), none of which were significant.

*Table 4.9: Frequency of month of birth by declared difficulty in 2018-19 (*** = data suppressed for anonymity).*

Month	*Mental Health observed*	*Mental Health percentage*	*Dyslexia observed*	*Dyslexia percentage*	*Dyscalculia observed*	*Dyscalculia percentage*	*Expected (college-derived)*
Sep	19	7.06%	27	6.26%	***	***%	6.94%
Oct	20	7.43%	31	7.19%	***	***%	7.80%
Nov	28	10.41%	24	5.57%	9	18.37%	7.54%
Dec	13	4.83%	40	9.28%	***	***%	7.78%
Jan	27	10.04%	46	10.67%	6	12.24%	8.58%
Feb	28	10.41%	38	8.82%	***	***%	7.47%
Mar	23	8.55%	40	9.28%	***	***%	8.54%
Apr	18	6.69%	36	8.35%	***	***%	8.03%
May	31	11.52%	41	9.51%	7	14.29%	9.90%
Jun	21	7.81%	37	8.58%	***	***%	9.84%
Jul	19	7.06%	36	8.35%	8	16.33%	8.47%
Aug	22	8.18%	35	8.12%	***	***%	9.11%
Total	**269**	**100%**	**431**	**100%**	**49**	**100%**	**100%**

4.2.2.8 Month of birth distribution by GCSE English Language and Mathematics

Within the research literature in England, there is evidence that those born later in the academic year achieve less well at GCSE level (Hedger, 1992). This evidence is usually reported in terms of grade differences rather than actual number of GCSE examinations passed. Inevitably there are consequences for those who do not perform as well as their peers. The significant difference is between those who achieve a Grade 4 and above and those who do not, specifically in English Language and Mathematics. GCSE grades can enable or bar entry to school sixth forms, those not entering often choosing to attend their local further education college instead. For all students in the English education system not achieving a Grade 4 in either English Language or Mathematics leads to a requirement to retake these subjects until the Grade 4 is achieved or the student starts a new programme of study already aged 18 on 1 September of the academic year.

GCSE English Language and Mathematics grades on entry are recorded and are an indicator of relative performance at GCSE level for the students within this study. These entry grades are captured in whatever form the individual students presents them,

leading to a mixture of functional skills achievements, legacy GCSE Grades A*-C and the new Grades 1-9 (9 being the highest grade achievable). For clarity, only the new Grades 1-9 are included in this analysis as there is no direct correspondence between the legacy grades and the new grades. Therefore, 2222 grades for GCSE English Language and 2198 grades for GCSE Mathematics are included. For both GCSE English Language and Mathematics Grade 9s are not included in the tables. For GCSE English there were only three achievements at this level on entry, so their inclusion would make an individual too identifiable in the data, and for GCSE Mathematics there were no incoming achievements at this grade across the whole student cohort in the study.

Table 4.10: Relative frequency of month of birth by grade on entry for GCSE English Language in 2018-19.

Month of birth	*Grade 1*	*Grade 2*	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*	*Expected (college-derived)*
Sep	1.89%	5.85%	5.17%	7.01%	9.59%	9.66%	6.98%	23.08%	6.94%
Oct	7.55%	3.51%	8.28%	6.06%	9.81%	9.66%	16.28%	7.69%	7.80%
Nov	3.77%	7.02%	6.21%	7.82%	8.10%	8.97%	4.65%	23.08%	7.54%
Dec	7.55%	6.43%	6.72%	7.55%	7.46%	10.34%	6.98%	15.38%	7.78%
Jan	3.77%	9.94%	9.83%	7.01%	6.18%	11.03%	9.30%	0.00%	8.58%
Feb	3.77%	9.36%	7.76%	7.28%	7.04%	6.21%	6.98%	0.00%	7.47%
Mar	15.09%	12.28%	7.24%	9.43%	7.25%	5.52%	6.98%	0.00%	8.54%
Apr	11.32%	7.60%	8.97%	7.95%	8.74%	7.59%	4.65%	0.00%	8.03%
May	9.43%	7.60%	10.52%	10.65%	8.53%	8.97%	6.98%	15.38%	9.90%
Jun	20.75%	7.60%	10.00%	10.65%	10.45%	10.34%	11.63%	7.69%	9.84%
Jul	9.43%	11.11%	10.00%	8.63%	8.53%	3.45%	6.98%	0.00%	8.47%
Aug	5.66%	11.70%	9.31%	9.97%	8.32%	8.28%	11.63%	7.69%	9.11%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 4.10 shows the relative frequency of each grade achieved by month of the academic year for English. The frequency and relative frequency are shown in Appendix H. Although the data per month varies considerably, for GCSE English Language the number of students arriving with Grades 1-5 peaks for births from the middle of the academic year onward for the lowest grades and from May onward for Grades 3-5 (Grade 1: March n= 8, 15.09%; Grade 2: March n=21, 12.28%; Grade 3: May n=61, 10.52%; Grade 4: May and June, n=158 combined, 10.65% each; Grade 5: June n=49, 10.45%). Notably, this trend of lower grades being more common for those born later in the academic year then reverses for Grades 6, 7 and 8, with many more of these higher grades being achieved by those born earlier in the academic year (Grade 6: January n=16, 11.03%; Grade 7: October n= 7, 16.28% and Grade 8: September and November, n=6 combined, 23.08% each). Although the numbers are small, they may well be

indicative, given that many of those students with higher grades cannot be taken into consideration in this dataset because they have remained in school sixth forms. Figure 4.5 shows that the peak months for having arrived with a Grade 1, the lowest grade, for those students in the sample are March through to June.

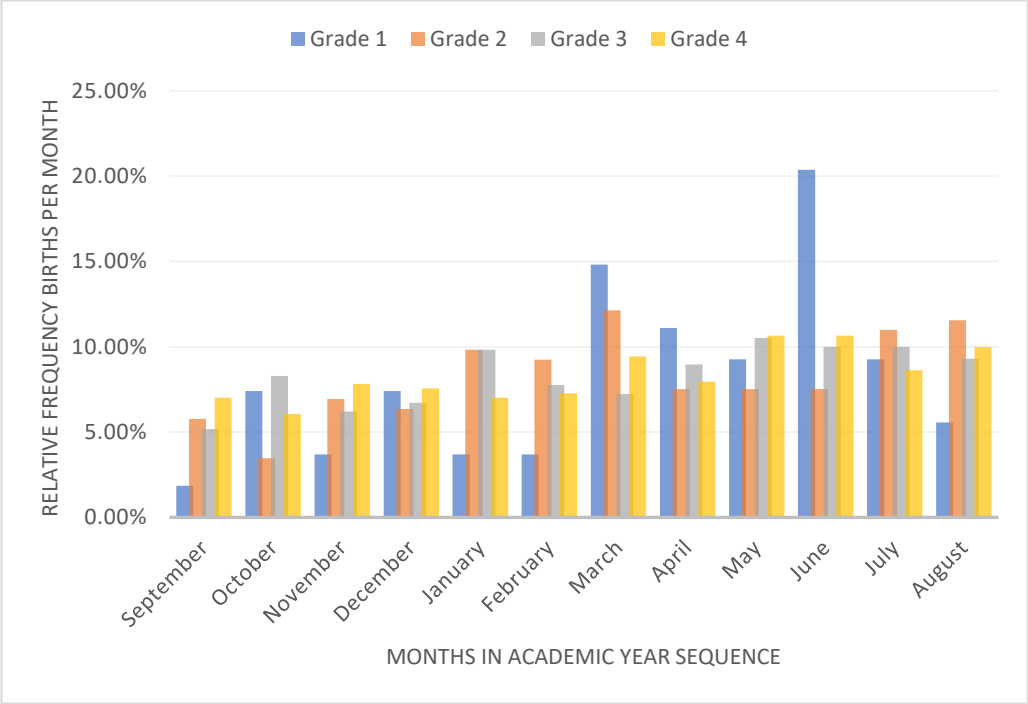

Figure 4.5: Relative frequency of GCSE English Language Grades 1-4 on entry by month of birth in 2018-19.

A Wilcoxon signed-ranks test was performed, which indicated that there was no overall difference between the observed and expected GCSE English Language incoming grades as shown in Appendix H. The results of the Spearman's correlation indicated that there was a strong negative correlation for months of birth in academic year sequence and incoming Grades 2, 3 and 4 in GCSE English Language (Grade 2: $rs(10) = -.76$, $p < .05$; Grade 3: $rs(10) = -.81$, $p < .05$; Grade 4: $rs(10) = -.83$, $p < .05$). Although the negative correlation was moderate for Grade 1 ($rs(10) = -.48$, $p > .05$), it was positive and very weak for Grades 5-9 combined ($rs(10) = .14$, $p > .05$) and in neither case significant.

The data for GCSE Mathematics grades on entry show a more even pattern of distribution in comparison to GCSE English Language, although in both cases there is a low relative frequency for Grade 1 in September, rising to a peak in January, as can be seen in Figure 4.6. Table 4.11 shows the relative frequency of GCSE Mathematics grades on entry. The frequency and relative frequency are shown in Appendix H. Grade 1 (n=172) shows a very low relative frequency for September (the number is supressed to preserve anonymity), but a significantly higher relative frequency in January (13.37%, n= 23), February (10.47%, n=18) and August (10.47%, n=18). Grade 2 to Grade 5 show clear progression from smaller numbers for those born earlier in the year to larger numbers for those born

later in the year (for example, Grade 2: May n=35, 11.44%; Grade 3: August n= 46, 10.8%; Grade 4: June n= 81, 10.51%; Grade 5: June n= 49, 12.41%).

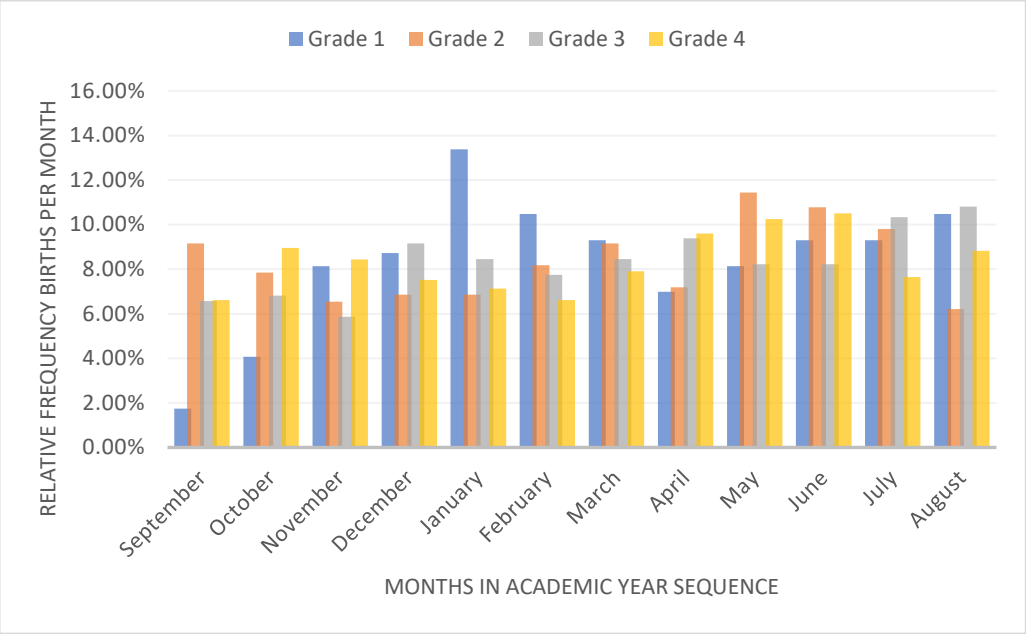

Figure 4.6: Relative frequency of GCSE Mathematics Grades 1-4 on entry by month of birth in 2018-19.

*Table 4.11: Relative frequency of grade on entry for GCSE Mathematics by month of birth in 2018-19 (*** = data suppressed for anonymity).*

Month	*Grade 1*	*Grade 2*	*Grade 3*	*Grade 4*	*Grade 5*	*Grade 6*	*Grade 7*	*Grade 8*	*Expected (college-derived)*
Sep	***%	9.15%	6.57%	6.61%	8.61%	10.64%	3.70%	14.29%	6.94%
Oct	***%	7.84%	6.81%	8.95%	8.35%	10.64%	11.11%	0.00%	7.80%
Nov	8.14%	6.54%	5.87%	8.43%	6.84%	5.32%	11.11%	0.00%	7.54%
Dec	8.72%	6.86%	9.15%	7.52%	5.82%	6.38%	3.70%	14.29%	7.78%
Jan	13.37%	6.86%	8.45%	7.13%	6.33%	9.57%	14.81%	28.57%	8.58%
Feb	10.47%	8.17%	7.75%	6.61%	6.58%	6.38%	7.41%	0.00%	7.47%
Mar	9.30%	9.15%	8.45%	7.91%	9.62%	7.45%	3.70%	0.00%	8.54%
Apr	6.98%	7.19%	9.39%	9.60%	7.09%	6.38%	7.41%	14.29%	8.03%
May	8.14%	11.44%	8.22%	10.25%	9.62%	6.38%	7.41%	14.29%	9.90%
Jun	9.30%	10.78%	8.22%	10.51%	12.41%	9.57%	11.11%	0.00%	9.84%
Jul	9.30%	9.80%	10.33%	7.65%	7.59%	14.89%	7.41%	14.29%	8.47%
Aug	10.47%	6.21%	10.80%	8.82%	11.14%	6.38%	11.11%	0.00%	9.11%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

A Wilcoxon signed-ranks test was performed, which indicated that there was no overall difference between the observed and expected GCSE Mathematics incoming grades. The results of the Spearman's correlation indicated that there was a strong negative

correlation for months of birth in academic year sequence and incoming Grade 3 in GCSE Mathematics ($rs(10) = -.74$, $p < .05$), supporting the suggestion that the relative age effect is strongest for this group of students. There was a moderate negative correlation for Grades 1, 4 and 5-9, but only a very weak correlation for Grade 2, and not significant for either Grade 2 or 4.

GCSE English Language and Mathematics retakes for those not yet having achieved Grade 4 or higher have been a feature of post-16 education in England since 2014, following the introduction of the *Condition of Funding* regulation, whereby funding is removed from an institution for the following year for every student who fails to be enrolled to a resit in either subject where they do not hold a Grade 4 or above (GOV.UK, 2020). The pass rates have remained stubbornly low across the sector which has resulted in students resitting the subjects at least once, if not twice a year throughout their post-16 educational journey. In 2018-19 the GCSE English Language pass rate at Grades 9-4 was 25% for all General Further Education colleges and the college in this sample achieved 29%. For GCSE Mathematics the pass rate at Grades 9-4 was 17% for General Further Education colleges and the college in this sample achieved 16.9%. Therefore, the college in this sample achieved results typical of the sector, slightly above in GCSE English Language and at the mean for GCSE Mathematics. Table 4.12 shows the relative frequency of GCSE English Language grade outcomes by month of birth for the combined November and June examination series in that academic year (n=1693). The frequency and relative frequency are shown in Appendix H. Grades 5-8 have been combined as there were so few in each category that individuals could have been identified. For the same reason, those failing (Grade U) or not attending any of the examinations (X) have been removed from the table. There were no Grade 9s in the final data to report. Based on the college-derived data it is already known that there are more students born later in the year. However, those achieving Grade 1 (the lowest classified grade), which suggests that they have either stayed the same or gone backwards at least one grade, show a distinct increase in births towards the latter part of the year (May 14.29%, n=16 and August 11.61%, n=13).

However, the group of students who either gained an unclassified result (probably by missing one of the two examinations) or did not attend either of the examinations (n=50) show the steepest rise across the academic year, suggesting that those born later in the year are disproportionately negatively affected. The next most affected grade is Grade 3, clearly below the expected trend in the early part of the year and, apart from the unclassified and non-attenders, shows the steepest rise for those born in the summer months, for example May 11.38% (n= 90). Given 71.87% of all those retaking GCSE

English Language started the year with a Grade 3, this result, which indicates that many students remain at this grade, underpins the difficulty the sector has in enabling them to move up a grade over the course of the year. This finding suggests that it is not just a simple question of delivering a further few months of tuition to bring these students up to the required standard. However, the outcomes for Grade 4 are also slightly higher than expected, suggesting that there is some benefit for those summer born students who can take advantage of the second chance offered by further education.

Table 4.12: Relative frequency of GCSE English Language grade outcome by month of birth in 2018-19.

Month	*Grade 1*	*Grade 2*	*Grade 3*	*Grade 4*	*Grades 5-8*	*U or X*	*Percentage expected (college-derived)*
Sep	2.68%	5.73%	5.06%	9.60%	8.06%	8.00%	6.94%
Oct	8.04%	7.01%	8.72%	6.62%	9.68%	8.00%	7.80%
Nov	8.04%	6.05%	6.32%	7.62%	7.26%	2.00%	7.54%
Dec	7.14%	7.96%	6.95%	5.63%	8.87%	4.00%	7.78%
Jan	5.36%	10.51%	9.36%	6.62%	4.84%	4.00%	8.58%
Feb	8.04%	8.60%	6.95%	6.62%	5.65%	6.00%	7.47%
Mar	8.93%	10.51%	7.71%	5.30%	8.06%	10.00%	8.54%
Apr	8.04%	8.28%	7.96%	12.58%	9.68%	18.00%	8.03%
May	14.29%	6.69%	11.38%	9.93%	7.26%	8.00%	9.90%
Jun	8.93%	10.19%	9.36%	8.94%	11.29%	16.00%	9.84%
Jul	8.93%	7.96%	10.24%	10.26%	9.68%	12.00%	8.47%
Aug	11.61%	10.51%	9.99%	10.26%	9.68%	4.00%	9.11%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

A Wilcoxon signed-ranks test was performed, which indicated that there was no overall difference between the observed and expected GCSE English Language outcome grades. The Spearman's correlation result for months of birth in academic year sequence and GCSE English Language outcome grades indicated negative correlations for all grades, significant for Grades 1-3 and strongest for Grade 1 ($rs(10) = -.80$, $p < .05$), although Grade 3 outcomes were also strong ($rs(10) = -.75$, $p < .05$).

Table 4.13 shows the relative frequency of outcome for GCSE Mathematics for the combined November and June series examinations (n=1821). The frequency and relative frequency are shown in Appendix H. Grades 4-7 have been aggregated to protect anonymity as there were relatively few in each of the Grades 5-7 (n=32) and none for Grade 8 or 9. More students than expected gain or retain a Grade 3 as births across the academic year unfold (September 5.23%, n= 29; July 11.37%, n=63), thus still not achieving the benchmark 'good' pass at Grade 4. Grade 3 achievement starts well below what could be expected for births in the early part of the academic year (5.23% in

September) and finish the year well above what is expected (11.37% in July). Significantly, those not attending any examinations or gaining an unclassified result (probably through missing two of the three examinations) show the greatest effect by month of birth (n=78), as was found for GCSE English Language. More positively, those gaining a Grade 4 or higher (n=246) also show an increase across the year above that expected, suggesting that for at least some students born later in the academic cycle, the extra year of tuition has enabled them to regroup and catch up with their peers.

Table 4.13: Relative frequency of GCSE Mathematics grade outcome by month of birth in 2018-19.

Month	*Grade 1*	*Grade 2*	*Grade 3*	*Grades 4-7*	*Percentage expected (college-derived)*
Sep	6.68%	7.38%	5.23%	4.47%	6.94%
Oct	6.42%	7.56%	5.78%	10.16%	7.80%
Nov	9.09%	7.91%	5.78%	5.69%	7.54%
Dec	6.42%	8.26%	8.84%	6.50%	7.78%
Jan	10.43%	7.21%	9.57%	7.72%	8.58%
Feb	8.56%	5.98%	8.84%	8.54%	7.47%
Mar	7.75%	8.44%	7.76%	9.35%	8.54%
Apr	8.56%	7.56%	8.30%	11.38%	8.03%
May	8.29%	10.72%	8.30%	6.50%	9.90%
Jun	7.22%	9.84%	9.21%	10.98%	9.84%
Jul	10.70%	9.67%	11.37%	9.35%	8.47%
Aug	9.89%	9.49%	11.01%	9.35%	9.11%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

A Wilcoxon signed-ranks test was performed, which indicated that there was no overall difference between the observed and expected GCSE Mathematics outcome grades. The Spearman's correlation result for months in academic year sequence and GCSE Mathematics outcome grades indicated negative correlations for all grades as for GCSE English Language and significant for all grades from Grade 2 upwards. The correlation was strong for Grade 3 ($rs(10) = -.70$, $p < .05$) and moderate for Grade 2 ($rs(10) = -.64$, $p < .05$). These results suggest that although there is some evidence for achievement at Grade 4 and above for summer-born students retaking both GCSE English Language and Mathematics examinations, there is still a significantly strong and enduring sticking point at Grade 3 for those born later in the academic year.

4.2.2.9 Month of birth distribution by attendance

Research in both primary and secondary schools in England (Carroll, 1992; Cobley et al., 2009) suggested that those born earlier in the academic year had higher attendance rates, by as much as 6 days for the Key Stage Three pupils in Cobley et al.'s (2009)

study, in comparison to those born later in the year, who were more likely to be in the bottom 20% for attendance rates. This study, therefore, seeks to investigate whether this trend of lower attendance for those born later in the academic year continues when year cohorts separate between school sixth forms and further education colleges at age 16 as new subject specific groups are formed from diverse feeder schools.

