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MATERNAL EMPLOYMENT AND INDICATORS OF CHILD HEALTH – A SYSTEMATIC REVIEW IN PRE-SCHOOL CHILDREN IN OECD COUNTRIES

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ABSTRACT

Objective

To determine whether maternal employment is associated with two indicators of family health behaviour in pre-school children – childhood vaccination uptake, and childhood overweight including obesity - in OECD countries.

Design

Narrative systematic review.

Data sources

Nine medical/social science databases (1980-2007); relevant websites; retrieved article reference lists; consultation with experts.

Review methods

We included relevant articles in English published from 1980; we excluded studies of pregnancy, single occupational groups, non-OECD countries.

Results

8924 abstracts yielded 21 eligible articles: 15 on vaccination and 6 on overweight. Meta-analysis was not possible. Vaccination uptake appeared at least as good or better for children of employed as unemployed mothers. Child overweight may be more prevalent with maternal employment, particularly if long hours are worked.

Conclusions

Maternal employment may have variable effects on pre-school children's health. Policies promoting parental employment should monitor and evaluate the effect on the health and wellbeing of all members of the family.

INTRODUCTION

The promotion of parental employment forms a central element of current UK policies to tackle child poverty.^{1:2} For low income couple families, this may mean both parents going to work. Support is provided for lone parents to find employment³ and there is active debate about whether to require them to seek employment when their youngest child reaches a certain age, and, if so, what that age should be.⁴ In the UK, employment of mothers of children under five years of age has increased markedly over the last two decades, from 27% in 1984⁵ to 56% in 2005.⁶ In contrast, paternal employment has remained steady over this period. The view that 'work...promotes good physical and mental health' was asserted in 2008 in a consensus statement from more than 30 UK bodies of health professionals.⁷ Systematic review evidence shows that employment is associated with better health in men, and the limited research on women generally shows a neutral or beneficial effect.⁸

Since unemployment, poverty and deprivation are all associated with poorer adult health^{8 9:10} and child poverty is associated with poorer child health¹¹, maternal employment might be expected to improve maternal and child health by increasing household income. Other potential benefits (to mothers) of paid employment include training and empowerment.^{12:13} However, employment may limit time for parenting, increase stress and alter childcare arrangements. Childcare may incur costs and could bring additional benefits or harms depending on quality and affordability. Thus maternal employment could have adverse or beneficial effects on children's health.

Forthright opinions on this topic are widely expressed in the media but do not appear to draw on a substantial research base. A synthesis of available evidence could inform a debate on policies on parental employment as well as highlighting areas for further investigation. To start this debate, we carried out a systematic review of studies describing an association between maternal employment and two indicators of health in pre-school children in Organisation for Economic Co-operation and Development (OECD) member countries.

METHODS

To focus the review question, we mapped the literature on maternal employment and ten child health indicators from 'CHILD'.¹⁴ Following systematic searches to assess the scope and quantity of the literature¹⁵ we selected childhood vaccination and childhood overweight/obesity for review. These were chosen because they: are important for pre-school children's health; are sufficiently prevalent to allow adequate power in studies examining differences by maternal employment status; are relevant to health and social policy; and had been examined in a suitable number of papers for a review. In addition, they relate in contrasting ways to the financial and time resources available to the family.

In this review, we have used the term ‘overweight’ to describe children meeting definitions of ‘overweight’ or ‘obese’, irrespective of the terminology chosen by the authors of the primary research.

We included quantitative studies irrespective of design, if they: reported the relationship of maternal employment with any measure of child overweight (including obesity) or child vaccination uptake; included children below statutory school age for the country of residence; collected information on maternal employment after the birth of the index child; were published in or after 1980. Thus cross-sectional, case-control, cohort, intervention and evaluative studies were eligible for inclusion, as well as reports of “natural” experiments. We excluded studies: in which employment was only measured in pregnancy; which contained only qualitative research; from non-OECD countries; on single occupational groups; not reported in English.

Search strategy

We searched from 1980 – 2007 (a period of rising maternal employment) in these databases: Medline, Embase, Psycinfo, Cochrane, Kings Fund (all using dialog datastar interface), Science Citation Index and Social Science Citation Index (via Web of Science), IBSS, and JSTOR, and the websites INTUTE¹⁶ and OECD.¹⁷ We searched for papers containing terms related to all the following concepts: employment ‘and’ mothers ‘and’ children ‘and’ OECD countries. We used ‘and’ to combine these results with searches for each of the indicators of child health. For each concept we maximised sensitivity, making use of synonyms for text word searches, thesaurus terms and ‘explosion’ where possible. Full details are available on request.

