

# Does home visiting improve parenting and the quality of the home environment? A systematic review and meta analysis

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## Abstract

**Aims**—To evaluate the effectiveness of home visiting programmes on parenting and quality of the home environment.

**Design**—Systematic review of the literature of randomised controlled trials and quasi-experimental studies evaluating home visiting programmes involving at least one postnatal visit.

**Subjects**—Thirty four studies reported relevant outcomes; 26 used participants considered to be at risk of adverse maternal or child health outcomes; two used preterm or low birth weight infants; and two used infants with failure to thrive. Only eight used participants not considered to be at risk of adverse child health outcomes.

**Results**—Seventeen studies reported Home Observation for Measurement of the Environment (HOME) scores, 27 reported other measures of parenting, and 10 reported both types of outcome. Twelve studies were entered into the meta analysis. This showed a significant effect of home visiting on HOME score. Similar results were found after restricting the analyses to randomised controlled trials and to higher quality studies. Twenty one of the 27 studies reporting other measures of parenting found significant treatment effects favouring the home visited group on a range of measures.

**Conclusions**—Home visiting programmes were associated with an improvement in the quality of the home environment. Few studies used UK health visitors, so caution must be exercised in extrapolating the results to current UK health visiting practice. Further work is needed to evaluate whether UK health visitors can achieve similar results. Comparisons with similar programmes delivered by paraprofessionals or community mothers are also needed.

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Keywords: home visiting; parenting; home environment; health visitor

Parenting has received increasing attention over recent years, with evidence that adverse child health outcomes such as antisocial behaviour are related to parenting style.<sup>1,2</sup> There has therefore been a growing interest in methods of supporting parents and improving

parenting skills to reduce the frequency of such adverse outcomes.<sup>3-6</sup> Recent changes in government policy have provided funding for enhancing the role of the health visitor in this area and also for "Sure Start", a support programme for parents delivered by outreach workers.<sup>5</sup>

It has been argued that improving the parenting given to vulnerable children is an important child health strategy, and that health visitors are ideally placed, and capable of, detecting poor parenting at an early stage.<sup>4</sup> This is encapsulated in the enhanced role of the health visitor as described in *Supporting families*.<sup>5</sup> We have undertaken this systematic review as part of a larger systematic review assessing the effectiveness of home visiting. We considered it important to review the existing literature relating to parenting and the quality of the home environment in view of the difficulty of undertaking evaluations of the effectiveness of home visiting, the resource intensive nature of these programmes, and the recent emphasis on improving parenting within health care policy. As the larger systematic review has covered a range of maternal and child health outcomes, we have also been able to assess the effect of home visiting on other aspects of maternal and child health that may be related to parenting.

## Methods

The systematic review aimed to assess the effectiveness of home visiting programmes on a range of maternal and child health outcomes. The results relating to parenting and the quality of the home environment are presented here.

## SEARCH STRATEGY

We searched Medline from 1966 to July 1996; Cinahl from 1982 to July 1996; Embase from 1980 to October 1996; and the Cochrane Library. The Medline search involved four searches. Firstly, MeSH methodology terms ("clinical trials", "randomised controlled trials", "comparative", "evaluative", "follow-up", and "prospective") were combined with MeSH subject terms ("Community Health Nursing") using the search strategy devised by Dickersin *et al.*<sup>7</sup> Secondly, MeSH methodology terms were combined with the text words "health visit\$", "home visit\$", and "domiciliary visit\$". Thirdly, the subject MeSH terms were used in combination with text words relating to methodology

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(“evaluation”, “effectiveness”, and “outcome”). Fourthly, the text words relating to methodology and subjects were used in combination.

The Embase search included two searches: the first using the index terms “clinical trial”, “clinical study”, “evaluation and follow up”, and “economics” combined with the index term “health visitor”; and the second using the text words “effectiveness”, “evaluation”, and “outcome” combined with the text words “home + visit” and “domiciliary + visit”. The Cinahl search used the same text words as the second Embase search, but also included the index term “health visitor”.

We hand searched the journal *Health Visitor* from 1982 to 1997 and the reference lists of reviews of the literature in the field reporting outcomes relevant to parenting.<sup>8-12</sup> Key individuals and organisations were contacted to trace unpublished work, and advertisements were also placed in relevant journals to identify unpublished work.

#### INCLUSION CRITERIA

Articles were included if they were randomised controlled trials or quasi-experimental studies including a control group that evaluated a home visiting programme. The home visiting programme had to include at least one post-natal home visit. The personnel delivering the home visiting had to undertake tasks which were within the remit of British health visiting (for example, social support, education on child development and child health, facilitation of mother-child interaction, and promotion of parenting) and the study had to report outcomes relevant to British health visiting (for example, measures of the quality of the home environment, measures of parent-child interaction, attitudes towards child and child rearing practices).

#### SELECTION OF STUDIES TO BE INCLUDED IN THE REVIEW

The full text of all studies identified by the search were obtained. One researcher (RE) reviewed all studies for inclusion criteria and for relevance. Where there were doubts about relevance relating to whether the tasks undertaken fell within the remit of British health visiting, or whether the outcomes were relevant to British health visiting, the health visiting members of the study team (JR, KB, DW) reviewed the article and reached a joint decision.

