Maternal employment and early childhood overweight: findings from the UK Millennium Cohort Study

Running title: maternal employment and early childhood overweight

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Abstract

Background: In most developed countries, maternal employment has increased rapidly. Changing patterns of family life have been suggested to be contributing to the rising prevalence of childhood obesity.

Objectives: Our primary objective was to examine the relationship between maternal and partner employment and overweight in children aged three years. Our secondary objective was to investigate factors related to early childhood overweight only among mothers in employment.

Design: Cohort study

Subjects: 13113 singleton children aged three years in the Millennium Cohort Study, born between 2000 and 2002 in the United Kingdom, who had complete height/weight data and parental employment histories.

Measurements: Parents were interviewed when the child was aged 9 months and 3 years and the child's height and weight were measured at 3 years. Overweight (including obesity) was defined by the International Obesity Task Force cut-offs.

Results: 23% (3085) of children were overweight at 3 years. Any maternal employment after the child's birth was associated with early childhood overweight (OR [95% CI]; 1.14 [1.00, 1.29]), after adjustment for potential confounding and mediating factors. Children were more likely to be overweight for every 10 hours a mother worked per week (OR [95% CI]; 1.10 [1.04, 1.17]), after adjustment. An interaction with household income revealed that this relationship was only significant for children from households with an annual income of £33,000 ($57,750) or higher. There was no evidence for an association between early childhood overweight and whether or for how many hours the partner worked or with mothers' or partners' duration of employment. These relationships were found to be stronger among

mothers in employment. Independent risk factors for early childhood overweight were consistent with the published literature.

Conclusions: Long hours of maternal employment rather than lack of money may impede young children's access to healthy foods and physical activity. Policies supporting work-life balance may help parents reduce potential barriers.

Keywords: obesity, preschool children, employment, mothers, fathers

Introduction

The prevalence of obesity in young children has increased in recent decades.(1-4) Over the past 10 years in the UK, overweight (including obesity) has risen from 17 to 22% in boys aged 2-5 years and from 20 to 25% in girls.[3] Concurrently, employment among women has increased, particularly among those with young children.[5] In 1984, 27% of women with children under age five in the UK were employed[6]; while in 2004, 59% of married/cohabiting women and 34% of lone parents were employed.[7] Over this time period, employment among men has remained relatively stable[5] and employment status does not appear to vary by the age of their youngest child[7]. Similar trends are evident in countries such as the USA, which has data sources tracking childhood overweight and maternal employment since the 1970s.[2;8] Policies in both countries to reduce child poverty may have resulted in an increase of the number of parents, primarily women with young children, entering the workforce.[9;10]

Changing patterns of family life associated with single parent households or both parents working have been suggested to be partially responsible for the rising prevalence of overweight in children. Recently, Haslam and James stated, "Now the environment is deliberately designed to promote inactivity, even children are sedentary, especially when both parents work and they are confined indoors or at school."[11] Furthermore, the Great Britain Parliament House of Commons Health Committee also reported, "These changing patterns of consumption are in part a response to the far reaching social changes of the last 50 years, including a greater number of women working outside the home, longer working hours, and higher levels of disposable income."[12] Despite these assertions, there is limited evidence to

support or refute the association between maternal employment and childhood overweight.

Studies in school-age children have found that the greater number of hours a mother worked per week increased the likelihood of childhood overweight[13;14], but there is no relationship with paternal work patterns[14]. However, there is limited research in preschool children.[15] Our primary objective was to examine the relationship between maternal and partner employment and overweight in a recent, nationally representative cohort of UK children aged three years. Our secondary objective was to investigate factors related to early childhood overweight only among mothers who have entered employment since the birth of the cohort child.