For every article meeting the inclusion criteria we screened the citations generated by the ‘related articles’ feature of Pubmed¹⁸, those from the ‘cited reference search’ facility of Web of Science and the reference lists of the paper. We checked the final reference lists for obvious omissions with an expert in each field.

Study selection, data extraction and synthesis

Two reviewers independently screened the abstracts (agreement 95%) and the retrieved candidate papers for inclusion. Data were then independently extracted by these reviewers (MJM and RJ), with differences resolved by discussion and involvement of a third party (CL) if necessary.

Socio-demographic and behavioural factors may be associated with both maternal employment and child health. We conceptualised factors likely to lie on the causal pathway as mediators, and the rest as confounders.¹⁹ Potential mediators of an association between maternal employment and the chosen health indicators included household income, time available to spend with

children, and childcare. Potential confounders, not lying on the putative causal pathway, included socio-economic position, ethnicity, being a single mother, maternal education, and maternal age.

We extracted data on the date, setting and the population, definitions and measurement (of exposure, outcomes, potential confounders and mediators), and the analyses performed. We noted the results of both unadjusted and adjusted analyses, as they may offer different insights into the relationship between maternal employment and child health. As the direction or strength of any association might differ between social groups, we noted the results of stratified analyses and included studies confined to single minority groups.

Wherever possible, the data were transformed into a common format, as odds ratios taking a value less than one where maternal employment was associated with a better health outcome (more complete vaccination, not being overweight). Results which could not be transformed to odds ratios were presented in their original form.

The Effective Public Health Practice (EPHP) quality tool (version downloadable in 2007)²⁰ was designed for use in quantitative intervention and observational studies. We used this to assess internal validity, also developing its criteria for cross sectional studies (not explicitly considered in the tool). At the time of our study, the tool did not include a method for a summary score or global rating. To clarify the presentation, we assigned ratings of strong, moderate or weak internal validity, based on the 3 point scores (strong, moderate and weak) in the domains of the quality tool and the reviewers' judgement (see footnotes to tables). Applicability to the UK context was assessed using criteria based on those used at the National Institute for Health and Clinical Excellence (NICE).²¹ EPPI-reviewer software²² was used to track the references, and to extract and tabulate the data.

We conducted a narrative synthesis and also considered whether meta-analysis was possible. We assessed whether relationships between maternal employment and indicators of child health varied by study quality, year of birth of participants, prevalence of maternal employment, proportion of single mothers, and the geographic, socio-economic and ethnic composition of the study population.

RESULTS

The search of bibliographic databases generated 8924 citations, with a further 268 identified through the secondary search strategies. After screening, 21 full-text articles, reporting on 20 studies, met the inclusion criteria (Figure 1).

The studies are described in tables 1-2, ordered by year of birth of the study children. Heterogeneity of analysis and presentation of the results precluded graphical presentation, or meta-analysis. All the studies were observational (8 cohort studies, 12 cross-sectional). Although many studies adjusted for socio-economic position, only three studies used stratification to examine differences with socio-economic position or ethnicity.²³⁻²⁵ We rated the internal validity as high for three articles²⁶⁻²⁸ weak for three articles²⁹⁻³¹ and moderate for the rest.

Childhood vaccination

Fifteen articles, reporting the results of fourteen studies, included vaccination as an indicator of child health.^{25-27;30-41} (Table 1). Only one was specifically designed to assess the relationship with maternal employment.³⁷ Five were cohort studies and nine cross-sectional. Three studies were nationally representative^{27;36;40}, three overrepresented disadvantaged groups^{25;32;35}, and one overrepresented advantaged groups³⁹; in others the socioeconomic position of participants was mixed or unclear. Most studies were from the USA or Europe. Year of birth of the children ranged from 1970 to 2003. Only one paper stratified by ethnicity²⁵, and none by socio-economic position.

Most studies showed a tendency to higher vaccination uptake in children of employed mothers, although this was not always statistically significant. There was some inconsistency within studies; for instance three studies showed a significant association in the unadjusted but not adjusted analysis^{25;36;38}, two studies found differences between results for measles-containing and pertussis vaccinations^{36;38}, two studies had results differing by the age of the subjects^{26;35} and the only study to stratify on ethnicity found differences between ethnic groups²⁵.

The relationship between maternal employment and vaccination showed no consistent relationship with year of birth, percentage of mothers employed, socio-economic or ethnic composition, proportion of single mothers, internal validity, or applicability.