#### DATA EXTRACTION

For each study, the following data were extracted: purpose of study, experimental design, sample size determination, description and suitability of subjects, randomisation and stratification, comparison group usage, procedures for management, blinding, subject attrition, evaluation of subjects, and management. The number of participants in each treatment group was extracted, along with the mean and standard deviation for continuous variables. Where such data were not available, the lead author was written to, or contacted by email,

and asked to provide further information. Where results from the same intervention study have been reported in more than one paper, the study has only been counted once. The quality of the studies included in the review was assessed by the Reisch scale, which is scored between 0 and 1, with higher scores representing higher quality reports.<sup>13</sup> Three members of the research team quality scored the articles (DK, MH, MB), blind to the authors, results, and conclusions of the studies. The Reisch scale was applied to 19 articles by each of the three reviewers to assess inter-rater reliability. The correlation coefficients between the pairs of raters were 0.71, 0.79, and 0.82. The overall intraclass correlation coefficient was 0.74 (95% confidence interval 0.52 to 0.88).

#### OUTCOME MEASURES

Parenting and the quality of the home environment have been measured in a variety of ways in the studies we reviewed. The standard measure used most commonly was the Home Observation for Measurement of the Environment inventory (HOME).<sup>14</sup> This is administered by an interviewer within the family home and is based on observations of the interviewer. The infant-toddler version of the HOME inventory consists of six subscales measuring aspects of the quality of the home environment in relation to parenting. These include emotional and verbal responsiveness of the mother, avoidance of restriction and punishment, organisation of the environment, provision of appropriate play materials, maternal involvement with the child, and opportunities for variety within the daily routine. Results can be presented as mean score for the overall scale, or for separate subscales. The majority of studies reporting HOME scores, did not report the mean plus standard deviation (table 2), hence the meta analysis was undertaken using Fisher's method. This represents a conservative estimate of the overall effect of home visiting as it is based only on the p values given in each article. We have therefore not been able to produce a figure for an overall improvement in the HOME score across the studies included in the meta analysis. Those studies reporting other measures of parenting and the quality of the home environment have not been included in the meta analysis.

#### Results

In total 1218 references were found from the searches; 102 studies fulfilled the inclusion criteria, of which 34 reported outcomes relating to parenting and the quality of the home environment.<sup>15-48 49-51</sup> Seventeen studies reported HOME scores,<sup>15-33</sup> 27 studies reported other measures of parenting,<sup>15 16 19-22 25 26 32-51</sup> and 10 studies reported both HOME scores and other measures of parenting.<sup>15 16 19-22 25 26 30 32 33</sup> Table 1 presents the characteristics of the studies reporting HOME scores. Table 2 presents the evaluation periods, outcome measures, and the results of each study. Table 3 presents the characteristics

Table 1 Characteristics of studies reporting HOME scores, including those also reporting other measures of parenting

