



HAL
open science

Examining the relationship between maternal employment and health behaviours in 5-year-old British children

Summer Sherburne Hawkins, Tim J Cole, Catherine Law

► **To cite this version:**

Summer Sherburne Hawkins, Tim J Cole, Catherine Law. Examining the relationship between maternal employment and health behaviours in 5-year-old British children. *Journal of Epidemiology and Community Health*, 2009, 63 (12), pp.999-n/a. 10.1136/jech.2008.084590 . hal-00484143

HAL Id: hal-00484143

<https://hal.science/hal-00484143>

Submitted on 18 May 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Examining the relationship between maternal employment and health behaviours in 5-year-old British children

Summer Sherburne Hawkins, Tim J Cole, Catherine Law, The Millennium Cohort Study Child Health Group*

Summer Sherburne Hawkins
Research Fellow

Tim J Cole
Professor

Catherine Law
Professor

The Millennium Cohort Study Child Health Group*

All authors from: Centre for Paediatric Epidemiology & Biostatistics, UCL Institute of Child Health, 30 Guilford Street, London WC1N 1EH, UK

Please send all correspondence to: C Law

c.law@ich.ucl.ac.uk

(t) +44 (0) 20 7905 2304

(f) +44 (0) 20 7905 2381

Word count: 3069

*Other members of the Millennium Cohort Study Child Health Group who contributed to this work: Carol Dezateux (Professor), Catherine Peckham (Professor), Helen Bedford (Senior Lecturer), Jugnoo Rahi (Reader), Lucy J Griffiths (Senior Research Fellow), Anna Pearce (Research Fellow), Carly Rich (Research Fellow), all at Centre for Paediatric Epidemiology & Biostatistics, UCL Institute of Child Health, 30 Guilford Street, London, WC1N 1EH, UK.

Keywords: mothers, employment, preschool children, diet, physical activity, television

ABSTRACT

Background: There is little known about potential mechanisms underlying the association between maternal employment and childhood obesity. We examined the relationships between maternal hours worked per week (none, 1-20 hours, 21+ hours) and children's dietary and physical activity/inactivity habits. Where mothers were employed, we also examined the relationships between flexible work arrangements and these health behaviours.

Methods: We analysed data from 12 576 singleton children age five years in the UK Millennium Cohort Study. Mothers reported information about their employment patterns. Mothers also reported on indicators of their child's dietary (crisps/sweets, fruit/vegetables, sweetened beverage, fruit consumption), physical activity (participation in organised exercise, transport to school), and inactivity (television/computer use) habits at age five.

Results: After adjustment for potential confounding and mediating factors, children whose mothers worked part-time or full-time were more likely to primarily drink sweetened beverages between meals (compared to other beverages), use the television/computer at least two hours daily (compared to 0-2), or be driven to school (compared to walk/cycle) than children whose mothers had never been employed. Children whose mothers worked full-time were less likely to primarily eat fruit/vegetables between meals (compared to other snacks) or eat three or more portions of fruit daily (compared to two or fewer). Although in unadjusted analyses children whose mothers used flexible work arrangements engaged in healthier behaviours, relationships were no longer significant after adjustment.

Conclusions: For many families the only parent or both parents are working. This may limit parents' capacity to provide their children with healthy foods and opportunities for physical activity. Policies and programmes are needed to help support parents and create a health promoting environment.

Studies in preschool[1] and older[2,3] children have reported that maternal employment is associated with an increased risk for childhood obesity after adjustment for socio-demographic characteristics, particularly when mothers work long hours. In contrast to the stable trends in paternal employment[4,5], employment patterns among women with children have changed substantially in recent decades.[6-8] Currently, approximately 60% of women with a child **age five or younger** in the UK or USA are employed.[7,8] However, there is little known about potential mechanisms underlying the relationship between maternal employment and childhood obesity.

A few studies have examined the associations between maternal employment and health behaviours in children of any age. Overall, there are few differences in dietary habits by maternal employment status among preschool[9] and school-age[10] children. A review by Gorely and colleagues identified eight studies that examined the relationship between maternal employment (yes/no) and television viewing in children age 2-18 years.[11] The authors concluded there was an inconsistent relationship.[11] We are not aware of any studies that have examined children's physical activity patterns by maternal employment status.