Table 1

Summary data extracted from studies of childhood vaccination ordered by year of birth of study children

| Author Year of publication Study design | Year of birth of study children Sample population Setting/data source % single mothers | Maternal employment measure (prevalence %) and comparator | Health indicator | Unadjusted OR (95% CI) (OR>1 indicates poorer health outcome) | Adjusted OR (95% CI)* (OR>1 indicates poorer health outcome) | Variables included in adjusted analysis | Quality rating [†] |
|---|---|--|--|--|---|--|-----------------------------|
| Butler ³⁶ 1986 cohort | 1970 Children (n=13135) aged 5 years British Births Survey, UK 3.9% | Mother employed during the child's life (54.5%) vs not employed during the child's life | Not vaccinated against measles or pertussis | Measles: 1.15 (1.07 to 1.23) ^{††} Pertussis: 0.93 (0.81 to 1.07) ^{††} | No significant association after indirect standardisation No adjusted analysis | Region of the country. Number of household moves. Number of other children. Maternal smoking. Type of neighbourhood. | II AAA |
| Adjaye ³⁰ 1981 cross-sectional | 1973-76 Mothers (n=258) of children aged 27-74 months South London, UK N/R | Mother's working status (categories and prevalence not stated) | Not vaccinated against measles | No significant association (OR not reported) | No adjusted analysis | N/A | I A |
| Coreil ³⁷ 1998 cohort | 1984 [†] Mothers (n=5212) of children aged 5 years Public schools in Florida, USA N/R | Mother working ≥21 hours per week [54.3%] vs working <21 hours per week | Incomplete vaccination at time of school entry | No data available | 0.94 (p>0.67) | Mother's age/education. Household income. Child's gender/ethnicity. Number of siblings living at home. | II AAA |
| Jones ³⁹ 1994 cross-sectional | 1988-90 [†] Children (n=208) aged 2-4 years Military hospital-based paediatric clinic, USA 9% | Both parents employed full-time (39.7%) vs not employed full-time | Not optimally vaccinated before second birthday | 1.78 (0.84 to 3.78) ^{††} | No adjusted analysis | N/A | II AA |

| | | | | | | | |
|---|--|--|---|--|---|---|-------|
| Wood ²⁵ 1995 cross-sectional | 1989-91 [†] Children aged 12-36 months, of African-American (n=301) or Latino (n=724) ethnic origin Los Angeles, USA African-American = 57%, Latino = 26% | Mother working (African American mothers = 30%; Latino mothers = 19%) vs not working | a) Not in receipt of all required vaccines at age 3 months | a) African-American: association, p<0.1 (OR and direction not reported) Latino: association, p<0.1 (OR and direction not reported) | a) African-American: 0.50 (0.27 to 0.91) ^{††} Latino: no significant association (OR not reported) | a) Both ethnic groups: Number of pre-school children in household. Child age/gender/health status. Family income. Mother's marital status/ education. Health insurance. Source of well child care. Family mobility. Additional variables included for the African-American [§] and Latino ethnic groups [‡] b) Both ethnic groups: Child age/health status. Mother's marital status/ education. Source of well-child care. Additional variables included for the African-American [§] and Latino ethnic groups [‡] | II AA |
| Impicciatore ³⁸ 2000 cross-sectional | 1990-96 [†] Mothers [n=1035] of children aged 3.6 months-6.4 years Public spaces in 3 urban/3 rural areas, Italy N/R | Mother has part-time or full-time job (53%) vs unemployed | Not fully vaccinated (or up to date) against MMR or pertussis | MMR: 0.58 (0.45 to 0.75) ^{††} Pertussis: 0.78 (0.61 to 1.00) ^{††} | MMR: no significant association (OR not reported) Pertussis: no significant association (OR not reported) | Mother's residency/ educational level/age/ attitude towards immunisation. Setting. Family size. Child's position in family. Year of child immunisation. Information on immunisation. | II A |