Subjects and methods

Subjects and design

The Millennium Cohort Study (MCS) is a UK-wide prospective study of children born in the new millennium. Families were invited to participate if they were eligible for Child Benefit and resident in the UK when their child was aged nine months.[16] A stratified cluster sampling framework was employed to adequately represent families from disadvantaged areas and ethnic minority groups. The overall response rate was 72% and additional details on sampling have been previously reported.[17] The original cohort was comprised of 18819 children (18553 families) born between September 2000 and January 2002 in England, Wales, Scotland, and Northern Ireland. Children who did not permanently emigrate were eligible to participate in the second contact, which took place between September 2003 and January 2005.[18] Among the 18296 singleton infants from the first contact, 14630 (80%) participated at the second.

Refusals were highest in Northern Ireland, in electoral wards in England classified as 'ethnic' (if at least 30% of residents were from an ethnic minority group, based on the 1991 census), and 'disadvantaged' wards from all UK countries (the upper quartile of the Child Poverty Index).[18] Main respondents and their partners were interviewed in the home when the children were mean age 9.7 months (range 8-12) and 37.7 months (range 32-55) and information was collected on a variety of topics relating to the child and their family. Over 99% of the main respondents were natural mothers. Data from were obtained from the UK Data Archive, University of Essex. The MCS received ethical approval from the South West and London Multi-Centre Research Ethics Committees.[19]

Among the 14630 singletons, 13113 had complete and plausible child height/weight data and parental employment histories. Families were excluded if the main respondent was not female (184), the partner respondent was not male (132), there were two children from the same family (10), the main respondent had missing employment data (202), or the child had a missing (802) or implausible (467) height, weight, or body mass index (BMI; weight/height^2). Children were less likely to be included in the final sample if their mother was from an ethnic minority group or a lone parent, had lower socioeconomic circumstances, lower household incomes, or a lower academic qualification; however, the overall differences were small.

Outcome measure

At the second contact, trained interviewers weighed the children, without shoes or outdoor clothing, using Tanita HD-305 scales (Tanita UK Ltd, Middlesex, UK) and weights were recorded in kilograms to one decimal place. Heights were obtained by

the Leicester Height Measure Stadiometer (Seca Ltd, Birmingham, UK) and recorded to the nearest millimetre. The primary outcome measure was childhood overweight (including obesity) which was defined by the International Obesity Task Force cut-offs for BMI.[20]

Employment variables

At each contact employment histories were collected for the main respondent, while current employment was collected for the partner respondent. A dichotomous employment variable was constructed for mothers and partners. A parent was considered to have been employed if she/he held any job since the birth of the cohort child. A parent was considered to have had no employment if she/he was on leave from employment, not employed, or a student at both contacts.

Based on the methodology of Anderson and colleagues[13], two independent indicators of employment were constructed for the main and partner respondents: average hours worked per week during the weeks worked and duration of employment. The hours worked per week were calculated by averaging the hours of employment during the weeks worked at the current position at each contact. The duration of employment was calculated by adding together the months worked at the current position at each contact; however, mothers' intensity or duration of employment may have been under- or over-estimated because of a change in employment status between the two contacts. Women who were employed at the first contact and on leave or not employed at the second contact may have been employed prior to this period of not working. For these women, their most recent period of employment was included in their estimates (1279). For women who were employed during the entire period

between the first and second contacts and also gave birth (692), four months was subtracted from their estimates.

Approximately 20% of partner employment data were not available. There were more missing data for duration of employment (3090) than hours worked (2737) because duration of employment was not collected for partners who were self-employed at the first contact.

Socio-demographic and other risk factors

Demographic and other risk factors were identified that could confound the relationship between parental employment and early childhood overweight. At the first contact, maternal ethnicity was self-reported and classified according to guidelines from the Office for National Statistics[21], maternal socio-economic circumstances were classified according to the National Statistics Socio-economic Classification[22], and maternal education was defined as the highest academic qualification attained. Information was also collected on the age at MCS birth, age at first live birth and lone motherhood status. At the second contact, the number of children in the household was calculated. Household income was reported in bands at both contacts. Household income at the second contact was used; however, if missing, values from the first contact were substituted (1553).

