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CHILDREN'S WELLBEING AND DEVELOPMENT OUTCOMES UP TO AGE 11, AND THEIR PREDICTORS

DRAFT LITERATURE REVIEW (STAGE 1)

London School of Economics and Political Science
Department of Social Policy and LSE Consulting

LSE Consulting

AUTHORS

Mireia Borrell-Porta (Postdoctoral Researcher, Department of Social Policy, Oxford University)
Joan Costa-Font (Associate Professor of Political Economy and Social Policy, LSE)
Chiara Orsini (Postdoctoral Researcher and Visiting Researcher, Social Policy, LSE)
Berkay Ozcan (Assistant Professor of Social Policy)*
Lucinda Platt (Professor of Social Policy and Sociology)+

* TEAM LEADER, + SENIOR ADVISER

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LSE Consulting
LSE Enterprise Limited
London School of Economics and Political Science

Houghton Street
London
WC2A 2AE

(T) +44 (0)20 7955 7128
(E) Email: lseenterprise.consulting@lse.ac.uk
(W) lse.ac.uk/consulting

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PROTOCOL FOR THE LITERATURE REVIEW

1. DESCRIPTION OF THE METHOD AND ITS RATIONALE

The UK Government Social Research Service defines six types of literature reviews depending on their scope and methodology. Each is listed below according to the length of time each review type takes, with summaries by Spears, Gross and Heptonstall (2015):

1. Literature review, a non-systematic and quick summary and analysis of evidence [1 week to 2 months].
2. Quick scoping review, a non-systematic overview of existing research on a constrained topic [1 week to 2 months].
3. Rapid Evidence Assessment (REA), a short but systematic assessment on a constrained topic [2 to 6 months].
4. Review of reviews, a full systematic review of existing review studies [shorter than 8 months].
5. Full systematic review, a broad systematic review of existing research on a topic [8 months to 1 year].
6. Multi-arm systematic review, a systematic examination of different types of evidence, with several research sub-questions [at least 1 year]" (Spears, Gross and Heptonstall, 2015; p.3).

Given the highly constrained timescale for the project (i.e. less than two weeks for the literature review), this review is essentially a "literature review", briefly defined as a non-systematic but quick collation and analysis of evidence. However, we incorporate some of the principles and methods of Rapid Evidence Assessment (REA), which are described below.

Grant and Booth (2009) define REAs in their seminal work as reviews that "… aim to be rigorous and explicit in method and thus systematic but make concessions to the depth or breadth of the process by limiting particular aspects of the systematic review process" (Grant and Booth, 2009, p. 100). The UK Government Social Research Service recommends REAs "to support programming decisions by providing evidence on key topics; and to support the commissioning of further research by identifying evidence gaps". They estimate that "REAs would normally take between 3 to 6 months" [1].

The general principles and characteristics of REA that we adopt in our review are:

- Defined scope: We have limited the scope of the review to four child outcomes and the key measures of these child outcomes previously agreed.
- Method: We have outlined and agreed on this protocol, which provides explicit *inclusion criteria* and a search method. Having an explicit methodology is a key element in REAs but not in "literature reviews".

[1] https://www.gov.uk/government/collections/rapid-evidence-assessments#documents

- **Use of existing reviews**: REAs, in the interests of time, often rely on existing reviews. Where possible, we have relied on the existing literature reviews and we make this a general guiding rule and part of our protocol.

2. LIMITATIONS

This literature review may potentially suffer from the issues that all "literature reviews" generally suffer from. That is, the review's coverage may not be complete. There is a risk of biasing the conclusions as a result of choosing a limited number of search terms and as a result overlooking some areas of the literature. To mitigate this potential problem, this document specifies how the literature will be mapped and documented, including the terms we focus on. The comprehensiveness of the literature review is linked to such terms and criteria.

3. INCLUSION CRITERIA

We have applied the following *inclusion criteria*:

1. The literature review covers the studies published in the last decade, between 2005 and 2016 (inclusive).

   Studies prior to this date are likely to be covered a) in previous reviews of the literature, some of which are mentioned in this review; and b) in the preview research literature review. Moreover, we believe that the MCS children are subject to period effects that are most likely to govern the findings of the most recent studies. Studies published during 1990s and earlier decades are likely to have findings that are not relevant for the MCS children.

2. Only peer-reviewed articles are included.

   Government reports will be treated as peer-reviewed. Book chapters, blogs, magazine articles and unpublished working papers are not included in our criteria. Exceptionally, if an "unpublished working paper" has already been extensively cited in peer-reviewed work and is published in one of the prestigious (sometimes peer-reviewed) working paper series, such as National Bureau of Economic Research (NBER), then those papers may be included in our review. Those cases are rare.

3. We only include publications in English.

   Our team members are capable of reading literature in more than five languages. However, we do not make use of this expertise because, first, covering studies in these languages is not feasible given the short timescale. Second, the most prominent research in those languages is often translated or published separately in English. Third, appropriate quality checks would not be possible in other languages.

4. We give priority to the studies conducted in the UK and EU.

   Nevertheless, in the absence of studies in these countries for our key outcome measures, we pay attention to other post-industrial country contexts, such as the USA, Canada, Australia, etc.

Literature on low or middle-income countries remains out of our scope. Child outcomes and their predictors are too different in these contexts.

5. We include only quantitative studies that use large and, as far as possible, representative samples.

Smaller scale studies, qualitative studies, and professional and grey literature are excluded. Clinical studies with very small samples or non-representative experimental studies are excluded, even if they claim to provide causal findings, as they would not be easily generalizable to the population in England, which is one of the requirements of the project.

4. SEARCH METHOD

We have used **Google Scholar** as the primary source of "search site". Google Scholar has a few practical features such as allowing searches to restrict the publication date to any time interval, it allows sorting the articles by citation, relevance, year, etc., which is useful to weed out the papers that do not fit our inclusion criteria.

Study selection is conducted in two stages: we first screened titles and abstracts against the inclusion criteria to identify potentially relevant papers, and then we followed up the full papers identified as possibly relevant in the initial screening.

Our main focus is on examining the literature on the determinants of a set of specific child outcomes in a number of discrete domains, namely:

a) **Health**: e.g. child obesity and overweight (BMI), and height, long-term limiting illness.

b) **Behavioural Outcomes**: e.g., Strength and Difficulties Questionnaire (SDQ).

c) **Cognitive and Educational Outcomes:** e.g., cognitive ability, educational attainment.

d) **Peer and Social Outcomes:** e.g. bullying, peer problems in the SDQ.

The search keywords have been each measures of these four outcomes. The outcome term is combined with the keywords "child", "children", "determinants" and "predictors" with an "and" command.

5. ANALYSIS AND FORMAT

We analyse existing determinants, where possible grouped by the stage in the life course of children and parents. For example, each section starts by looking at pregnancy and prenatal factors, then early childhood factors, and then time-varying factors across the life-course, such as socioeconomic factors, family structure, parenting, family life-styles, etc.

We use both narrative and tabular formats to assess what is known about key predictors of child outcomes. We provide tables summarising the literature for each outcome, and narrative text supplements the table, describing the most relevant findings from the literature. The end of each section provides full references.

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Spears, J. Gross, R. and Heptonstall, P. (2015) Developing a Rapid Evidence Assessment (REA) methodology: A UKERC [UK Energy Research Centre] TPA technical document. Retrieved from file:///H:/Downloads/developing%20a%20rapid%20evidence%20assessment%20v3.pdf.pdf"

1 Health Outcomes: Obesity, Overweight, Weight Gains and Long Term limiting Illness

1.1 Life Course Determinants of Child Obesity and Overweight

Obesity and overweight in children is a growing health and socio-economic concern with far reaching consequences. Estimates from the International Association for the Study of Obesity (EASO) indicate that the rates of overweight (including obesity) of children aged 5-17 years in the United Kingdom (UK) are among the highest in Europe.[2]

Obesity and overweight, as with many health conditions, can exhibit both significant hereditary and shared environmental components. In addition to a large genetic component to obesity and BMI, children's caloric intake, dietary habits, level of physical activity and health behaviour in general are, at least partially, dictated by their parents' health behaviour, social norms and culture. However, the rapid development of an obesity epidemic is suggestive of important environmental influences including parental influences,[3] which work either directly or indirectly through epigenetic influences.

This literature review identifies the determinants that are highlighted as most relevant in the literature. Such determinants are classified under the following headings: (i) pregnancy and early parenthood, (ii) family lifestyles, (iii) social influences and parenting styles, (iv) intergenerational transmission, (v) Socio-economic determinants, (vi) demographic determinants, and (vii) longitudinal determinants. The following sections elaborate on each of these sets of determinants.

1.2 Pregnancy and early life parenthood

The risk of developing obesity and overweight originates in the child's foetal development. At the beginning of life, human nutritional intake is controlled by biological systems and internal signals. These determine innate preferences that are subsequently modified by environmental processes. Environmental processes include the acquisition of cognitive structures, attitudes, and beliefs about food and nutrition, which are influenced by parents, and social context and have a particular importance for nutritional intake in adulthood.

Monasta et al. (2010) find that mother's obesity at the beginning of pregnancy is a risk factor for the onset of childhood obesity. Smoking behaviour can also influence the onset of child obesity; and some diseases in pregnant woman can be significant predictors for child obesity, such as diabetes type II. Monasta et al. (2010) identify some important clinical factors associated with later overweight and obesity, such as pre-gestational diabetes, maternal malnutrition early in pregnancy, maternal smoking, rapid infant growth, no or short breastfeeding. Hypercaloric nutrition of mothers in the third trimester

[2] http://easo.org/education-portal/obesity-facts-figures/

[3] Indeed, a study by Reilly et al. (2005) using longitudinal data form ALSPAC in the UK finds obesity of both parents to be the most significant determinants of childhood obesity, as well as some behavioural factors such predicting sedentary lifestyles (more than 8 hours of TV watching) and short sleep, and finally longitudinal determinants such as birth weight, and weight at different stages of development.

of pregnancy, excessive protein and toxic substance intake, prematurity, and low weight are linked to childhood obesity (Tabacchi et al., 2007).

Monasta et al. (2010) find that a lower risk of overweight is associated with higher socioeconomic status (SES) in childhood as determined by parental occupation, education, family income, or a combination of these three factors. One of the potential drivers of an SES gradient in child obesity lies in maternal behaviour whilst the child is in the uterus and parental behaviour in early life. Specifically, mothers with low SES are documented to breastfeed less.

In another systematic literature review, Tabbacchi et al. (2007) identify some elements of nutrition early in life, such as high consumption of dietary fats and whole grains, and high consumption of foods rich in carbohydrates with a high glycemic index. Breastfeeding is negatively associated with child obesity. Breastfed children have a lower intake of soft sugared drinks and added sugars; and formula milk and early weaning are found to predict obesity in childhood.

1.3 Family lifestyles

Parental influences operate through a variety of mechanisms including availability of nutrients, socialization patterns deriving from their own eating dynamics, culture and food preferences, alongside exercise patterns, and socio-economic status and income. Parental socio-economic status stands out as specific driver of overweight and obesity in children, which we examine below more specifically.