| | | | | | | | |
|---|---|---|--|--|---|--|---------|
| Alio ²⁷ 2005 cross-sectional | 1991-2000 Children (n=10525) aged 0-5 years 1996-2000 Medical Expenditure Panel Survey public use files, USA Black = 60%, White = 24% | Mother employed (Black mothers = 67.1%; White mothers = 63%) vs not employed | Not receiving preventive care (including up to date vaccination) | No data available | 0.96 (0.84 to 1.09) | Mother's race/insurance coverage/age/education. Family size. | III AAA |
| <i>The following two papers analysed data collected in the same study</i> | | | | | | | |
| Bates ³² 1994 cohort | 1992 Mothers (n=500) of children aged 0-12 months Large municipal teaching hospital, Midwest USA 72% | Mother employed (24%) vs not employed | Not up to date with vaccination at age 3 and 7 months | At age 3 months: 0.92 (0.58 to 1.44) ^{††} At age 7 months: 0.82 (0.52 to 1.30) ^{††} | Adjusted analysis does not include maternal employment variable | N/A | II AAA |
| Bates ³³ 1998 cohort | 1992 Mothers (n=500) of children aged 24-30 months Large municipal teaching hospital, Midwest USA 71% | Mother's employment (categories and prevalence not stated) | Not up to date with vaccination at age 2 years | No significant association (paper presents neither OR nor data required to calculate OR) | Adjusted analysis does not include maternal employment variable | N/A | II AAA |
| Brenner ³⁵ 2001 cohort | 1994-95 [†] Mothers (n=452) of children aged 0-12 months Three hospitals in the District of Columbia, USA 71% | Mother employed postpartum (37%) vs not employed (including students) | Not up to date with vaccination at age 3 and 7 months | At age 3 months: 0.64 (0.37 to 1.11) ^{††} At age 7 months: 0.53 (0.34 to 0.85) ^{††} | At age 3 months: adjusted analysis does not include maternal employment variable At age 7 months: 0.52 (0.31 to 0.87) ^{††} | At age 3 months: N/A At age 7 months: Child birth order/birth weight. Mother's drug use. Intended infant sleeping position. Someone in home with a drug problem. WIC during pregnancy. | II AA |

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|--|---|---|--|---|---|--|---------|
| Bond ³⁴ 1999 cross-sectional | 1994-97 ^f Children (n=1779) aged 0-35 months Council-run family day care or centre-based care in Melbourne, Australia 13% | Mother in paid employment (80%) vs no paid employment | Incomplete or no vaccination | 0.67 (0.48 to 0.90) | Maternal employment variable not listed as significantly associated with vaccination; unclear whether or not it was included in adjusted analysis | See previous column | II AA |
| Matsumura ²⁶ 2005 cross-sectional | 1998-2000 ^f Children (n=5047) Health check-ups at age 18 months or 36 months in Kyoto City, Japan N/R | Mother working (25% at 18 months; 33.3% at 36 months) vs not working | Uncompleted vaccination against measles at age 18 or 36 months | At age 18 months: 1.66 (1.37 to 2.01) At age 36 months: 2.60 (1.95 to 3.49) | At age 18 months: 1.38 (1.00 to 1.89) At age 36 months: 1.75 (1.16 to 2.66) | Mother's age/concern about the adverse effects of measles/knowledge of measles. Not the first born child. Child's interaction with other children. Presence of allergies in child. | III AAA |
| Iordanou ³¹ 2006 cross-sectional | <2000 ^f Children (n=500) aged 5-6 years at primary school entry Selected areas of Greece 4% | Mother's profession (various categories = 44%) vs mother as 'housekeeper' | Incomplete or no vaccination against diphtheria, tetanus and pertussis | DTP and DT vaccines: rates of incomplete or no vaccination higher among employed mothers, p<0.002 (OR not reported) | DTP and DT vaccines: 1.34 ^{††} (CI not reported) | Unclear | I A |
| Samad ⁴⁰ 2006 cohort | 2000-02 Children (n=18488) aged 9 months Millennium Cohort Study, UK 17% | Mother has returned to or started work since birth of cohort baby (46%) vs not returned to or started work since birth of cohort baby | Partially or not vaccinated at age 9 months | No data available | Partially vaccinated: rate ratio = 0.7 (0.6 to 0.8) Not vaccinated: rate ratio = 0.6 (0.4 to 0.8) | Mother's age at birth of cohort child/education/smoking/ethnic group. Family size. Country of UK. Ward type. Lone parenthood. Infant's hospital admission. | II AAA |
| Theeten ⁴¹ 2007 cross-sectional | 2003 Children (n=1349) aged 18-24 months | a) Mother in full-time salaried employment (33%) vs not working | Not in receipt of complete, valid (correctly | No data available | a) 0.56 (0.42 to 0.77) ^{††} | Maternal and paternal age/educational level. Main vaccinator. | II AAA |

| | | | |
|--------------------------|---|---|--|
| Flanders, Belgium N/R | timed) vaccination schedule | b) 0.91 (0.67 to 1.25) ^{††} | Province of residence. Family income. Age of the child. Use of day care. Number of siblings. |
| | b) Mother in less than full- time employment or freelance (39%) vs not working | | |

CI = confidence intervals.

DT = diphtheria and tetanus vaccine.

DTP = diphtheria, tetanus and pertussis vaccine.

MMR = measles, mumps and rubella vaccine.

N/A = not applicable.

N/R = not recorded.

OR = odds ratio.

WIC = Special Nutrition Program for Women, Infants and Children.

* 95% confidence intervals, unless otherwise stated.