Reference	Group allocation	Score	Intervenors	Participants	Intervention
*Field <i>et al</i> (1980), USA <sup>15</sup>	Random	0.52	Trained teenage black female students	Black teen mothers, low socioeconomic status, preterm infants	Home visit (n=30). 2 visits per week birth–4 months; then one per month. Control: no home visit (n=30) Intervention = education on child development, child rearing, teach stimulation of child, facilitate mother–child interaction
*Larson (1980), Canada <sup>16</sup>	Sequential	0.39	Psychology graduates	Working class families	A: pre- and postnatal home visits (n=35). 4 postnatal visits age 1–6 weeks, 5 visits age 6 weeks–15 months B: postnatal home visits (n=36). 7 visits age 6 weeks–6 months, 3 visits age 6–15 months Control: no home visits (n=44) Intervention = counselling and advice on care tasking, mother–infant interaction, social status, child development
*Field <i>et al</i> (1982), USA <sup>17</sup>	Random	0.52	Teachers	Black teen mothers, low socioeconomic status, term infants	A: home visit parent training (n=34). Biweekly visits for 6 months, B: nursery parent training (n=36) four hours per day for 6 months Control: No parent training (n=35) Intervention A: infant stimulation care taking, mother–infant interaction exercises. B: parent training, job training
*Barrera <i>et al</i> (1986), Canada <sup>18</sup>	Random	0.55	Infant parent therapists	Infants born 1979–81	A: home visits (n=16). 1 visit per week age 0–4 months, then 1 visit per 2 weeks age 5–9 months B: home visits (n=22). 1 visit per month age 9–12 months Control A: no home visits (n= 21, preterm infants). Control B: no home visits (n=24, full term infants) Intervention A: improve child's development. Intervention B: A + improve maternal–child interaction
Olds <i>et al</i> (1986, 1994), USA <sup>19,20</sup>	Random	0.50	Nurses	Children born to teenagers, unmarried, low socioeconomic status	A: Screening at 12 and 24 months of age, no home visits (n=90). B: A + transport to clinics, no home visits (n=94) C: B + antenatal home visits (n=100). Mean 9 visits in pregnancy D: C + postnatal home visits (n=116). Mean combined ante- and postnatal home visits =23 Intervention (C and D) = parent education, promotion of informal maternal support, linkage with community services
Barnard <i>et al</i> (1988)/Booth <i>et al</i> (1989), USA <sup>21,22</sup>	Random	0.29	Nurses	Pregnant and postpartum women lacking social support	Home visit mental health model (n=68). Mean 19 visits from 22 weeks gestation to 12 months of age Control: home visit information/resource utilisation model (n=79). Mean 14 visits (22 weeks gestation–12 months) Intervention: mental health model = therapeutic relation with pregnant women to deal with interpersonal situations and problem solving. Information/resource model information on physical and developmental health of child
Osofsky <i>et al</i> (1988), USA <sup>23</sup>	Random	0.38	Community women	Teenage, unmarried mothers	Home visits + telephone help line + drop in centre. Weekly visits for 1st month, then monthly to 30 months of age Control: no home visits. Total n = 130 (intervention + control, figures not given for each arm) Intervention = teaching child stimulation discussion of parenting issues and maternal problems
*Infante-Rivard <i>et al</i> (1989), Canada <sup>24</sup>	Random	0.46	Public health nurses	Socioeconomically disadvantaged families	Home visits (n=21). 3 prenatal visits + 5 postnatal visits. Control: no home visits (n=26) Intervention = counselling, teaching about child development, child health and behaviour
*Wasik <i>et al</i> (1990), USA <sup>25</sup>	Random	0.52	Day care teachers, social workers, nurses	Children at risk of cognitive difficulties	A: home visits + child development programme (n=16). Weekly visits first 3 years of life B: home visits (n=25). Weekly visits for 3 years. Control: no home visits/child development programme (n=23) Intervention = promotion of parent problem solving strategies
*Huxley and Warner (1993), USA <sup>26</sup>	Non-random	0.18	Nurses	Families referred to tri-agency intervention programme	Home visits (n=20). Visit frequency dependent on need. Control: routine care (n=20) Intervention = prevention of parent dysfunction, education in maternal and child health
*Black <i>et al</i> (1994), USA <sup>27</sup>	Random	0.57	Community nurses	Mothers with prenatal cocaine/heroin use	Home visits (n=31). 2 prenatal visits. Biweekly visits from birth–18 months of age. Control: no home visits (n=29) Intervention = maternal support, promote parenting, child development, use of resources and advocacy
*Casey <i>et al</i> (1994), USA <sup>28</sup>	Random	0.64	Paediatrician, nurse, social worker	Infants with failure to thrive	Home visits (n=67). 1 visit per week year 1. One visit per 2 weeks years 2–3. Control: no home visits (n=113) Intervention = cognitive, language, social development, help with managing parental self identified problems
Marcenko and Spence (1994), USA <sup>29</sup>	Random	0.25	Lay home visitors	Pregnant and postpartum women at risk of child abuse	Home visits (n=125). Prenatal 1 visit per 2 weeks. Postnatal weeks 1–6 weekly visit, weeks 7–26 1 visit per 2 weeks, weeks 27–52 monthly visit. Control: no home visits (n=100). Intervention = peer support, identify service needs, health education, parent training
*Black <i>et al</i> (1995), USA <sup>30</sup>	Random	0.61	Lay home visitors	Children with failure to thrive	Home visits + clinics (n=64). Weekly visits for one year. Control: clinics only (n=66) Stratified by age of child: younger group = 0–12 months; older group = 21.1–24.9 months Intervention = maternal support, promotion of parenting, child development, use of resources and advocacy
Shapiro (1995), Canada <sup>31</sup>	Random	0.18	Community nurse and home maker	Low birth weight newborns	Home visits (n=50). Mean 3.8 visits + 8.4 telephone contacts up to 8 weeks post discharge Control: routine home visits (n=50). Mean 1.4 visits + 1.9 telephone contacts up to 8 weeks post discharge Intervention = early discharge from hospital, personal maternal support, respite care, help with infant care, light housekeeping, information on infant care

Table 1 *cont'd*

Reference	Group allocation	Score	Intervenors	Participants	Intervention
*Kitzman <i>et al</i> (1997), USA <sup>32</sup>	Random	0.79	Nurses	African-American women, 1st pregnancy <29 weeks gestation, >1 sociodemographic risk factors	Home visits (n=228). Mean number prenatal visits = 7, mean number from birth to age 24 months = 26 Control: no home visit, but free transport for prenatal and child development services (n=515) Intervention = helping women improve health related behaviour, child care, and life course development
*Davis and Spurr (1998), UK <sup>33</sup>	Non random	0.54	Health visitors, medical officers	Preschool children, multiple psychosocial problems	Intervention: home visits and routine community services (n=87). Weekly 1 hour sessions. Mean 6 visits Control: routine community services (n=38)

\*Studies whose outcome measures have been included in the meta analysis.

of studies reporting other parenting outcomes. Table 4 presents the evaluation periods, outcome measures, and the results of each study.

Twelve of the 17 studies reporting HOME scores were included in the meta analysis.<sup>15-18 24-28 30 32 33</sup> Eleven of the 12 studies reported total HOME scores,<sup>16-18 24-28 30 32 33</sup> and one reported a subscale score only.<sup>15</sup> Five studies did not report either the mean and standard deviation of the HOME scores, or a p value and therefore could not be included in the meta analysis.<sup>19-23 29 31</sup> Fourteen effect sizes were extracted from the 12 studies (two studies reported outcomes for two age groups separately<sup>30 33</sup>) and entered into the meta analysis using Fisher's method. A highly significant result was obtained suggesting home visiting was effective in improving the quality of the home environment as measured by the HOME score ( $\chi^2 = 126.9$ , 28 df,  $p < 0.001$ ). Restricting the analysis to randomised studies produced similar findings ( $\chi^2 = 70.6$ , 20 df,  $p < 0.001$ ). Restricting the analysis to studies with a quality score of 0.5 or above also produced similar findings ( $\chi^2 = 93.3$ , 22 df,  $p < 0.001$ ).