Children's lifestyles play an important role in the development of child obesity and overweight. Recent research on the role of short sleep found it increased overweight and obesity (Hitze et al., 2009). Monasta et al. (2007) identify short sleep duration, less than 30 minutes of daily physical activity, and consumption of sugar-sweetened beverages as risk factors for overweight. Calorie intake and the type of diet children follow, emerge as an obvious determinant. In a sample of children (age ranging from 24 to 72 months) from 22 nursery schools in London, England, the amount of fruit or vegetables that parents reported as their own intake was the strongest predictor of their children's intake of fruit and vegetables. Contrary to much popular belief, the total amount of food being eaten by British children at home has declined between 1975 and 2000 (De Agostini, 2007), even though it might well be the composition of that food has varied. Among schoolchildren whose fat intake was high, more than half continued to have high consumption of fats, and also energy dense diets are found to affect obesity in childhood (Johnson et al., 2006).

1.4 Social Influences and Parenting styles

By the time children are 3 or 4 years old, eating is no longer deprivation-driven but influenced by their responsiveness to environmental cues about food intake. Family strongly influences childhood eating practices, including children's attitudes towards food (Nicklas et al., 2001). Food preferences developed during infancy remain relatively stable and are reflected in food choices made later in life (Patrick and Nicklas, 2005). Peer effects are important too, but such effects appear to be more important over time, especially in adolescence, and the same applies to school meals (Patrick and Nicklas, 2005). Table 2 summarizes the main recent studies that report on social and parenting determinants of obesity and overweight in children. These studies indicate the presence of some environmental factors that are

conducive to child obesity including the role of marketing and advertisement.

Sleddens et al. (2011) perform a systematic review regarding the relationship between general parenting and weight-related outcomes. They find that many studies reported some non-significant findings regarding associations between particular parenting dimensions or styles and children's BMI, but some studies did indeed show a moderate effect of an authoritative parenting style with lower BMI. Other parenting dimensions identified were low maternal warmth and difficult child temperament. Goode et al. (2008), using the 2003 Scottish Health Survey, find that whilst paternal histories of their eating habits had no impact on either sons or daughters, maternal history of eating habits negatively influences the eating behaviour of daughters.

1.5 Intergenerational transmission

In general, having an overweight mother significantly increases the likelihood of becoming overweight or obese. Table 3 summarizes the main findings from studies examining paternal direct transmission of obesity and overweight.

Martin (2008) measures the intergenerational relationship of BMI using data from the US National Longitudinal Survey of Adolescent to Adult Health (Add Health). The study finds that children whose parents are both reported to be obese have BMI levels one standard deviation above the sample mean. Anderson et al. (2007) use data from repeated cross sections of the US National Health and Nutrition Examination Survey (NHANES) and find a correlation between mothers and children's BMI. Classen and Hokayem (2005) use data from the US NLSY79 and find that children of extremely obese mothers (with BMI greater than 40) are 50 per cent more likely to be obese than their counterparts. Classen's (2010) findings suggest a correlation of BMI between sons and mothers of between 0.32 and 0.38. This association increases at higher levels of BMI.

1.6 Socio-Economic Determinants

1.6.1 Income and Socio-Economic Determinants

Only a limited number of studies examine the relationship between socio-economic inequality and child obesity. These studies are summarised in Table 4. Some of those studies examine the direct effect of income and measure income related inequalities on child obesity (Costa-Font and Gil, 2013) whilst others examine the effect of exogenous changes income from the introduction of subsides (Schmeiser, 2012). Baum II and Ruhm (2009) find that an additional year of maternal education reduces obesity by an average of 0.2 kg/m2. However, the socio-economic effect on child obesity does not appear to operate through family income. A recent study examining conditional cash transfers in the US finds that income transfer (derived from casino profits on an American Indian reservation) did not influence the BMI and obesity of higher income children but did increase the BMI of poorer children (Akee et al., 2013).

One potential explanation of the transmission is the result of a common external factor, such as poverty or female employment. If this were the case, then redistribution and social policies that enhance a work-life balance would in turn exert positive spill-overs by reducing child obesity. Some studies find

an association between child obesity and female employment, and that the relationship among poorer people is more intense in the UK (Scholder, SvHK, 2008).

1.6.2 Maternal Employment

Maternal employment has been argued as a factor that decreases maternal time available for overseeing children's activities. This then generally results in increased sedentary activities as opposed to activities that have the positive effect of expending calories; specifically, in increased television viewing and decreased participation in active play. Table 5 below summarises the most recent studies from 2006 onwards. Chia (2008) finds evidence from Canada documenting that an increase in the mother's work intensity when she first returned to work in the period after the child's birth and before the child started school, increased the risk of child overweight. However, these studies generally do not take account of the intergenerational transmission of obesity and overweight. An exception is Costa-Font and Gil (2013) who find that after accounting for the intergenerational transmission, a mother's labour market participation only explains obesity among boys but not among girls. Hence, it appears income and parental influences are the central determinants of obesity among children. Scholder, SvHK, (2008) find, using British data, some evidence of an employment effect among teenagers but not before. Miller (2011) finds similar results using US data; and Miller and Chang (2015) find evidence of higher child obesity and overweight among mothers who work non–standards shifts. Finally, Fertig et al. (2009) find that the effect of maternal employment varies by the mother's education.

1.7 Demographic Determinants

A recent review Tabacchi et al. (2007) finds that sex is an important determinant of child obesity, with a predisposition in females to be overweight at all ages. The study identifies ethnicity as a determinant, with black and Latino populations exhibiting a higher prevalence. Mother's age also appears to correlate with child obesity (Baum II and Ruhm, 2009). Some report a protective effect of physical activity against obesity, others find no association and a few have suggested that higher activity is related to increased weight (Goran et al., 1998, Fogelholm et al., 2000). Generally, it is well established that there is a gender difference in children's physical activity (Fogelholm, et al., 2000).

1.8 Other Longitudinal Influences

Other factors refer to *longitudinal effects* such as obesity in infancy indicating some degree of persistence in child obesity. Infants who are at the highest end of the distribution for weight or body mass index or who grow rapidly during infancy, are at an increased risk of subsequent obesity (Baird et al., 2005). Tabacchi et al. (2007) find that an increase of BMI before the age of 5 (early adiposity rebound) is an early indicator of risk of obesity.

1.9 Conclusion

The determinants of child obesity are multidimensional. First, there are non-time varying determinants such as gender, material effects, pregnancy and early parenthood events and intergenerational transmission (genetic) influences. Second, it is possible to identify some time varying determinants such as the influence of socialization, TV advertisement and sedentary behaviour in addition to certain

longitudinal effects such as weight gain in the first five years, family roles, socioeconomic status and employment. The detailed findings are as follows:

- There is mixed evidence of an employment effect on obesity and overweight among women who work long hours and who have low educational attainment.
- There is some evidence that additional income increases the risk of being overweight among low-income groups, but the evidence is more consistent with the finding that income related inequalities increase obesity.
- There is consistent evidence of intergenerational transmission and of maternal obesity at the beginning of pregnancy and high caloric consumption underpinning child obesity.
- Pre-gestational diabetes, maternal malnutrition early in pregnancy, maternal smoking, rapid infant growth, no or short breastfeeding all increase the risk of obesity.
- Other lifestyle factors identified are short sleep duration, fewer than 30 minutes of daily physical activity, and consumption of sugar-sweetened beverages.

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TABLES

Table 1. Parental and family lifestyles

Study	Characteristics	Results
L.J. Cooke et al. (2003)	Children (age ranging from 24 to 72 months) from 22 nursery schools in London.	The amount of fruit or vegetables that parents reported as their own intake was the strongest predictor of their children's intake of fruit and vegetables.
Taveras, et al. (2005)	Cross-sectional and longitudinal associations between frequency of family dinner and overweight status in a large sample of 9- to 14-year-old children.	Eating a family dinner was found to be associated with a healthy diet.
John J Reilly, Julie Armstrong, Ahmad R Dorosty, Pauline M Emmett, A Ness, I Rogers, Colin Steer, Andrea Sherriff for the Avon Longitudinal Study of Parents and Children Study Team (2005)	Participants were 8234 children in cohort aged 7 years and a subsample of 909 children (children in focus) from the UK (Avon).	The risk factors were: parental obesity, very early BMI or adiposity rebound, more than eight hours spent watching television per week at age 3, catch-up growth, standard deviation score for weight at age 8 months and 18 months and weight gain in first year (as well as birth weight).

Table 2. Studies reporting on social determinants of obesity and overweight

Study	Characteristics	Findings
J.M. McGinnis (Ed.) et al. (2006)	Food marketing to children and youth: threat or opportunity? Institute of Medicine, Committee on Food Marketing and the Diets of Children and Youth, National Academies Press, Washington	Exposure to TV advertising is associated with adiposity in children aged 2 to 11 years.
T. Lobstein, S. Dibb. Obes Rev, 6 (2005), pp. 203–20	Ecological evidence for a link between advertising to children and the risk of overweight using data from surveys of advertising on children's television and estimates of the prevalence of overweight among children, in the USA, Australia and eight European countries.	Evidence of a link between obesogenic food advertising and child overweight.
Klazine van der Horst et al. (2007)	Systematic review of environmental correlates of obesity-related dietary behaviours in youth.	The most important associations of obesity and overweight are with parental and sibling fruit/vegetable intakes, fat intakes and parental education with adolescent's fruit/ vegetable intake.
Lobstein T, Dibb S. Obes Rev 2005;6:203-8.	Compares the prevalence of overweight children in 9 participating countries with the extent of advertising of energy-dense and healthier foods.	They find a significant positive correlation between overweight prevalence and the promotion of energy-dense foods. Evidence of a possible link between obesogenic food advertising and child overweight.

Table 3. Summary of measure of findings from studies measuring transmission of BMI and obesity

Study	Characteristics	Results
Classen and Hokayem (2005)	NLSY79	Children of extremely obese mothers (with BMI greater than 40) are 50% more likely to be obese than their counterparts.
Classen (2010)	NLSY79	Suggests a correlation of BMI between sons and mothers of between 0.32 and 0.38. This association increases at higher levels of BMI distribution.
Martin (2008)	National Longitudinal Survey of Adolescent to Adult Health (Add Health).	Finds that children whose parents are both reported to be obese have BMI levels one standard deviation above the sample mean.
Anderson et al. (2007)	Cross sections of the National Health and Nutrition Examination Survey (NHANES).	Finds an intergenerational BMI elasticity between women and their children of roughly 0.2.
Costa-Font and Gil (2013)	Cross-section of health systems in Spain.	Finds an intergenerational transmission with correlation varying from 0.2-0.4.