† III = strong internal validity (4 or more domains strong or 3 domains strong and none weak); I = weak internal validity (3 or more domains weak); II = moderate internal validity (those not fulfilling criteria for strong or weak).

AAA = findings likely to be applicable across a broad range of populations and settings (but may need appropriate adaptation); AA = findings applicable only to populations and settings included in the study – success of broader application is uncertain; A = applicable only to populations and settings included in the study.

^{††} odds ratio calculated by review authors using data derived from the published paper.

[‡] estimated year of birth of study children.

[§] analyses at 3 months = receipt of immunisation information from friends/relatives, given appointment in hospital for first well child visit, and mother's use of preventive services; analyses at 24 months = family mobility and patient satisfaction with care.

^{||} analyses at 3 months = 'shot' [i.e. vaccination] information from the media, number of family financial difficulties reported, belief that shots prevent colds/diarrhoea, use of seatbelt, percent of preschool children on WIC, receipt of 6 or more prenatal visits, and sampling area; analyses at 24 months = number of preschool children in household and sampling area.

Childhood overweight

Six articles^{23;24;28;29;42;43}, detailing the results of six studies, featured overweight or obesity as an indicator of child health. (Table 2). Two studies were designed to examine the relationship with maternal employment.^{23;24} Three were cross-sectional^{28;29;43} and three were cohort studies^{23;24;42}. Two studies were nationally representative^{23;24}, two were representative of smaller geographical areas^{28;42}, and two were in specific ethnic groups.^{29;43} Three studies were from the USA^{23;29;43}, and one each was from the UK²⁴ Germany²⁸ and Japan.⁴² Year of birth of the children ranged from 1975 to 2003. Two studies stratified by socio-economic position.^{23;24}

Most studies showed a higher rate of childhood overweight where mothers were employed, though this was not always statistically significant. The most informative studies (Anderson et al²³, Hawkins et al²⁴ and Lamerz et al²⁸) showed congruence between their research question and ours, and so presented particularly relevant analyses, including analyses to assess a dose response effect between maternal employment and childhood overweight.

Anderson et al²³ presented data from the National Longitudinal Study of Youth, aged 3-11. The percentage of overweight (above 95th BMI centile) children was higher in mothers who had been employed, and higher in full-time than part-time employed mothers. While the overall percentage of overweight children was greater in poorer families than wealthier ones, the adverse effect of employment was observed only for wealthier families and those with better educated or non-Hispanic mothers. Econometric analyses using probits examined effects of employment intensity and duration, adjusted for various socio-demographic factors. Overweight was more common in children whose mothers were employed for longer hours; an extra 10 hours per week of maternal employment increased the likelihood that children would be overweight by 1.2 percentage points. The association was stronger where mothers were more educated. After adjustment for socio-demographic factors, childhood overweight was unrelated to duration of employment.

Hawkins et al²⁴ analysed data from the UK Millennium Cohort Study at age 3 years. Prevalence of overweight was higher in children of employed than non-employed mothers. Overweight prevalence was higher in lower income groups, but stratification demonstrated that the association between maternal employment and childhood overweight was stronger in higher income groups. A dose-response relationship was shown for overweight with intensity of maternal employment (hours per week). Duration of maternal employment (weeks per year) was not significantly associated with childhood overweight.

Lamerz et al²⁸, in their cross-sectional study of 5-7 year olds in Aachen, found lower rates of overweight in the children of employed mothers than non-employed mothers though this was not significant after adjustment. Overweight rates were higher in the children of full-time than part-time employed mothers, but this did not reach statistical significance.

These three studies suggest that increasing intensity of employment (working longer hours) may be associated with increases in childhood overweight, while increased duration (working more weeks) is not. Although childhood overweight rates are higher in disadvantaged groups, the effects of employment appear more marked in affluent households.

The other studies were consistent with these findings. Two small cross-sectional studies in specific ethnic groups (Mexican Americans⁴³ and Hmong²⁹) primarily examined feeding practices in relation to overweight, but found a non-significant unadjusted relationship between maternal employment and child overweight. In the Toyama study⁴², a cohort study in a single prefecture in Japan, overweight rates were significantly higher where mothers worked full time.

The relationship between maternal employment and childhood overweight showed no consistent relationship with year of birth, country of study, percentage of mothers employed, socio-economic or ethnic composition, percentage of single mothers, internal validity, or applicability.