The five studies using HOME scores as an outcome measure which were not included in the meta analysis included four which did not report any data relating to the HOME scores.<sup>21-23 29 31</sup> Barnard *et al* claimed intervention group families had improved HOME scores at 12 and 24 months,<sup>21 22</sup> Osofsky *et al* reported results relating only to a subgroup analysis within the intervention group,<sup>23</sup> Marcenko and Spence reported no significant difference between treatment groups,<sup>29</sup> and Shapiro claimed a significant improvement in HOME scores in the intervention group at 12 months.<sup>31</sup> Olds *et al* reported non-significant differences in mean HOME scores between the treatment groups at 34 and 46 months.<sup>19 20</sup>

Table 4 shows that the 27 studies reporting other measures of parenting used a wide range of outcome measures. Seventeen studies reported outcomes related to assessing the interaction between the mother and child. Twelve of these studies reported significantly better interaction between mother and child in the intervention group, using a range of measures<sup>15 16 19 20 33 36 37 41 43-46 51</sup> (shown in tables 2 and 4) including greater observed involvement and reciprocal interaction,<sup>19 20 43</sup> responsiveness to the child's behaviour,<sup>16</sup> the

quantity and type of interaction between mother and child,<sup>36 44</sup> greater observed conversation with the child,<sup>43</sup> lower rates of reported difficulties in the mother-infant relationship,<sup>51</sup> greater positive feedback and more praise of the child, and fewer negative interactions between mother and child,<sup>36 45</sup> and a more positive attitude towards the child.<sup>33</sup> Barker and Anderson reported receipt of intervention to be significantly associated with cognitive and educational environment within the home in some, but not all of the geographical areas evaluating the Child Development Programme.<sup>46</sup>

Five studies found no significant difference between the intervention and control groups in terms of mother-child attachment, maternal interaction with child, parental warmth, verbal praise, and engaging in shared activities with the child.<sup>18 21 22 30 32 48</sup>

Seven studies reported outcomes assessing parental attitudes and actions towards child discipline.<sup>15 19 20 25 26 35 36 44</sup> Three studies reported outcomes favourable to the intervention group; these included significantly less negative or punitive attitudes towards child rearing,<sup>15 26</sup> and more "appropriate" answers to questions regarding the parents' handling of aggressive behaviour in their child.<sup>36</sup> Four studies did not find a positive effect in the home visited group on preference for the use of positive as opposed to negative motivation in disciplining the child,<sup>35</sup> the extent to which the parents were authoritarian in their attitudes to child rearing,<sup>25</sup> or use of physical punishment.<sup>19 20 44</sup>

Five studies reported parents' developmental expectations of their child.<sup>26 35 38 39 43</sup> Four reported significant differences favouring the intervention group in terms of more positive or more realistic expectations.<sup>35 38 39 43</sup> Two studies reported outcomes related to mothers' teaching ability, both of which found intervention group mothers were significantly more involved in the child's schooling or provided more stimulation likely to promote future success at school.<sup>36 42</sup> Five studies reported parental stimulation of the child using books, games, or toys.<sup>19 20 35 36 49 50</sup> Three reported significantly better outcomes in the intervention group.<sup>35 36 49</sup> The other outcomes reported in table 4 were only reported for one or two studies.

In total, six of the 27 studies reporting other measures of parenting failed to show positive results in the intervention group.<sup>18 21 22 25 30 32 40</sup>