In the UK Millennium Cohort Study (MCS) mothers reported on the dietary and physical activity/inactivity habits of their child at age five, giving us the opportunity to assess the relationship between maternal employment and these health behaviours in a large and diverse nationally representative sample. Our primary objective was to examine the relationships between maternal hours worked per week and children's dietary and physical activity/inactivity habits. In the UK, parents with a child under age six have had the right to request flexible work arrangements since 2003.[12] Flexible work arrangements may influence how mothers are able to provide their child with healthy foods and opportunities for physical activity. Our secondary objective was to examine the relationships between flexible work arrangements and children's health behaviours among mothers who were employed.

METHODS

Participants

The MCS is a prospective study of British children born in the new century. Families were invited to participate if they were eligible for Child Benefit (a universal benefit for families with children) and resident in England, Wales, Scotland, or Northern Ireland when their child was age nine months.[13] The original cohort consisted of 18819 children (n=18553 families) born between September 2000 and January 2002 (response 72%).[14] The second contact occurred when the children were age three years and the third contact occurred when the children were age five years.[15] **In the UK, nearly all five-year-old children are in school.** Seventy-one percent (n=12989/18296) of the singleton infants from the original cohort participated at all three contacts. Data were obtained from the UK Data Archive, University of Essex. The Millennium Cohort Study received ethical approval from the South West and London Multi-Centre Research Ethics Committees.[15]

Among the 12 989 singleton children, 12 576 had data available to address the primary objective. Families were excluded if the main respondent was not female at any contact (n=455), there were two cohort children from the same family (n=7), or the main respondent had missing or implausible employment data (n=46). Some participants had more than one exclusion criterion.

Among mothers who were currently employed at the third contact and fulfilled these criteria (n=7055), 712 had missing information on flexible work arrangements leaving 6343 with data available to address the secondary objective.

Outcome measures

At all three contacts main respondents (over 99% were natural mothers) were interviewed in the home. At the third contact, mothers responded to a series of questions about their child's

dietary and physical activity/inactivity habits. Mothers were asked what the child mainly ate between meals out of six categories (crisps and similar snacks; sweets or chocolate; cakes and sweet biscuits; fruit or vegetables; bread products; dairy products). An outcome measure was based on whether the child primarily ate crisps or sweets (crisps and similar snacks; sweets or chocolate; cakes and sweet biscuits) or other snacks. A second outcome measure was based on whether the child primarily ate fruit or vegetables or other snacks. Mothers were asked what the child mainly drank between meals out of six categories. An outcome measure was based on whether the child primarily drank sweetened beverages (sweetened drinks; artificially sweetened drinks) or other beverages (unsweetened fruit juice; water; hot drinks; milk). The Department of Health recommends that children should eat at least five portions of fruit and vegetables daily.[16] Mothers were asked how many portions of fresh, frozen, tinned or dried fruit the child ate each day, with responses ranging from none to three or more. An outcome measure was based on whether the child consumed two or fewer servings or three or more. No additional dietary data were available. The American Academy of Pediatrics recommends that parents should limit children's total media time to 1-2 hours daily.[17] Mothers were asked how many hours a day their child watched television/videos/DVDs and used a computer/played electronic games. An outcome measure was based on whether the child used the television/computer for 2+ hours or 0-2 hours per day. Mothers reported how many days a week their child went to a club or class to do sport or any other physical activity, with responses ranging from none to five or more days/week. An outcome measure was based on whether the child participated in organised exercise two days/week or less or three days/week or more. Mothers also were asked how the child usually travelled to school from seven options. An outcome measure was based on whether the child was driven to school or walked/cycled.

Maternal employment and flexible work arrangements

Mothers reported their current and/or previous employment at each contact. If mothers were working, they were asked the average number of hours they worked each week at each

employment since the last contact. Maternal hours worked per week was calculated by averaging the hours of employment during the weeks worked at each position. Mothers who were not employed at all three contacts were considered to have never worked. Maternal hours worked per week was defined as: none, 1-20 hours (part-time), 21+ hours (full-time).

Mothers who were currently employed were asked whether they had made use of any arrangements in their current job from 16 possible choices. Mothers were considered to have made use of flexible work arrangements if they reported using any of the following (yes/no): job-sharing, working at or from home occasionally, school term-time contracts, or caring for children after school hours or during school holidays.