Table 2

Summary data extracted from studies of childhood overweight ordered by year of birth of study children

| Author Year of publication Study design | Year of birth of study children Sample population Setting/data source % single mothers | Maternal employment measure (prevalence %) and comparator | Health indicator | Unadjusted OR (95% CI)* (OR>1 indicates poorer health outcome) | Adjusted OR (95%CI) (OR>1 indicates poorer health outcome) | Variables included in adjusted analysis | Quality rating [†] |
|---|--|---|--|--|---|---|-----------------------------|
| Anderson ²³ 2003 cohort | 1975-1993 ^{††} Mothers and their children (n=16650) aged 3-11 years National Longitudinal Survey of Youth, USA 27.9% | a) Mother worked ≥ 35 hours per week (prevalence not stated) vs never worked b) Mother worked <35 hours per week (prevalence not stated) vs never worked c) Employment intensity: average hours worked per week if working since child's birth (units of 10 hours) | Child overweight: BMI >95 th percentile of CDC growth charts | a) 1.43 (CI not calculable) [¶] b) 1.08 (CI not calculable) [¶] c) No unadjusted analysis | a) No adjusted analysis b) No adjusted analysis c) Probit estimates: mothers who work 10 hours more per week increase the likelihood that their children will be overweight by 1.2 percentage points Stratification by maternal education: estimated increase in childhood overweight per extra 10 hours worked is greater for children of more educated than less educated mothers | a) N/A b) N/A c) Block 1 [§] Blocks 1, 2 and 3 [§] d) Blocks 1 and 2 [§] | II AAA |

| | | d) Employment duration: number of weeks mother employed since child's birth (units of 52 weeks) | | d) No unadjusted analysis | | d) Probit estimates: number of weeks of maternal employment not significantly associated with childhood overweight | |
|--|--|--|--|--|---|--|--------|
| Takahashi ⁴² 1999 cohort | 1989 Children (obese, n=427; non- obese, n=854) aged 3 years Toyama prefecture, Japan N/R | Mother's job, full-time (34.6%) vs not full-time | Child obesity: BMI ≥18 | 1.33 (p<0.05) | No significant association (OR not reported) | Obesity of mother and father. Child's physical activity/ weight at birth/duration of outdoor playtime/ snacking regularity/meal times/BMI at birth/ snacking frequency/ sleeping time/bedtime/ wake-up time/ kindergarten attendance/seasoning of food. Caretaker status. | II AAA |
| Melgar-Quinonez ⁴³ 2004 cross-sectional | 1993-95 Families (n=238) with a child aged 3-5 years, of low income and Mexican-American ethnic origin California, USA N/R | Mother employed outside the household [41%] vs not employed outside the household | Child overweight (BMI ≥85 th percentile of CDC growth charts) or obesity (BMI ≥95 th percentile) | No significant association (OR not reported) | Adjusted analysis does not include maternal employment variable | N/A | II AA |

The following paper comprised cross-sectional and case-control elements

| | | | | | | | |
|---|--|---|--|--|---|--|---------|
| Lamerz ²⁸ 2005 cross-sectional | 1995-96 Parents of children (n=1979) aged 5-7 years Aachen, Germany 11% | a) Maternal employment, full time (8.9%) vs none | Child obesity: BMI $\geq 90^{\text{th}}$ percentile for German children | a) 0.75 (0.41 to 1.37) [†] | a) 0.92 (0.49 to 1.75) | Education/BMI of mother and father. Father's employment. Living space per person (m ²). Single parent. Gender. | III AAA |
| | | b) Maternal employment, part time (39.4%) vs none | | b) 0.62 (0.43 to 0.88) [†] | b) 0.82 (CI not calculable) | | |
| | | c) Maternal employment, full or part time (48.3%) vs none | | c) 0.64 (0.46 to 0.89) [†] | c) No data available | | |
| | | d) Maternal employment, full time vs part time | | d) 1.21 (0.64 to 2.30) [†] | d) 1.12 (0.58 to 2.17) | | |
| Lamerz ²⁸ 2005 case-control | 1995-96 Children (obese, n =146; non- obese, n = 221) aged 5-7 years Aachen, Germany 11% | a) Maternal employment (55.2%) vs none | Child obesity (cases = BMI $\geq 85^{\text{th}}$ percentile for German children; controls = BMI 40 th to 60 th percentile for German children) | a) 0.60 (0.38 to 0.94) [†] | a) No significant association (OR not reported) | Education/type of occupation of mother and father. Father's employment/ hours of work/hours of work at weekends. Household net income. | |
| | | b) Employed more than 4 hours per day (25.4%) vs not employed | | b) 0.78 (0.45 to 1.35) [†] | b) No significant association (OR not reported) | | |
| | | c) Employed up to 4 hours per day (28.6%) vs not employed | | c) 0.47 (0.27 to 0.81) [†] | c) No significant association (OR not reported) | | |
| | | d) Employed more than 4 hours per day vs up to hours per day | | d) 1.66 (0.88 to 3.10) [†] | d) No significant association (OR not reported) | | |
| | | e) Employed at weekends (19.4%) vs not employed | | e) 0.79 (0.44 to 1.41) [†] | e) No significant association (OR not reported) | | |