Overall attendance is not collected for the Individualised Learner Record, therefore the data available has been drawn from internal register records. Attendance is captured at every class throughout every day in college, rather than full or half days for schools, resulting in a highly detailed record. However, only 4549 (92.9%) of the individual students had sufficiently reliable records (with no unexplained gaps) that could be extracted to add to this data set. The attendance data was checked for both homogeneity and normality. It was not found to be homogenous (p=.001781), but it was normally distributed as shown in Appendix B. The skew was -1.51626 but was not considered significant as p=.072, even though 107 students had 100% attendance throughout the year. Two steps of data analysis were undertaken. Firstly, to determine whether relative age correlated with overall mean attendance taken as a continuous variable, mean attendance per birth month was calculated and then divided by the number of available records per birth month to determine mean percentage attendance per birth month as shown in Table 4.14. Compared to an expected mean attendance of 83.23% based on all the captured attendances, the table shows relatively small variations by birth month, with those born in December the lowest at 81.78% and those born in July the highest at 85.15%. Based on a typical study programme of 4 days per week over 35 weeks the attendance range of 3.37% represents approximately 4.7 days per year.

Table 4.14: Frequency and relative frequency of month of birth by mean attendance in 2018-19.

Month of birth	*Sum of percentage attendance*	*Number of students*	*Mean percentage attendance*	*Mean expected attendance*	*Mean sum of expected attendance*
Sep	26452	317	83.44%	83.23%	31551
Oct	28880	353	81.81%	83.23%	31551
Nov	27464	335	81.98%	83.23%	31551
Dec	28624	350	81.78%	83.23%	31551
Jan	31675	383	82.70%	83.23%	31551
Feb	27295	335	81.48%	83.23%	31551
Mar	32229	383	84.15%	83.23%	31551
Apr	30872	370	83.44%	83.23%	31551
May	38786	464	83.59%	83.23%	31551
Jun	36992	439	84.26%	83.23%	31551
Jul	33548	394	85.15%	83.23%	31551
Aug	35801	426	84.04%	83.23%	31551
Total	**378617**	**4549**	**83.23%**	**83.23%**	**378617**

However, this difference of nearly 5 days per year is in complete contrast to the findings of Cobley et al. (2009) because the higher attendance is among those born later in the year, the trend of which can be clearly seen in Figure 4.7.

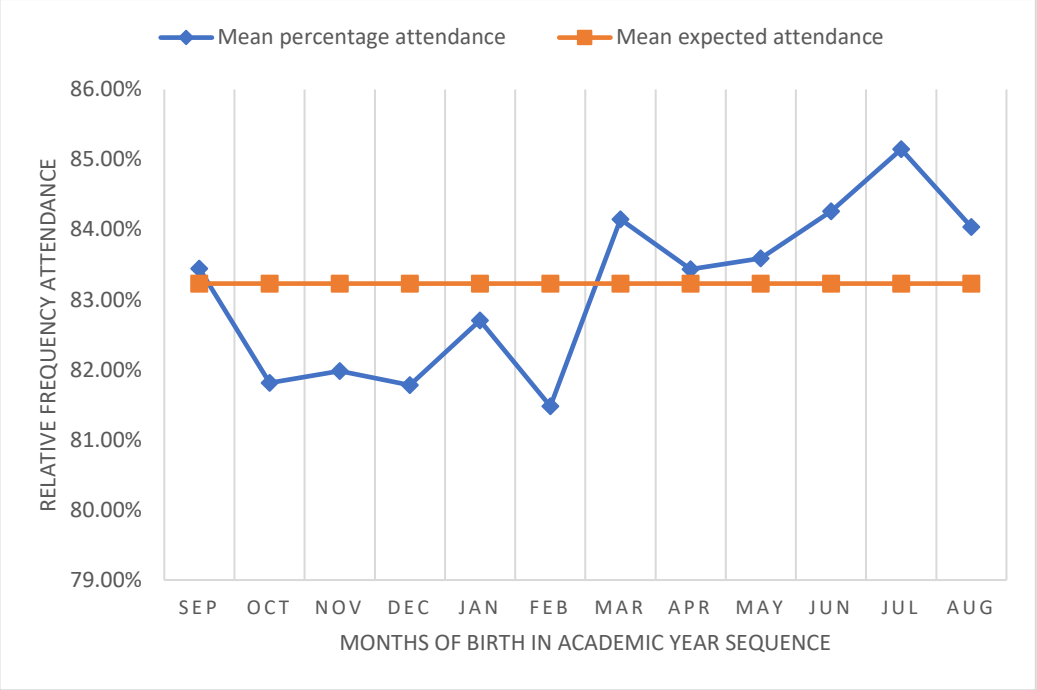

Figure 4.7: Relative frequency of mean attendance by month of birth in 2018-19.

Secondly, following the tests undertaken by Cobley et al. (2009) particularly high and low attendance rates were examined to determine whether there was any relationship between month of birth and attendance, using their categorisations. Contrary to Cobley et al.'s findings (2009), there was no evidence of those older in the academic year having better attendance. Instead, as shown in Table 4.15, for those in the mid-range 60%, attendance increased by month of birth throughout the academic year from 7.07% in September (n=193) to 10.34% in May (n=282). The contrast is even greater for those in the highest attending 20%, rising from 6.37% for those born in September (n=58), although the lowest was for those born in February at 5.71% (n=52), to 11.2% of the cohort for those born in June (n=102). For those in the lowest attending 20% there does not appear to be any significant pattern of attendance in relation to month of birth. This overall result is positive for those students in the sample born in the summer months, suggesting that they may have learned to counter poorer academic outcomes by developing better attendance habits.

A t-test was conducted comparing the means of observed attendance (m = 31551.42 with a sd = 4061.406) and expected attendance (M= 31551.42 with a SD = 870.9672). As $p>.05$ it was concluded that there was no difference between the overall observed and

expected attendance across the year. Pearson's product moment correlation was used to test for strength and direction of any association between attendance and the months of birth in academic year sequence. As suggested by the descriptive data above, there was a strong positive correlation ($r(10) = .82$, $p=<.001$).

Table 4.15: Frequency and relative frequency of month of birth by attendance category in 2018-19.

Month of birth	*Lowest 20%*	*Percentage lowest 20%*	*Mid 60%*	*Percentage mid 60%*	*Highest 20%*	*Percentage highest 20%*
Sep	66	7.25%	193	7.07%	58	6.37%
Oct	76	8.35%	210	7.70%	67	7.35%
Nov	75	8.24%	201	7.37%	59	6.48%
Dec	88	9.67%	192	7.04%	70	7.68%
Jan	80	8.79%	233	8.54%	70	7.68%
Feb	82	9.01%	201	7.37%	52	5.71%
Mar	68	7.47%	240	8.80%	75	8.23%
Apr	72	7.91%	223	8.17%	75	8.23%
May	85	9.34%	282	10.34%	97	10.65%
Jun	79	8.68%	258	9.46%	102	11.20%
Jul	55	6.04%	245	8.98%	94	10.32%
Aug	84	9.23%	250	9.16%	92	10.10%
Total	**910**	**100%**	**2728**	**100%**	**911**	**100%**

4.2.2.10 Month of birth distribution by completion and achievement

Successful students are those that are retained throughout their programme of study and achieve their qualification aims by the end of their courses. The Individualised Learner Record captures both completion status and main aim achievement outcomes. Completion status indicates the degree of completion of each learning aim and is used to calculate overall retention. There are four possible codes as shown in Table 4.16.

Table 4.16: Individualised Learner Record categories for completion in 2018-19.

Code	*Definition*	*Number of students*	*Percentage*
1	The student is continuing their study for the learning aim	886	18.09%
2	The student has completed all learning activities for the learning aim	3400	69.43%
3	The student has withdrawn from the learning aim	611	12.48%
6	The student has temporarily withdrawn from the learning aim	0	0.00%
	Total	**4897**	

Learning aim outcomes are also defined by four codes, plus no code required for those who are continuing their studies as shown in Table 4.17.

Table: 4.17: Individualised Learner Record categories for achievement outcomes in 2018-19.

Code	*Definition*	*Number of students*	*Percentage*
1	Achieved	3077	62.83%
2	Partial achievement	1	0.02%
3	No achievement	933	19.05%
6	Learning activities complete but outcome not yet known	0	0.00%
None	Student is continuing so no code recorded	886	18.09%
	Total	**4897**	

In 2018-19 there were no temporary withdrawals among the Study Programme students and no unknown outcomes. Continuing students are those who are half-way through a two-year Level Three programme (n=886, 18.09%). To continue from the first to the second year of a programme suggests a positive student experience and successful completion of year one units. In Table 4.18 continuing students show a steady rise from 6.55% of their cohort (n=58) born in September to 10.5% born in August (n=93). There is clearly no negative consequence of relative age in this cohort, which might be expected as they are Level Three students, already having successfully completed their GCSEs.

Table 4.18: Frequency and relative frequency of month of birth by completion status in 2018-19.

Month of birth	*Number continuing*	*% continuing*	*Number completed*	*% completed*	*Number withdrawn*	*% withdrawn*	*Number expected*	*% expected (college-derived)*
Sep	58	6.55%	247	7.26%	35	5.73%	422	6.94%
Oct	74	8.35%	259	7.62%	49	8.02%	421	7.80%
Nov	79	8.92%	240	7.06%	50	8.18%	400	7.54%
Dec	60	6.77%	263	7.74%	58	9.49%	405	7.78%
Jan	67	7.56%	295	8.68%	58	9.49%	406	8.58%
Feb	69	7.79%	237	6.97%	60	9.82%	373	7.47%
Mar	66	7.45%	299	8.79%	53	8.67%	408	8.54%
Apr	75	8.47%	276	8.12%	42	6.87%	394	8.03%
May	79	8.92%	345	10.15%	61	9.98%	415	9.90%
Jun	91	10.27%	331	9.74%	60	9.82%	407	9.84%
Jul	75	8.47%	305	8.97%	35	5.73%	426	8.47%
Aug	93	10.50%	303	8.91%	50	8.18%	420	9.11%
Total	**886**	**100%**	**3400**	**100%**	**611**	**100%**	**4897**	**100%**

Similarly, those who completed their programmes show a steady rise in births across the academic year culminating in 10.15% (n=345) completions for those born in May, again in line with the expected rise based on the underlying college dataset as shown in Figure 4.8. In contrast, those withdrawn are much more varied, above the expected level from

October through to February and equal to or below the expected level from March through to August. This result suggests that those born earlier in the academic year are slightly more likely to withdraw than expected and those born later are no more or less likely to withdraw than expected, a reverse relative age effect.

One further disparity in the completion and achievement data remains to be considered. Table 4.19 shows that 3400 (69.43%) of students completed their learning aim in 2018-19, meaning that they got to the end of the academic year without withdrawing from their course. However only 3077 (62.83%) achieved their main learning aim. Therefore, 323 (6.59%) of students who remained in college throughout the full academic year were unsuccessful in passing their main learning aim. Reviewing the full dataset shows that although there is a steady rise throughout the academic year for those completing but not achieving, the percentages are close to the underlying month of birth distribution for the college.

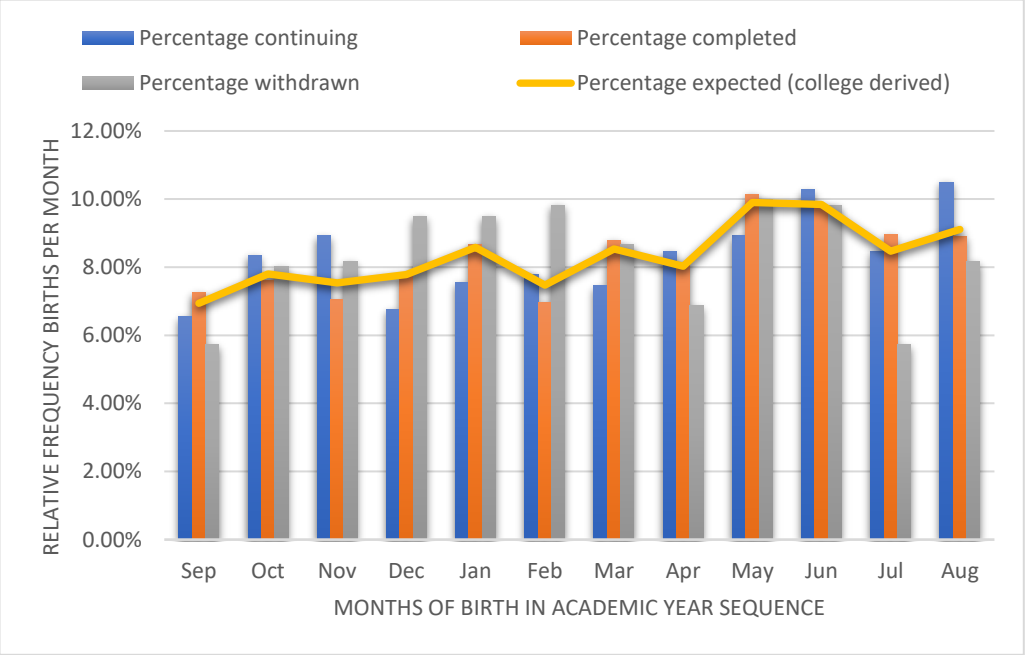

Figure 4.8: Relative frequency of month of birth by completion status in 2018-19.

A t-test was conducted comparing the means of observed and expected completion, observed completion (m = 283.3333 with a sd = 35.31246) and expected completion (M= 283.27, SD = 31.58181). As $p>.05$ it was concluded that there was no significant overall difference between observed and expected completions. Pearson's product moment correlation was used to test for strength and direction of any association between completion and the months of birth in the academic year. There was a moderate positive correlation ($r(10) = .42$, $p=.173$), but it was not significant.

4.3 Phase Two

4.3.1 Research question three

The second phase of the Explanatory Sequential approach sought to answer the third research question by identifying what events, acknowledged or unacknowledged, had contributed to further education summer-born students' academic journeys. Seven semi-structured interviews were undertaken, the selection of participants for which was based on potential areas of interest derived from the first quantitative phase, specifically at least two participants who were born in May, at least two participants who were in their second or their third year of college, at least two participants who were studying GCSE English Language or Mathematics and no more than three participants who were studying at Level Three.

Although the number of research participants was relatively small in comparison to the overall student population, there was still the risk of identification. Specific quotations have been included with direct permission from the participants, but full transcripts have not been included in the appendices due to the risk of identification. Each participant and their story needed to be treated with respect, giving appropriate reflexive and ethical consideration to the whole process. Each participant has been given a pseudonym that reflects their gender but not necessarily their individual ethnicity, although the balance has been kept overall. References to COVID-19 are threaded throughout for all participants and the pandemic overshadows many of the responses. Brief portraits are given for each of the participants below, followed by the main findings which are from the stage of the process where categories and subcategories have already been generated by careful consideration and reconsideration of the participants' contributions. In addition to the pseudonyms, personal details have been changed to preserve anonymity.

4.3.2 The participants

Ahana (May) is in her first year at college. She migrated from India in her early teens and has experienced schooling from being among the oldest in her year group in India to being among the youngest on arrival in England. She has had to adapt quickly, becoming fluent in English and passing both GCSE English Language and Mathematics. Although the A Level route was an option, she chose to focus on a Level Three vocational course prior to applying for university.

Connor (August) is in his first year at college. He is taking a Level Two vocational course. He found primary school 'quite fun' but found the later years of secondary quite difficult academically. He had a good friendship group, played a lot of football but has a self-declared memory problem that has affected his performance. He continues to struggle with both English Language and Mathematics.

Daniella (May) is in her first year of college on a Level One vocational course. Her accounts of both primary and secondary school are troubling, riven with bullying and struggles with late-diagnosed dyslexia. She has continuing problems with both English Language and Mathematics and has some ongoing mental health issues. She is now settled and happy in college.

Laura (July) is in her second year at college, but on her first year of A Levels. She described happy times at her primary school but frustration at being held back by inadequately managed behavioural issues in her secondary school. Overall, she is disappointed in her GCSE grades, but having taken a vocational course for a year, she has taken the decision to aim for university and has swapped to the A Level route.

Lei (July) is in his first year at college and has mixed feelings about his school experiences, overshadowed by being quite small and having been frequently bullied. He did well in his GCSEs, passing both English Language and Mathematics and is on a Level One catering course, having developed a passion for cooking early in his life.

Henry (August) is in his second year at college taking a Level Three vocational course. His secondary school days were traumatic, involving frequent, severe physical bullying, one incident of which involved the police. He passed GCSE Mathematics at school and subsequently passed GCSE English Language with a Grade 5 in the November resits at college. He has underlying health issues.

Rory (May) is in his first year at college taking a Level Three vocational course in Sport, based on a good set of GCSE grades. He describes a strong and consistent friendship group throughout his primary, secondary and college attendance. He is confident and positive about his future.

4.3.3 Thematic analysis

Analysis of the field of the relative age effect has been underway from the outset of this study. From taking early notice of clusters of summer birth dates and consideration of how individual students perform academically on arrival in further education through to the categorisation of the transcripts by theme, each step has demanded careful and thoughtful examination (Coffey and Atkinson, 1996). The following main themes were identified: Settings; Academic subjects; Relationships; Being younger and Academic self-concept. Although there were multiple ways in which the contributions could have been segmented into themes, the themes chosen were the strongest topic clusters and linked well with the current literature in the relative age effect field.

4.3.3.1 Settings

The semi-structured interviews took a linear approach with each participant, starting from primary school. Although originally the focus was just going to be on primary and secondary, all participants were keen to share their more recent college experiences. Existing research suggests that the relative age effect is at its strongest within primary school, lessening in impact throughout secondary (Oshima and Domaleski, 2006; Crawford, Dearden and Greaves, 2013), so it was expected that the strongest evidence might be in this early phase.

All participants reflected mainly positively about primary school. For most it was a time of safety and fun, with memories of friendships, kindly teachers and interesting school topics. Rory described his primary days as 'safe and vibrant' and 'a good time in my life'.

Daniella reflected appreciatively on the outside environment:

> 'I remember clearly there was a chestnut tree that was always sat there dangling really lovely colours'.

Henry remembered an event that triggered a continuing interest in Greek mythology:

> 'A day where we had someone come in dressed as a Roman or a Roman/Greek and we learned about ancient Greek mythology. I can remember that day in a bit of detail….I remember he showed us a replica of an ancient Greek javelin and a replica of one of their shields'.

Henry explicitly noted that he had gained confidence during his time at primary school stating that 'I felt that stuff would go okay', when contemplating the transition to secondary school, even though he reported not having made many friends. Equally, Daniella had mixed experiences, having struggled with friendship problems throughout primary school.

Secondary experiences were much more varied and for most of the participants COVID-19 impacted their last year. Laura and Henry were critical of the level of discipline in their schools, both feeling that they were adversely impacted by poor standards and inadequate teacher intervention. Laura starkly described the impact of examination pressure on her secondary school experience saying:

> '…when you're going to a classroom it's not like you're learning to learn. You're learning because you have an exam to sit'.

Both Laura and Daniella took on roles in secondary school. Daniella was made a prefect and Laura became part of the school council, which was unsatisfying for her:

> 'So, I had a badge that said I am part of the school council, but I don't think we ever actually did anything, as bad as it sounds'.

Laura and Henry were the only two participants who sat GCSE examinations in the summer of 2019. All the others were given centre-assessed grades in the summer of 2020

due to COVID-19, so much of their talk was around the impact, both positive and negative, of not having the full examination experience. Connor described a loss of control and that, given the opportunity, he 'could have done a bit better in some subjects, but would have done worse in others'. Lei was more downbeat saying 'I don't think I would have passed them to be honest, even if I had to do them', admitting to falling asleep in his English mocks and feeling a bit caught out by not having known how important the mocks would become once the examinations were cancelled.

For most of the participants, coming to college was an active choice. Rory seemed to have lost confidence by not having taken examinations and was more attracted to a vocational course in college based more on coursework, rather than taking the examination-only A Level route from school to university. Laura, having gained confidence in her vocational course in her first year at college, swapped to A Levels, so will take three years post-16 before progressing to university. As for Rory, Laura hoped that she could compensate for not getting high Grades (7-9s) in her GCSEs by doing well at college.

Overall, college experiences contrasted sharply with those from secondary school in terms of learning experiences and relationships. Henry, also in his second year, was effusive about the difference:

> 'I feel that teaching this year has gone *exponentially* well, and I have learned quite a lot…. I am actually fully engaged in lessons and actually enjoy going to lessons for once……. I actually feel like I want to go in and I want to learn'.

Daniella had not wanted to come to college due to her strong attachment to her secondary school, but her GCSE English Language and Mathematics results were so low (Grade 1s) that her options to study at school were very limited. She wanted to carry on with her favourite vocational subject at school, but it was only available as an A Level from which she was excluded. She has since come to accept the enforced change stating:

> 'So, it was like a shock to me. And so, I think that then maybe that was meant to be, the idea of me not doing that course after all at school'.

4.3.3.2 Academic subjects

The participants spoke freely about their most and least favourite subjects at school. Specific questioning probed the participants' experiences of English Language and Mathematics in particular, as these subjects had been identified as having a disproportionate number of summer-born student enrolments in Phase One of this study. Participation in school sport was also explored given the clear research evidence that those furthest away from the annual cut-off date are least likely to be chosen to represent their school (Cobley, Abraham and Baker, 2008).

Inevitably, the focus of many of the participants was on their actual grade at GCSE for English Language, which itself was interwoven with the issue of centre-assessed grades for all but Henry and Laura. Daniella, Henry and Connor described ongoing issues with English throughout their time at school. Interventions to support them varied. Connor describes extra reading lessons at primary school that were ineffective for him as no direct instruction was given:

> '….we would have our English class and on a Friday that would be in a library and in another class we would have like with the head of English and just be in there and just reading again, so reading twice, on a Friday. So yeah, like going in there, reading but majority of the time obviously like you're not allowed to talk if that makes sense to you. You're supposed to read in silence and every single time I'd just get distracted. I was with my mates, start talking that kind of stuff'.

Connor did like writing though, but principally when that involved copying from the board rather than creating his own text.