Potential confounding and mediating factors

Potential confounding factors were based on prior research on maternal employment and childhood obesity.[1-3] All factors were collected by maternal self-report at the first contact, unless specified. Maternal ethnicity was categorised according to guidelines from the Office for National Statistics[18] and socioeconomic circumstances were categorised according to the National Statistics Socio-economic Classification.[19] Mothers reported their highest academic qualification attained, whether they were a lone parent, and their age at the birth of the cohort child. At the third contact, mothers reported the number of children in the household.

Household income **may mediate the relationship between maternal employment and children's health behaviours as income is related to the number of hours worked. Household income reported at the third contact was used; if missing, values reported at the second (n=805) or first (n=300) contacts were used.**

Statistical methods

All analyses were conducted using STATA statistical software, version 10.1 SE (Stata Corporation, Texas) with survey commands to account for the clustered sampling design and obtain robust standard errors. Weighted percentages were derived and regression analyses were conducted using survey and non-response weights to account for the study design and attrition between contacts.

To address the primary objective, unadjusted logistic regression analyses were conducted separately between each health behaviour and maternal hours worked per week. Each analysis was adjusted subsequently for the potential confounding (maternal ethnicity, socioeconomic circumstances, highest academic qualification, lone motherhood status, maternal age at MCS birth, number of children in the household) and mediating (household income) factors.

To address the secondary objective, unadjusted logistic regression analyses were conducted separately between each health behaviour and whether mothers had used flexible work arrangements. Each analysis was adjusted subsequently for the potential confounding and mediating factors. Since the relationships may be related to whether the mothers worked part-time or full-time rather than the flexible arrangements themselves, each analysis was also adjusted for maternal hours worked per week.

Since odds ratios overestimate the risk ratio when an outcome is common, all analyses were repeated using the Zhang and Yu correction.[20] As expected, the relative risks were closer to 1 and the pattern of the results was similar (data not shown).

RESULTS

The MCS represents a diverse cohort of contemporary children in the UK (Table 1). Thirty percent (n=4030) of mothers had not worked since the birth of the cohort child. The mothers

who were employed ($n=8546$) had worked a median of 21 hours per week (interquartile range, 16 to 30 hours) and for 45 months (interquartile range, 25 to 55 months).

Overall, many children engaged in health behaviours that may promote excess weight gain (Table 1). For example, 37% of children primarily ate crisps or sweets and 41% primarily drank sweetened beverages between meals, and 61% used the television/computer at least two hours daily.

Table 1. Socio-demographic characteristics of the families in the Millennium Cohort Study and prevalence of children's health behaviours at age five.

| | N (Weighted %) |
|--|-----------------------|
| Socio-demographic characteristics | |
| Maternal ethnicity | |
| White | 10965 (90) |
| Mixed | 100 (1) |
| Indian | 298 (2) |
| Pakistani | 487 (3) |
| Bangladeshi | 180 (1) |
| Black | 350 (2) |
| Other ethnic group | 174 (1) |
| Missing | 22 |
| Maternal socioeconomic circumstances | |
| Managerial and professional occupations | 3746 (32) |
| Small employers and own account workers | 464 (4) |
| Intermediate occupations | 2240 (19) |
| Lower supervisory and technical occupations | 701 (5) |
| Semi-routine and routine occupations | 4325 (34) |
| Never worked and long-term unemployed | 977 (6) |
| Missing | 123 |
| Maternal highest academic qualification | |
| Degree | 2268 (18) |
| Diploma in higher education | 1201 (10) |
| A/AS/S levels | 1266 (10) |
| O levels/GCSE grades A-C | 4288 (35) |
| GCSE grades D-G | 1304 (11) |
| Other academic qualifications | 279 (2) |
| None of these qualifications | 1957 (14) |
| Missing | 13 |
| Age at MCS birth (years) | |
| Mean (SD) | 28.9 (5.8) |
| Missing | 5 |
| Lone motherhood status | |
| Non-lone mother | 10748 (86) |
| Lone mother | 1828 (14) |
| Missing | 0 |
| Number of children in the household | |