| | | | | | | | |
|---|--|--|--|---|---|--|--------|
| Hawkins ²⁴ 2007 cohort | 2000-02 Children (n=13113) aged 3 years Millennium Cohort Study, UK 14% | a) Maternal employment, any since child's birth (58.2%) vs none b) Hours worked per week, per 10 hours c) Duration of employment, per 1 year | Child overweight, including obesity, as defined by IOTF cut-offs for BMI | a) 1.07 (0.97 to 1.18) b) 1.06 (1.02 to 1.09) c) 1.03 (0.99 to 1.07) | a) 1.15 (1.02 to 1.29) b) 1.12 (1.06 to 1.18) c) 0.97 (0.91 to 1.04) | Birth weight. Maternal ethnic group/ highest academic qualification/age at first live birth/lone motherhood status/pre- pregnancy body size/ smoking during pregnancy. | II AAA |
| Kasemsup ²⁹ 2006 cross-sectional | <2003 ^{††} Mothers of overweight (n=35) or normal weight (n=45) children aged 3-5 years, of Hmong ethnic origin Minneapolis/St Paul metropolitan area, USA N/R | Mother employed part- or full-time [48%] vs not employed | Child overweight: BMI $\geq 95^{\text{th}}$ percentile of growth charts | 2.50 (0.98 to 6.37) [¶] | No adjusted analysis | N/A | I A |

BMI = body mass index.

CDC = Centers for Disease Control and Prevention.

CI = confidence intervals.

IOTF = International Obesity Task Force.

N/A = not applicable.

N/R = not recorded.

OR = odds ratio.

[†] III = strong internal validity (4 or more domains strong or 3 domains strong and none weak); I = weak internal validity (3 or more domains weak); II = moderate internal validity (those not fulfilling criteria for strong or weak).

AAA = findings likely to be applicable across a broad range of populations and settings (but may need appropriate adaptation); AA = findings applicable only to populations and settings included in the study – success of broader application is uncertain; A = applicable only to populations and settings included in the study.

^{††} estimated year of birth of study children.

[¶] odds ratio calculated by review authors using data derived from the published paper.

[§] Block 1 variables = average hours worked per week if working since child's birth, number of weeks worked since child's birth, mother reported height and weight; Block 2 variables = Black non-Hispanic, Hispanic, mother's education, child was first born, number of children, child's birth weight, child's and mother's age in years, year of survey, education levels of the mother's parents, whether mother's parents were present when she was 14, whether the child is female; Block 3 variables = child was breastfed, mother's BMI, average family income since birth, child's life mother was married.

^{||} employment measures b) and c) additionally adjusted for employment [maternal hours worked and duration, partner hours worked and duration].

DISCUSSION

Findings

There was some evidence that compliance with vaccination programmes is at least as high, or higher, in employed mothers compared with unemployed mothers. There was also some evidence that maternal employment was associated with greater risk of childhood overweight, an effect which was more marked in higher income households. Rates of overweight were higher amongst the children of mothers who were employed for more hours per week, after adjustment for potential confounding variables. Few studies investigated whether relationships between maternal employment and indicators of child health differed by socio-economic position, or ethnic group.

Strengths and limitations of the review

Strengths of this review include the use of rigorous standard methodology and extensive searching, using databases from a range of disciplines,^{15,44} though it remains possible that we missed some studies. Any systematic review is dependent on the quality, conduct and relevance of the primary studies; this varied considerably, in common with much observational literature.^{45,46} Very few studies in our review had been designed to examine our review question, making publication bias less likely but meaning that authors did not always employ designs or report (or possibly conduct) analyses which optimally addressed these associations. The quality ratings could not always distinguish between problems with methodology (in relation to the review question) and inadequate reporting.⁴⁷ Publication bias remains possible; heterogeneity in the presentation of results precluded construction of a funnel plot to assess this.

Effect modification by setting is possible; some factors, such as social policy, which vary between countries, may affect the relationship between maternal employment and child health. For example, a comparative study has shown that unemployment is a more important factor in the health disadvantage of single mothers in the UK than in Sweden⁴⁸, though child health was not studied in this comparison. Unfortunately we could not assess effect modification further because of the limited data available. However, the nature of employment, its social meaning and the reasons for the participation of women with young children in the paid workforce are all likely to vary over time and between settings.