At nine months, mothers were also asked questions pertaining to their own health and their infant. The mothers' prepregnancy body size was determined based on self-reported prepregnancy weight and current height. Mothers with a BMI $\geq$ 25 were considered overweight, including obesity. Mothers were classified as having smoked

during pregnancy if they reported consuming any cigarettes throughout pregnancy or giving up during pregnancy. Mothers also reported the baby's birthweight, duration of breastfeeding, and when the infant was introduced to solid foods. At the second contact mothers provided information on the number of hours the child watched television or videos daily, whether the child had his/her meals at regular times, and who primarily cooked the main meal.

Among mothers in employment, additional information was collected. The type of day care for the child at the second contact was categorised as informal (grandparents, other relatives, friends, neighbours), formal (nanny/au pair, childminder [registered or unregistered], nurseries or crèche [workplace, college, local authority or private]) or by the mother/partner.[23] Working atypical hours at the second contact was defined as working every week either in the evening, at night, or at weekends. Working atypical hours at the first contact was defined as previously as well as working away from home overnight. At the second contact, main respondents also reported whether they "don't spend enough time with their child because of work".

Statistical analysis

All analyses were conducted using STATA statistical software, version 9.2 SE (Stata corporation, Texas), with 'svy' commands to allow for the cluster sampling design and obtain robust standard errors. Weighted percentages, univariate and adjusted analyses were calculated using survey and non-response weights. Univariate logistic regression analyses were conducted to calculate odds ratios for each variable with respect to childhood overweight and Wald tests were used to obtain p-values. Victora and colleagues recommend using a hierarchical framework to determine potential

confounding factors and mediators.(24) Factors potentially confounding the relationship between maternal employment and early childhood overweight were likely to have occurred before mothers took up employment and potential mediators were likely to be on the causal pathway between maternal employment and early childhood overweight. The following were considered potential confounding factors: maternal ethnic group, socioeconomic circumstances, household income, highest academic qualification, age at first live birth, age at MCS birth, lone motherhood status, number of children in the household, maternal prepregnancy body size, smoking during pregnancy, birthweight. The following were considered potential mediating factors: breastfeeding during, introduction of solid foods, television viewing, whether child has meals at regular times, who primarily cooks main meals. Additional potential mediating factors were relevant for mothers who were employed only: type of day care, working atypical hours – 1st and 2nd contacts, don't spend enough time with child because of work. Potential confounding, mediating, and employment-related factors significant at the $p \leq 0.1$ level were included in the adjusted models in a stepped approach. Analyses were separately adjusted for potential confounding and mediating factors in order to assess the effects of each; analyses among employed mothers only were also subsequently adjusted for employment-related factors.

In total, four sets of logistic regression analyses were conducted. The first examined the relationship between a dichotomous measure of maternal and partner employment and childhood overweight. The second examined the relationship between maternal and partner intensity and duration of employment and childhood overweight. This analysis was repeated for mothers in employment only. The third analysis was run for

mothers in employment only, with an interaction between maternal hours worked per week and type of day care. In the fourth analysis, based on the findings by Anderson and colleagues[13], the regression models were rerun with an interaction between maternal hours worked per week and household income.

When an outcome is relatively common, then odds ratios often overestimate the relative risk.(25) Analyses were repeated using modified Poisson regression(26), which estimates rate ratios as a measure of relative risks. The findings were similar, but the rate ratios tended to be closer to 1 than the odds ratios by 2-10%.

Results

At age three years, 23% (3085) of children were overweight or obese. Approximately 89% (11253) of the mothers were white, 31% (3754) were in managerial or professional occupations, 35% (4598) were in semi-routine and routine occupations, and 14% (1966) were lone mothers. The mean age of the mothers at the birth of the cohort child was 29 years (range 13-48) and the partners' age was 32 years (range 15-68). Since the cohort child's birth, 41% (5484) of mothers and 3% (389) of partners had not worked. The mothers who were employed (7629) worked a median of 22 hours per week (interquartile range, 16 to 31 hours) and for 27 months (interquartile range, 13 to 32 months) since the birth of the cohort child. The partners who were employed (9987) worked a median of 40 hours per week (interquartile range, 38 to 48 hours) and for 28 months (interquartile range, 13 to 36 months).