| | | |
|---|------------------------|------------|
| | 1 | 2021 (16) |
| | 2 or 3 | 8982 (73) |
| | 4 or more | 1561 (11) |
| | Missing | 12 |
| Household income | | |
| | £0-13000 per annum | 2779 (20) |
| | £13000-26000 per annum | 4293 (33) |
| | £26000-36400 per annum | 2349 (19) |
| | £36400+ per annum | 3035 (27) |
| | Missing | 120 |
| <hr/> | | |
| Dietary factors | | |
| Whether primarily eats crisps or sweets between meals | | |
| | Other snacks | 7805 (63) |
| | Crisps or sweets | 4728 (37) |
| | Missing | 43 |
| Whether primarily eats fruit or vegetables between meals | | |
| | Other snacks | 7137 (55) |
| | Fruit or vegetables | 5396 (45) |
| | Missing | 43 |
| Whether primarily drinks sweetened beverages between meals | | |
| | Other beverages | 7353 (59) |
| | Sweetened beverages | 5182 (41) |
| | Missing | 41 |
| Number of portions of fruit consumed each day | | |
| | 2 or fewer | 6152 (46) |
| | 3 or more | 6393 (54) |
| | Missing | 31 |
| <hr/> | | |
| Physical inactivity/activity factors | | |
| Television/computer use daily | | |
| | 0-2 hours | 4859 (39) |
| | 2+ hours | 7689 (61) |
| | Missing | 28 |
| Number of days child exercises each week | | |
| | 2 days/week or less | 11305 (90) |
| | 3 or more | 1250 (10) |
| | Missing | 21 |
| Transport to school | | |
| | Walk or cycle | 6204 (52) |
| | Vehicle | 6195 (48) |
| | Missing | 177 |
| <hr/> | | |

Maternal employment

Compared to children whose mothers had never been employed, in unadjusted analyses children whose mothers worked part-time or full-time were more likely to eat fruit or vegetables between meals (compared to other snacks), eat three or more portions of fruit per day (compared to two or fewer), participate in organised exercise three or more days/week (compared to two or less), or be driven to school (compared to walk/cycle) (Table 2).

Children whose mothers worked part-time or full-time were also less likely to primarily eat crisps or sweets between meals (compared to other snacks). Children whose mothers worked full-time were less likely to primarily drink sweetened beverages between meals (compared to other beverages).

After adjustment for potential confounding factors most of the relationships reversed.

Children whose mothers worked part-time or full-time were more likely to primarily drink sweetened beverages between meals, use the television/computer at least two hours daily (compared to 0-2 hours), or be driven to school. Children whose mothers worked full-time were less likely to primarily eat fruit or vegetables between meals or eat three or more portions of fruit per day. **The relationships were similar after adjustment for household income.**

Table 2. Unadjusted and adjusted odds ratios (OR) (95% CI) for relationships between maternal employment and children's health behaviours at age five.

| | Weighted % engaged in outcome | Unadjusted OR (95% CI) | OR Adjusted for confounding factors* (95% CI) | OR Adjusted for confounding and mediating factors* [†] (95% CI) |
|---|-------------------------------------|---------------------------|--|---|
| Primarily eats crisps or sweets between meals (N=12533) | | | | |
| None | 40 | 1 | 1 | 1 |
| 1-20 hours/week | 37 | 0.86 (0.76, 0.97) | 1.07 (0.94, 1.22) | 1.08 (0.95, 1.24) |
| 21+ hours/week | 35 | 0.79 (0.71, 0.87) | 1.10 (0.98, 1.23) | 1.10 (0.98, 1.25) |
| Primarily eats fruit or vegetables between meals (N=12533) | | | | |
| None | 41 | 1 | 1 | 1 |
| 1-20 hours/week | 46 | 1.20 (1.07, 1.35) | 0.95 (0.84, 1.08) | 0.93 (0.82, 1.06) |
| 21+ hours/week | 46 | 1.21 (1.09, 1.34) | 0.86 (0.77, 0.97) | 0.84 (0.74, 0.95) |
| Primarily drinks sweetened beverages between meals (N=12535) | | | | |
| None | 43 | 1 | 1 | 1 |
| 1-20 hours/week | 43 | 0.97 (0.86, 1.10) | 1.15 (1.01, 1.30) | 1.14 (1.01, 1.29) |
| 21+ hours/week | 38 | 0.82 (0.73, 0.92) | 1.14 (1.00, 1.30) | 1.15 (1.01, 1.31) |
| Consumes 3 or more portions of fruit per day (N=12545) | | | | |
| None | 47 | 1 | 1 | 1 |
| 1-20 hours/week | 57 | 1.53 (1.36, 1.72) | 1.06 (0.94, 1.20) | 1.01 (0.90, 1.15) |
| 21+ hours/week | 56 | 1.45 (1.29, 1.63) | 0.86 (0.76, 0.97) | 0.80 (0.71, 0.91) |