Table 4. Studies examining the association of income and education on obesity and overweight among children

Study	Characteristics	Results
Akee et al. (2013)	The effect of exogenous income transfers during adolescence affect contemporaneous BMI measures and young adult obesity rates, using evidence from the Great Smoky Mountains Study of Youth, US.	Income transfer (derived from casino profits on the American Indian reservation) did not influence the BMI and obesity of children at the high pre-treatment annual income but did increase the BMI of poorer children.
Costa-Font and Gil (2013)	Series of Health Surveys from Spain.	Income and education being the main predictor of child obesity and income inequalities increasing over time.
Baum II and Ruhm (2009)	National Longitudinal Survey of Youth (NLSY) in the US.	Weight increases with age and is inversely related to SES during childhood. They find that an additional year of maternal education reduces obesity by an average of 0.2 kg/m2.
Schmeiser, M. D. (2012)	Effect of participation in the Supplemental Nutrition Assistance Program (SNAP) on BMI using NLSY 1997.	SNAP participation is found to significantly reduce BMI percentile and the probability of being overweight or obese for boys and girls aged 5–11 and boys aged 12–18.

Table 5. Main studies on paternal employment and obesity and overweight

Study	Characteristics	Results
Scholder, SvHK (2008)	Data on a nationally representative British birth cohort are used to examine this; the 1958 National Child Development Study.	Full-time maternal employment during mid-childhood positively affects the probability of being overweight at age 16. There is no evidence that part-time or full-time employment at earlier/later ages affects this probability.
Costa-Font and Gil (2013)	Study employing series of cross sections of health surveys.	Mothers' labour market participation only explains obesity among boys but not among girls.
Miller (2011)	National Longitudinal Survey of Youth (NLSY) – Child Supplement	Maternal work at ages 9–11 and 12–14 was related to an increased rate of overweight during the same periods, while work at ages 6–8 resulted in a decreased rate of obesity in the same period and later at ages 9–11.
Miller, D. P., & Chang, J. (2015)	Longitudinal data from the Fragile Families and Child Wellbeing Study.	Probability of child overweight or obesity was higher for children living with mothers who worked standard shifts at a primary job and nonstandard shifts at a secondary job compared to children living with mothers who worked a standard shift at a primary job only. Fathers' work schedules were not associated with child overweight or obesity.
Chia (2008)"Maternal labour supply and childhood obesity in Canada: evidence from the NLSCY"	Data from the National Longitudinal Survey of Children and Youth in Canada.	An increase in the mother's work intensity when she first returned to work, in the period after the child's birth and before the child started school, is associated with an increase in the risk of the child's becoming overweight or obese later in childhood.
Liu et al. (2009)	US National Longitudinal Survey of Youth 79 (NLSY79).	The mother's full-time employment does have some impact on her children's BMI and likelihood of becoming overweight across models and inference procedures.
Fertig et al. (2009)	Child Development Supplement of the Panel Study of Income Dynamics.	The effect of maternal employment varies by the mother's education.

2 CHILD BEHAVIOURAL OUTCOMES

The literature on child behavioural outcomes and its determinants is extensive. This review has drawn from meta-analysis and literature reviews and has been complemented with single study articles for more recent years, especially for the UK. The findings are organised by types of predictors. First time-invariant factors are analysed. The focus has been on low birth weight and preterm birth, which seem to be the most relevant time-invariant factors affecting child behavioural outcomes. Second, maternal factors are examined. The literature suggests that the most relevant maternal factors are stress – including antenatal stress and postnatal stress and depression – maternal smoking, and maternal drinking. Finally, the review focuses on time-variant factors and more specifically on socioeconomic status.

The review points towards the following results:

- There are significant effects of low birth weight or preterm birth on child behavioural outcomes. Nevertheless, the magnitude and significance of such effects vary depending on the observed outcome variable, with attention problems getting the most robust results.
- With regard to maternal stress and depression, the review suggests that more research is needed in terms of antenatal stress, as results are sometimes inconsistent.
- Studies on post maternal stress are more robust, and they generally find an effect of stress on behavioural outcomes of children, but the field would benefit from more studies, as the overall number of studies is small.
- Studies focusing on maternal depression are more abundant and they point towards a significant effect.
- Maternal smoking seems to have important effects on outcomes, and more analysis is needed for maternal drinking, as results are rather inconclusive as yet.
- Finally, research on the effect of socio-economic status suggests that it is a relevant factor, although the effects are small.

2.1 NON-VARIANT FACTORS

2.1.1 Low birth weight or preterm

There exists a strong consensus in the literature that low birth weight or preterm weight significantly affect behavioural development of children. More specifically, the literature consistently finds an excess of attention deficits and hyperactivity disorders in preterm and/or low birth weight children (Hayes and Shariff, 2009); Aarnoudse-Moens, Weisglas-Kuperus, Bernard van Goudoever, Oosterlaan, 2009; Johnson, 2007; Bhutta et al., 2002).

However, the literature is less clear about the effects of these determinants on internalising (anxiety and depression, withdrawn behaviour and somatic complaints) and externalising (delinquent and

aggressive) behaviours.[4] In their meta-analysis, Bhutta et al. (2002) find that preterm birth is positively associated with both externalising and internalising behaviours. This finding is contested by Aarnoudse-Moens et al.'s meta-analysis (2009), which shows that preterm birth or low birth weight have small effects on internalising behaviour and that the effects on externalising behaviour are negligible. They also make reference to Bhutta et al.'s results (2002) and question whether their high prevalence of externalising behaviour is due to the fact that attention problems are included in there. Moreover, the issue is also raised about the fact that Bhutta et al.'s review is not a quantitative meta-analysis, and it is therefore not directly comparable to their results. In a similar vein, the literature reviews carried out by Hayes and Sharif (2009) and by Johnson (2007) do not find conclusive evidence on the effects of these determinants on both types of behaviours.

Studies using UK data are very scarce, and their results not directly comparable, as they use different measures of child behavioural development. Two of the most recent ones have been carried out by Kelly and colleagues (2001) and Foulder-Hughes and Cooke (2003). Foulder-Hughes and Cooke's study (2003) focus on the 1991-1992 cohort in Liverpool and it uses the Movement Assessment Battery for Children (MABC) to test 12 behaviours (overactive, passive, timid, tense, impulsive, distractible, disorganised, overestimates ability, underestimates ability, lacks persistence, upset by failure, no pleasure from success), as well as testing for inattention and impulsivity using Connor's ratings. They find that preterm children are more likely to present the MABC behaviours stated above and they report more significant signs of inattention and impulsivity.

Kelly et al. (2001) carry out a national study using the 1997 Health Survey for England and use the Strength and Difficulties Questionnaire (SDQ). They do not focus on a specific cohort, but rather take children aged 4 to 15 years old. They find that low birth weight is a significant predictor of the total SDQ score. Within the SDQ score, low birth weight seems to be correlated with peer-relationship problems and the hyperactivity scales. It is not significantly correlated with the other scales: emotion symptom scale, conduct problems and peer problems. They also report sociodemographic variables which are related to behavioural problems. They find that children coming from low social class or lone parents are more likely to experience behavioural problems. With regard to gender, the problems seem to be different. Boys are more likely to experience hyperactivity or conduct problems, whereas girls are more likely to have high scores on emotional symptoms sub-scale.

Some avenues for improvement pointed out by the present review are as follows: several studies in the literature seem to suffer from a small number of observation subjects, high attrition rates, substantive variations in methods and an incomplete control for socio-demographic variables. In particular, Foulder-Hughes and Cooke's study only covers the area of Liverpool and it suffers from incomplete data (i.e. they mention that some students did not complete all tests). Kelly et al.'s analysis (2003) lacks information on gestational age, which makes it difficult to fully estimate the potential effect of birth weight on outcomes. Moreover, research has usually been focused on very preterm or very low or low birth weight, overlooking late preterm births. Given that a high percentage of births are late preterm (McGowan et al., 2011), it would be interesting to include them in the analysis. Another shortcoming

[4] The distinction between internalising and externalising problems comes from the clustering of some participant's behavioural problems following the taxonomy developed by Achenbach (1991). This taxonomy includes eight syndromes: Social Withdrawal, Somatic Complaints, Anxiety/Depression, Social Problems, Thought Problems, Attention Problems, Delinquent Behaviour, and Aggressive Behaviour.

concerns the long-term effects of low birth weight or preterm birth. The existing literature could not properly assess these effects, and Johnson (2007), Aarnoudse-Mones et al. (2009) and Hayes and Sharif (2009) all argue for more studies which longitudinally monitor the outcomes through middle childhood. The UK studies were not of help on that matter, as Foulder-Hughes and Cooke's study focused on outcomes for 7- to 8-year-olds and Kelly et al.'s article used cross-sectional data. Finally, Aarnoudse-Mones et al. (2009) point to the possibility that there is a publication bias, with results that fail to report a significant effect being less likely to be published.

2.2 Previous factors

2.2.1 Maternal lifestyle factors – Stress

The literature reviews stress-related effects on children behavioural outcomes by differentiating between antenatal stress, postnatal stress and postnatal depression.

With regard to antenatal stress, there is considerable evidence from animal studies that maternal antenatal stress leads to behavioural disturbances in offspring (O'Connor 2002). The hypothesis that this could also happen in humans was developed as early as the 70s (Stott 1973 cited in O'Connor 2002), but the analyses done have not been very robust until the 2000s. One review of 14 studies carried out by Van den Bergh and colleagues (2005) shows a link between antenatal stress and anxiety and cognitive, behavioural and emotional problems in the child. More specifically, results point towards problems of inattention, irritability and difficulty in infants and hyperactivity, attention problems, behavioural and emotional problems in pre-school children and children. The review also highlights the gendered results, suggesting that boys are more susceptible to maternal anxiety and stress than girls.

However, the authors flag some problems with the studies reviewed: some studies do not include important confounders, such as postnatal maternal mood or maternal coping strategies; and magnitude of effects vary across studies, probably because of different timing and intensity of stress. The studies' results are also difficult to compare as children behavioural outcomes are measured differently across studies. These and other problems are also picked up by another review done by Linnet and colleagues (2003) which review several maternal lifestyle factors, such as psychological stress. The five studies focusing on stress indicate a possible modest contribution of this factor to behavioural problems, but the authors emphasise that methodological problems abound, with some studies suffering from inaccurate exposure assessments, low statistical power or insufficient controls.

The studies in both reviews are from several countries, including one study from the UK, others from the Netherlands, USA, Canada and Germany among others and they include children from several ages. The study from the UK is carried out by O'Connor et al. (2002) and it uses the ALSPAC dataset. They provide evidence on antenatal stress and the effect on offspring behavioural problems. With a sample of around 7,000 individuals from the 91-92 birth cohort and using parents' reports and an index of psychiatric symptoms in children from Elander and Rutter (1996), they find that antenatal maternal anxiety is positively correlated with hyperactivity and inattention problems and emotional problems for boys, and emotional problems for girls.

The review focusing on postnatal anxiety effects on child behavioural outcomes are more robust, but the results are weakened by the small number of studies. Many earlier studies focused on postnatal

depression as opposed to anxiety and stress, and although there has been a change in focus, studies about postnatal anxiety are still few and with mixed results (Glasheen et al., 2010). The authors of the review highlight that the most robust studies are those carried out by O'Connor in 2002 and 2003 in the UK. These studies find that postnatal maternal anxiety is associated with changes in emotional and conduct problems, but not with hyperactivity. This is interesting as it differs slightly from the results for antenatal maternity anxiety from the same studies. The studies recruited the sample during the prenatal period, which allows the possibility to control for antenatal anxiety and other confounders (Glasheen et al., 2010).

