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► **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-00484143v1>

Submitted on 18 May 2010

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

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Word count: 3069

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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.

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