| | | | | | |
|--|-----------------|----|-------------------|-------------------|-------------------|
| Uses television/computer 2+ hours daily (N=12548) | | | | | |
| | None | 61 | 1 | 1 | 1 |
| | 1-20 hours/week | 61 | 0.98 (0.88, 1.09) | 1.17 (1.05, 1.32) | 1.16 (1.03, 1.31) |
| | 21+ hours/week | 61 | 0.99 (0.88, 1.10) | 1.33 (1.18, 1.50) | 1.33 (1.18, 1.50) |
| Exercises 3 or more days/week (N=12555) | | | | | |
| | None | 7 | 1 | 1 | 1 |
| | 1-20 hours/week | 12 | 1.78 (1.47, 2.16) | 1.13 (0.92, 1.37) | 1.08 (0.88, 1.32) |
| | 21+ hours/week | 12 | 1.82 (1.46, 2.26) | 0.99 (0.78, 1.24) | 0.92 (0.73, 1.16) |
| Driven to school (N=12399) | | | | | |
| | None | 38 | 1 | 1 | 1 |
| | 1-20 hours/week | 48 | 1.46 (1.32, 1.61) | 1.16 (1.04, 1.29) | 1.13 (1.01, 1.26) |
| | 21+ hours/week | 57 | 2.09 (1.85, 2.36) | 1.55 (1.36, 1.77) | 1.48 (1.29, 1.69) |

* Adjusted for maternal ethnicity, socioeconomic circumstances, highest academic

qualification, lone motherhood status, maternal age at MCS birth, number of children in the household

† Adjusted for household income

Mothers' flexible work arrangements

Among mothers who were currently employed when the cohort child was age five ($n=7055$), 31% had reported using flexible work arrangements. In unadjusted analyses, children whose mothers used flexible work arrangements were more likely to primarily eat fruit or vegetables between meals, eat three or more portions of fruit per day, participate in organised exercise three or more days/week, or be driven to school (Table 3). Children were also less likely to primarily eat crisps or sweets or drink sweetened beverages between meals. After adjustment for potential confounding and mediating factors, only the positive relationship with daily fruit consumption was maintained. Additional adjustment for maternal hours worked per week did not influence the relationships (data not shown).

Table 3. Unadjusted and adjusted odds ratios (OR) (95% CI) for relationships between whether mothers made use of any flexible work arrangements and children's health behaviours at age five.

| | | Weighted % engaged in outcome | Unadjusted OR (95% CI) | OR Adjusted for confounding factors* (95% CI) | OR Adjusted for confounding and mediating factors* [†] (95% CI) |
|--|-----|-------------------------------------|---------------------------|--|---|
| Primarily eats crisps or sweets between meals (N=6340) | | | | | |
| | No | 37 | 1 | 1 | 1 |
| | Yes | 34 | 0.85 (0.75, 0.96) | 0.98 (0.86, 1.13) | 0.98 (0.85, 1.12) |
| Primarily eats fruit or vegetables between meals (N=6340) | | | | | |
| | No | 44 | 1 | 1 | 1 |
| | Yes | 49 | 1.22 (1.07, 1.38) | 1.07 (0.94, 1.21) | 1.07 (0.94, 1.22) |
| Primarily drinks sweetened beverages between meals (N=6334) | | | | | |
| | No | 44 | 1 | 1 | 1 |
| | Yes | 37 | 0.75 (0.65, 0.85) | 0.92 (0.80, 1.05) | 0.92 (0.80, 1.06) |
| Consumes 3 or more portions of fruit per day (N=6343) | | | | | |
| | No | 54 | 1 | 1 | 1 |
| | Yes | 63 | 1.45 (1.28, 1.65) | 1.18 (1.03, 1.35) | 1.17 (1.02, 1.34) |
| Uses television/computer 2+ hours daily (N=6338) | | | | | |
| | No | 62 | 1 | 1 | 1 |
| | Yes | 59 | 0.89 (0.79, 1.02) | 1.07 (0.93, 1.23) | 1.07 (0.93, 1.23) |
| Exercises 3 or more days/week (N=6343) | | | | | |
| | No | 10 | 1 | 1 | 1 |
| | Yes | 14 | 1.53 (1.27, 1.84) | 1.21 (0.98, 1.49) | 1.21 (0.98, 1.49) |
| Driven to school (N=6285) | | | | | |
| | No | 52 | 1 | 1 | 1 |
| | Yes | 56 | 1.16 (1.02, 1.32) | 1.00 (0.88, 1.15) | 0.99 (0.86, 1.13) |

