Factors associated with young children being overweight on entry to primary school

› Abstract

Childhood obesity is a serious public health challenge, and there is limited evidence to show which pre-school interventions may prevent its occurrence. This study assessed whether selected factors, including contact with the Starting Well 0–19 service for children aged 1–3 years in north-west England, influenced children's risk of being overweight at primary school entry. It found that families with the most contact with the service (an integrated health visitor and children's centre offer) were more at risk. The findings show that the focus of these contacts does not positively influence risk factors for later overweight prevalence. The study findings replicate a known association between deprivation and children being overweight. Families having the highest contact levels with the Starting Well service had a significant association with their children being overweight at entry to primary school. This provides an opportunity to target these families with healthy lifestyle interventions and reduce the potential risk of childhood obesity.

Key words

› Early years › Childhood obesity › Breastfeeding › Sure Start › Social deprivation

The UK government's vision for ensuring the best start in life for all stresses the importance of early experiences from conception throughout the first 1001 days of life. The key to improving child health focuses on early brain development and cognition, and mental, emotional and physical health. This includes reducing obesity by promoting healthy eating and physical activity (Darling et al, 2020; Department of Health and Social Care, 2021).

In 2018, Cheshire West and Chester local authority (CWaC) commissioned the Starting Well 0–19 service (CWaC, 2023). It is unique in combining the delivery of previously separate health and local authority programmes, such as Sure Start, the Healthy Child Programme and the UK National Childhood Measurement Programme (NCMP) (Bate and Foster, 2017; Office for Health Improvement and Disparities, 2022; 2023).

The Starting Well service presents an opportunity for families to access advice and guidance in relation to health and wellbeing, parenting and school readiness. Every child requires two contacts with the service annually between birth and 5 years of age. Contacts focus on a range of subjects, many related to reducing possible future obesity, including infant feeding advice to help families make informed decisions, breastfeeding support post-birth, weaning advice, healthy routines and meal ideas, all delivered based on family need. Research has shown that breastfeeding, for example, can reduce childhood obesity risk by up to 25% (Rito et al, 2019).

Childhood obesity is a serious public health challenge, both nationally and globally (Rankin et al, 2016). The causes are multifactorial and complex. These include gestational exposures and biological predisposition; familial, societal, commercial, and political influences; and environmental characteristics, such as inadequate space for exercise (Mullan et al, 2022). The consequences of childhood obesity are serious and include impaired physical and psychological health, as well as premature adult mortality (Lobstein et al, 2015; Jebeile et al, 2022). Among the various policies and

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interventions proposed to tackle this crisis, school-based interventions with combined diet and physical activity components and a home element are reported to have the greatest effectiveness (Bleich et al, 2018). There is some limited evidence to suggest that preschool-based interventions may also be effective (Bleich et al, 2018).

The UK NCMP measures the weight, height and age of children at entry to primary school through a systematic and standardised approach (NCMP, 2022). The Starting Well service includes the NCMP programme, which presents an opportunity to explore whether the family's socio-economic and demographic characteristics, breastfeeding and early engagement have any impact on weight outcomes at school entry.

Study aim

The aim of this study was to assess which factors, including the number of contacts with the Starting Well 0–19 service for children in CWaC, were associated with the child's risk of being overweight on entry to primary school in 2021.

Specific objectives were to: document the sociodemographic characteristics of children who started primary school in September 2021 and the number of their contacts with the Starting Well service over a 2-year period between the ages of 1 and 3 years; record the body mass index (BMI), centile and weight status of children who started primary school in September 2021 to determine the number and proportion who were underweight, a healthy weight and overweight; and determine whether there were any factors associated with being overweight at primary school entry.

Study design

This was a cohort study using secondary data. A cohort study is a type of observational study and a cohort comprises a group of subjects exposed to potential risk factor(s) who are followed forward in time to see whether a defined outcome differs in those exposed to the risk factors compared with those not exposed. Secondary data is information that has not been collected directly by the research team, but has been already been collected as part of routine practice.

Cheshire and Wirral Partnership NHS Foundation Trust provides health and care services for local people, including mental health, learning disability, community physical health and all-age disability care. The organisation delivers services across Wirral and Cheshire, and parts of the north west of England. These

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are provided in partnership with commissioners, local authorities, voluntary and independent organisations, people who access the services, people who provide care and families.

The 0–19 service is commissioned to integrate the children's centre core offer (Sure Start) and the Healthy Child Programme. A multidisciplinary team of health and educational practitioners delivers the service across 15 children's centre bases, family homes and community venues. Every child in Cheshire West and Chester under 5 years of age is targeted for two contacts with the service each year. If these are achieved, the child is defined on an annual basis as 'reached' (Children's Centre Handbook, 2014). The service is notified of all new births, which means it is aware of all children locally, and actively seeks to make contact where needed.