Table 1 presents the potential confounding and mediating factors that were independently associated with early childhood overweight. Among all mothers, these

included maternal ethnicity, lower academic qualifications, age at first live birth, lone motherhood, overweight prepregnancy, smoking during pregnancy, birthweight, never breastfeeding, breastfeeding for less than four months, introduction of solid foods before four months, watching at least one hour of television daily, and both parents cooking the main meal. Among mothers in employment, children were more likely to be overweight if they were cared for by informal day care arrangements and the mother reported that she "didn't spend enough time with her child because of work".

There was limited evidence for an association between early childhood overweight and any employment after the child's birth for mothers or partners in univariate analyses (Table 2). The relationship strengthened after adjustment for potential confounding factors and attenuated slightly after adjustment for potential mediating factors. Children were also more likely to be overweight for every 10 hours their mother worked per week. The relationship strengthened after adjustment for potential confounding factors and was maintained after adjustment for potential mediating factors. There was no evidence for an association between early childhood overweight and hours the partner worked or with mothers' or partners' duration of employment.

The model was rerun including an interaction between maternal hours worked per week and household income. For every 10 hours a mother worked, children from households with an annual income of £22000 ($38500) or higher were more likely to be overweight than children from the lowest income group in univariate analyses (Table 3). After adjustment the relationship was maintained for children from families with an annual income of £33000 ($57750) or higher.

Mothers in employment

Among the 7629 mothers who were employed, 24% (1851) of their children were overweight. Approximately 93% (6999) of the mothers were white, 40% (2949) were in managerial or professional occupations, 29% (2210) were in semi-routine and routine occupations, and 9% (699) were lone mothers.

Children were also more likely to be overweight for every 10 hours their mother worked per week. The relationship strengthened after adjustment for potential confounding factors and was maintained after adjustment for potential mediating factors and employment-related factors (Table 2). The effect size for this relationship was larger than that found among all mothers. There was no evidence for an association between partners' hours worked or mothers' or partners' duration of employment and early childhood overweight. An interaction between maternal hours worked per week and type of day care revealed that for every 10 hours a mother worked, children in formal day care arrangements were more likely to be overweight than children cared for by their mother/partner in univariate analyses (1.25 [1.12, 1.38]); this relationship was maintained after adjustment for potential confounding, mediating and employment-related factors (1.24 [1.09, 1.40]). There was no difference in early childhood overweight between children cared for by informal arrangements and those cared for by their mother/partner in univariate (1.04 [0.95, 1.14]) or adjusted analyses (1.02 [0.92, 1.13]).

The model was rerun including an interaction between maternal hours worked per week and household income. For every 10 hours a mother worked, children from households with an annual income of £33000 ($57750) or higher were more likely to

be overweight than children from the lowest income group in univariate analyses (Table 3). The relationship slightly attenuated after adjustment.

Discussion

We found that children were more likely to be overweight at age three years if their mother had held any employment since their birth. Specifically, the more hours their mother worked per week increased the likelihood they would be overweight; however, this relationship was only significant for children from families with the highest household income levels. We found no evidence for a relationship between partner hours worked or maternal or partner duration of employment and early childhood overweight. The effects were evident after adjustment for both potential confounding factors and mediating factors. These relationships were found to be stronger among mothers in employment. Independent risk factors for early childhood overweight were consistent with the published literature.

The breadth of data on parental employment and other risk factors for early childhood overweight in the MCS afforded us the opportunity to examine this relationship among a contemporary, nationally representative cohort of UK preschool children. In studies of older children, one examined intensity and duration of employment among mothers only[13], while the other examined intensity of employment only among mothers and partners[14]. We were able to combine the methodologies of both studies because of the extensive employment data that were collected. Furthermore, interviewers measured the height and weight of the children, which removed any potential biases related to parent-reported height and weight.