* Adjusted for maternal ethnicity, socioeconomic circumstances, highest academic

qualification, lone motherhood status, maternal age at MCS birth, number of children in the household

[†] Adjusted for household income

DISCUSSION

After adjustment for socio-demographic characteristics, children whose mothers were employed were more likely to have poor dietary habits, engage in more sedentary activity, and be driven to school than children whose mothers had never been employed. However,

there was little evidence that flexible work arrangements increased children's uptake of positive health behaviours.

Strengths and limitations

The data available on children's health behaviours at age five permitted the exploration of potential mechanisms for the relationship between maternal employment and childhood obesity. However, there are some limitations with the data. Complete employment histories were not able to be constructed, so proxy measures were developed. Although the measure took into account previous and current employment to create a continuous measure of employment from birth to age five, it may have under- or over-estimated the number of hours mothers worked each week. Analyses were repeated using current maternal employment status (none, 1-20 hours/week, 21+ hours/week) and a similar pattern of results was evident (data not shown). **We have also used non-response weights in all of the analyses to account for attrition in the MCS over time. Furthermore, we have no reason to believe that the relationship between maternal employment and children's health behaviours would be different for those mothers and children who did not participate. While there is also the potential for residual confounding due to unmeasured factors, the analyses were adjusted for a range of socio-demographic characteristics.**

The dietary and physical activity/inactivity behaviours examined should be considered only as indicators of the children's health behaviours, as they were often based on a single question. Since children's health behaviours were collected by maternal report, there is also the possibility of reporting bias. Basterfield and colleagues found that parents substantially over-estimated physical activity collected through a questionnaire in their 6-7-year-old children compared to activity which was objectively measured through accelerometry.[21] Future studies should try to assess children's health behaviours by using objective measures. Research in school-age children has shown that health behaviours cluster,[11,22] suggesting that dietary and physical activity/inactivity habits are not independent. Although we examined

health behaviours individually, children may be more or less likely to engage in particular health behaviours because of their other habits. **It would be valuable for future studies to examine the clustering of health behaviours in young children and how they track over time.**

Comparison with the literature

Few studies have examined the impact of maternal employment on children's health behaviours, particularly in young children. Research has found no consistent relationships between maternal employment and children's dietary[9,10] and television viewing[11] habits. Although in unadjusted analyses we found that maternal employment was associated with positive health behaviours in five-year-old children, after adjustment for socio-demographic characteristics maternal employment was associated with poor dietary habits and high levels of physical inactivity. When the relationship between each health behaviour and maternal employment was adjusted for the covariates separately, often no one factor accounted for the change in the association; only including the covariates together influenced the direction of the association (data not shown). These findings provide some evidence for why maternal employment may increase children's risk for becoming overweight. Discrepancies between our findings and previous research may be due to the use of differing measures of employment or inclusion of different potential confounding factors.

While employment should lead to increased income, it is also likely to reduce parents' free time. A study of the British Household Panel Survey found that women experience a "dual burden" (p. 233) of paid and unpaid work.[23] Women in dual earner couples reported being primarily responsible for household work activities.[23] This implies that changes in health behaviours are more likely to be attributed to changes in maternal than paternal employment patterns. A majority of our results were consistent for children whose mothers worked part-time or full-time, but two of the dietary indicators were only significant for children whose mothers worked full-time (Table 2). Mothers who work full-time may have greater barriers to providing their children with healthy food options than mothers who work part-time and

future studies should examine whether time constraints are particularly detrimental for children's diets. Although there was no relationship between maternal employment and children's participation in organised exercise, children are more likely to participate in organised activities when they are older. These relationships can be re-examined when the MCS children are age seven.[24]

Although unadjusted analyses indicated that children whose mothers used flexible work arrangements engaged in healthier behaviours, relationships were no longer significant after adjustment. This suggests that it is not whether women take up flexible work arrangements that influence their child's health behaviours, but rather the socio-demographic characteristics of the family. There were no statistically significant differences by household income if mothers requested flexible arrangements or whether their request was granted, but significant differences in actual uptake. Although 31% of mothers reported using flexible work arrangements, the percentages ranged from 19% for women from the lowest income families to 43% for women from the highest income families. Women from lower income households may be as aware of the right to request flexible work arrangements, but less able to take them up.