A greater emphasis is placed on trying to 'reach' those who reside in areas of higher deprivation. Each contact is around 1 hour long, and uses holistic assessment to identify problems early and act where needed to improve child development, school readiness, parenting aspirations and parenting skills, and provide personalised advice and guidance in relation to healthy lifestyles.

Contacts may be nationally set Healthy Child Programme developmental reviews at 10–14 days, 6–8 weeks, and 1 and 2 years of age. Take-up of these reviews is strong (80–90%) and the service follows up on missed appointments, regardless of reportable time frames. In addition to these reviews, families may contact services through the duty advice line, open advice clinic, parenting groups or play groups. These contacts count towards defining the child as being 'reached'.

The current study was concerned with whether 'reach' (a minimum of four contacts) was achieved for a cohort of children during a 24-month period between the ages of 1 and 3 years. The reason for focusing on this period was that data was not available in the system for these children between 0 and 1 year of age.

» Residence in a household in the highest areas of deprivation, according to the English Deprivation Index, was independently associated with increased odds of being overweight «

Also, after the age of 3 years, access to the service is reduced due to no mandated developmental reviews. As all children become eligible for 15–30 hours government-funded childcare at 3 years of age, access to the Starting Well 0–19 service is reduced. Childhood obesity is multifactorial, and there was a need in the study to explore the effect of other factors, such as breastfeeding and socio-economic status.

The Starting Well 0–19 service holds individual electronic records for all children, capturing the number of contacts they have. The recorded data also includes weights, heights, ages and weight categories collected by the NCMP. Weight and height measurements are taken at entry to primary school for all children. Children's ages are taken into consideration to plot BMI as a centile measure to indicate whether a child is underweight, healthy weight or overweight.

Study population

The study population included children born between September 2017 and August 2018 who entered primary school in September 2021 in the Cheshire West and Chester borough. The sample size for the study was calculated at 500. Approximately 3500 children started primary school in September 2021, of whom 12% in the borough were estimated to be overweight (CWaC, 2021).

Based on a 99.9% confidence interval, the sample size required for the study was a minimum of 405. To allow for minor differences in the 12% estimate of the prevalence of overweight, a sample size of 500 was selected. The children were randomly sampled from the eight main children's centre groupings within the borough.

Data collection and analysis

Data variables are described under each specific objective. For childhood characteristics, variables included:

- Gender (male, female)
- Residence in a top 30% 'super output area' – defined as a household in the highest areas of deprivation according to the English Deprivation Index (Ministry of Housing, Communities and Local Government, 2019)
- Child known to social care – a child who is unlikely to achieve health or development without needs provision, or a child who is disabled and/or a child who has been in the care of their local authority for more than 24 hours
- Low-income family – family eligible for 2-year childcare funding when net income meets government criteria
- Child breastfeeding status that was recorded when the child was 6 weeks old (Yes/No)
- Number of contacts with the Starting Well 0–19 service from 1–3 years of age (categorised as 0–3, ≥4, ≥10 and ≥20).

For weight at primary school entry, variables included:

- Underweight
- Healthy weight
- Overweight – according to child BMI centiles, recorded using national standards based on weight categorisation using the NHS online calculator (www.nhs.uk/live-well/healthy-weight/bmi-calculator/).

The source of data was drawn from Report Manager, which uses live data from individual patient electronic records (EMIS system). Data was collected between December 2022 and March 2023 in an Excel format, and after cleaning was coded and analysed using SPSS (version 24). Characteristics and weights were presented as frequencies and proportions.

Crude odds ratios (OR) with 95% confidence intervals (CI) were calculated for sociodemographic characteristics and numbers of contacts with the Starting Well 0–19 service from the ages of 1–3 years in relation to being overweight.

To control for and adjust for confounders, variables with P values=<0.1 in this univariable analysis were included in a multivariable Poisson regression model. Multivariable regression examines the relationship between an outcome variable and two or more exposure variables to assess which types of exposure are independently related to an increased risk of the outcome.