Henry was triumphant at achieving a Grade 5 in English Language on his third attempt, having had just over a year of extra teaching at college. Ahana, in contrast, found English difficult on arrival in England due to it being her second language, but persevered and with the support of her teacher achieved her highest overall GCSE grade in English Language.

Daniella's difficulties culminated in a diagnosis of dyslexia in year 10. She talked of 'hating' English Language, finding it 'stressful', focussing on her inability to spell and struggling to read 'big words' like hyperbole. She avoids reading out loud as it's so difficult, annoyed with those who suggest she should not be ashamed of her difficulty. She said:

> 'They even say I'm not dyslexic but don't be ashamed of it, and I'm like, why, why can't I be ashamed of it when it's my learning disability?'.

Discussion of Mathematics generated more polarised viewpoints from the participants. Only Lei and Henry reported unproblematic achievement throughout school, Lei being in the top three in Mathematics in primary school. Both achieved Grade 5s at GCSE, good passes, but not sufficient for them to continue with the subject for A Level. The language used to describe Mathematics among the other participants ranged from not being 'a huge fan of maths' (Rory) and 'I weren't particularly good at maths' (Connor), through 'I'm terrible at maths' and 'I'm so bad at it' (Laura) to the extreme of 'I literally hated maths' (Daniella).

Connor found himself in a small Mathematics support group at primary school 'to make it easy and more fun for us'. By secondary school his parents were paying for private tuition for him until COVID-19 prevented that from continuing. Laura described being just good enough to avoid being put into extra classes at secondary school, whereas Ahana turned

to her brother for Mathematics support. Daniella has turned to a friend in college for help but still says:

> 'I'll stand here and put my foot down or even say it to my maths teacher in college. I hate maths. The only way they can get me to do maths is if I knew what I was doing'.

Her reference to knowing what she is doing suggests Mathematics anxiety that is only allayed by staying within her comfort zone of confidence based on what she can already do.

The participants' responses confirm the research evidence that GCSE grades may be depressed for those who are born later in the academic year (Crawford, Dearden and Meghir, 2007). Although Lei, Laura, Rory and Ahana had achieved what would be considered good GCSE grades in that they got a Grade 4 or just above, Henry took three attempts for English Language and Daniella and Connor continue to struggle. Even those who passed at the first attempt were not particularly satisfied with their results, confirming substantial research evidence that relative age has a negative impact on overall result profiles, most recently evidenced by Givord (2020).

Only one of the participants, Rory, spoke of representing his school at secondary level, in football until the end of Year 10. Both Daniella and Connor referenced their height as being an issue, although Connor did get chosen once to represent his primary school at a game that involved sitting on a bench and throwing a ball to teammates. Lei described being 'kicked out of the sessions' in primary school but was a back-up for the rugby team in secondary. However, Lei and Connor both played for local football teams where selection draws on a much smaller initial cohort, until examination pressure became too much. Daniella spoke of undertaking a lot of sport including football, hockey, tennis and table tennis, although there was no suggestion of any school representation involved. Thus, the research evidence that being born in the summer months makes it less likely to be chosen to be a representative within a school sports team appears to be confirmed (Musch and Hay, 1999; Cobley, Abraham and Baker, 2008), not because only one of the participants was a sports representative but because three of the participants made specific references to not being selected.

4.3.3.3 Relationships

Participants' relationships with parents, siblings, and teachers, all as significant others in their lives, will have inevitably influenced a lot of their educational experience to date (Elder-Vass, 2012). All participants indirectly referenced supportive familial relationships throughout their school years. Examples given included Ahana's Mathematics support from her brother, mentioned above, and Lei's early experiences baking with each of his

parents that helped foster his passion for cooking. Henry warmly remembered working on various school projects in primary school with his parents:

> ‘I remember doing these with my family. So, I used to do the written part with my mum and then the making part for project to make something like a diagram, which I used to do with my dad’.

Equally warm were the memories of teachers from both primary and secondary setting, some of whom the participants still had contact with. Both Lei and Daniella described themselves as ‘a teacher’s pet’ in primary school, who, along with Henry, had parents who were personal friends with at least one of their teachers. Overwhelmingly, the participants’ descriptions of individual teacher relationships were positive, identifying individuals who had influenced, supported and cared for them across the years. Only Henry and Laura had criticism to share around school disciplinary standards, laying blame mainly at the management level. Henry was the only one who identified poor teacher professionalism at school in contrast to college, referring to his GCSE English Language experience:

> ‘At college it was a lot more professional and the teachers absolutely cared about you passing instead of *we’ve just got to teach these to get a wage’*.

Both Daniella and Ahana spoke about developing a ‘bond’ with some of their teachers, although how reciprocal that was is unclear. Both Henry and Connor related to specific male teachers who they depict as someone ‘who joked about and made it that you wanted to learn’, and ‘a really good understanding guy’ respectively. Both teachers broke the conventional mould but made real connections with their pupils. Connor described his teacher as:

> ‘He’d swear and everything. He was a joker…but then he used to bring his dog in and… everyone used to go into his classroom like break and lunch. He was just a funny guy’.

The participants thus described social aspects of their relationships with their teachers rather than showing awareness of the daily interactions that may have shaped their own self-perceptions (Burns, 1982). Although critical of professional standards (Laura and Henry), the disapproval was aimed at general behaviours rather than individual interactions.

Accounts of peer relationships, in contrast, were more inconsistent. Only Rory and Connor related unproblematic and positive friendships lasting through primary and at least into secondary school, happily ‘hanging out’ at break times (Connor) and having two best friends who he has ‘known for almost eleven years’ (Rory).

Primary school was a period when making friends was difficult for three of the participants. Henry, Lei and Daniella all reported being unable to break into friendship groups and spending time alone or being ‘socially left out from all the other kids’ (Lei). Lei stated that

he was ‘a bit closer to’ the older kids from the year younger, because they were sort of born at a similar time’, suggesting an age effect due to the academic year cut-off. Ahana reported friendship issues due to moving from school to school in her early education in India, which, in the end she reflected, made her more able to cope when the final move to the UK occurred.

Henry explained his initial problem due to moving house and starting a new primary school halfway through year one, when friendship groups had already been established. He only managed to make friends when some new children joined his class in year three. Laura recalled wanting to join in with the boys playing football in year three, but her female friends saying ‘they didn’t want to speak to me anymore if I started hanging out with the boys’, suggesting control of membership of friendship groups. Daniella took a different approach and played football with the boys anyway, because ‘the majority of the girls were scared of football’, but, nevertheless, described herself as ‘the odd one out’.

In secondary school Laura described ‘the power dynamic of the popular group and then the people who weren’t popular’ that emerged by year eight. Locating herself as ‘sort of in the middle’, she reported no issues of being picked on or bullied. Ahana also navigated her friendship groups effectively, making the conscious transition from Hindi speaking friends to those who only spoke English, even though ‘the people who used to speak Hindi started hating me’.

Unfortunately, the secondary years for Henry, Lei, Rory and Daniella involved considerable amounts of bullying. Rory was the least affected, suffering a lot in year seven ‘before I put my game up and during the other years it wasn’t so bad’. He thought it was simply something that was bound to happen in year seven when you joined a new school. However, Lei, Henry and Daniella had persistent and extremely unpleasant experiences meted out by their school mates. Lei mentioned bullying without prompting very early on in his interview. He believed that his relative age was a contributory factor stating:

> ‘Obviously, being born in the summer I was one of the youngest in the year, so they just thought, let’s pick on that kid...’.

Lei felt safe in lessons, being ‘pretty academic’, but in the unregulated spaces in break times outside classes he continued to have issues, until he started defending himself towards the end of year nine.

Henry’s whole interview was riven with accounts of violence towards him at secondary school. He spoke of several assaults: having one of his teeth knocked out in year seven, having his head cracked open by a stone in year ten and the police being involved after

another assault in year ten. He described bullying as ‘commonplace’ in his secondary school and throughout his time there he filed over two hundred incident reports, but felt that only four of them were dealt with appropriately. His sense of injustice was only matched by his utter fear of going to school, stating:

> ‘After the assault I felt like I didn’t want to step foot even on the bus that would get me to secondary school. I felt that scared when I was at secondary school. It was that bad’.

Daniella’s problems with bullying started in primary school, but on arrival in secondary school where she also experienced a lot of bullying, it became ‘a living hell’ halfway through year eight when she was falsely accused of something by a bully. That one specific incident continues to affect her:

> ‘To this day what the person said to me and said to the teachers still haunts me, but now I’ve realised it weren’t my fault. I still have scars from that person. I’m going through college trying to get through it. I’ve told my tutors and my counsellor about it’.

The accounts of peer relationships focused on social rather than academic interactions with peers. There was no overt indication that the participants compared themselves academically to their peers and yet implicitly throughout the participants’ accounts they expected there to be a rank order both socially and academically as suggested by Borke (1972) and Erikson’s fourth industry versus inferiority stage of development (Cherry, 2020), whereby comparative teacher references can insidiously undermine confidence in those who do not receive as strong reinforcement of their academic performance as others.

4.3.3.4 Being younger

The theme of the research around being summer-born was explicit from the outset for participants as they had to meet the birthday criterion of being born between May and August to be eligible. Laura (July) and Daniella (May) admitted that they had never thought about their age relative to their classmates as being of interest, apart from one minor incident for Laura who was teased by her classmates for not being old enough to watch a 12/A rated film at the end of the summer term of year seven. Ahana (May) had the odd experience of being among the oldest in her year group throughout her time in India where the new academic year starts in April and then amongst the youngest when she transferred to the UK. She had only thought about her relative age in relation to the friends she left behind, finding herself effectively a year ahead of those still in India and now feels ‘a bit smarter’.

Henry (August) was more aware of differences in maturity and size, and his position in the year group, stating:

> In primary school… 'I was the youngest in my year and I could tell that by how I acted, how tall and how I looked. But in secondary school I was the third youngest in my part of the year….I did feel throughout I could feel the effects of about being one of the youngest'.

Lei (July) too was aware of his relative lack of maturity and being small, an issue that Connor (August) also referred to: 'I was one of the smallest as well to be honest, one of the smallest in my class' and was aware of the 'cut-off'. Rory (May) too was aware of his relative age, referring to himself as 'a late', but had made friends with children who were in the year above, stretching the age difference even further. He reflected that, had it not been for COVID-19, he would have felt left behind by them being able to learn to drive and go to the pub, but in fact he was catching them up, as they had not been able to take part in these activities.

Connor (August) considered the issue of the timing of his birthday from a social rather than an academic viewpoint, as his birthday always fell in the summer holidays. He was thankful that he did not have to endure the 'birthday beats' every year, when peers would punch the birthday celebrator once for every year of their life. On the other hand, he was sad to have not been able to bring in sweets to share with friends at primary school on his birthday:

> 'Also like not bringing in sweets as I wanted people to get sweets off me but obviously, I never got to do that, if that makes sense?'.

No existing research was found that had specifically asked summer-born students what their perceptions of being younger in the classroom meant to them, so these observations are interesting in that they again focus on the social aspects of being younger within a cohort rather than explicitly relating to academic progress. Participants were generally unaware of the potential impact of being younger on their academic performance and had developed only a limited sense of agency, in that they could exert control over either their environment or the events that unfold there. The balance of power and agency within the early primary classroom, which Bandura would describe as an imposed environment (1977), would not facilitate any challenge to reciprocal interactions that subtly ranked or classified such young individuals. Indeed, the research on cognitive dissonance hints that all children are likely to avoid the uncomfortable process of challenging teacher expectations, instead assimilating the teachers' viewpoints, positive or negative, into their own self-belief system (Elliott and Devine, 1994).

4.3.3.5 Academic self-concept

Participants gave hints of their academic self-concept throughout the interviews. However, as with many young people, the participants in this study identified several different underlying issues that they thought contributed to their academic progression through the

educational system. In particular, Henry, Connor and Daniella identified specific problems that had affected them.

Henry was identified as having epilepsy in year five and autism in year eight. Daniella finally got her diagnosis for dyslexia in year ten and has ongoing mental health issues, including panic attacks. Connor mentioned poor eyesight but talked much more about having a poor memory as a root cause for many of his problems, not being able to remember unless he was 'proper interested in it'. His explanations for his poor memory were twofold. Firstly, he recounted that he had fallen down the stairs at age one which affected his brain although there was no medical evidence for this. Secondly, he shared that his father's side of the family 'can't study either. They're not good in school', although his sister and his mother's side of the family were more academic.

Lei juxtaposed his report of being bullied with his academic self-concept saying, 'I was pretty academic, again sometimes bullied in lessons, but still a very academic student', but only rated himself academic 'up to about year eight'. Ending up with one Grade 6 and the remainder Grade 5s at GCSE, albeit centre-assessed grades, his judgement of having done 'reasonably well' is justified. Rory was happy with his eight GCSEs although he didn't specify the grades, but Laura was more self-critical:

> 'I didn't really push myself. My GCSEs are okay. I think I got three 6s, a 5, three 4s and a merit. So, like they're decent'.

Connor was also self-critical, blaming himself for not putting more effort in earlier and being caught out by the cancellation of the examinations. He described himself as 'a bit lazy' and that he could have been 'a bit more motivated'.

Daniella rejected her teacher's viewpoint that she was 'good at art', saying 'I'm rubbish at art', but then going on to claim:

> 'For instance, I do drawings of like nature or when I go to beaches. I was trying to memorise what I do and beaches and draw that out. That's the one thing I loved about secondary. I can like just imagine anything and I could put it on paper, which was great for me 'cause I can express things through pictures'.

Daniella appears to separate academic art, as judged through a GCSE examination, and her own personal pleasure in creating art to express herself.

Connor also separated out school-based activities from those done for personal gain. Connor described a family acquaintance who was posting pictures of books the acquaintance was reading on social media, which inspired Connor to buy a copy of one of the books online. He was five pages in at the time of the interview, as his reading was 'a bit slow' but he was planning to buy another book once he'd finished the first one. In contrast, Ahana expressed confidence in her own abilities, assuming that she would

progress to university just as her parents and her brother had done, irrespective of whether she took an academic A Level or a more vocational route to get there.

The participant interviews demonstrated the messy and intertwined nature of human interactions that, over time, build and change social relationships and self-concepts, based on implicit and explicit classifications (Hacking, 2000). The participants gave encouragingly honest views of their school experiences, perhaps enabled by now being in a different setting. They all tried to deliver appropriate responses in the context of the interviews, responding to the questions posed, thereby co-constructing the resultant dialogue (Freeman and Mathison, 2009). Responsibility for academic performance, in the participants' views, sat firmly within themselves. Any difficulties or disabilities were wholly owned by them, as in Daniella's claiming of 'my learning disability', and any poor performance was also internally situated due to their individual behaviours of being 'lazy' and 'not pushing myself', as remarked by Connor and Laura respectively.

4.4 Summary

In this chapter the findings from both the quantitative and qualitative phases of this research have been presented. Comparing the enrolment onto Study Programmes for 2018-19 for the further education college in this study, it has been shown that there is evidence of the relative age effect. Not only are those born in the summer months affected, demonstrated by higher than expected enrolment from among this group of students when compared to national birth data, but those born in the first few months of the academic year are under-represented. Thus, the effect is in operation throughout the academic year but in different directions depending on the month of birth. In addition, it has been demonstrated that there is a strong association with GCSE grades in Mathematics and English Language for this pattern of enrolment particularly for programmes at Levels One and Two. Ongoing issues with GCSE achievements continue for those born in the summer months in comparison to their peers born earlier in the year.

Interviews with the study participants revealed that they found primary school a safer and happier place to study than secondary school. Most of the participants formed strong friendship bonds and had good relations with their teachers, but some of the participants reported having difficulties with friendship groups and suffered quite severe bullying as they progressed through secondary school. Participants were aware that they were younger than many of their peers but did not regard this as a possible cause for not succeeding as well as they might have done in the GCSE examinations. The last year had been profoundly affected by the impact of COVID-19 for all participants, disrupting examinations, friendships and modes of study.

5 Analysis

5.1 Introduction

Having considered the results that emerged from both the quantitative and qualitative phases of the study separately, this chapter moves to the final phase of the Explanatory Sequential approach, by bringing together the findings in two distinct stages, deductive and retroductive analysis (Ritz, 2020). Firstly, in the deductive stage, I will start from the concept of the relative age effect and the phenomena that have been identified through the quantitative and qualitative phases of this research. I will explore connections to the relevant literature to date (Coffey and Atkinson,1996) and creatively conceptualise the necessary properties of the phenomena (Danermark, Ekström and Karlsson, 2019). Secondly, in the retroductive phase, I will attempt to identify the mechanisms and triggers for what was observed in the quantitative and qualitative phases of this study.

5.1.1 Deductive analysis

The purpose of this deductive analysis is to draw together the findings from the first two research phases and, by referring to the relative age effect research literature, infer what the best explanations might be for the data presented, leading to identification of the relative '*pursuitworthiness*' of any emerging theories for the following retroductive stage (McKaughan, 2008, p.447). Some findings, such as attendance, completion and achievement, are only evident in the quantitative data. Contrastingly, other findings can be located only in the qualitative phase such as peer and teacher relationships, individual influences and hints towards academic identity. The richest source of analytical evidence is where both quantitative and qualitative findings can be related to the existing literature, as found for patterns of enrolment, mental health and bullying, and GCSE English Language and Mathematics incoming grades, for example.

Taking themes that emerged in the quantitative phase first, this section will consider how the quantitative data identified by this study can be considered in relation to the research literature, thereby suggesting possible areas for further analysis in the retroductive phase. The themes are gender, ethnicity, attendance, completion and achievement.

5.1.1.1 Gender

The quantitative data indicated that there was little difference in enrolment patterns by gender, apart from August when females were 1.7% more likely to be enrolled than males, although the enrolments still followed the rising trend from September through to August. The participant sample only contained males born in August so it was not possible to investigate directly further in the second phase why that might be the case. However,

potential reasons might include greater incidence of delayed entry or more frequent referral to support or Special Educational Need diagnosis for males born in August. Delayed entry might be due to greater parental perception of immaturity for males close to school start dates, whereas increased support and Special Educational Need referrals might have a similar explanation but instigated by a teacher once in school, given that in general referrals are much more likely for those young in the year (DiPasquale, Moule and Flewelling, 1980; Uphoff and Gilmore, 1986; Crawford, Dearden and Meghir, 2007), and significantly so for males according to one study in the United States (Tarnowski et al., 1990). Delayed entry would remove a small number of August-born males from the cohort data. Equally, increased support and Special Educational Need referral might boost comparative male performance just enough and early enough to counter some impacts of the relative age effect.

5.1.1.2 Ethnicity

Langer, Kalk and Searls' (1984) study in the United States found that the relative age effect was longer lasting for Black students in comparison to other ethnicities, but evidence from the United Kingdom and for post-16 setting is scant. Nevertheless, the quantitative data from Phase One suggested that, of all the ethnicities, White students showed the greatest difference in enrolment between those born in September (5.49%, n=269) to those born in May (9.83%, n=370) and June (9.78%, n=368). The only reference to race in any of the interviews came from Ahana, who described her friendship difficulties when she chose to speak only in English at school. Possible explanations for increased enrolments from summer-born White students might be that the numbers of the other ethnicities were too low to show any significant effect. Alternatively, monitoring of ethnicities other than White is routine in schools, so perhaps White students are not as readily picked up for interventions.

5.1.1.3 Attendance, completion and achievement

Gaps in overall achievement for gender, by programme level, for declared disability or difficulty and by ethnicity are monitored in all further educational colleges. Ideally, there are no gaps in achievement between groups with different demographic characteristics and, where gaps remain, they are no larger than the national data identifies (GOV.UK, 2019b). The quantitative data presented in this study suggest that the relative age effect does not impact on main programme achievement once the skew of enrolments towards the latter end of the year is accounted for. Whereas Carroll (1992) and more recently Cobley et al. (2009) found poorer attendance amongst those born later in the academic year in primary and secondary school settings respectively, data from the college sample showed that those born later in the academic year, from March onward, were the higher

attenders. The interview participants did not mention attendance either positively or negatively, and it is not possible to compare their previous school attendance with their current attendance. Although research data in the literature (Cobley et al., 2009) suggest lower attendance for summer-born students, this study evidenced an opposite, positive trend in attendance for summer-born students. It is possible that the fresh opportunity of a new setting, enthusiasm for the choice of subject chosen to study, combined with the relief from bullying that had happened at school, could support more robust attendance, although arguably the first two factors, if not all three, could apply equally to all students arriving in college from school.

All participants spoke positively of their future plans and gave no hint that they would be likely to drop out of college before completing their programmes. Indeed, having survived the difficulties of lockdown and remote learning due to COVID-19, all but Daniella were enthusiastic to return to on-site learning. The quantitative data indicated that course completion and achievement was just as robust for those born in the summer as for those born at any other time of year. There is no comparative data in the research literature as earlier phases of schooling are compulsory and, although education to age 18 is equally compulsory in England, a post-16 student has far greater leeway to drop out of courses, gain employment or simply become NEET (Not in Education, Employment or Training). It can, therefore, be inferred from these data that month of birth is not a significant predictor of course completion or achievement in this post-16 setting.

Some themes emerged through the participant interviews but were not visible directly in the original observed dataset in the quantitative phase of this study. These themes were peer and teacher relationships, individual influences resulting from being younger in a year cohort and the formation of academic identity.

5.1.1.4 Relationships

Notwithstanding the bullying issues mentioned above, peer relationships formed a substantial amount of the conversation in the interviews. The focus was on social interactions rather than academic comparisons, making friends or not making friends, and dealing with group dynamics. There was no suggestion of being academically more or less able than their peers. Participants located any social differences within themselves, as in Daniella's description of herself as 'the odd one out' and Lei's statement that he 'got on with a few people, but not a lot of people'. The participants were unaware of the impact that other's perceptions of them might have over time through iterative feedback loops, nor were they aware of how their own accumulated self-perceptions might be contributing

to their academic identity (Hacking, 1983; Mead, 1934). This level of awareness is not unexpected given the relatively young age of the participants.