Our findings highlight the need to use **different study samples and additional** research methods to provide greater insights into these relationships. **In Nordic countries where policies provide greater access to publicly provided child care and flexible work arrangements than most European countries and the US, nearly three quarters of women with a child under age six are employed.**[25] This suggests that the influence of maternal employment and flexible working arrangements on children's health behaviours may vary depending on parental employment patterns, the policy context, and the environment. For example, it would be valuable to compare these relationships in Nordic countries where there is higher maternal employment, but stronger family-friendly policies. It would also be important to ask mothers themselves about their experience. For example, it would be **helpful to understand how**

mothers balance home life and work and how time constraints may influence the types of food or opportunities for physical activity they can offer their children. While **exploration of these areas may not be feasible in** large surveys, qualitative methods could provide some of the answers.

Implications for policy

Increasing employment among adults is a UK Government priority.[26,27] Current levels of maternal employment will likely be maintained or even increase. This suggests that for many families the only parent or both parents will be working. Time constraints may limit parents' capacity to provide their children with healthy foods and opportunities for physical activity. Although we found that flexible work arrangements were not detrimental, they are unlikely to be important in helping parents support the development of positive health behaviours in their children.

Our results do not imply that mothers should not work. Rather they highlight the need for policies and programmes to help support parents. Policies and regulations can create an environment that promotes healthy eating and physical activity.[28] For example, the UK Government provides some free early learning and care for all three- and four-year-olds[29] and children are also enrolled in other formal care arrangements. Dietary guidelines for formal child care settings were created in Scotland in 2006[30], but there are no dietary or physical activity guidelines in England. Providing structured guidance could support parents by ensuring that the foods and physical activity offered at child care would help their children to achieve dietary[16] and physical activity[31] recommendations.

WHAT THIS PAPER ADDS

What is already known on this subject?

- Maternal employment is associated with an increased risk for childhood obesity after adjustment for socio-demographic characteristics, particularly when mothers work long hours.
- There is little known about potential mechanisms for the relationship between maternal employment and childhood obesity.

What does this study add?

- After adjustment for socio-demographic characteristics, children whose mothers were employed part-time or full-time were more likely to have poor dietary habits, engage in more sedentary activity, and be driven to school than children whose mothers had never been employed.
- There was little evidence that flexible work arrangements increased children's uptake of positive health behaviours.

Acknowledgments

We would like to thank all of the Millennium Cohort Study families for their cooperation, and the Millennium Cohort Study team at the Centre for Longitudinal Studies, Institute of Education, University of London.

Competing interests

All authors have no competing interests to declare.

Funding

The Millennium Cohort Study is funded by grants to Professor Heather Joshi, director of the study from the ESRC and a consortium of government funders. SSH is funded through a Department of Health Researcher Development Award. TJC is funded through an MRC programme grant (G9827821). This work was undertaken at GOSH/UCL Institute of Child Health who received a proportion of funding from the Department of Health's NIHR Biomedical Research Centres funding scheme. The study design, collection, analysis, and interpretation of data, writing of the report, and the decision to submit the article for publication was conducted independent of the funding sources.

Copyright

The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors, an exclusive licence (or non exclusive for government employees) on a worldwide basis to the BMJ Publishing Group Ltd and its Licensees to permit this article (if accepted) to be published in JECH and any other BMJPGL products to exploit all subsidiary rights, as set out in our licence.