Poisson regression assumes that the distribution of outcomes is positively skewed, i.e., that most outcomes fall at the lower end of the distribution rather than being normally distributed

Table 1. Characteristics of children who started primary school in Cheshire West and Chester, September 2021

Characteristics	Variable	n (%)*
Gender	Male Female	233 (46.6) 267 (53.6)
Residence in a top 30% super output area	Yes No	161 (32.2) 339 (67.8)
Breastfed at 6 weeks old	Yes No	98 (19.6) 402 (80.4)
Child known to social care	Yes No	4 (0.8) 496 (99.2)
Low-income family	Yes No	62 (12.4) 438 (87.6)
Number of contacts with the Starting Well 0–19 service aged 1–3 years	4 or more ('reached') 3 or less 10 or more 9 or less 20 or more 19 or less	439 (87.6) 61 (87.8) 242 (48.4) 258 (51.6) 44 (8.8) 456 (91.2)
Total	**All children**	**500**

*percentages are column percentages

Table 2. Weight status of children who started primary school in Cheshire West and Chester, September 2021

Weight category	n (%)*
Children who are underweight (≤2 centile)	4 (0.8)
Children who are healthy weight (>2 to ≤90 centile)	434 (86.8)
Children who are overweight (>90 centile)	62 (12.4)
Total	**500**

*percentages are column percentages

(Kirkwood, 1988) to produce adjusted odds ratios (aOR). Levels of significance were set at 5% ($P<0.05$).

Ethical approval

This project was reviewed and approved by Clinical Directors at Cheshire and Wirral Partnership NHS Foundation Trust. The study analysed retrospective data, which was collected routinely as part of standard clinical care, and staff had access to this data as part of their clinical duties.

All data were anonymised and were non-identifiable. There were no ethical or confidentiality issues requiring NHS research approvals. This study was not defined as research, according to the Health Research Authority algorithm (see http://www.hra-decisiontools.org.uk/research).

Results

The sociodemographic characteristics of children who entered primary school in September 2021, as well as their number of contacts with the Starting Well 0–19 service from the ages of 1–3 years, are shown in *Table 1*.

There were 500 children (more girls than boys), with about one third living in a top 30% super output area. Nearly 20% were breastfed at 6 weeks of age. Only four children were known to social care, and 12% lived in a low-income family.

Table 3. Factors associated with being overweight in children who started primary school in Cheshire West and Chester, September 2021

Category	Variable	*n*	Overweight *n* (%)*	Odds ratio	95% CI*	Adjusted odds ratio	95% CI	P value
Gender	Male Female	233 267	30 (12.9) 32 (12.0)	1.09 ref	0.64–1.85			
Residence in a top 30% super output area	Yes No	161 339	30 (18.6) 32 (9.4)	2.20 ref	1.28–3.76	2.12	1.22–3.68	0.007
Breastfed at 6 weeks old	Yes No	98 402	6 (6.1) 56 (13.9)	0.40 ref	0.17–0.96	0.44	0.18-1.07	0.07
Child known to social care	Yes No	4 496	2 (50) 60 (12.1)	7.28 ref	1.00–52.5			
Low-income family	Yes No	62 438	10 (16.1) 52 (11.9)	1.43 ref	0.68–3.00			
Number of contacts with the Starting Well 0–19 service aged 1–3 years	≥4 ≤3 ≥10 ≤9 ≥20 ≤19	439 61 242 258 44 456	55 (12.5) 7 (11.5) 33 (13.6) 29 (11.2) 12 (27.3) 50 (11.0)	1.11 ref 1.25 ref 3.05 ref	0.49–2.55 0.73–2.12 1.47–6.29	3.26	1.55-6.85	0.002
Total	**All children**	**500**	**62 (12.4)**					

*percentages are row percentages; CI=confidence interval

The median (interquartile range) number of contacts with the Starting Well service was eight (six to 15). Nearly 90% of the children had four or more contacts with the Starting Well service (and therefore met the definition of being reached), nearly 50% had 10 or more contacts and just under 10% had 20 or more contacts. The weight status of children who entered primary school is shown in *Table 2*.

Only four children were underweight, 87% were of healthy weight and 62 (12.4%) were overweight (defined as ≥90 centile).

Factors associated with being overweight are shown in *Table 3*. After multivariable regression, residence in a top 30% super output area was significantly associated with increased odds of being overweight (aOR 2.12; 95% CI 1.2–3.7). Having 20 or more contacts with the Starting Well service was significantly associated with increased odds of being overweight (aOR 3.26; 95% CI 1.6–6.9). On univariate analysis, breastfeeding at 6 weeks was significantly protective against being overweight at primary school entry, but the effect was lost on multivariate analysis.

Discussion

This study examined the association between the number of contacts young children had with the Starting Well 0–19 service, along with other selected characteristics and the odds of being overweight at primary school entry. This is the first study of this type in Cheshire West and Chester, and there were several key findings, as follows.