Although the study sample is slightly more advantaged than the MCS families from the second contact, the results are still broadly generalisable to the UK population. Complete employment histories were not able to be constructed for each parent, so proxy measures were developed. These calculations could potentially under- or over-estimate parents' intensity or duration of employment; however, these situations were considered and modified accordingly. Although there is the potential for residual confounding, risk factors were included from prior studies[13;14] as well as additional risk factors for overweight in preschool children, such as prepregnancy body size, smoking during pregnancy, and television viewing[15].

Our findings are consistent with two nationally representative studies of school-age children from the US and Canada, which found that the greater number of hours a mother worked per week increased the likelihood of childhood overweight.[13;14] The effect sizes in the present study are slightly larger than those in the previous studies. We have been able to account for many potential confounding and mediating factors that were not included in the previous studies, such as age at first live birth, smoking during pregnancy, introduction of solid foods, and television viewing. This could also suggest that the intensity of mother's employment is particularly important for an onset of overweight during the preschool years as compared to onset in later childhood. Our results are also compatible with Phipps and colleagues who reported no relationship between paternal work patterns and childhood overweight.[14] We also concur with Anderson and colleagues that the intensity of employment increased the risk of overweight only among children from families with the highest household incomes.[13] However, Anderson and colleagues also stratified their analysis by age and found no relationship among preschool-age children.[13] A recent review

identified two studies in preschool children which reported a direct relationship between overweight and a dichotomous measure of maternal employment in univariate analyses only.[15] In contrast, we found that this association gained significance after adjustment for potential confounding factors.

Similar to Phipps and colleagues, we found that partner employment was not associated with childhood overweight.[14] In the MCS, only 3% of partners didn't engage in any employment since the child's birth and approximately 92% worked at least 31 hours per week. The lack of variability may partially explain the difficulty in exploring this relationship. However, employment among men has remained stable in recent years, while employment among women, especially those with young children, has increased.[5]

Our results and those by Anderson and colleagues found that maternal work intensity was associated with childhood overweight only among families in the highest income groups.[13] These findings suggest that long hours of maternal employment rather than lack of money may impede young children's access to healthy foods and physical activity. For example, parental time constraints could increase a child's consumption of snack foods and/or increase television use. However, few studies have examined the impact of maternal employment on determinants of overweight in children of any age and there is even less evidence in preschool populations. Johnson and colleagues found that many preschool children in the US did not meet dietary requirements in the late 1980s, but there was no difference in the quality of their diet by maternal employment status.[27] In school-age children, those whose mothers were employed were less likely to have 'less healthy eating' than children whose mothers were full-

time homemakers.[28] Certain and Kahn reported no difference in television viewing among children aged 0-11 or 24-35 months by maternal employment status, but children aged 12-23 months were more likely to watch at least two hours of television daily if their mother was not employed.[29]

Among mothers who were employed, there was also evidence that the intensity of a mother's employment was a risk factor for early childhood overweight, specifically among children from families in the highest income group. We found that children were more likely to be overweight if the mother reported that she "didn't spend enough time with her child because of work". We can only speculate that these children may have had greater access to convenience foods and/or fewer opportunities for physical activity. Although there was some evidence in univariate analyses that children cared for by informal arrangements were more likely to be overweight than children cared for by their parents, an interaction between maternal hours worked and type of day care revealed that children in formal arrangements may be at higher risk for overweight if their mother worked more hours. While only a few studies have examined the impact of day care on overweight in young children, they define day care differently. For example, a study of German preschool children found no association between the type of kindergarten and overweight[30]; however, this study compared how long the child stayed with the provider, rather than type of care provider. As these authors suggest, categories of provider may not represent the diet or physical activity available to the children.