REFERENCES

1. Hawkins SS, Cole TJ, Law C, *et al.* Maternal employment and early childhood overweight: findings from the UK Millennium Cohort Study. *Int J Obes* 2008;**32**:30-8.
2. Anderson PM, Butcher KF, Levine PB. Maternal employment and overweight children. *J Health Econ* 2003;**112**:477-504.
3. Phipps SA, Lethbridge L, Burton P. Long-run consequences of parental paid work hours for child overweight status in Canada. *Soc Sci Med* 2006;**62**:977-86.
4. Walling A. Families and work. *Labour Market Trends, July 2005*. London: Office for National Statistics, 2005.
5. Mosisa A, Hipple S. Trends in labour force participation in the United States. *Mon Labor Rev* 2006;**October**:35-57.
6. Central Statistics Office. *Social Trends 21*. London: Central Statistics Office, 1991.
7. Office for National Statistics. *Work and family: two-thirds of mums are in employment*. <http://www.statistics.gov.uk/cci/nugget.asp?id=1655> (accessed 18 March 2008).
8. U.S. Department of Labor, U.S. Bureau of Labor Statistics. *Women in the Labor Force: A Databook*. Washington, D.C.: U.S. Department of Labor, 2008.
9. Johnson RK, Smiciklas-Wright H, Crouter AC, *et al.* Maternal employment and the quality of young children's diets: empirical evidence based on the 1987-1988 food consumption survey. *Pediatrics* 1992;**90**:245-249.
10. Sweeting H, West P. Dietary habits and children's family lives. *J Hum Nutr Diet* 2005;**18**:93-97.
11. Gorely T, Marshall SJ, Biddle SJH. Couch kids: correlates of television viewing among youth. *Int J Behav Med* 2004;**11**:152-163.
12. Department for Trade and Industry. *Flexible working: The Right to Request and the Duty to Consider*. London: Department for Trade and Industry, 2003.
13. Dex S, Joshi H. *Babies of the New Millennium*. London: Policy Press, 2005.

14. Plewis I. *Millennium Cohort Study: Technical Report on Sampling 4th Edition*. London: Institute of Education, University of London, 2007.
15. Hansen K. *Millennium Cohort Study First, Second, and Third Surveys: A Guide to the Datasets*. London: Institute of Education, University of London, 2008.
16. Department of Health. *5 a day*.
<http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/FiveADay/fs/en> (accessed 31 Jan 2006).
17. American Academy of Pediatrics. Children, adolescents, and television. *Pediatrics* 2001;**107**:423-426.
18. Office for National Statistics. *Ethnic Group Statistics: A Guide for the Collection and Classification of Ethnicity Data*. London: The Stationery Office, 2003.
19. Rose D, Pevalin D. *A Researcher's Guide to the National Statistics Socio-economic Classification*. London: Sage Publications, 2003.
20. Zhang J, Yu KF. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. *JAMA* 1998;**280**:1690-1691.
21. Basterfield L, Adamson AJ, Parkinson KN, *et al*. Surveillance of physical activity in the UK is flawed: validation of the health Survey for England physical activity questionnaire. *Arch Dis Child* 2008;doi: 10.1136/adc.2007.135905.
22. Scully M, Dixon H, White V, *et al*. Dietary, physical activity and sedentary behaviour among Australian secondary students in 2005. *Health Promot Int* 2007;**22**:236-245.
23. Bond S, Sales J. Household work in the UK: an analysis of the British household panel survey 1994. *Work Employ Society* 2001;**15**:233-250.
24. Centre for Longitudinal Studies. *Millennium Cohort Study*.
<http://www.cls.ioe.ac.uk/studies.asp?section=000100020001> (accessed 7 Sept 2007).
25. Gupta DN, Smith N, Verner M. The impact of Nordic countries' family friendly policies on employment, wages, and children. *Rev Econ Household* 2008;**6**:65-89.
26. HM Government. *PSA Delivery Agreement 8: Maximise Employment Opportunities For All*. London: HMSO, 2007.

27. HM Government. *Public Service Agreement 9: Halve the Number of Children in Poverty by 2010-11, on the Way to Eradicating Child Poverty by 2020*. London: HMSO, 2007.
28. Swinburn B. Obesity prevention: the role of policies, laws and regulations. *Aust New Zealand Health Policy* 2008;**5**:12.
29. HM Government. *Child Care Act 2006*. London: HMSO, 2006.
30. Scottish Executive. *Nutritional Guidance for Early Years: Food Choices for Children aged 1-5 Years in Early Education and Childcare Settings*. Edinburgh: Scottish Executive, 2006.
31. Department of Health. *At Least Five a Week: Evidence on the Impact of Physical Activity and its Relationship to Health. A Report from the Chief Medical Officer*. London: The Stationery Office, 2004.