5.1.1.5 Teachers

Teacher relationships for the interview participants were a satisfying part of their primary and secondary experience, even if school-wide discipline issues did not protect them as much as they wished. Ahana and Daniella spoke of developing bonds with their teachers and Henry and Connor found male role models to whom they could directly relate. Only Ahana spoke specifically about approaching teachers for extra academic support. There was some mention of sets for Mathematics and Laura was annoyed at not being in a segregated, higher set for English Language. Teacher-pupil relationships were overwhelmingly positive but interview evidence also suggested that responsibility for academic achievement was located in the individual pupil rather than shared with the teacher. Given the evidence from Campbell (2014) that in-class grouping by ability increases the likelihood that younger-in-cohort children are judged as less able, it could be inferred that the English school system's emphasis on demonstrating and practising differentiation has contributed to reifying academic assumptions, and thus limiting potential, for some summer-born children. In contrast to the suggestion that teachers might over-refer summer born children for Special Educational Need assessments (DiPasquale, Moule and Flewelling, 1980; Crawford, Dearden and Meghir, 2007), none of the participants reported having been incorrectly identified with Special Educational Need issues. Indeed, the opposite seemed true, Henry being diagnosed with autism in year 8 and Daniella only gaining a dyslexia assessment in year 10. Connor's underlying difficulties that could well be dyslexia, if not greater cognitive impairment due to his fall, have gone completely unassessed. Both qualitative and quantitative phases of this research do not support any suggestion of over-referral or assessment for specific learning difficulties.

5.1.1.6 Individual influences resulting from being younger in the year cohort

Personal experiences of being younger-in-year were not addressed in the research literature directly through any purposive qualitative enquiry, rather they were extrapolated from existing datasets and subsequently referenced to month of birth. However, the participants in this study expressed their school experiences in such a way as to illuminate their personal journeys and responses to events that unfolded during this time. In the imposed environment that constitutes school (Bandura, 1977), due to its overt hierarchical power structures, the participants' sense of agency was still in development for some of the participants (Daniella and Connor) but more developed for others (Ahana, Laura, Rory

and, more recently, Henry). Each expressed the ability to self-regulate, or to have learned to self-regulate. For example, Connor stated:

> '…since the start of year 9 I started realising that I need to focus if that makes sense…So I started getting better at like most things I do'.

Therefore, Connor took some personal control of his destiny in Year 9, but it did not work out completely as he admitted to not putting much effort in and falling asleep in his GCSE English Language mock. Rory, Connor and Lei played football regularly, but all gave it up for Year 11 to focus on their studies for upcoming examinations. None of the participants described a sudden or significant improvement in their academic ability as they progressed through school, appearing to be on set trajectories from early primary school. It is possible that participants had internalised their teachers' perceptions of their academic abilities and continued to perform within these boundaries through aspects of modelling and mirroring. Early pathways were confirmed as the participants progressed, supporting the idea of path dependency.

5.1.1.7 Academic identity

All interview participants were well able to separate out their social, physical and academic selves, and their emotional well-being appeared to be dependent on all three aspects (Montemayor and Eisen, 1977). All participants situated their academic performance within themselves, seemingly accepting of their teachers' assessments, which were then confirmed by either external examinations (for Henry and Laura) or, rather self-referentially, by centre-assessed grading due to COVID-19 for the other participants. Only Daniella gave an example of refuting her teachers' assessment of her 'good' skills, specifically when she spoke about art. However, her explanation was contradictory, in that at the same time as claiming she was 'rubbish at art', she gave examples of drawing regularly and being 'able to express things through pictures'. She was confident enough to claim that she was good at her vocational area, so she was not underplaying her abilities across all subject areas to avoid cognitive dissonance (Cooper, 2007). Art, sport and, to a lesser extent reading, offer opportunities for out-of-school activities that are not bound up with set curricula and subsequent examination pressure. Having separate, even contradictory self-assessments of these skills is, therefore, logical. Students entering further education, probably from all months of birth, have internalised their conception of their own academic ability. They believe that their ability is quite fixed and are self-critical if they have not achieved as well as they had hoped in their examinations. They may blame schools and teachers for negative social events, such as

classroom disruption or bullying, but the students do not hold their teachers in any way accountable for their own perceived lack or limit of academic achievement.

Finally, for this third part of the deductive analysis, themes that intersected the quantitative phase and the qualitative phase are brought together and related to the research literature. The themes are patterns of enrolment, English Language and Mathematics, and mental health and bullying.

5.1.1.8 Patterns of enrolment

The quantitative data for student enrolments in 2018-19 showed that, in comparison to the 20 year birth trends by month, as evidenced by the Office for National Statistics data for England and Wales (Office for National Statistics, 2015a), fewer students than predicted, born between September and December, enrolled at college and more students than expected, born between May and August, enrolled at college. Although the overall differences were only between 1.7% below in September and 1.5% above in May, nevertheless, the trend was consistent across all the months of the year. Based on the sample population of 4897, these data suggest, for example, that 83 fewer September-born students enrolled in the college and 73 more students born in May enrolled in the college, than might have been expected in 2018-19. However, these figures mask the far more substantial impact when specific programme levels are considered. Although no relative age effect was found for Entry Level, overall differences in enrolment from that predicted by the Office for National Statistics population data (2015a) showed that Level One enrolments had a difference of 4.26% between September and July, Level Two enrolments had a difference of 4.16% between November and May and Level Three enrolments had a difference of 3.39% between September and June.

The sample interview participants had birthdays between May and August and attended programmes of study between Level One and Level Three. As the quantitative findings did not show any relative age effect at Entry Level no one from that level of programme was recruited. Rory and Laura confirmed the suggestion that some 17-year olds are starting new Level Three courses, Henry having moved up from Level Two and Laura having changed direction from her first year on a Level Three vocational programme and now in her first year of A Levels. Daniella and Lei were both on Level One programmes but for different reasons. Daniella had weak GCSE grades overall, including English Language and Mathematics, which prevented her from accessing a Level Two programme even though she had studied the vocational subject at school. Lei, on the other hand, had good passes at GCSE but was required to start at Level One because he needed to build his

vocational knowledge and skills from the most basic level. Connor too was on a Level Two course because he had not yet gained a Grade 4 for GCSE English Language and Mathematics. Only Rory and Ahana had direct access to Level Three programmes as their GCSE results, including English Language and Mathematic, were sufficient. Students can access most Level Three study programmes with either GCSE English Language or Mathematics at Grade 4 still to achieve. These patterns of enrolment indicate that overall GCSE achievement, particularly English Language and Mathematics, are strong determiners of level of programme. Level of programme is significant as it determines whether a student spends two or three years in post-16 education, the lower the starting level the longer they may spend. Thus, the relative age effect dictated by GCSE English Language and Mathematics outcomes appears to be a determiner of how long a student spends in their post-16 educational phase.

5.1.1.9 English Language and Mathematics

The research literature is unequivocal about the negative impact of being younger-in-cohort on academic outcomes in English Language and Mathematics across primary and secondary school years. From Key Stage One results (Daniels, Shorrocks-Taylor and Redfern, 2000), GCSE outcomes (SEB, 1995; Massey, Elliott and Ross, 1996) and the UK results from the *Programme for International Student Assessment* (PISA) tests in 2018, it is evident that being born in the summer months reduces potential grade achievement in both subjects (Givord, 2020). According to the participants, they had incoming GCSE grades (i.e., grades achieved whilst still at school) ranging from 1 to 6.

The quantitative data for incoming grades for GCSE English Language indicated that of the cohort who arrived with a Grade 3, twice as many were born in May (10.52%) as opposed to September (5.17%). Similar stark differentials were found for Grade 1 (1.89% September-born and 20.75% June-born) and Grade 2 (5.78% September-born and 11.70% August-born). Although Henry had achieved a Grade 5 in English Language at his third attempt once he had arrived at college, Daniella (Grade 1) and Connor (Grade 3) continued to struggle, finding that even trying to improve by one grade was challenging, identifying reading as the most difficult skill.

The quantitative data that emerged from this study for Mathematics showed a similar differential between incoming grades depending on month of birth as English Language. For example, only 6.57% of September-born students came with a Grade 3 as opposed to 10.8% of those born in August. The mention of Mathematics produced some emotional responses with only Lei and Henry happy with their mathematical performance. Primary

school Mathematics was overtly identified as an issue by Connor and Daniella, but described as being ‘really enjoyable’ by Rory. Secondary level Mathematics was more problematic, with Laura, Ahana and Daniella being the most vocal. Laura had difficulty with the abstract nature of the tasks, not seeing the application clearly enough, and Ahana identified the speed she was expected to work at the in top set as the root cause of her difficulties. Daniella had developed a hatred for Mathematics that caused her considerable anxiety.

Only Ahana achieved highly enough to consider studying English at A Level, which she rejected, and none considered Mathematics. Given the overall depression of grades for those born in the summer months, even though some passed with Grades 4-6, they still did not achieve well enough to be obvious A Level candidates. Early and ongoing success in English rests on ability with language, a good vocabulary and, arguably, absence of dyslexia. It is conceivable that being significantly young-in-year (20% at age five) would reduce actual and perceived performance from both the pupil’s and the teacher’s perspective when measured against standardised assessment criteria for year cohorts. For Mathematics, similar issues must surely apply in terms of being able to perceive and manipulate numerical concepts. The divergence in abilities due to twelve months difference between an early September- and a late August-born child would be at its most intense in the early years of primary school and may lay the foundations for subsequent, long-term difficulties in performance for both English Language and Mathematics for some pupils.

Henry had been in college long enough to retake his GCSE Mathematics under examination conditions in November 2020 in which he achieved a Grade 5. His positive account is mirrored in the quantitative data that shows that more than twice as many August-born students pass GCSE Mathematics with a Grade 4 or above (9.35%, n=23) in contrast to those born in September (4.47%, n=11). However, this positive finding must be tempered by the more significant finding that overall, those born later in the academic year are much more likely to get stuck at Grade 3 for both GCSE Mathematics (11.01%, n=61 for August against 5.23%, n=29 for September) and English Language (11.38%, n=90 in May against 5.06%, n=40 in September), suggesting a residual impact of relative age that is not remediated by completing another year’s study of these subjects.

There is evidence that, for a minority of students, trends in incoming grades and outcome grades appear to reverse based on month of birth. Perhaps, for some summer-born students at least, being in a cohort with others who are only as good as or weaker than

themselves at Mathematics, boosts confidence and provides an opportunity to catch up. Alternatively, arriving in a new educational establishment where past performance in Mathematics or English Language is reduced to a simple grade, offers the opportunity to reset attitudes and behaviours from the student's perspective and eliminates biases and preconceptions among the teaching staff. It is feasible that this conjunction of beneficial events contributes to some of the positive outcomes, although it must be borne in mind that the national average pass rate at Grade 4 and above in 2018-19, the last year that in-person examinations were taken, was 17% for GCSE Mathematics and 25% for GCSE English Language. The greater volume of evidence at Grade 3 confirms this national trend for both subjects. Although for any further education student retaking these qualifications their chances of achieving a Grade 4 or above are limited, there is a particular difficulty making the leap from Grade 3 to Grade 4 for those born later in the academic year. There is strong evidence of poor performance for summer-born students for both Grade 1 outcomes and missed or incomplete examinations.

5.1.1.10 Mental health and bullying

Although research literature linking relative age to mental health issues is absent for post-16 settings in the United Kingdom, there are sufficient studies from a variety of countries to suggest that being younger-in-cohort can impact on mental health status. The quantitative data showed no trend for declared mental health difficulties by month of birth across the four college sites. However, three of the interview participants (43%) mentioned mental health issues that had affected or were continuing to affect them, but only one had declared this difficulty formally. Four of the participants (57%) mentioned bullying as significant events in their school lives. Both Henry and Daniella linked their mental health issues directly to being bullied, although not directly to their relative age. Lei thought that his relative age was at least part of the reason why he was bullied, but he did not suggest that he had resultant long-term mental health difficulties. Mühlenweg's (2009) findings that younger-in-cohort children were more likely to endure bullying in comprehensive school systems, including being physically hurt, are supported by all three accounts, as is Ballatore, Paccagnella and Tonello's (2020) study, which confirmed Mühlenweg's findings, particularly for males (2009). To find four out of seven accounts emphasising the occurrence of bullying was striking, matched only by the focus on COVID-19 and the pressure to gain good GCSE English Language and Mathematics results. The primacy of bullying events in the participants' accounts suggests that being relatively younger, linked closely with being physically smaller and mentally less mature, may indeed have a significant and enduring impact through ongoing victimisation and learnt victimhood. Absence of any obvious trend in mental health difficulties in the

quantitative phase could be explained because not all actual mental health difficulties are declared and so would not show in the quantitative data.

5.1.2 Retroductive analysis

The quantitative evidence from Phase One showed that summer-born students on Study Programmes in English further education were indeed over-represented. Additionally, the data showed that the relative age effect was evident across all months of the year, not just for those born in the summer. Those born in the months September to December were under-represented in comparison to the national birth data by month and those born in the summer months were over-represented. Those born in the mid-months of January to April did not appear to be affected either way.

Taking McKaughan's (2008, p. 447) notion of '*pursuitworthiness'* in relation to the deductive analysis above, further significant evidence from the empirical layer stood out for exploration through retroduction:

- The link between being younger-in-year and being bullied
- Grouping by ability and differentiation in classroom instruction
- GCSE English Language and Mathematics incoming grades' impact on patterns of enrolment
- Possible reversal of attendance trends for those younger-in-year in college in contrast to school
- Lack awareness of the impact of teachers' perceptions, peer comparisons or of students' own developing self-conceptions
- Continued weaker performance for those younger-in-year in GCSE English Language and Mathematics outcomes
- The relative age effect exists more strongly for White further education students

Proponents of critical realism posit that the observable empirical layer of reality can be explained by events that are actualised in open, social systems, whether these events are observed or not (Sayer, 1992, p.105). In turn, underlying generative mechanisms set in motion forces, known as tendencies, that may, or may not, depending on circumstances, trigger actual events. Events may exist regardless of whether they are observed or measured in any way (Collier, 1994). Therefore, the aim of this retroductive phase of analysis is to search for potential generative mechanisms that might trigger tendencies that in turn account for the observed phenomenon at the empirical level within the open, social, educational system, albeit inconsistently in the form of demi-regularities (Lawson, 1997).

The structure of the English educational system is predicated on a pupil's age with the academic year running from 1 September to 31 August. The underlying generative mechanism that results from this structure facilitates the existence of age-bound cohorts of pupils from Reception through to Year 13. Thus, pupils tend to move through the system year by year with a cohort of their peers who are born within the same twelve-month period, bounded by the academic year dates. A possible counter-tendency exists in the form of delayed admission, triggered if parents/carers feel that a summer-born child is not yet ready to start school. At the empirical level the tendency is realised, and most pupils attend school with their age-bound peers. The interface between this mechanism, tendencies and what is experienced is shown in Figure 5.1 (based on Sayer, 2000, p.15).

Figure 5.1 thus demonstrates one underlying condition, the age-bound structure within the English educational system, that must exist for the relative age effect to exist, because without age-bound cohorts there could be no relativity between ages from the first months of the cohort to the last.

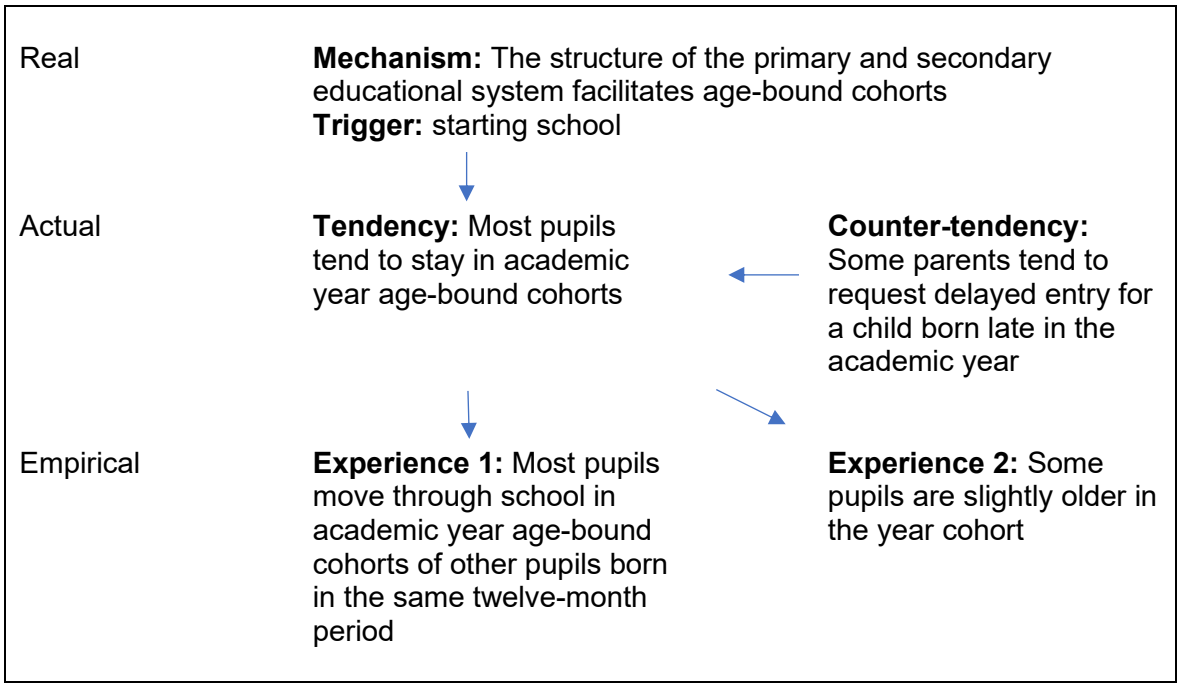

Figure 5.1: Layers of reality deriving from the structure of the primary and secondary educational system.

However, identifying this underlying condition does not begin to explain why there are differences in achievement amongst those born in different months within any given year. No mechanism exists in isolation, either spatially, temporally or culturally, and other mechanisms 'having their own causal powers…may trigger, block or modify its actions' (Sayer, 2000, p.15). For example, the English system of assessment, including

Standardised Achievement Tests (SATS) in Year 6 and GCSE examinations in Year 11 are norm-referenced, meaning that a pupil's assessment score is calculated as a percentile rank as compared to all other pupils who took the same assessment at the same time. Figure 5.2 demonstrates how this structural feature of the educational system generates relevant tendencies and empirical experiences.

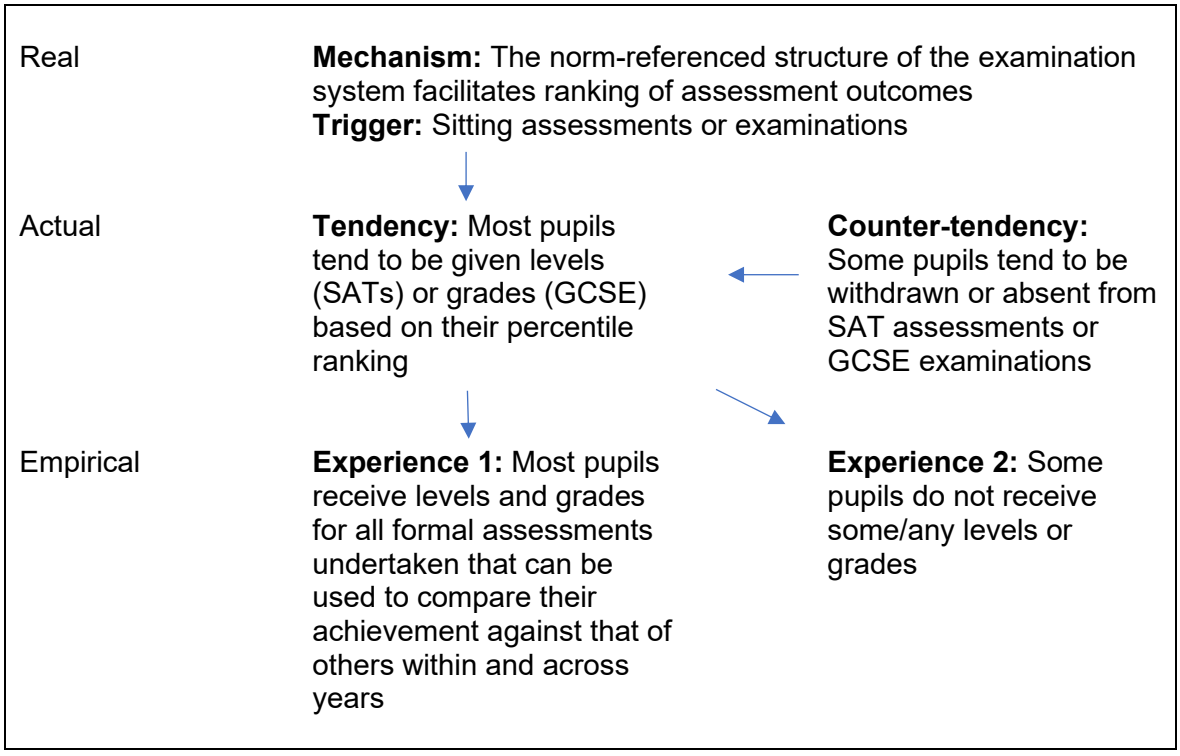

Figure 5.2: Layers of reality deriving from the norm-referenced structure of the examinations system.

Taking the two mechanisms together, it is possible to see that the combination of an age-bound cohort structure combined with a norm-referenced assessment and examinations system could advantage those who are older within the age cohort and disadvantage those who are younger within the age cohort. The counter-tendency of having a delayed start might mitigate the impact of having a norm-referenced assessment and examination system.