Studies also varied in their approach to confounding and mediating variables, further hindering synthesis of the findings. Multivariable analysis which specifically addressed the hypothesis that maternal employment was associated with vaccination or overweight could give clues as to causality¹⁹. Studies which included maternal employment among a barrage of potential 'predictors' in an adjusted analysis risked underestimating the strength of the relationship if they adjusted for potential mediators (e.g. household income), and overstating it if they omitted potential confounders. Some of the variation between studies in the adjusted odds ratios may therefore be due to the variation in the factors included in multivariable analyses. Potentially

illuminating analyses, such as stratification, were rarely performed. This limited the inferences which could be drawn about specific groups, such as single mothers, and more generally about the potential effect of maternal employment on health inequalities.

Fit with the literature

Most studies of the health effects of paid employment focus on men.⁸ The limited available evidence suggests that, for women, employment generally has beneficial or neutral effects on overall health.⁸ We recognise that paternal employment or living in a workless household may also influence children's health. Furthermore, work in the form of domestic and caring tasks is an integral part of parenting and may not be equally distributed between adults in a household; paid employment forms only a part of the work done by mothers. However our review focused only on the associations of maternal paid employment and indicators of child health.

Maternal employment was associated with vaccination uptake among children which appeared to be at least as good, or better than, that in the children of mothers without paid work, but there were inconsistencies between and within studies which may be due to chance or differences in social context. Maternal employment might reduce financial obstacles to vaccination in countries where families have to pay, and employed mothers may be more motivated to avoid time off work for preventable illnesses, or have different attitudes to reports of vaccine 'risks' in the media. On the other hand, access to vaccination services could be reduced if mothers could not attend appointments because of employment commitments.⁴⁹

Putative pathways linking maternal employment to childhood overweight²³ include factors likely to be protective (e.g. higher income allowing purchase of a healthier diet or more opportunities for physical activity) and those likely to increase overweight (lack of time for active play or food preparation, use of prepared foods which tend to be more energy dense⁵⁰, and encouragement of sedentary behaviours). There is some evidence that mothers in employment tend to maintain time spent with their children at the expense of other activities, such as domestic or cooking tasks.⁵¹ This review found that increases in the numbers of hours mothers worked per week were associated with increased rates of childhood overweight. Increased duration of maternal employment did not show this association. The association between maternal employment and childhood overweight was stronger for those of higher income. These findings suggest that either lack of maternal time, or increases in time spent by children in non-maternal care, may make overweight more likely.

What this study adds (implications for policy and practice)

The findings suggest that recent changes in the prevalence of maternal employment are unlikely to have a general deleterious effect on child health. This is reinforced by evidence from large UK cohort studies suggesting maternal employment has little effect on pre-school children's educational and

behavioural outcomes.⁵² However, maternal employment may be contributing to trends in specific aspects of child health, such as the prevalence of childhood overweight, particularly if long hours are worked. More research is needed to explore this possibility further, and to find how to support employed parents to promote the health of their children.

The analytical approaches used in some of the studies highlight the importance of making the best use of observational data, using stratified analyses to reveal differential effects in specific social groups, and seeking dose-response relationships to test causality. Separate analyses of single and couple mothers might clarify whether different approaches are needed to promote the health of their children.

Policies which promote parental employment need to monitor and evaluate the effect of these policies on the health and wellbeing of all members of the family. Such evaluations need to recognise that the relationship between employment and child health may be different in different social contexts and groups, and that parental employment has potentially beneficial and adverse effects on children's wellbeing.

What is already known

- Maternal employment in developed countries has increased markedly from the 1970s to the present day.
- UK government policy promotes parental employment as one strategy to reduce child poverty, but the effects on child health are unknown.

What this study adds

- Overall compliance with vaccination programmes appears at least as good or better for the children of employed mothers compared to mothers without paid employment.
- Childhood overweight may be more common in the children of employed mothers and there are indications of an increase with increased hours per week of maternal employment.

Policy implications

- Policies promoting parental employment should monitor and evaluate the effect on the health and wellbeing of all members of the family.

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COMPETING INTEREST STATEMENT

In the past, MJM and CL have had paid employment while their children were of pre-school age.

All authors declare that the answer to the questions on your competing interest form are all No and therefore have nothing to declare.

ETHICS APPROVAL

This systematic review was based on published research articles and ethics approval was not required.

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DETAILS OF CONTRIBUTORS

MJM and CL contributed to the conception, design and interpretation of the data. MJM conducted the searches. MJM and RJ screened the references for inclusion and extracted data from the included articles. MJM, RJ and CL contributed to drafting the article. All authors have seen and approved the final version. MJM will act as guarantor for the paper.

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Figure 1

Identification of articles included in the review