Table 2 Evaluation period, outcome pleasures, and HOME scores

Reference	Evaluation period	Outcome measures	HOME scores				Other parenting outcomes	
*Field <i>et al</i> (1980), USA <sup>15</sup>	8 months	Mean HOME subscale score (specific subscale not specified), mother-child interaction, developmental expectations, discipline strategies	Int = 5.6, Con = 4.2; p<0.001				Intervention group: better knowledge of developmental milestones, more realistic expectations, better mother-child interaction, less punitive child rearing attitudes	
*Larson (1980), Canada <sup>16</sup>	8 weeks, 6, 12, 18 months	Mean HOME scores, maternal behaviour towards child	Int A	Int B	Con	p	Intervention group: more positive emotional involvement with child, more responsive to child	
			6 weeks	29.3	25.8	26.7	<0.001	
			6 months	35.2	33.7	33.2	=0.055	
			12 months	40.1	37.8	37.8	<0.001	
			18 months	41.2	38.6	39.0	=0.041	
*Field <i>et al</i> (1982), USA <sup>17</sup>	4, 8, 12, 24 months	Mean HOME score	Int A 35, Int B 36, Con 33 NS					
*Barrera <i>et al</i> (1986), Canada <sup>18</sup>	4, 16 months	Total HOME score Mother-child interaction	ANOVA: F(3, 79) = 4.17, p<0.01				No difference in mother-child interaction	
Olds <i>et al</i> (1986, 1994), USA <sup>19,20</sup>	34, 46 months	Mean HOME score Mother-child interaction, discipline strategies.	A	Int C	Int D	A-D (95% CI)	Intervention group: greater maternal involvement with child. No difference in frequency of spanking, hitting, or scolding	
			34 months	39.0	38.5	39.1	-0.05 (-1.9, 1.8)	
			46 months	39.7	40.2	39.7	0.01 (-1.7, 1.7)	
Barnard <i>et al</i> (1988)/Booth <i>et al</i> (1989), USA <sup>21,22</sup>	12, 24, 36 months	HOME score Mother-child interaction (nursing child assessment teaching scale)	Reported more positive HOME scores at 12 and 24 months in intervention group. No data provided				Intervention group: more positive mother-child interaction reported. No data provided	
Osofsky <i>et al</i> (1988), USA <sup>23</sup>	6, 13, 20 months	HOME score	Reported no difference in HOME scores. No data provided					
*Infante-Rivard <i>et al</i> (1989), Canada <sup>24</sup>	9 months	Mean HOME score	Int = 35.6 (SD 3.2), Con = 33.7 (SD 4.7) p>0.05					
*Wasik <i>et al</i> (1990), USA <sup>25</sup>	6, 12, 18, 30 months	Mean HOME score Discipline strategies	Int A (SD)	Int B (SD)	Con (SD)	p	No difference in authoritarian or progressive attitudes to discipline	
			6 months	30.3 (6.3)	26.9 (7.5)	29.1 (5.1)	>0.05	
			12 months	32.4 (4.8)	29.6 (6.5)	28.0 (6.6)	>0.05	
			18 months	32.2 (4.5)	29.6 (6.4)	30.4 (6.6)	>0.05	
			30 months	31.8 (6.8)	31.2 (5.4)	30.1 (4.8)	>0.05	
*Huxley and Warner (1993), USA <sup>26</sup>	Mean 13 (int) and 16 (con) months	Total HOME score Discipline strategies, inability to empathise with child's needs, role reversal	$\chi^2=19.55$ , p=0.0001. Unclear how HOME score was categorised				Intervention group: diminished belief in corporal punishment. No difference in empathy or role reversal	
*Black <i>et al</i> (1994), USA <sup>27</sup>	18 months	Mean HOME score	Int = 35.1 (SEM 1.2), Con = 31.4 (SEM 1.5), F=3.78, p=0.065					
*Casey <i>et al</i> (1994), USA <sup>28</sup>	36 months	Mean HOME score	Int = 38.1 (SD 9.1), Con = 35.6 (SD 9.5), p>0.05					
Marcenko and Spence (1994), USA <sup>29</sup>	6 months	HOME score	Reported no difference in HOME scores. No data provided					
*Black <i>et al</i> (1995), USA <sup>30</sup>	18 months	Mean HOME score Parental warmth, child interaction	Int (SD)	Con (SD)			No difference in parental warmth or child interaction	
			Younger	31.6 (3.6)	29.3 (4.2)			
			Older	32.4 (5.1)	30.3 (5.7)			
				F=3.84, p=0.05				
Shapiro (1995), Canada <sup>31</sup>	12 months	HOME score	Reported significant difference favouring intervention group. No data provided					
*Kitzman <i>et al</i> (1997), USA <sup>32</sup>	24 months	Mean HOME score Mother-child interaction (nursing child assessment teaching scale)	Int = 32.2, Con = 30.9, mean difference = -1.3 (-2.2, -0.4) p=0.003				No difference in mother-child interaction	
*Davis and Spurr (1998), UK <sup>33</sup>	13-23 weeks	Mean HOME score	Mean change in HOME score 0-3 years: Int 5.37, Con -2.08, p=0.005 4+ years: Int 8.71, Con -2.13, p=0.03				Increased positiveness towards child in intervention group	

\*Studies whose outcome measures have been included in the meta analysis.

Three of these studies reported significantly higher HOME scores in the intervention group,<sup>18 21 22 32</sup> suggesting the intervention did have a positive impact, even if the other measures of parenting did not show significant improvements.

## Discussion

Our review of the effectiveness of home visiting programmes suggests they are effective in increasing the quality of the home environment as measured by HOME scores, and that the majority of studies using other outcome