Research on postnatal maternal depression is abundant, and as Goodman and colleagues report (2011), well-established. Grace, Evindar and Steward (2003) review 15 studies (9 of them are a meta-analysis from another author) carried out between 1978 and 2001 and find that postnatal maternal depression has a small effect on child behaviour up to 5 years. More specifically, they found that it was linked to distractibility, antisocial behaviour or neurotic behaviour at home. However, they could not find a significant effect on prosocial behaviour at school or interaction with a teacher. Given that the results in school and at home rely on different reports (teachers' reports for the former and maternal reports for the latter), it may suggest that maternal reports of child behaviour may be biased. Of these 15 studies, 6 are from the UK, and they were carried out between 1986 and 1999. Some of them study local or regional communities (e.g. one study looks at North London, another one at South London, and another one at Cambridge).

Goodman and colleagues have carried out several reviews in the 2000s (see Goodman (2007), Connel and Goodman (2002), Goodman et al. (2011)) which confirm Grace et al.'s (2003) results. They suggest that children with depressed mothers have significantly higher rates of internalising and externalising problems, emotional difficulties and mood disorders. In particular, Goodman (2011) conducts a meta-analysis of 193 studies and finds that the associations with the mentioned variables are of small size but significant.

Maternal stress and depression therefore seems to affect child behavioural outcomes and this is what we may expect to find in our analysis. Note, however, that the existing reviews may suffer from selective bias, with those studies which have not found an effect not being published. Given that the existing analyses are mainly based on data from the 80s and 90s, the use of the MCS can provide a more up-to-date picture of the effects of these group of determinants on child behavioural outcomes. The longitudinal nature of the study will be useful to understand what happens to these effects as the child grows up, and will allow for the control of many covariates with the use of fixed-effects. Finally, the availability of teachers' reports will allow us to alleviate the potential reporter bias highlighted in the UK studies carried out by O'Connor et al. in 2002 and 2003.

2.2.2 Maternal lifestyle factors – Alcohol drinking and smoking

The literature on the effects of smoking on child behavioural outcomes points towards important effects. With regard to drinking alcohol, the effects of heavy drinking are better documented than the effects of moderate drinking.

Linnet et al. (2003) found in their review of 24 studies on tobacco smoking carried out between 1973 and 2002 that this action was associated with greater risk of ADHD-related disorders. Eight of these

studies were argued to be very well designed, with appropriate controls, large samples, prospective exposure assessments and socioeconomic status controls, and reported small but significant and independent effects of smoking. One of them is the O'Connor et al. (2002) UK study (which uses ALSPAC data from 91-92 cohort) and the rest are from Australia and the US. These studies on ADHD are complemented by two other studies cited in Huizink and Mulder's review (2006) which use twin-data and also find an effect on ADHD prevalence. At the same time though, they also emphasise the importance of genetic and environmental factors as the child grows up.

Tobacco smoking also seems to be related to other behaviours aside from ADHD. Huizink and Mulder (2006) carry out a review of several studies (including the review by Linnet (2003)) and outline three studies – none from the UK and one using twin-data – which find that maternal smoking during pregnancy is associated with externalising behaviours such as oppositional and aggressive behaviours. Using the 1997 Health Survey for England and SQD scores for child behavioural outcomes, Kelly et al. (2001) also find heavy maternal smoking to be associated with hyperactivity, peer relationship, conduct, emotional and total score difficulties in children aged 4-15 years old. It is not, however, associated with pro-social scale.

Reviews on maternal drinking are less conclusive. Testa et al.'s (2003) meta-analysis of 10 studies carried out from the late 1980s until the early 1990s suggest that foetal alcohol exposure at low, moderate and high levels is associated with lower Mental Development Index scores. However, the effect is attenuated when covariates are introduced and only infants from 12-13 months are affected, with no significant effect found on infants from 6-8 and 18-26 month-old. The studies included use the Bayley Scales of Infant Development and focus on localities in the US, Canada, Denmark, Germany and the UK. The authors convey that the studies are not conclusive because of the heterogeneity of the samples, measurements and analysis.

Linnet et al.'s (2003) review also points towards rather inconsistent results. Only half of the reviewed papers presented a significant relationship with inattention and impulsivity, but in general, studies suffered from methodological problems such as inaccurate exposure assessment, low statistical power or insufficient controls (ibid.). One of Linnet et al.'s reviewed studies is the one by O'Connor et al. (2002) in the UK, which has a large sample of around 7,000 individuals and did not find any association.

Huizink and Mulder (2006), who review a handful of studies carried out in the 1990s and early 2000s, argue that the reason why Linnet et al.'s revision may get inconsistent effects has to do with the dichotomization of exposure measures of alcohol intake (p. 31). They argue that some studies in their review suggest that the pattern of maternal drinking seems to be of importance. One of them, Sood et al. (2001), finds aggressive and externalising behaviour in children aged 6-7 years old even at moderate drinking levels.

More recent studies add to the confusion of previous findings. D'Onofrio et al. (2007) carry out a study in the US using the National Longitudinal Survey of Youth (NLSY) with sibling fixed-effects and find that both moderate and heavy maternal drinking is associated with conduct problems, although they do not find any association with attention and impulsivity disorders. A similar result is reported in Chen (2012), using the same survey for the US with sibling fixed-effects as well. He finds that both moderate and heavy maternal drinking is associated with infant difficultness, but not with positive mood or fearfulness. Conversely, a study by Kelly et al. (2008) in the UK using the first two sweeps of the

Millennium Cohort Study (MCS) and the SDQ scores find that moderate drinking is not associated with higher SDQ scores, whereas heavy drinking is. Interestingly enough, they also find that for boys, the effect has a J-shape, with boys born to moderate drinkers being less likely to have hyperactivity or conduct problems than abstainers, with controls included. They do not find this effect for girls.

These contradicting results suggest that more research is needed, especially about maternal drinking. Later sweeps from the MCS may help clarify the effect on child behavioural outcomes and apply sibling fixed-effects. With regard to maternal smoking, some more research using up-to-date databases, panel data and following children behavioural outcomes at different ages would also shed more light onto the effects.

2.3 VARIANT FACTORS

2.3.1 Socioeconomic status

The literature gives evidence that socioeconomic status (SES) is linked to child behavioural outcomes, although some outcomes are better researched than others.

A review by Bradley and Corwyn (2002) cites around 12 studies which support this relationship, although they admit that the evidence is not as robust and consistent as the one that looks at child cognitive development. They also find that the relationship becomes more significant with age and from early and middle childhood to adolescence, with little evidence suggesting a link for very young children. At the same time, the evidence is more consistent for externalising behaviours rather than for internalising ones.

This is confirmed by a meta-analysis carried out by Letourneau et al. (2013), in which the impact of socioeconomic status (SES) on externalising and internalising behaviours were examined. All but one of the included studies which focus on children are cross-sectional and were drawn from the US mostly, but also the Netherlands and South Africa (none of them is drawn from the UK) in the early 2000s or earlier. Composite measures of SES include any combination of income, education, marital status, occupational prestige, financial assets and liabilities, and eligibility for subsidy.

Of the 7 articles analysing externalising behaviours, only one (McElroy 2005) focuses on children below 12 years old, and another one focuses on children and adolescents (Veenstra et al., 2006). Both of them focus on aggression as outcome and find a very small but significant relationship between lower SES and increased aggression. The studies focusing on internalising behaviour and depression show different results. Of the five studies included, one focuses on adolescents only, and therefore is disregarded in here. With regard to depression, results are contradicting, with two studies finding that SES is not related to depression and the other one finding otherwise. As for internalising behaviour, the two studies include both children and adolescents and do not find a relationship between SES and such behaviour.

Another very recent review of 133 studies carried out by Piotrowska et al. (2015) focused on the effect of SES on anti-social behaviour, understanding the latter as a heterogeneous concept including fighting, bullying, rule-breaking behaviour and oppositional behaviour. They find that lower SES are associated

with higher levels of anti-social behaviour, which is in line with the findings above about externalising behaviour.

For the UK, Propper and Rigg (2007) find evidence that children from lower SES are more likely to have behavioural problems than their counterparts from higher social classes. The study uses ALSPAC data from the 1990s and the SDQ scores.

The findings show that while the effects of SES on externalising behaviour are fairly established, this is not the case for research on internalising behaviour. Moreover, more studies focusing on the UK are needed, which could benefit from more recent and longitudinal data.

TABLES

Table 6. Studies on Children's Behavioural Outcomes

Determinants	Reference	Journal	Study title	Effect on behavioural outcomes	Qualifiers
Low birthweight / preterm birth	Bhutta, Cleves, Casey, Cradock, Anand (2002)	The Journal of the American Medical Association	Cognitive and behavioral outcomes of school-aged children who were born preterm	Significant	Focus on internalising and externalising behaviour and attention deficits and hyperactivity.
	Johnson (2007)	Seminars in Fetal & Neonatal Medicine	Cognitive and behavioural outcomes following very preterm birth	Significant for attention problems. No consensus for internalising and externalising behaviours.	Focus on internalising and externalising behaviour and attention deficits and hyperactivity.
	Aarnoudse-Moens, Weisglas-Kuperus, Bernard van Goudoever, Oosterlaan (2009)	Pediatrics	Meta-analysis of neurobehavioral outcomes in very preterm and/or very low birth weight children	Significant for attention problems. Not significant or small for internalising and externalising behaviour.	Focus on internalising and externalising behaviour and attention deficits and hyperactivity.
	Hayes and Shariff (2009)	The Journal of Maternal-Fetal & Neonatal Medicine	Behavioural and emotional outcome of very low birth weight infants – literature review	Significant	Especially with attention, withdrawn behaviour and poorer adaptive functioning.
	Kelly, Nazroo, McMunn, Boreham, Marmot (2001)	International Epidemiological Association	Birthweight and behavioural problems in children: a modifiable effect?	Significant	Especially for total SDQ score, hyperactivity, and peer-relationship problems.
	Foulder-Hughes and Cooke (2003)	Developmental Medicine & Child Neurology	Motor, cognitive, and behavioural disorders in children born very preterm	Significant	Especially for inattention and impulsivity and ADHD diagnosis.
Maternal stress and depression	O'Connor, Heron, Golding, Beveridge, Glover (2002)	British Journal of Psychiatry	Maternal antenatal anxiety and children's behavioural/emotional problems at 4 years.	Significant	Focus on antenatal and postnatal stress.