Another underlying condition is that of teachers' expectations. Based on their initial and in-service training, teachers learn how to make professional and formal judgements about individual pupils' academic performance and potential, which are then communicated to all stakeholders – parents/carers, pupils and school reporting systems through to the Department for Education and emerging as factors in annual league tables. Teachers use information from any previous educational setting and evidence of in-class performance, both absolute and relative to peers, to make such assessments, which may become self-

reinforcing. A counter-tendency may be introduced by a change of teacher or more fundamentally, a change of setting, for example, the transition from primary to secondary school or from secondary school to college. However, how much a change of setting might challenge established teachers' expectations would be moderated by how much prior information is shared between institutions. An example of minimal information sharing was given by Ahana, who arrived from India and was asked to provide her own judgement of how good she was at Mathematics, resulting in her being put in the top set and then having to ask to be moved down when she could not keep pace. The articulation between the mechanism, tendencies and experience are shown in Figure 5.3.

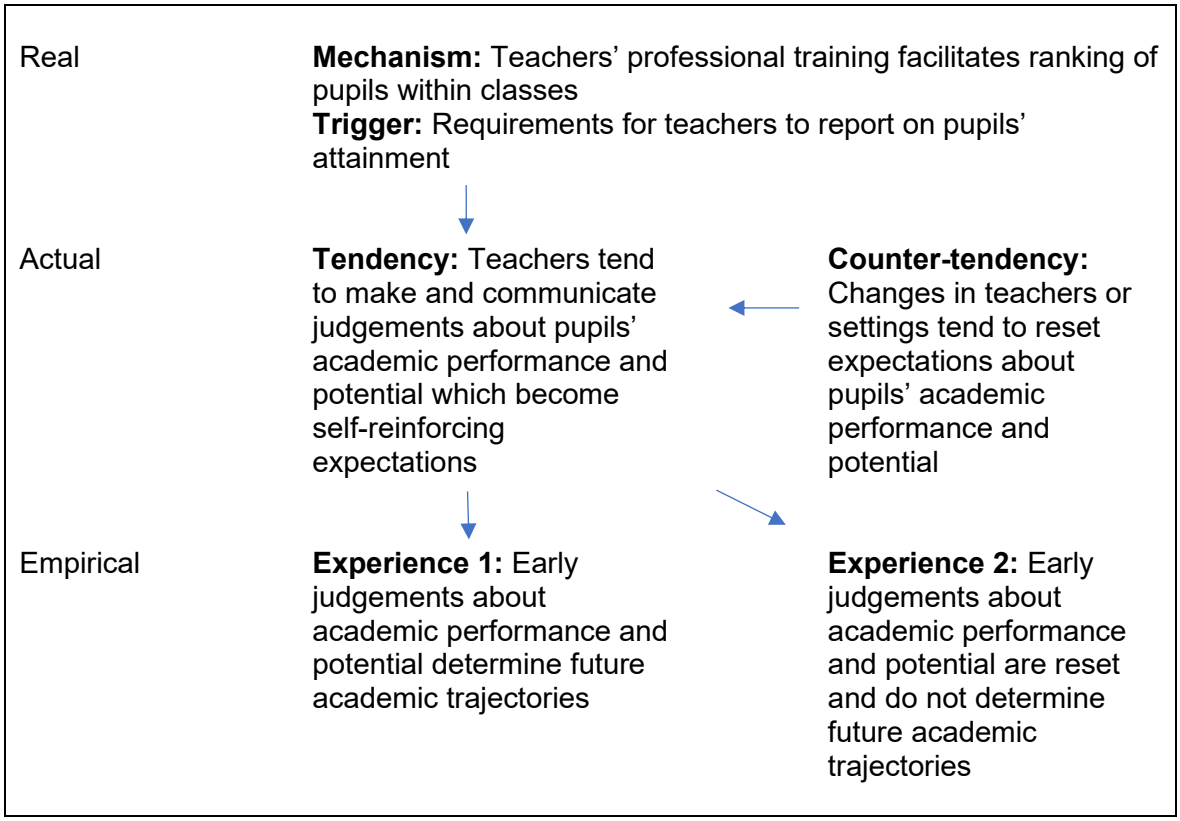

Figure 5.3: Layers of reality deriving from teachers' professional training.

Teachers' judgements do not only occur at times of formal assessment, but throughout the school calendar. Their daily informal assessments of pupil performance feed into choices about what, when and how to structure and deliver sessions to meet the needs of individuals through differentiation, ability grouping and targeting extra support. Teacher-pupil relationships are the underlying condition of the classroom triggered by moment-by-moment interactions, looping back and forth between pupil and teacher, which are, nevertheless, based on a hierarchy of power that is inherently unequal (Hacking, 2000). These looping interactions generate tendencies for pupils to internalise their teachers'

perceptions of them, accurate or not, which in turn the pupils tend to mirror back to their teachers through their behaviours, attitudes and performance, establishing a confirmatory cycle. Other stakeholders, such as parents or carers, will also be looped into this cycle, contributing further to the perpetuation of these perceptions. These interactions are shown in Figure 5.4.

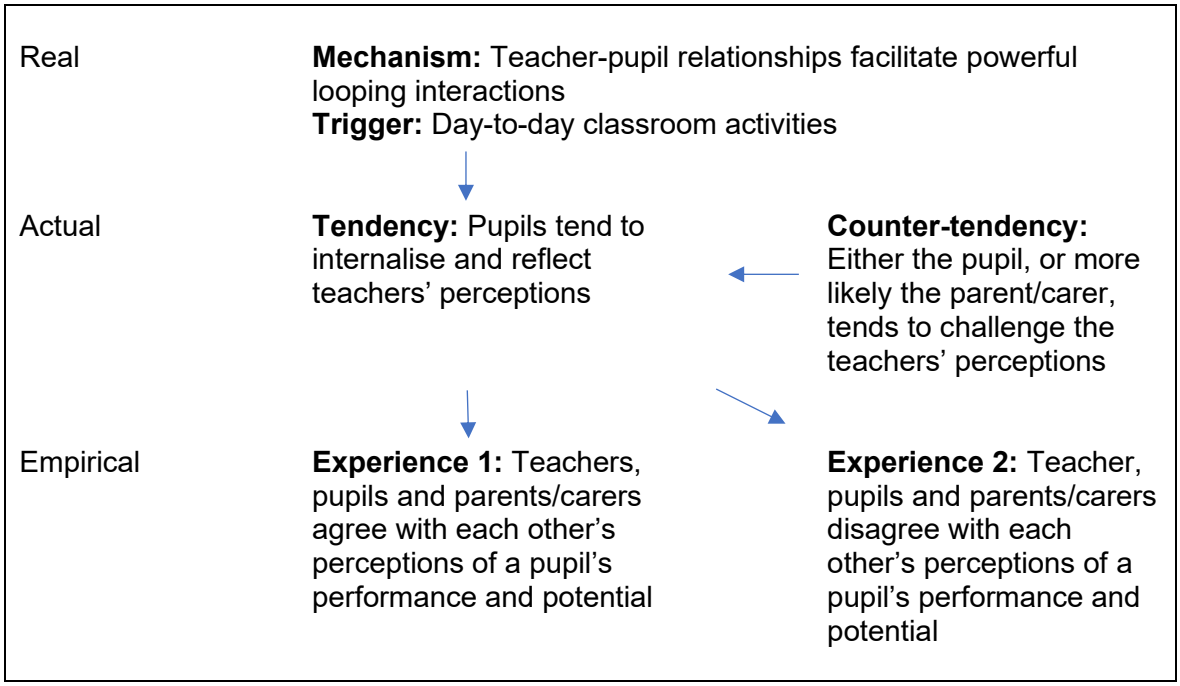

Figure 5.4: Layers of reality deriving from teacher-pupil relationships.

However, as Collier (1994, p. 63) reminds us, not all tendencies are triggered in the first place or observed at the empirical level. Participants interviewed in this study showed no awareness of the power of the impact of multiple teachers' perceptions of their academic abilities over time.

Teachers do not have complete professional freedom in what they choose to teach. They are constrained by the National Curriculum and by awarding organisations' syllabi for formal examinations. Teachers are no more unconstrained in how they choose to teach, frequently observed and expected to conform to the guidance in the most recent Ofsted framework (currently the Education Inspection Framework published in 2019) to ensure that their organisation meets the standards expected. Among these expectations has been the need to personalise learning through differentiation, either for individuals or through ability-group setting. Figure 5.5 shows the interactions between expected approaches to teaching, differentiation and the experience of getting stuck in a lower ability group.

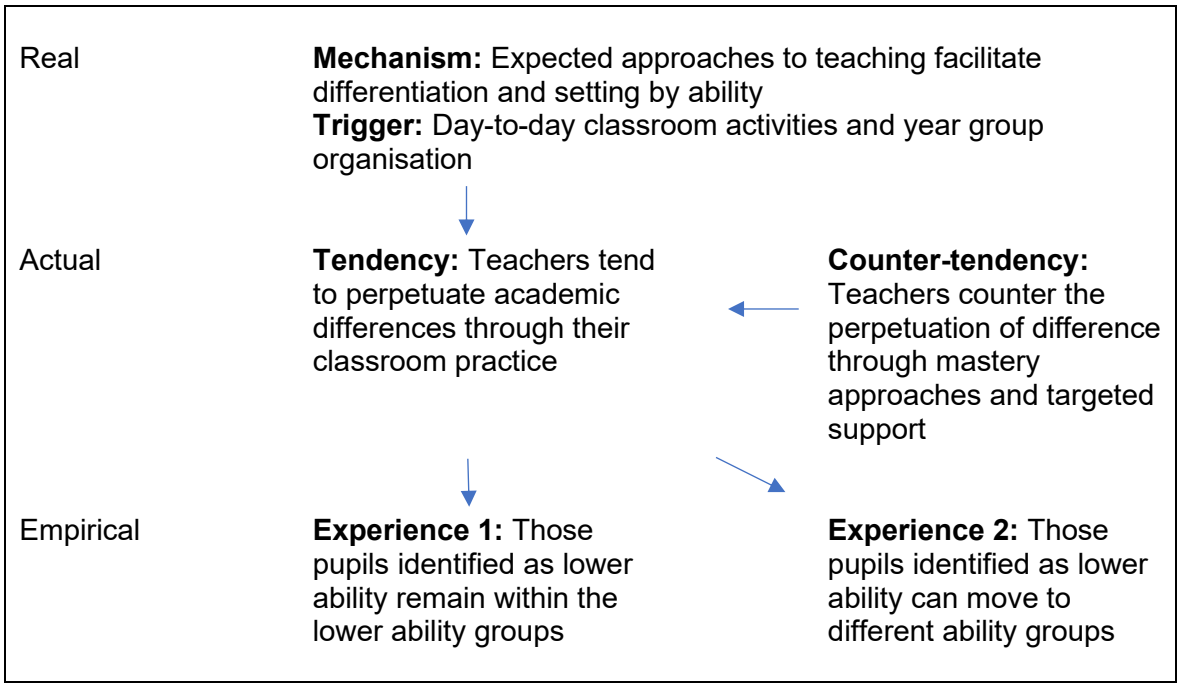

Figure 5.5: Layers of reality deriving from expected approaches to teaching.

During their interviews, participants spoke a great deal about their social relationships with other pupils, those within their age-bound year groups and those in groups that were older or younger. Some participants (Rory and Henry) spoke of long-term friendships lasting from primary to secondary school and even to college, whereas there were other accounts of intense verbal and physical bullying (Henry and Daniella). Figure 5.6 identifies the underlying condition to be peer-to-peer relationships triggered by ongoing, iterative and looping interactions between pupils, in various daily activities in and out of class. Through such repeated interactions most, but not all pupils, develop sufficient social skills to establish strong friendship bonds and avoid being the victim of bullying.

Not all peer-to-peer interactions occur within classrooms. Many peer-to-peer interactions occur in the liminal spaces between lessons and between home and school. The location of schools at a distance from where pupils live and the structure of the school day, including breaks and lunch, create unsupervised and unregulated physical and temporal spaces, where pupils are left to navigate their peer-to-peer relationships alone. If a school's behavioural expectations do not make bullying utterly unacceptable, a counter-tendency of a bullying culture may develop, as pictured in Figure 5.6.

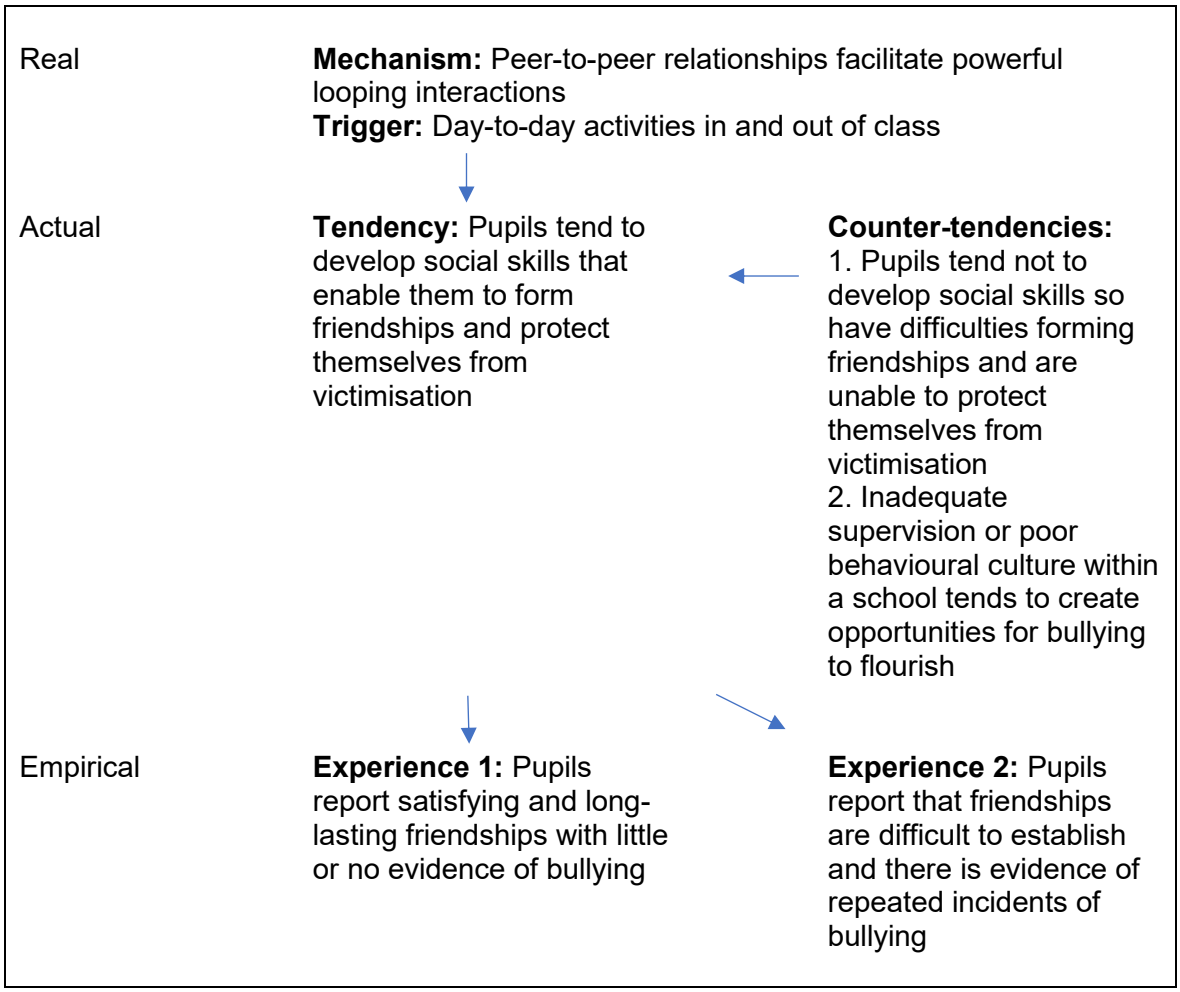

Figure 5.6: Layers of reality derived from peer-to-peer relationships.

Returning to the first generative mechanism (Figure 5.1) identified as 'the structure of the primary and secondary educational system facilitates age-bound cohorts', consideration can now be given to the change that takes place as a result of the transition to the tertiary phase of education. Excluding the private sector, primary and secondary schooling tends to be non-selective (except for areas in which grammar schools still exist), whereas tertiary education in either school sixth forms or further education colleges is selective. Entry to the tertiary phase is age-bound in the sense that a student must be aged 16 or over, and for entry to a Study Programme no older than 18 on 1 September at the point they start a new programme. However, the underlying condition within tertiary education is that the level a student studies at is determined by entry criteria based on incoming GCSE grades, school sixth forms tending to attract those who have higher GCSE grades and further education colleges tending to attract those with somewhat lower grades. On entering a further education college, for the first time in a young person's educational journey they are likely to be mixed in with others who are a year or two different in age. One finding that stood out from the quantitative data in this study was that attendance

covaried with month of birth, being higher for those born in the summer months in comparison to those born in the autumn term, in contrast to the research literature (Cobley et al., 2009). Additionally, there was some evidence that summer-born students retaking GCSE English Language and Mathematics were slightly more likely to achieve a Grade 4 than their peers born earlier in the year, although predominantly the summer-born students remained at Grade 3. These findings are visualised in Figure 5.7.

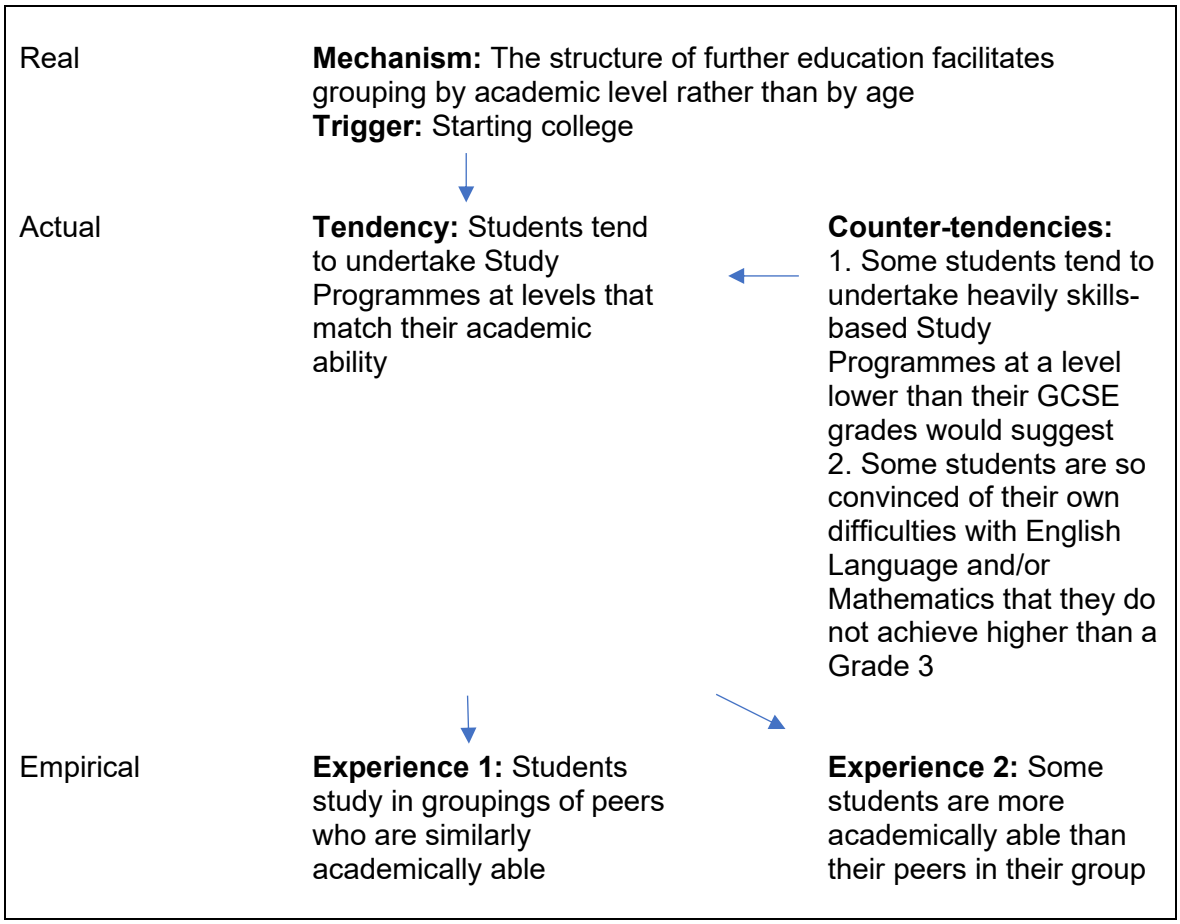

Figure 5.7 Layers of reality deriving from the structure of further education.

Thus, it may be possible to explain increased attendance and greater success at GCSE English Language and Mathematics as being due to the students' experiences of being in an educational setting that enables them to reset their own academic self-concept because they are surrounded by and compared to peers who are similarly academically able. This observation should not be taken as an argument for ability grouping within the schooling system. Rather it suggests that the damage having been done earlier in their educational careers, accessing programmes that reflect an individual's, now crystallised, academic ability does offer opportunities for some students at least, for reinvention and considerable academic success.

Given the arguments presented above, albeit admitting the fallibility of any of them individually, there still seems to be plenty of evidence that the relative age effect has its origins in structural and social relations that could be mitigated. The fact that this has not happened prompts the question as to who benefits from the problem not being resolved. It was identified above that the English assessment and examination systems are norm-referenced. It is reasonable to ask why and who benefits from this being the case. The government are keen to bring market forces to education and, as such, introduced school league tables, based on SAT and examinations scores. In addition, universities are keen to identify the most able amongst each year's available cohort of potential students, so norm-referenced outcomes ensure they can identify their target groups very easily. The potential unfairness that derives from these structural and social relations for those born in the summer months is weak in comparison to these driving forces.