We also identified independent risk factors for overweight which are consistent with the published literature. Reviews have found that maternal overweight

prepregnancy[15], smoking during pregnancy[15;31], birthweight[31;32], and television viewing[15] are associated with overweight, while breastfeeding is a protective factor[15]. We also found that children who were introduced to solid foods before four months were more likely to be overweight at age three years; however, reviews have reported inconsistent evidence for this relationship.[15;32]

While rates of maternal employment have increased in recent decades, there have also been changes in children's and women's health-related behaviours. Children's consumption of snack foods[33] and sweetened beverages[34] has increased substantially. Current estimates suggest that preschool children from the UK also watch approximately 19 hours of television weekly.[35] Furthermore, there is evidence that overweight among women early in pregnancy has increased over the past decade.[36] In addition, breastfeeding has been found to be protective against overweight in our study and others[15;31]; however, rates remain lower[37] than the World Health Organization recommendation[38]. Returning to work soon after a child's birth is also a barrier to women initiating and continuing breastfeeding.[39;40]

Although we found that maternal employment is associated with overweight among British preschool children, our results and the larger evidence base suggest there are many risk factors for overweight. Recent reviews have concluded that prevention is a necessary component to halting the rise in childhood obesity.[15;31] However, policies and interventions should address not only individual factors, but also the contextual environment of children including the family, community, society, and government. Our findings on maternal employment and other risk factors should be considered within this framework. Further research is needed to examine factors along the causal

pathway between maternal employment patterns and childhood overweight, which can help inform policy and interventions. For example, little is known about differences in children's diet or physical activity levels by maternal employment status. It will be important for future studies to capture this information so these factors can be controlled for in analyses. If they confound the relationship between maternal employment and childhood overweight, then "maternal employment" may actually be a proxy for the changing patterns of health-related behaviours as a result of time constraints due to modern society. However, policies supporting parents, particularly women, to enter the workforce[9;10] suggest that current levels of maternal employment are likely to be maintained or increase in the future. UK policies promoting work-life balance[41] may help protect parents' time to provide opportunities for their children to access healthy foods and physical activity.

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Ethics approval

The Millennium Cohort Study was approved by the South West and London Multi Centre Research Ethics Committees. The present analyses did not require additional ethics approval.

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Details of contributors

SSH and CL contributed to the conception, study design, interpretation of the data, and first draft of the article. SSH also contributed to the analysis. TJC contributed to the analysis and interpretation of the data and further drafting of the article. All authors have also seen and approved the final version. All authors have no conflicts of interest to declare. SSH will act as guarantor for the paper.

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Table 1. Weighted percentages and univariate odds ratios (OR) (95% confidence intervals (CI)) for overweight in children aged 3 years.

	n	Overweight (Weighted %)	Univariate OR (95% CI)
All mothers (N=13113)			
Potential confounding factors			
Maternal ethnic group			
White	11253	23.3	1
Mixed	111	26.6	1.19 (0.76, 1.87)
Indian	347	11.9	0.44 (0.31, 0.63)
Pakistani or Bangladeshi	784	19.1	0.78 (0.66, 0.92)
Black Caribbean or Black African	389	30.2	1.42 (1.09, 1.87)
Other ethnic group	209	21.7	0.92 (0.58, 1.45)
Maternal socioeconomic circumstances			
Managerial and professional occupations	3754	23.2	0.94 (0.83, 1.06)
Small employers and own account workers	470	19.3	0.75 (0.58, 0.96)
Intermediate occupations	2290	21.3	0.84 (0.73, 0.97)
Lower supervisory and technical occupations	720	23.1	0.94 (0.76, 1.16)
Semi-routine and routine occupations	4598	24.3	1
Never worked and long-term unemployed	1141	22.6	0.91 (0.75, 1.10)
Household income			
£0-11000 per annum	3040	23.9	1
£11000-22000 per annum	3845	24.0	1.00 (0.88, 1.14)
£22000-33000 per annum	2777	23.8	0.99 (0.87, 1.14)
£33000+ per annum	3152	21.1	0.85 (0.73, 0.99)
Highest academic qualification			
GCSE grades A-C or higher	9548	22.3	1
GCSE grades D-G or lower	3553	25.1	1.17 (1.04, 1.31)
Age at first live birth, per 5 year increase	12751		0.96 (0.92, 1.00)
Age at MCS birth, per 5 year increase	13104		1.00 (0.96, 1.04)
Lone motherhood status			
Non-lone mother	11147	22.6	1
Lone mother	1966	26.1	1.21 (1.06, 1.39)
Number of children in the household			
1	3269	22.7	1
2 or 3	8488	23.0	1.02 (0.91, 1.14)
4 or more	1356	24.5	1.10 (0.93, 1.30)
Maternal prepregnancy body size			
Normal weight	8718	19.7	1
Overweight	3634	31.1	1.84 (1.66, 2.03)
Smoked during pregnancy			
No	8573	22.2	1
Yes	4494	24.5	1.14 (1.03, 1.25)
Birthweight (kg)	13093		1.83 (1.66, 2.01)
Potential mediating factors			
Breastfeeding duration			
≥ 4 months	3436	20.4	1
Never breastfed	4178	25.5	1.34 (1.18, 1.52)
< 4 months	5491	23.2	1.18 (1.05, 1.33)
Introduction of solid foods			
≥ 4 months	8501	21.6	1
< 4 months	4609	25.7	1.26 (1.14, 1.38)
Television viewing daily			
Less than 1 hour	3046	21.1	1
1-2 hours	7724	23.4	1.14 (1.03, 1.28)
3+ hours	2342	24.8	1.23 (1.06, 1.44)
Whether child has meals at regular times			