The estimate of 12% prevalence of children being overweight in the sample size calculation proved to be correct. This proportion is broadly in line with national data, which show an overweight prevalence of 10.1% in 2021/22 (NHS Digital, 2022). This finding is of concern, as children who are overweight on entry to primary school are likely, without effective interventions, to remain overweight (Ijaz et al, 2021).

Long-term clinical consequences with respect to cardiovascular, respiratory and endocrine disease, and mental health are huge. This will have a significant overall impact on future demands for healthcare services and increasing healthcare costs (Mohamed et al, 2022).

Residence in a household in the highest areas of deprivation, according to the English Deprivation Index, was independently associated with increased odds of being overweight. This is in line with findings from other studies in England and Scotland (El-Sayeed et al, 2012; Noonan, 2019). In England and Scotland, there has been a widening of inequalities in obesity

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between the most and the least deprived groups, between 2007 and 2018.

The most deprived areas have experienced a greater risk of obesity in 5-year-old children compared with an unchanged risk in children from the least deprived areas (White et al, 2016; Stewart et al, 2021). Studies in the English county of Hampshire have also found that moving home to a more deprived area is associated with obesity development in primary school children (Twaits and Alwan 2020).

Data from the NCMP for 2021/22 also found that the prevalence for being overweight was twice as high in the most deprived areas compared to the most affluent ones at school entry (Lepkowska, 2022; 2023). This relationship between childhood obesity and living in deprived areas is not only confined to the UK but is noted in reports from other countries as well (De Bont et al, 2020).

Most children attained the target of being 'reached', having a minimum of two contacts with the Starting Well 0–19 service on an annual basis. This is a target defined by the UK government (Ofsted, 2014), and it was reassuring to see it being met. Being 'reached', however, was not associated with protection against being overweight at entry to primary school. This was possibly due to the variation of the content of individual contacts, which may not have focused on topics relating healthy lifestyles.

Where there had been 20 or more contacts over a 2-year period, there was a significantly increased risk of being overweight. A probable explanation is that the families with this high level of contact with the service are likely to be assigned a clinical lead for greater levels of vulnerability, needs and risk factors, all of which may predispose to the children being overweight. Breastfeeding at 6 weeks appeared to be protective against being overweight on univariate analysis, although the finding was no longer significant on multivariate analysis. Previous literature clearly shows that ever having breastfed during the first year of life is associated with a 15% lower risk of overweight or obesity over the next 2–14 years compared with never having breastfed (Gunnell et al, 2016).

There is also a dose–response effect between duration of breastfeeding and reduced risk of early childhood obesity (Qiao et al, 2020), and this may be the reason for the lack of effect in this study as breastfeeding was included at one set moment in time and did not measure duration.

Strengths and limitations

In this study, the estimated sample size was met, which enabled use of multivariable regression to find factors independently associated with being overweight at primary school entry. The conduct and reporting of the study were also in line with the Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) guidelines (van Elm et al, 2007).

There were, however, some limitations; the main being that the Starting Well 0–19 service contacts were listed, but information on the content and type of each contact was not collected. The duration of breastfeeding, an important factor in reducing risk of childhood obesity, was also not recorded (Qiao et al, 2020). It is possible that a slightly larger sample size may have found that breastfeeding was independently protective.

Recommendations

Despite its limitations, there are two important implications from this study.

First, the association between a high number of contacts with the Starting Well 0–19 service and being overweight at primary school provides an opportunity to target interventions with a potentially vulnerable population. In the 0–5 age group it is still unclear which interventions work best to reduce overweight prevalence (Flynn et al, 2022). However, one potentially effective measure is to target the family as a whole and encourage the development of healthy eating patterns in children (Savage et al, 2007).

The 'voice of the child' enables children to influence their own lives, but with pre-verbal and young children, practitioners must be skilled in viewing lived experiences through the eyes of the child, including type and quantity of food intake and activity levels (Sudarsan et al, 2022), and use this to discuss health lifestyles with their parents.

Second, the data collected routinely by the Starting Well 0–19 service on children's weights as part of the Healthy Child Programme at 1 and 2 years of age should be analysed to see whether preventive interventions could be initiated before entry to primary school.

Conclusion

This study on 500 children who entered primary school in Cheshire West and Chester in 2021 found that residence in a household in the highest areas of deprivation was independently associated with an increased risk of being overweight at school entry.

The risk of being overweight at primary school entry was also associated with having the highest number of contacts with the Starting Well 0–19 service. This provides a significant opportunity to intervene with a potentially vulnerable population. Recommendations have been made to increase targeted interventions for families in the most deprived areas and to increase the effectiveness of contacts to reduce the risk of childhood obesity. JHV

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