5.2 Summary

This chapter has drawn on the findings from both the quantitative and qualitative phases of this explanatory sequential approach and explored them first through deductive reasoning and then via retroductive analysis. Conceptualisation during the deductive stage contributed to an in-depth understanding of what mechanisms might be at play at the deepest 'real' level, albeit accepting that the mechanisms identified may or may not be correct. The structures of primary, secondary and further education were considered relevant for the emergence of the relative age effect. Primary and secondary school structures facilitate age-bound cohorts, whereas further education facilitates academic level-bound cohorts. Assessments and examinations through all three sectors are norm-referenced (rather than criterion-referenced), thereby facilitating the ranking of individuals by academic performance. Looking at the agential mechanisms at play, teacher-pupil and peer-to-peer relationships were identified as potentially causative for creating the relative age effect. Expectations of teachers to identify, teach and report on pupils based on perceived differences in ability might have contributed to the relative age effect if early variability due to month of birth was not sufficiently considered. Finally, the internalisation of teachers' perceptions of individuals, which in turn are reflected to the teachers, may have facilitated the perpetuation of the relative age effect long beyond the original triggers for those perceptions.

6 Conclusion

The four research questions were effectively answered as a result of this study. The quantitative analysis confirmed that patterns of enrolment to Study Programmes varied by month of birth when compared to the expected pattern based on the underlying birth pattern data (Office for National Statistics, 2015a) and considering the length of each month (Research Question One). Fewer students than expected born in the early months of the academic year (September – December) enrolled and more than expected born in the later months (May – August) enrolled. Thus, the relative age effect for enrolment was not confined to those born in the summer months but affected those born earlier but in the opposite direction. The ways in which summer-born students were over-represented (Research Question Two) demonstrated that patterns of enrolment for those born in the summer months were strongest for those enrolling to Level One and Level Two courses. Those students presenting with Grades 1-3 for GCSE English Language and Mathematics on enrolment showed similar patterns, suggesting that these specific GCSE outcomes covaried with enrolment patterns. In contrast, having spent one or more years at college, some summer-born students (April – August for English Language and July and August for Mathematics) were more likely to achieve a Grade 4 or above, although the majority were still getting stuck at Grade 3 or going backwards achieving only a Grade 1 or an unclassified result. A positive trend for attendance was found for those born from March onward but there was no relative age effect found for overall main programme achievement.

Participant interviews explored the events that may have contributed to further education students' perceptions of their academic journeys (Research Question Three). Analysis of the interviews suggested that primary school was a more secure and enjoyable phase than secondary, although for some participants issues began emerging even in early primary settings. Mathematics particularly became much more problematic in terms of attitudes and achievement during secondary school. Participants reported positive and supportive relationships with family, teachers and most of their peers. However, for some participants early social difficulties led to serious and ongoing experiences of bullying. Participants were aware of the relative position of their birthday, but none identified that as a source of any academic difficulty. The participants were only aware of social and physical differences caused by being younger than many of their peers.

Potential underpinning mechanisms derived from the previous stages of research indicated that the structure of primary and secondary schooling created age-bound cohorts of pupils (Research Question Four). The norm-referenced nature of formal assessments and examinations facilitated the ranking of individuals by academic performance. Teacher training and an ongoing requirement to identify, teach and report on pupils by differential ability perpetuated any early perceived differences. Pupils consequently internalised their teachers' perceptions as their own academic identities, unaware that some of the differences may have been due to their relative age. The structure of further education facilitated the grouping of individuals by academic level rather than age, offering opportunities to those born in the summer months for more positive self-concepts to emerge.

These findings are particularly significant because the clustering of summer-born students in further education has not been evidenced before. Not only did this study show that those born in the summer months were more likely to be in further education, but it was demonstrated that the effect of month of birth was evident right across the academic year, impacting all students from October onward in terms of level of course accessed at age 16. The school-based academic pipeline leaks students right across the year, not just those born in the summer months (Darling-Hammond, 2010, p.16).

The most direct reason for the impact of the relative age effect was GCSE grade outcomes, which the existing research literature had already identified as being affected by month of birth. The bifurcation of study routes at age 16 directly evidences the consequence of not gaining quite as high grades in these two subjects as age-cohort peers. Far from the relative age effect disappearing post-16, students with lower GCSE grades are still in the educational system, just not where the previous researchers had been looking. Of course, many summer-born students continue with very successful academic trajectories; it is only when analysing data at a larger scale that the impact can be seen. Encouragingly, academic pathways are not necessarily fixed, although additional disadvantages, such as learning difficulties, may make it harder to escape a set track. The evidence of some reversal of achievement for GCSE Mathematics and English Language demonstrated that, for a minority of students at least, catching up was possible. Nevertheless, life trajectories are fundamentally different for those young people held back by their lack of GCSE achievement and subsequent choice of a vocational pathway.

Conclusion

One of the major contributions of this study is the purposeful application of critical realism within educational research. Although not unknown in this research field (Tao, 2013), the versatility and applicability that has made critical realism increasingly popular in health studies was effectively demonstrated. Embracing a critical realist stance helped to structure deep thinking about the issue and what the underlying drivers might be. The retroductive approach meant that I could delve deeply into the patterns of quantitative data and the accounts given by the participants. Social rather than structural issues were to the fore in the participants' interviews and yet, buried in the background, the age-bound organisation of the educational system, including the examination system, were key drivers of their entire experiences. The sequential design helped identify the importance of the birth month of May among further education students, enabling inclusion of May-born representatives in the study, who would otherwise have been left out if the months of interest in the existing literature had been rigorously followed. The research design also enabled inclusion of a range of students from Level One, Level Two and Level Three courses, exemplifying the stratification that takes place in post-16 vocational settings.

Additionally, this research demands that other relative age effect researchers consider both academic and vocational routes post-16 in their future work, particularly focusing on the pivot point of GCSE examinations, and demonstrates that May through to August are all months of key interest. The inclusion of direct accounts of summer-born students, so close in time to their school experiences, offered a richness missing from other purely quantitative research. Although the participants were a small sample (n=7), their contributions suggested that the intersectionality of all characteristics, including month of birth, are important fields of study within education, thereby promoting month of birth to a more significant status than currently exists. The layering of relative advantage or disadvantage due to month of birth on top of other factors that may result in superiority or inferiority, is worthy of serious consideration.

The use of images to trigger recollections of school did not work particularly well. Part of the reason may have been the need to work online with only a few images visible at a time to the participants. Another reason may have been that the images were too disconnected from their experiences to trigger a lot of relevant memories. However, connotations are powerful, and any images of actual schools may have unwittingly inserted my own biases into the conversations. On balance, I would not repeat the use of online visual prompts in a future study.

Ethical considerations were embedded throughout this study, from the early conception of equity and fairness for all students, irrespective of their month of birth through to the detailed planning and execution of the participant interviews, so that none could have been negatively affected by taking part. Data security was efficiently maintained through careful use of storage and transfer protocols. Even though I was an insider within my own organisation, gatekeeper access was dealt with as rigorously as if I had been external. Throughout the study the impact of the pandemic loomed large for study participants which only added to the need for greater flexibility and sensitivity as they recounted their experiences. Particularly successful was the approach to introduce positive role models of other summer-born people via the thank you leaflets to counter any negative perceptions in the participants' minds that had not previously existed. Participants' enthusiasm to discuss the famous people who shared their birthdays was genuine and all commented that they had enjoyed their interview experiences. One significant factor was that the participants had all left school and had positive stories to tell of their new lives at college. Had the interviews taken place one or two years earlier in school, I would not be as confident that all the responses would have been as optimistic.

This study is only the starting point for further investigation into the relative age effect in further education which is acknowledged as a being transformational and a driver of social justice (Duckworth and Smith, 2019). The distinct character of further education, offering a fresh start for individuals in academic-level rather than age-bound cohorts, presents both opportunities and issues for the relative age affected student. Positively, teachers could take a more targeted approach to identify and start to remediate the impact of years of negative academic self-concept for summer-borns. Bringing the role of month of birth to the fore, will enable teachers to have a better understanding of the complex, but largely invisible emotional drivers, thereby unlocking transformed academic performance. Conversely, raising relative age to the status of the other protected characteristics may inadvertently stigmatise individuals and further perpetuate ingrained perceptions, keeping individuals locked into their life-trajectories, if teachers are not sufficiently knowledgeable and skilled to overcome these issues. Thus, extensive awareness-raising alongside appropriate and effective training for Further Education teachers in this area is an urgent requirement.

The intersectionality between relative age and other protected characteristics should be a key area of future research in this field, surfacing resultant elements of discrimination and privilege in all sectors of education. In addition, having identified the existence of the relative age effect in one, albeit quite large, college, further studies need to be undertaken

to confirm that this effect is indeed evident right across the vocational sector. If this is the case, then how does this effect subsequently appear in adult life? If Pupil Referral Units and prisons were analysed for intakes in relation to month of birth, would equally strong trends be found? Is it possible that there are more adults who have been born in the summer in certain categories of employment – those practical areas that are so well catered for in vocational education? Indeed, are there more summer-born personnel among the further education staff cohort too as they choose to return to the educational institutions where they found self-confidence and success? At the other end of the age spectrum, further research is vital into how the relative age effect perpetuates through the daily interactions within every primary classroom. Finally, the impact of the formal assessments and the examination system must not be left unscrutinised and could be usefully reviewed in the light of two years of Centre and Teacher Assessed Grades for GCSE English Language and Mathematics. These systems entrench disadvantages, and have become so taken-for-granted that we might inadvertently miss the songs of the summer-born students in our educational coalmines.

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Appendices

Appendix A: Evidence for approval, information and consent

A1: Data protection impact assessment form

Step One: Describe the process

The **purpose** of this assessment is to detail the data protection measures as part of a thesis research project undertaken by a member of *** College staff as a Doctor of Education student of *** University which involves both quantitative and qualitative data from Activate Learning. The research proposed is to consider the extent of impact of month of birth in relation to the following key variables: level of enrolment; gender; income deprivation; declared specific learning difficulty; ethnicity; attendance, achievement and retention. The research will also elicit narrative accounts from up to ten participants in semi-structured interviews.

Quantitative Data:

A 95% sample will be taken from the 2018-19 Individual learner Record (ILR) for 16-18 year old Study Programme students (**data subjects**) for four of the seven colleges in *** College by Management Information Systems (MIS). The data will be de-identified by MIS (student code being replaced by a randomly generated code) prior to be being shared with the researcher. The only data shared from the ILR will be:

1. Randomly generated identification code
2. Month of birth
3. Enrolment level of main course (E; 1; 2 or 3)
4. English and/or maths retake enrolments (yes/no)
5. Gender (male/female)
6. Postcode/income deprivation band (aggregated)
7. Declared Specific Learning Difficulty (yes/no)
8. Ethnicity (White; Mixed/multiple ethnic groups; Asian/Asian British; Black/ African/Caribbean/Black British; Other)
9. Attendance (%), achievement (yes/no) and retention (yes/no for pre- and post-42 days)

Qualitative Data:

Up to ten participants drawn from the current (2019-20) Study Programme cohort from across the college will be invited to undertake a semi-structured narrative interview in which they can share experiences of both primary and secondary school. Including any reflections on whether their relative age within their year cohort seemed relevant to their experiences. Audio-recorded transcripts of each interview will be thematically analysed.

Staff involvement:

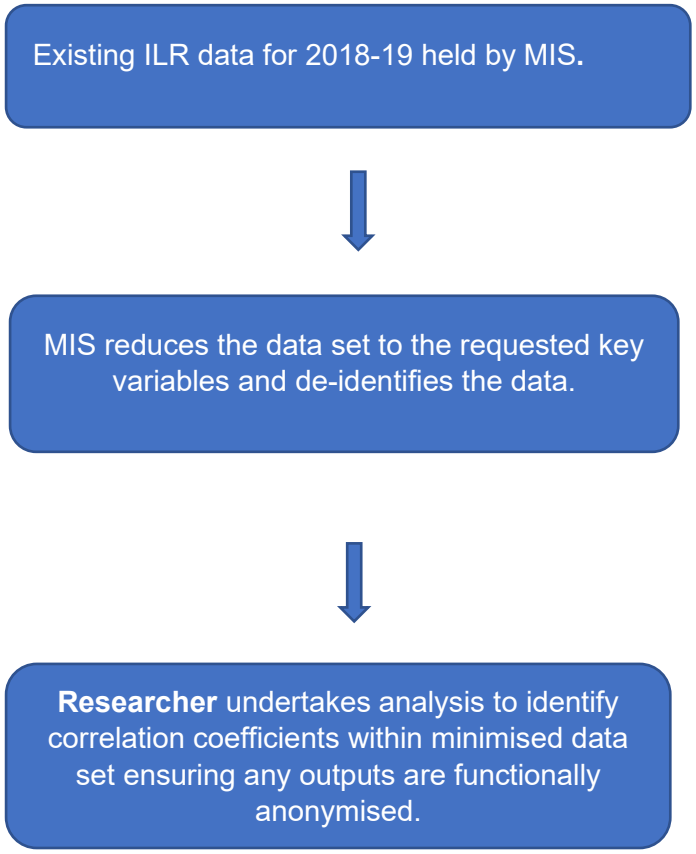
Anne Smith will be the principal researcher.

Step Two: Describe the information flows

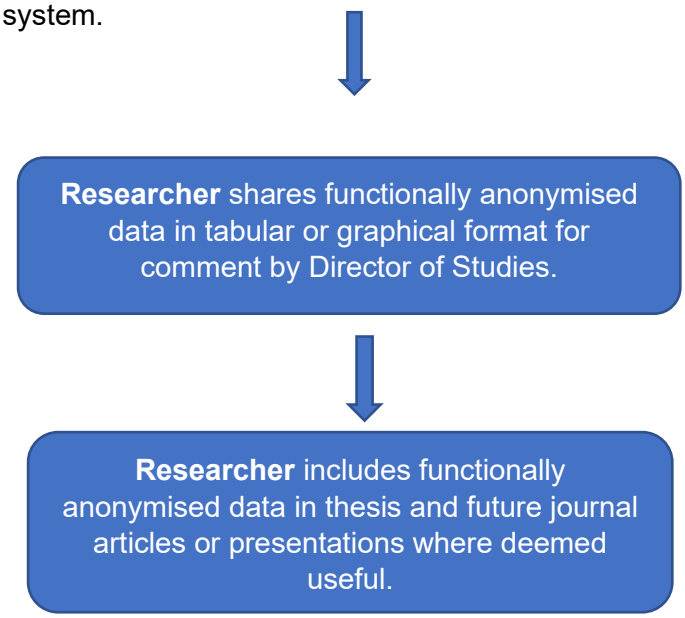
Data Controller is identified in bold at each step.

Quantitative Data:

Data Environment A – *** College Microsoft O365 secure cloud-based system

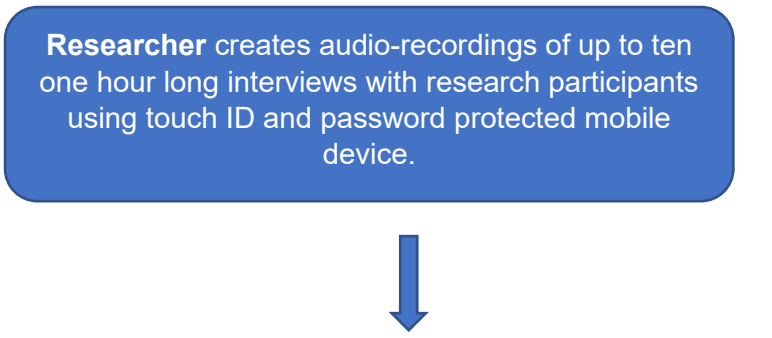


Transfer to **Data Environment B** –*** University secure Google Drive cloud-based system.



Qualitative Data:

Data Environment A – *** College device



Transfer to **Data Environment B** – *** University secure Google Drive cloud-based system.

Consultation requirements

This DPIA will be submitted to the *** College Data Protection Officer for detailed consent.

Step three: identify the privacy and related risks

Identify the key privacy risks and the associated compliance and corporate risks. Where is there potential for a breach of data protection regulations?

Privacy Issue	Risk to Individuals	Compliance Risk	Organisational Risk
Consent	Specific consent not given for this research by individuals	Using data with no specific consent.	Reputational damage if considered a breach of regulations.
Identification	Individual could be identified within the data published in the thesis or in conference/journal papers.	Breach of Data Protection and Privacy regulations.	Reputational damage if considered a breach of regulations.
Unintended/accidental release	Individuals' data is shared publicly.	Breach of Protection and Privacy regulations.	Reputational damage if considered a breach of regulations.

Step Four: Identify privacy solutions

Describe the actions you could take to reduce the risks, and any future steps which would be necessary (e.g., the production of new guidance or future security testing for systems).

Risk	Solution	Result *Is the risk eliminated, reduced, or accepted?*	Evaluation *Is the final impact on individuals after implementation a justified, compliant and proportionate?*
Consent	**Quantitative Data** Enrolling students agree to their use of data for research by *** College and by	Risk is reduced as multiple occasions for individuals to find out how their data is used.	Final impact is justified, compliant and proportionate as research outcomes are intended to

	the Education and Skills Funding Agency. Regular push-notifications on their central dashboard remind students of privacy and data agreements with links to formal policies. **Qualitative Data** Fully informed consent will be obtained from each participant through verbal explanations and detailed information sheets, confirmed with a signed consent form.	Risk is eliminated as participants will be reminded at each stage that they withdraw from the process without having to give any reason.	benefit directly further education students. UK Anonymisation Network state that is 'impractical and undesirable' to seek informed consent for every activity given current state of information society[1]. Robust specific consent is in place for the qualitative part of the research.
Identification	**Quantitative Data** Researcher is DBS checked. Before data is shared with Researcher: • Initial 95% sample reduces dataset from population level to subset. • Randomised code replaces student ID number. • Postcodes converted to Income Deprivation aggregated bands • Ethnicity identifiers aggregated to 5 top level bands Researcher will conduct cross-tabular analysis that ensures:	Risk is reduced as the data is de-identified.	Final impact is justified, compliant and proportionate as data is systematically de-identified and then carefully anonymised before any public release occurs.

	• No categories have zero individuals • No categories have less than 5 individuals • There are no unique samples or classes however the data is compared Researcher will round or aggregate bands further if necessary **Qualitative Data** Participants will be recruited from four of the seven colleges within the Activate Learning Group. Audio-recordings will be deleted as soon as the transcriptions have been made. Pseudonyms will be inserted for all participants and any other people or places (e.g., schools) named in any of the recordings. Accounts given by participants will be mixed up in the thesis to give increased protection. Participants will not know the identity of any other participants.	Risk is eliminated as data is functionally anonymised. Risk is reduced. A participant could still self-identify by telling others about their participation.	Final impact is justified, compliant and proportionate as all reasonable steps will have been taken to protect identity of individual participants.
Unintended/ accidental release	**Quantitative Data** Original data is held on secure *** College Office 365 cloud-based system.	Risk is eliminated as the data is always held on secure systems.	Final impact is justified, compliant and proportionate as all reasonable steps

	Transfer to Researcher is within this secure environment (A). Once data is functionally anonymised it will be transferred to *** University secure Google Drive cloud-based environment (B) via a desk PC (no mobile/portable devices involved). **Qualitative Data** Original recordings will be made on *** College Touch ID and password protected mobile device. Transcriptions will be directly onto *** University Google Drive cloud-based secure system for thematic analysis. Original recordings will be deleted immediately once the transcriptions have been made. Transcriptions will be digitally and securely shared with participants for confirmation, change or amendment, rather than emailed as attachments.	Risk is reduced. A participant could still tell others about the content of their interview.	will have been taken to ensure the security of the data. Final impact is justified, compliant and proportionate as all reasonable steps have been taken to ensure the security of the data.

Step Five: Sign off and record the DPIA outcomes

Which solutions will you implement? Who has approved the privacy risks involved in the project?

Risk	Approved Solution	Approved by
Consent	All solutions indicated in Step 4 above.	*** College Data Protection Officer
Identification	All solutions indicated in Step 4 above.	*** College Data Protection Officer
Unintended/accidental release	All solutions indicated in Step 4 above.	*** College Data Protection Officer

Step Six: Integrate the DPIA outcomes back into the project plan

Who is responsible for implementing the solutions that have been approved? Who is the contact for any privacy concerns which may arise in the future?

Action	Target Completion Date	Responsible
Consent actions - quantitative	December 2019	Researcher – Anne Smith
Consent actions - qualitative	June 2020	Researcher – Anne Smith
Identification actions - quantitative	July 2020	Researcher – Anne Smith
Identification actions - qualitative	June 2020	Researcher – Anne Smith
Unintended/accidental release actions - quantitative	August 2020	Researcher – Anne Smith
Unintended/accidental release actions - qualitative	December 2020	Researcher – Anne Smith

A2: Participant Information Sheet

Participant information sheet

Study title

An investigation of summer-born students in Further Education Study Programmes

Invitation paragraph

You are being invited to take part in a research study which will form part of my doctoral thesis. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study?

There is quite a lot of research about students who are born in the summer months of June, July and August in schools and universities but nothing in Further Education. It looks as though there are more summer-born students in Further Education than we might expect. This study aims to find out why. The study will run from February 2020 to April 2021 and will include an analysis of the college data and talking to individual students who are summer-born.

Why have I been invited to participate?

You have been invited to participate because you are a Study Programme student and your birthday falls in one of the summer months. Up to nine other students will also be included in this study but you will all be interviewed separately.

Do I have to take part?