	Van den Bergh, Mulder, Mennes, Glover (2005)	Neuroscience and Biobehavioral Reviews	Antenatal maternal anxiety and stress and the neurobehavioral development of the foetus and child: links and possible mechanisms. A review	Significant	Focus on antenatal stress.
	Linnet, Dalsgaard, Obel, Wisborg, Henriksen, Rodriguez, Kotimaa, Moilanen, Thomsen, Olsen, Jarvelin (2003)	American Journal of Psychiatry	Maternal Lifestyle Factors in Pregnancy Risk of Attention Deficit Hyperactivity Disorder and Associated Behaviors: Review of the Current Evidence	Inconsistent	Focus on antenatal stress. Inconsistent results but they may indicate a possible modest contribution to ADHD symptoms.
	Glasheen, Richardson, Fabio (2010)	Archives of Women's Mental Health	A systematic review of the effects of postnatal maternal anxiety on children	Significant, but more studies needed.	Focus on postnatal anxiety. Significant, although more robust research is needed.
	Goodman, Rouse, Connell, Broth, Hall, Heyward (2011)	Clinical Child and Family Psychology Review	Maternal Depression and Child Psychopathology: A Meta-Analytic Review	Small, but significant.	Focus on maternal depression.
	Grace, Evindar and Steward (2003)	Archives of Women's Mental Health	The effect of postpartum depression on child cognitive development and behavior: A review and critical analysis of the literature	Small, but significant.	Focus on maternal depression.
Alcohol drinking and smoking	Linnet, Dalsgaard, Obel, Wisborg, Henriksen, Rodriguez, Kotimaa, Moilanen, Thomsen, Olsen, Jarvelin (2003)	American Journal of Psychiatry	Maternal Lifestyle Factors in Pregnancy Risk of Attention Deficit Hyperactivity Disorder and Associated Behaviors: Review of the Current Evidence	Significant for smoking. Inconsistent for alcohol drinking.	Focus on tobacco smoking and alcohol drinking. Focus on ADHD.
	O'Connor, Heron, Golding, Beveridge, Glover (2002)	British Journal of Psychiatry	Maternal antenatal anxiety and children's behavioural/emotional problems at 4 years.	Significant	Focus on smoking and alcohol drinking.
	Huizink and Mulder (2006)	Neuroscience and Biobehavioral Reviews	Maternal smoking, drinking or cannabis use during pregnancy	Significant	Focus on moderate levels of smoking and drinking.

			and neurobehavioral and cognitive functioning in human offspring		
	Kelly, Nazroo, McMunn, Boreham, Marmot (2001)	International Epidemiological Association	Birthweight and behavioural problems in children: a modifiable effect?	Significant	Focus on smoking.
	Testa, Quigley, Das Eiden (2003)	Alcohol & Alcoholism	The effects of prenatal alcohol exposure on infant mental development: a meta-analytical review	Inconclusive	Focus on alcohol drinking.
	D'Onoffrio, Van Hulle, Waldman, Rodgers, Rathouz, Lahey (2007)	Archives of General Psychiatry	Causal Inferences Regarding Prenatal Alcohol Exposure and Childhood Externalising Problems	Significant for conduct problems. Not significant for attention and impulsivity disorders.	Focus on moderate and heavy drinking.
	Chen (2012)	Alcohol & Alcoholism	Maternal Alcohol Use during Pregnancy, Birth Weight and Early Behavioral Outcomes	Significant for infant difficultness. Not significant for positive mood and fearfulness.	Focus on maternal alcohol drinking.
	Kelly, Sacker, Gray, Kelly, Wolke, Quigley (2008)	International Journal of Epidemiology	Light drinking in pregnancy, a risk for behavioural problems and cognitive deficits at 3 years of age?	Not significant for moderate drinking. Significant for heavy drinking.	Focus on maternal alcohol drinking.
Socioeconomic status	Bradley and Corwyn (2008)	Annual Review of Psychology	Socioeconomic status and child development	Significant, although it needs to be more robust.	
	Piotrowska, Stride, Croft, Rowe (2015)	Clinical Psychology Review	Socioeconomic status and antisocial behaviour among children and adolescents: A systematic review and meta-analysis	Significant	Focus on anti-social behaviour.
	Propper and Rigg (2007)	Centre for Analysis of Social Exclusion (CASE)	Socio-Economic Status and Child Behaviour: Evidence from a contemporary UK cohort	Significant	

	Letourneau, Duffett-Leger, Levac, Watson, Young-Morris	Journal of Emotional and Behavioral Disorders	Socioeconomic Status and Child Development: A Meta-Analysis	Small but significant on externalising behaviours. Contradictory results with regard to depression. Not significant with regard to internalising behaviours	

3 Cognitive Development Outcomes

3.1 Framework

Conti and Heckman (2013) present a framework for children's development that implies that there may be a large array of determinants of cognitive outcomes for children. This presents challenges for effectively summarising all those potential determinants. A recent literature review by Almond and Currie (2011) provides a useful organising framework by dividing the predictors into broad categories of: prenatal factors, early life factors, and impact of public policies. In addition, the review below focuses more (though not exclusively) on studies that can claim to represent a causal relationship between factors and outcomes. Factors identified by the existing literature are surveyed below under these three headings. Tables 7 to 9 offer a summary of the literature and key findings for each of these set of factors.

3.2 Prenatal Factors

Studies increasingly acknowledge that the prenatal environment can be crucial in determining cognitive outcomes. Birthweight has long been recognised as a distinct marker of in utero health; and Black et al. (2007), using administrative data from Norway, find that an increase in birthweight increases the probability of school completion.

Maternal behaviour during pregnancy can also affect children's cognitive development. Nilsson (2008) uses administrative data from Sweden to convincingly establish that a sharp increase in alcohol availability resulted in a decline in schooling, high school graduation and graduation from higher education for cohorts exposed in utero to the increased alcohol availability. Research for younger children in the UK using matched samples of light drinkers and abstainers from the Millennium Cohort Study (MCS) found that light drinking during pregnancy had no negative consequences for children's cognitive outcomes (Kelly et al., 2013).

Infections during pregnancy can also have long lasting consequences. For the UK Kelly (2011) using the National Child Development Study (1958 Cohort) finds that exposure in utero to the 1957 Asian flu decreased cognitive test scores at age 7 and 11.

Maternal education is found to be important in cognitive development in a number of studies. Carneiro, Meghir and Parey (2013) use data from the United States and exploit variation in minimum school requirements by different US states to show that an additional year of mother's schooling increases cognitive outcomes for children aged 7-8. Part of the effect was due to higher maternal education leading to lower likelihood of smoking while pregnant. Additionally, who are better educated tend to spend more time breastfeeding their children, a mechanism discussed further below. Bradbury et al. (2015) demonstrate that maternal education is associated with children's cognitive outcomes across the early years and across four countries: the US, the UK, Canada and Australia. While some of the differences can be accounted for by parenting behaviours (discussed further below), these do not fully explain the role of parental education. Using the MCS for the UK, they show that differences in cognitive scores are found at each age up to age 11.

Timing of birth also matters for cognitive development (Crawford et al., 2014). Crawford et al. were able to show that children born late in the school year (end August) face a disadvantage in cognitive outcomes relative to those born early in the school year (September) across their whole school career, even after controlling for observed characteristics. The authors find that differences in the age at which cognitive skills are tested accounts for the vast majority of the difference in these cognitive outcomes between children who are born at different times of the year.

Environment and context can also impact cognitive development. Almond and Palme (2009) using data for Sweden find that prenatal exposure to radioactive fallout from Chernobyl caused a decline in the probability of qualifying for high school. A recent review of neighbourhood effects by Sharkey et al. (2014) suggests that, at least for the US, neighbourhood poverty or disadvantage appear to be consistently linked with children's academic or developmental trajectories. The authors suggest that it is still not clear what it is about the residential environment that impacts children's learning and cognitive skills. Sharkey and Elwert (2012) note a link between neighbourhood and cognitive ability that extends across generations. They find that being raised in a high-poverty neighbourhood in one generation has a substantial negative effect on children's cognitive ability in the next generation, and that exposure to poverty across two consecutive generations is associated with a reduction in the cognitive ability of children in such families.

3.3 Early Childhood Factors

Maternal breastfeeding has now been linked in a number of studies to child cognitive development in addition to health outcomes. Borra et al. (2012) investigate the relationship between breastfeeding and children's cognitive and non-cognitive development using data from the Avon Longitudinal Survey of Parents and Children (ALSPAC) a longitudinal study of around 12,000 children born in the Bristol area in the early 1990s. Borra et al. (2012) find that breastfeeding for four weeks is positively and statistically significantly associated with higher cognitive test scores at ages 7, 11 and 14, and the results of school entry tests at age 5.

There have been many attempts to identify how far family effects on children's cognitive outcomes are driven by parenting styles and practices. Ermisch (2008) finds that 'what parents do' in terms of educational activities and parenting style affects cognitive development in children, using the first four surveys of the MCS. Other studies have noted the role of parenting on children's outcomes. Home Learning Environment has been linked to better cognitive and school performance among young children (Sylva et al., 2008); while Waldfogel and Washbrook (2011) note that directly observed maternal sensitivity and responsiveness was strongly linked to cognitive performance.

Other studies from the UK, such as Kiernan and Huerta (2008) and Kiernan and Mensah (2009), look at various determinants of cognitive outcomes in young children and find that parental depression is related to cognitive development in children. They also find that income and poverty persistence are related to cognitive test scores. This is consistent with a range of other studies linking poverty and income to cognitive and school outcomes. Cooper and Stewart (2013) provide a helpful review of these findings, focusing on studies which identify causal

relationships between income and child outcomes. This review suggests that the association between family income and cognitive outcomes is robust and substantial.

There is a large body of evidence showing that children of married parents on average have better outcomes than children of unmarried parents or lone mothers. This has been documented for various sets of outcomes and across different contexts including the UK (for recent reviews of the literature, see: McLanahan, Tach and Schneider, 2013; Bernardi et al., 2013). Regarding cognitive development, overall evidence has been mixed. For example, McLanahan, Tach and Schneider (2013) review 31 studies on the effect of father's absence (at birth or due to subsequent separation) on children's test scores and find that 14 of these studies report significant negative effects and 17 studies found no significant effect of father's absence and these results were clearly patterned by the methodology used: studies using fixed effects models, or quasi-experimental methods found no effect, whereas other methods (including growth curve models) found that a father's absence had significant effects on the test scores of children. Additionally, these authors reviewed 9 more studies, where they found more consistent evidence and significant negative effects of the family structure and father's absence on educational attainment of children (e.g. years of schooling, dropping out, and college attendance). However, most educational attainment indicators used in these studies are measured at later teenage years, which are not covered by the MCS data.

Health in childhood can be also linked to cognitive development. Case and Paxsons (2008) found for the UK that higher height-for-age was associated with an increase in test scores at age 3, and at ages 5 to 10.

Gregg et al. (2015) analyse data from ALSPAC to examine the impact of early maternal employment on three outcome variables measuring child cognitive development between 4 and 7 years of age. Gregg et al. (2015) also explore whether the effect varies with the mother's educational attainment, lone parent status or the type of replacement non-maternal childcare used. The two school-based measures of cognitive development available in ALSPAC are foundation stage profile taken shortly after starting school at age 4 or 5 and the Key Stage 1 assessment which is administered in Year 2. Their third assessment of cognitive ability was administered by the ALSPAC team to children at the age of 7. Gregg et al. (2015) find that maternal employment negatively affects scores for children of mothers who have attained a minimum of an O-level or vocational qualification. The negative effects of early full-time maternal employment are concentrated in children who attended little or no paid care (i.e. in 44% of the sample whose mothers returned full-time by 18 months). Maternal employment has significant and relatively large negative effects on literacy scores when children are placed predominantly in the care of a friend or relative. By contrast, authors find no significant negative effects when the child attends a paid provider and the Entry Assessment equation suggests that working in conjunction with centre-based care may lead to significantly higher child outcome scores.