Table 3 Characteristics of studies reporting other measures of parenting

Reference	Group allocation	Score	Intervenor	Participants	Intervention
McNeil and Holland (1972), USA <sup>34</sup>	Non-random	0.21	Public health nurses	Mothers with newborns	Home visits + group child health teaching (n=93). Mean no. of visits = 3.1 Control: home visits for teaching child health (n=96) Mean no. of visits = 4.3
Grantham-McGregor and Desai (1975), Jamaica <sup>35</sup>	Non-random	0.39	Nurses	Mothers with 3 year old children	Int: home visits (n=22). Weekly for 8 months. Maximum 29 visits Con: no home visits (n=22) Intervention: use of toys to encourage child development
Gutelius <i>et al</i> (1977), USA <sup>36</sup>	Random	0.59	Paediatrician/nurse	1st born black infants, low income families	Home visits (n=49) visits from 7 months gestation to age 3 years. Control: no home visits (n=48) Intervention = counselling and anticipatory guidance, cognitive stimulation
Hall (1980) <sup>38</sup> / Law-Harrison and Twardosz (1986), USA <sup>39</sup>	Random	0.41	Nurse	Primiparas, normal pregnancy and delivery	Home visit (n=15). 1 visit only. Control: no home visit (n=15). Intervention = teaching re infant behaviour
Siegel <i>et al</i> (1980), USA <sup>37</sup>	Random	0.36	Paraprofessional	Low income families	Normal labour and delivery: A: early and extended contact + home visits (n=47). 9 visits age 0–3 months B: early and extended contact, no home visits (n=50). C: home visits (n=53). 9 visits age 0–3 months Control: no early or extended contact, no home visit (n=52) Complicated labour +/- delivery: A: extended contact + home visits (n=60). 9 visits age 0–3 months Control: no extended contact, no home visits (n=59) Intervention = emotional support and aims to promote maternal involvement with family Home visit (n=80). 1 visit within 3 weeks of delivery. Control: no home visit (n=76) Intervention: enhance maternal confidence in caring for infant, increase knowledge and skills in child care 3 cohorts: 1974: home visit (n=22) 46 visits over 24 months. Control: no home visits (n=26) 1975: home visit (n=17). Control: no home visit (n=12). 1976: home visit (n=29) Control: no home visit (n=26). Intervention = toys and books left in home with input from toy demonstrator Control = verbal interaction stimulus materials left in home. No input from toy demonstrator Home visit (n=17). Mean 28 visits, pregnancy to 30 months of age. Control: no home visit (n=17). Intervention = problem solving, obtain adequate food/housing, discuss long term problems, reduce physical dangers, liaise with other services
Stanwick <i>et al</i> (1982), Canada <sup>40</sup>	Random	0.39	Public health nurses	Mothers with newborns	Home visits (n=80). 1 visit within 3 weeks of delivery. Control: no home visit (n=76) Intervention: enhance maternal confidence in caring for infant, increase knowledge and skills in child care 3 cohorts: 1974: home visit (n=22) 46 visits over 24 months. Control: no home visits (n=26) 1975: home visit (n=17). Control: no home visit (n=12). 1976: home visit (n=29) Control: no home visit (n=26). Intervention = toys and books left in home with input from toy demonstrator Control = verbal interaction stimulus materials left in home. No input from toy demonstrator Home visit (n=17). Mean 28 visits, pregnancy to 30 months of age. Control: no home visit (n=17). Intervention = problem solving, obtain adequate food/housing, discuss long term problems, reduce physical dangers, liaise with other services
Madden <i>et al</i> (1984), USA <sup>41</sup>	Random	0.46	Volunteer women toy demonstrators	Low income families, infants 21–33 months old	Home visits (n=678 <sup>46</sup> and n=348 <sup>50</sup> ). Monthly visits Control: no home visits (n=373 <sup>46</sup> and n=222 <sup>50</sup> ) Intervention = child development programme
Seitz <i>et al</i> (1985), USA <sup>42</sup>	Non-random	0.14	Home visitor, paediatrician, primary care day worker	Low socioeconomic status, first child, inner city	Home visits (n=678 <sup>46</sup> and n=348 <sup>50</sup> ). Monthly visits Control: no home visits (n=373 <sup>46</sup> and n=222 <sup>50</sup> ) Intervention = child development programme
Barker <i>et al</i> (1988), <sup>46</sup> (1994), UK <sup>50</sup>	Not clearly specified	0.46	Health visitors	Children on caseloads, age 3–27 months <sup>46</sup>	Home visits (n=678 <sup>46</sup> and n=348 <sup>50</sup> ). Monthly visits Control: no home visits (n=373 <sup>46</sup> and n=222 <sup>50</sup> ) Intervention = child development programme
Beckwith (1988), USA <sup>43</sup>	Random	0.36	Nurse, early childhood educator	Primiparas age 14–21 <sup>50</sup> Pregnant and postpartum women, less than high school education, un/semi-skilled job, low birth weight, preterm infants, >3 days intensive neonatal care	Home visits (n=37). Until infant aged 13 months. Control: no home visits (n=55) Intervention = develop supportive relationship with mother
Resnick <i>et al</i> (1988), USA <sup>45</sup>	Random	0.57	Paediatric nurse and child development specialist	Premature infants <1800 g at birth	Int: home visits (n=21). Weekly visits until adjusted birth date, then 2 per month from child development specialist for 12 months. Con: no home visits (n=20) Intervention: language, social, cognitive, muscular exercises for infants and parenting activities Home visits (n=78). Weekly visits for 2 years Control: no home visits (n=39) Intervention = promote cognitive and social development, train mothers to teach child effectively
Scarr and McCartney (1988), Bermuda <sup>44</sup>	Random	0.55	Community mothers	Mothers with 2 year olds	Home visits (n=78). Weekly visits for 2 years Control: no home visits (n=39) Intervention = promote cognitive and social development, train mothers to teach child effectively
Sutton (1992), England <sup>47</sup>	Sequential	0.36	Psychologist	Difficult preschool children	A: group sessions (n=7). Weekly sessions for 8 weeks B: home visits (n=9). Weekly visits for 8 weeks C: telephone contact (n=11). Weekly contact for 8 weeks. Control: waiting list for parent training (n=10) Intervention = parent training teaching behavioural principles
Thompson <i>et al</i> (1992), USA <sup>48</sup>	Random	0.46	Nurses	Black, adolescent, unmarried mothers, low socioeconomic status	Home visits (n=20). Monthly visits for 2 years. Control: no home visits (n=20) Intervention = encourage positive parent–child relationship and encourage parents to interact with child in developmentally conducive way
Johnson <i>et al</i> (1993), Ireland <sup>49</sup>	Random	0.25	Community mothers	Disadvantaged first time mothers	Home visits (n=127). Monthly visits during 1st year of life Control: routine care (n=121) Intervention = child development programme
Seeley <i>et al</i> (1996), England <sup>51</sup>	Non-random	0.43	Health visitors	Postnatal women	Home visits (n=70). 1 visit per week for 8 weeks. Control: routine primary care (n=30, historical controls) Intervention = counselling, including use of cognitive behavioural skills

Note that Barker (1988)<sup>46</sup> and Barker (1994)<sup>50</sup> are two separate studies with same intervention.