It is up to you to decide whether or not to take part in this research study. If you do decide to take part you will be given this information sheet along with a privacy notice that will explain how your data will be collected and used, and you will be asked to give your consent. If you decide to take part now, you are still free to withdraw at any time up to the point of data analysis and without giving a reason.

If you choose to take part in this study it will have absolutely no impact on your marks, assessments or future studies.

What will happen to me if I take part?

If you choose to take part the next step will be that we will arrange to meet online. We will arrange a time that suits you to talk for about an hour. You will be shown some cards with images on them on the screen and asked to choose one and talk about your experience of primary school. We will then repeat this for secondary school. Our conversation will be audio-recorded with your permission.

What are the possible disadvantages and risks of taking part?

You can expect to spend about an hour in the meeting where you talk about your school experiences. You will be asked to read through the transcription of the conversation from the meeting a couple of weeks afterwards to see if you want to change, add or delete anything. This could take you up to 30 minutes of your time. You might tell stories of both good and bad experiences of school, some of which could possibly bring back upsetting memories. If you think this might be too upsetting for you, you do not need to participate.

What are the possible benefits of taking part?

You will have the opportunity to tell the story of your experience of education and be able to frame your journey so far. Telling our life stories positively helps us make sense of what has happened in our lives. By taking part in this study, you will be directly helping this research and furthering our understanding of the topic of being summer-born specifically for students in Further Education.

Will what I say in this study be kept confidential?

All information collected as a result of you taking part will be kept strictly confidential (unless you tell me something that indicates serious harm to yourself or others). Audio recordings of the conversations will be held securely on the university Google Drive account of the researcher. I will have written up transcriptions of our conversation within 3 weeks and then the actual recording will be deleted. The transcriptions will be stored on a password protected *** University Google Drive file system. The transcription will only be shared with you and no one else.

Any email contact between us will be subject to a maximum email retention limitation of 15 months but will be deleted earlier once all correspondence has been completed and is no longer needed. Data generated by this study must be retained in accordance with *** University's Policy on Academic Integrity. Therefore, the data generated in the course of this research will be kept securely in paper or electronic form for a period of ten years after the completion of this research project.

In writing up the research I will make sure that no individual or their originating school can be identified. All the data will be completely de-identified and pseudonyms used throughout for all the participants and anyone or any place we talk about. Due to the small number of people taking part and/or if you or other participants choose to tell others about your participation in this research, your anonymity or confidentiality cannot be completely guaranteed.

What should I do if I want to take part?

If you want to take part, you can contact me through email or leave a phone message later on. Recruitment will be based on those who opt in first but the final deadline for participation will be 30 April 2021.

What will happen to the results of the research study?

Initially the results of the research will form part of my thesis for my Professional Doctorate in Education. I may also present the findings in training sessions across *** College, which includes schools as well as the colleges. I intend to submit at least two papers derived from this study to academic journals. I also hope to present the overall findings of my research at various conferences, most likely those that focus on post-16 education.

Who is organising and funding the research?

I am conducting this research as a student of ***University. I am a student in the School of Education which is part of the Faculty of Humanities and Social Sciences. There is no funding connected with this research.

Who has reviewed the study?

This research has been approved by the University Research Ethics Committee, *** University.

Thank you for taking the time to read this information sheet.

A3: Participant consent form

CONSENT FORM

Investigation of summer-born students in Further Education Study Programmes

Contact details: Anne Smith

	Please select Yes or No
1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.	Yes / No
2. I understand that my participation is voluntary and that I am free to withdraw at any time up to the point of data analysis, without giving reason.	Yes / No
3. I agree to take part in the above study.	Yes / No
4. I understand that the interview will be audio recorded.	Yes / No

	Please select Yes or No
5. I agree to the use of anonymised quotes in publications.	
6. I agree that an anonymised data set, gathered for this study may be stored in a specialist data centre/repository relevant to this subject area for future research.	Yes / No

Name of participant:

Date:

Name of researcher:

Yes / No

Date:

Appendix B: Normality and variance tests

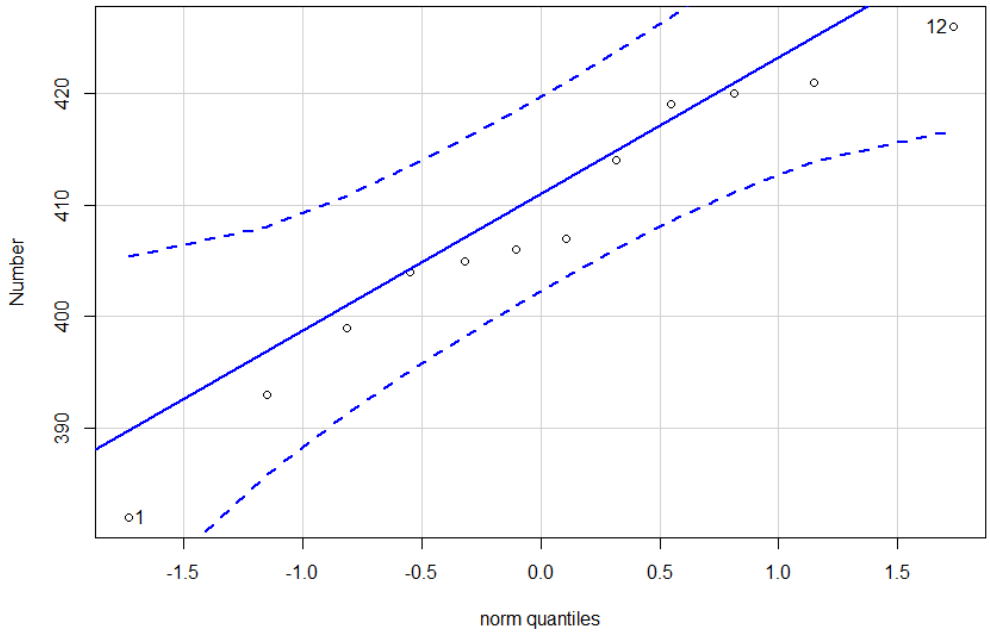


Figure B1: QQ plot for target population for months of birth.

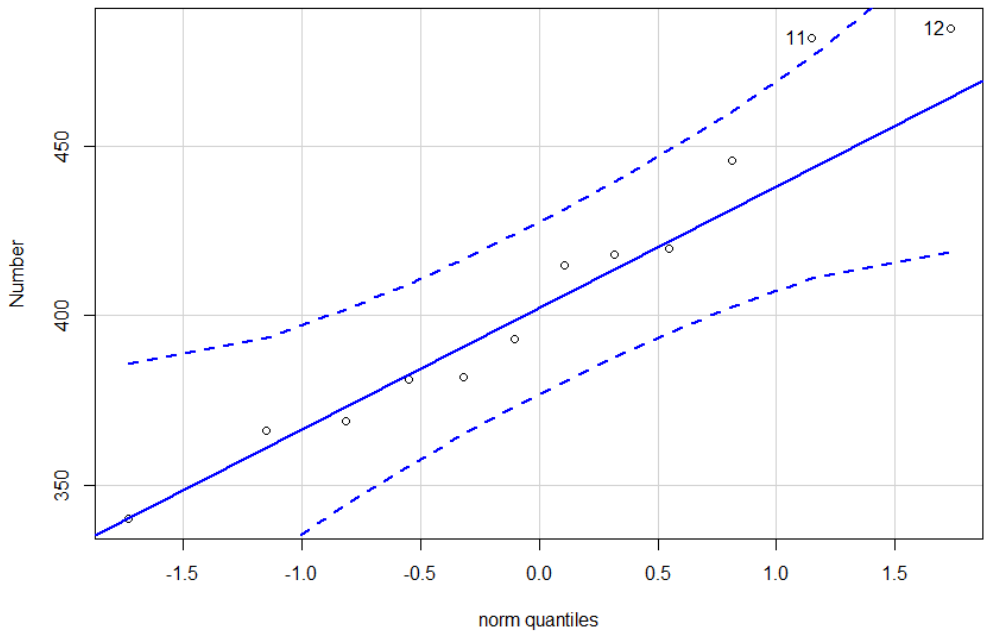


Figure B2: QQ plot for college's study programme sample population for months of birth.

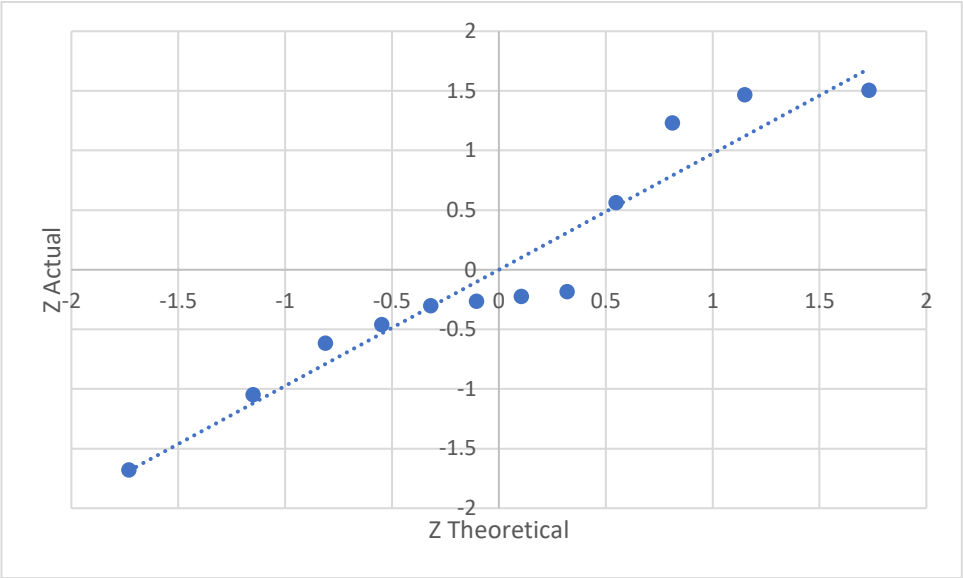


Figure B3: QQ plot for category Females.

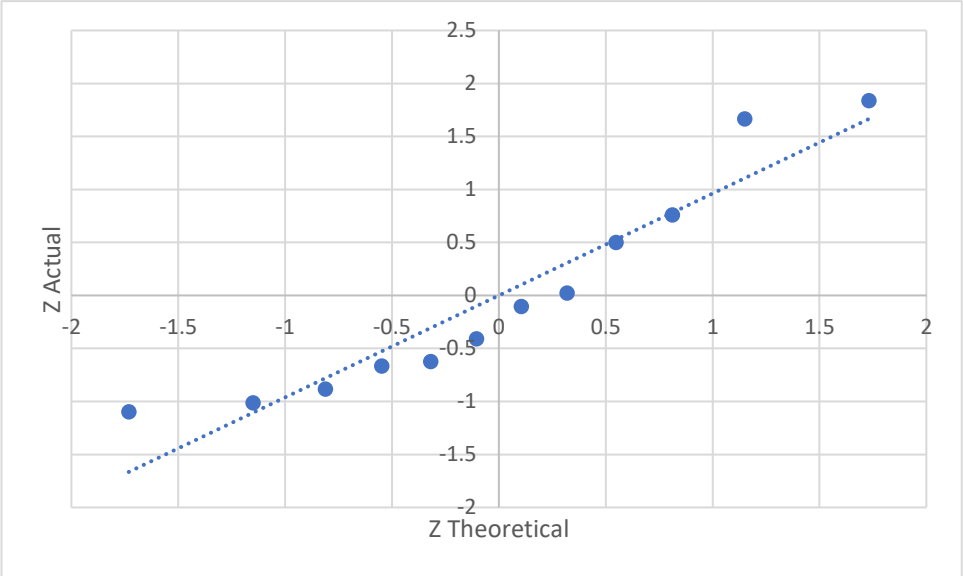


Figure B4: QQ plot for category Males.

Table B1: Test for variance (Anova single factor) for gender.

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Female difference	12	242.6667	20.22222	201.2189
Male difference	12	221.8333	18.48611	163.2801

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	18.08449	1	18.08449	0.099229	0.755725	4.30095
Within Groups	4009.488	22	182.2495			
Total	4027.573	23				

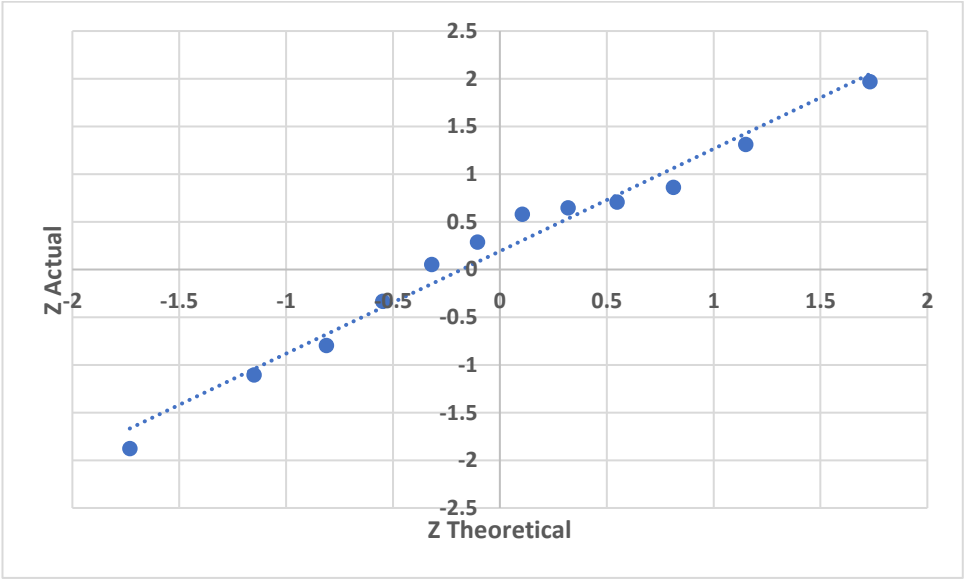


Figure B5: QQ plot for category Asian/Arab.

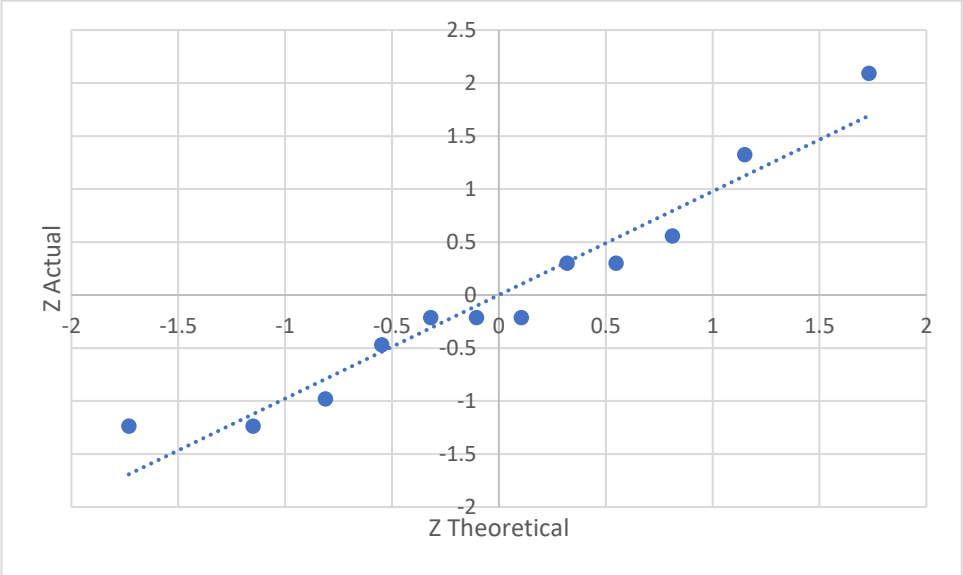


Figure B6: QQ plot for category Black.

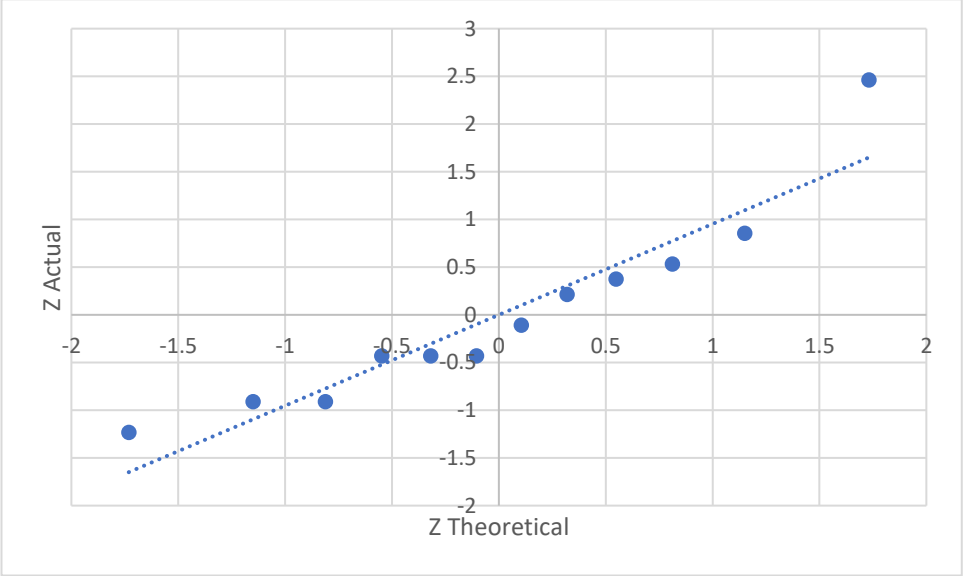


Figure B7: QQ plot for category Mixed.

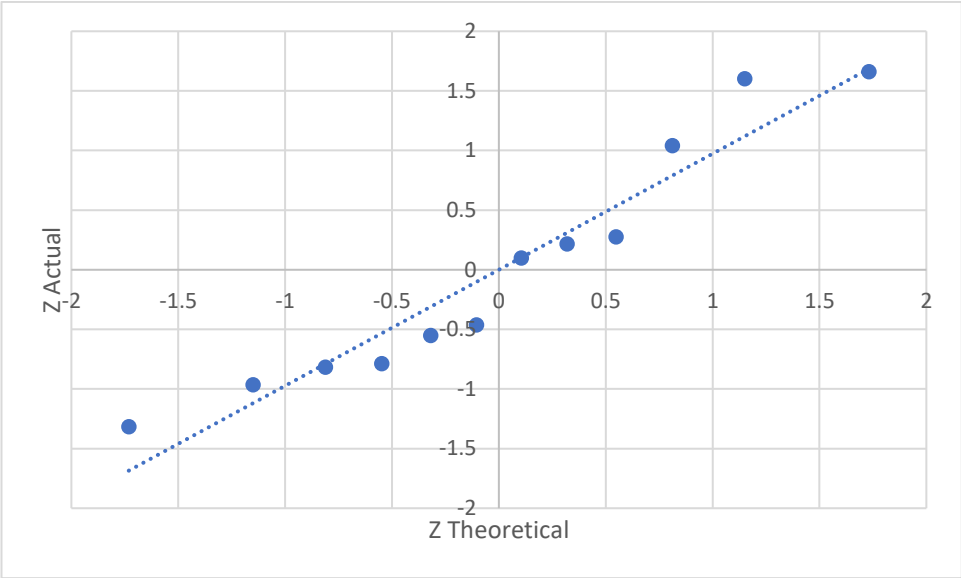


Figure B8: QQ plot for category White.

Table B2: Test for variance (Anova single factor) for ethnicity.

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Black African/Caribbean difference	12	35.66667	2.972222	5.605219
Arab difference	12	20.33333	1.694444	0.655724
Asian difference	12	56	4.666667	18.21212
Mixed difference	12	55.33333	4.611111	15.59259
White difference	12	332	27.66667	315.7576
Other difference	12	20.66667	1.722222	1.006734

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	6122.315	5	1224.463	20.58902	2.5E-12	2.353808958
Within Groups	3925.13	66	59.47166			
Total	10047.44	71				

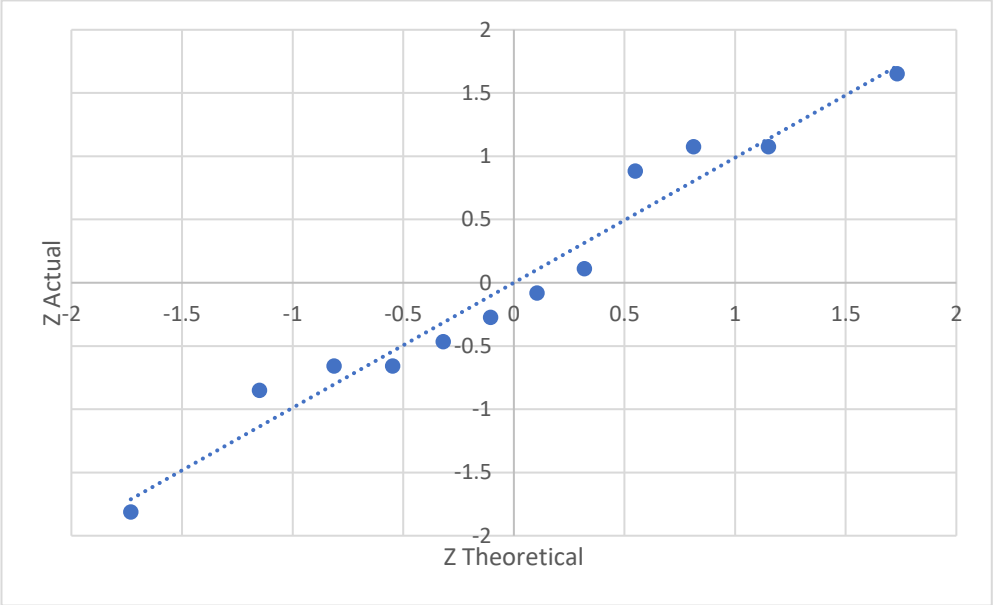


Figure B9: QQ plot for declared mental health difficulties.