As a gap in cognitive skill between richer and poorer children is evident from a very early age, Jerrim and Vignoles (2012) – following earlier work by Feinstein (2003) – investigate whether highly able children from disadvantaged homes are overtaken by their rich but less able peers before the age of 10 years, in terms of their cognitive skill. Using data from the Millennium

Cohort Study and studying vocabulary skills at age 4 and reading at age 7, they do not find that able but disadvantaged pupils fall behind their more advantaged but less able peers, though these conclusions have been extensively debated (Feinstein 2015). Bradbury et al. (2015) extend the analysis of cognitive skill development up to the age of 11, in a comparative study investigating the US, Canada and Australia as well as the UK. They find some indication that the gap for the UK may be closing between age 7 and age 11, by contrast with the US.

3.4 Public Policies

Given the results presented in the previous sections on the importance of early life conditions for children's cognitive development, the next step is to ask whether public policies can make a difference.

An obvious place to start is maternity leave. Evidence on whether maternity leave benefits affect cognitive development in Europe is mixed. For example, Dustman and Schönberg (2009) use administrative data on Germany and a series of reforms to identify the causal effect of expansions in paid and unpaid maternity leave and find that the reforms had no significant effect on grade retention, grade attendance, and selective high school attendance. By contrast, Carneiro, Loken and Salvanes (2015) using administrative data from Norway and a reform that increased paid and unpaid maternity leave, find that increased paid and unpaid maternity leave leads to a decline in high school dropout and the effect is larger for children whose mothers are low educated.

Another policy that government can use to try to influence cognitive outcomes early on, is the provision of childcare. Research using comprehensive administrative data from Norway (Havnes and Mogstad, 2009) and an expansion in childcare finds that increased provision of childcare increases educational attainment, decreases the probability of dropping out of high school, and increases the probability of college enrolment.

Governments can also employ income transfers to try to compensate for socioeconomic influences on child outcomes (Cooper and Stewart 2013). Convincing evidence is provided on the impact of income transfers for children from the expansion of the Earned Income Tax Credit (EITC) in the United States (which is a work-conditional income transfer program) by Dhal and Lochner (2012). They find that increased income from the EITC is good for children's cognitive outcomes: combined math and reading scores increase as a consequence of the EITC, especially for children aged 11-15, and increase more for children aged 5 to 10. Also, effects were larger for children from disadvantaged families. For Canada, Milligan and Stabile (2011) find that the child tax benefit in Canada caused a reduction in the likelihood of learning disability for children of low educated mothers and positive effects on math and vocabulary scores.

Another important question is whether moving to a better neighbourhood can improve children's cognitive outcomes, given the apparent role of neighbourhood context, as discussed above. Experimental evidence for the United States comes from the Moving to Opportunity (MTO) experiment, the only large-scale experiment on neighbourhood effects. The MTO was designed to assess the impact of providing families living in subsidized housing with the opportunity to move to neighbourhoods with lower levels of poverty, compared to those who

did not move. Families were recruited for the MTO program from public housing developments in Boston, Baltimore, Chicago, Los Angeles, and New York. While the experiment cannot provide a direct method for distinguishing between different mechanisms through which neighbourhoods affect children, it can potentially offer more precise estimates of the impact of neighbourhoods on educational (and other) outcomes. Using data from the MTO experiment on more than 5,000 children aged 6 to 20, Sambonmatsu et al. (2006) did not find evidence of improvements in reading scores, math scores, behaviour or school problems, or school engagement, overall or for any age group of the MTO experiment.

3.5 Conclusion

- Evidence suggests that in-utero factors such as alcohol availability, infections, and pollution cause impaired cognitive development in children. However, there is need for more research to understand which infections and which pollution matter for child development.
- Low birthweight, a marker for issues during gestation, also influences cognitive abilities in childhood.
- Maternal education increases cognitive outcomes in children. This is partly via less maternal smoking and higher breastfeeding. Children who are young for their school year have lower cognitive outcomes relative to children who are old for their school year. Better health in childhood as measured by higher height-for-age is related to better cognitive outcomes for children. Parental style and parental educational activities matter for children's cognitive outcomes.
- Breastfeeding is linked to better cognitive outcomes for children. Parental depression and persistent poverty are related to poorer cognitive outcomes. Results on early Maternal Employment are not clear. Evidence for England suggests that early maternal employment results in poorer cognitive outcomes for her children only if the mother is low educated and if children attend little or no paid care for England. However, expansion of maternity leave policies in other countries has either positive or null effects on child development.
- Public policies can affect cognitive development. Income transfers to poor families is found to cause an increase in cognitive outcomes in children, but a lot more is needed to find out which types of transfers matter (for example work-conditional or not). Early provision of childcare increases educational attainment, but more research is needed to improve our understanding of which type of childcare matters most for cognitive development.
- Whether moving from deprived neighbourhoods benefits cognitive development remains an open question.

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TABLES

Table 7. Prenatal Factors

Study	Characteristics	Results
Black et al. (2007)	Birth Records From Norway for 1997-1997, using twin fixed effects. The sample is 33,366 twin pairs.	An increase in birthweight causes an increase in the probability of high school completion.
Currie and Hyson (1999)	Data from the National Child Development Study 1958 cohort in the UK, with a sample of 11,609 observations.	Low birthweight children are less likely to pass Math O-level. Low birthweight females are less likely to pass English O-level tests.
Nilsson (2015)	Swedish LOUISE database of first born children born between 1964 and 1972. The sample is equal to 353,742 observations.	Increased alcohol availability caused a decline in years of schooling, a decline in the fraction graduating from high school, and a decline in graduation from higher education.
Kelly (2011)	National Child Development Study 1958 cohort of 16,765 individuals, at birth 14,358.	Exposure in utero to the 1957 Asian Flu caused a decline in test scores at 7 and 11.
Carneiro et al. (2013)	Data from the National Longitudinal Study of Youth in the US, observations are 4,212 depending on the outcome and age of children.	Maternal Education improves cognitive outcomes (PIAT math and verbal and grade repetition) for children between 7 and 8 years of age. Part of the effect is due to lower likelihood of maternal smoking during pregnancy.
Almond et Palme (2009)	Administrative data on all Swedes who were born in 1983-1988, a sample equal to 562,637 observations.	Prenatal exposure to radioactive fallout from Chernobyl caused a decline in the probability of qualifying for high school.
Crawford et al. (2014)	English National Pupil Database and results from the Foundation Stage Profile (FSP), sample size varies depending on the many subgroup considered and outcomes.	Results suggests that being born in August rather than September matters for cognitive development when looking at cognitive scores or all outcomes and all ages between 5 and 18.

Table 8. Early Childhood Factors

Study	Characteristics	Results
Borra et al. (2012)	Data from the Avon Longitudinal Survey of Parents and Children (ALSPAC), a longitudinal study of around 12,000 children born in the Avon area in the early 1990s.	Breastfeeding for four weeks is positively and statistically significantly associated with higher cognitive test scores. The cognitive outcome variables used in this paper are Standard Attainment Test (SATs) scores at ages 7, 11 and 14, and the results of school entry tests at age 5.
Case and Paxson (2008)	National Child Development Study 1958 for the UK, with a sample equal to 9,003 observations.	Higher height-for-age was associated to higher PPVT scores for children aged 3, and higher PIAT math, reading comprehension and reading recognition scores for children aged 5 to 10.
Frank and Meara (2009)	US data from children of the National Longitudinal Study of Youth 1979 aged 1-5 in 1987, a sample of 1587 observations.	Maternal alcohol abuse leads to a decrease in child's PIAT math score at ages 11-14.
Ermisch (2008)	UK, families from the MCS, white children only, up to age 3.	Parenting is associated with cognitive development (British Ability Scales and Bracken School Readiness Assessment).
Gregg et al. (2015)	Data from ALSPAC, a cohort of children born in the UK in the early 1990s born in Avon, with a sample size of 6,792 children.	They examine the impact of early maternal employment on three outcome variables measuring child cognitive development between 4 and 7 years of age. They find that maternal employment negatively affects scores for children of mothers who have attained a minimum of an O-level or vocational qualification. The negative effects of early full-time maternal employment are concentrated in children who attended little or no paid care (i.e. in 44% of the sample whose mothers returned full time by 18 months). For the ALSPAC literacy score, maternal employment has significant and

		relatively large negative effects when children are placed predominantly in the care of a friend or a relative. In contrast, authors find no significant negative effects when the child attended by a paid provider and the Entry Assessment equation.
Fitzsimons and Vera-Hérnandez (2013)	Data from the Millennium Cohort Study, UK, 5,015 observations on children 3, 5 and 7.	Large positive effect of breastfeeding on an index of cognitive development.
Jerrim and Vignoles (2012)	Data from MCS 9,449 observations.	Investigate whether highly able children from disadvantaged homes are overtaken by their rich but less able peers before the age of 10 years, in terms of their cognitive skill. Authors do not find that able but disadvantaged pupils fall behind their more advantaged but less able peers. Outcome used were BAS vocabulary subdomain at age 5 years, and the reading subscale of the BAS at age 7 years.
Kiernan and Mensah (2010)	UK, 13877 families from the MCS, ethnically diverse, up to age 3.	Persistent poverty and parental depression related to cognitive outcomes (Bracken Basic Concepts).
Kiernan and Huerta (2008)	UK, 13877 families from the Millennium Cohort Study up to age 3.	Economic deprivation and maternal depression related to lower scores on a test of school readiness.

Table 9. Public Policies

Study	Characteristics	Results
Dustman and Schönberg (2012)	Administrative data on students from Germany attending public schools in Hesse, Bavaria, and Schleswig-Holstein for 2002-2003 to 2005-2006, a sample of 101,257 individuals.	The effect of expanding maternity leave coverage no significant effect on grade retention, grade attendance, and selective high school attendance.
Carneiro, Loken, Salvanes (2015)	Administrative data from Norway, sample size equal to 29,163.	Use regression discontinuity design and find that increased paid and unpaid maternity live leads to a decline in high school dropout and the effect is larger for children whose mothers are low educated.
Havnes and Mogstad (2011)	Administrative data from Norway on a sample of individuals whose mothers were married at the end of 1975, a sample of 499,026 children.	Increase in provision of child care places increases educational attainment, decreases the probability of dropping out of High School and increases the probability of college enrolment.
Dahl and Lochner (2008)	Data from National Longitudinal Survey of Youth in the US on children and their mothers for 1988-2000. Sample size equal to 4720 children.	Earned Income Tax Credit expansions raise combined math and reading scores. Larger gains exists from contemporaneous income for children aged 5 to 10 than for those aged 11-15. Larger gains for children from disadvantaged families.
Milligan and Stabile (2012)	Child tax benefits Data from Canadian National Longitudinal Study of Children & Youth for 1994-2005 for children 10 and under, the sample size is equal to 56,000.	An increase in benefits leads to a reduction in likelihood of learning disability for children of low educated mothers and positive effects on math and vocabulary scores.
Sambonmatsu et al. (2006)	Data from the Moving To Opportunity experiment on more than 5.000 children aged 6 to 20, US.	No evidence of improvements in reading, math scores, behaviour or school problems, or school engagement, overall or for any age group of the MTO experiment.