Always	6240	22.7	1
Usually	5651	23.6	1.05 (0.96, 1.16)
Sometimes or Never	1221	22.2	0.97 (0.82, 1.15)
Who primarily cooks main meal			
Main respondent	6856	22.6	1
Partner	822	21.3	0.93 (0.76, 1.13)
Both share responsibility	2154	24.6	1.12 (0.99, 1.26)
Mothers in employment (N=7629)			
Type of day care			
Main/partner	1738	22.9	1
Informal	2972	25.4	1.15 (0.99, 1.33)
Formal	2272	22.5	0.98 (0.84, 1.14)
Working atypical hours weekly – 1st contact			
No	3617	24.1	1
Yes	2512	23.7	0.98 (0.85, 1.13)
Working atypical hours weekly – 2nd contact			
No	3915	23.7	1
Yes	2868	23.1	0.97 (0.85, 1.10)
Don't spend enough time with child because of work			
No	7122	23.2	1
Yes	498	28.6	1.33 (1.06, 1.65)

Missing number of cases for all mothers: whether partner worked (2737), maternal ethnic group (20), socioeconomic circumstances (140), household income (299), highest academic qualification (12), age at first live birth (362), age at MCS birth (9), main prepregnancy body size (761), smoked during pregnancy (46), birthweight (20), breastfeeding duration (8), introduction of solid foods (3), television viewing (1), whether child has meals at regular times (1), who primarily cooks main meal (3281)
Missing number of cases for mothers in employment: type of day care (647), working atypical hours weekly – 1st contact (1500), working atypical hours weekly – 2nd contact (846), don't spend enough time with child because of work (9)

Table 2. Univariate and adjusted odds ratios (OR) (95% confidence intervals (CI)) for parental employment and overweight in children aged 3 years.