Table 4 Evaluation period, outcome measures and parenting outcomes

Reference	Evaluation period	Outcome measures	Parenting outcomes
McNeil and Holland (1972), USA <sup>34</sup>	18–21 months	Knowledge of child health	Mean (SD) knowledge score. Int = 89.8 (18.7), Con = 76.4 (16.7). $t=3.9$ , $p<0.05$
Grantham-McGregor and Desai (1975), Jamaica <sup>35</sup>	8 months	Playing and talking to child, awareness of child's mental abilities, awareness of educational value of toys, reading to child, positive motivation, time spent with child	Playing and talking to child, $p<0.05$ ; awareness of child's mental abilities, $p<0.05$ ; awareness of educational value of toys, $p<0.05$ . No differences in other outcomes between groups. Data not presented for any outcomes, only significance test results
Gutelius <i>et al</i> (1977), USA <sup>36</sup>	24, 36 months	Mother-child interaction Appropriately handling aggression Promoting future school success Daily use of praise	Int = 20/46, Con = 6/45, $p<0.01$ Int = 15/44, Con = 6/42, $p<0.05$ Int = 29/44, Con = 13/42, $p<0.01$ Int = 37/44, Con = 27/42, $p<0.05$
Hall (1980) <sup>38</sup> / Law-Harrison and Twardosz (1986), USA <sup>39</sup>	1 month	Neonatal Perception Inventory	Mean (variance) NPI 1: Int = 1.27 (3.31), Con = 1.87 (2.92), $p=0.05$ score NPI 2: Int = 2.8 (6.8), Con = 2.14 (15.2), $p=0.05$
Siegel <i>et al</i> (1980), USA <sup>37</sup>	4, 12 months	Acceptance Interaction/stimulation	Acceptance 4 months, $p<0.05$ ; 12 months, NS Interaction/stimulation 4 months, NS; 12 months, $p=0.02$
Stanwick <i>et al</i> (1982), Canada <sup>40</sup>	4 weeks	Mother's infant hygiene skills Knowledge about immunisation	No difference
Thompson <i>et al</i> (1982), USA <sup>48</sup>	30 months	Mean number of positive statements Mean number of positive responses	Mean (SD) statements: Int = 5.94 (4.6), Con = 3.44 (2.58), $p<0.06$ Mean (SD) responses: Int = 5.94 (4.6), Con = 3.44 (2.58), $p<0.06$
Madden <i>et al</i> (1984), USA <sup>41</sup>	24 months	Mother-child interaction Mother's teaching ability	Mean maternal interaction 1974: Int = 324, Con = 216. $F(1,36) = 12.2$ , $p<0.01$ 1975: Int = 352, Con = 178. $F(1,14) = 3.38$ , $p<0.1$ 1976: Int = 267, Con = 156. $F(1,40) = 18.6$ , $p<0.001$ Int = 1/15, Con = 6/15, $\chi^2=4.59$ , $p<0.05$
Seitz <i>et al</i> (1985), USA <sup>42</sup>	10 years	Involvement with child's schooling only at request of teacher	Int = 1/15, Con = 6/15, $\chi^2=4.59$ , $p<0.05$
Barker <i>et al</i> (1988), <sup>46</sup> (1994), UK <sup>50</sup>	12 and 36 months	Mean difference scores on home socialisation, language, cognitive and educational environment <sup>46</sup> Quality of home reading environment	Significant improvements in cognitive environment in 1 area at 36 months only and in educational environment in 1 area at 36 months. <sup>46</sup> Reported improvement in quality of reading environment in intervention group (no significance tests reported)
Beckwith (1988), USA <sup>43</sup>	1, 9 months	% observed talking to child % observed holding child Realistic developmental expectations	1 month 9 months Int = 47, Con = 31 Int = 57, Con = 47 Int (mean) = 2.2, Con (mean) = 1.5, $F(1, 63) = 3.9$ , $p<0.05$ Int = 11, Con = 20, $F(1, 60) = 3.7$ , $p<0.05$ Int = 11, Con = 4, $F(1, 60) = 4.2$ , $p<0.05$
Scarr and McCartney (1988), Bermuda <sup>44</sup>	18 months	Mother-child interaction Discipline strategies, mother's teaching ability	Significantly more intervention group mothers engaged in shared activities ( $p<0.01$ ). No difference in extent to which mothers relied on physical punishment as opposed to reasoning. No difference in mother's teaching ability
Sutton (1992), England <sup>47</sup>	12, 18 months	Application score	Mean application score: A=6.00, B=5.50, C=5.25, Con = 11.82. All intervention groups had significantly lower score than control group
Johnson <i>et al</i> (1993), Ireland <sup>49</sup>	12 months	Percentage reading to child Mean number (SD) of cognitive games Mean number (SD) of nursery rhymes	Int = 98% (n=125), Con = 54% (n=57), $p<0.0001$ Int = 3.75 (2.11), Con = 1.62 (1.39), $p<0.01$ Int = 7.74 (1.65), Con = 3.50 (3.24), $p<0.01$
Seeley <i>et al</i> (1996), England <sup>51</sup>	4 months	Mother-infant problems	Significantly fewer mother-infant problems in intervention group ( $\chi^2=13.3$ , 1 df, $p<0.001$ )

measures also indicated significant improvements in a variety of measures of parenting. While the majority of the studies we reviewed focused on families living in socioeconomic deprivation, it should not be assumed that "poor parenting" is the preserve of such families; or that inequalities in terms of material resources do not need addressing.