4 PEER AND SOCIAL OUTCOMES

4.1 BULLYING OUTCOMES

The literature on bullying has increasingly been the subject of research, especially from the 2000s onwards. The review has drawn from meta-analysis and literature reviews and has been complemented with single study articles for more recent years, especially for the UK. The findings are organised by types of predictors. First time-invariant factors are analysed. The focus has been on age, gender and genes effects, appearance, ethnicity, family background and disability, which seem to be the most relevant time-invariant factors affecting bullying outcomes. Second, the review focuses on time-variant factors and more specifically on socioeconomic status, school achievement and externalising and internalising behaviour.

The literature has focused on several types of bullying. A very common way to categorise bullying across the literature is to differentiate between physical, verbal and also relational bullying (Berger, 2007). The latter includes bullying which disrupts the social relationship with peers with, for example, the peer moving away from the bullied person or ignoring such a person. The literature also mentions three different types of roles: the bully, the victim and the bully-victim, with factors having different effects depending on the type of role.

The review points towards the following results:

- Age and gender affect the intensity of bullying and the type of bullying.
- Genes affect bullying intensity, but the explanatory power is highest when genes are combined with parenting and social environment.
- Size – being small and weak – is the most relevant aspect of appearance affecting bullying. The other aspects of appearance (excluding disabilities) do not seem to play a role.
- The effect of ethnicity is still contested.
- Family environment is a good predictor of bullying roles, but its power decreases when compared to other contextual factors.
- Disability is associated with being bullied.
- More research is needed with regard to socioeconomic status and school achievement.
- Externalising behaviours seem to be good predictors of bullying.

4.1.1 Time invariant factors

Age, gender and genes effects

The literature suggest that boys bully more than girls, even after accounting for indirect and relational bullying, and that both sexes are more cruel to those of the same sex (see for example Berger, 2007). With regard to being bullied, several studies indicate that both genders are equally likely to be bullied, although the form of bullying may differ, with boys being more likely to be physically bullied and girls being more likely to suffer verbal bullying (Sweeting and West, 2001, and studies therein).

With regard to age, early research suggested that bullying decreased with age. Smith, Madsen and Moody (1999) reviewed the literature on age and bullying and found that large-scale studies in several countries – England, Sweden, Norway, Ireland, Australia – showed a steady year-by-year decline in reports of being bullied, by both genders. However, more recent research carried out in the 2000s and reviewed in Berger (2007) paint a more nuanced picture. Although physical bullying seems to decrease with age, other forms of bullying, such as verbal bullying remain (Berger, 2007, and references therein).

Genetic predisposition is increasingly studied and some emotional aspects such as anger and temper, which are at least partially genetic, influence bullying roles. However, Berger's review (2007), which draws from studies done between the 1970s and the late 2000s finds that it is still the combination between genes, parenting and social environment which has the most power.

Appearance

Early research from the 1970s found contradictory results with regard to appearance and bullying victimisation. Sweeting and West's review (2001) included studies which examined teacher's ratings of 'unusual or deviant' characteristics such as physical handicap, obesity, size, personal hygiene and facial expression and found that only physical strength was a good predictor, with weaker and smaller children being more likely to be picked up by bullies. At the same time, a UK study and other subsequent studies in the 1980s have found that victims of bullying are less physically attractive and more likely to have odd mannerism or physical handicaps.

However, research done in the 1990s and 2000s suggest that most aspects of appearance do not cause bullying, although they accompany it. Two exceptions to this are obesity and size. Size – i.e. appearing small and weak – does increase the odds of being bullied (Berger, 2007), and the same is true for obese children. Puhl and King (2013) carry out a review of the problems obese individuals face throughout their lifetime and conclude that weight biases and negative stereotypes are already established in early childhood. Already at age 3 and 4 overweight children are identified as ugly, lazy and undesirable playmates, and as children get into elementary school the likelihood of being bullied is positively correlated with obesity.

Ethnicity

The effect of ethnicity on bullying victimisation is still contested nowadays. Earlier literature (see for example Sweeting and West, 2001) find contradicting results, with some studies reporting race as a major cause of bullying and others – in the UK – reporting no differences by race and ethnicity. A more contemporary study in the US finds immigrant children are at a higher risk of bullying than natives. However, this finding is contested by further research which suggests that bullying happens more within ethnicity or race than between them. Interestingly, other authors in another review done by Berger (2007) suggest that ethnic diversity is negatively correlated with bullying. In the UK, findings are less mixed and Tippett, Wolke and Platt (2013) highlight that small sample studies in the 1990s and in the 2000s have found no differences in bullying prevalence among ethnic groups (Tippett et al., 2013, and references therein).

Family background

Family background and environment has received significant attention in the bullying literature, but results are still not conclusive. Berger's (2007) review of the literature finds a significant association between family environment and bullying roles, although he points out that the direction of the relation could go both ways. Harsh, neglecting, abusive or cold parents are related with being a bully, with children being less attached to cold parents. However, it is not clear from this review whether parental behaviour causes detachment from children or the other way round. With regard to bullied children, these ones tend to present more family attachment, especially with mothers. Again, the direction of the relationship is contested.

Lereya et al. (2013) find similar findings when conducting a systematic review of the published literature on parenting behaviour and bullying from 1970 until 2012. Both victims and those who are victims and bullies are more likely to be exposed to negative parenting behaviour. They find that the effects are smaller for victims than for those who are bullies and victims at the same time. Nevertheless, Cook et al. (2010) partially contest these findings by providing more evidence from a meta-analysis of 153 studies carried out between 1970s and mid-2006. Although they find family environment to be a good predictor of being a bully, it is weak in comparison with other contextual predictors such as peer influence and community factors such as crime and violence rates in the neighbourhood where the child lives.

Disability

An early literature review from Sweeting and West (2001) finds that disability is usually associated with bullying. Language impairment, the wearing of a hearing aid or physical disabilities like cerebral palsy or spina bifida are some of the disabilities that bullied children have. Conversely, a study focusing on asthma published in 1995 did not find an association between this disability and being bullied, although it did find an association with those being frequently hospitalised. A recent UK study written by Chatzitheochari, Parsons and Platt (2015) uses the MCS to evaluate the impact of disability on bullying victimisation and finds an independent association with it.

4.1.2 Time variant factors

Socioeconomic status

Reviews suggest that SES is linked to bullying roles, especially when it comes to bullying victimisation and bully and victim status. However, the number of studies is still relatively small, and more research would be welcome.

Early research (see Sweeting and West, 2001, and references therein from earlier periods) cites studies which suggest contradicting results. Some of them find that children from socioeconomic status are less likely to be popular, but others find no significant differences in SES between bullied and non-bullied children.

A more up-to-date review of 28 studies on SES and bullying in children and adolescents from 4-18 years-old carried out by Tippett and Wolke (2014) indicate a significant but weak association

between measures of SES and bullying roles. More specifically, the review found a positive relationship between being bullied and low SES and a negative relationship between being bullied and high SES. There was a positive relationship between being bully and victim and low SES, but no association to high SES. Bullies were less likely to come from high SES backgrounds, but the relationship was very weak, and there was no association with low SES. That is interesting, as low SES is strongly linked with behavioural difficulties and aggression, and suggests that more research onto the mechanisms behind SES influencing bullying roles is needed. On this vein, the article mentions recent research on total inequality in a society predicting bullying, seeing this one as a social strategy, which may lead to some gains.

School achievement

The evidence is not fully conclusive. Numerous early studies published throughout the 1980s and 1990s found an association between low academic achievement and being bullied. Nevertheless, a meta-analysis carried out by Cook et al. (2010) reviewing evidence from the 1970s until mid-2006s, only found a weak association between academic performance and being a victim of bullying.

Externalising and internalising behaviour and peer influence and status

Cook et al. (2010) examined individual and contextual behaviour and showed that externalising behaviour is the strongest individual predictor of being a bully, together with other related cognitions, which include children's thoughts, beliefs or attitudes about others such as empathy, perspective taking or normative beliefs about others. The effect was higher when the individual was a child than an adolescent. Conversely, internalising behaviour was one of the weakest predictors.

With regard to contextual predictors, peer influence and status was a very strong predictor of bullying roles, especially for those children who were bully-victims. The meta-analysis by Cook et al. (2010) showed that these ones are very likely to experience rejection by their peers and at the same time tend to be negatively influenced with the peers they interact with.

4.1.3 Limitations of existing reviews

The reviewed literature reviews and meta-analysis show some limitations and shortcomings that could be overcome with further research. First, existing analyses focus more on individual factors as opposed to contextual factors such as family environment, school climate, community factors, peer status and peer influence (Cook et al., 2010). More analysis on contextual factors, and comparison of effect size between those and individual factors would be interesting from a policy and research perspective.

Second, the cross-sectional nature of most of the studies reviewed makes it difficult to establish cause and effect (Lereya et al., 2013), and therefore using cohort studies can improve the quality of the findings.

Third, more research could be done focusing on the different effect size on boys and girls, and paying more attention to how they differ depending on the type of bullying.

Fourth, research on SES and bullying roles is expanding but still insufficient, and therefore, more research at societal and contextual level could shed light onto the rationale for bullying (Tippett and Wolke, 2014). The reviews focusing on SES found significant heterogeneity across studies, depending on the measures of SES used (Tippett and Wolke, 2014). Moreover, most studies did not report the relationship between SES and bullying for types of bullying, which would be interesting. There was some indication that the results could differ depending on the type of bullying, but there was insufficient data. Finally, publication bias was found in some of the reviews, such as the one carried out by Tippett and Wolke (2014).