	Univariate OR (95% CI)	Adjusted OR[a] (95% CI)	Adjusted OR[a,b] (95% CI)	
All mothers (N=13113)				
Maternal employment				
None	1	1	1	
Any since the child's birth	1.07 (0.97, 1.18)	1.15 (1.02, 1.29)	1.14 (1.00, 1.29)	
Partner employment				
None	1	1	1	
Any since the child's birth	0.99 (0.74, 1.32)	0.90 (0.64, 1.26)	0.94 (0.65, 1.36)	
	Univariate OR (95% CI)	**Adjusted OR[a,c] (95% CI)**	**Adjusted OR[a,b,c] (95% CI)**	
Maternal employment				
Hours worked per week, per 10 hours	1.06 (1.02, 1.09)	1.12 (1.06, 1.18)	1.10 (1.04, 1.17)	
Duration of employment, per 1 year	1.03 (0.99, 1.07)	0.97 (0.91, 1.04)	0.99 (0.92, 1.06)	
Partner employment				
Hours worked per week, per 10 hours	0.99 (0.95, 1.04)	0.99 (0.94, 1.04)	0.99 (0.94, 1.05)	
Duration of employment, per 1 year	1.01 (0.97, 1.06)	1.00 (0.95, 1.05)	0.98 (0.92, 1.04)	
	Univariate OR (95% CI)	**Adjusted OR[a,c] (95% CI)**	**Adjusted OR[a,b,c] (95% CI)**	**Adjusted OR[a,b,c,d] (95% CI)**
Mothers in employment (N=7629)				
Maternal employment				
Hours worked per week, per 10 hours	1.11 (1.05, 1.17)	1.15 (1.08, 1.22)	1.13 (1.06, 1.20)	1.14 (1.06, 1.22)
Duration of employment, per 1 year	1.01 (0.94, 1.09)	1.00 (0.92, 1.10)	1.02 (0.92, 1.12)	1.00 (0.90, 1.11)
Partner employment				
Hours worked per week, per 10 hours	1.00 (0.94, 1.06)	1.01 (0.95, 1.07)	1.01 (0.95, 1.08)	1.02 (0.95, 1.09)
Duration of employment, per 1 year	1.01 (0.95, 1.07)	1.00 (0.94, 1.06)	0.98 (0.91, 1.05)	0.99 (0.92, 1.06)

[a]Adjusted for potential confounding factors (maternal ethnic group, highest academic qualification, age at first live birth, lone motherhood status, maternal prepregnancy body size, smoked during pregnancy, birthweight)

[b]Adjusted for potential mediating factors (breastfeeding duration, introduction of solid foods, television viewing daily, who primarily cooks main meal)

[c]Adjusted for employment (maternal hours worked and duration, partner hours worked and duration)

[d]Adjusted for employment-related risk factors (type of day care, "don't spend enough time with child because of work")

Table 3. Univariate and adjusted odds ratios (OR) (95% confidence intervals (CI)) for overweight in children aged 3 years with interaction between maternal hours worked per week and household income.

	Univariate OR (95% CI)	Adjusted OR[a] (95% CI)
All mothers (N=12814)		
Household income		
£0-11000 per annum		
Hours worked per week, per 10 hours	1	1
£11000-22000 per annum		
Hours worked per week, per 10 hours	1.03 (0.97, 1.10)	1.09 (0.99, 1.20)
£22000-33000 per annum		
Hours worked per week, per 10 hours	1.08 (1.00, 1.17)	1.10 (0.99, 1.21)
£33000+ per annum		
Hours worked per week, per 10 hours	1.16 (1.09, 1.24)	1.15 (1.07, 1.24)
	Univariate OR (95% CI)	**Adjusted OR[a,b] (95% CI)**
Mothers in employment (N=7497)		
Household income		
£0-11000 per annum		
Hours worked per week, per 10 hours	1	1
£11000-22000 per annum		
Hours worked per week, per 10 hours	1.06 (0.95, 1.19)	1.08 (0.93, 1.25)
£22000-33000 per annum		
Hours worked per week, per 10 hours	1.07 (0.97, 1.19)	1.13 (0.98, 1.30)
£33000+ per annum		
Hours worked per week, per 10 hours	1.22 (1.12, 1.33)	1.19 (1.07, 1.33)

[a]Adjusted for employment (maternal hours worked and duration, partner hours worked and duration), potential confounding factors (maternal ethnic group, highest academic qualification, age at first live birth, lone motherhood status, maternal prepregnancy body size, smoked during pregnancy, birthweight), and potential mediating factors (breastfeeding duration, introduction of solid foods, television viewing daily, who primarily cooks main meal)

[b]Adjusted for employment-related risk factors (type of day care, “don’t spend enough time with child because of work”)

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