Measuring a complex process such as parenting is inevitably difficult. The HOME scale is the standard tool used most frequently for this purpose; however it only measures six dimensions of parenting, and other important aspects of parenting are not measured (and some may not be possible to measure). For this reason we have also included studies reporting other measures of parenting although they have not been included in the meta analyses. It is possible in the studies that we reviewed that social desirability bias may have overestimated the effect of home visiting. Although the HOME score is based on observations of the mother-child interaction and the home environment rather than maternal self reported outcomes, this will not completely remove the bias introduced by the parents' desire to achieve a good outcome, and their consequent "best behaviour" during the observation period. However, these measurements should be less biased than those that rely entirely on maternal self report. Many of the studies that

we reviewed did not use blinded outcome assessment, so this may also have led to the introduction of bias. The interpretation of the results from the studies using other measures of parenting is more difficult, but the majority of studies reported positive findings. Unfortunately, where studies reported both HOME scores and other measures of parenting, most papers did not present HOME subscale scores allowing comparisons to be made with their other parenting outcome measures. The use of such a large number of different outcome measures makes comparisons difficult within a systematic review.

The omission of the data necessary for undertaking a meta analysis in many of the studies has limited us to using Fisher's method of meta analysis. Despite attempting to contact authors to request means and standard deviations for total HOME scores and for subscale scores, we were unable to obtain sufficient data to undertake a meta analysis to calculate the size of the overall treatment effect in terms of increasing the HOME score. In future, authors should present this data, as its omission severely limits the use of their findings. Restricting the analysis to Fisher's method also precluded a statistical assessment of heterogeneity between effect sizes and an assessment of the likelihood of publication bias in terms of plotting effect size against sample size.

Despite the limitations of our systematic review and meta analysis, we have found that home visiting programmes are associated with an increase in the quality of the home environment as measured using the HOME scale and in improving parenting using a range of other measures. The majority of studies we reviewed used professional home visitors, most commonly nurses, but also teachers or social workers. Eight studies used lay workers, and the results of these studies appeared similar to those using professional visitors. Overall, eight studies failed to show a positive effect of home visiting, but they do not appear to be a distinctive group in terms of the characteristics of intervenors, participants, nature, duration, and intensity of intervention or sample size.

Most of the studies did not report repeated measurements of HOME scores over time. This would have been helpful in assessing the duration of the effect of treatment. However, more of the studies reporting follow up periods of less than two years appear to show a treatment effect,<sup>15-18 24-27 30 33</sup> than those with follow up periods of two years or more.<sup>17 25 28 32</sup> It is therefore possible that the effect of home visiting on the quality of the home environment reduces over time.

It is difficult to ascertain the content of the home visiting programme, which is effective in improving parenting. Many of the studies we reviewed did not provide a theoretical framework which attempted to hypothesise how the intervention would improve parenting. All of the studies we reviewed were pragmatic in design, in that they offered multifaceted interventions, similar to those already offered by health visitors in a UK context, and similar to those suggested for health visitors, and for Sure Start outreach workers in *Supporting Families*.<sup>5</sup> These interventions included education, advice, emotional and social support, “concrete help” (for example, transport to child health clinics, help repairing or obtaining household items, help finding housing, help in securing welfare benefits), increasing formal and informal support, and helping access community services. It is not possible, therefore, to separate out the effect of each of these aspects of the interventions. However, we have shown that the package of interventions was associated with improvements in parenting and the quality of the home environment.

One of the limitations of undertaking a systematic review in the field of home visiting, where many maternal and child health outcomes are assessed, is that by analysing each outcome separately, the relations between the various outcomes are obscured. The relation between improving HOME scores and child and maternal health outcomes is important as the clinical significance of these improved scores is difficult to assess. Looking across the findings from the 102 studies included in our overall review (results will be presented elsewhere), shows that home visiting programmes were also found to be effective in ameliorating child behavioural problems, improving child intellectual development, improving the detection and management of postnatal depression,

enhancing the quality of social support for mothers, and reducing the frequency of unintentional injury. It is possible that improvements in these outcomes, for example, providing better maternal support, may help families to parent in a way that enables them to achieve their child care goals more easily, or helps remove the barriers preventing them from achieving their child care goals.

How do the results of this review relate to health visiting in the UK? Only four of these studies used UK health visitors.<sup>33 46 50 51</sup> It is therefore difficult to extrapolate these results to UK health visiting, especially to a universal service, as the majority of studies have concentrated on families at high risk of adverse child and maternal health outcomes. The results of this review do however suggest that home visiting programmes by health visitors may have the potential to improve parenting skills and the quality of the home environment. Lay workers may also be able to achieve similar outcomes. Further work is required assessing the effectiveness of health visitors undertaking home visiting programmes to families considered to be at risk of poor parenting, or those identified at an early stage as having poor parenting skills. Comparisons between health visitors and lay workers are also needed, including an analysis of cost effectiveness.

The results of this review are important as they provide some evidence that there is action that can be taken to improve the parenting we provide for our children. However, the necessity to increase material resources and to improve the environment in which many socio-economically disadvantaged families live must not be ignored.<sup>6</sup> Interventions aimed at improving parenting can only ever be part of a wider preventive child health strategy.

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