TABLES

Table 10. Studies on Peer and Social Outcomes

Determinants	Reference	Journal	Study title	Effect on bullying outcomes	Qualifiers
Gender	Berger (2007)	Developmental Review	Update on bullying at school: Science forgotten?	Significant	Boys bully more than girls.
	Sweeting and West (2001)	Research Papers in Education	Being different: correlates of the experience of teasing and bullying at age 11	Significant	Both sexes are equally bullied Forms of bullying vary.
Age	Smith, Madsen and Moody (1999)	Educational Research	What causes the age decline in reports of being bullied at school? Towards a developmental analysis of risks of being bullied	Significant	Bullying decreases with age.
	Berger (2007)	Developmental Review	Update on bullying at school: Science forgotten?	Not significant	Physical bullying may decrease with age, but other forms of bullying prevail.
Genes	Berger (2007)	Developmental Review	Update on bullying at school: Science forgotten?	Significant - weak	Genetic predisposition matter, but more so when combined with parenting and social environment.
Appearance	Sweeting and West (2001)	Research Papers in Education	Being different: correlates of the experience of teasing and bullying at age 11	Inconclusive	

	Berger (2007)	Developmental Review	Update on bullying at school: Science forgotten?	Children's size is significant	
	Puhl and King (2013)	Best Practice & Research Clinical Endocrinology & Metabolism	Weight discrimination and bullying	Obesity is significant	
Ethnicity	Sweeting and West (2001)	Research Papers in Education	Being different: correlates of the experience of teasing and bullying at age 11	Inconclusive	
	Berger (2007)	Developmental Review	Update on bullying at school: Science forgotten?	Significant	Ethnic diversity negatively correlated with bullying
	Tippett, Wolke and Platt (2013)	Journal of Adolescence	Ethnicity and bullying involvement in a national UK youth sample	Insignificant	UK studies reviewed
Family background	Berger (2007)	Developmental Review	Update on bullying at school: Science forgotten?	Significant	Direction of the effect unknown
	Lereya et al. (2013)	Child Abuse & Neglect	Parenting behaviour and the risk of becoming a victim and a bully/victim: A meta-analysis study	Significant	
	Cook et al. (2010)	School Psychology Quarterly	Predictors of Bullying and Victimization in Childhood and Adolescence: A Meta-analytic Investigation	Significant – weak predictor	
Disability	Sweeting and West (2001)	Research Papers in Education	Being different: correlates of the experience of teasing and bullying at age 11	Significant	
	Chatzitheochari, Parsons and Platt (2015)	Sociology	Doubly Disadvantaged? Bullying Experiences among	Significant	

			Disabled Children and Young People in England		
Socio-economic status	Sweeting and West (2001)	Research Papers in Education	Being different: correlates of the experience of teasing and bullying at age 11	Inconclusive	
	Tippett and Wolke (2014)	American Journal of Public Health	Socioeconomic Status and Bullying: A Meta-Analysis	Significant -weak	
School achievement	Cook et al. (2010)	School Psychology Quarterly	Predictors of Bullying and Victimization in Childhood and Adolescence: A Meta-analytic Investigation	Weak association	
Externalising and internalising behaviour	Cook et al. (2010)	School Psychology Quarterly	Predictors of Bullying and Victimization in Childhood and Adolescence: A Meta-analytic Investigation	Externalising – significant Internalising –weak	
Peer influence and status	Cook et al. (2010)	School Psychology Quarterly	Predictors of Bullying and Victimization in Childhood and Adolescence: A Meta-analytic Investigation	Significant	

4.2 Strength and Difficulties Questionnaire (SDQ) Peer Problems

4.2.1 Premise

The very specific nature of the Strength and Difficulties Questionnaire (SDQ) peer problem subscale implied that when looking for a literature review on determinants of SDQ peer problems subscale, the outputs of the search were either methodological papers on SDQ in general, or papers describing the components of the SDQ scale, or reviews that did not mention whether a paper reported separate results on the SDQ peer subscale. Also, several papers using the MCS and surveyed in the literature review on cognitive outcomes looked at determinants (or causes) of children behaviour as measured by SDQ, but *did not separately* look at determinants (or causes) of the SDQ peer problems subscale.

Therefore, given the low reliability of literature reviews in uncovering papers looking at determinants of SDQ peer problems subscale, a search for individual papers reporting results on SDQ peer problems subscale was necessary and it was targeted at finding papers using data from the MCS.

4.2.2 Conceptual Framework

We can adopt here the same conceptual framework used when considering cognitive outcomes, which highlighted that outcomes in a domain of human development at a given point in time can depend in important ways not only on inputs in the same domain earlier in life, but also on inputs in other domains of human development earlier in life. So, just to mention an example, it is possible that peer problems at a given point in time can be determined by ill health of the child at an earlier date, suggesting that focusing on ways of improving children's earlier life health can result in improved behavioural outcomes as measured by the SDQ peer problems subscale.

The above implies that there is potentially a large array of determinants of peer problems for children. Factors identified by the existing literature using MCS are surveyed below and we can see a summary of these factors in Tables 11 and 12.

4.2.3 Prenatal Factors

One paper was found for this critical period of life by Kelly et al. (2008). The objective of Kelly et al.'s (2008) study was to determine whether there was an association between mothers' light drinking during pregnancy and risk of behavioural problems in their children at age 3. When considering the SDQ peer subscale perhaps surprisingly the study finds that girls born to mothers who were light drinkers (1-2 drinks per week) during pregnancy are less likely to have peer problems compared with those born to abstainers.

4.2.4 Early Childhood Factors

Schoon et al. (2013) investigated the factors and processes promoting the wellbeing of young children growing up in conditions of poverty, hardship and family instability. Children's wellbeing was conceptualised using cognitive, social, emotional and behavioural adjustment by age 5. Schoon (2013) found that the experience of material hardship in early life was associated with decline in the cognitive development and psycho-socio-emotional adjustment of children. Verbal skills, levels of conduct problems and hyperactivity, and problems with peers were particular areas of vulnerability.

Fauth et al. (2014) identify the incidence and development of disabled children's problem behaviours, including conduct, peer, hyperactivity and emotional problems during the early years from age 3 to 7 to examine the emergence of problems and whether disabled girls' and boys' behaviour converges or diverges from non-disabled children over time. The study also examined whether parenting and the home environment moderate any associations between disability and behaviour. Fauth et al. (2014) find no evidence that trajectories converge for disabled and non-disabled children; rather, disabled children show a greater increase in peer problems, hyperactivity and emotional problems over time. Also, Fauth et al. (2014) find little evidence that parenting moderates associations between disability and behaviour.

Frauke et al. (2015) investigate the potential impact of entering day care at an older age on the social and emotional behaviour of children at the age of 5 and 7 and find clear evidence of significant associations at the age of 7 years: later day care entry appears to increase children's peer problems and to reduce prosocial behaviour. Frauke et al. (2015) find hardly any associations with the emotional development of children. Children with low-educated mothers and those from families with a household income below the poverty line are most strongly affected, which provides support for a social gradient in how earlier day care entry impacts non-cognitive skills.

Midouhas et al. (2014) use sweeps 2-4 of MCS to examine how low neighbourhood human capital (measured by the percentage of residents with no qualification) may be related to children's emotional and behavioural problems. The study finds that adjusting for family and child background characteristics low neighbourhood human capital is related to peer problems.

Griffiths et al. (2011) examined cross-sectional and longitudinal associations between obesity and emotional and behavioural problems in children at age 3 and 5. At age 5, obese boys had more peer relationship problems. Obese girls only had more peer relationship problems. Obesity, at age 3, was also predictive of peer relationship problems at age 5 in boys.

Flouri et al. (2012) consider children in continuously single mother families, that is, children who lived only with their mother in sweep 1 and 2 and children whose father's involvement was reported at sweep 2. Child adaptability reported by the mother in sweep 1 was negatively related to later problems with peers. Adaptability also predicted later father involvement negatively. Also, Flouri et al. (2015) updated the study of Flouri et al. (2012) using sweeps 2-4 and focusing on parents who were co-residents in sweep 1. For peer problems, father absence at age 3 predicted borderline/abnormal problems at age 5, and father absence at age 5 predicted borderline/abnormal problems at age 7. However, severe conduct and peer problems at age 3 also predicted the likelihood of the father being absent at age 5. Girls were less likely to have borderline/abnormal levels of peer problems.

4.2.5 Conclusion

Given that most studies focusing on determinants of behavioural differences in children using MCS focus on an aggregate SDQ (or focus on a sub-aggregation of measures in the SDQ scale such as eternalising and internalising problems) there is scope to focus on determinants of the SDQ peer subscale problems. Given that Almond and Currie (2011) and especially Conti and Heckman (2013) suggest that insights from biology can help us to better understand when there is a "critical period" in life that can impact the trajectory of human development, it seems important to focus on such critical periods to understand determinants of peer problems as measured by the SDQ subscale. For example,

one such critical period is the period in utero. Additionally, the first year of life is critical because that is the period in which the human brain develops the most. Therefore, there seems to be for this MCS project room for trying to understand whether prenatal factors and factors in the first year of life impact the SDQ peer subscale outcomes for the new sweeps of children at age 7 and 11. In fact, it is an open question as to whether factors early in life always affect peer problems over the life course in the same way or if there are "cycles" in a person's life, whereby the influence of earlier factors in a period is stronger than in other periods. It could be, for example, that some factors early in life that affected peer problems outcomes at age 3 and 5 are more important at age 7 and/or 11, or the opposite can be true. Additionally, given that children at age 7 and 11 are in school, this gives us the opportunity to understand the influence of school quality and the mix of school and childcare arrangements in determining peer problems for children aged 7 and 11. Finally, given research on the importance of month of birth for cognitive outcomes in the UK it will be important to control for month of birth in our analysis of peer behavioural problems as well.

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Table 11. Prenatal Factors

Study	Characteristics	Results
Kelly et al. (2008)	MCS data, 6,162 observations.	Girls born to mothers who were light drinkers (1-2 drinks per week) are during pregnancy less likely to have peer problems at age 3 compared to those born to abstainers.

Table 12. Early Childhood Factors

Study	Characteristics	Results
Schoon et al. (2013)	Data From MCS at for children at age 5, sample size equal to 8,832.	Higher poverty was associated with more severe peer problems (SDQ peer subscale).
Fauth et al. (2014)	Data From MCS at for children from age 3 to 7, sample size equal to 6,371.	Over time disabled children experience increasing problems as measured by the SDQ peer subscale and there is little evidence that parenting moderates associations between disability and behaviour.
Frauke et al. (2015)	Data From MCS at for children from age 5 and 7, sample size equal to 6,460.	Age at day care entry appears to increase children's peer problems at age 7. Children with low educated mothers and those from families with a household income below the poverty line are most strongly affected.
Midouhas et al. (2014)	Sweeps 2-4 of MCS, 9,850 observations.	After adjusting for family and child background characteristics low neighbourhood human capital is related to peer problems.
Griffiths et al. (2011)	Sweeps 2 and 3 of MCS, 11,202 observations.	At age 5, obese boys had more peer relationship problems. Obese girls only had more peer relationship problems. Obesity, at age 3, was also predictive of peer relationship problems at age 5 in boys.
Flouri et al. (2012)	Sweeps 1 and 2 of MCS of children of single mothers and whose father's involvement was reported in sweep 2, a total of 930 observations.	Child adaptability reported by the mother in sweep 1 was negatively related to later peer problems. Adaptability also predicted later father involvement negatively.

Flouri et al. (2015)	Sweeps 2 to 4 of the MCS, 15,293 observations on children of parents who were co-residents at sweep 1.	Father absence at age 3 predicted borderline/abnormal problems at age 5, and father absence at age 5 predicted borderline/abnormal problems at age 7. However, severe conduct and peer problems at age 3 also predicted the likelihood of the father being absent at age 5. Girls were less likely to have borderline/abnormal levels of peer problems.