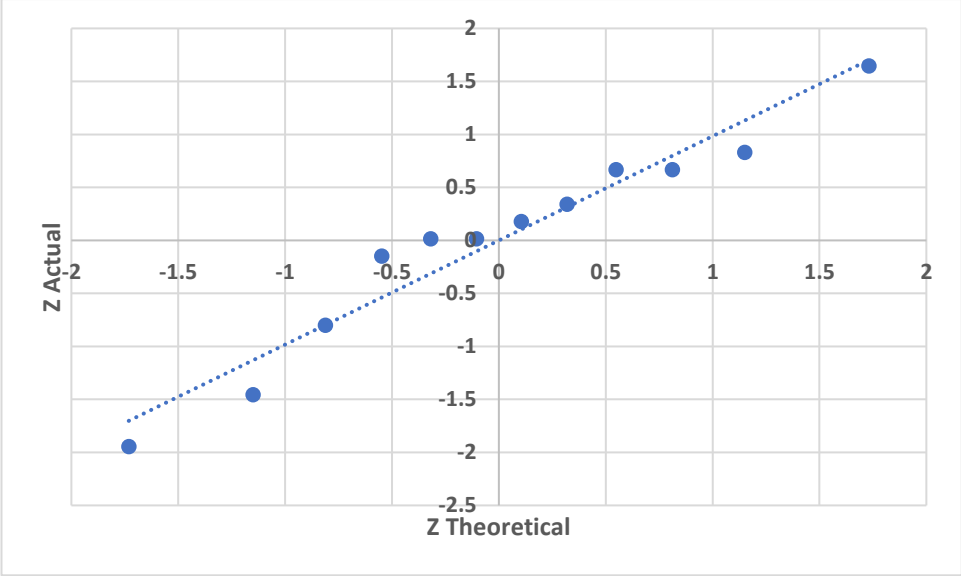


Figure B10: QQ plot for declared dyslexia.

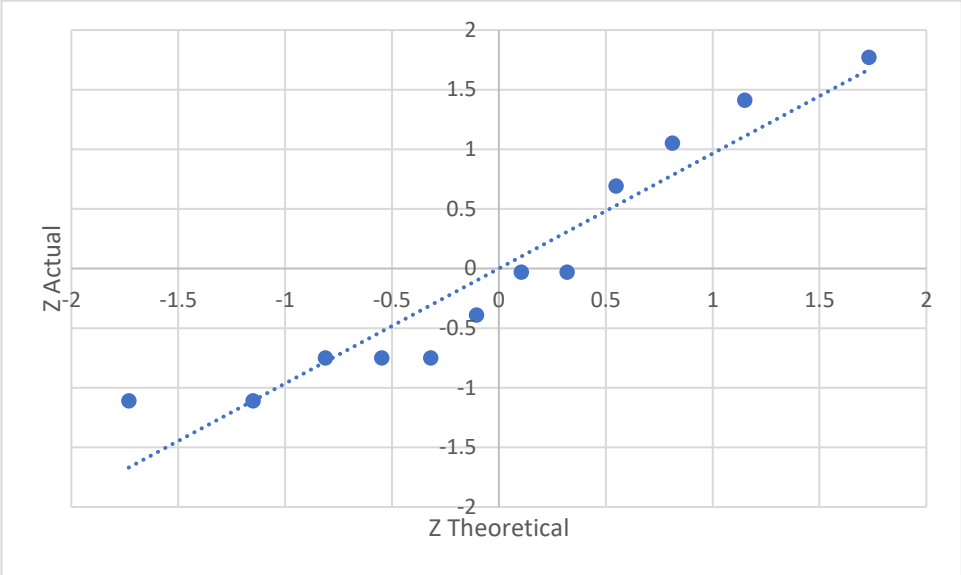


Figure B11: QQ plot for declared dyscalculia.

Table B3: Test for variance (Anova single factor) for declared difficulties.

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
September	3	48	16	163
October	3	52	17.33333	230.3333
November	3	61	20.33333	100.3333
December	3	55	18.33333	382.3333
January	3	79	26.33333	400.3333
February	3	70	23.33333	305.3333
March	3	67	22.33333	324.3333
April	3	55	18.33333	306.3333
May	3	79	26.33333	305.3333
June	3	60	20	307
July	3	63	21	199
August	3	60	20	259

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	356.3056	11	32.39141	0.118409	0.999624	2.216309
Within Groups	6565.333	24	273.5556			
Total	6921.639	35				

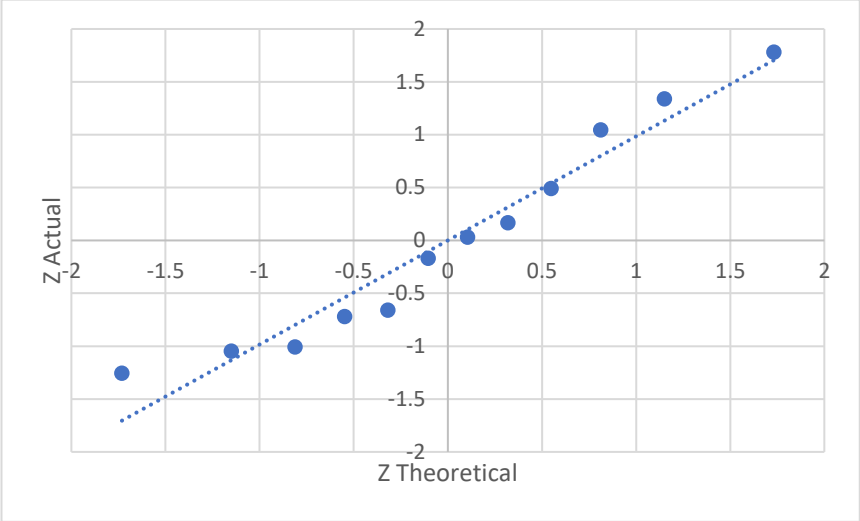


Figure B12: QQ plot for attendance.

Table B4: Test for variance (Anova single factor) for attendance.

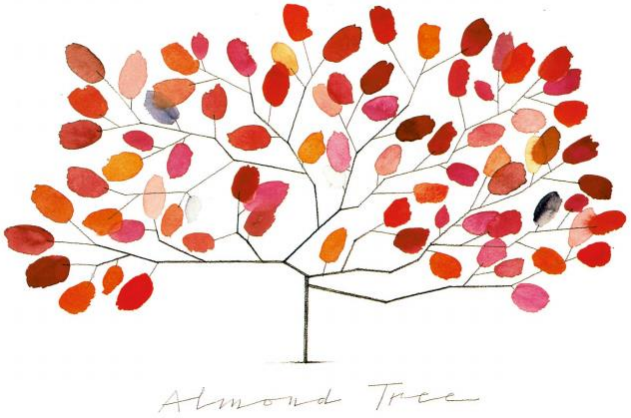
SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Expected difference	12	8066.452	672.2043	232030.5
Observed difference	12	39443.27	3286.939	4708877

ANOVA

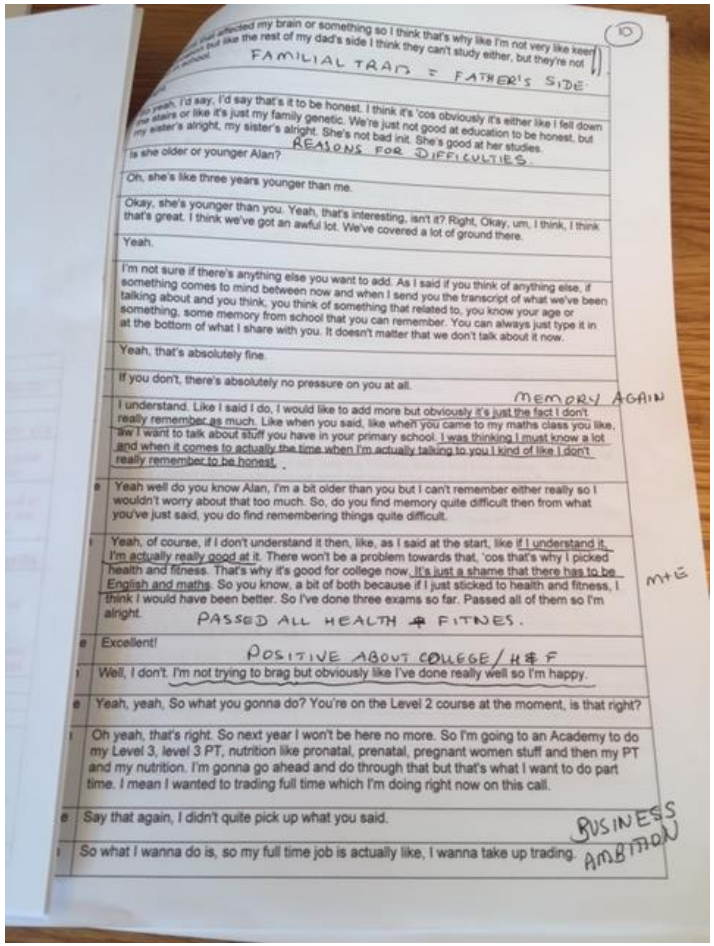
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	41021027	1	41021027	16.60465	0.000502	4.30095
Within Groups	54349982	22	2470454			
Total	95371009	23				

Appendix C: Sample of images used in semi-structured interviews.



Appendix D: Photographs of the thematic analysis of the interview transcripts.

D1: Initial thematic analysis of transcripts.



D2: Using sticky notes to categorise themes.

D3: Grouping and further annotating themes by colour-coded transcript excerpts.

Appendix E: Mean births per month in academic year sequence.

Table E1: Mean births per month in academic year sequence derived from the Office for National Statistics dataset 1994-2015 (Office for National Statistics, 2015a).

Month of birth	*Total mean births per month*	*Mean per month by days per month*	*Relative frequency per month*
Sep	57035.25	1901	8.74%
Oct	56971.9	1838	8.45%
Nov	54053.85	1802	8.28%
Dec	54754.15	1766	8.12%
Jan	54951.1	1773	8.15%
Feb	51826.45	1787	8.21%
Mar	55150.45	1779	8.18%
Apr	53263.85	1775	8.16%
May	56070.5	1809	8.31%
Jun	55026.75	1834	8.43%
Jul	57753.55	1863	8.56%
Aug	56772.5	1831	8.42%
Total	**663630.3**	**21759**	**100%**

Appendix F: Index of Multiple Deprivation.

Table F1: Frequency and relative frequency of month of birth by aggregated Index of Multiple Deprivation (IMD) categories for the sample population in 2018-19.

Month of birth	*IMD 1-2*	*% IMD 1-2*	*IMD 3-4*	*% IMD 3-4*	*IMD 5-6*	*% IMD 5-6*	*IMD 7-8*	*% IMD 7-8*	*IMD 9-10*	*% IMD 9-10*	*Expected %*
Sep	21	8.33%	33	7.04%	28	4.99%	37	6.15%	72	7.75%	8.62%
Oct	21	8.33%	40	8.53%	38	6.77%	51	8.47%	66	7.10%	8.60%
Nov	20	7.94%	28	5.97%	46	8.20%	48	7.97%	65	7.00%	8.17%
Dec	17	6.75%	33	7.04%	47	8.38%	51	8.47%	66	7.10%	8.27%
Jan	17	6.75%	42	8.96%	49	8.73%	49	8.14%	80	8.61%	8.29%
Feb	15	5.95%	39	8.32%	43	7.66%	48	7.97%	60	6.46%	7.62%
Mar	21	8.33%	44	9.38%	55	9.80%	40	6.64%	79	8.50%	8.33%
Apr	19	7.54%	36	7.68%	46	8.20%	55	9.14%	75	8.07%	8.04%
May	41	16.27%	49	10.45%	49	8.73%	58	9.63%	98	10.55%	8.47%
Jun	28	11.11%	42	8.96%	45	8.02%	62	10.30%	104	11.19%	8.31%
Jul	11	4.37%	44	9.38%	61	10.87%	50	8.31%	83	8.93%	8.72%
Aug	21	8.33%	39	8.32%	54	9.63%	53	8.80%	81	8.72%	8.57%
Total	**252**	**100%**	**469**	**100%**	**561**	**100%**	**602**	**100%**	**929**	**100%**	**100%**

Appendix G: Statistical tests for age groups (16, 17 and 18).

Table G1: t-test paired two sample for means: 16-year olds.

	Variable 1	*Variable 2*
Mean	185.75	408.042525
Variance	404.38636	159.8907105
Observations	12	12
Pearson Correlation	0.2130242	
Hypothesized Mean Difference	0	
df	11	
t Stat	-36.0629	
P(T<=t) one-tail	4.485E-13	
t Critical one-tail	1.7958848	
P(T<=t) two-tail	8.97E-13	
t Critical two-tail	2.2009852	

Table G2: t-test: Paired two sample for means: 17-year olds.

	Variable 1	*Variable 2*
Mean	148.75	408.042525
Variance	408.02273	159.8907105
Observations	12	12
Pearson Correlation	0.2495461	
Hypothesized Mean Difference	0	
df	11	
	-	
t Stat	42.799569	
P(T<=t) one-tail	6.902E-14	
t Critical one-tail	1.7958848	
P(T<=t) two-tail	1.38E-13	
t Critical two-tail	2.2009852	

G3: t-test: Paired Two Sample for Means: 18 year olds.

	Variable 1	*Variable 2*
Mean	73.583333	408.042525
Variance	142.81061	159.8907105
Observations	12	12
Pearson Correlation	0.0377836	
Hypothesized Mean Difference	0	
df	11	
t Stat	-67.88544	
P(T<=t) one-tail	4.398E-16	
t Critical one-tail	1.7958848	
P(T<=t) two-tail	8.795E-16	
t Critical two-tail	2.2009852	

Table G4: Pearson's product moment correlation for age.

Regression Statistics	
Multiple R	0.633809213
R Square	0.401714118
Adjusted R Square	0.34188553
Standard Error	16.31356851
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1786.924825	1786.924825	6.714417472	0.02689364
Residual	10	2661.325175	266.1325175		
Total	11	4448.25			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	162.7727273	10.04030735	16.21192674	1.65351E-08	140.4015284	185.1439262	140.4015284	185.1439262
Month	3.534965035	1.364209132	2.591219302	0.02689364	0.495317666	6.574612404	0.495317666	6.574612404

Appendix H: GCSE English Language and Mathematics grades on entry and outcomes 2018-19.

*Table H1: Frequency and relative frequency of GCSE English Language grades on entry (to Grade 6 only). In total 59 students had Grades 7-9 in GCSE English Language on entry in 2018-19 (*** = suppressed for anonymity).*

Month of birth	*Grade 1*	*Grade 1*	*Grade 2*	*Grade 2*	*Grade 3*	*Grade 3*	*Grade 4*	*Grade 4*	*Grade 5*	*Grade 5*	*Grade 6*	*Grade 6*
Sep	***	***%	10	5.85%	30	5.17%	52	7.01%	45	9.59%	14	9.66%
Oct	***	***%	6	3.51%	48	8.28%	45	6.06%	46	9.81%	14	9.66%
Nov	***	***%	12	7.02%	36	6.21%	58	7.82%	38	8.10%	13	8.97%
Dec	***	***%	11	6.43%	39	6.72%	56	7.55%	35	7.46%	15	10.34%
Jan	***	***%	17	9.94%	57	9.83%	52	7.01%	29	6.18%	16	11.03%
Feb	***	***%	16	9.36%	45	7.76%	54	7.28%	33	7.04%	9	6.21%
Mar	8	15.09%	21	12.28%	42	7.24%	70	9.43%	34	7.25%	8	5.52%
Apr	6	11.32%	13	7.60%	52	8.97%	59	7.95%	41	8.74%	11	7.59%
May	5	9.43%	13	7.60%	61	10.52%	79	10.65%	40	8.53%	13	8.97%
Jun	11	20.75%	13	7.60%	58	10.00%	79	10.65%	49	10.45%	15	10.34%
Jul	5	9.43%	19	11.11%	58	10.00%	64	8.63%	40	8.53%	5	3.45%
Aug	***	***%	20	11.70%	54	9.31%	74	9.97%	39	8.32%	12	8.28%
Total	**53**	**100%**	**171**	**100%**	**580**	**100%**	**742**	**100%**	**469**	**100%**	**145**	**100%**

*Table H2: Frequency and relative frequency of GCSE Mathematics grades on entry (to Grade 6 only). In total 34 students had Grades 7-9 in GCSE Mathematics on entry in 2018-19 (*** = suppressed for anonymity).*

Month of birth	*Grade 1*	*Grade 1*	*Grade 2*	*Grade 2*	*Grade 3*	*Grade 3*	*Grade 4*	*Grade 4*	*Grade 5*	*Grade 5*	*Grade 6*	*Grade 6*
Sep	***	***%	28	9.15%	28	6.57%	51	6.61%	34	8.61%	10	10.64%
Oct	***	***%	24	7.84%	29	6.81%	69	8.95%	33	8.35%	10	10.64%
Nov	14	8.14%	20	6.54%	25	5.87%	65	8.43%	27	6.84%	5	5.32%
Dec	15	8.72%	21	6.86%	39	9.15%	58	7.52%	23	5.82%	6	6.38%
Jan	23	13.37%	21	6.86%	36	8.45%	55	7.13%	25	6.33%	9	9.57%
Feb	18	10.47%	25	8.17%	33	7.75%	51	6.61%	26	6.58%	6	6.38%
Mar	16	9.30%	28	9.15%	36	8.45%	61	7.91%	38	9.62%	7	7.45%
Apr	12	6.98%	22	7.19%	40	9.39%	74	9.60%	28	7.09%	6	6.38%
May	14	8.14%	35	11.44%	35	8.22%	79	10.25%	38	9.62%	6	6.38%
Jun	16	9.30%	33	10.78%	35	8.22%	81	10.51%	49	12.41%	9	9.57%
Jul	16	9.30%	30	9.80%	44	10.33%	59	7.65%	30	7.59%	14	14.89%
Aug	18	10.47%	19	6.21%	46	10.80%	68	8.82%	44	11.14%	6	6.38%
Total	**172**	**100%**	**306**	**100%**	**426**	**100%**	**771**	**100%**	**395**	**100%**	**94**	**100%**

*Table H3: Frequency and relative frequency of GCSE English Language outcome grades (Grades 5-8 aggregated to preserve anonymity) for 2018-19 (*** = suppressed for anonymity).*

Month of birth	*Grade 1*	*Grade 1*	*Grade 2*	*Grade 2*	*Grade 3*	*Grade 3*	*Grade 4*	*Grade 4*	*Grade 5-8*	*Grades 5-8*	*Grades U or X*	*U or X*
Sep	***	***%	18	5.73%	40	5.06%	29	9.60%	10	8.06%	***	***%
Oct	9	8.04%	22	7.01%	69	8.72%	20	6.62%	12	9.68%	***	***%
Nov	9	8.04%	19	6.05%	50	6.32%	23	7.62%	9	7.26%	***	***%
Dec	8	7.14%	25	7.96%	55	6.95%	17	5.63%	11	8.87%	***	***%
Jan	***	***%	33	10.51%	74	9.36%	20	6.62%	6	4.84%	***	***%
Feb	9	8.04%	27	8.60%	55	6.95%	20	6.62%	7	5.65%	***	***%
Mar	10	8.93%	33	10.51%	61	7.71%	16	5.30%	10	8.06%	5	10.00%
Apr	9	8.04%	26	8.28%	63	7.96%	38	12.58%	12	9.68%	9	18.00%
May	16	14.29%	21	6.69%	90	11.38%	30	9.93%	9	7.26%	***	***%
Jun	10	8.93%	32	10.19%	74	9.36%	27	8.94%	14	11.29%	8	16.00%
Jul	10	8.93%	25	7.96%	81	10.24%	31	10.26%	12	9.68%	6	12.00%
Aug	13	11.61%	33	10.51%	79	9.99%	31	10.26%	12	9.68%	***	***%
Total	**112**	**100%**	**314**	**100%**	**791**	**100%**	**302**	**100%**	**124**	**100%**	**50**	**100%**

*Table H4: Frequency and relative frequency of GCSE Mathematics outcome grades (Grades 4-7 aggregated to preserve anonymity). No students achieved Grades 8 or 9 in 2018-19 (*** = suppressed for anonymity).*

Month	*Grade 1*	*Grade 1*	*Grade 2*	*Grade 2*	*Grade 3*	*Grade 3*	*Grades 4-7*	*Grades 4-7*	*Grade U or X*	*U or X %*
Sep	25	6.68%	42	7.38%	29	5.23%	11	4.47%	***	***%
Oct	24	6.42%	43	7.56%	32	5.78%	25	10.16%	***	***%
Nov	34	9.09%	45	7.91%	32	5.78%	14	5.69%	***	***%
Dec	24	6.42%	47	8.26%	49	8.84%	16	6.50%	5	6.41%
Jan	39	10.43%	41	7.21%	53	9.57%	19	7.72%	7	8.97%
Feb	32	8.56%	34	5.98%	49	8.84%	21	8.54%	6	7.69%
Mar	29	7.75%	48	8.44%	43	7.76%	23	9.35%	8	10.26%
Apr	32	8.56%	43	7.56%	46	8.30%	28	11.38%	8	10.26%
May	31	8.29%	61	10.72%	46	8.30%	16	6.50%	11	14.10%
Jun	27	7.22%	56	9.84%	51	9.21%	27	10.98%	7	8.97%
Jul	40	10.70%	55	9.67%	63	11.37%	23	9.35%	***	***%
Aug	37	9.89%	54	9.49%	61	11.01%	23	9.35%	11	14.10%
Total	**374**	**100%**	**569**	**100%**	**554**	**100%**	**246**	**100%**	**78**	**100%**